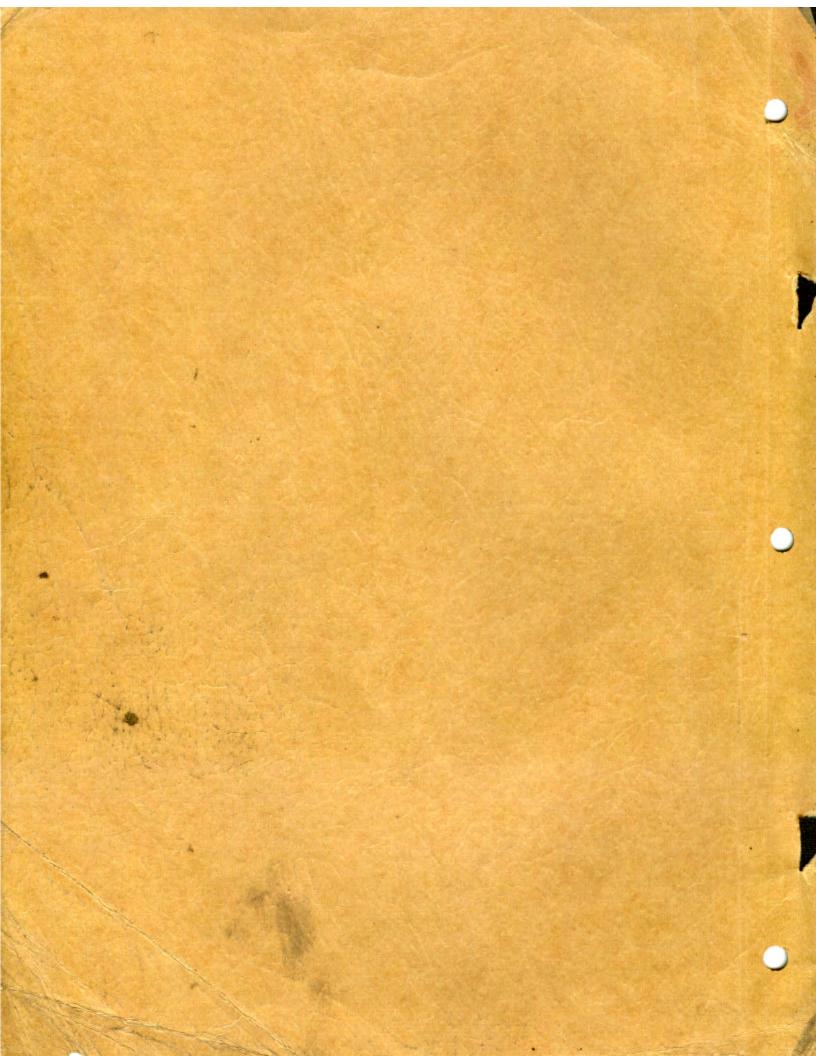
HUDSON



HYDRA-MATIC TRANSMISSION SERVICE MANUAL

HUDSON MOTOR CAR COMPANY DETROIT 14, MICH., U.S.A.



FOREWORD

This manual is a guide and a reference book to be used in the proper servicing of the Hydra-Matic Transmissions for Hudson cars.

The information in this manual applies to Hydra-Matic Transmission Models H-50, H-51, J-51, H-52 and J-52.

Where the repair operation or descriptive information is common to more than one model, the subject heading will include all models so affected.

Before proceeding with any repairs, determine the model and serial number, which can be found on the name plate affixed to the right side of the transmission case.

Pages are numbered consecutively. Illustrations are also in consecutive order.

Tools referred to or illustrated in this manual are available through the Kent-Moore Organization, Detroit, Michigan.

ALPHABETICAL INDEX

Page	Page
ACCUMULATOR CHECK VALVE -	Cleaning and Inspection
REAR SERVO 53-123	Description
	Detent Plug (3-2) - operation of 47
ADJUSTMENTS - TRANSMISSION	Differences in Design47-129-132
IN CAR 169	Disassembly126-130-131-132
Bands - External	Front Servo Exhaust Valve 45-46
Bands - Oil Pan Removed 159-175	Installation
Manual Control Linkage 172	Removal
Neutral Safety Switch 174	Reverse Check Valve 45
Throttle Control Linkage 169-171	"T" Oil Ball Check Valve 49
	Timing Valve (3-2) - operation of . 47
BAND ADJUSTMENTS	T. V. Regulator Valve -
External	operation of
Oil Pan Removed	
	DIAGNOSIS AND TESTING
CHECK GOVERNOR RUNOUT 144-159	Checking Oil Level
	Instructions for use of Guide 178
CHECKING MAINSHAFT END	Operating Conditions 182-183
CLEARANCE 77-155	Road Test
	Shift Points M.P.H 180-181
CHECKING OIL LEVEL 177	Slipping 177
	"Stall" or Torque Test 177
COMPONENTS OF A TWO-SPEED	Test for Broken Rear Servo Check
PLANETARY TRANSMISSION 12	Valve
Band Application	Test for Fluid Leaks 187
Clutch Operation	Test for Missing or Sticking Torus
Governor	Check Valve or Front Pump Relief Valve
Manual Valve Operation 14	
Oil Pump Operation	Testing for Noises
Pressure Regulator	Testing Rear Pump Pressure 184 Test Route
시구 있다. 프로그램 아름다면 하는 이 없어졌다면 보는 아름다면 하는데 이 사이를 하고 있다면 하는데	
Servo Operation	DIAGNOSIS GUIDE INSTRUCTIONS 178
ommer valve	DIAGNOSIS REVERSE UNIT
CONTROL VALVE ASSEMBLY	Low Oil Pressure, Slippage, De-
Assembly	layed Erratic Shift 187
Addemoty	my ou mand billion in the control of

ALPHABETICAL INDEX—CONTINUED

	Page		Page
DIAGNOSIS REVERSE UNIT (Cont'd)		FRONT SERVO EXHAUST VALVE	45-46
No Drive in Reverse (Lock-Up)			
when Shifting from "DR" to "LO"		FRONT UNIT	
to "R"	186	Assembly	84
No Drive in Reverse (Slipping)	185	Cleaning and Inspection	84
No Parking Pawl Engagement when	2000	Disassembly	83
Engine is Shut Off with Trans-		Installation on Planet Carrier 15	
mission in Reverse	186	Removal	80
Ratcheting Noise when Placing the	-		35.71
Selector Lever in the "R" Posi-		FUNDAMENTALS OF THE HYDRA-	
tion (With Car Moving)	187	MATIC TRANSMISSION	10
Reverse Application During For-	10.	Two Speed	10
ward Movement in Drive or Low		Description	10
Range	186	Planetary Gear Train	10
Selector Lever Hard to Move	185	Four Speed	21
Selector Lever Sticks in Reverse	100	Description	21
Position	185	Description	
Selector Lever Will Not go into	100	GENERAL SPECIFICATIONS	196
Reverse Position (With Engine	9	GENERAL BRECH ICATIONS	100
Running)	185	GOVERNOR	
Rummig/	100	Assembly	113
DRAINING	55	Cleaning and Inspection	112
DRAINING	00	Disassembly 11	100000000000000000000000000000000000000
DETITING INCORDITIONS	5	Disassembly11	0-156
DRIVING INSTRUCTIONS	6	[TRUITED BETTER STORE THE STORE OF STORE	58-77
Acceleration	6	Removal	50-11
Deceleration		COMPRISON ALICANTENE	169
Forced Downshift	6-8	GOVERNOR ALIGNMENT	163
"LO" Range Driving	8	COMEDNO DINOME CHECKING	144
Parking	9	GOVERNOR RUNOUT - CHECKING	144
Pushing Car to Start Engine	9		
Reverse	8-9	HYDRA-MATIC DRIVE COMPO-	00
Shift Points M.P.H	7	NENTS AND THEIR LOCATION	20
Starting	6		
Stopping the Car	8	HYDRA-MATIC TRANSMISSION	
Towing Car	9	DISASSEMBLY - REMOVAL OF	F0 F1
		() 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 () 전 ()	73-74
EXHAUST VALVE - FRONT SERVO.	46	Flywheel Housing	71
		Front Drive Gear Assembly	78
EXHAUST VALVE - MAIN LINE	50		80-81
		Governor	77
FLUID COUPLING	19	Main Shaft	79
		Oil Pan	72
FLUID LEAKS - TESTING FOR	187	Oil Pump - Front	78
1202 2012		Oil Pump - Rear	77
		Parking Brake Bracket Assembly.	74
FLYWHEEL	**************************************	Pressure Regulator Assembly 75-	76-77
Removal	147		79-80
Inspection	147	Reverse Shifter Bracket	73
Installation	148	Servo - Front	72
		Servo - Rear	72
FLYWHEEL HOUSING	1505434	Side Cover	72
Installation	164	Torus Cover	71
Removal	71	Torus Members	71

ALPHABETICAL INDEX—CONTINUED

	Page	Page
HYDRAULIC ACTION AND POWER-	1 000	OIL SEAL - REAR BEARING
FLOW	22	RETAINER 56
Compensator Pressure	39	Removal 56-92
Downshift - Forced (3-2)	41	Installation 57-101
Downshift - Forced (4-3)	40	OPERATING CONDITIONS 182-183
First Speed - Hydraulic Action	25	
First Speed - Powerflow	26	OPERATION OF A HYDRAULICALLY
Fourth Speed - Hydraulic Action	31	OPERATED TWO-SPEED TRANS-
Fourth Speed - Powerflow	32	MISSION
Modulated Line Pressure	38	Fluid Coupling
Neutral - Engine Not Running	22	High Gear - Direct Drive
Neutral - Engine Running	23 24	
Neutral - Powerflow	36	Neutral - Engine Running 17 Throttle Valve Operation 18
Reverse - Powerflow	37	
Second Speed - Hydraulic Action.	27	OVER-RUN CONTROL VALVE 52-120
Second Speed - "LO"	35	PARKING BLOCKER PISTON 50
Second Speed - Powerflow	28	경기 없게 되고 있다. 그리고 있었다. 내 보고 있는 사람이 되었다. 그 그 그 그 그 그 그 그 그 그 그 그 그 그 그 그 그 그 그
Third Speed - "Drive - 3"	34	PARKING BRAKE BRACKET Alignment Checking
Third Speed - Hydraulic Action	29	1116
Third Speed - Powerflow	30	Assembly
Timing the Shifts	33	Description
INSTALLING HYDRA-MATIC		Disassembly
TRANSMISSION	166	Installation 64-162
	1200	Parking Blocker Piston 50
INSTALLING UNITS IN TRANS-	440	Removal
MISSION CASE	149	Reverse Blocker Piston 49
MAIN LINE EXHAUST VALVE	50-145	PRESSURE REGULATOR ASSEMBLY
MAIN LINE PRESSURE REGULATION	42	Description 14-15-43
MAIN LINE PRESSURE TESTING	184	Inspection
NOISES - TESTING FOR	189	Removal
Front Oil Pump	189	
Front Unit Planet Gear	191	PUMP - FRONT
Rear Oil Pump	190	Assembly
Rear Unit Gear	191	Cleaning and Inspection 107-108
Rear Unit Planet Gear	190	Description
Reverse Planet Gear	189	Disassembly
Scraping Torus Members	190	Operation of
OIL CAPACITY	55	Removal
OIL DELIVERY SLEEVE		PUMP - REAR
Removal	82	Assembly 115
Inspection	151	Cleaning and Inspection 114
Installation	151	Disassembly 114
OIL LEVEL CHECKING	177	Installation
OIL LEVEL INDICATOR	165	Removal
	100	
OIL PAN SCREEN		REAR BEARING RETAINER
Removal	59	Assembly
Installation	164	Cleaning and Inspection 96-98
		The second secon

ALPHABETICAL INDEX—CONTINUED

THE THEODITORIE AND	DER GOTTE TO THE
Page	Page
REAR BEARING RETAINER (Cont'd)	REVERSE BOOSTER PRESSURE 43
Disassembly 92-93	REVERSE CHECK VALVE 45-47
Installation	REVERSE GEAR BACKLASH
Removal	CHECKING
REAR BEARING RETAINER OIL	REVERSE UNIT DIAGNOSIS 185
SEAL REPLACEMENT 56	
REAR OIL PUMP DRIVE GEAR	
Installation	SERVO - FRONT
Removal	Assembly
REAR PUMP PRESSURE TESTING 184	Cleaning and Inspection117-118
	Compensator Pressure 51 Design Changes 51-52
REAR SERVO EXHAUST VALVE 54-126 .	Design Changes
REAR UNIT	Exhaust Valve
Assembly89	Installation62-156-157
Cleaning and Inspection 88	Operation 50-52
Disassembly	Valve (4 to 3) 51
Installation	
Removal80	SERVO - REAR Accumulator Check Valve 53-123
REFILLING TRANSMISSION 55-56	
REPAIR PROCEDURES WITH	Assembly
TRANSMISSION IN CAR 55	Compensator Pressure 53
Capacity	Design Changes 54
Control Valve Assembly 65	Disassembly120-122
Draining Transmission and Torus. 55	Exhaust Valve
Drain Plug Gasket Replacement 56	Installation
Front Band Adjustment174-175	Operation 53-54
Governor	Removal
Oil Pan Assembly	SHIFT POINTS M.P.H
Oil Screen	"STALL" OR TORQUE TEST 177
Pressure Regulator Valve 57	
Rear Band Adjustment 175	TEST FOR BROKEN REAR SERVO CHECK VALVE
Rear Bearing Retainer Oil Seal 56-57	
Rear Oil Pump Assembly .58-59-60-61-62	TESTING FOR FLUID LEAKS 187
Refilling	TEST ROUTE
Reverse Anchor Bracket 63 Servo - Front 62	THRUST WASHER SPECIFICATIONS. 195
Servo - Rear	TIMING THE SHIFTS 7-180-181
REVERSE ANCHOR BRACKET	TORQUE SPECIFICATIONS 193
Installation	TORUS CHECK VALVE
Overhaul 63	Installation
Removal	Removal
REVERSE ASSEMBLY	TORUS COVER
Assembly 99-102	Inspection
Cleaning and Inspection 96-98	Installation
Disassembly 92-93	Removal
Installation	TORUS MEMBERS
Rear Oil Pump Drive Gear Repairs. 98-99	Cleaning and Inspection 146
Removal	Installation
	Removal
REVERSE BLOCKER PISTON 49	TRANSMISSION - REMOVAL 69

HYDRA-MATIC TRANSMISSION

INSTRUCTIONS ON OPERATING HUDSON WITH HYDRA-MATIC

(Models H-50, H-51, J-51, H-52, and J-52)

The manual selector lever located just below the steering wheel, Figure 1, (Models



FIGURE 1

H-50, H-51 and J-51) is used to select neutral, one of two forward speed ranges and reverse.

On Models H-52 and J-52 "Dual Range", the lever is used to select neutral, one of three forward speed ranges, and reverse, Figure 2.

These positions are all shown on the indicator dial. The indicator dial is illuminated when the lighting switch is turned on. An explanation of the indicator dial markings for Models H-50, H-51 and J-51 are as follows:

- N Neutral.
- DR For all normal forward driving.
- LO For maximum power forward, such as operating up steep grades under heavy loads, or in sand and also to be used as a brake when descending steep grades.
- R Reverse (Selector lever must be raised to engage reverse position).

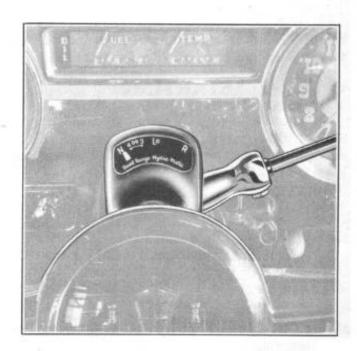


FIGURE 2

For Models H-52 and J-52 "Dual Range" the selector lever indicator positions are explained as follows:

- N Neutral
- DR-4 For country driving, better fuel economy and reduced engine speed.
- DR-3 For heavy traffic driving and under conditions where top performance is needed, for down hill braking under conditions where "DR-4" braking is inadequate and "LO" range braking is too severe.
- LO For maximum power forward, such as operating up steep grades under heavy loads, off highway driving (through sand, mud and snow) and also to be used as a brake when descending steep grades. It is also best for getting the car in motion on slippery roads.

NOTE: With "Dual Range" transmissions, the manual selector lever must be raised to change from "DR-4" or "DR-3" to reach the "LO" range position.

CAUTION: The change from either "DR-4" or "DR-3" to "LO" (car in motion) should never be made on slippery pavement as skidding may result.

 Reverse. Reverse position is also used for holding car on grades when parking.

NOTE: Selector lever must be raised slightly when going into low and reverse position.

STARTING

(Models H-50, H-51, J-51, H-52 and J-52)

NOTE: The starting circuit is wired so the starter will not (and should not) operate unless the manual selector lever is in the "N" (neutral) position.

To start the engine:

(a) Apply the hand brake.

(b) Place the manual selector lever in "N" (neutral) position.

(c) Depress the accelerator pedal halfway and release.

CAUTION: Never pump the accelerator or race the engine.

(d) Turn ignition switch on and crank engine.

NOTE: If the engine fails to start in five to ten seconds, it is possible that the carburetor is flooded. In that case, it will be necessary to depress the accelerator pedal to the wide open position while continuing to operate the starter.

OPERATING IN "DR" RANGE

(Models H-50, H-51, J-51, H-52 and J-52)

NOTE: In extreme cold weather allow the engine to idle with the selector lever in the "N" position until the engine and transmission are warmed up. After the engine is started, move the manual selector lever to the desired position.

NOTE: When both the engine and transmission are cold, there may be a tendency for the car to creep slightly due to the increased engine RPM, when the engine is operating on fast idle and the manual selector lever is in the "DR" position for Models H-50, H-51 and J-51 and in either "DR-4" or "DR-3" position for Models H-52 and J-52. A slight application of the foot brake or hand brake will hold the car during this condition. When the brakes are released, the car will move forward when the accelerator pedal is depressed.

On Models H-52 and J-52 the "DR" position is the four speed range and should be used for all normal forward driving. This position provides reduced engine speeds, greater fuel and oil economy and smoother and more comfortable operation. The "DR-3" position is the three speed range which provides better acceleration and handling in congested traffic and more effective control when climbing or descending long mountain grades.

The control lever can be moved from the "DR-4" to the "DR-3" or vice-versa at any car speed on dry pavement.

ACCELERATION: (Models H-50, H-51, J-51, H-52 and J-52)

The shifts from first speed to second, second speed to third and from third to fourth (direct drive), will occur at different car speeds depending upon the amount of accelerator pedal pressure. With slight accelerator pedal pressure, the shifts will occur at lower car speeds. As the accelerator pedal pressure is increased, the car speed at which the shifts will occur will be higher.

DECELERATION: (Models H-50, H-51, J-51, H-52 and J-52)

With the manual selector lever in the "DR" position and the car is decelerating with the accelerator pedal fully released and free, the shift from fourth speed to third occurs automatically. Continuing to decelerate, the transmission will automatically shift from third speed to second and finally from second to first. See "Hydra-Matic Shift Points in Miles Per Hour" for the particular model you are checking.

FORCED DOWNSHIFT FROM FOURTH TO THIRD: (Models H-50, H-51 and J-51)

For increased power when climbing hills or passing a car on the open highway at speeds below 60 miles per hour, fully depress the accelerator pedal. The drive then changes from fourth speed to third for a rapid pickup and returns to direct drive (fourth speed) automatically when the accelerator is released or when the car has reached approximately 65 miles per hour. "See Chart", Page 7.

HYDRA-MATIC SHIFT POINTS IN M.P.H.

(Models H-50, H-51 and J-51) UPSHIFTS

	DRIVE	RANGE	"LO"	RANGE
SHIFT	MINIMUM THROTTLE	FULL THROTTLE	MINIMUM THROTTLE	FULL THROTTLE
1 - 2	4 - 8	10 - 15		22 - 27
2 - 3	10 - 14	26 - 35		
3 - 4	15 - 20	55 - 66		
		- 18		

DOWNSHIFTS

	DRIVE RANGE			"LO" RANGE		
SHIFT	CLOSED THROTTLE	FULL THROTTLE	FORCED	CLOSED THROTTLE	FULL THROTTLE	LOCKOUT
4 - 3	15 - 10	19 - 15	60 - 15			
3 - 2	10 - 5	14 - 9				
2 - 1	5 - 3	10 - 5		9 - 5	14 - 10	
4 - 2						48 - 39
			the same of the			

(Models H-52 and J-52) UPSHIFTS

	"DR-4" RANGE		"DR-3"	"LO" RANGE	
SHIFT	MINIMUM THROTTLE	FULL THROTTLE	MINIMUM THROTTLE	FULL THROTTLE	FULL THROTTLE
1 - 2	6 - 9	17 - 20	6 + 9	17 - 20	17 - 20
2 - 3	11 - 14	32 - 36	11 - 14	32 - 36	
3 - 4	20 - 23	63 - 69			

DOWNSHIFTS

	"'I	OR-4" RANGE		"I	"DR-3" RANGE		
SHIFT	CLOSED THROTTLE	FULL THROTTLE	FORCED (Approx.)	CLOSED THROTTLE	FULL THROTTLE	FORCED (Approx.)	
4 - 3	16 - 14	21 - 17	20 - 60				
3 - 2	11 - 8	10 - 7	10 - 22	11 - 8	10 - 7	10 - 22	
2 - 1	7 - 5	10 - 7	0 - 10	7 - 5	10 - 7	0 - 10	
4 - 2			20 - 10				
3 - 1			10 - 7			10 - 7	

"LO" RANGE

LOCKOUT	FORCED	FULL THROTTLE	SHIFT
			4 - 3
 49 - 41			3 - 2
	0 - 10	10 - 7	2 - 1
49 - 41			4 - 2
, , , , , , , , , , , , , , , , , , , ,			3 - 1

FORCED DOWNSHIFT: (Models H-52 and J-52)

For quick acceleration when passing other cars or climbing grades, when driving in "DR-4", "DR-3" or "LO" range positions, depress the accelerator pedal completely. The transmission will then shift to a lower speed for rapid acceleration and will return to a higher speed automatically as car speed is increased. The downshifts will occur as follows (also see page 7).

