Separating the engine from the transmission

CAUTION: ALWAYS FOLLOW SAFETY GUIDELINES WHEN RAISING THE TABLES. USE THE PROP ROD ON THE SECOND TABLE, AND MAKE SURE THE TOP OF THE LOAD RACK IS ANGLED AWAY FROM THE BALE WAGON BEFORE WORKING IN THE ENGINE AREA. THE LOAD RACK TINES AND ROLLING RACK SHOULD BE ON THE GROUND WITH THE LOAD RACK RAISED.

1. Disconnect the starter motor wiring, remove mounting bolts, 1, and remove starter motor, 2.
2. Drain the coolant from the engine block and cooling system, using the port in the engine block, 1, (near the oil filter) and the drain plug at the bottom of the radiator. Place a large, clean container under the engine to capture coolant for future use.

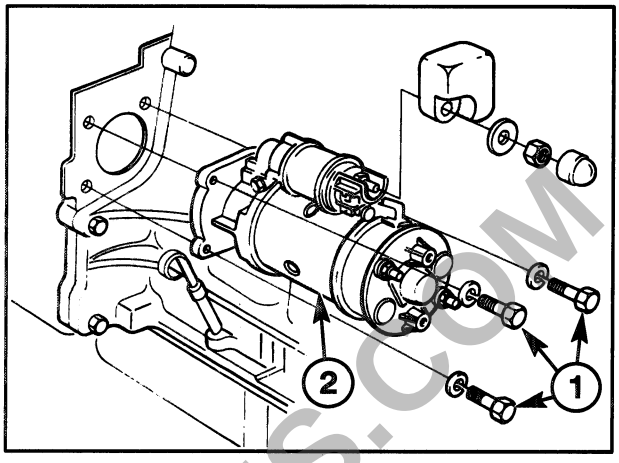


Figure 1-15

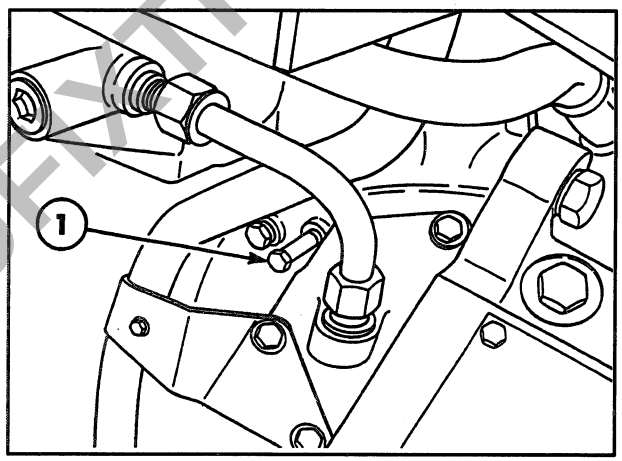


Figure 1-16

3. Remove the filter hoses, 1, from the transmission.
4. Support the engine and transmission with stands, jacks and other suitable equipment. Both should be fully supported before they are separated from each other or removed from the Bale Wagon.
5. Disconnect the shift cable, 2, modulator cable, 3, speedometer cable, 4, and any other hoses, cables, lines or wires that link the transmission to the engine or chassis.
6. Remove the buckle-up bolts, 5, connecting the engine and transmission and carefully pry the transmission from the engine.
7. Carefully lower the transmission away from the engine using a jack or hoist capable of supporting the weight of the component.

NOTE: Separation may be easier if the drive shaft is disconnected; however, this is not necessary unless the transmission is to be removed entirely from the Bale Wagon.

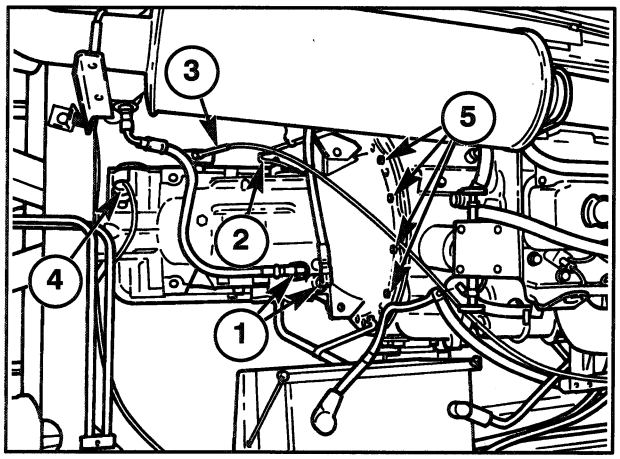


Figure 1-17

(Top View)

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TORQUE VALUES	NON-EMISSIONIZED N·m (ft. lbs.)	EMISSIONIZED N·m (ft. lbs.)
Belt Tensioner Pulley Bolt	54 (40)	54 (40)

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ENGINE TROUBLESHOOTING

Correct diagnosis of a problem works best with systematic troubleshooting. Note symptoms of trouble in the engine, along with warning lights and specific error codes that may appear on the instrument cluster.

NOTE: Be sure to thoroughly investigate any problem before making a repair. This will help ensure that the repair fixes the problem and prevents it from recurring.

The following table lists problems, their possible causes, and the recommended corrective action(s).

PROBLEM	POSSIBLE CAUSES	CORRECTION
Engine does not develop full power	Clogged air cleaner	Clean or replace element
	Fuel line obstructed	Clean
	Faulty injectors	Clean and reset
	Incorrect valve lash adjustment	Check and reset
	Burnt, worn, or sticking valves	Replace valves with new or oversize and/or machine the valve guide bores
	Blown head gasket	Check head flatness and install new gasket
	Incorrect fuel delivery	Check injectors and pump
	Low compression	Replace piston rings or rebore/ resleeve as necessary
Engine knock	Diluted or thin oil	Check crankshaft bearings for damage, change as required. Drain and refill with specified oil and renew filter. Determine cause of dilution
	Insufficient oil supply	Check oil level and top up as necessary. Overhaul or replace pump as necessary. Check oil is not clogged
	Low oil pressure	Overhaul pump or relief valve as necessary
	Excessive crankshaft end play	Install new thrust bearing filter

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Flywheel Removal

1. To gain access to the flywheel, separate the engine from the transmission. Refer to Separating the Engine from the transmission, page 1-30.
2. Prior to removal, using a dial indicator, 1, rotate the flywheel, 2, and measure to 0.13 mm (0.005″) Total Indicator Reading. If not to specification, check crankshaft-to-flywheel seating.

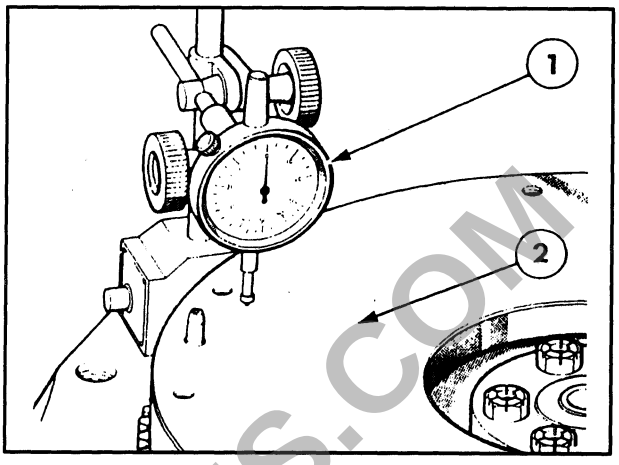


Figure 1-106

Inspection and Repair

Inspect the flywheel ring gear; if damaged, repair in the following manner:

1. Cut old ring gear free from the flywheel.
2. Clean the mating surfaces of the new ring gear and flywheel.
3. Use temperature indicating crayons to mark the side face of the ring gear in six equal places, mark with a 204°C (400°F) crayon at a point 13 mm (0.5″) below the root of the teeth, and mark with a 212°C (450°F) crayon at a point just below root of the teeth.
4. Use an oxyacetylene torch with a #2 tip size (maximum), and direct the flame against the internal face of the gear.
5. Quickly place the hot gear on the flywheel with the flat face against the shoulder on the flywheel. Check the gear-to-flywheel runout using a dial indicator. Runout should not exceed a Total Indicator Reading of 0.63 mm (0.025″).

