FIATAGRI

WINNER

FIAT

F100 F110

F120 F130 Turbo

WORKSHOP MANUAL

06910101

SERVIZI TECNICI DI ASSISTENZA

Reprinted

WORKSHOP MANUAL

SECTIONS

S E R V I Z I T E C N I C I D I A S S I S T E N Z A

FOREWORD

◊ *This Manual is subdivided into Sections, each identified by a two–digit number and with separately numbered pages.*
For ready reference, these Sections maintain the same identification number and group description of the corresponding Flat Time Rate Manual.

◊ *Topics and information can be easily retrieved by consulting the Index on the following pages.*

◊ *Manual Print no. and respective edition/updating date appear on the bottom of each page.*

◊ *Revised sheets will carry the same print number followed by a 2–digit number (e.g. first revision 603.54.276.01; second revision 603.54.276.02 etc.) and date of issue.*
These pages will be accompanied by a specifically revised and updated index.

◊ *Information contained in this Manual are updated to the date reported on the print. As FIATAGRI maintains a constant improvement program for its product range, some information may not result updated because of modifications motivated by reasons of a technical or marketing nature as well as by the legal requirements of different Countries. In case of discordance, consult FIATAGRI Sales and Service Organizations.*

◊ *The imperial weights and measures are given for operators' convenience and though the closest approximation is sought, they are normally rounded off for practical reasons. In case of discrepancies only the metric units should be considered.*

IMPORTANT NOTICES

◊ *All maintenance and repair work reported and described in this Manual is the exclusive reponsibility of the FIATAGRI Service Network, which must carry it out by strictly following directions and using, wherever necessary, the specific service tools specified therein.*

◊ *Anybody carrying out service operations dealt with in this manual without abiding strictly to its prescriptions makes himself personally responsible for of any ensuing damage.*

◊ *The Manufacturer and all of the Organizations associated with its distribution network, including but not limited to national, regional or local distributors, decline any and all responsibility for damages that may derive from the abnormal behaviour of parts and/or components not specifically authorized by the Manufacturer, including those utilized in maintenance and/or repair work on its products, manufactured or commercialized by the same.*
In no case, warranties of any kind may be issued or forced on the products fabricated or distributed by the Manufacturer for damages deriving from any abnormal behaviour of parts and/or components unauthorized by the Manufacturer itself.

PRINTED IN ITALY

FIATGEOTECH S.p.A. – Viale delle Nazioni, 55 – 41100 MODENA – Italia
FIATAGRI – POST VENDITA – Servizi Tecnici di Assistenza – Pubblicazioni Tecniche
Print No. **603.54.276.00** – 01 – 1992 – 800

CONTENTS

GENERAL INSTRUCTIONS

IMPORTANT NOTICE

All service interventions dealt with in this Manual are intended to be the exclusive competence of the **FIATAGRI Service** world network organization and must be carried out in the absolute respect of the indications given hereafter, using, whenever necessary, the envisaged special service tools and equipment.
Anyone attempting to or carrying out work and operations included in this Manual without following full instructions and specifications makes himself personally and directly responsible for resulting damages.

ADJUSTMENTS

At each adjustment operation, select shim packs by measuring shims one by one with a micrometer gauge and summing up readings obtained: do not preventively rely on shim pack thickness or on nominal values of shims.

ROTARY SHAFT OIL SEALS

When installing oil seals on rotary shafts, pay attention to the following:

- prior to fitting, keep seals dipped for at least half an hour in the very fluid which is to be retained at work;
- thoroughly clean the shaft and make sure working surfaces are free from damages or faults of any kind;
- place seal with the lip facing the fluid; if the seal is of the thrower–lip type, grooves must be so oriented that during shaft rotation the fluid tends to be thrown back towards the inside of the machine part or component containing it.
- coat the sealing lip with a thin film of lubricant (possibly oil instead of grease) and pack the space between sealing lip and dust shield with grease;
- fit the seal in place pressing it or driving it with a flat–head tool or ram of the right diameter: on no account strike it with a hammer or mallet;
- when being pressed or driven in place, make sure that the seal is introduced perpendicularly to the seat surface and, once fitted, check that the seal is fully home and seated properly;
- to prevent seal lip damage during fitting, use some sort of protection interposed between mating surfaces of seal and shaft.

TOROIDAL "O–RING" OIL SEALS

Lubricate O–ring seals prior to installation to prevent their rolling over themselves and remain twisted during fitting.

JOINT SEALING COMPOUNDS

Upon joining mating surfaces indicated by an "X", apply one of the following sealing compounds: RTV SILMATE, RHODORSIL CALF 1 or LOCTITE PLASTIC GASKET.
Prior to sealing compound application, prepare the joint surfaces as follows:

- remove scales or encrusted matter using a wirebrush;
- thoroughly degrease surfaces using one of the following detergents: solvent (trichloroethylene), kerosene or water/soda solution.

BEARINGS

Suggested bearing preparation procedure prior to installation:

- heat to 80 to 90°C (176 to 194°F);
- cool them off before force fitting in place.

ROLL PINS

When fitting split pins make sure the cut is facing in the direction of force in order to put the pin under stress.
Instead, spiral pins do not require any particular way of fitting.

SPARE PARTS INFORMATION

Use exclusively FIATAGRI genuine spare parts **identified with the trademark shown below.**

These are the same and only spares assuring the standards of quality, safety and service life of the original parts fitted at the Factory.
Only the FIATAGRI original spare parts **can offer this guarantee.**
When ordering spare parts make sure to state:

- tractor model (marketing denomination) and chassis serial number;
- engine type and serial number;
- part number, found on microfish or printed Spare Parts Catalogue.

SERVICE TOOL INFORMATION

The service tools that FIATAGRI proposes and illustrates in this Manual are:

- studied and designed specifically for the FIAT tractor range;
- essential for technically reliable repairs and service work;
- manufactured and tested conforming to strict quality standards to offer efficient and long lasting service.

Service workshops and staff are also reminded that being equipped with the right tools means:

- operating in optimum working conditions;
- obtaining the best results;
- saving time and fatigue;
- working in more safety.

NOTE

Permissible wear limits suggested in this Manual for some of the parts or components are to be considered indicative only and absolutely not binding.
"Front", "rear", "right" and "left" indications given throughout this Manual are referred to the tractor operator seated on board and facing the direction of forward travel.

WHEN PUTTING IN MOTION A TRACTOR WITHOUT BATTERY

Outside feeder cables must be connected exclusively to the respective positive and negative cable terminals of the tractor using using efficient clamps ensuring an adequate and stable electric contact.
Disconnect all user circuits (lights, windshield wipers, etc.) prior to starting the tractor.
Should it be necessary to make functional checks of the tractor electrical system, make sure the feeder is connected; upon completion of check, disconnect all user circuits and put off the feeder before disconnecting the cables.

*Print No. **603.54.276.00** – 01 – 1992*

SAFETY RULES

PAY ATTENTION TO THIS WARNING SIGN

This symbol alerts you for important messages involving your safety.
Read messages attentively and strictly follow suggested precautions designed to avoid potential dangers and safeguard your health and personal safety.
You will find, throughout this manual, this sign associated with the following keywords:

***ATTENTION** – Warning intended to prevent unsuitable repair procedures with potential consequences to repairman's safety.*

***DANGER** – Associated with warnings of specific potential dangers for the repairman and any other people directly or indirectly involved.*

AVOID ACCIDENTS

Most accidents occurring in the workshop are a consequence of the failure to follow some simple and prudential safety rule. For this reason MOST ACCIDENTS CAN BE AVOIDED: it is enough to recognize possible causes and act consequently, using the necessary attention and precautions.

Handling any type of machine, regardless of how well it has been designed and manufactured, cannot exclude the possibility that an accident may occurr.

A cautions and alert repairman is the best guarantee against accidents.

Scrupolous observance of a single elementary safety rule would already be sufficient to avoid many serious accidents.

DANGER. Never attempt to clean, lubricate or service a tractor with engine running.

SAFETY RULES

GENERAL

◊ Pay your best attention to given maintenance and repair procedures.

◊ Do not wear rings, wrist watches, jewelry, loose or hanging apparel such as ties, torn clothing, scarves, unbottoned or unzipped jackets that can catch on moving or rotating mechanical parts. Wear instead safety prevention clothing, for example: anti–skid shoes, gloves, safety glasses, helmets, ect.

◊ Do not carry on any work on the machine with anyone on the operator' seat unless recognized as a qualified operator called to assist with the work at hand.

◊ Never attemp to operate the machine or any attached implement or equipment in any position other than the operator's seat.

◊ Never attemp any intervention of any kind on the machine when engine is running, unless the case is conforming to instructions

◊ Shut the engine off and check that hydraulic fluid is no longer under pressure before removing caps, covers, valves, etc.

◊ All servicing operations deserve best care and attention.

◊ Shop or field ladders and service stands should conform to present accident prevention regulations.

◊ Disconnect batteries and put signs on all controls to warn that the machine is being repaired or serviced. Block the machine and any attached implement or equipment to be lifted.

◊ Never check or fill fuel tanks and batteries, or use preheating fluid, while smoking or when there are open flame sources in the vicinity, as fluids involved are highly inflammable.

◊ Brakes are inactive when manually released for servicing: in such cases the machine should be secured with blocks or similar devices.

◊ The fuel gun must be steadily kept in contact with the filler cap while re–fuelling: the contact must be maintained until fuelling is completed to avoid the possibility of sparks consequent to accumulation of static electricity.

◊ When towing use exclusively the prescribed towing or pulling points. take care in making attachments: be sure pins and locks are sure before pulling. Stay clear of drawbars, cables or chains under load.

◊ To move a disabled machine, use a trailer or low–body truck if available.

◊ Load or unload the machine on level grounds affording full support to the trailer or truck wheels. Fix the machine securely to the trailer or truck platform and block wheels as required for transport.

◊ Use exclusively grounded auxiliary power sources to feed electric heaters, battery–chargers and similar equipment in order to avoid the hazards of electric shocks.

◊ If necessity arises to handle or transport heavy parts and components, make sure to use hoists or similar equipment of appropriate lifting capacity.

◊ Always watch out for presence of people in the vicinity.

◊ Never pour gasoline or diesel fuel into open or wide and low containers.