 When driving at a speed below 60 MPH with the selector lever in the "DR-4" position the transmission will shift from fourth speed to third when the accelerator is fully depressed.

 When driving at a speed less than 20 MPH in either "DR-4" or "DR-3" position the transmission will downshift to second speed when the accelerator is fully de-

pressed.

When driving in either of the "DR" positions or "LO" at a speed of less than 10 MPH the transmission will downshift to first speed when the accelerator is fully depressed.

CAUTION: Do not coast with the control lever in the "N" (neutral) position.

STOPPING THE CAR: (Models H-50, H-51, J-51, H-52 and J-52)

To stop the car, release the accelerator pedal and apply the brakes in the conventional manner. The manual selector lever remains in the "DR" position and the engine is then "in gear" and helps to slow down the car until its speed reaches a few miles per hour. The slippage of the fluid coupling is sufficient to prevent the engine from stalling.

CAUTION: Always return the manual selector lever to the "N" position whenever the driver leaves the car with the engine still running. For additional safety always apply the hand brake. This precaution prevents movement of the vehicle should the pedal be accidentally depressed.

"LO" RANGE POSITION: (Models H-50, H-51 and J-51)

With the manual selector lever in the "LO" position, the transmission will operate

in only the first and second speeds; it will not change to the third or fourth speed regardless of engine speed.

The "LO" range position is provided for two special uses. (1) For descending steep hills, where traffic signs call for second gear, this affording the maximum engine braking power. (2) Pulling through deep sand or up steep grades under heavy loads when upshifting is not desired.

The shift change from "DR" to "LO" range position can be made at any speed below 48 miles per hour when the road is dry and traction is good.

NOTE: Selector lever should not be moved from "DR" to "LO" range while driving on slippery pavement as skidding may result.

"LO" RANGE POSITION; (Models H-52 and J-52)

In the "LO" (low range) position, the transmission operates only in second and first speeds and will not change to third or fourth speed regardless of engine speed. This provides maximum power, for pulling through deep sand or snow and ascending or descending steep grades where traffic signs call for placing the transmission in first or second gear. It is also best for getting the car in motion on icy roads.

The change from either "DR-4" or "DR-3" positions to "LO" is made by lifting the control lever and moving it to the "LO" position. This change can be made at any car speed; however, "LO" range will not engage until the car speed is reduced to below 50 MPH.

When driving in the "LO" range position at a car speed of less than 10 MPH, the transmission will shift down to first speed when the accelerator pedal is completely depressed. The transmission will automatically shift to second speed at a higher car speed.

CAUTION: The change from either of the two "DR" positions to "LO" should only be made on dry roads where traction is good. Release the accelerator pedal when moving the selector lever from either of the two "DR" positions to "LO".

REVERSE: (Model H-50)

The car must be brought to a full stop before shifting selector lever to the reverse position. To engage reverse after a complete stop, move the manual selector lever to the "LO" range position, then raise the end of the selector lever slightly, hesitate a second or two then move the selector lever into the "R" position.

REVERSE: (Models H-51, J-51, H-52 and J-52)

With the car standing, place the selector lever in "N" (neutral), start the engine and while holding the car stationary with the foot brake, raise the selector lever toward the steering wheel and move it to the "R" (reverse) position.

If the car is stuck in deep snow, mud or sand, it is not necessary to come to a complete stop before shifting to reverse. The car can be rocked backward and forward by moving the selector lever back and forth quickly from the "R" (reverse) position to the "LO" (low) position with little accelerator pressure.

NOTE: Avoid engaging reverse above 5 miles per hour.

PARKING: (Model H-50)

For additional safety, when the car is parked, place the selector lever in "LO" position, shut off the engine, then place the selector lever in the "R" position.

PARKING: (Models H-51, J-51, H-52 and J-52)

For additional safety while parking, turn off ignition key and move selector lever to "R" position. This permits engagement of transmission parts thereby providing "in gear" parking ability.

IMPORTANT: When parking on an incline, hold the car with foot brake a few seconds to permit engagement of transmission parts.

PUSHING OR TOWING TO START ENGINE: (Models H-50, H-51, J-51, H-52 and J-52)

Should it become necessary to start the engine by pushing or towing the car, place the selector lever in the "N" (Neutral) position and move the car until a speed of approximately 25 miles per hour is reached. Then turn on ignition and move the selector lever for Models H-50, H-51 and J-51, to the "DR" position and for Models H-52 and J-52 move the lever to either the "DR-4" or "DR-3" range position and engine should turn over.

CAUTION: Never place the selector lever in "LO" to start engine by towing or pushing.

NOTE: The possibility of damage due to sudden acceleration after the engine starts is avoided if the car is pushed instead of towed. Do not push or tow the car faster than 25 miles per hour.

FOR TRANSMISSION NOT FUNCTIONING PROPERLY:

The propeller shaft must be disconnected at the rear universal joint or the rear wheels raised off the ground to prevent possible damage to the transmission.

FOR MECHANICAL FAILURES OTHER THAN TRANSMISSION:

Propeller shaft need not be disconnected if transmission has been operating normally provided that the car has been driven a minimum of 1000 miles and that towing speeds of not less than 15 or not more than 25 miles per hour be maintained.

FUNDAMENTAL PRINCIPLES OF THE HYDRA-MATIC TRANSMISSION

(Models H-50, H-51, J-51, H-52, and J-52)

DESCRIPTION

The Hydra-Matic Transmission is an automatic means of transmitting the engine power to the vehicle propeller shaft, after which it is directed to the rear axle and the rear wheels in the conventional manner.

The Hydra-Matic Drive consists of a fluid coupling which replaces the clutch and is combined with a hydraulically-controlled automatic transmission having four speeds forward and one reverse.

Gear ratios are obtained through planetary gears in the Hydra-Matic transmission.

PLANETARY GEAR TRAIN

A planetary gear train, Figure 3, consists of three members:

- 1. A "Center" or "Sun" gear.
- A planet carrier with three planet pinion gears.
- 3. An internal gear.

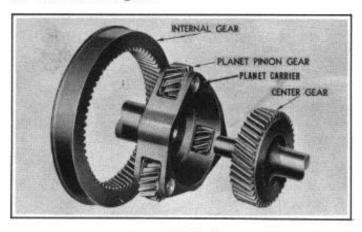


FIGURE 3

The "Sun" gear is surrounded by and meshes with the planet pinion gears, the pinion gears rotate freely on pins attached to a common housing called a "planet carrier." A ring with teeth machined on the inside circumference surrounds the planet assembly and meshes with the planet pinion gears. This ring is called the "internal" gear, because of its internal teeth.

ADVANTAGES OF A PLANETARY GEAR TRAIN:

- With the use of a planetary gear train, the load is distributed over several gears and while planetary gears are smaller and occupy less space than the sliding type gears, they can transmit more tooth load because there is more tooth area in contact at all times.
- As the planetary gears are always completely in mesh, there is no possibility of gear tooth damage due to gear clash or partial engagement.
- The common axis for all members of the planetary train makes the unit more compact and facilitates its use as a coupling.

OPERATION OF THE PLANETARY GEAR TRAIN:

 A planetary gear train can be used to increase power and decrease speed in either of two ways.

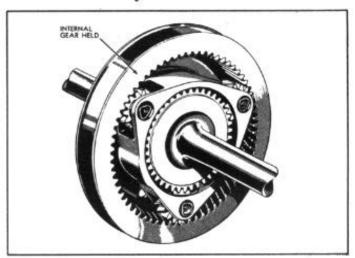


FIGURE 4

(a) In Figure 4, the internal gear is held stationary, and power is applied to the center gear. As the "Sun" gear turns, the planet pinion gears which are in mesh with it, rotate on their respective pins. Since they are also in mesh with the stationary internal gear, they must "walk around" inside the internal gear carrying

the planet carrier with them in the same direction of rotation as the "Sun" gear. The planet carrier then rotates at a speed less than that of the "Sun" gear, and the planetary gear train functions as a power-increasing speed reducing unit.

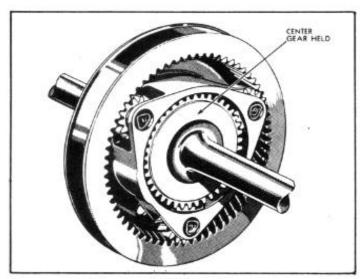


FIGURE 5

(b) The same results can be obtained by holding the "Sun" gear stationary and applying power to the internal gear, Figure 5. In this case, rotation of the internal gear causes the planet pinion gears to rotate on their respective pins and at the same time "walk around" the "Sun" gear, thus rotating the planet carrier at a speed less than that of the internal gear, and making the gear train function as a power-increasing, speed reducing unit.

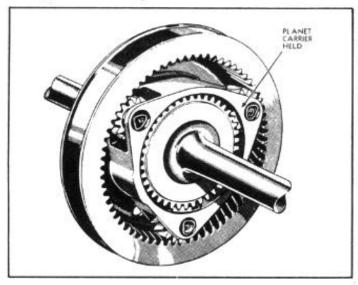


FIGURE 6

2. A planetary gear train can be used to reverse direction of rotation when the planet carrier is held stationary. In this instance, if power is applied to the "Sun" gear, the planet pinion gears rotate on their respective pins; but since the carrier is stationary, they act merely as idlers, transmitting power to the internal gear and causing it to rotate in the opposite direction, Figure 6.

In all of the examples shown, one member has been held stationary, the power applied to another member, and taken off the third member.

 A planetary gear train can be used to function as a coupling for direct mechanical drive when any two members are locked together.

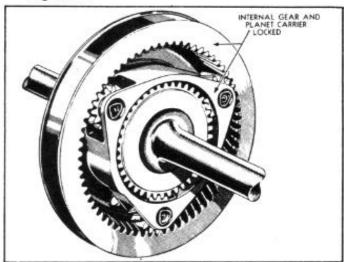


FIGURE 7

Under this condition no movement can take place between the gears and the entire gear train will rotate as a unit, Figure 7.

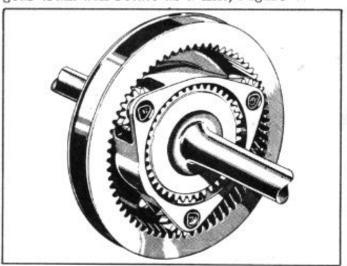


FIGURE 8

4. When no member is held and no two members are locked together the planetary gear train will not transmit power, therefore, it is in neutral, Figure 8.

COMPONENTS OF A TWO-SPEED PLANETARY TRANSMISSION

(Models H-50, H-51, J-51, H-52, and J-52)

A simple two speed planetary transmission will be described as an introduction to the operation of the Hydra-Matic Drive.

The following components make up the two speed transmission:

A single planetary gear train.

A band and servo for band application.

A clutch to lock two members together.

An oil pump and pressure regulator.

A manual valve.

A shifter valve.

A governor.

A regulator plug.

PLANETARY GEAR TRAIN:

The planetary gear train in the two speed transmission is arranged as shown in Figure 9.

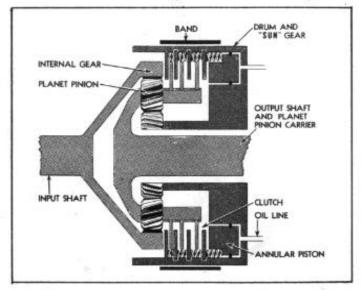


FIGURE 9

The internal gear is part of the input shaft. The planet pinion gears and carrier are part of the output shaft. The "Sun" gear is attached to the drum which is encircled by a band.

In the multiple disc clutch one set of plates is splined to the planet carrier, the other set is attached to the drum. The annular piston is also attached to the drum and when applied, locks the "Sun" gear to the planet carrier.

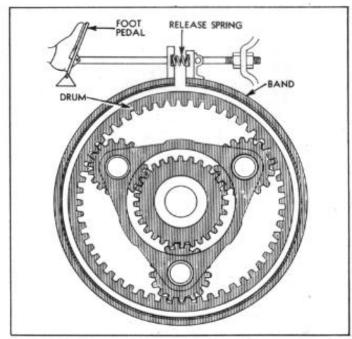


FIGURE 10

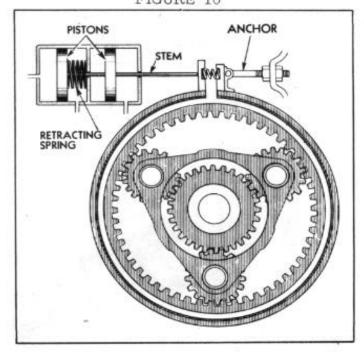


FIGURE 11

BAND AND SERVO FOR BAND APPLICA-TION:

A band is used to hold the drum which is attached to the center gear. At one time, some cars used planetary transmissions in which the band was applied by a foot pedal, Figure 10.

Hydraulic application of the band will be used to coincide with the method used in the Hydra-Matic transmission, Figure 11.

The two pistons are mounted on a common stem. The piston and stem assembly is installed in a cylinder or servo body with a division in the body between the pistons to hold the servo in the released position when no fluid pressure is applied. When the piston stem acts on one end of the band the anchor holds the other end to facilitate band application.

OPERATION OF THE SERVO:

When hydraulic force greater than the spring pressure is applied at point A, Figure 12, the piston stem will be forced against the band, applying the band on the drum.

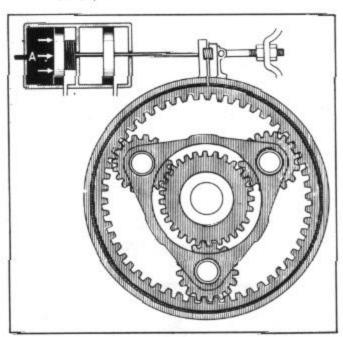


FIGURE 12

When hydraulic force equal to that applied at point A is applied at both points B and C the piston stem will be forced away from the band because in this case "release" force is greater than "apply" force, Figure 13.

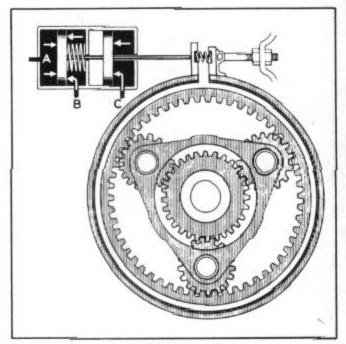


FIGURE 13

CLUTCH TO LOCK TWO MEMBERS TO-GETHER:

A multiple plate clutch is used to lock the planet carrier and output shaft to the "Sun" gear. The clutch could be applied mechanically and released by spring pressure as shown in Figure 14.

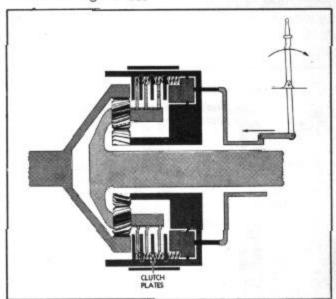


FIGURE 14

Hydraulic application will be used to coincide with the method used in the Hydra-Matic Transmission. An annular piston is located in the drum which surrounds the gear train, Figure 15.

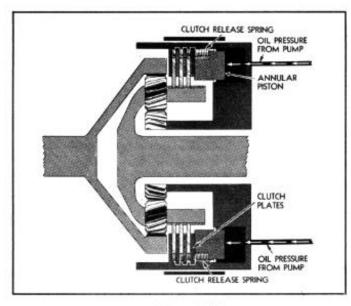


FIGURE 15

When no hydraulic force is applied to the piston, the clutch is released by the release springs. When hydraulic force is applied on the piston, it compresses the multiple plates locking the planet carrier and output shaft to the "Sun" gear.

OIL PUMP AND PRESSURE REGULATOR:

A gear type oil pump driven by the input shaft, and a spring loaded pressure regulator valve are required to provide hydraulic pressure for operation of the transmission, Figure 16.

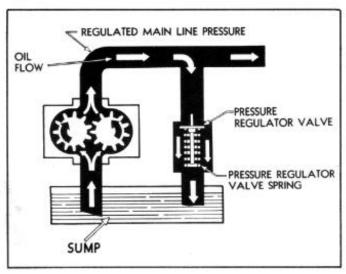


FIGURE 16

With the oil pump in operation, oil is drawn up from the pan and forced into the system and against the regulator valve. When pressure is sufficient to force the regulator valve off its seat, the valve will bypass oil to the pan. When pressure in the system falls below that required to hold the valve open, the valve will close. This cycle is repeated continuously and constant regulated "main line" pressure results.

MANUAL VALVE:

A manually operated valve is placed in the main line beyond the pressure regulator valve to permit shutting off oil to the hydraulically operated components, Figure 17.

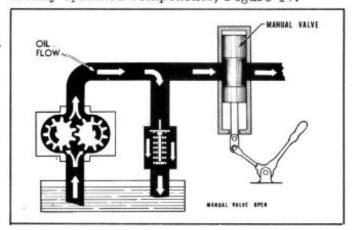


FIGURE 17

SHIFTER VALVE:

A shifter valve is required to make the automatic shift from low to direct drive. The valve is held in the closed position by a spring, Figure 18.

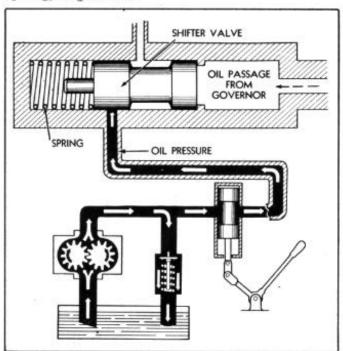


FIGURE 18

The valve is opened hydraulically when oil pressure on the end of the valve is greater than spring pressure.

GOVERNOR:

The shift from reduction to direct drive must be made at the correct time in relation to vehicle speed so that the engine will be neither racing excessively nor overloaded. This can be accomplished by means of a simple centrifugal or flyweight governor, Figure 19, driven by the transmission output shaft.

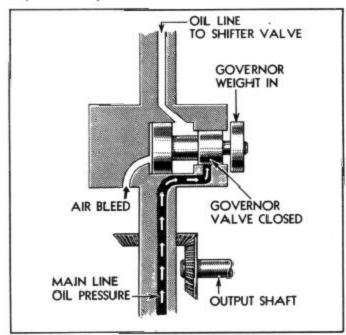


FIGURE 19

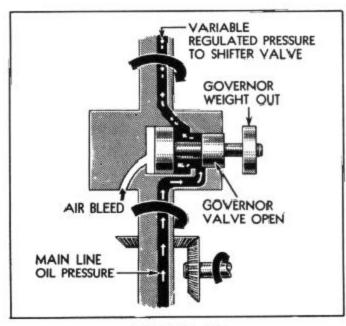


FIGURE 20

When the vehicle is standing, the governor weight, to which a valve is attached, is
"In", closing off the oil passage. As the vehicle starts to move, the output shaft rotates
the governor assembly. As the vehicle speed
increases, the governor weight moves outward
moving the valve and uncovering the oil passage to the shifter valve. Oil going through
the valve exerts force against the large area
of the valve, acting against centrifugal force.
The valve then regulates pressure to the
shifter valve, variable with vehicle speed,
Figure 20.

As vehicle speed continues to increase, centrifugal force increases, moving the valve further outward thus increasing the variable regulated pressure to the valve. This pressure is known as governor pressure.

REGULATOR PLUG:

With the shifter valve, shifter valve spring, and governor described above, the shift from low to direct drive will always occur at the same vehicle speed.

This arrangement is undesirable in a vehicle because many circumstances arise when a shift at higher or lower speeds is desired. Examples of this are when rapid getaway is desired or when climbing a hill.

The need for a higher shift point thus corresponds closely with the need for increased power output of the engine. Since engine power output is controlled by throttle opening, which in turn is controlled by the accelerator pedal, the timing of the shift can be regulated with the position of the accelerator pedal.

One way of accomplishing this is shown in Figure 21. Assume that the shifter valve spring is seated against a movable regulator plug which is connected to the accelerator pedal. As the accelerator pedal is depressed, the plug is moved inward compressing the spring and thereby increasing its tension. Because of this increased tension, more governor pressure is required to move the shifter valve and consequently the shift will occur at higher vehicle speeds, determined by the act celerator pedal position.

With this arrangement, the transmission will upshift at a very low vehicle speed when the throttle is nearly closed, and at a much higher speed when the throttle is wide open.