Installation

Clean the crankshaft rear flange and mating surface of the flywheel, and install the flywheel. Tighten the bolts to 244 N·m (180 ft. lbs.) torque.

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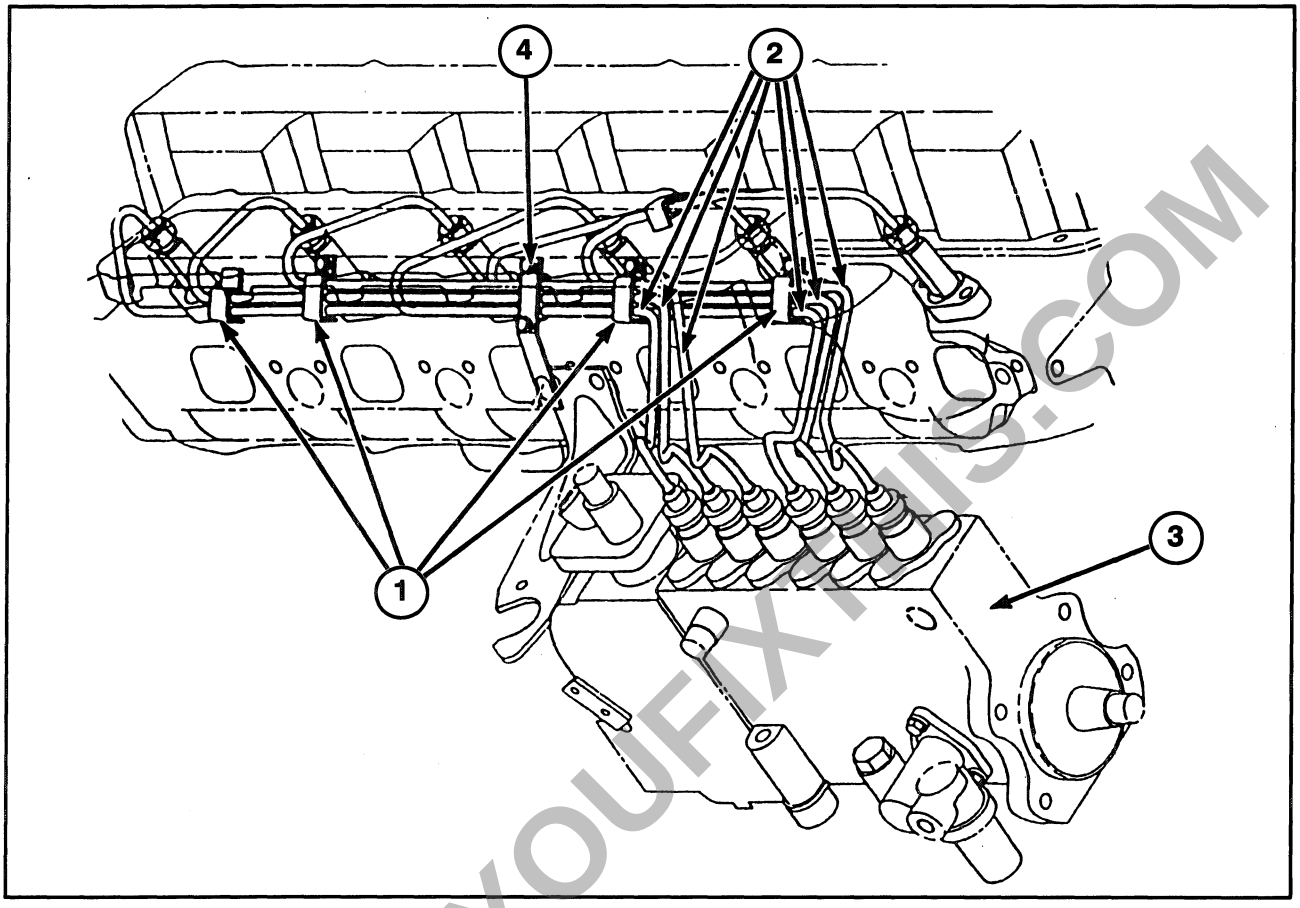


Figure 2-40

Installation

1. Make sure the clamps, 1, holding the lines together are tight.

   NOTE: High-pressure fuel lines must be installed as a set. It is much easier than installing them individually.

2. Wiggle the high-pressure fuel injection lines into position on the engine. Start from the back and work toward the front of the engine.
3. Install the injection lines, 2, onto the injection pump, 3, and tighten the nuts to 22 - 27 N·m (16 - 20 ft. lbs.). Tighten the bracket, 4, holding the high-pressure fuel lines to the intake manifold. Use two wrenches to tighten the lines to prevent accidental rotation of the pumping element.
4. Connect the high fuel injection lines to the fuel injectors one at a time starting with cylinder No. 1.

   NOTE: Do not remove the caps from the fuel lines or components until they are to be connected. This will help prevent the entry of dirt into the system.

1. Tighten the fuel injection line to injector nuts, 4, to 22 - 27 N·m (16 - 20 ft. lbs.).
2. Install the low-pressure fuel lines and filter assembly back on the engine. Tighten the nuts to specification.
3. Connect the battery ground cables to both batteries.
4. Run the engine and check for leaks.

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1089, 1095 BALE WAGON REPAIR MANUAL CONTENTS



SECTION 1 - ENGINE
SECTION 2 - FUEL AND INDUCTION SYSTEMS
SECTION 3 - TRANSMISSION

SECTION 4 - REAR AXLE AND SUSPENSION
SECTION 5 - FRONT AXLE AND SUSPENSION
SECTION 6 - BRAKE SYSTEM

SECTION 7 - STEERING SYSTEM
SECTION 8 - HYDRAULIC SYSTEM

SECTION 9 - ELECTRICAL SYSTEM
SECTION 10 - ELECTRONIC CONTROL SYSTEM
SECTION 11 - AIR CONDITIONING SYSTEM

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MAIN V-BELT AND FAN BELT

Removal/Replacement

WARNING: ALWAYS MAKE SURE SECOND TABLE IS FULLY RAISED AND PROPERLY BRACED UP WITH THE PROP ROD, 1, BEFORE WORKING IN THIS AREA.

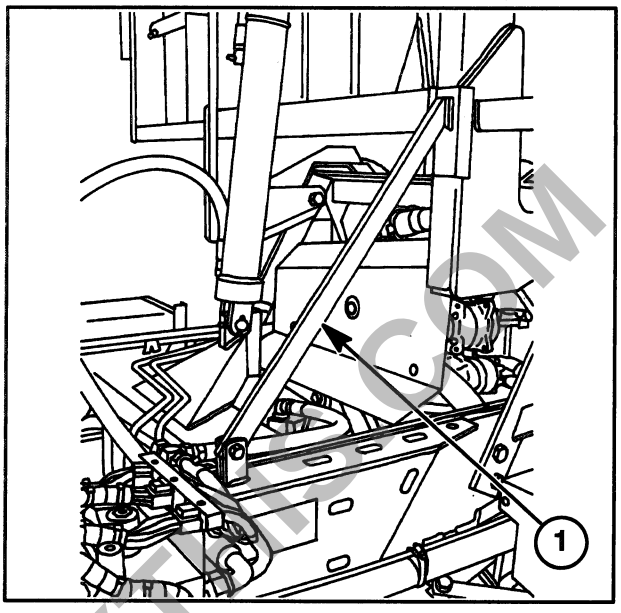


Figure 1-62

1. With the second table fully raised and braced up, remove the shield, 1, from the front of the engine.

   NOTE: Make a note of the proper location for each of the spacers that fits on the shield-mounting bolts, and which maintain the proper distance between the shield and the engine. This will ease reassembly.