◊ Never use gasoline, diesel fuel or other flammable liquids detergents: use, instead, non–flammable and non–toxic solvents available in commerce.

◊ When using compressed air to clean parts, wear safety glasses with side protections.

◊ Limit the pressure within a maximum of 2.1 bar, conforming to local or national legislation.

◊ Do not run engines in closed premises not adequately ventilated.

◊ Do not smoke and neither use or allow open flames or sparking in the vicinity, when re–fuelling or handling easly flammable materials.

◊ Do not use flames for lighting purposes when searching for sources of fluid leaks on the machine.

◊ Move very carefully when working under the machine and also on it or in the vicinity of the same. Wear the prescribed safety equipment: helmets, glasses and special shoes.

◊ When carrying on checks requiring engine running, call for the help of a qualified assistant remaining in the operator seat at all times with the repairman in sight.

◊ For field service, bring the machine possibly on level grounds and block it. If the job must be necessarily carried out on a gradient, preventively block the machine and move it on a level area as soon as feasible and affording adequate safety.

◊ Beware of kinky or bent chains and cables, do not use them for lifting or towing. To handle them, wear thick gloves.

◊ Chains should always be anchored securely: check that anchoring point is robust enough to carry the load. Keep people clear of anchor point, chains or towing cables.

◊ Keep maitenance and servicing areas always CLEAN and DRY. Remove any water or oil puddles immediately.

◊ Do not pile up grease or oil–impregnated rags: they are a fire hazard. Always teare them in a closed metal container. Before moving the machine or attached implement, check, adjust and block the operator seat. Also make sure no people are in the immediate vicinity within operating area of machine or implements.

◊ Do not hold in your pockets objects that may fall, unseen, inside the machine.

◊ Where metal particles or objects are apt to fly or fall, wear protective equipment such as goggles or safety glasses with side shields, hard hats or helmets, safety shoes and heavy gloves.

◊ When welding is required, wear the specific protective accident–prevention equipment: dark glasses, helmets, overalls, special gloves and shoes. Dark glasses must be worn also by anyone standing by while welding is in progress. DO NOT LOOK AT ARK WITHOUT ADEQUATE EYE PROTECTION.

◊ Wire ropes develop metallic sleevers with use: protect yourself by wearing adequate safety equipment (heavy gloves, glasses ect.).

◊ Handle all parts with extreme care. Keep hands and fingers off rotating parts, closed parts and open joints and similar. Always use the authorized accident prevention clothing items, such as safety glasses, heavy gloves and safety shoes.

STARTING

◊ Do not run engines inside closed premises without adequate ventilation or equipped with suitable means for removal of exhaust gases.

◊ Never bring head, body, arms and legs, feet, hands and fingers close to running fans or drive belts.

ENGINE

◊ Before removing the radiator cap, turn it very slowly in order to remove inside pressure. Add coolant only with engine stopped or idling, if warm.

◊ Do not let the engine run when re–fuelling, particularly if still hot, owing to the possibility of fire hazard if fuel is spilled over.

◊ Never attempt to check or adjust fan belts when engine is running. Do not adjust the engine fuel pump when the machine is in motion.

◊ Never lubricate the machine when the engine is running.

ELECTRIC SYSTEM

◊ When using auxiliary batteries, remember that cables must be connected at both ends following the prescribed procedure: (+) with (+) and (–) with (–).Avoid short–circuiting battery posts. BATTERY GAS IS HIGHLY INFLAMMABLE. When re–charging, let the battery comparment open, thus affording a better ventilation. Never check battery charge by "bridging" across posts with metal objects. Avoid sparks or flames in the battery area. Do not smoke, to prevent explosions.

◊ Prior to servicing interventions of any sort, make sure there are no fuel or electrical leaks or losses: remove and rectify them before proceeding with work.

◊ Do not re–charge batteries inside closed premises: make sure ventilation is adequate to prevent the possibility of accidental explosions caused by the accumulation of battery gas produced during the charging process.

◊ Always disconnect batteries prior to interventions of any kind involving the electric system.

HYDRAULICS

◊ Fluid escaping under pressure through a small hole can be almost invisible and can develop sufficient striking force to penetrate the skin; in these cases, should it be necessary to verify the leak, protect yourself using a cardboard or a piece of wood. NEVER DO IT WITH YOUR BARE HANDS: if the fluid spray penetrate the skin, see a doctor immediately. In fact, without qualified medical assistance, a serious infection or reaction may develop.

◊ When measuring fluid pressure, use a gauge compatible with expected values.

WHEELS AND TYRES

◊ Make sure tyres are inflated correctly to the pressure specified by the Manufacturer.
Periodically check for damages at wheel rims and tyres.

◊ Stand to one side when correcting pressure or inflating tyres.

◊ Check tyre pressure on unloaded machines and with cold tyres only in order to avoid erroneous readings with resulting overinflation. Do not use recovered wheel parts because improper welding, brazing or heating may have weakened them and caused failures.

◊ Never cut or weld on the rim of mounted and inflated tyre.

◊ To remove wheels, block front the machine at front and rear on all wheels. After lifting the machine, place supports underneath to prevent it from falling, according to present regulations.

◊ Deflate the tyre before attempting to remove objects caugt in the threads.

◊ Never inflate tyres using an inflammable gas: explosions with injuries to nearby people may occur.

REMOVAL – INSTALLATION WORK

◊ Lift and handle all heavy parts using means and equipment of adequate capacity. Make sure appropriate hooks and slings are used. Use the lifting eyes specifically provided. Watch out for people in the vicinity of the load to be lifted.

◊ Handle all parts with extreme care. Keep hands and fingers away from open joints between parts components. Wear homologated accident–prevention safety clothing such as goggles, gloves and special shoes.

◊ Guard against twisted and kiking chains and cables. Always wear safety gloves to handle chains or cables.

LUK 13"/13" CLUTCH (F100–F110–F120)

Type	single, dry–plate with torsion springs
Control	hydrostatically operated, pedal control
Release mechanism	diaphragm spring
Clutch plate friction material	cerametallic buttons
Clutch plate total thickness under a load of 8800 N – 897 kg or 2280 lb)	9.6 to 10.4 mm (.38 to .41 in)
Spline backlash on gearbox drive shaft	0.076 to 0.136 mm (.003 to .005 in)
Clearance fit of throw–out collar	0.060 to 0.136 mm (.002 to .005 in)
Clutch pedal mounting adjustment	see page 18–10

LUK 14"/14" CLUTCH (F130)

Type	single, dry–plate with torsion springs
Control	hydrostatically operated, pedal control
Release mechanism	diaphragm spring
Clutch plate friction material	cerametallic buttons
Clutch plate total thickness under a load of 8800 N – 897 kg or 2280 lb	10.1 to 10.9 mm (.40 to .43 in)
Spline backlash on gearbox drive shaft	0.076 to 0.136 mm (.003 to .005 in)
Clearance fit of throw–out collar	0.060 to 0.136 mm (.002 to .005 in)
Clutch pedal mounting adjustment	see page 18–10

TORQUE DATA

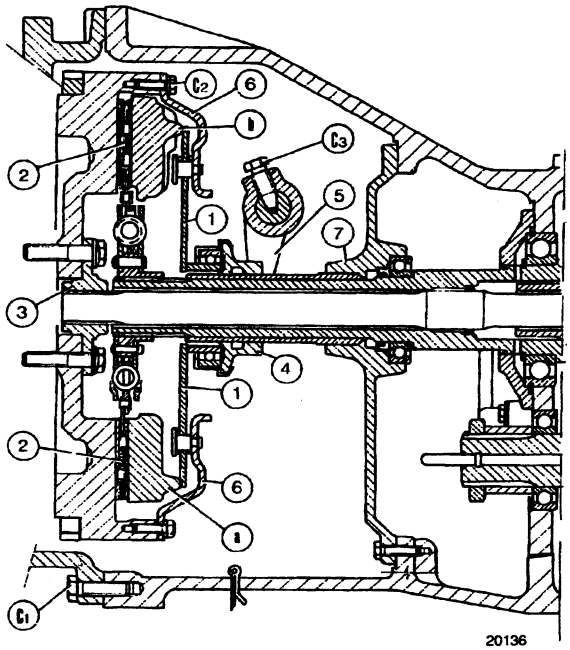
DESCRIPTION	Thread size	Torque		
		Nm	kgm	ft.lb
Capscrews and nuts, clutch case to engine (C_1)	M 12 x 1.25	88	9	65
Capscrews, clutch to engine flywheel (C_2)	M 8 x 1.25	23	2.4	17.5
Screws, shift forks (C_3)	M 16 x 1.5	157	16	116

SERVICE TOOLS

ATTENTION – Operations included in this section of the Manual must be performed using the **ESSENTIAL** tools further evidenced by the identification code **(X)**.
Besides, to work safely and achieve the best technical results, with additional savings of time and fatigue, these mandatory tools should be used in conjonction with the suggested special tools listed below and further integrated with the self–made ones for which you will find the necessary working drawings and specifications directly on this manual.

List of the special tools necessary to perform service operations covered by this section of the Manual:

	292320	Workshop stand, tractor disassembly
X	**293974**	Spigot, clutch centering (on tractor)
	292888	Pilot pins, transmission housing/engine alignment



Longitudinal sectional view of LUK 13" and 14" clutches

a. LUK 13" clutch – b. LUK 14" clutch – C_1. Capscrew, clutch case to engine – C_2. Capscrew, clutch to engine flywheel – C_3. Lockscrew, clutch release levers – 1. Diaphragm spring – 2. Master clutch plate – 3. Splined hub, PTO oil clutch shaft control – 4. Throw–out collar and thrust bearing – 5. Throw–out collar (4) shift fork – 6. Clutch cover – 7. Fixed collar cover.

ENGINE CLUTCH TROUBLE–SHOOTING CHART

Fault	Diagnosis	Correction
Clutch slips	1. Lack of clearance (G, page 18–12) between rod and hydraulic pump piston.	Replace pump.
	2. Disk (2) and/or pressure plate and flywheel wear.	Replace disk and the clutch, if necessary, and grind the flywheel.
	3. Weak or unserviceable diaphragm spring (1).	Replace clutch.
	4. Oil or grease on clutch disk (2) facings.	Replace disk, eliminate the cause for the presence of lubricants inside the clutch compartment and thoroughly clean friction surfaces.