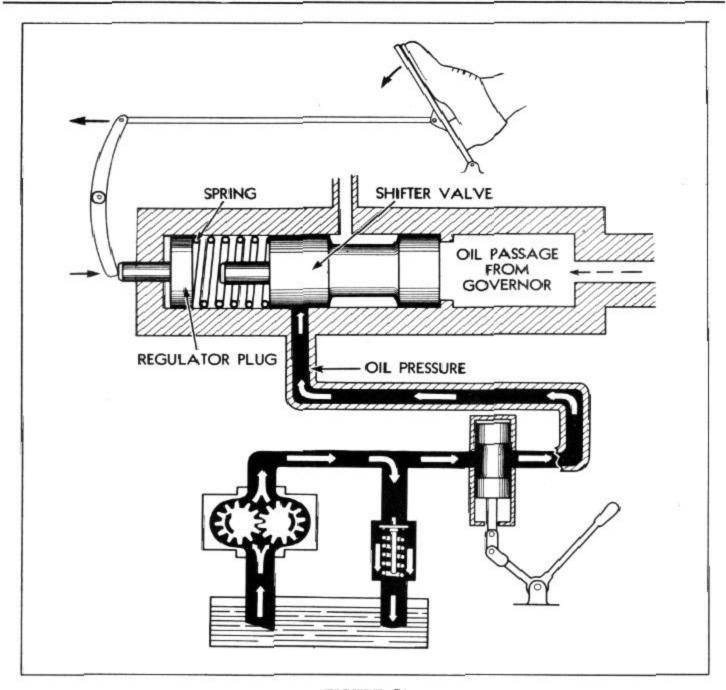


FIGURE 21

OPERATION OF A HYDRAULICALLY OPERATED TWO-SPEED TRANSMISSION

(Models H-50, H-51, J-51, H-52, and J-52)

In order to simplify the explanation of the two speed transmission, the components described above will be illustrated schematically.

LEGEND FOR SCHEMATIC ILLUSTRATIONS:

- Solid lines with arrows represent passages filled with oil at constant regulated main line pressure.
- Solid lines without arrows represent passages in which no pressure exists.
- - Broken lines with arrows represent passages filled with oil at variable pressure.
- - Broken lines without arrows represent passages in which no variable pressure exists.

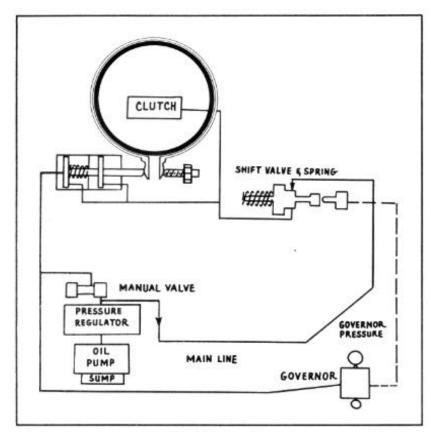


FIGURE 22

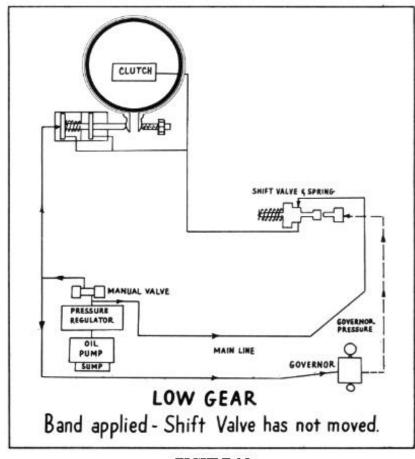


FIGURE 23

NEUTRAL -- (ENGINE RUNNING):

In neutral the manual valve is closed. The oil pump, driven from the input shaft which turns with the engine, delivers oil to the pressure regulator and the shifter valve. The regulator returns excess oil to the pump, Figure 22.

The band is released by the spring because there is no oil pressure on the servo piston. The clutch is released by springs because there is no oil pressure to apply the annular piston.

LOW GEAR (REDUCTION):

The manual valve is moved to direct oil pressure to the servo piston and governor. Oil pressure is present on the land of the closed shift valve. The servo applies the band and the clutch is released by springs, Figure 23.

When vehicle speed is such that the governor pressure over-comes the shifter valve spring, the valve will open automatically and allow oil to flow through the oil line to apply the clutch and release the servo. This places the planetary unit in direct drive.

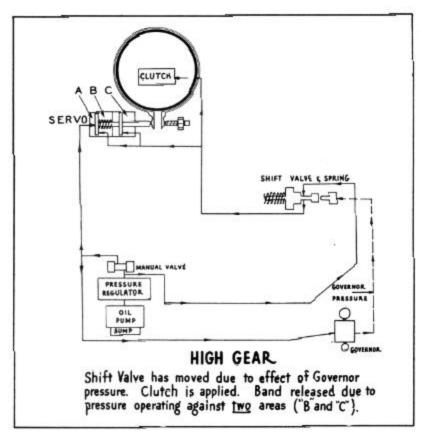
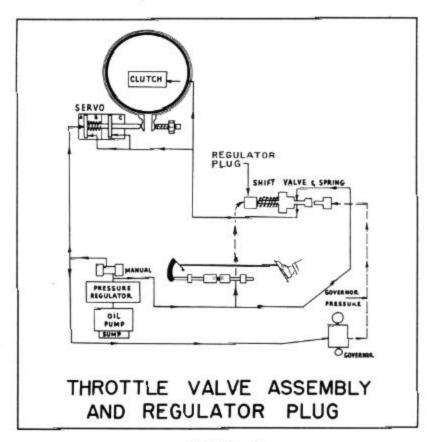


FIGURE 24



HIGH GEAR (DIRECT DRIVE):

The manual valve continues to direct oil pressure to the servo piston at A, and to the shifter valve and governor. Governor pressure, due to vehicle speed, has overcome the shifter valve spring pressure and moved the valve so that the main line regulated pressure is directed to the servo at B and C, releasing the band, and to the planetary unit to apply the clutch, Figure 24.

The transmission will stay in direct drive as long as vehicle speed is sufficient to maintain governor pressure high enough to hold the shifter valve spring compressed. When speed is reduced to a point where the spring overcomes governor pressure the transmission will automatically downshift to low, Figure 24.

REGULATOR PLUG:

The need for a regulator plug was outlined on page 15. In that case, the regulator plug was moved mechanically to increase spring tension to delay the upshift. To coincide with the Hydra-Matic Drive the regulator plug in the simple two speed transmission is moved by a variable regulated hydraulic pressure called "Throttle pressure".

Throttle pressure is obtained by the use of a throttle valve assembly which is moved by mechanical linkage from the accelerator pedal. The valve assembly is so designed that "throttle pressure" increases with carburetor throttle opening. Therefore, the further the accelerator pedal is depressed, the more the shifter valve spring tension is increased to delay the upshift, Figure 25.

FLUID COUPLING

A fluid coupling is employed in the Hydra-Matic drive to relieve the driver of operating a clutch pedal and to cushion the shifts.

The fluid coupling consists of two parts called "torus members" splined to independent shafts and located in a fluid filled housing consisting of a flywheel and torus cover.

The principal parts of each torus member Figure 26 are, the outer shell and hub, the inner shell, and the vanes interconnecting these shells. The two members are identical in construction except for the hubs which are different in size to fit their respective shafts, Figure 28.

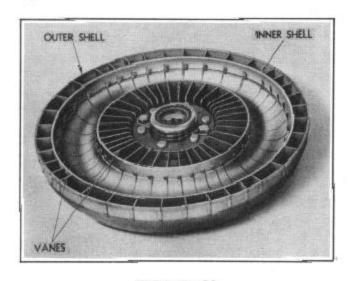


FIGURE 26

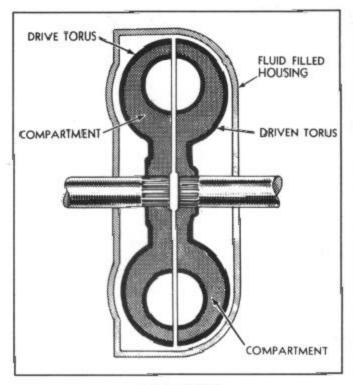
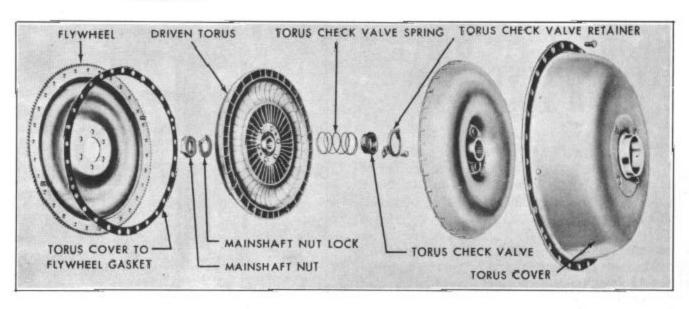


FIGURE 27

A schematic cross-section of two torus members attached to independent shafts and located in a fluid filled housing; the shape of the compartment formed by the vanes is shown shaded. Figure 27 illustrates the component parts which make up the fluid coupling.

NOTE: The component parts which make up the fluid coupling are shown in Figure 28.



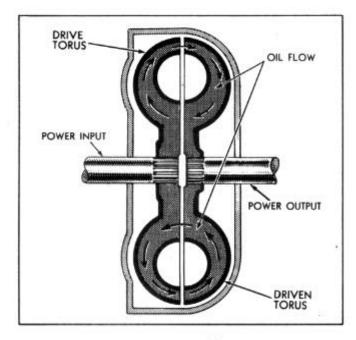


FIGURE 29

In operation, rotation of the drive torus member causes the fluid within that member to be forced radially outward. Fluid then crosses over and strikes the vanes of the driven torus member causing it to rotate in the same direction as the drive member as shown in Figure 29.

The higher the speed of the drive member, the greater the force exerted by the fluid on the driven member due to centrifugal action. Consequently, a fluid coupling is

> Very effective at high speed. Less effective at low speed. Non-effective at idle speed.

HYDRA-MATIC DRIVE COMPONENTS AND THEIR LOCATION

It is possible to obtain only two forward speeds, reduction and direct, from one planetary gear train or unit when applying power at the same source (for example "Sun" or center gear). As a greater variation of speed ratios is required to satisfactorily operate a vehicle, the Hydra-Matic transmission contains two planetary gear trains arranged to provide four speeds forward. This is accomplished by various combinations of bands and clutches. It also contains a third planetary gear train for reverse. In all forward speeds

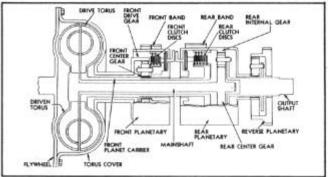


FIGURE 30

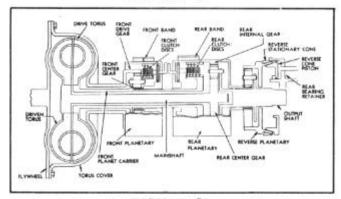


FIGURE 31

the reverse planetary unit has no function and simply revolves with the output shaft.

Power travels from the flywheel to the torus cover through the front planetary, which is in reduction because the band is applied, and then to the rear torus, Figure 32. The rear torus in the Hydra-Matic Drive is the drive member while the front torus is the driven member. As the vehicle starts, power

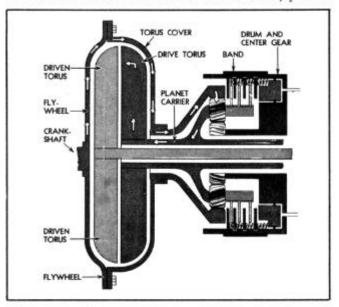


FIGURE 32

travels from planetary, in reduction, then through the fluid coupling and back to the rear planetary unit. When the speed of the vehicle has increased to a point where the reduction of the front planetary unit is no longer required, the front planetary unit shifts to direct drive and the drive torus turns at the same speed as the engine.

FUNDAMENTALS OF THE HYDRA-MATIC TRANSMISSION

In the Hydra-Matic transmission two planetary units are used to give four forward speeds, Figure 33. Although both units are similar, the rear unit differs in two ways from the front unit.

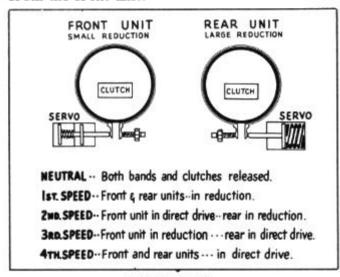


FIGURE 33

- It is longer, has more clutch plates and greater gear reduction.
- The servo is normally applied by spring pressure and released by oil pressure.

Memorize bandand clutch application for the four forward speeds. One way this can be done is as follows:

The greatest forward speed reduction will be wanted in first speed -- call this 100% usable reduction.

The next greatest reduction will be wanted in second speed--call this 60% usable reduction.

The next greatest reduction will be wanted in third speed -- call this 40% usable reduction. In fourth speed, direct drive is wanted-call this 0% reduction.

For simplicity in this example, the front unit will be considered capable of giving 40% usable reduction and the rear unit 60% usable reduction. The two units then can be used in various reduction and direct drive combinations to provide four speeds forward and reverse, Figure 34.

NOTE: Review clutch and band applications frequently. Ability to visualize "reduction" or "direct drive" in each unit for each forward speed is invaluable in diagnosing trouble.

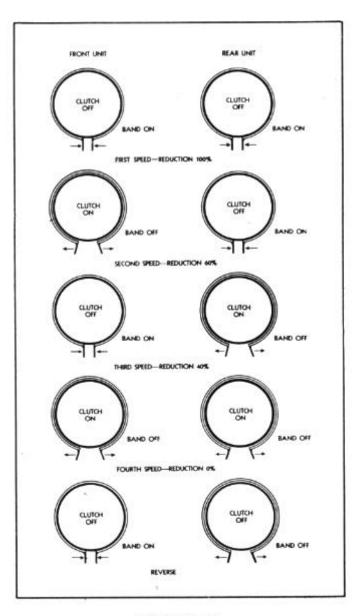


FIGURE 34

HYDRAULIC ACTION AND POWER FLOW IN THE HYDRA-MATIC TRANSMISSION

The hydraulic principle of the Hydra-Matic transmission is basically the same as in the two speed transmission described earlier. Oil is delivered by the oil pump to a pressure regulator, which maintains constant "main line" pressure, then to the manual valve. When the manual valve is in the "DR", "LO" or "R" position, it directs oil to the front serve to apply the band.

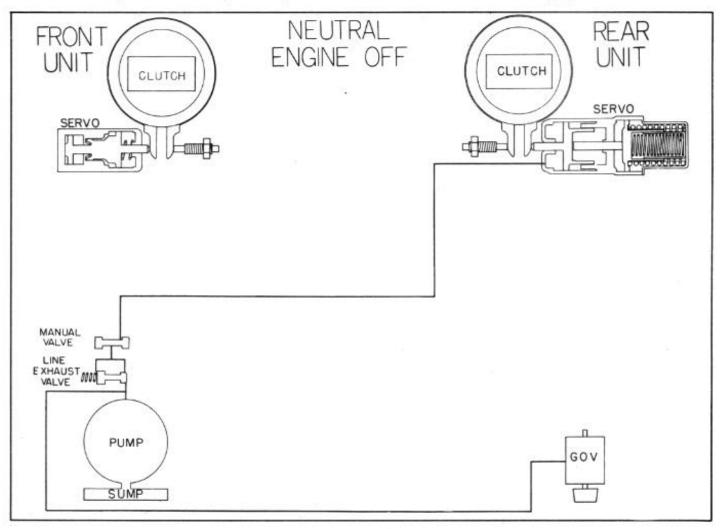


FIGURE 35

NEUTRAL

CAR STANDING - (ENGINE NOT RUNNING):

The front servo is oil applied and oil and spring released. Therefore, when the car is standing and the engine not running, the front band and the front clutch are released by spring, Figure 35.

The rear servo is spring and oil applied and oil released. When the vehicle is standing and the engine not running, there is no oil pressure. The band is applied by spring pressure, placing the rear unit in reduction. The clutch is released by spring pressure.

On Models H-52 and J-52, a main line exhaust valve has been added to permit a more rapid engagement of the parking pawl when the car is at a standstill and the engine is shut off.

With the engine off the pumps are inoperative, spring pressure opens the valve and exhausts oil into the case, Figure 36. This mainline exhaust valve is not used in Models H-50, H-51 and J-51.

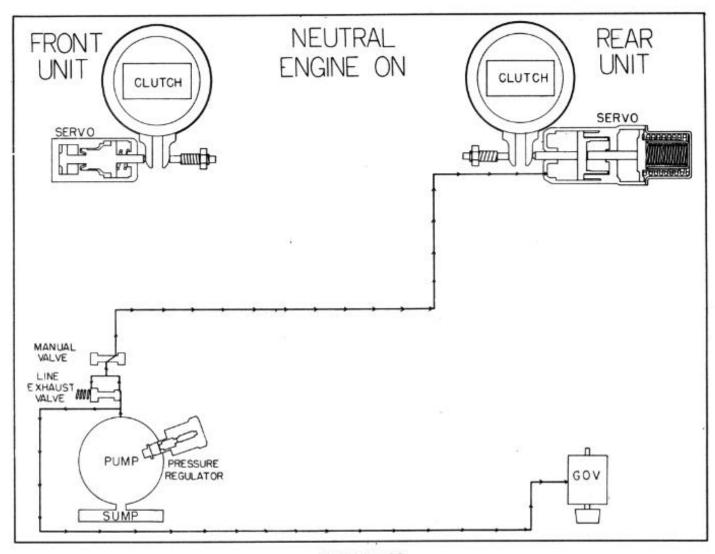


FIGURE 36

NEUTRAL

CAR STANDING - (ENGINE RUNNING):

HYDRAULIC ACTION IN NEUTRAL-ENGINE RUNNING

When the manual valve is in the neutral position, oil is directed to the rear servo to release the band. No oil can get into the line leading to the front servo so it is held in the

released position by a retracting spring. Both bands and clutches are then released and the transmission is in neutral, Figure 36.

On Models H-52 and J-52, a line exhaust valve has been added. (Not used on Models H-50, H-51 and J-51). When the pumps are operating, oil pressure is applied against the end of the main line exhaust valve overcoming the spring pressure and keeping the valve closed.

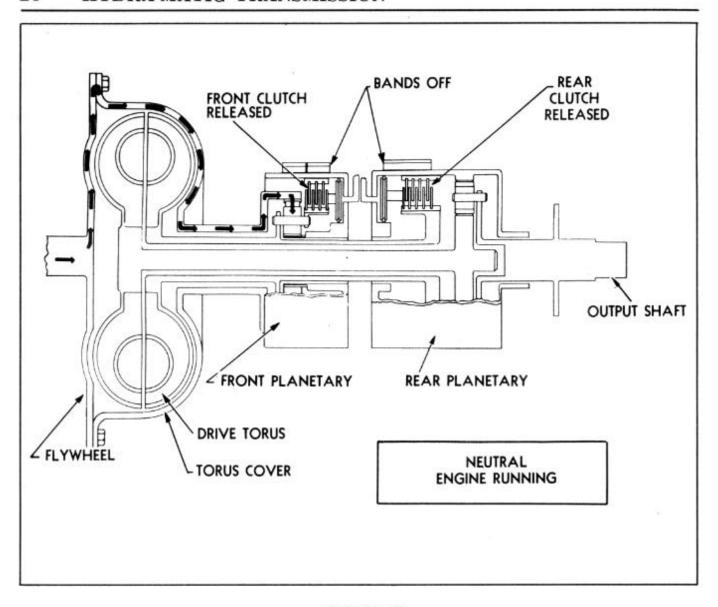


FIGURE 37

POWER FLOW IN NEUTRAL -- (ENGINE RUN-NING):

The flywheel, torus cover, and the front drive gear (front unit internal gear), are all attached to each other and rotate at engine speed. Since the front drive gear is the internal gear of the front planetary unit, its rotation causes the front unit planet gears to rotate on their pins. Since no member of the front unit is held, no power is transmitted to the planet carrier and drive torus, Figure 37.

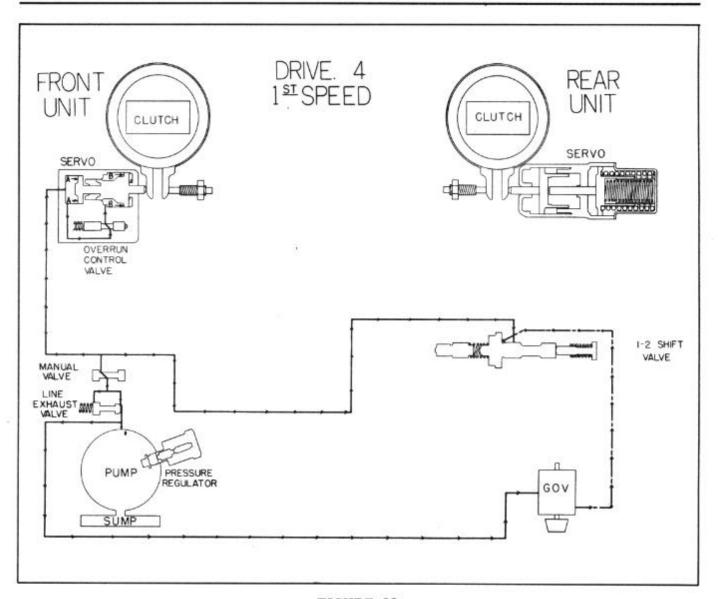


FIGURE 38

FIRST SPEED

HYDRAULIC ACTION IN FIRST SPEED:

Placing the manual selector lever in "DR" range for Models H-50, H-51 and J-51 ("DR-4" for Models H-52 and J-52) positions the manual control valve for all forward speeds. It cuts off oil pressure to the rear unit servo, permitting the spring to apply the band, and at the same time directs oil pressure to the front unit servo, applying the front band. There is no oil pressure to the clutches. On Models H-52 and J-52, the front servo was redesigned to give a greater holding force to the front band under closed throttle conditions In Figure 38, spring pressure is hold-

ing the over-run control valve in the open position, allowing oil to be directed to the second apply area in the front servo to assist in holding the front band on. Oil is also directed to the shifter valves, but their position is such that the oil is blocked off from the units.