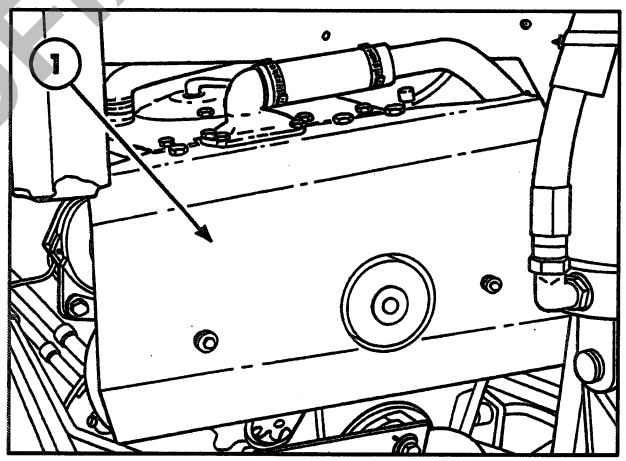


Figure 1-63

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Removal

Emissionized

1. Drain the cooling system.
2. Follow the instructions to remove the V-belt and fan belt.
3. Loosen the clamps holding the hoses, 1, onto the water pump and thermostat housing and remove the hoses. Remove any remaining hoses from the pump and thermostat housing, including those running to the coolant reservoir and the oil cooler.

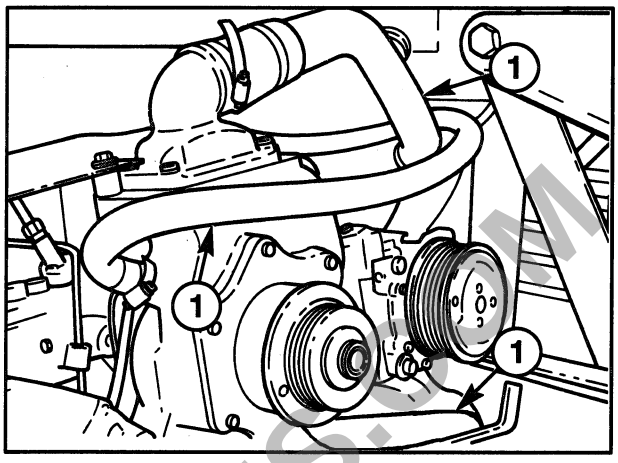


Figure 1-164

4. Remove the six bolts holding the water pump cover onto the front cover, 1.

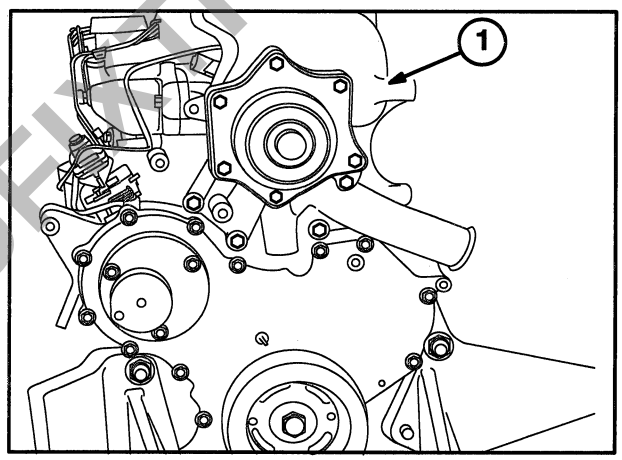


Figure 1-165

5. With the water pump cover detached, remove the four bolts fastening the water pump to the block. The pump comes off the front of the engine as an assembly and can be further disassembled on a bench. The sealing O ring, 1, may or may not come off with the pump assembly.

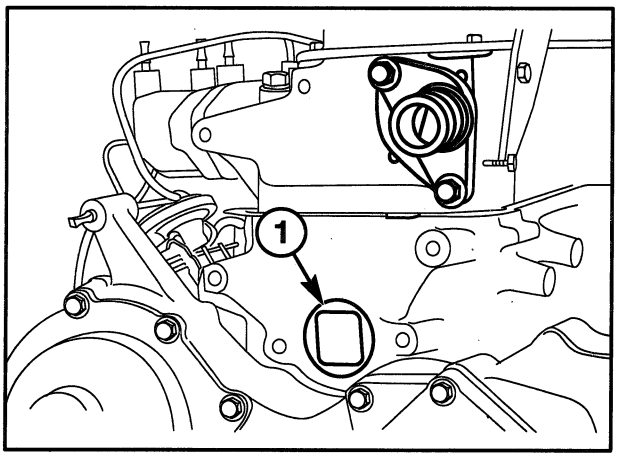


Figure 1-166

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Injection system bleeding

Bleeding the fuel system may be necessary after injection pump removal, replacement of high pressure lines, or running out of fuel. Bleeding purges the fuel system of unwanted air. If the engine fails to start in one of the above situations, bleed the system using the following procedure:

1. Start with a fully-charged battery and fuel in the tank.
2. "Crack" open the nut, 1, (loosen it slightly to allow air to escape) that fastens the high-pressure injection line to the fuel injector assembly at each cylinder.
3. Crank the engine with the starter motor to expel the air. If possible (with the aid of a second person), tighten the injector nuts as the engine begins to fire.

   If no second person is available, "crack" open the injector nuts, crank the engine, then close the injector nuts and start the engine. With the engine running, "crack" open each injector nut briefly to allow any remaining air to escape, then close it again. The engine should run smoothly at this point.

   IMPORTANT: Do not crank the starter continuously for more than 30 seconds at a time. Let the starter cool for two minutes between attempts.

WARNING: WEAR PROPER EYE AND SKIN PROTECTION. FUEL CAN BE EXPELLED UNDER HIGH PRESSURE AND CAN CAUSE SERIOUS INJURY.

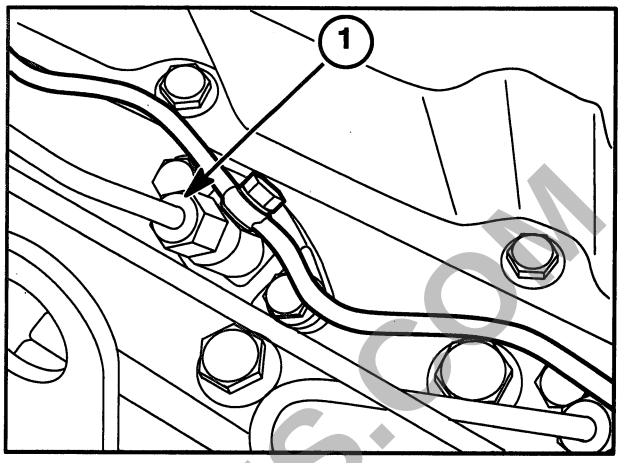


Figure 2-67

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OIL AND OIL FILTER CHANGE PROCEDURES

The transmission should be at operating temperature to assist draining. Shift the transmission to Neutral.

Drain the oil by removing the drain plug and disconnecting the oil fill tube from the oil pan.

Remove twenty-one washer-head screws that retain the oil pan to the transmission housing. Discard the pan gasket. Clean the pan with mineral spirits.

Remove the screw and washer that retain the internal oil filter. Remove the oil filter and oil intake tube. Remove and discard the sealring.

Clean or replace the governor oil screen. The screen is located in the governor feed tube bore. Replacement of the screen can only be accomplished by removing the governor feed tube. This tube and the two remaining tubes are held in place by the control valve body.

Install a new sealring onto the top end of the oil intake pipe. Lubricate the sealring with transmission fluid.

Insert the intake pipe and sealring into the hole in the bottom of the transmission. Install the new oil filter assembly (includes grommet) onto the intake pipe.