ENGINE CLUTCH TROUBLE–SHOOTING CHART

(cont.)

Fault	Diagnosis	Correction
Clutch grabs or chatters	1. Tight external control linkage.	Check linkage pivot points and lubricate.
	2. Bent or warped clutch disk (2, page 18–2).	Replace disk.
	3. Disk (2) hub tight on clutch shaft.	Remove clutch and check meshing: if necessary, replace defective parts.
	4. Disk (2) with damaged torsion damper springs or loose at hub (loose rivets).	Replace disk.
	5. Oil or grease on clutch disk (2) facings.	Replace disk, eliminate the cause of the presence of lubricants inside the clutch compartment and thoroughly clean disk facings.
	6. Diaphragm spring (1) with broken elements.	Replace clutch.
Clutch fails to disconnect and drags	1. Bent or warped clutch disk (2).	Replace disk.
	2. Seizure of external controls.	Check, replace defective parts and lubricate.
	3. Inefficient hydraulic pump and/or lower cylinder.	Overhaul or replace hydraulic pump and/or cylinder.
	4. Disk (2) hub tight on clutch shaft.	Free disk and, if necessary, replace disk or clutch shaft.
	5. Controls out of adjustment.	Adjust controls (see page 18–11).
	6. Presence of air inside the clutch hydraulic control system.	Bleed hydraulic system (see page 18–13) and, if necessary, replace pump and/or lower cylinder seals.
	7. Diaphragm spring (1) with broken elements and/or damaged throw–out bearing.	Replace clutch and/or throw–out bearing.
Clutch noise at engagement or disengagement	1. Bent or warped clutch disk.	Replace disk.
	2. Clutch disk (2) with defective torsion damper springs.	Replace disk.
	3. Excessive backlash on clutch shaft and disk (2) hub meshing splines.	Replace disk and, if necessary, the clutch shaft.
Clutch noise at disengagement	1. Worn throw–out bearing.	Replace bearing
Clutch control pedal hardness	1. Broken or disconnected clutch return spring.	Replace or hook–up the return spring.
	2. Seized pump plunger.	Overhaul or replace hydraulic pump.
	3. Tight external control linkage.	Check linkage points and lubricate.
	4. Hard pedal.	Check linkage and lubricate.

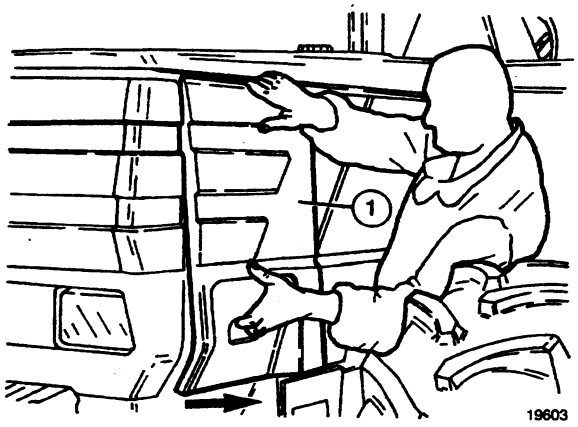
LUK CLUTCH
Removal–Installation (Op. 18 110 10)

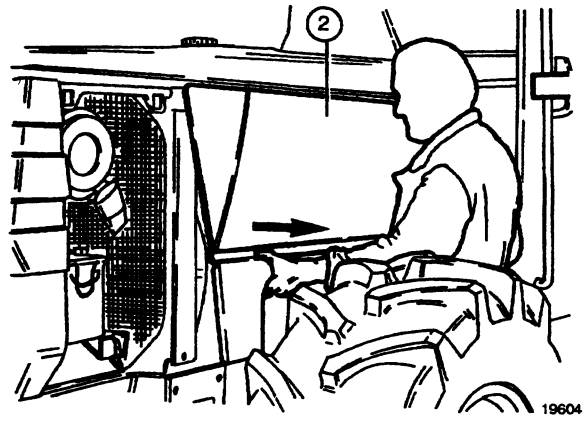
To gain access to the clutch, separate the engine with attached front axle or live axle from the transmission.

⚠ DANGER ⚠

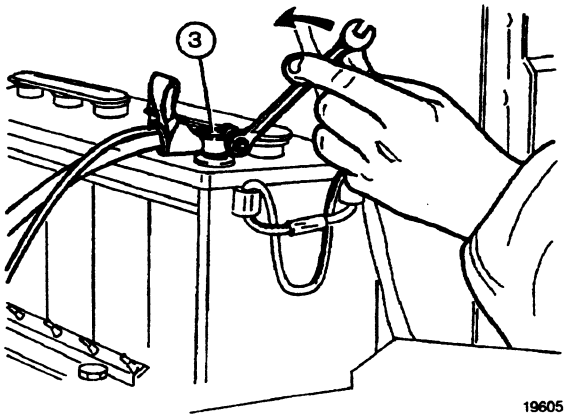
Lift and handle all heavy components using lifting equipment of appropriate capacity.
Ensure that units or parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of the load to be lifted.

Proceed as follows:

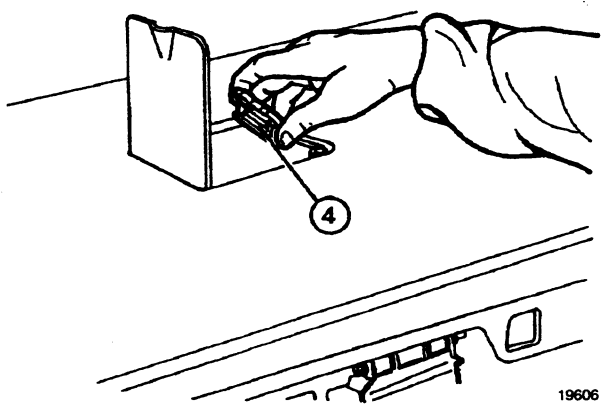




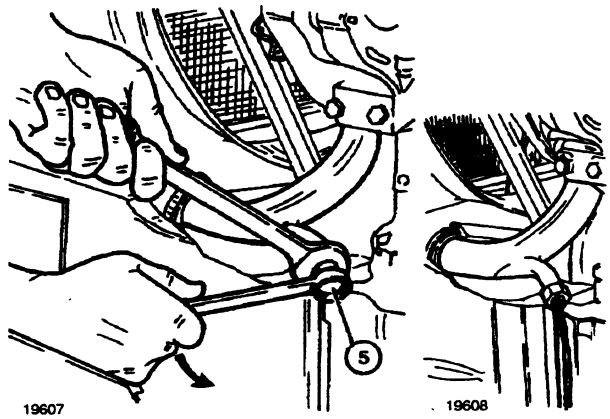
1. Remove panels (1 and 2) on both sides.



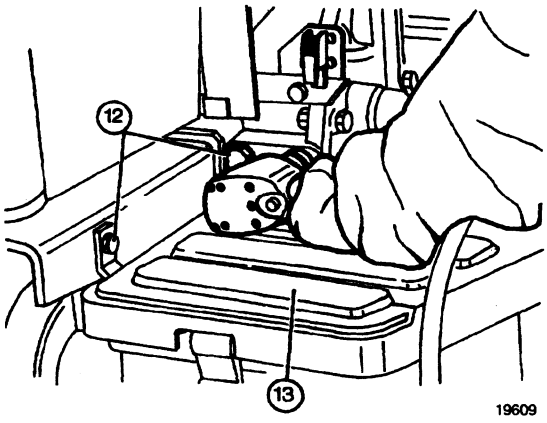
2. Disconnect the battery positive cable (3) and insulate properly.



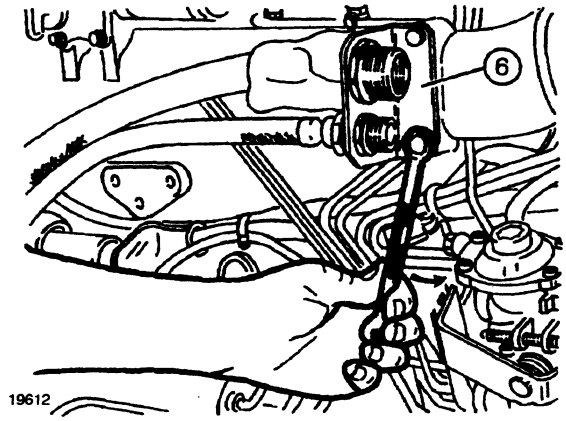
3. Remove the engine cooling radiator filler plug (4).



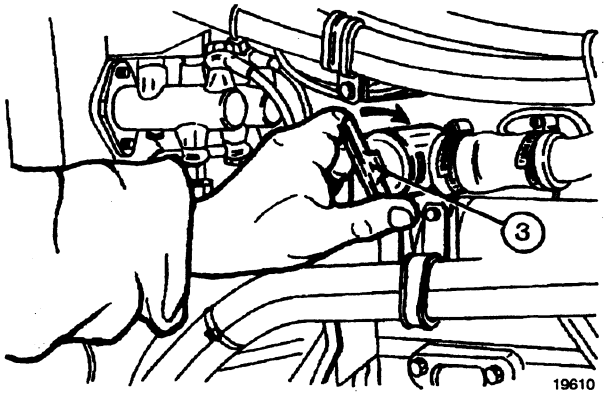
4. Remove the radiator cooler drain pipe plug (5).



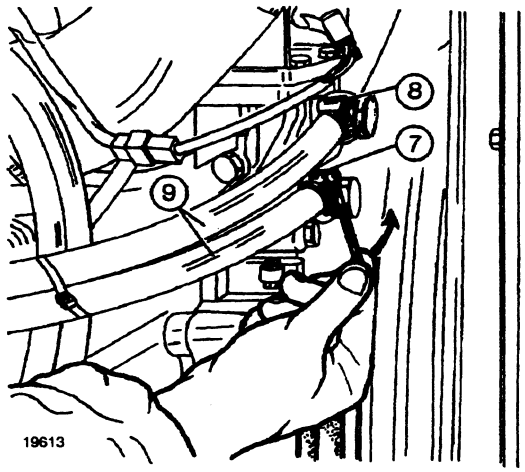
5. Remove the retaining screws (12) and tractor tool box (13).