When the vehicle is set in motion the output shaft and governor start to rotate and oil from the governor, "governor pressure" is directed against the governor plug on Models H-50, H-51 and J-51 and to the large area of the shifter valve for Models H-52 and J-52.

Both front and rear units are in reduction and the transmission is in first speed.

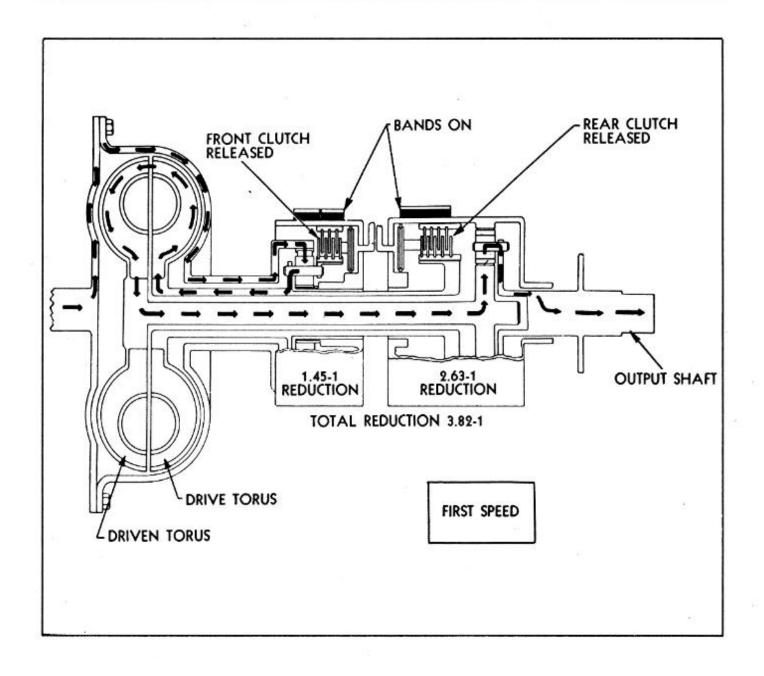


FIGURE 39

POWER FLOW IN FIRST SPEED:

When the vehicle starts to move, the path of power is through the flywheel to the torus cover and front drive gear, Figure 39, to the front planet carrier. The front band is holding the front unit "Sun" gear, carrying the front planet carrier in the same direction as the internal gear but at reduced speed.

Since the drive torus is connected to the front planet carrier it also turns at reduced speed. From the drive torus the power is transferred through fluid to the driven torus, then along the main shaft to the "Sun" gear of the rear planetary, then, through the planet pinions to the planet carrier on the output shaft in reduction because the internal gear of the rear unit is held stationary by the band.

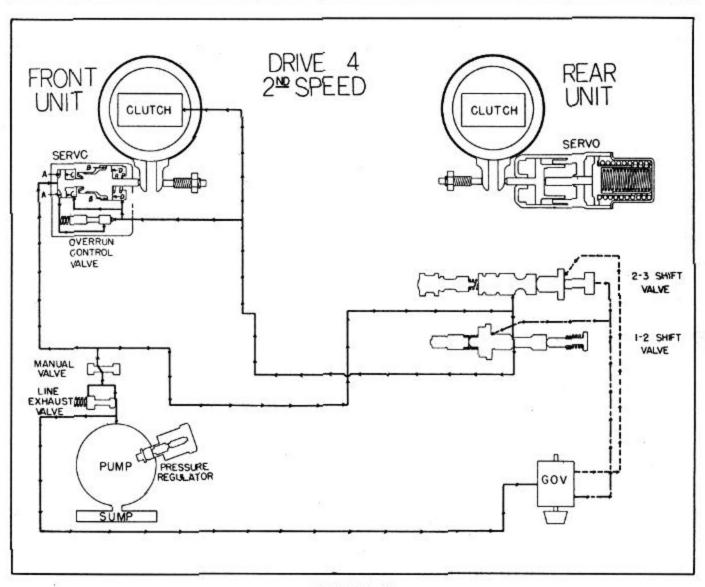


FIGURE 40

SECOND SPEED

HYDRAULIC ACTION IN SECOND SPEED:

Governor pressure increases with vehicle speed. When governor pressure is sufficient to overcome the 1-2 shifter valve spring, the valve will open allowing main line pressure from the 1-2 shift valve to enter a passage which connects with the front unit direct drive circuit, applying the front unit clutch and releasing the front unit band. On Models H-52 and J-52, front unit direct drive oil is directed against the end of the over-run control valve, compressing the spring closing the passage to the secondary apply areas, A and B, of the front servo. Oil is then directed to the release areas C and D to assist in releasing the band and also to the clutch to apply the clutch.

Application of the front unit clutch locks the planet carrier to the "Sun" gear and the front unit acts as a coupling. The drive torus is now revolving at the same speed as the flywheel. The rear unit remains in reduction and the transmission is in second speed, Figure 40.

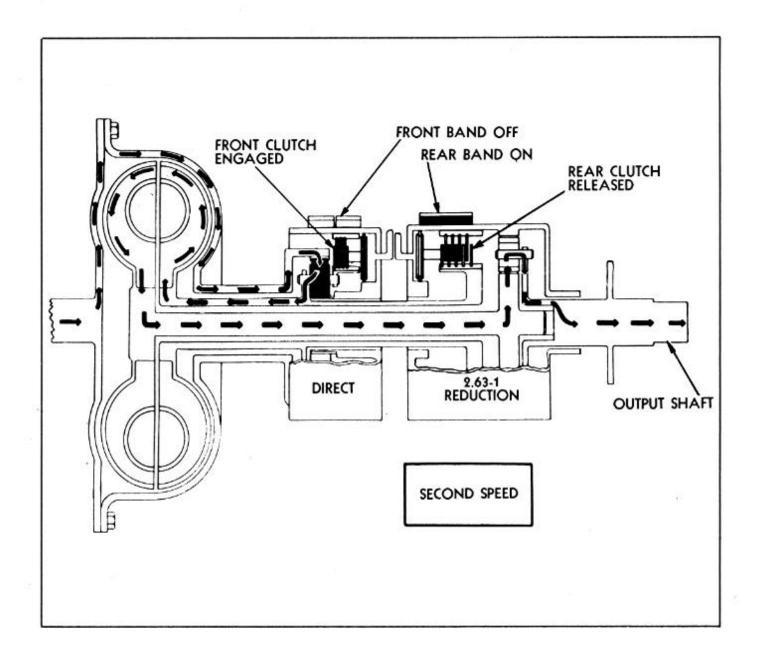


FIGURE 41

POWER FLOW IN SECOND SPEED:

Power travels from the flywheel to the torus cover. Through the front planetary unit in direct drive, forward to and through the fluid coupling, then back along the main shaft. Through the rear planetary which is in reduction, to the output shaft, Figure 41.

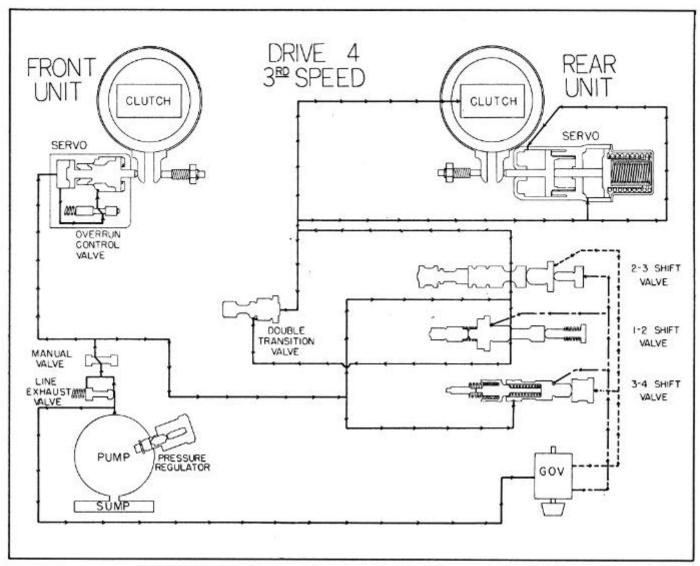


FIGURE 42

THIRD SPEED

HYDRAULIC ACTION IN THIRD SPEED:

The oil directed to the 2-3 shift valve rests on the land of the valve until governor (G-1) pressure against the 2-3 governor plug and governor (G-2) pressure against the 2-3 auxiliary valve increases to a point where it is greater than the spring pressure on the 2-3 shift valve: the valve opens allowing oil to flow to the rear unit where it releases the band and applies the clutch, Figure 42.

At the same time, oil is directed against the double transition valve moving it over and cutting off the oil that holds the front unit in direct drive.

The front servo "apply pressure" applies the front unit band causing the unit to go into reduction. Spring pressure is holding the over-run control valve in the open position allowing oil to be directed to the second apply areas in the front servo to assist in holding the front band on.

With the front unit in reduction and the rear unit in direct drive, the transmission is in third speed.

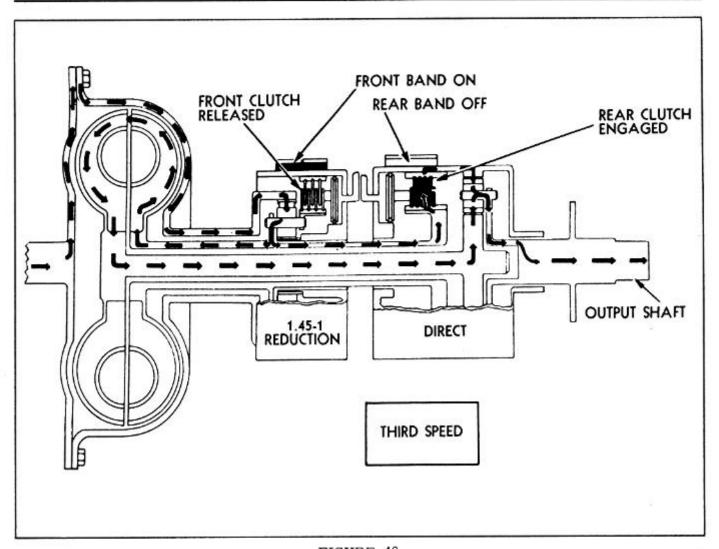


FIGURE 43

POWER FLOW IN THIRD SPEED

Power travels from the flywheel to the torus cover, then through the front unit in reduction, but at the front planet carrier the power divides. Part of it travels forward, through the shaft of the front planet carrier, through the fluid coupling and back along the mainshaft to the "Sun" gear. The other part of the power travels back through the shaft of the front planet carrier, through the rear unit clutch to the internal gear, where it is combined with the power from the fluid coupling at the "Sun" gear, then passes to the output shaft, Figure 43.

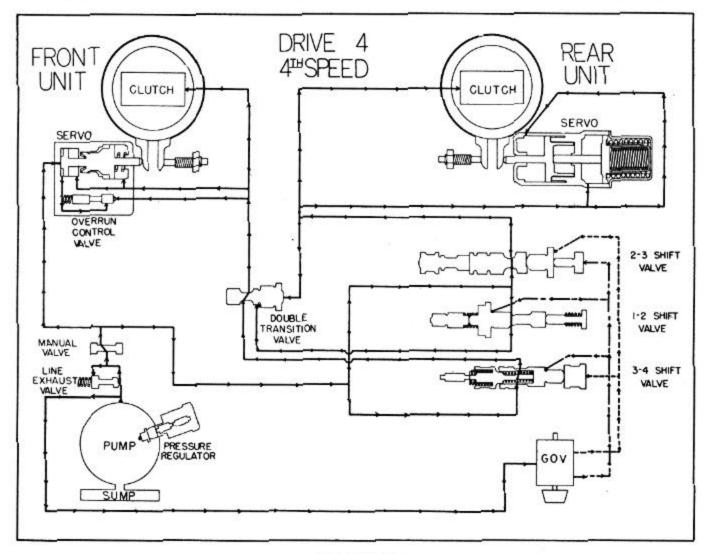


FIGURE 44

FOURTH SPEED

HYDRAULIC ACTION IN FOURTH SPEED:

The oil directed to the 3-4 shift valve rests on the land of the valve until governor (G-1) pressure against the 3-4 shift valve and governor (G-2) pressure against the 3-4 governor plug is increased to a point where it is greater than spring pressure on the 3-4 shift valve. When governor pressure overcomes

spring pressure, the shift valve will open a passage directing oil through the double transition valve, Figure 44. The oil then flows to the front unit direct drive circuit applying the front unit clutch and releasing the front unit band. On Models H-52 and J-52, front unit direct drive oil is also directed against the end of the over-run control valve, compressing the spring closing the passage to the secondary apply areas of the front servo. Both front and rear units are in direct drive and the transmission is in fourth speed.

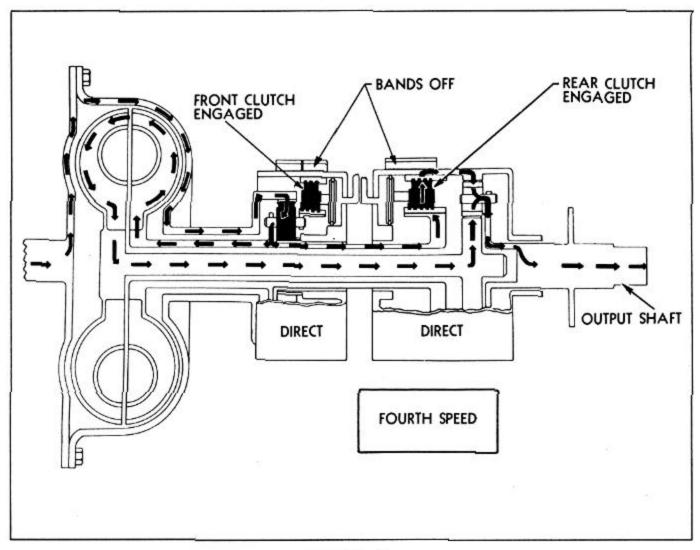


FIGURE 45

POWER FLOW IN FOURTH SPEED

The path of power is exactly the same as in third speed except that it passes through the front planetary in direct drive instead of reduction, Figure 45.

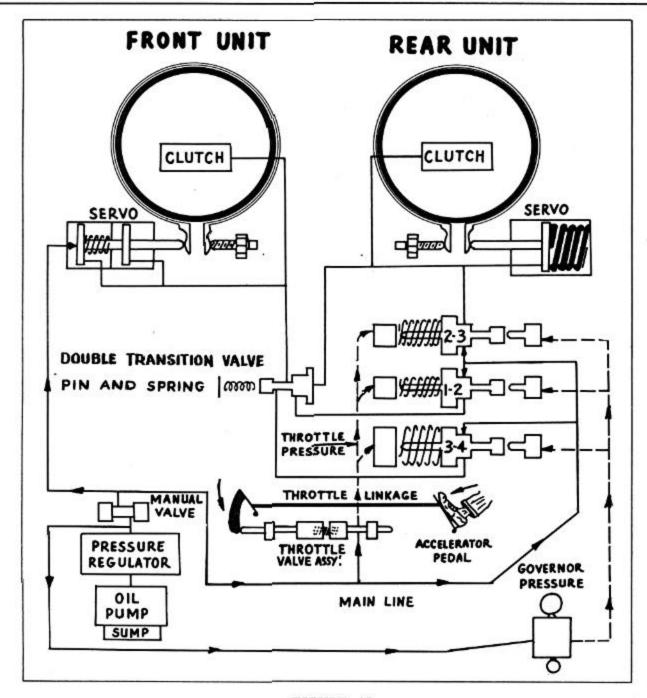


FIGURE 46

TIMING THE SHIFTS

To delay the shifts for rapid acceleration or hill climbing, a throttle valve assembly is used. This valve assembly is operated by linkage from the accelerator pedal and regulates the oil pressure which varies with the carburetor throttle opening. This pressure, called "Throttle Pressure," works against the regulator plugs to increase shifter valve spring pressure, Figure 46.

Therefore, higher vehicle speeds and higher governor pressure will be required to accomplish each shift.

When accelerating slowly the accelerator pedal is depressed only slightly, the shifts will then occur at a low vehicle speed. When accelerating rapidly, the accelerator pedal is almost fully depressed and, therefore, the shifts will not take place until a higher vehicle speed is reached.

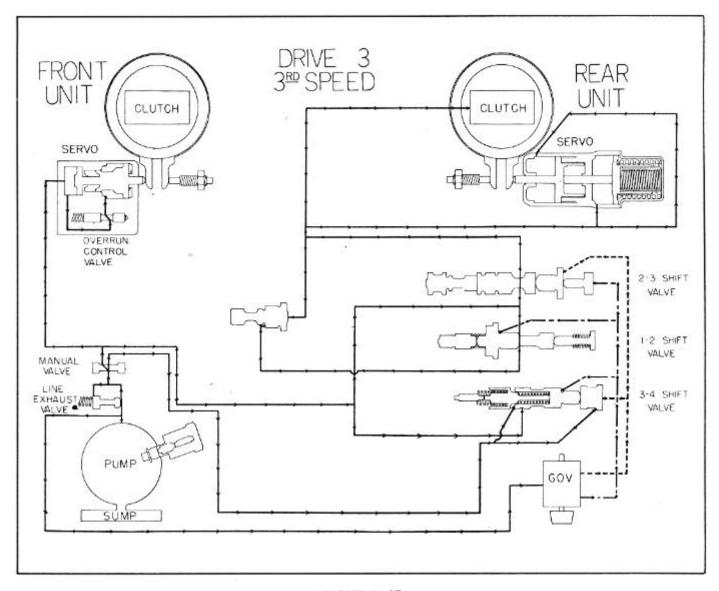


FIGURE 47

DRIVE 3—3RD SPEED (Models H-52 and J-52)

When the selector lever is placed in the "DR-3" position, the manual valve directs main line pressure to the same passages used in "DR-4" (fourth speed) position. Also, main line pressure is directed to an area on the 3-4 governor plug and the 3-4 shifter valve to assist the spring and throttle pressure to hold the 3-4 shift valve closed so that the transmission will not shift into fourth speed.

The "DR-3" range is provided for better

performance when driving in congested traffic and is also effective when climbing or descending long mountain grades.

The over-run control valve is held open by spring pressure allowing oil to be directed to the second apply areas of the front serve to assist in holding the front band on. This valve is particularly needed when the engine is used for braking in "DR-3" range since there would be a closed throttle condition and therefore no compensator pressure to assist in applying the front band.

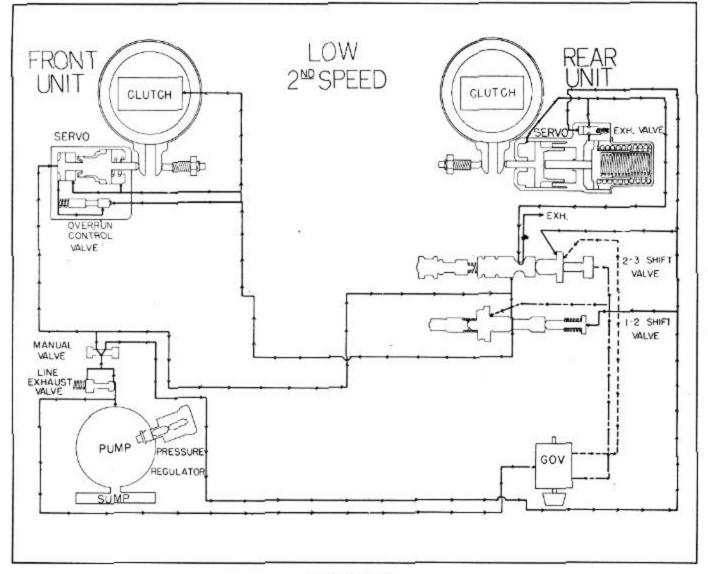


FIGURE 48

LOW — 2ND SPEED ("LO" RANGE)

When descending steep grades where maximum braking power of the engine is desired so when pulling through deep sand or up steep grades, it is desirable to keep the vehicle operating in first and second regardless of vehicle speed. This is accomplished by moving the selector lever to "LO" position which directs main line pressure to the large area on the 2-3 auxiliary valve. Here it opposes governor pressure, thereby, preventing the 2-3 shift valve from opening.

Main line pressure is also directed to the large area on the 2-1 detent which is sufficient to open the 1-2 shift valve, putting the front unit in direct drive. Since the rear unit is in reduction at all times, in low range, and the front unit is in direct drive, the transmission is in 2nd speed. Under normal conditions, there is only 2nd speed in low range for Models H-52 and J-52. However, if the accelerator is pushed down hard, the throttle pressure will be sufficient to close the 1-2 shift valve thus making possible 1st speed in low range.

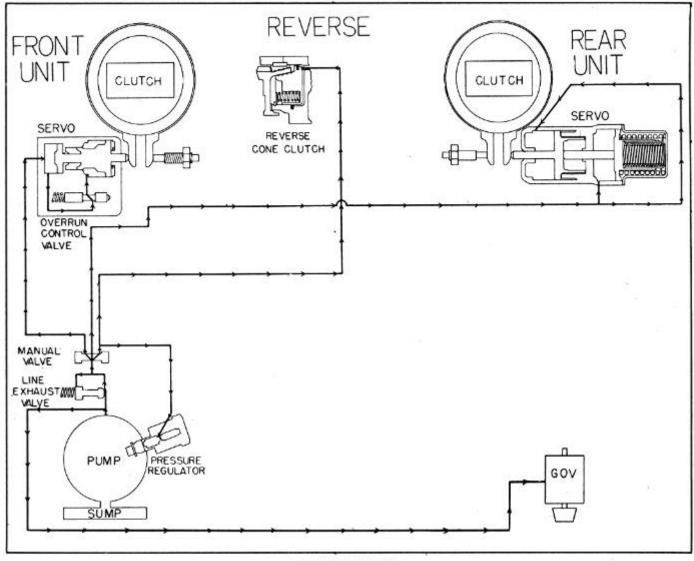


FIGURE 49

REVERSE

When the selector lever is moved to the "R" (reverse) position on Model H-50, the reverse anchor engages the external teeth on the reverse internal gear. At the same time oil is directed to:

- The Reverse Clutch to lock the reverse internal gear to the transmission case, (Models H-51, J-51, H-52 and J-52).
- The rear unit servo to release the band.