Retain the oil filter with one 5/16-18 x 5/8 inch washer-head screw. Tighten the screw to 14 - 20 N·m (10 - 15 ft. lb.).

Submerge the gasket in transmission fluid for five minutes. Place the oil pan gasket onto the oil pan. Do not use any substance as a gasket retainer.



CAUTION: Do not use gasket-type sealing compounds any place inside the transmission or where they might get washed into the transmission. Also, nonsoluble, vegetable base, cooking compounds, or fibrous greases must must not be used inside the transmission.

Install the oil pan. Guide the pan and gasket carefully into place. Guard against dirt or foreign material entering the pan. Retain the pan to the housing with four 5/16-18 washer-head screws, installed by hand into the corners of the pan.

Install the remaining seventeen washer-head screws by hand, carefully threading each through the gasket and into the transmission. Bottom all of the screws before tightening any of them.

Tighten all twenty-one screws evenly to (14 - 20 N·m (10 - 15 ft. lb.). Check gasket fit while the screws are being tightened.

NOTE: The oil pan bolts must maintain a minimum of 5 ft. lb. (7 N·m) of torque after the oil pan gasket has taken a set.

Install the filler tube at the side of the pan. Tighten the tube fitting to 122 - 136 N·m (90 - 100 ft. lb.). Install the drain plug and O ring. Tighten the plug to 20 - 27 N·m (15 - 20 ft. lb.).

Replace the external auxiliary oil filter element (cooler-out line), if present.

Refill the transmission with fluid.

Oil Fill - Servicing	Oil Fill - Rebuild
8.5 liters (9 U.S. qts.)	8.5 liters (9 U.S. qts.)

Check the oil level.

BREATHER

The breather is located at the top of the transmission housing. It serves to prevent pressure buildup within the transmission and must be kept clean and the passage open. The prevalence of dust and dirt w ill determine the frequency at which the breather requires cleaning. Use care when cleaning the transmission. Spraying steam, water or cleaning solution directly at the breather can force the water or solution into the transmission.

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DIFFERENTIAL AND PLANETARY GEAR

Disassembly

1. Remove the shift unit-to-carrier stud nuts and washers. Lift the shift unit from the carrier and set aside.

   NOTE: There may be a small amount of spring tension in the shift unit during removal.

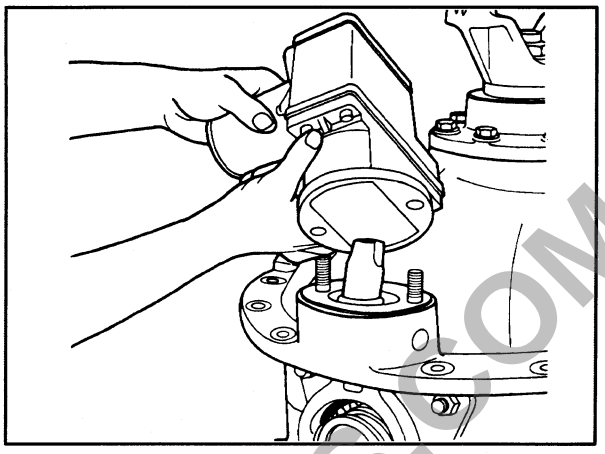


Figure 4-38

2. Remove the shift fork seal diaphragm, 1, and retaining spring, 2, from the shift unit tower by pulling them off the top of the fork.

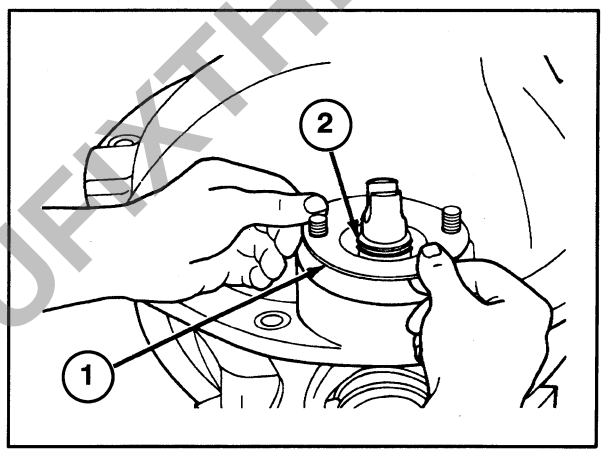


Figure 4-39

3. Remove the shift fork pivot pin, 1, and plugs. Use a thin brass drift to tap the pin and two plugs from the carrier. Drive the pin from the side shown to remove the pins as the left side has a smaller diameter in the housing.

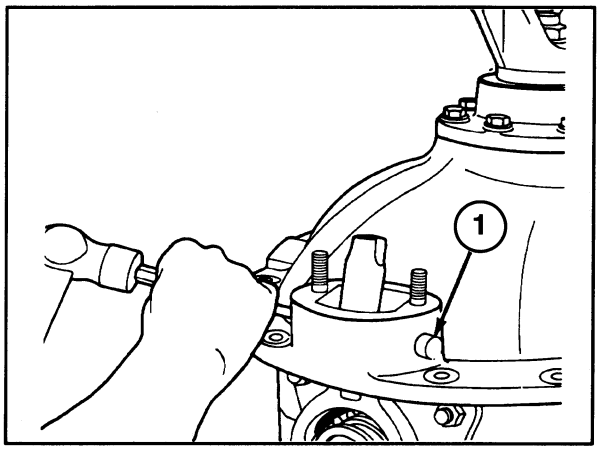


Figure 4-40

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INTRODUCTION

The front axle used on the Models 1089 and 1095 bale wagons is a Rockwell FF-941 series.

Special Tools

Special tools are required to properly service and repair the front axle. It is recommended that major repairs and service be performed by an authorized Rockwell dealer or service facility. Many truck repair facilities may be equipped to service the axle.

If the bale wagon is not taken to one of these facilities, follow the procedures in this manual to correctly service the axle.

The following special tools can be used to service the axle:

Kent-Moore Heavy Duty Division
29874 Little Mack
Roseville, MI 48066-2298

Kingpin Removal Tool #J36136

Kingpin Bushing Service Kits (one of each required):
- Basic Kit #PT 4375
- FF Series Kit # PT 4370-10

OTC Tool and Equipment Division
655 Eisenhower Drive
Owatonna, MN 55060

Kingpin Removal Tool #4240

Snap-On (Contact your local dealer)

Kingpin Removal Tools:
- CG430HYB - 20 ton
- CG730HY - 30 ton

CAUTION: THE REPAIR OR RECONDITIONING OF FRONT AXLE COMPONENTS IS NOT ALLOWED. THE MANUFACTURER, ROCKWELL, RECOMMENDS REPLACING DAMAGED OR OUT-OF-SPECIFICATION COMPONENTS. ALL MAJOR COMPONENTS ARE HEAT-TREATED AND TEMPERED. THE COMPONENTS CANNOT BE BENT, WELDED, HEATED OR REPAIRED IN ANY WAY WITHOUT REDUCING THE STRENGTH OR LIFE OF THE COMPONENT AND VOIDING THE WARRANTY.

THE FOLLOWING OPERATIONS ARE PROHIBITED ON FRONT AXLE COMPONENTS.