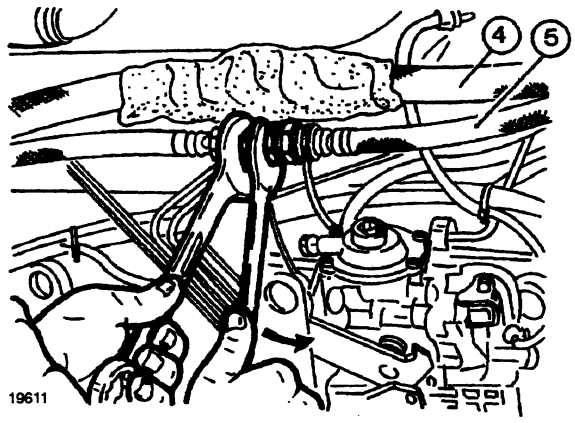
8. Remove retaining screws and supporting bracket (6) of the previously disconnected lines (4 and 5).



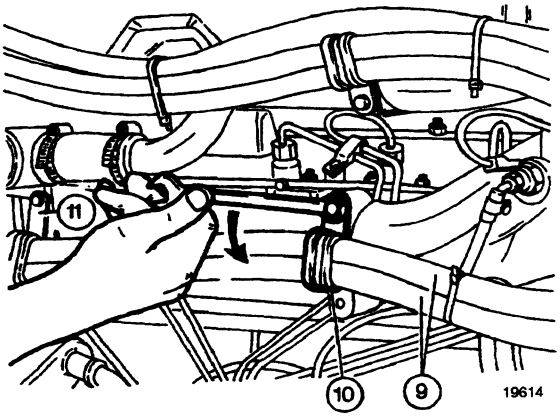
6. Shut off the cock (3) on the line connecting main and auxiliary tanks.



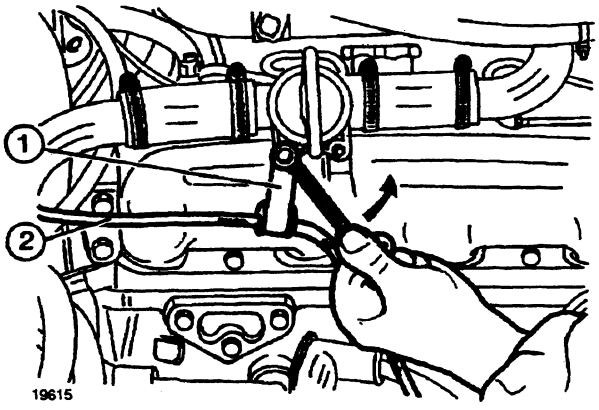
9. Unscrew clamps (7 and 8) securing the heater–to–engine connecting lines (9).



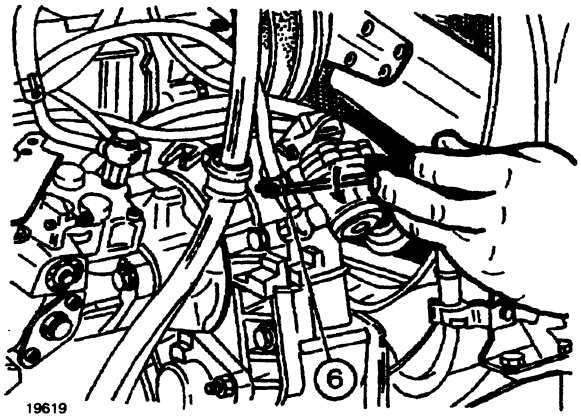
7. If the cabin is air–conditioned, remove both refrigerant lines (4 and 5).



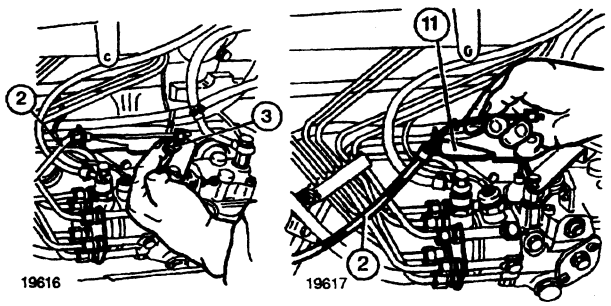
10. Remove the retaining screws of the supporting clamps (10 and 11) and subsequently the lines (9) from the engine.



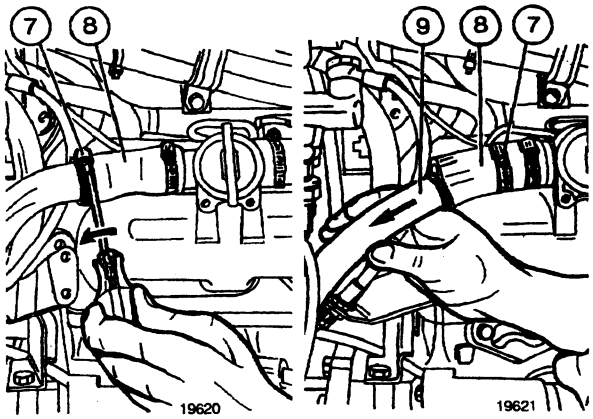
11. Slacken the engine accelerator cable supporting clamp (1) screw.



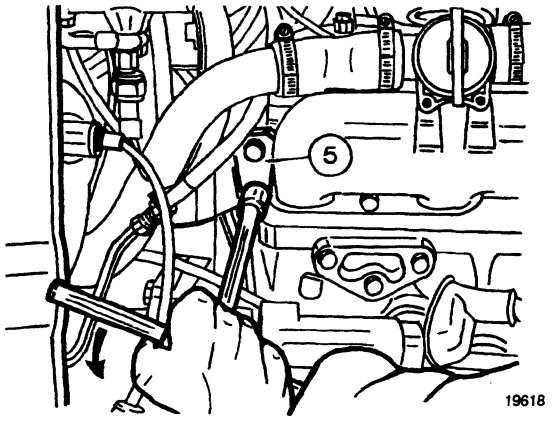
14. Loosen the feed line securing band clamp (6) and withdraw the former from its connection.



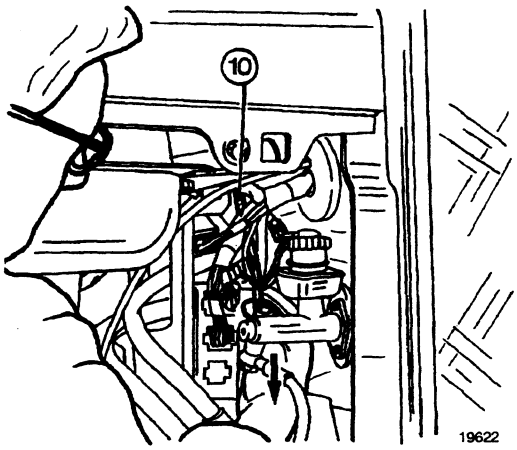
12. Snap off the stop spring (3), free the terminal section of cable (2) and finally withdraw the latter from the bracket (11).



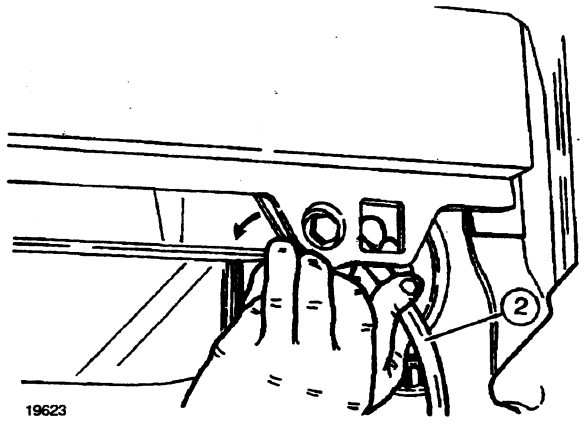
15. Drain out approx. 2 liters or 1/2 gallon of fuel by removing plug (6, page 21–14), loosen band clamp (7) securing hose (8) and finally withdraw the latter from pipe (9).



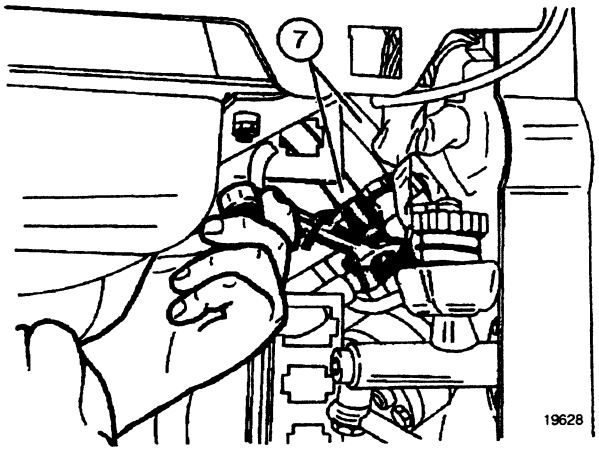
13. Unscrew the fastenings of the brake oil lines supporting bracket (5) and remove the latter from the engine.



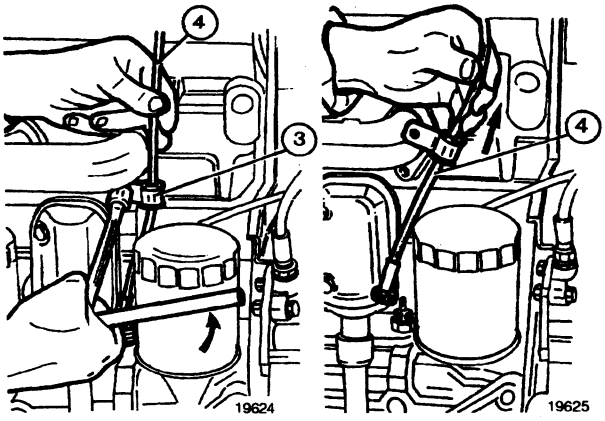
16. Pull out the windscreen washer fluid tubelet (10).