- The front unit servo to apply the band.
- (On Models H-51, J-51, H-52 and J-52) to the reverse booster plug in the pressure regulator plug to increase main line pressure which is necessary for reverse operation.

Spring pressure is holding the over-run control valve in the open position allowing oil to be directed to the second apply areas in the front servo to assist in holding the front band on.

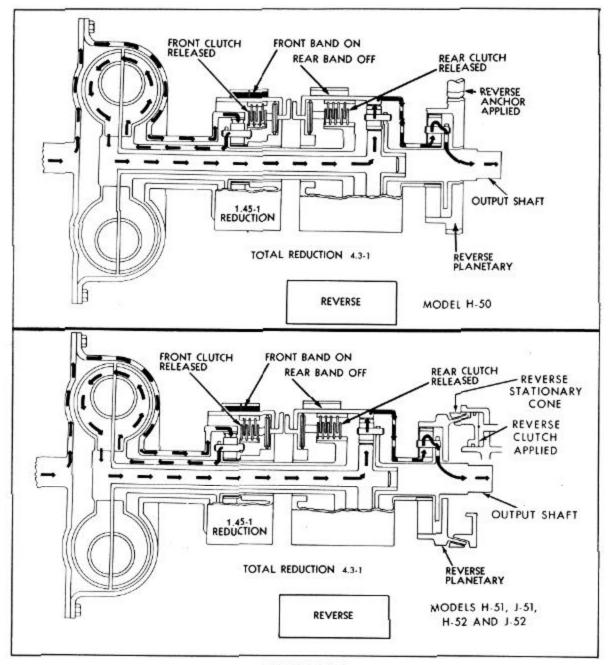


FIGURE 50

POWER FLOW IN REVERSE

Power travels from the flywheel and torus cover through the front planetary in reduction to the fluid coupling, then along the mainshaft to the "Sun" gear of the rear planetary. The clutch and band of the rear planetary are released and the planet carrier is held by the propeller shaft. The planet pinion gears then act as idlers and the rear unit "Sun" gear turns the internal gear in the opposite direction. The internal gear through a flange, drives the "Sun" gear of the reverse unit in a reverse direction. Power then travels through the reverse planetary to the output shaft (which is also the planet carrier of the rear unit) in reduction because the internal gear is held by the reverse anchor, Model H-50 and by the reverse clutch for Models H-51, J-51, H-52 and J-52.

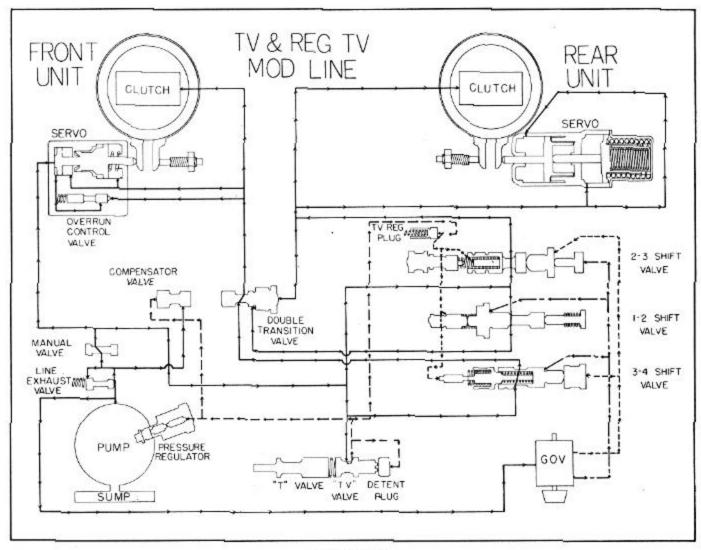


FIGURE 51

T.V. AND REGULATED T.V. MODULATED LINE PRESSURE

(Models H-50, H-51, H-52 and J-52)

The pressure regulator permits a low line pressure at low car speeds. This pressure varies depending on throttle opening.

Modulated main line pressure is obtained by allowing throttle valve pressure to act upon the T.V. plug assisting the pressure regulator spring, increasing main line pressure to prevent the clutches from slipping under heavy throttle acceleration.

Regulated T.V. pressure is delivered to the regulator plugs and shift valve to help delay the shifts.

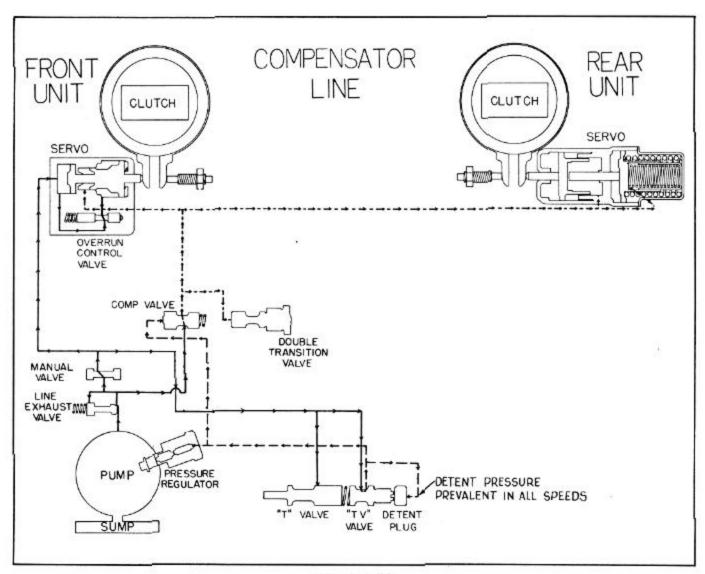


FIGURE 52

COMPENSATOR PRESSURE

The increased torque developed under rapid acceleration required additional pressure to hold the bands to the drums without slipping. This pressure is obtained through the use of a compensator valve which directs variable regulated oil pressure to both the front and rear servos and to the end of the double transition valve to aid in positioning

the valve, Figure 52.

The compensator valve which is operated by the throttle valve, regulates a pressure that varies with accelerator opening. Therefore, the greater the accelerator pedal travel (giving greater throttle pressure) the greater the resulting compensator pressure to assist in applying the bands.

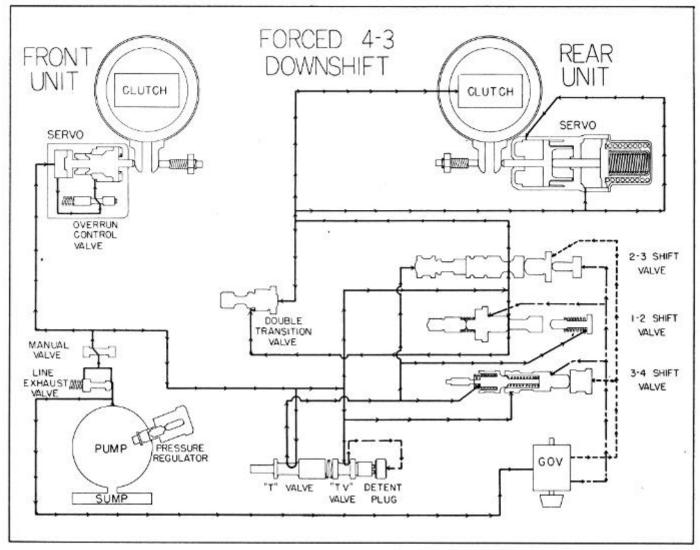


FIGURE 53

FORCED 4-3 DOWNSHIFT

It is sometimes desirable, while driving in fourth speed, to shift the transmission into third speed for rapid acceleration.

The 4-3 downshift is accomplished through the "T" valve (part of the throttle valve assembly) and a detent plug. The detent plug is located at the end of the throttle valve assembly, Figure 53.

When the accelerator pedal is depressed to wide open throttle position, the throttle valve comes into contact with the detent plug where resistance can be felt in the pedal. Depressing the pedal further will overcome this resistance and move the detent plug.

The "T" valve then reaches a position where it opens a port directing main line pressure back of the 3-4 shifter valve, on Models H-50, H-51, J-51 and against the lockout valve on Models H-52 and J-52, forcing it closed. This cuts off the pressure to the front unit clutch and it is disengaged by spring pressure. Pressure is also cut off from the release side of the front servo and pressure on the apply side of the servo applies the band. The transmission is then in third speed. With accelerator pedal held fully depressed, throttle pressure with spring pressure is sufficient to hold the valve closed until a high vehicle speed is reached. If the accelerator pedal is released, the shift from third to fourth will occur when governor pressure overcomes the spring pressure.

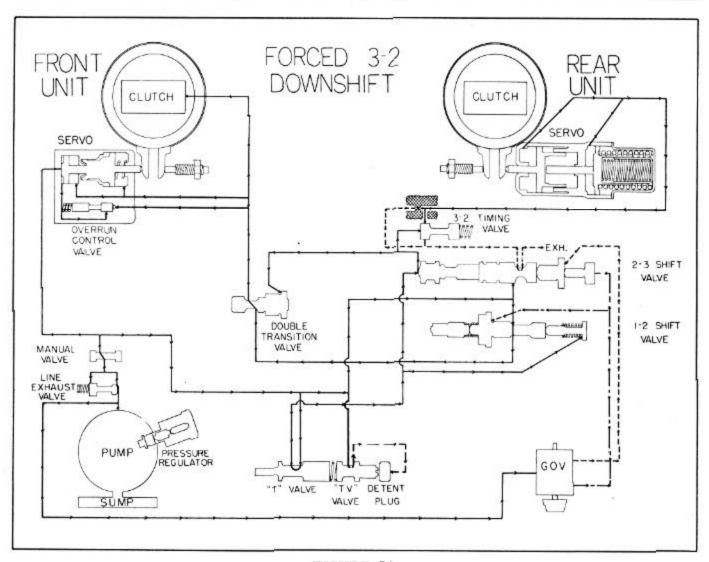


FIGURE 54

FORCED — 3-2 DOWNSHIFT (Models H-52 and J-52)

When the accelerator is depressed through the detent and the car is going slowly enough to obtain a 3-2 downshift, main line pressure from the "T" valve will open the 3-2 detent plug which moves the 2-3 shift valve to the closed position, Figure 54.

With the 3-2 detent plug opened, regulated T.V. Pressure to the 2-3 shifter valve is shut off. Main line pressure from the "T" valve flows past the large end of the 3-2 detent plug to close the 3-2 timing valve.

Regulated T.V. pressure (main line pressure at full throttle) flows into a passage uncovered by the small end of the 3-2 detent plug. This passage delivers oil to the 1-2 shift valve through a larger port then normal in order to insure a fast application of the front clutch.

Because the 3-2 timing valve is closed, release oil from the rear servo that is exhausting through the 2-3 shift valve must flow through the small hole by the timing valve. This results in slow application of the rear band. Because the front clutch is applied quickly and the rear band is applied slowly, the transmission will shift into second speed smoothly.

MAIN LINE PRESSURE REGULATION

(Model H-50)

The pressure regulator permits a low line pressure at low car speeds. This pressure (modulated main line pressure) varies depending on throttle opening.

Modulated main line pressure is obtained by allowing throttle valve pressure to act upon the T.V. plug. The inner end of the T.V. plug bears against the regulator valve, which controls main line pressure.

When the engine is idling (low throttle pressure), force against the pressure regualator valve is from the regulator spring only.

As throttle pressure is increased more force is exerted on the T.V. plug forcing the T.V. plug against the regulator valve assisting the regulator spring to hold the regulator valve closed increasing main line pressure.

MAIN LINE PRESSURE REGULATION

(Models H-51 and J-51)

Model H-51 uses modulated main line pressure. The pressure regulator spring is calibrated to give a lower main line pressure. Therefore, during light acceleration (slight throttle pressure), the main line pressure is regulated almost entirely by the regulator spring (A), Figure 55, resulting in a low pressure action of the clutches giving a smooth shift. However, as the throttle is opened,

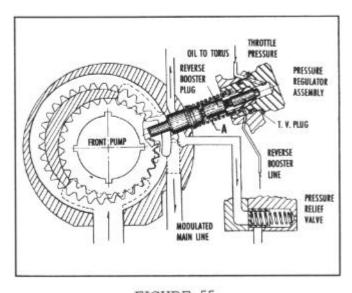


FIGURE 55

throttle pressure is directed behind the T.V. plug assisting the pressure regulator spring, increasing main line pressure to prevent the clutches from slipping under heavy throttle acceleration.

NOTE: The Model J-51 transmission does not have modulated main line pressure, therefore, the pressure regulator assembly for Model J-51 does not have a T.V. plug. The pressure regulator assembly for the J-51 transmission does not have the neoprene seal and has only one drilled passage (just below the gasket) and only one plug (the reverse booster plug). The J-51 regulator spring is heavier than the spring in the H-51 regulator and is not interchangeable. See Figure 56 for exploded view and Figures 126 and 127 for legend of parts for the H-51 and J-51 pressure regulators.

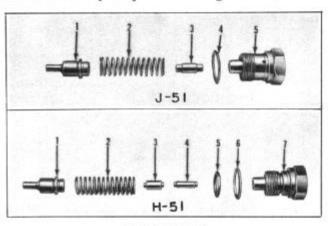


FIGURE 56

CAUTION: Pressure regulator plugs and springs must be used in the model transmission they were designed for and should not be interchanged.

MAIN LINE PRESSURE REGULATION

(Models H-52 and J-52)

The H-52 and J-52 pressure regulator assembly is very similar to the H-51 pressure regulator assembly. However, the pressure regulator valve for H-52 and J-52 is of new design to conform with the new front pump. The action of this valve is described under "Front Pump" on Page 43.

As on H-51 transmissions the H-52 and J-52 pressure regulator assembly includes a T.V. plug to provide modulated main line pressure and a reverse booster plug to provide increased pressure when operating in reverse, see Figures 57 and 129.

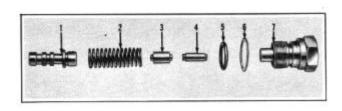


FIGURE 57

REVERSE BOOSTER PRESSURE (Models H-51, J-51, H-52 and J-52)

With the friction reverse assembly used in the above models it is necessary to raise main line pressure to a greater extent in order to obtain the proper holding action to prevent the reverse cone from slipping. The increased main line pressure is obtained in the following manner.

When the selector lever is placed in the "R" (Reverse) position, the transmission is shifted into reverse, main line pressure is then directed behind the reverse booster plug in the pressure regulator, Figures 55 and 57. The resulting line pressure in reverse will be approximately double the normal line pressure, because main line pressure is used as booster pressure against a large diameter booster plug.

FRONT PUMP

(Models H-50, H-51 and J-51)

The differences between the front pump used in the H-51 and J-51 transmissions and the pump used in the H-50 transmissions are as follows:

- a. The front pump for H-51 is the same as the front pump used in the J-51 transmission, however, the H-51 and J-51 Model front pump has thicker gears, requiring a new deeper front pump cover. b. The H-51 and J-51 pump has a greater volume and has better pressure regulation.
- c. The H-51 and J-51 pump cover will extend out of the transmission case much further than the pumps used in the H-50 transmissions.

NOTE: The flywheel housing has been changed for Models H-51 and J-51 to accommodate the new pumps. The H-50 front pumps must not be used on the H-51 or J-51 transmissions.

FRONT PUMP (Models H-52 and J-52)

The H-52 and J-52 vane type front pump regulates its output to the transmission hydraulic system requirements. The vane type front pump consists of the pump body, slide, rotor, seven vanes, two guide rings, a priming spring and a pump cover, see Figure 58.

The output of the front pump is determined by the position of the pump slide. When the slide is up, the pump delivers maximum output; when the slide is centered, the output is zero; when the slide is down the front pump can act as a relief valve for excessive rear pump output.

The pump rotor is keyed to the front drive gear. Therefore, when the engine starts, the flywheel drives the torus cover, the torus cover drives the front drive gear turning the front pump rotor. The priming spring keeps the slide up causing the pump to deliver maximum output to the transmission. The pressure regulator valve spring holds the valve in until the transmission hydraulic system comes up to pressure. With the pressure regulator valve held in, the pressure regulator meters oil into the front pump cover lower control chamber, thus oil pressure takes over the function of the priming spring and keeps the slide up, Figure 59.

If any oil should be trapped in the upper control chamber, the oil will bleed through the hole in the slide to the suction side of the pump or exhaust past the land on the pressure regulator valve.

When the transmission hydraulic system comes up to operating pressure, the pressure regulator valve will move out overcoming the pressure regulator spring pressure and T.V. pressure, Figure 59.

With the pressure regulator valve in the "OUT" position, pump pressure is directed through the pressure regulator valve to build up pressure in the front pump upper control chamber (above the slide). Pressure in the lower chamber (below the slide) is allowed to exhaust by the pressure regulator valve. The slide then moves down reducing the output of the pump.

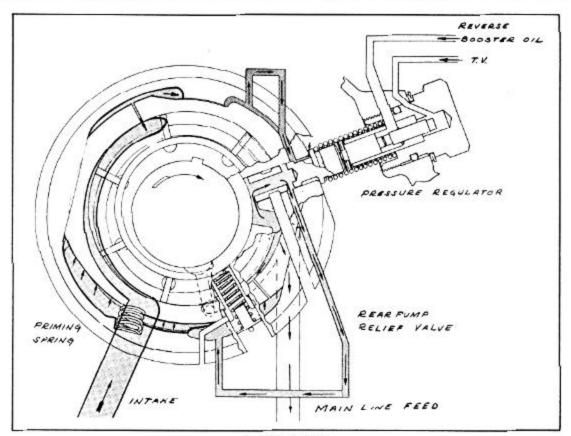


FIGURE 58

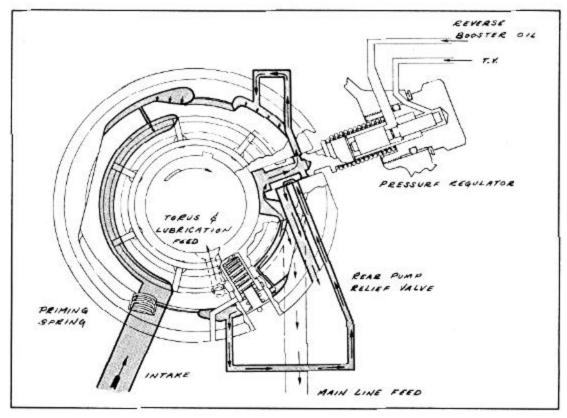


FIGURE 59

As the slide moves down, it uncovers a port that allows oil pump pressure to flow to the fluid coupling and supply lubrication to the transmission.

Since the front pump supplies the proper amount of oil to the transmission hydraulic system any time it is running, the front pump relief valve has no effect while the front pump is operating, however, the front pump relief valve is necessary in order to relieve excessive output of the rear oil pump which may develop when the car is being towed and the front pump is not operating.

CONTROL VALVE ASSEMBLY (Model H-50)

The control valve assembly consists of an inner and outer valve body, front valve body, valve body rear cover, detent ball retainer, control lever, outer valve body front plate, front valve body plate, inner valve body rear plate, valve body spacer plate throttle lever, manual valve, three shifter valves, three governor plugs, three regulator plugs, two regulator plug springs, two shift valve springs, a compensator valve and spring, auxiliary valve and pin, double transition valve and spring, throttle valve and spring, "T" valve and detent plug, control lever detent ball and spring and assorted attaching screws and lockwashers. See Figure 296 and page 136 for exploded view of the control valve assembly and nomenclature.

The throttle valve in the valve body is operated by direct mechanical connection to the accelerator pedal and carburetor throttle. The function of the throttle valve is to meter oil pressure leading to the shift valve in the control valve assembly.

The manual valve is controlled mechanically by the manual selector lever on the steering column which selects "N" (Neutral), "DR" (Drive), "LO" (Low) and "R" (Reverse) ranges.

Regulated oil pressure is directed to the control valve assembly and the valves in the valve body open or close oil passages through which oil under pressure may flow.

Governor pressure acts on the shift valves which in turn cut off or admit oil to

passages leading to the servos and clutches, therefore, as car speed increases, governor pressure increases and the shift valves operate in the proper sequence to engage second, third and fourth speeds. At each car speed when a shift is made, the valves move to open up a passage corresponding to the required shift.

Governor pressure and throttle T.V. pressure control the time in which the shift occurs. The throttle valve T.V. pressure and the pressure asserted by the shift valve springs both work against governor pressure which is also acting on the shift valves; these opposing forces control the car speeds at which the shift valves will operate. Therefore, as the accelerator pedal is pushed down, the shifts are made depending upon engine and car speeds. Refer to pages 10 thru 41 "Fundamentals of the Hydra-Matic Transmission" for additional information of the individual shifts in the Hydra-Matic transmission.