WELDING ON THE FOLLOWING:
- **STEERING ARM**
- **TIE ROD AND TIE ROD ARMS**
- **KINGPIN**
- **AXLE BEAM**
- **WHEEL HUBS**
- **BRAKES**

BENDING (HOT OR COLD) ANY OF THE FOLLOWING:
- **KNUCKLES**
- **STEERING ARM**
- **TIE ROD AND TIE ROD ARMS**
- **AXLE BEAM**
- **BALL STUDS**

DRILLING THE FOLLOWING:
- **HOLES IN THE AXLE BEAM FOR THE KINGPIN**
- **DRAW KEY HOLES IN THE KNUCKLE**

MILLING OF ANY COMPONENT

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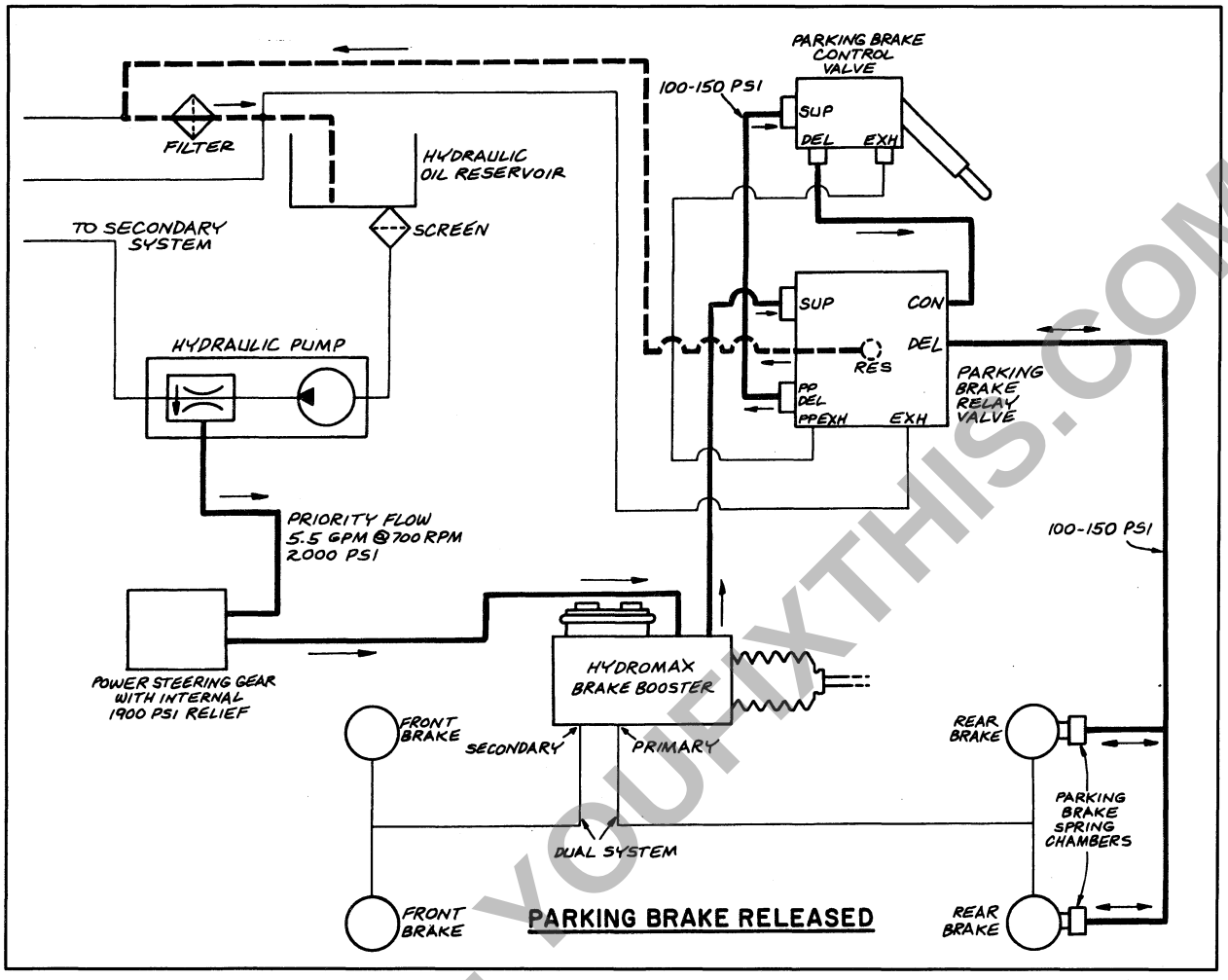


Figure 6-25

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MASTER CYLINDER DIAGNOSIS

TEST STEP	RESULT	ACTION TO TAKE
1. FLUID LEVEL CHECK Check fluid level in master cylinder reservoir. Fluid level should be at the level of the bottom of the rings as indicated on the master cylinder reservoir.	Full reservoir. OK Low or empty reservoir. OK	GO to 2. GO to 4.
2. FLUID LEVEL CONDITION Apply and release brake pedal one full stroke. Observe reservoir fluid level of both chambers as pedal is released.	Level remains constant. OK Fluid level in one chamber rises very slowly on application and drops approximately 3.175 mm (1/8″) on release of pedal. OK	GO to 3. Internal leak in master cylinder. REPAIR master cylinder.
3. FLUID LEVEL CONDITION Pump up brakes several times. Observe reservoir fluid as pedal is released.	Geyser appears as pedal is released. Slight ripple appears as pedal is released.	Air in brake system. BLEED brakes. Refer to “Brakes Not Working, Excessive Pedal Travel. Brake Feels Spongy When Fully Applied” in “Trouble-shooting.”
4. LOW OR EMPTY RESERVOIR Fill the reservoir and bleed the brake system. Check for minor external leakage.	No leakage. OK Leakage. OK	GO to 5. REPAIR leak as required.

7

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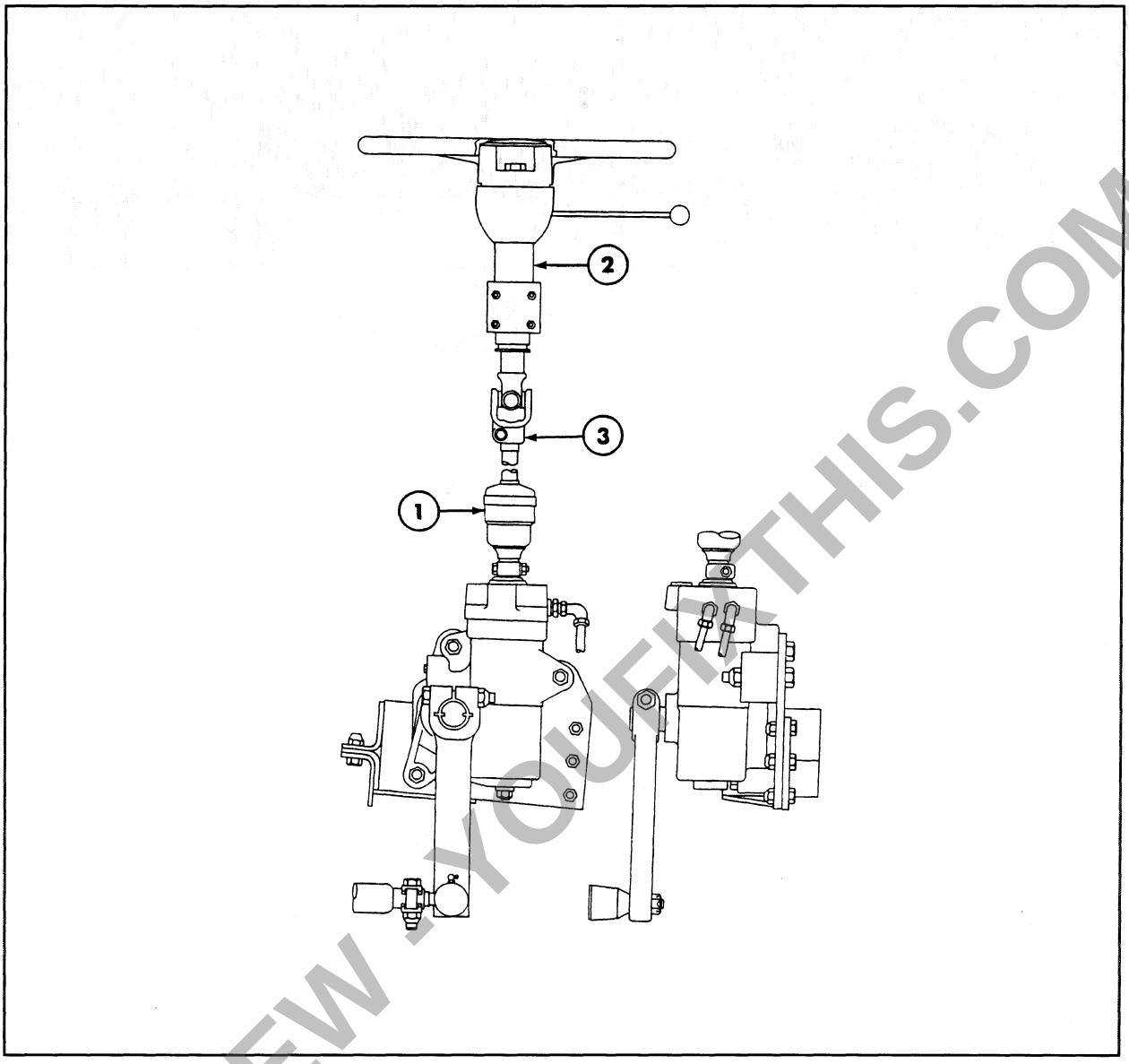