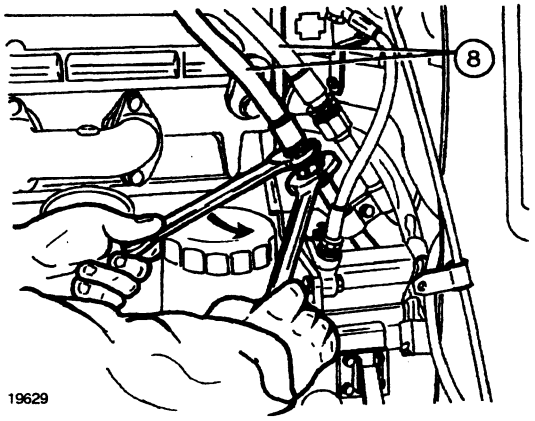
17. Loosen the breather line (2) clamp.



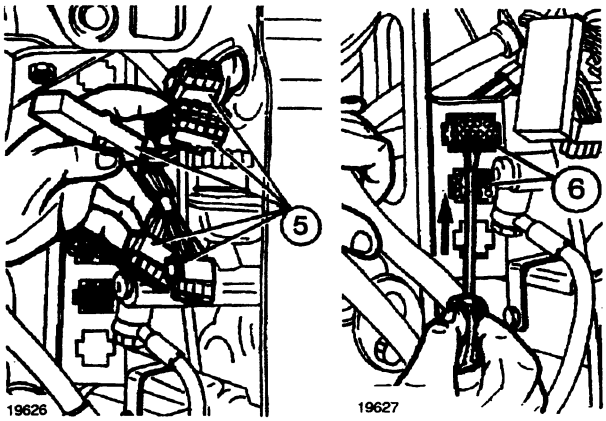
20. Unscrew the connections of the power steering cylinders oil lines (7) and remove them.



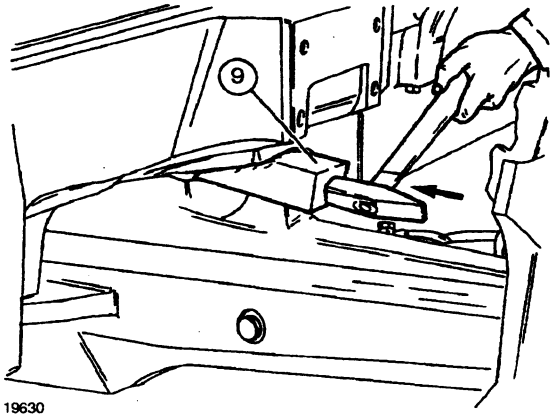
18. Back off the retaining clamp (3) screw and the tractor meter gauge (4) cable connection, then remove the instrument from the engine.



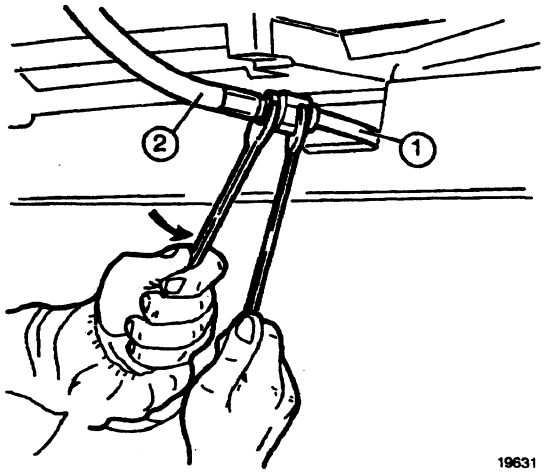
21. Unscrew the connections of the power steering hydrostatic unit oil lines (8) and remove them.



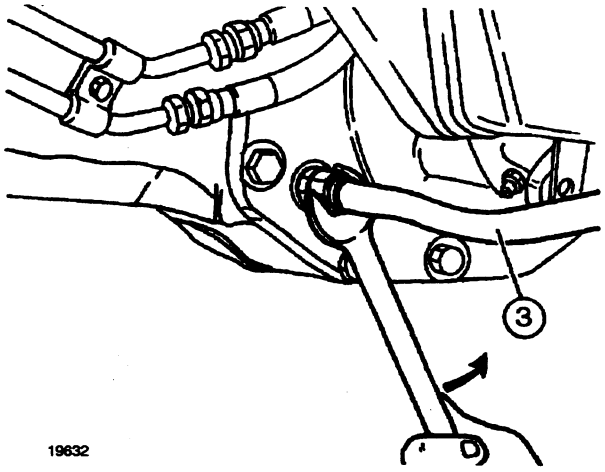
19. Disconnect electric leads (5 and 6).



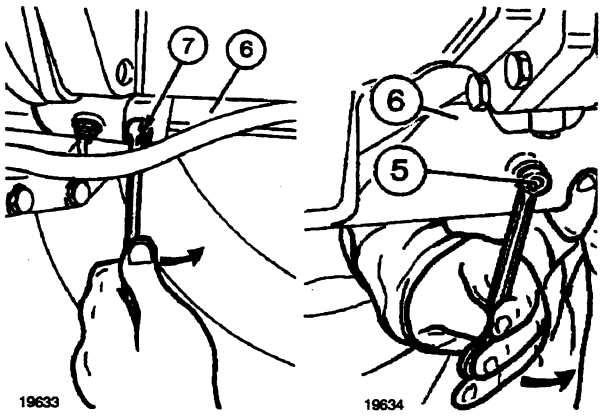
22. Block the engine with respect to front axle or live front axle by installing two wood supporting blocks (9), one on each side , as shown in the figure.



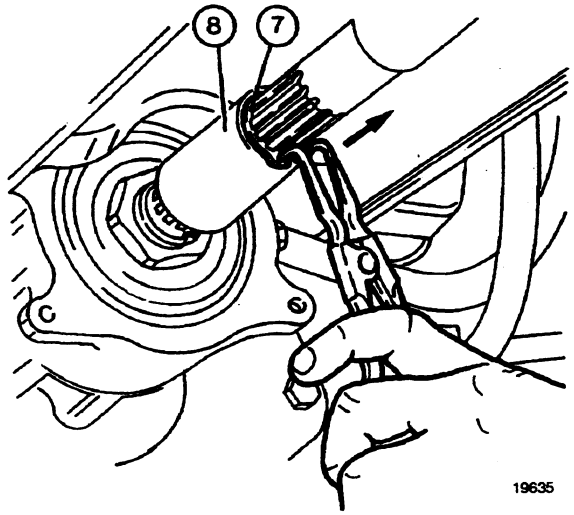
23. Disconnect hose (2) from pipe (1) leading to the live front axle differential lock.



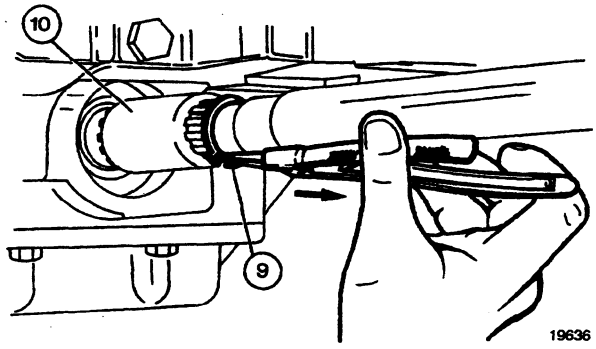
24. Remove hose (3) from live front axle.



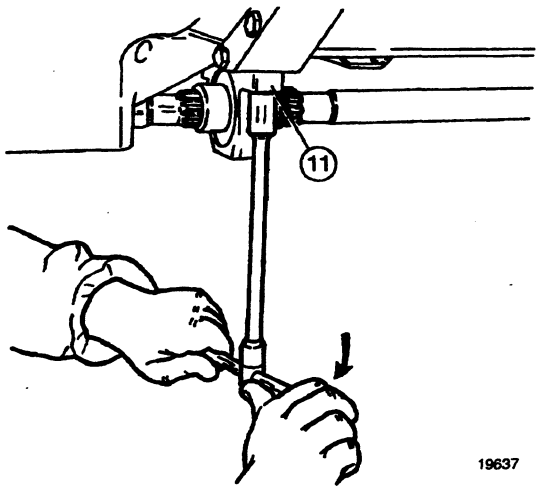
25. Unscrew the fastenings, front (4), central (5) and rear screws securing the live front axle transmission and drive shafts guard (6).



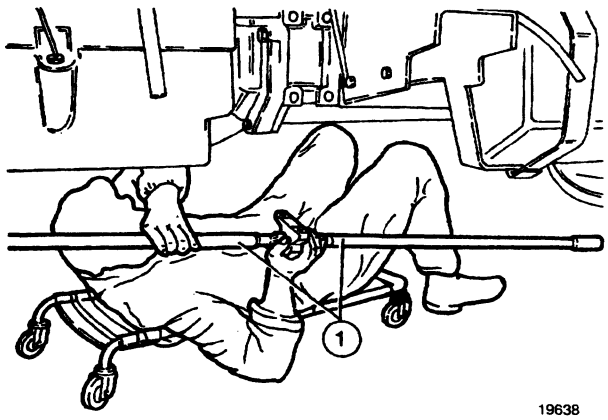
26. Snap the retaining ring (7) open and move back sleeve (8) to free it from the front axle splined connection.