CONTROL VALVE ASSEMBLY (Models H-51 and J-51)

The control valve assembly used in Models H-51 and J-51 transmissions is similar in operation to the Model H-50 control valve assembly with the following new additions and changes:

- a. A front servo exhaust valve assembly and spacer has been added at the front of the outer valve body. A passage has been drilled in the front servo exhaust valve body for the new pressure regulator reverse oil pipe.
- b. The detent plunger retainer is different.
- c. A reverse check valve has been added to the detent retainer.
- d. The manual control valve has a pointed end; the H-50 type was flat.

NOTE: The H-51 or J-51 control valve assemblies must not be used in the H-50 transmissions or vice-versa.

CAUTION: The J-51 control valve assembly, is the same as the H-51 control valve assembly with the exception that the front valve body for the H-51 control valve is drilled to pass throttle pressure to the passage in the inner valve body which indexes with the passage in the case leading to the pressure regulator. Never use a J-51 control valve assembly to replace an H-51 control valve assembly. The H-51 control valve assembly can be identified by the drilled passage through the front valve body and an end mill mark on one end of the front valve body, Figure 60.

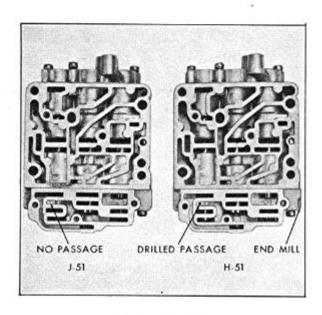


FIGURE 60

FRONT SERVO EXHAUST VALVE (Models H-51 and J-51)

A new valve called the front servo exhaust valve has been added to the control valve body on Models H-51 and J-51. This valve is not used on Models H-50, H-52 and J-52. The purpose of the front servo exhaust valve is to allow for instantaneous exhausting of the front servo apply oil while the reverse clutch is engaging. This momentarily sets the transmission in neutral so that the reverse cone can be applied without excessive torque tending to wear the stationary cone or reverse piston. As soon as the reverse clutch is fully engaged, the front servo exhaust valve recedes allowing the front servo to apply the band for operation in reverse.

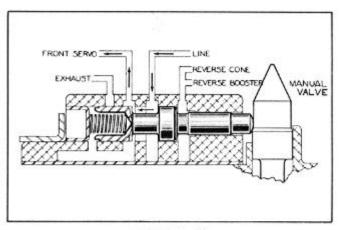


FIGURE 61

In Figure 61, the front servo exhaust valve is in the closed or normal position, (selector lever in "N", "DR" or "LO").

The manual valve keeps the front servo exhaust valve in the inoperative position, until the transmission manual control lever is placed in the "R" (Reverse) position.

When the transmission manual selector control lever has been placed in the reverse position, the manual valve is moved rearward. Figure 62 shows the front servo exhaust valve immediately after the shift to Reverse.

The release spring opens the valve allowing the front servo apply oil to exhaust.

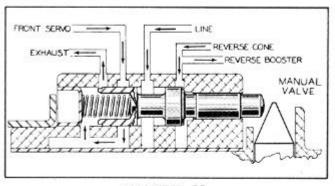
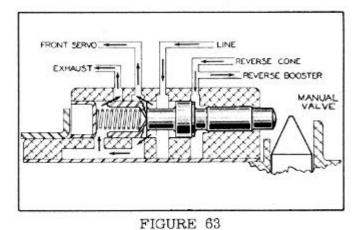


FIGURE 62

Simultaneously, the manual valve directs oil to the reverse clutch, the reverse booster plug in the pressure regulator, and the release side of the front servo exhaust valve. The oil to the reverse booster valve causes a greater force to be applied behind the pressure regulator plug increasing line pressure to approximately 180 lbs.

As the reverse clutch line builds up, the front servo exhaust valve moves back and forth, regulating the front servo apply pressure to approximately 50% of the reverse line pressure. Figure 63 shows the front servo exhaust valve, selector lever in the "R" position.



REVERSE CHECK VALVE (Models H-51 and J-51)

A reverse check valve was added to the detent plunger retainer, Figure 64.

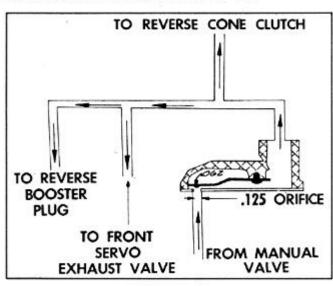


FIGURE 64

The purpose of this spring type check valve with an .062" orifice restricts the flow of oil to the reverse cone allowing the reverse cone to apply without having the parking blocker piston recede.

Without this check valve, if the manual selector lever were placed in the reverse position while the engine was idling, the demand for oil to the reverse cone may cause a drop in line pressure mementarily which would allow the parking blocker piston to recede causing the parking pawl to engage.

CONTROL VALVE ASSEMBLY (Models H-52 and J-52)

MAIN DIFFERENCES IN DESIGN OVER MODELS H-51 AND J-51

The control valve assembly for Models H-52 and J-52 has been changed in order to accommodate the new "Drive 3" range and full throttle downshift from any forward selector position within set speed ranges.

To simplify the explanation of their operation, the names of some of the valves have been changed. The 2-3 regulator plug is now called the 3-2 detent plug and the previous 1-2 governor plug is now called the 2-1 detent plug. These valves play an important part in controlling the forced downshifts, 3-2 and 2-1. In addition, "LO" (Low) range pressure is directed against the 2-1 detent plug to move the shift valve giving a second speed start in "LO" range.

Three new valves have been added. These are the 3-2 timing valve, the 3-4 lockout valve and the T.V. regulator valve. The 3-2 timing valve delays the application of the rear band until the front clutch is applied during a 3-2 downshift, thereby providing a smoother shift. The 3-4 lockout valve locks out fourth speed when the selector lever is in the "DR-3" position. The T.V. regulator valve is controlled by T.V. pressure and spring force. When T.V. pressure reaches a certain value, it opens the T.V. regulator valve and allows regulated T.V. pressure to act on the regulator plug and shifter valves to help time the shifts. Other valve body changes are a 2-3 auxiliary valve between the 2-3 shift valve and governor plug. a spring loaded ball check valve in the throttle pressure passage in the front valve body; and the elimination of the front servo exhaust valve assembly. See Figure 298 on page 139 for correct nomenclature of the component parts of the control valve assembly.

OPERATION OF THE 3-2 TIMING VALVE AND 3-2 DETENT PLUG

Until the accelerator is depressed through the detent, the 3-2 detent plug remains closed and the 3-2 timing valve is opened, Figure 65. When the 3-2 detent plug is closed, regulated T.V. pressure flows through it to act on the regulator plugs and shifter valves to help delay the shifts.

Because the 3-2 timing valve is open, main line pressure can flow through it freely during 2-3 upshifts and 3-2 downshifts.

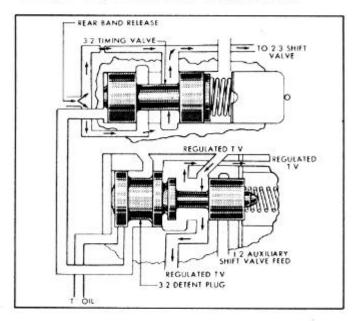


FIGURE 65

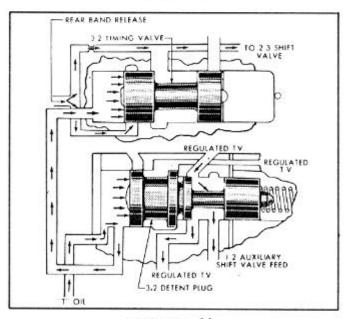


FIGURE 66

When the accelerator is depressed through the detent and the car is going slowly enough to obtain a 3-2 downshift, main line pressure from the "T" valve will open the 3-2 detent plug which moves the 2-3 shift valve to the closed position, Figure 66.

With the 3-2 detent plug opened, regulated T.V. Pressure to the 2-3 shifter valve is shut off. Main line pressure from the "T" valve flows past the large end of the 3-2 detent plug to close the 3-2 timing valve.

Regulated T.V. pressure (main line pressure at full throttle) flows into a passage uncovered by the small end of the 3-2 detent plug. This passage delivers oil to the 1-2 shift valve through a larger port than normal in order to insure a fast application of the front clutch.

Because the 3-2 timing valve is closed, release oil from the rear servo that is exhausting through the 2-3 shift valve must flow through the small hole by the timing valve. This results in slow application of the rear band. Because the front clutch is applied quickly and the rear band is applied slowly, the transmission will shift into second speed smoothly.

T. V. REGULATOR VALVE

The purpose of the T.V. regulator valve is to regulate throttle or T.V. pressure, Figure 67. This regulated T.V. pressure is then delivered to the regulator plugs and shift valves to help delay the shifts.

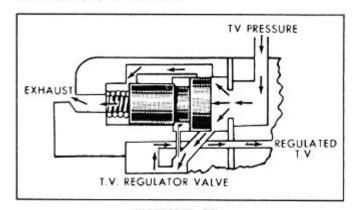


FIGURE 67

T.V. Pressure acting on the large end of the T.V. regulator valve opens a port that permits some T.V. to exhaust and some to come through as regulated T.V. pressure. This regulated T.V. pressure is allowed to act on the back of the large end of the valve helping the spring to close it. Thus the T.V. regulator valve becomes a balanced valve, balanced between T.V. pressure and spring pressure, plus regulated T.V. Pressure.

With increased T.V. pressure, the T.V. Regulator valve will close the exhaust port allowing regulated T.V. pressure to become normal T.V. pressure. On light throttle, T.V. pressure is non-existent.

"T" OIL BALL CHECK VALVE (Models H-52 and J-52)

The "T" oil check valve (7) is located in the front valve body, Figure 298 and allows momentary discharge of main line pressure from the "T" valve to exhaust until such time as throttle pressure can take effect during the 1 to 2 upshift.

PARKING BRACKET ASSEMBLY

(Models H-51, J-51, H-52 and J-52)

Models H-52 and J-52 Parking Brake Bracket assembly is essentially the same as the parking brake bracket used on the H-51 and J-51 models. In order to provide for greater oil flow to the governor, the pipe that was used to feed the governor has been redesigned and relocated in the H-52 and J-52 transmissions. The new governor oil feed pipe is larger and is assembled between the front servo and the transmission case at a point near the parking brake bracket assembly, Figure 112. Oil feeding the governor now bypasses the control valve assembly and flows directly from the front servo through the governor oil delivery pipe and transmission case into the parking brake bracket assembly to the governor. Due to the routing of the main line oil through this new oil delivery pipe, the governor feed passage and the parking brake bracket body indexes with a passage in the transmission case resulting in the elimination of the previous oil delivery pipe (this was the middle pipe used in the H-51 and J-51 transmissions).

Another change in the H-52 and J-52 Parking Brake Bracket assembly is the use of a recess pin to hold the parking blocker piston release spring in position. A new parking blocker piston pin retainer assembled under the head of one of the parking brake bracket attaching bolts keeps this pin in place.

REVERSE BLOCKER PISTON (Models H-51, J-51, H-52 and J-52)

When the car is moving forward at speeds above 10 miles per hour, governor pressure is directed behind the reverse blocker piston (reverse inhibitor), Figures 68 and 69 and the selector lever cannot be moved to the "R" (Reverse) position. When the car forward speed is less than 10 miles per hour the blocker piston spring overcomes the reverse blocker piston oil pressure and the selector lever can be easily moved to the "R" (Reverse) position, Figure 69. Oil is directed to release the rear band and apply the reverse cone clutch. Oil to the front servo goes through the front servo exhaust valve as outlined on Page 46 under "Front Servo Exhaust Valve".

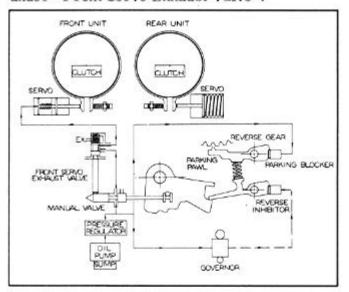


FIGURE 68

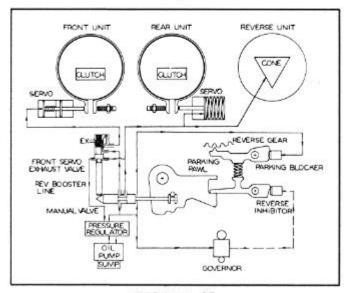


FIGURE 69

PARKING BLOCKER PISTON (Models H-51, J-51, H-52 and J-52)

As the detent lever on the valve body rotates into the reverse position, it engages and turns the parking brake lever. This lever sets the parking brake lever spring in tension against the parking brake pawl crank.

As long as the engine is running or the vehicle is rolling forward at a speed of approximately 4 M.P.H. or more, the parking blocker piston (actuated by line pressure) will prevent the parking pawl from engaging the reverse internal gear.

When the engine is turned off and the vehicle stops rolling forward, the parking lever spring rotates the parking lever crank past the blocker piston, (which is spring released), and the pawl engages the reverse internal gear, Figure 69.

MAINLINE EXHAUST VALVE

(Models H-52 and J-52)

A main line pressure exhaust valve located under the front servo in the transmission case, Figure 306, has been added to permit a more rapid engagement of the parking pawl when the car is at a standstill and engine is shut off.

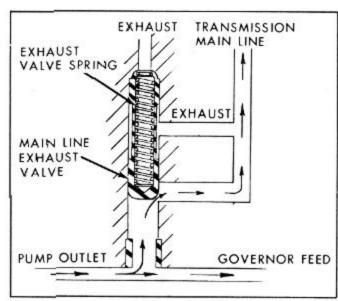


FIGURE 70

When either or both pumps are operating, pressure behind the main line exhaust valve moves the valve up against spring pressure closing off the exhaust port, Figure 70.

When the engine is turned off and the car is at a standstill, the release spring opens the valve allowing main line pressure to exhaust rapidly and the parking blocker piston to release and allow the parking pawl to engage immediately.

OPERATION OF FRONT SERVO

NEUTRAL:

(Models H-50, H-51 and J-51)

When the selector lever is in the "N" position there is no oil pressure to the servo and the retracting spring holds the servo apply piston in the released position, Figure 71.

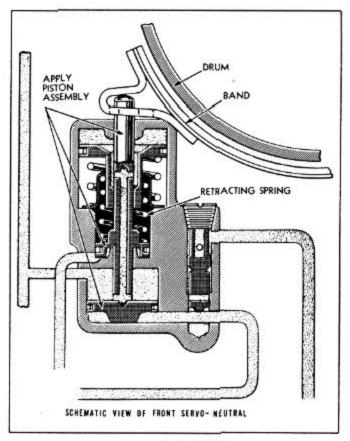


FIGURE 71

APPLY: (Models H-50, H-51 and J-51)

With the selector lever in "DR", "LO" or "R", position regulated main line pressure is directed to piston area (A) to move the piston and stem and apply the band, Figure 72.

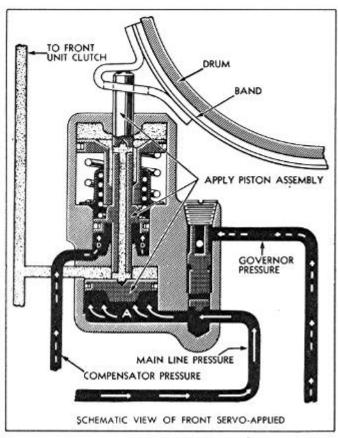


FIGURE 72

COMPENSATOR PRESSURE: (Models H-50, H-51, J-51, H-52 and J-52)

Compensator pressure is applied at point (D), Figure 72, to assist the regulated main line pressure (which is applied at piston area "A" to prevent the band slipping under heavy acceleration). Compensator pressure is always present when there is any carburetor throttle opening and this pressure increases with carburetor throttle opening.

RELEASE: (Models H-50, H-51, J-51, H-52 and J-52)

To release the band, regulated main line pressure is applied at piston area (B) and (C), Figure 73. The area of these two pistons is greater than the area of pistons (A) and (D) and the apply piston is moved to the released position.

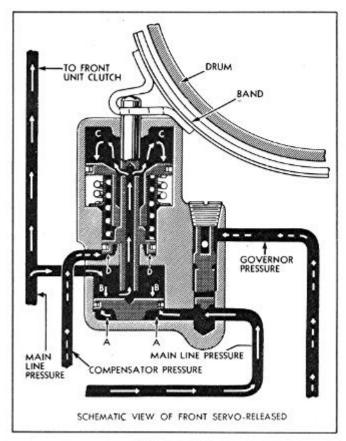


FIGURE 73

4 TO 3 VALVE: (Models H-50, H-51, J-51, H-52 and J-52)

The 4 to 3 valve controls the passage leading to piston area (A), Figure 74. At car speeds below approximately 25 miles per hour regulated main line pressure under the 4-3 valve keeps the valve in a position so the entire passage leading to point (A) is open.

At car speeds above approximately 25 miles per hour governor pressure on the top of the 4-3 valve is great enough to move the valve to restrict the oil flow which delays front band application and permits the necessary engine speed increase before the front unit goes into reduction during the 4-3 downshift. This same condition exists on full throttle 2-3 upshifts.

FRONT SERVO (Models H-52 and J-52)

The front servo assembly has been redesigned for the Models H-52 and J-52 Hydra-Matic transmissions in order to give a greater holding force to the front band primarily

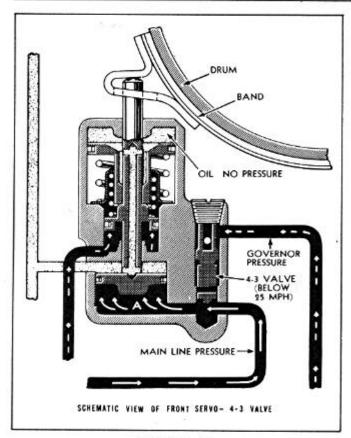


FIGURE 74

when the transmission is operating as a brake in third gear.

Important new features of the H-52 and J-52 front servo are the addition of the over run control valve and the larger additional front servo apply piston, Figure 75.

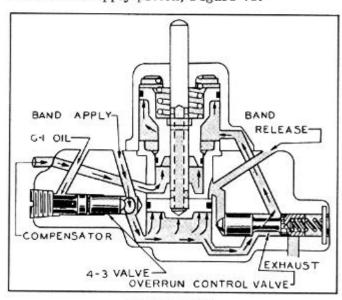


FIGURE 75

OPERATION OF THE FRONT SERVO

(Models H-52 and J-52)

FRONT SERVO APPLIED - 1ST, 3RD AND REVERSE:

Main line pressure from the manual valve is directed to hold the front servo in the applied position in all ranges except neutral. At speeds less than approximately 25 MPH, main line pressure to apply the servo keeps the 4-3 downshift valve out allowing free flow of oil to the servo apply piston, Figure 75. At speeds above approximately 25 MPH, G-1 pressure from the governor is great enough to move the valve to restrict the oil flow which delays front band application and permits the necessary engine speed increase before the front unit goes into reduction during the 4-3 downshift. This same condition exists on full throttle 2-3 upshifts.

When the front servo is applied, main line pressure flows past the over-run control valve to act on the back of the release piston. Main line pressure on this area provides the additional holding of the front band necessary when using the engine as a brake in third gear.

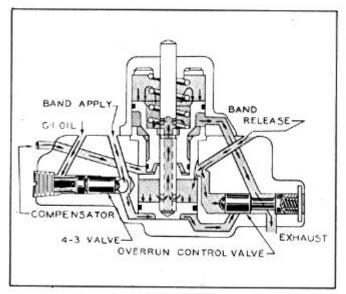


FIGURE 76

FRONT SERVO RELEASED - 2ND AND 4TH: (Models H-52 and J-52)

When the transmission shifts into second or fourth speeds, the front band is released. Band release oil coming into the front servo acts on the back of the apply piston, travels through the servo stem and acts on the release piston, Figure 76. Band release oil also moves the over-run valve cutting off the flow to the rear of the release piston and allows the oil that did act on the back of the release piston to exhaust.

Spring pressure, plus oil pressure, acting on the release piston and back face of the apply piston, releases the front servo.

NOTE: The compensator piston operation and the 4-3 downshift valve operation for Models H-52 and J-52 is the same as the operation of Models H-51 and J-51 Front Servo.

OPERATION OF REAR SERVO

(Models H-50, H-51 and J-51)

APPLY:

The rear servo is applied by the servo springs which operate on the accumulator piston, the stem of which contacts the Booster piston applying the band, Figure 77.

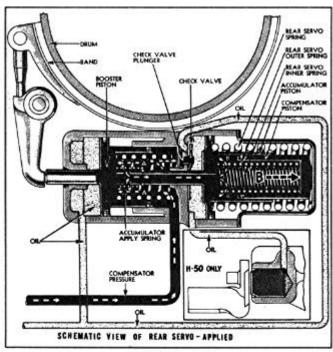


FIGURE 77

COMPENSATOR PRESSURE:

Compensator pressure is applied at points (A) and (B) to assist the servo springs and to prevent the band slipping under rapid acceleration. Compensator pressure is always present when there is any carburetor throttle opening and increases with carburetor throttle opening, Figure 77.

RELEASE:

Regulated main line pressure is applied at points (C) and (D) to release the band. The force applied at these two areas is greater than the force of the servo springs and the compensator pressure and the servo pistons are moved to the released position, Figure 78. On Model H-50, oil is also directed to the reverse blocker piston.

REAR SERVO ACCUMULATOR CHECK VALVE AND PLUNGER:

This accumulator check valve controls the passage through which oil flows to the face of the accumulator piston at (D). The oil going through this passage lifts the check valve off its seat and allows the oil to flow through freely to release the band.