Figure 7-14

Installation

Place the shaft in the flexible coupling, 1, in the universal joint yoke, 3, at the bottom of the steering column, 2, and install the Grade 5, UNF, 3/8″ x 1-3/4″ retaining bolt, lock washer and nut to secure the yoke to the shaft.

Install the coupling on the steering gear shaft. (The coupling collapses.) It may be necessary to loosen the steering column bolts to pivot the column to the side to install the coupling on the shaft. Retighten the steering column bolts.

Install the Grade 5, 3/8″ x 1-3/4″ retaining bolt and locknut in the bottom of the flexible coupling to secure it to the steering gear shaft.

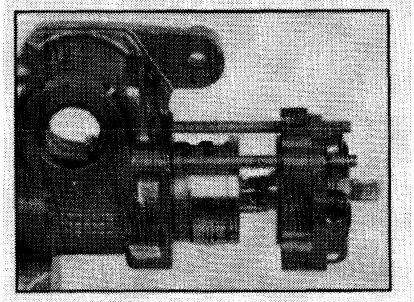
Install the cover at the rear of the steering console.

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Position rack piston in housing

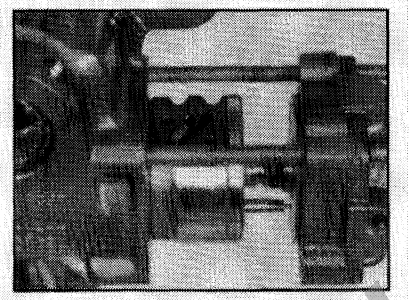
8. Apply clean oil to housing cylinder bore. Place the rack piston (19) in the housing piston bore with ball return guide holes up.



Insert worm and valve assembly into rack piston

7/16"-14 x 7¼" All Thread

9. Insert the worm screw into the rack piston close to maximum depth, without the valve housing making contact with the poppet stem. Insert two 7/16"-14 All threads through valve housing bolt holes and tighten into housing to support the worm screw. Line up rack piston ball guide holes with the worm ball track grooves by rotating the input shaft.



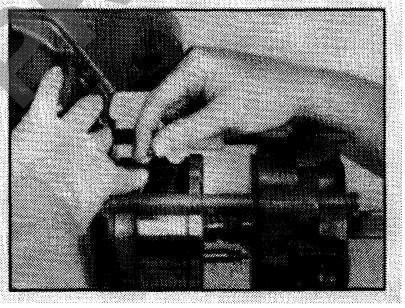
Assemble ball return guide halves

10. Compare the new guides with the guides removed from the gear, use the ones that look the same. Left hand guides are copper plated, right hand guides are unplated. Assemble the new ball return guide halves (28) into the rack piston until seated, rotate the input shaft slightly if necessary.

⚠ WARNING **Do not seat guides with a hammer. Damage to guides can result in subsequent lockup or loss of steering.**

⚠ CAUTION **If a new rack piston (19) or a new input shaft, valve, worm subassembly (13 or 13A) is being assembled, the balls (27) removed from the unit must be discarded and a service ball kit utilized. The balls in a service ball kit are sized to function in the ball track guide path as altered by component replacement.**

⚠ CAUTION **When using the service ball kit, use the correct quantity of service balls: TAS40-29, TAS55-31, TAS65-32, TAS85-34.**



Assemble balls

11. **Hold the ball return guides (28) firmly in place during this entire procedure.** Insert as many of the steel balls as you can through the hole in the top of the ball return guides. Rotate the input shaft to pull the balls down and around the ball track guide path. Continue until the correct number of balls are in the ball track guide path.

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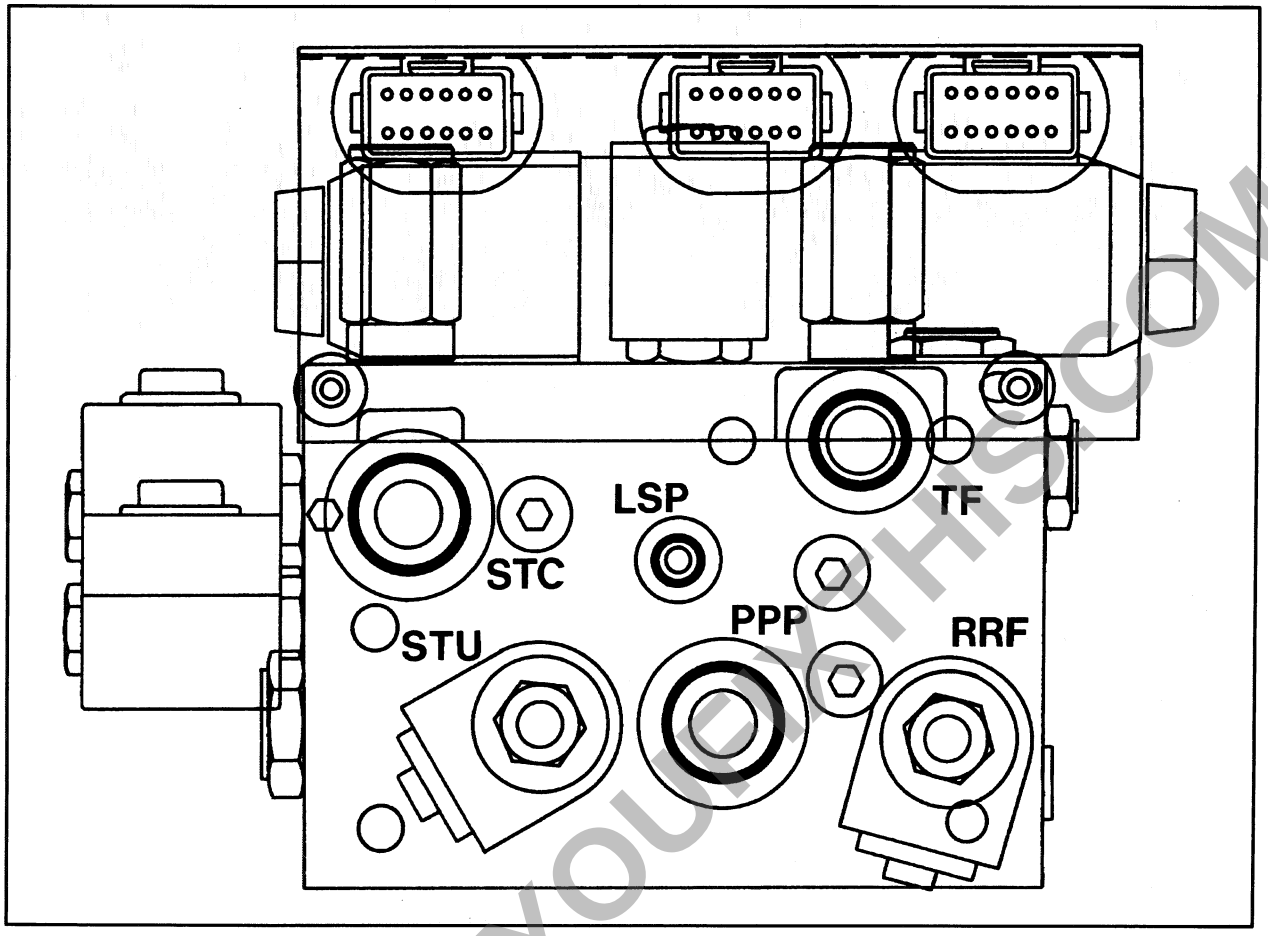