27. Snap the retaining ring (9) open and move sleeve (10) forward to free it from the drive box splined connection.

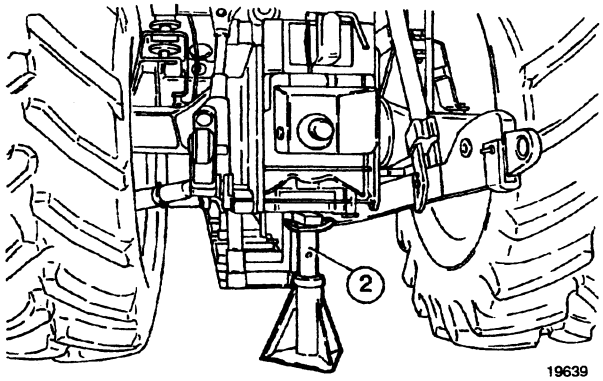


28. Back off the capscrews of the front axle transmission drive shafts mounting bracket (11).

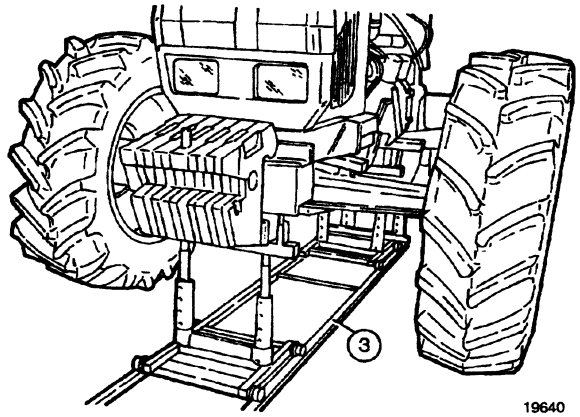


29. Retrieve shafts (1) and respective supports.

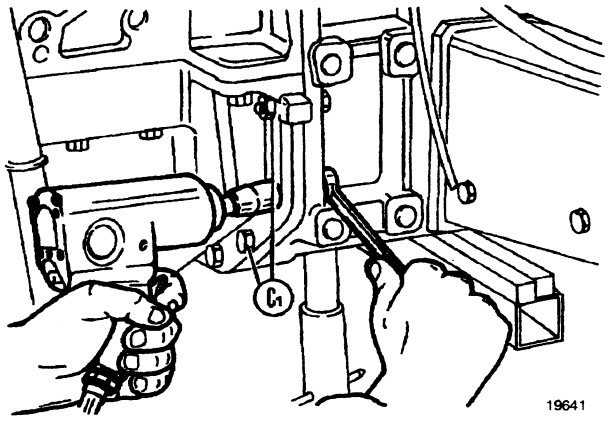
Note – Operations 23 to 29 apply in case of 4WD tractors only.



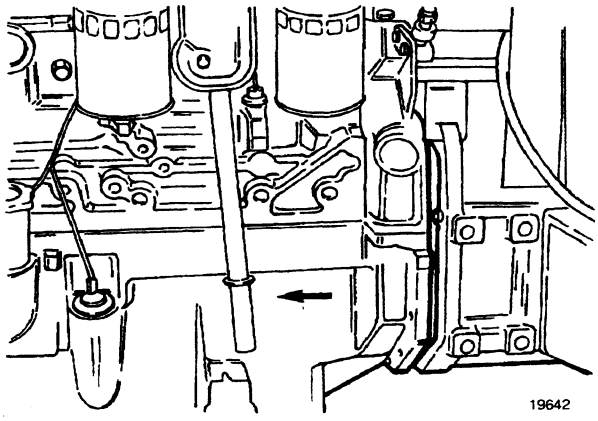
30. Support the rear end of the tractor through a stationary stand (2) positioned underneath the rear transmission case.



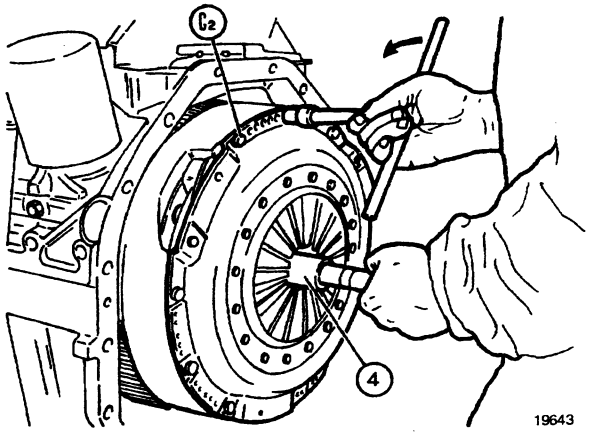
31. Place the tool **292320** (3) under the tractor positioning the stationary support underneath the clutch case and the two mobile parts under the tractor weights and engine oil sump, respectively.



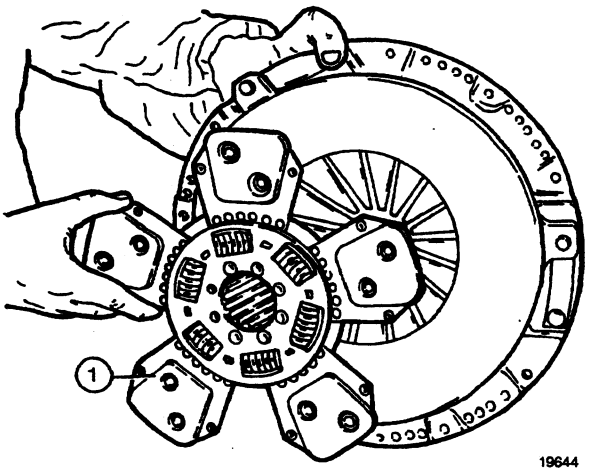
32. Block rear wheels by pulling the hand brake or through wedge blocks suitably installed and then unscrew capscrews (C_1).



33. Split the tractor by separating engine and clutch case, move the former forward making sure that there no parts still connected or any undue resistance.



34. Unscrew the clutch to engine flywheel fastening capscrews (C_2) and remove the clutch with the aid of the centralizer spigot tool no. **293974** (4).



35. Check the clutch disk (1) for wear and replace it if rivets are near to or flush with the cerametallic button friction surface.

36. When installing the clutch pay attention to the following:

    a. proceed by reversing the removal sequence of operations starting from no. 35 back to no. 1;

    b. torque tighten fastenings to specifications data of page 18– 2;

    c. apply grease (**grassofiat TUTELA G9**) on the clutch disk splined drive;

    d. use special tool **293794** (4, page 18–9) to join clutch and flywheel correctly;

    e. screw on two centering dowels **292888** to ease installation, paying attention to avoid interferences;

    f. thoroughly clean and degrease mating surfaces prior to assembly.

CLUTCH HYDROSTATIC CONTROL
Pump removal–installation (Op. 18 104 15 – 18 104 30)

⚠ CAUTION ⚠

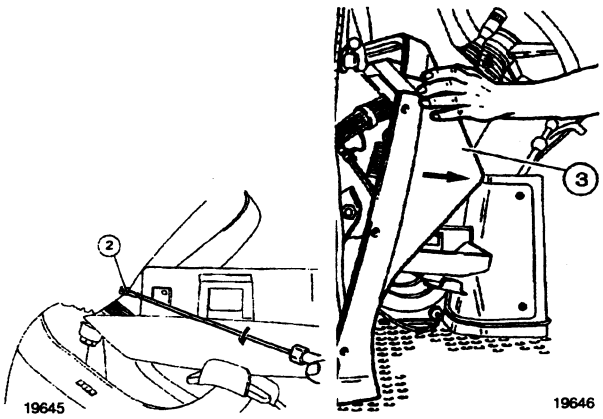
Handle all parts with great care. Do not put hands or fingers between parts.
Wear safety equipment such as goggles, gloves and special shoes.

⚠ CAUTION ⚠

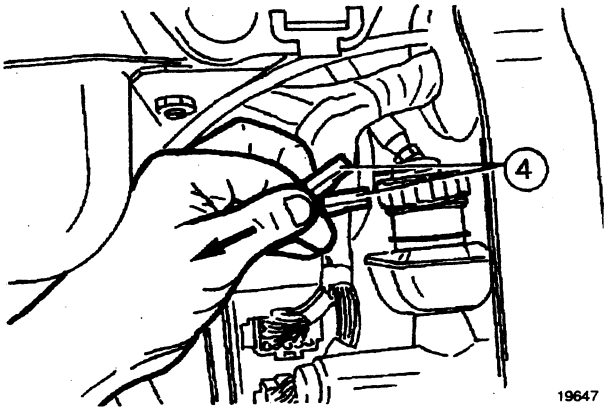
Use suitable tools to align holes. DO NOT USE FINGERS OR HANDS.

Proceed as follows:

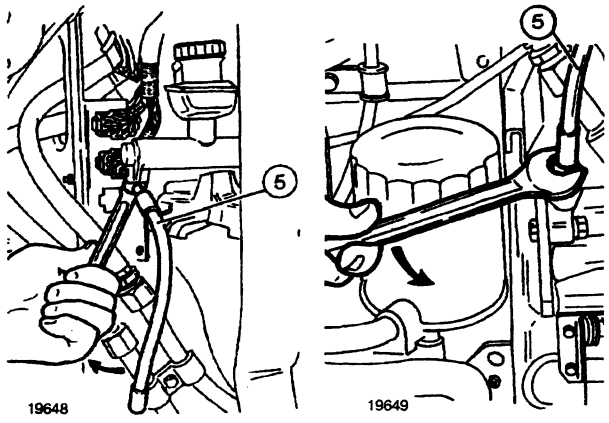
1. Remove body panels (1 and 2, page 18–4) on both sides.
2. Disconnect the battery positive cable (3, page 18–4) and insulate properly.



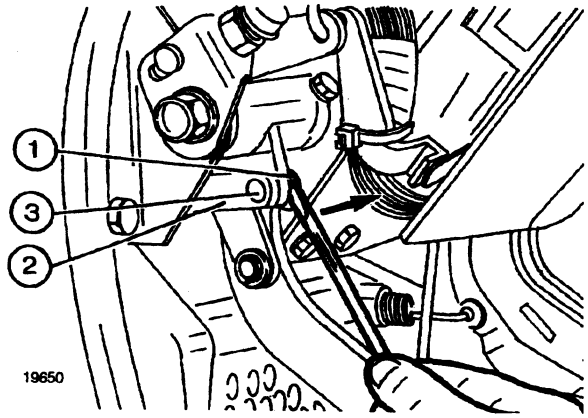
3. Remove the three side screws, the rear one (2) and finally the LH side protection (3).



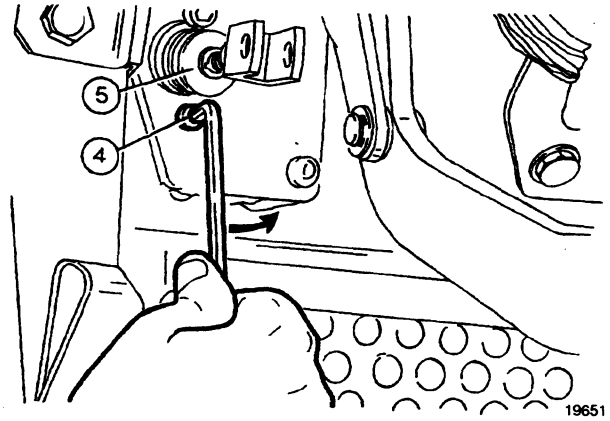
4. Disconnect the reservoir oil level gauge electric connecting (4).