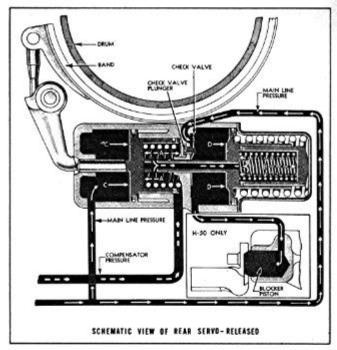


FIGURE 78

NOTE: There are two different ways in which this check valve operates when the servo is being applied.

 On a closed carburetor throttle downshift when the main line pressure applied at point (D) is released the check valve then returns to its seat causing the oil under the accumulator piston to pass through the small hole in the check valve and in this way delays application of the band, Figure 78. 2. On an open carburetor throttle downshift, compensator pressure is effective at points (A) and (B) and also on the end of the check valve plunger which is connected to the accumulator check valve. When the pressure applied at point (D) is released the compensator pressure applied on the check valve plunger holds the check valve off its seat and the oil under the accumulator piston is allowed to exhaust freely for a rapid application of the band, Figure 78.

BLOCKER PISTON: (Model H-50)

A blocker piston is located in the reverse bracket assembly. It is operated by regulated main line oil pressure. Its function is to prevent engagement of the reverse anchor into the reverse internal gear until the rear band is applied to the drum to stop the rear unit and reverse internal gears from turning, Figure 78.

REAR SERVO (Models H-52 and J-52)

The rear servo has been redesigned to allow faster rear band application in "LO" (Low) range resulting in better "car rocking" control by speeding up the low and reverse engagement.

The more rapid rear band application in low is accomplished by directing "LO" range oil from the manual valve to a new rear servo exhaust valve, Figure 79.

The "LO" range oil moves the exhaust valve against spring pressure opening a passage which will rapidly exhaust rear servo release pressure.

In the "DR-4" or "DR-3" ranges, the rear servo exhaust valve is closed by spring pressure and the accumulator check valve operates as it has on Models H-50, H-51 and J-51.

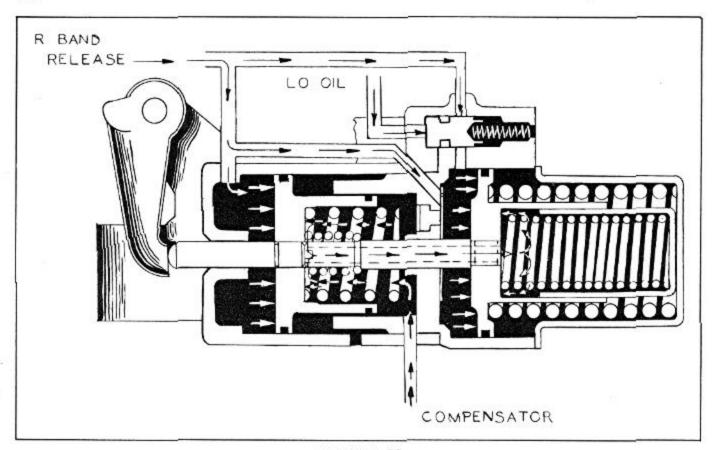


FIGURE 79

REPAIR PROCEDURES WITH TRANSMISSION IN CAR

DRAINING:

(Models H-50, H-51, J-51, H-52 and J-52)

NOTE: Drain while the oil is warm (immediately after operation).

- Remove flywheel housing dust cover.
- Remove hex head pipe plug from torus cover (using six-point socket) and drain torus cover at (B), Figure 80.

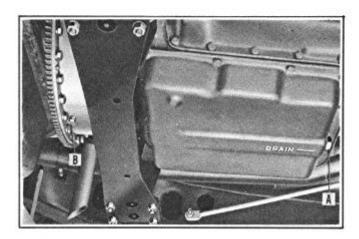


FIGURE 80

 Remove oil pan drain plug (at back of pan) and drain transmission case at (A).

NOTE: Ordinarily, flushing of the unit is not necessary; however, if it is flushed for any reason use only Hudson part #305096 approved Hydra-Matic Drive Fluid.

- After draining replace and tighten both torus cover and oil pan drain plugs.
- 5. Replace flywheel housing dust cover.

CAPACITY:

(Models H-50, H-51, J-51, H-52 and J-52)

Eleven (11) quarts of fluid are required to refill after draining torus cover and oil pan. Twelve (12) quarts of fluid are required to refill after the transmission has been disassembled and rebuilt. Use Hudson part #305096 approved Hydra-Matic Drive Fluid only.

REFILLING: (Models H-50, H-51, J-51, H-52 and J-52)

 Protect the seat upholstery with a suitable seat cover and raise the right side of front floor mat. Remove transmission inspection floor hole cover (A), Figure 81.

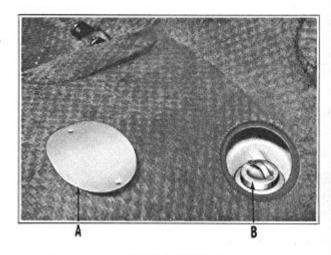


FIGURE 81

CAUTION: Clean all gravel, sand or lint from floor and around oil level indicator before removing indicator and cap.

 Remove cover and indicator (B) and pour eight (8) quarts of Hydra-Matic Fluid into transmission through oil filler hole.

NOTE: It is important to use only Hudson part #305096 approved Hydra-Matic Drive Fluid in the Hydra-Matic transmission.

 Set hand brake tightly and allow engine to idle for several minutes to fill torus unit. Then add oil (approximately three quarts) to bring level to the full mark when oil is hot. DO NOT OVERFILL.

NOTE: Always check oil level when oil is hot, engine idling, hand brake tightly set and control lever in "N" range.

- Stop the engine, replace oil indicator and cover, also floor cover.
- Replace floor mat and remove seat protector.

OIL LEVEL UNDER DIFFERENT CONDITIONS:

(Models H-50, H-51, J-51, H-52 and J-52)

Oil level as observed on the level indicator will vary as shown in Figures 82, 83, 84, 85 and 86.

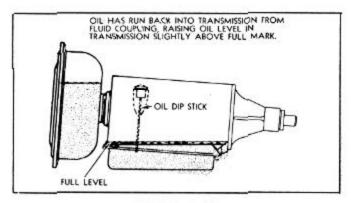


FIGURE 82

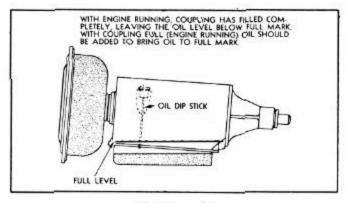


FIGURE 83

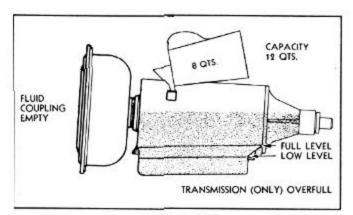


FIGURE 84

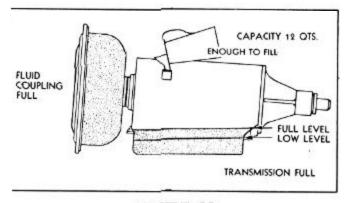


FIGURE 85

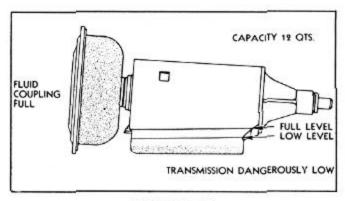


FIGURE 86

REPLACING TRANSMISSION OIL PAN DRAIN PLUG GASKET

(Models H-50, H-51, J-51, H-52 and J-52)

- 1. Raise car.
- Remove transmission oil pan drain plug and drain transmission fluid into a clean container.
- 3. Remove drain plug gasket.
- Inspect the threads in oil pan and drain plug for nicks and burrs.
- Soak new gasket in water until it is sufficiently pliable to install on drain plug.

CAUTION: Do not enlarge hole of gasket.

- Install gasket on drain plug and allow it to dry.
- Replace drain plug in transmission oil pan.
- 8. Lower car.
- 9. Raise right side of floor mat.
- Remove the transmission inspection floor hole cover (A), Figure 81.

CAUTION: Clean all gravel, sand, or lint from around oil level indicator before removing the indicator.

 Check fluid level of transmission and refill as outlined on pages 55 and 56.

REPLACING REAR BEARING RETAINER OIL SEAL

(Models H-50, H-51, J-51, H-52 and J-52)

- 1. Raise car.
- Disconnect the propeller shaft at the rear axle companion flange.
- Disconnect propeller shaft at the transmission companion flange.

- Remove one bolt at center bearing support and slide propeller shaft rearward to clear flange at transmission.
- 5. Remove transmission companion flange.
- Remove the rear bearing retainer oil seal dust shield.
- 7. Using a blunt chisel remove the oil seal.
- Inspect the rear bearing retainer core and output shaft for nicks and burrs.
- Apply lubri-plate to felt rubber portion of new rear bearing retainer seal.
- Install the new seal carefully over the output shaft and seat the seal using Installer Tool J-1354, Figure 87.

NOTE: Cleanliness is most important.

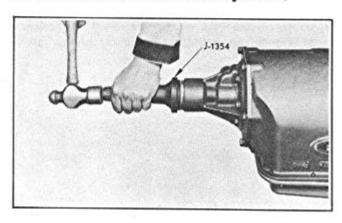


FIGURE 87

- After seal has been installed, apply a sealing compound around the outside of seal at the rear bearing retainer.
- Using Installer Tool, J-1354, install the rear bearing retainer seal dust shield, Figure 88.

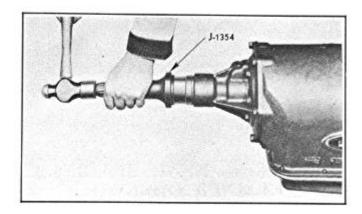


FIGURE 88

- 13. Install transmission companion flange.
- Replace propeller shaft by reversing procedure of removal.
- 15. Lower car.

NOTE: Recheck fluid level.

PRESSURE REGULATOR VALVE

REMOVAL:

(Models H-50, H-51, J-51, H-52 and J-52)

- Remove the accelerator pedal and front floor mat.
- On Models H-50, H-51 and J-51, it is necessary to remove the complete transmission floor opening cover before the pressure regulator valve can be removed. On Models H-52 and J-52, remove the band adjusting screw hole cover (A), Figure 89.

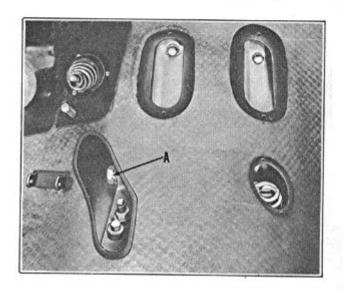


FIGURE 89

- Clean transmission so dirt will not enter transmission assembly when regulator plug is removed.
- Loosen pressure regulator valve plug in transmission case (1-1/2" open-end wrench).

CAUTION: Pressure regulator valve assembly is under spring tension.

- Hold pressure against regulator plug while unscrewing plug by hand.
- Remove plug, spring, valve, and gasket from side of transmission case.
- Clean and inspect pressure regulator valve according to instructions on page 160.

INSTALLATION: (Models H-50, H-51, J-51, H-52 and J-52)

 Place a new gasket over pressure regulator plug and install a new neoprene seal on all models except J-51. With pressure regulator valve assembled into spring, locate valve on seat in front pump, Figure 342.

NOTE: On Models H-50, install the T.V. plug in the plug bore. On Models H-51, H-52 and J-52, install the T.V. plug and the reverse booster plug in the regulator plug bore. Models J-51, install the reverse booster plug in regulator plug bore. The Model J-51 does not have a T.V. plug.

- 3. Install regulator plug into spring.
- 4. Apply pressure to plug to start threads and tighten in transmission case to approximately 40 ft. lbs. torque. Check transmission oil pressure according to instructions on page 184.
- Install and seal floor opening cover or inspection hole.
- Install front floor mat and accelerator pedal.

GOVERNOR AND REAR OIL PUMP ASSEMBLY

REMOVAL: (Models H-50, H-51, J-51, H-52 and J-52)

- 1. Raise car.
- Remove oil pan drain plug, draining Hydra-Matic fluid into a clean container.
- Disconnect transmission throttle rod (G) from throttle control lever at transmission, Figure 90.

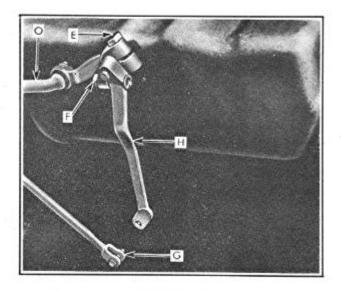


FIGURE 90

- Remove throttle control lever from shaft at side of transmission (7/16" socket).
- Disconnect selector lever control rod assembly from outer shift lever at side of transmission.
- Remove shifter lever from shaft (1/2" wrench).
- Clean transmission so dirt will not enter transmission assembly when side cover is removed.
- Remove the side cover bolts, cover and gasket. (Use a 7/16" socket and universal joint to facilitate removal of bolts.)
- On Model H-50, remove the two reverse shifter bracket and crank assembly mounting bolts and lock washers.
- Remove the reverse shifter bracket, shims retracting spring and roller, Figure 91.

NOTE: Do not lose shims, spring or roller.

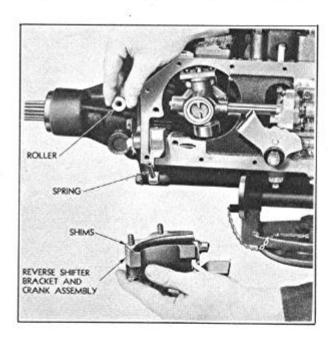


FIGURE 91

- Position inner detent control lever so steel ball is in the "LO" range detent position, Figure 92. Then remove four control valve assembly mounting bolts and lock washers (7/16" socket).
- 12. On Models H-51, J-51, H-52 and J-52, remove the pressure regulator reverse oil pipe (A), Figure 93. Unhook the parking brake release spring (B), Figures 93 and 94 from the brake lever pin assembly and loosen the two bolts that hold the parking brake bracket to the transmission case.

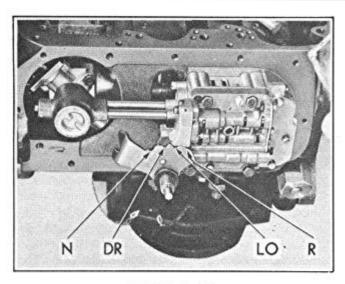


FIGURE 92

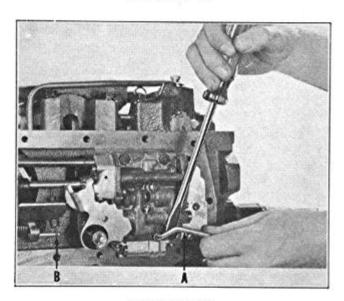


FIGURE 93

 Pull control valve assembly and governor oil delivery sleeve out approximately 1/8" and remove valve assembly from

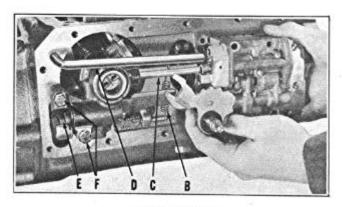


FIGURE 94

governor oil delivery pipes (C), Figure 94.

NOTE: On Model H-50, oil deliverypipes from valve assembly to governor sleeve may come off with valve assembly. If pipes do not come off with valve assembly, they should be pulled out of governor sleeve. Do not damage pipes.

- Wrap valve assembly in clean cloth and set the unit aside to prevent damage.
- 15. On Models H-51, J-51, H-52 and J-52, remove the two bolts (F) from the parking brake bracket assembly and while holding the parking pawl out of the way (upward) carefully remove the bracket from the governor.
- Remove transmission oil pan bolts, lock washers, oil pan, and gasket (1-1/2" socket).
- 17. Remove the oil pan screen.
- 18. Remove the two rear pump attaching bolts. With rear pump bolts removed, raise the rear pump slightly and work the rear oil pump discharge pipe into the rear oil pump until it comes out of the front servo, Figure 95. The pipe can then be pulled from the rear pump and removed from the transmission.

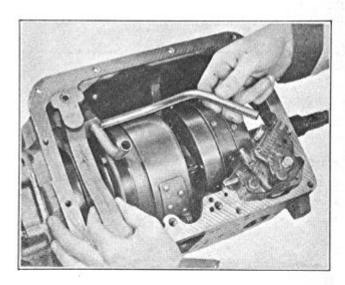


FIGURE 95

- Turn propeller shaft to position governor so that the large round governor weight is toward the front of the transmission.
- 20. Remove the pump and governor assembly by moving the rear pump toward the left side of the transmission case until pump end will clear the right side of the case. Then lower the pump end assembly below the case and move the unit out of and to the right, Figure 96.

CAUTION: On Model H-50, do not lose the plug from the governor sleeve.

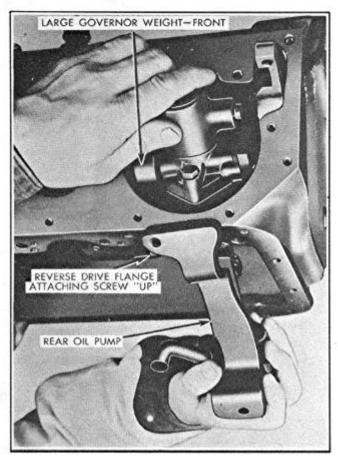


FIGURE 96

OVERHAUL:

Models H-50, H-51, J-51, H-52 and J-52)

NOTE: For overhaul of governor and rear oil pump assembly refer to

(a)	Disassembly	Page 111
(b)	Cleaning & Inspection	Page 112
	Assembly	Page 113

INSTALLATION:

(Models H-50, H-51, J-51, H-52 and J-52)

NOTE: Cleanliness is important, all parts must be free from dust and dirt.

- Before installing the rear pump, make certain the pump to case mating surfaces are free of nicks and burrs.
- Position the large round governor weight to the front of transmission.
- Slide the pump and governor assembly into position in case.

 On Models H-50, H-51 and J-51 insert the proper end of the rear pump discharge pipe into the rear pump. (The end with the small drilled hole connects to the front servo.)

On Models H-52 and J-52, the rear pump discharge pipe does not have this small drilled hole.

- 5. With the rear pump discharge pipe in the rear pump as far as it will go, turn the pipe so the front end lines up with the bore in the front servo check valve seat and work the pipe part way out of the rear oil pump and into the front servo.
- Install and tighten two governor and rear oil pump assembly attaching bolts and lock washer. Tighten to 15-18 ft. lbs. torque.

CAUTION: Be sure governor driven gear meshes with bronze driver gear.

- Check governor runout as outlined on pages 144 and 163.
- On Model H-50, install the oil delivery sleeve onto the governor, chamfered side of sleeve towards governor, pressing gently on sleeve while guiding the oil rings with your fingers.

On Models H-51, J-51, H-52 and J-52 with parking pawl installed in case, raise the parking pawl and while holding the parking pawl, place the chamfered side of the oil delivery sleeve over the end of governor and press it on gently while guiding the rings into the oil delivery sleeve, Figure 348.

 Install the roller on the parking brake pawl crank. Locate the parking pawl in proper position (if previously removed) and install the parking pawl support bolt. Torque bolt to 23-28 ft. lbs. and bend lock plate over flat of bolt.

10. Install the retracting spring in the reverse anchor bracket on Model H-50. On Models H-51 and J-51, install the parking blocker piston spring and spring retainer and start the parking brake bracket attaching bolts, Figure 349. On Models H-52 and J-52, be sure the parking blocker stop pin is behind the parking blocker piston spring and the pin is held in place by the pin retainer on the parking bracket mounting bolt, Figure 350.

 Install the oil delivery pipes into the holes in the oil delivery sleeve. (Three pipes for Models H-50, H-51 and J-51 and two pipes for Models H-52 and J-52.)

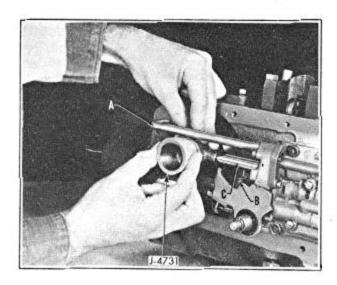


FIGURE 97

- 12. On Models H-51, J-51, H-52 and J-52, install the reverse clutch oil pipe (A) and the parking pawl return spring (B) over inside oil delivery pipe (hook outward) and hook lower end over the parking brake lever pin, Figure 97.
- Pull oil delivery sleeve out 1/8" from transmission case.
- With inside detent control lever in "LO" position push valve body onto oil delivery pipes.
- 15. To line up control valve assembly start one attaching bolt and lock washer. Then push oil delivery sleeve in to bring valve assembly against case.
- 16. Install remaining three control valve assembly attaching bolts and lock washers. Tighten all four bolts to 6-8 ft. lbs. torque.
- On Models H-51, J-51, H-52 and J-52, check proper alignment of governor and parking brake bracket assembly as follows:
 - a. With the rear pump bolts and parking bracket bolts loose, install the governor to sleeve aligning tool J-4731 over the governor, Figure 97.
 - b. With alignment tool in place, tighten the rear pump bolts and parking bracket bolts. Tool should rotate freely and governor should rotate freely as much as

gear backlash allows.

- c. Rotate output shaft to turn governor 1/4 turn and check governor and tool again for freeness. If the governor or tool bind at any point, loosen bracket and/or rear pump and adjust as required to give governor free movement. After rechecking governor for freeness, each 1/4 turn for a complete revolution, remove aligning tool J-4731.
- Slide oil screen over front pump intake pipe and position over rear pump intake pipe.