Figure 8-20

REAR VIEW

STU = Second Table Up Valve

STC = Second Table Cylinder Port

LSP = Load Sense Port

PPP = Piston Pump Pressure Port

TF = Tank Port - Filtered

RRF = Rolling Rack Forward Valve

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ORIFICES

There are fifteen orifices used in the manifold. Nine of them are plug, or screw-in style, and the remaining six are disc style that are held in place by a cartridge, relief, or check valve. The plug orifices are found in passages sealed with unmarked surface plugs.

LOCATION	DESCRIPTION	SIZE	TYPE
1	Bale Loader Up (BLU) drain	.026	Plug
2	Bale Loader Down (BLD)	.073	Disc
3	Load Sense drain (LS)	.026	Plug
4	Load Sense pressure (LS)	.073	Disc
5	Rolling Rack Relief (RRR)	.086	Disc
6	First Table Up (FTU) - 1095	.073	Plug *
6A	First Table Up (FTU) - 1089	.063	Plug *
7	Rolling Rack down - Manual	.073	Plug *
8	Push-Off Foot drain (PO)	.026	Plug *
9	Push-Off Foot pressure (PO)	.177	Plug *
10	Bale Loader Up pressure (BLU)	.055	Disc
11	Spikes pressure	.052	Plug *
12	Second Table Manual (STM)	.100	Disc
13	Second Table pressure	.177	Plug *
14	Rolling Rack Forward (RRF)	.073	Disc

The disc orifices are serviced in Parts, but the plug orifices are not. The Orifice Disc Kit, part #86514799, contains one orifice with a 0.055 inch hole as this is the smallest disc orifice used. The instructions included in the kit show where the disc orifices are located and what size each one is. The orifice supplied can be drilled out to the size required.

For the decimal equivalents of numbered and fractional drill sizes, refer to the chart in Section 12.

NOTE: Several orifices were changed from the plug type to the disc type. The new orifices slide into the bottom of the valve and are retained by the o-ring. They are used at the SPV, FTU and PO valves. This change is effective on 1089 Bale Wagons with a serial number on or above, 616020 and 1095 Bale Wagons with serial number of 616160 or above.

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ROLLING RACK AND AUXILIARY FIRST TABLE CYLINDERS

Figure 8-164 and Figure 8-165

1. Drain all oil from the cylinder and clamp the base clevis in a suitable vise. Never clamp the cylinder barrel, as this will cause distortion and damage to the cylinder.
2. This is a displacement-type cylinder in which there is no piston. The only seals that can be replaced in this cylinder are those in the cylinder head. The cylinder shaft is removed from the cylinder by simply pulling it completely free of the cylinder. After the shaft is removed, the O-rings can be removed by carefully prying them out with a pointed tool, using care to avoid scratching or otherwise raising burrs on the bore of the head. The wiper seal is removed in a similar manner.
3. Replace the O-rings in the proper grooves in the cylinder head, first being sure the head is free of burrs and is liberally lubricated with hydraulic oil. Seat the new seal in the cylinder head. Lubricate the cylinder shaft with hydraulic oil and carefully slide the end of the cylinder shaft past the lip of the shaft seal. Also, guide it very carefully to keep it parallel to the bore of the cylinder and allow it to pass the O-rings without damage. After the shaft has been inserted into the head approximately 127 mm (5″), it will have cleared all seals and the O-rings, and may be pushed all the way into the cylinder.

NOTE: There is an air bleed plug near the front end of the rolling rack cylinder. Always bleed the air from the cylinder whenever the hydraulic line to the cylinder has been disconnected or on replacement or repair of the cylinder.

TIE SPIKE CYLINDER

This cylinder cannot be serviced. No components are available. The complete unit must be replaced in the event of cylinder failure.

PISTON NUT TORQUE CHART

ID of Piston Nut	Min. Torque N·m	Ft. Lbs.
1/2″	61 N·m	(45)
5/8″	111 N·m	(82)
3/4″	210 N·m	(155)

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ENGINE DOES NOT TURN OVER WHEN THE KEY IS OPERATED

STEP	PRETEST INSTRUCTIONS	TEST	RESULT	PROBABLE CAUSE AND CORRECTION
1.	Place transmission shift lever in Neutral.	Turn key switch clockwise to Start position.	Engine starts. Engine does not start.	Transmission lever was not in Neutral. Go to next step.
2.	Key switch off.	Using a voltmeter, check the battery voltage.	Battery voltage less than 12 volts. Battery voltage greater than 12 volts.	Battery defective or not charged. Load test battery. Go to next step.
3.	Key switch off.	Check for battery voltage at the red (positive) battery cable on the starter.	No or low voltage. Battery voltage.	1. Open circuit or poor connection between battery and starter. Refer to "Battery Positive Cable" test. 2. Poor ground. Go to next step. Go to step 5.
4.	Transmission shift lever in Neutral. Turn key switch clockwise to Start position.	Refer to "Battery Ground Cable" test.	Greater than 0.4 volts. Less than 0.4 volts.	Check ground connections. If connections ok, replace battery ground cable. Go to next step.
5.	Transmission shift lever in Neutral. Turn key switch clockwise to Start position.	Check for battery voltage at FM143 at the starter solenoid.	Battery voltage. No or low voltage.	Starter solenoid defective. Replace. Go to next step.
6.	Transmission shift lever in Neutral. Turn key switch clockwise to Start position.	Check for battery voltage at FM143 at the start relay.	Battery voltage. Low or no voltage.	Open circuit or poor connection of FM143 between start relay and starter solenoid. Go to next step.
7.	Key switch off.	Check for battery voltage at the start relay terminal where FM144 and FM168 connect.	Battery voltage. No or low voltage.	Go to step 12. Go to next step.
8.	Key switch off.	Check for battery voltage where FM144 connects to CB04.	Battery voltage. No or low voltage.	Open circuit or poor connection between CB04 and start relay. Go to next step.
9.	Key switch off.	Check for battery voltage at the opposite terminal on CB04.	Battery voltage. No or low voltage.	Poor buss bar connection or CB04 defective. Repair or replace. Go to next step.
10.	Key switch off.	Check for battery voltage in FM140 connected to CB05.	Battery voltage. No or low voltage.	Poor buss bar connection at CB05. Go to next step.

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STEP	PRETEST INSTRUCTIONS	TEST	RESULT	PROBABLE CAUSE AND CORRECTION
6.	Same as #5.	Check for battery voltage green connector C37, socket #6 (FM066) on the valve manifold.	No or low voltage. Battery voltage.	Open or poor connection in FM066 wire between load rack microswitch and green connector C37. Repair. Go to next step.
7.	Key off.	Check continuity between green connector C37, socket #7 (FM187) and a good ground.	Continuity. No continuity.	Defective solenoid or hydraulic problem. Refer to troubleshooting guide in Section 8, "Hydraulics." Open or poor connection in FM187 wire between green connector C37 and splice "L". Repair.