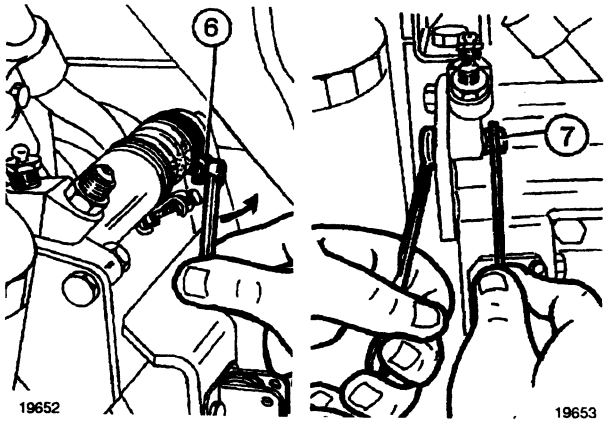
5. Unscrew the oil delivery line (5) between pump and lower cylinder.



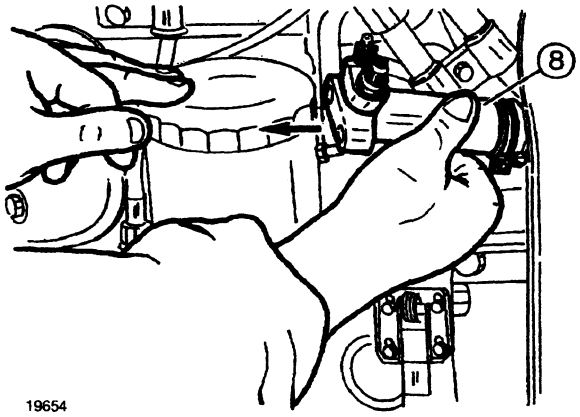
6. Remove the spring stops (1) and withdraw the pin (3) from fork (2).



7. Unscrew the fastenings (4) and retrieve the hydraulic pump (5) from engine side.



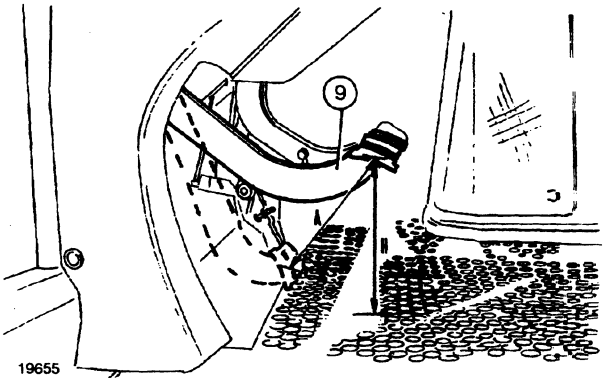
8. Slacken the band clamp (6) and retrieve it from the lever, remove screws (7).



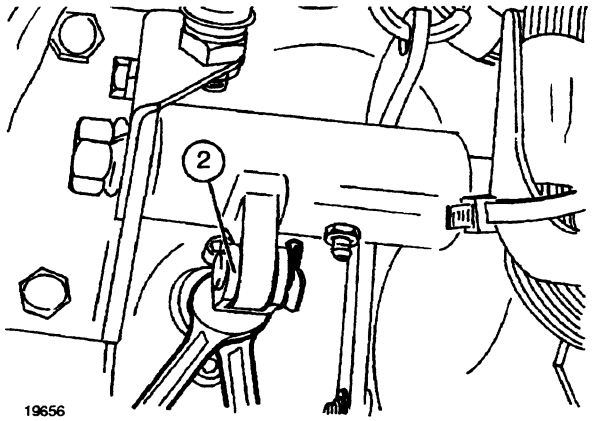
9. Retrieve the hydraulic cylinder (8).
10. Install the clutch control assembly by reversing the removal sequence of operations and, in addition, adjust the pedal position as follows:

Height clutch pedal adjustment.

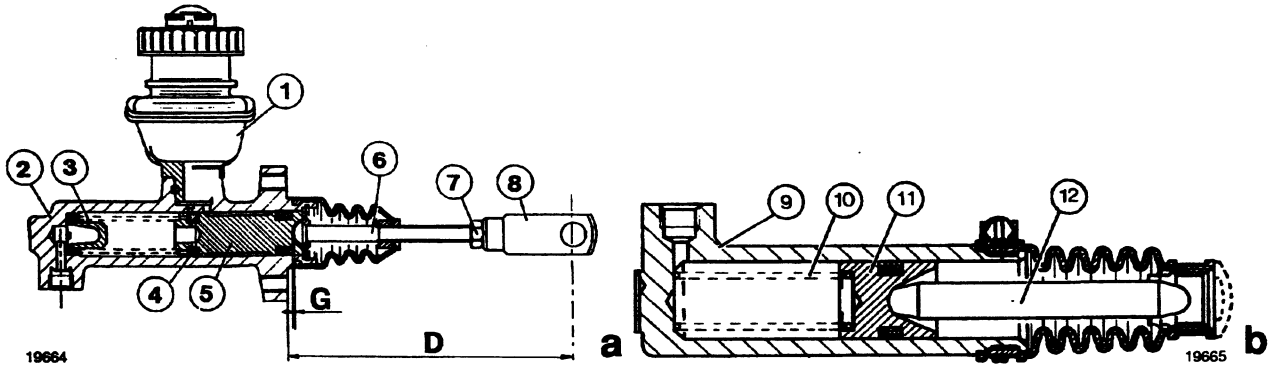
11. Adjust distance (D, page 12) prior to refitting the pump.



12. With clutch pedal (9) connected to fork (2) check that height (H) from center of pedal to the top surface of the mat is approx. 190 mm or 7–1/2 in.



13. If correction is needed, slacken the jam nut and turn the screw clockwise on the fork (2) until obtaining the desired height (H), then check that the free travel (A) of pedal (9) is 170 mm (6.69 in).



Clutch hydrostatic control assembly

a. Operating pump – b. Lower cylinder – G = .1 to 1.4 mm (.004 to .055 in). Pin (6) clearance with clutch pedal at rest – D = 137.5 to 138 mm (5.41 to 5.43 in). Distance measured from center of fork (8) to the mounting flange on pump body – 1. Reservoir – 2. Pump body – 3. Spring – 4. Seal – 5. Plunger – 6. Pin – 7. Jam nut – 8. Fork – 9. Clutch control cylinder – 10. Spring – 11. Plunger – 12. Pin.

HYDROSTATIC CLUTCH CONTROL
Disassembly–Assembly (Op. 18 104 18 – 18 104 33)

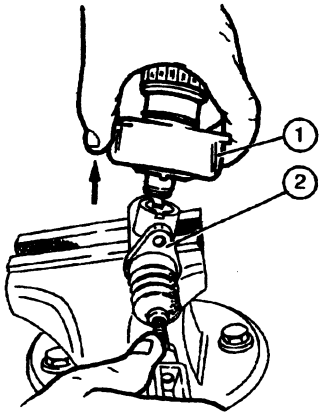
⚠ CAUTION ⚠

Handle all parts with great care. Do not put hands or fingers between parts.
Wear safety equipment such as goggles, gloves and special shoes.

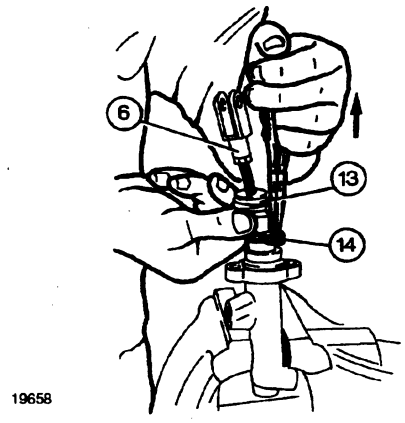
⚠ CAUTION ⚠

Use suitable tools to align holes. DO NOT USE FINGERS OR HANDS.

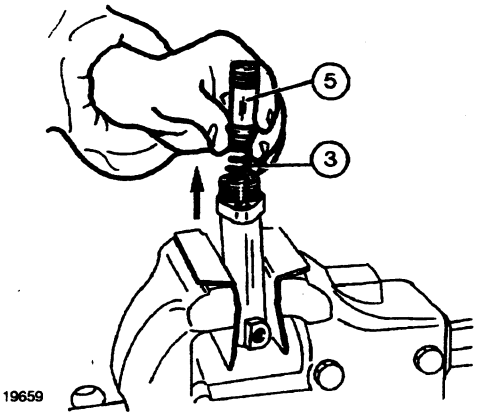
Proceed as follows:



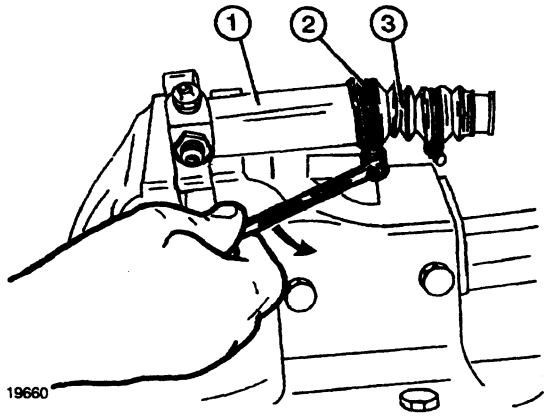
1. Hold the pump in a workbench vise and withdraw the reservoir (1) from pump body (2).



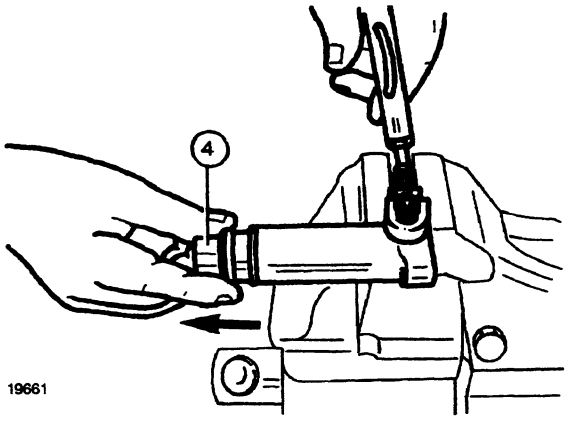
2. Move out hose (13), disengage the retaining ring (14) and remove the complete rod (6).