ROLLING RACK DOES NOT WORK CORRECTLY

STEP	PRETEST INSTRUCTIONS	TEST	RESULT	PROBABLE CAUSE AND CORRECTION
1.	Engine running. Safety gate raised.	Check other loading and unloading functions.	Other loading/unloading functions do not work. Load rack, push off feet, and rolling rack forward do not work. All other bale loading and unloading functions operate. Only the rolling rack forward and push-off feet do not work. Only the rolling rack does not work in either forward or reverse.	Go to "Bale Loading and Unloading Functions Do Not Work." Go to "Load Rack Does Not Work Correctly" in this section. Go to "Rolling Rack Forward Does Not Work" in this section. Go to next step.
2.	Key switch on. Safety gate raised.	Check for battery voltage at LR212 at rolling rack switch.	No or low voltage. Battery voltage.	Open or poor connection between LR212 wire at rolling rack switch and FM212 wire at load rack switch. Repair. Go to next step.
3.	Key switch on. Safety gate raised. Rolling rack switch pushed up.	Check for battery voltage at LR068 wire at rolling rack switch.	No or low voltage. Battery voltage.	Defective switch. Replace. Go to next step and "Rolling Rack Forward Does Not Work" in this section.
4.	Key switch on. Safety gate raised. Rolling rack switch pushed down.	Check for battery voltage at LR070 wire at rolling rack switch.	No or low voltage. Battery voltage.	Defective switch. Replace. Go to "Rolling Rack Reverse Does Not Work" in this section.

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OPERATION

INTRODUCTION

The following is the sequence of operations of the controller from the time the operator turns the balewagon ON to when the load is finished at the stack. The operation described is for Model 1095 that loads two bales on the first table for standard deliveries and one center bale for tie tiers. The 1089 loads additional bales for each first table delivery.

START UP

When the operator starts the engine, battery voltage is supplied through the key switch to the controller to operate its electronics. The controller goes through a start-up routine that ends with the controller in the Select mode. Raising the safety gate closes the gate switch sending battery voltage to the controller to operate the hydraulic system control valves, and also sending battery voltage to the switches in the control handles.

The operator presses the Start/Reset key to put the controller into the Automatic mode. This mode is indicated by nothing flashing in the display and by the cross conveyor starting in the forward direction.

BALE LOADER

When the bale loader is lowered, the bale loader sensor magnet moves away from the sensor. This tells the controller the loader is down and allows the cross conveyor to reverse and first table to deliver when necessary. The cross conveyor will still operate forward if the bale loader is not completely down.

CROSS CONVEYOR AND FIRST TABLE

The cross conveyer moves the first bale loaded to the left until it clears the end of the conveyor. The second bale loaded pushes the first into the left trip lever. This activates the left trip sensor by bringing a magnet to the sensor. The sensor signals the controller to stop moving the cross conveyor forward and start the cross conveyor in reverse. Forward and reverse are controlled by the Cross Conveyor (CC) valve.

The cross conveyor then pulls the second bale back to the right where it contacts the right trip lever. The trip lever moves to the right separating the magnet from the right trip sensor. This signals the controller to stop the cross conveyor and deliver the first table.

NOTE: If the tier being loaded is "non-reversed" the first table will deliver to the second table without reversing the cross conveyor.

The controller turns on the proper side of the First Table Up (FTU) control valve for either an "edge" or "flat" delivery depending on which one is called for by the stack pattern. A magnet moves with the first table as it delivers and activates the first table return sensor. This sensor tells the controller to return the first table to its home position and to restart the cross conveyor in the forward direction. It also advances the first table count in the controller's display.

When forming tie tiers, the controller changes the sequence slightly. The tie spikes and tie trip lever are started automatically by the controller based on the first and second table counts for the stack pattern being formed. After the tie trip lever rises, the cross conveyor pushes one bale into it (two bales on a 1089) and the trip lever activates the left trip sensor. This signals the controller to stop the cross conveyor and deliver the first table.

TIE SPIKES

When the tie spikes are lowered by the controller, there is a sensor that tells the controller when the spikes are fully lowered. This permits normal operation of the first table. If the sensor is not activated, the controller assumes the spikes are raised and will not allow the first table to make a standard delivery.

SECOND TABLE

Standard Tiers

When the controller has counted the proper number of first table deliveries for the tier being made, the controller turns the Second Table Up (STU) control valve ON. This raises the second table to deliver the tier to the load rack. A magnet travels with the second table as it rises. The magnet moves away from the second table down sensor when it begins to rise. This tells the controller the second table is not down and prevents the first table from delivering when the right trip is activated.

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Standard 700-88). This will ensure that the refrigerant you are using not only meets the purity requirements of SAE J1991 (for R-12) or J2099 (for R134a), but also that it does not contain incompatible lubricants or other contaminants from non-automotive air-conditioning systems.

USING RECYCLING EQUIPMENT

Recycling equipment is defined as equipment that both extracts and removes common contaminants from refrigerants. Recycling equipment designed and certified to meet SAE standards can make refrigerant recovery from mobile air-conditioning systems suitable for reuse in automotive air-conditioning systems. Like extraction equipment, SAE standards require that each piece of recycling equipment be dedicated to a single refrigerant.

NOTE: Only equipment capable of recovering and cleaning R-134a to meet SAE J2099 purity levels can be certified as meeting SAE standards. Recycling equipment capable of purifying R-134a to SAE J2099 purity levels will carry a label which contains the phrase "Design certified by Underwriters Laboratories, Inc. for compliance with SAE J2099." The Underwriters Laboratories label which certifies that the machine is free of reasonable shock or other safety hazards to the user is NOT an indication of compliance with SAE standards. The UL label must specifically state that the machine is "design certified" to the applicable SAE standard.

CONTAINMENT OF MOBILE AIR-CONDITIONING SYSTEM REFRIGERANTS

The following procedure is a guide to servicing mobile air-conditioning systems in a way that minimizes the potential for losing refrigerant to the atmosphere. Following the procedures in this section will help ensure compliance with SAE J2211 for R-134a systems.



CAUTION: FIRE OR EXPLOSION HAZARD EXISTS WITH R-134A UNDER CERTAIN CONDITIONS. R-134A HAS BEEN SHOWN TO BE NONFLAMMABLE AT AMBIENT TEMPERATURE AND ATMOSPHERIC PRESSURE. HOWEVER, TESTS UNDER CONTROLLED CONDITIONS INDICATE THAT AT PRESSURES ABOVE ATMOSPHERIC AND WITH AIR CONCENTRATIONS GREATER THAN 60% BY VOLUME, R-134A CAN FORM COMBUSTIBLE MIXTURES. WHILE IT IS RECOGNIZED THAT AN IGNITION SOURCE IS ALSO REQUIRED FOR COMBUSTION TO OCCUR, THE PRESENCE OF COMBUSTIBLE MIXTURES IS A POTENTIALLY DANGEROUS SITUATION AND SHOULD BE AVOIDED.

CAUTION: R-134A SERVICE EQUIPMENT OR VEHICLE AIR-CONDITIONING SYSTEMS SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR AND R-134A HAVE BEEN KNOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE. ADDITIONAL HEALTH AND SAFETY INFORMATION MAY BE OBTAINED FROM REFRIGERANT AND LUBRICANT MANUFACTURERS.

CONTAINERS FOR THE STORAGE OF RECYCLED REFRIGERANT

Recycled refrigerant must be stored only in DOT CFR Title 49 or UL containers approved for such use. The container must be specifically marked for the refrigerant type you are storing. The use of unmarked containers can lead to mixing of refrigerants and consequent air-conditioning system failure.

Disposable refrigerant containers should not be used for the storage or recovery of used or recycled refrigerant. Disposable containers are the type of containers in which virgin refrigerant is often sold.

Any container of recycled refrigerant that has been stored or transferred must be checked prior to its use in accordance with the temperature/pressure check described in "Checking Refrigerant for Excess Air."

New storage tanks must be evacuated to at least 635 mm (25") of mercury prior to use. Otherwise, excess air may be introduced to the refrigerant.

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