3. Retrieve plunger (5) and its spring (3).



4. Hold the lower hydraulic cylinder (1) in a workbench vise, slacken the band clamp (2) and remove hose (3).



5. Use compressed air to extract the plunger (4) and spring.
6. At re–assembly of the hydraulic pump and clutch control lower hydraulic cylinder pay attention to the following:

   a. proceed by reversing the sdequence of operations starting from no. 5 back to no. 1;

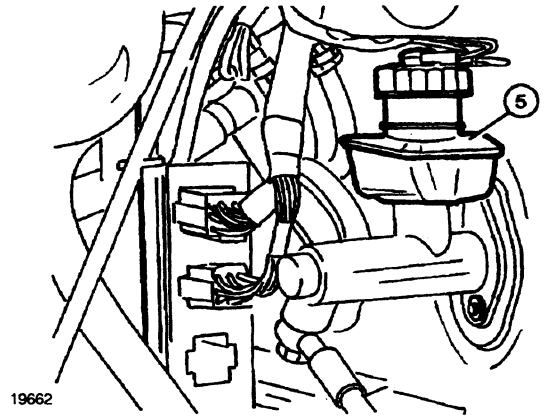
   b. inspect seals and replace them if necessary;

   c. check sliding surfaces of pistons and seats.

HYDROSTATIC CLUTCH CONTROL
Air bleeding of the clutch control hydraulic system (Op. 18 104 05).

Air bleeding is necessary after any intervention on the hydraulic system.
Proceed as follows:

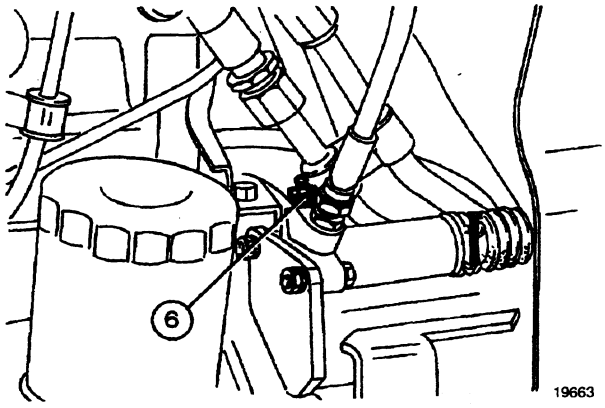
1. Accurately clean external surfaces in correspondence of the bleeding screw (6) and oil reservoir (5) cover.



2. Make sure that the reservoir (5) is filled to level before and after air bleeding.

Note – Previously drained oil must be thoroughly filtered before re–use.

3. Depress the clutch pedal **slowly and over its full travel run**, so to pressurize the system.

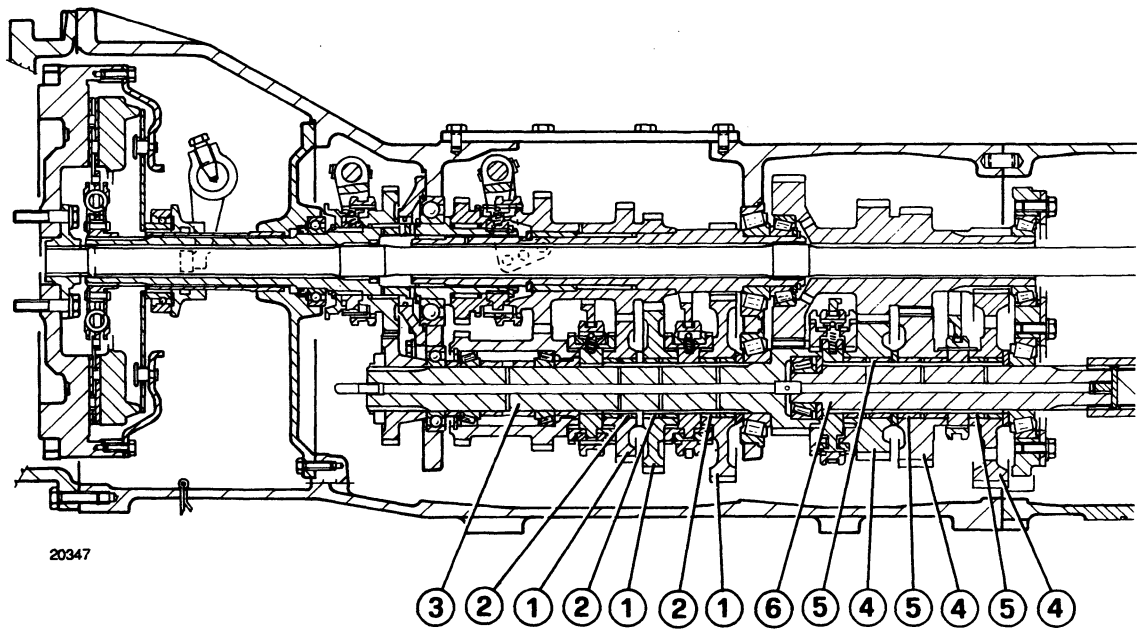


4. Hold the pedal depressed , loosen the bleed screw (6) half a turn and then let oil and air bubbles flow out.
5. Turn the screw (6) back on and repeat these operations until the oil flows out clean and free from air bubbles.
6. Operate the pedal again to pressurize the system; this condition exists when pedal operation is normal again.
7. Once the operation is completed top up the oil level in the reservoir (5).

SYNCHRO–RANGE TRANSMISSION

Transmission	4–speed w/ constant–mesh, fully synchronized gears
Gear type	helical–tooth
Range gears	cascade scheme, 4 forward plus 4 reverse ranges for a total of 16 forward and 16 reverse speeds
– gear type	helical–tooth
– reduction ratios:	
low range	(24 x 15) : (46 x 55) = 1 : 7.03
medium range	(24 x 26) : (46 x 40) = 1 : 2.95
normal range	(24 x 29) : (46 x 37) = 1 : 2.45
high range	1
Transmission and range shift controls	separate, w/ two hand levers located on the RH side of the operator.
Lubrication	forced–feed, w/ gear–type pump (the same of power steering)
I.D. of transmission driven gears (1)	60.060 to 60.090 mm (2.3645 to 2.3657 in)
O.D. of respective bushings (2)	59.981 to 60.000 mm (2.3614 to 2.3622 in)
Radial clearance of gears and bushings	0.060 to 0.109 mm (.0024 to .0043 in)
Dia. of transmission driven shaft (3)	49.375 to 49.391 mm (1.9439 to 1.9445 in)
I.D. of bushings (2)	49.400 to 49.430 mm (1.9449 to 1.9445 in)
Radial clearance of shaft in bushings	0.009 to 0.055 mm (.0003 to .0022 in)
I.D. of range driven gears (4)	60.060 to 60.090 (2.3645 to 2.3657 in)
O.D. of respective bushings (5)	59.981 to 60.000 (2.3614 to 2.3622 in)
Radial clearance of gears and bushings	0.060 to 0.109 mm (.0024 to .0043 in)
Dia. of range driven shaft (6)	49.375 to 49.391 mm (1.9439 to 1.9445 in)
I.D. of bushings (5)	49.400 to 49.430 mm (1.9449 to 1.9460 in)
Radial clearance of shaft in bushings	0.009 to 0.055 mm (.0003 to .0022 in)

(follows)



SYNCHRO–RANGE TRANSMISSION

(cont.)

Dia. of power take–off drive shaft (1), at bushing location	31.950 to 31.975 mm (1.2579 to 1.2588 in)
I.D. of force–fitted bushings (2)	31.990 to 32.085 (°) mm (1.2594 to 1.2632 in)
Radial clearance of shaft in bushings	0.015 to 0.135 mm (.0006 to .0053 in)
Thickness of transmission drive shaft (3) rear bearing thrust washer	2.950 to 3.000 mm (.1161 to .1181 in)
Adjustment of range–gear drive shaft bearings	see page 21–35
Thickness of range–gear drive shaft (4) bearing shims	1.70 – 1.80 – 1.90 – 2.00 – 2.05 2.10 – 2.15 – 2.20 – 2.25 – 2.30 – 2.35 2.40 – 2.45 – 2.50 – 2.55 – 2.60 2.65– 2.70 – 2.75 – 2.80 – 2.85 – 2.90 2.95 – 3.00 – 3.10 – 3.20 – 3.30 mm (.067 – .070 – .074 – .078 – .080 – .082 .084 – .086 – .088 – .090 – .092 – .094 –.096 – .098 – .100 – .102 – .104 – .106 – .108 – .110 – .112 – .114 – .116 .118 – .122 – .126 – .130 in)
Adjustment of range–gear driven shaft bearings	see page 21–35
Thickness of range–gear driven shaft (5) bearing shims	1.70 – 1.80 – 1.90 – 2.00 – 2.05 2.10– 2.15 – 2.20 – 2.25 – 2.30 – 2.35 2.40 – 2.45 – 2.50 – 2.55 – 2.60 2.65– 2.70 – 2.75 – 2.80 – 2.85 – 2.90 2.95 – 3.00 – 3.10 – 3.20 – 3.30 mm (.067 – .070 – .074 – .078 – .080 – .082 .084 – .086 – .088 – .090 – .092 – .094 –.096 – .098 – .100 – .102 – .104 – .106 – .108 – .110 – .112 – .114 – .116 .118 – .122 – .126 – .130 in)
Pressure–relief valve spring (1, page 21–10):	
– free length	127 mm (5.0 in)
– length under load of 278 to 304 N (28.4 to 31 kg = 72.1 to 78.7 lb)	102.5 mm (4.03 in)
Working pressure	16 bar (16.3 kg/cm^2) = (232 psi)
Lubrication pressure–relief valve (2, page 21–10):	
– free length	35.5 mm (1.40 in)
– length under load of 37 to 41 N (3.8 to 4.2 kg = 9.6 to 10.7 lb)	25.5 mm (1.0 in)
Lubrication pressure	6.5 to 7 bar (6.6 to 7.1 kg/cm^2) = (94.2 to 101.5 psi)

(°) Final dimension without reaming.