CAUTION: Make certain screen is free from foreign matter.

- 19. Position new gasket on oil pan and retain in place with petrolatum. Place pan on transmission case and start attaching bolts with lock washers to line up pan. Tighten bolts to 10-13 ft. lbs. torque.
- 20. Before installing the side cover make the following checks:
 - a. See that pickup pin of inside detent control lever engages in neck of manual valve.
 - b. See that governor oil delivery sleeve plug is in place, Model H-50.
 - c. Check operation of inside detent control lever with reverse crank, H-50. (Parking brake lever Models H-51, J-51, H-52 and J-52).
 - d. See that inner and outer spring washers and rubber seal are in place on manual control shaft, Figure 98.

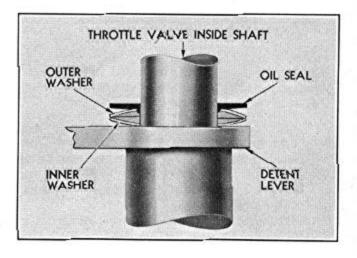


FIGURE 98

Place a new gasket on side cover and retain in place with petrolatum.

22. Position side cover and gasket assembly over manual shaft. Bolts with copper washers must be installed in the bottom holes to prevent leakage.

 Move cover to centralize manual shaft in hole and tighten bolts to 10-12 ft. lbs.

torque.

- 24. Install outer shift lever. Tighten clamp bolt to 10-13 ft. lbs. torque. Make certain lever does not bind on side cover.
- Connect selector lever control rod to outer shift lever.
- 26. Install throttle control lever. Tighten clamp bolt to 10-12 ft. lbs. torque.

27. Install oil pan drain plug. Tighten to 34-45 ft. lbs. torque.

- 28. Check throttle control adjustments, manual shift control adjustments and neutral safety switch adjustments according to instructions, in section "Adjustments With Transmission in Car," pages 169 through 174.
- 29. Lower car.
- Remove indicator and refill with the Hydra-Matic fluid which was previously drained from transmission, providing fluid is clean.
- Recheck fluid level and refill as outlined on pages 55 and 56.

CAUTION: Clean all gravel, sand or lint from floor and around oil level indicator before it is removed.

32. Set hand brake lever tightly and run engine for several minutes. Add oil to bring level to full mark when oil is hot.

NOTE: Check oil level when oil is hot, engine running manual selector lever in "N" range and hand brake lever set tightly.

- Remove oil pressure line pipe plug from between band adjusting screws using 7/16" six point socket.
- Check oil pressure according to instructions on page
- 35. Replace oil pressure line pipe plug.
- Replace and seal transmission floor inspection cover.
- Replace front floor mat.

FRONT OR REAR SERVO

REMOVAL: (Models H-50, H-51, J-51, H-52 and J-52)

- Raise car and place car on car stands.
- 2. Raise front floor mat.
- 3. Remove band adjusting floor hole cover.
- Loosen both band adjusting screw lock nuts (3/4" socket).
- Loosen both bands adjusting screws approximately five (5) turns.
- Drain fluid from transmission oil pan into a clean container.
- Remove the oil pan bolts, lock washers, oil pan and gasket (1/2" socket).
- 8. Remove the oil pan screen.
- Remove front and rear servo attaching bolts (9/16" socket).
- Separate front and rear servos at oil transfer pipe by moving rear servo toward rear of transmission and remove the rear servo.

NOTE: If the front servo is to be removed, first work the rear pump discharge pipe out of the front servo as far out as it will go, then pull the front servo down off the front pump delivery pipe.

OVERHAUL: (Models H-50, H-51, J-51, H-52 and J-52)

NOTE: For overhaul of servos refer to:

4		SERVO	SERVO
(a)	Disassembly	Page 115	Page 121
(b)	Cleaning & Inspection	Page 117	Page 123
(c)	Assembly	Page 119	Page 124

TOONT

DEAD

INSTALLATION: (Models H-50, H-51, J-51, H-52 and J-52)

- With front pump delivery pipe in front pump and rear pump discharge pipe in rear pump, position front servo with piston stem in socket of front band. Place servo on front delivery pipe, enter rear pump discharge pipe into check valve fitting of servo.
- Hold front servo in position and enter attaching bolts 2 or 3 threads.

- Place rear servo in position engaging rear band strut with actuating lever while entering oil transfer pipe from front servo.
- Enter rear servo attaching bolts, then tighten all four servo attaching bolts to 23-28 ft. lbs. torque.
- Adjust front and rear bands according to instructions on pages 175 and 176.
- Slide oil screen over front pump intake pipe, and position over rear pump intake pipe. Make certain oil screen is free of foreign matter.
- Place new gasket on oil pan and hold in place with petrolatum.
- Position oil pan to transmission case. Start attaching bolts with lock washers to line up pan. Tighten bolts to 10-13 ft. lbs. torque.
- Install the oil pan drain plug, tighten to 34-45 ft. lbs.
- 10. Lower car.
- Remove transmission oil filler inspection floor hole cover.

CAUTION: Clean all gravel, sand or lint from floor and around oil level indicator.

- Remove indicator and refill transmission with Hydra-Matic Fluid previously drained.
- Set hand brake lever tightly and run engine for several minutes. Then add oil to bring level to full mark when oil is hot.

NOTE: Check oil level when oil is hot, engine running, manual selector lever in "N" range and hand brake lever set tightly.

- Check oil pressure according to instructions on page 184.
- Install band adjusting and transmission oil filler inspection floor hole covers.
- 16. Install front floor mat.

REVERSE ANCHOR, BRACKET ASSEMBLY AND SHIMS

REMOVAL: (Model H-50)

- 1. Raise car.
- Remove oil pan drain plug, draining fluid into a clean container.
- Disconnect transmission throttle rod from throttle control lever at transmission.

- Remove throttle control outside lever from shaft at side of transmission (7/16" socket).
- Disconnect selector lever control rod assembly from shift lever.
- Remove shift lever from shaft of side of transmission, (1/2" wrench).
- Clean transmission so dirt will not enter assembly when side cover is removed.
- Remove side cover bolts (7/16" socket), side cover and gasket.
- Remove the two reverse shifter bracket and crank assembly mounting bolts and lock washers (1/2" socket), Figure 99.

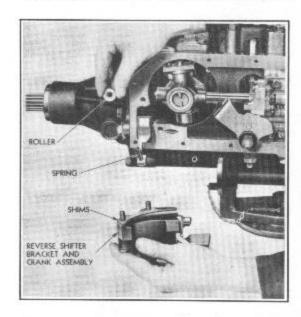


FIGURE 99

 Remove reverse shifter bracket, shims, retracting spring and roller.

NOTE: Do not lose shims, spring or roller.

- Straighten reverse anchor support bolt lock.
- Remove reverse anchor support bolt and reverse anchor.

OVERHAUL: (Model H-50)

- Inspect reverse anchor and reverse internal gear for damaged teeth.
- Remove blocker piston from bracket assembly.
- Clean retracting spring and blocker piston.
- Inspect piston and bore for wear and crankshaft for wear in bracket.

INSTALLATION: (Model H-50)

- Position reverse anchor in transmission case and install reverse anchor support bolt with a new lock. Tighten to 10-13 ft. lbs. torque.
- Replace blocker piston in bracket assembly.
- Position retracting spring and roller on bracket assembly.
- Assemble bracket and shims to transmission case.
- Install attaching bolts with lock washers. Tighten to 15-18 ft. lbs.
- Remove oil pan bolts, lock washers, oil pan and gasket.
- Check backlash in reverse internal gear according to instructions on page 157.
- Place new gasket on oil pan and hold in place with petrolatum.
- Position side pan to transmission case. Start attaching bolts with lock washers to line up pan. Tighten to 10-13 ft. lbs. torque.
- 10. Tighten oil pan drain plug to 34-45 ft. lbs.
- Before installing side cover make the following checks:
 - (a) See that pickup pin of inside detent control lever engages in neck of Manual
 - (b) See that governor oil delivery sleeve plug is in place.
 - (c) Check operation of inside detent control lever with reverse crank.
 - (d) See that inner and outer spring washers and rubber seal are in place on manual control shaft, Figure 98.
- Place new gasket on side cover and retain in place with petrolatum.
- Position side cover and gasket assembly over manual shaft.
- 14. Install side cover attaching bolts with COPPER WASHERS finger tight. Centralize manual shaft in hole by shifting cover and tighten bolts to 10-12 ft. lbs. torque.
- Install shifter lever. Tighten clamp bolt to 10-13 ft. lbs. torque. Make certain shift lever does not bind on cover.
- Connect selector lever control rear rod to shift lever.
- Install outside throttle control lever.
 Tighten clamp bolt to 10-12 ft. lbs. torque.
- Check throttle control adjustments, shift control adjustments and neutral safety adjustments according to instructions on pages 169 through 174.

- 19. Lower car.
- Remove indicator and refill transmission with the Hydra-Matic Fluid previously drained from transmission providing fluid is clean.
- Recheck fluid level and refill as outlined on pages 55 and 56.
- Replace and seal transmission floor opening inspection cover.
- 23. Replace front floor mat.

PARKING PAWL AND PARKING BRAKE BRACKET

REMOVAL:

(Models H-51, J-51, H-52 and J-52)

Perform operations 1 through 15 under "Governor and Rear Oil Pump Assembly" - Removal.

NOTE: The parking pawl can be removed after the parking brake bracket has been removed by removing the parking pawl support bolt, Figure

OVERHAUL:

(Models H-51, J-51, H-52 and J-52)

NOTE: For overhaul of the parking brake bracket, refer to:

(a)	Disassembly	Page	142
(b)	Cleaning & Inspection	Page	143
(c)	Assembly	Page	144

INSTALLATION: (Models H-51, J-51, H-52 and J-52)

- Install the parking pawl into position in transmission case, BUT DO NOT INSTALL parking brake pawl support bolt.
- 2. With the parking pawl installed in transmission case, raise the parking pawl and place the chamfered side of the governor oil delivery sleeve (A) over the end of the governor and install carefully guiding rings into the oil delivery sleeve, Figure 348.
- Install the roller in the parking pawl crank. Locate the parking pawl in proper position and install the parking pawl support bolt. Torque bolt to 23-28 ft. lbs. and bend lockplate over flat of bolt.
- On Models H-51 and J-51 install the parking blocker piston spring (C) and spring retainer (B) and start the parking brake bracket attaching bolts (A), Figure 349.

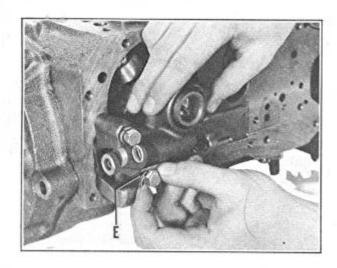


FIGURE 100

On Models H-52 and J-52 be sure the parking blocker stop pin is behind the parking blocker piston spring and that the pin is held in place by the pin retainer (E), Figure 100, on the parking bracket mounting bolt.

- Install the oil delivery pipes into the holes in the oil delivery sleeve. (Three pipes for Models H-51 and J-51 and two pipes for Models H-52 and J-52.) (Be sure center hole is plugged on Models H-52 and J-52.)
- Install the parking pawl return spring (B) over the inside oil delivery pipe (open end of hook out) and hook other end over the parking brake lever pin groove, Figure 97.
- Install the reverse clutch pipe (A), Figure 97, with "L" end in rear of transmission case.
- 8. Install the control valve assembly over the oil delivery pipes (C) and reverse clutch pipe (A), and start control valve attaching bolts. Place detent control lever in "LO" position and press valve body and parking brake bracket assembly against transmission case and tighten valve body bolts evenly to 6-8 ft. lbs.

NOTE: The governor oil delivery sleeve alignment is largely controlled by the position of the valve body rear cover, because the two parts are connected by the oil delivery pipes. For this reason, the valve body rear cover alignment should be carefully checked as follows:

(a) With the parking bracket bolts loose, install the governor to sleeve alignment tool J-4731 over the governor, Figure 97.
(b) With alignment tool in place, tighten

the rear pump bolts and parking bracket bolts. Tool should rotate freely and governor should rotate freely as much as gear backlash allows.

(c) Rotate output shaft to turn governor 1/4 turn and check governor and tool again for freeness. If the governor or tool bind at any point, loosen bracket and/or rear pump and adjust as required to give governor free movement. After rechecking governor for freeness, each 1/4 turn for a complete revolution, remove aligning tool J-4731.

NOTE: Follow with operations 20 through 37 under "Governor and Rear Oil Pump Assembly - Installation", Pages 61 and 62.

CONTROL VALVE ASSEMBLY

REMOVAL:

(Models H-50, H-51, J-51, H-52 and J-52)

- Raise car.
- Drain fluid from transmission oil pan into clean container.
- Disconnect transmission throttle rod from throttle control lever at transmission.
- Remove throttle control outside lever from shaft at side of transmission (7/16" wrench).
- Remove clevis pin connecting selector lever control rod assembly to outside shift lever at side of transmission.
- Remove shift lever from shaft (1/2" wrench).
- Remove side cover bolts (7/16" socket), cover, and gasket.
- Position inner detent control lever so steel ball is in "LO" range detent position, then remove four control valve assembly mounting bolts and lock washers (7/16" socket).
- 9. On Models H-51, J-51, H-52 and J-52, loosen the two bolts that hold the parking brake bracket to the transmission case.
- Pull valve assembly and governor oil delivery sleeve out approximately 1/8".
 Valve assembly can then be removed from governor oil delivery pipes.

NOTE: Oil delivery pipes from valve assembly to governor sleeve may come off with valve assembly. If pipes do not come off with valve assembly they should be pulled out of governor sleeve. Do not damage pipes in removal.

OVERHAUL:

(Models H-50, H-51, J-51, H-52 and J-52)

NOTE: For overhaul of the control valve assembly refer to the following sections:

(a) Disassembly Page 126 (b) Cleaning and Inspection Page 134 (c) Assembly Page 135

INSTALLATION: (Models H-50, H-51, J-51, H-52 and J-52)

1. Install the oil delivery pipes into holes in governor oil delivery sleeve.

2. On Models H-51, J-51, H-52 and J-52, hook the parking brake release spring (B), Figure 120, over the inside oil delivery pipe with the hook outward and fasten the other end over the parking brake lever pin.

3. With inside detent control lever in "LO" position and oil delivery sleeve out approximately 1/8", push valve assembly

onto oil delivery pipes.

4. To line up control valve assembly start one attaching bolt and lock washer. Then push oil delivery sleeve in to bring valve assembly against case.

Install remaining three control valve assembly attaching bolts and lock washers. Tighten all four bolts to 6-8 ft. lbs.

On Models H-51, J-51, H-52 and J-52, install the pressure regulator reverse oil pipe (A), Figure 118.

7. Before installing the side cover make the

following checks:

- (a) See that pickup pin of inside detent control lever engages in neck of manual
- (b) See that oil delivery sleeve plug is in place.
- (c) Check operation of inside detent control lever with reverse crank.
- (d) See that inner and outer spring washers and rubber seal are in place on manual control shaft, Figure 98.
- 8. Place a new gasket on side cover and retain in place with petrolatum.
- 9. Position side cover and gasket assembly over manual shaft.
- 10. Install side cover attaching bolts finger tight. Move cover to centralize manual shaft in hole and tighten bolts to 10-12 ft. lbs. torque.

NOTE: Bolts with copper washers must be in the bottom holes to prevent leakage.

- 11. Install outside shift lever. Tighten clamp bolt to 10-13 ft. lbs torque. Make certain shift lever does not bind on side cover.
- 12. Connect selector lever control rod to outside shift lever.
- 13. Install throttle control lever. Tighten clamp bolt to 10-12 ft. lbs. torque.
- 14. Install oil pan drain plug. Tighten to 34-45 ft. lbs. torque.
- 15. Check throttle control adjustments, manual selector control adjustments and neutral safety switch adjustments according to instructions on pages 169 thru 174.
- 16. Lower car.
- 17. Remove indicator and refill with Hydra-Matic Fluid which was previously drained from transmission.
- 18. Recheck fluid level and refill as outlined on pages 55 and 56.
- 19. Remove oil pressure line pipe plug from between band adjusting screws using 7/16" six point socket.
- 20. Check oil pressure according to instructions on page
- 21. Replace oil pressure line pipe plug.
- 22. Replace and seal transmission floor opening inspection cover.
- Replace front floor mat.

REAR BEARING RETAINER AND REVERSE ASSEMBLY

REMOVAL: (Models H-50, H-51, J-51, H-52 and J-52)

- 1. Perform operations 1 through 10 under "Front and Rear Servo" - Removal page
- Perform operations 3 through 20 under "Governor and Rear Oil Pump Assembly" -Removal pages 58 and 59.
- 3. Disconnect the propeller shaft at the transmission companion flange and disconnect the speedometer cable at the rear bearing retainer.
- 4. With the oil pan, front and rear servos, and rear oil pump and governor assemblies removed, loosen the five rear bearing retainer to reverse internal gear support attaching bolts. This aids in disassembly after the rear bearing retainer and reverse assembly is removed from the transmission case.

 Remove six reverse center gear and drive flange attaching bolts (1/2" wrench).

NOTE: The drive flange can be held from turning by bracing a screw driver under the drive flange bolt head.

6. Install a screw driver between the center bearing cap and the rear clutch drum, Figure 101 to prevent the drum from moving forward. The screw driver should be placed at an angle to prevent any damage to the oil delivery sleeve.

CAUTION: If a screw driver is not installed as outlined in paragraph 6, the rear clutch hub front thrust washer may drop from position. If the washer does drop out of position it will be necessary to remove the transmission from the car and reposition the thrust washer.

- Straighten the reverse anchor support bolt lock. Then remove the reverse anchor support bolt (9/16" socket) and remove reverse anchor.
- Remove the five rear bearing retainer to transmission case attaching bolts and lock washers (9/16" socket).
- Remove the reverse assembly from transmission case, Figure 101.

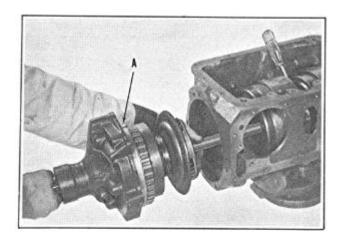


FIGURE 101

NOTE: If the assembly sticks in transmission case, do not rock the unit up and down, but pull straight out. Also do not lose locating key (A), Figure 101. The selective washer may stick to the main shaft or it may remain in the counterbore of the output shaft. Be sure to remove this washer when the reverse assembly is removed.

OVERHAUL: (Models H-50, H-51, J-51, H-52 and J-52)

For overhaul of the rear bearing retainer and reverse assembly refer to:

(a)	Disassembly	Page 92
(b)	Cleaning and Inspection	Page 96
	Repair	Page 98
(d)	Assembly	Page 99

INSTALLATION: (Models H-50, H-51, J-51, H-52 and J-52)

- Install the proper selector washer in the counterbore of the output shaft and retain in place with petrolatum.
- 2. Install the rear bearing retainer and reverse assembly into the rear end of the transmission case. Turn the output shaft to aid in engaging the rear unit center gear with the planet carrier pinions.
- Align the stationary cone lock key (A), Figure 102, with the keyway in the transmission case. Then align the rear bearing retainer bolt holes to case.

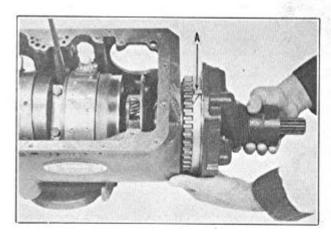


FIGURE 102

 Start the five rear bearing retainer to case attaching bolts and washer and the parking brake pawl support bolt and lock plate.

CAUTION: Do not attempt to pull the bearing retainer against the case with the attaching bolts.

5. Align the holes in the reverse drive flange and rear drum and install the six reverse drive flange bolts and washers. After two bolts have been entered finger tight, remove the screw driver (the screw driver was placed between the center bearing caps and the rear clutch drum before the reverse unit was removed).

- Tighten all flange bolts evenly to 10-13 ft. lbs.
- 7. Push or tap the rear bearing retainer against case and tighten the mounting bolts evenly to 28-33 ft. lbs. Remove the parking pawl support bolt. (This bolt was installed to insure proper alignment between the rear bearing retainer and transmission case.)
- Test for freeness of operation by holding the rear unit drum and turning the output shaft.
- 9. Install the governor and rear oil pump assemblies as outlined in steps 1 through 17 on pages 60 and 61; front and rear servo installation as outlined in steps 1 through 16 on pages 62 and 63.
- Connect propeller shaft at transmission companion flange and speedometer cable at rear bearing retainer.

REFERENCE

		r)
Source of Information	Date	Subject
7. S		
0.00		
		1 1 1 2 2
-1/-		
-		
	1	
	+	
	-	
	-	
	1	

REMOVING THE HYDRA-MATIC TRANSMISSION

(Models H-50, H-51, J-51, H-52 and J-52)

NOTE: The Hydra-Matic Transmission Flywheel Housing, Torus Cover and Torus Members are removed as an assembly. To remove the transmission unit proceed as follows:

- Raise hood and disconnect battery ground cable at battery terminal, also disconnect battery cable at starter motor.
- Remove two bolts and lock washers attaching the starter motor to the flywheel housing and remove starter motor.
- Remove the one bolt attaching the breather pipe to the valve chamber.
- Remove one bolt attaching the breather pipe attaching bracket to the flywheel housing and remove the breather pipe.
- Pull the floor mat to one side to expose the two floor opening covers, Figure 103.

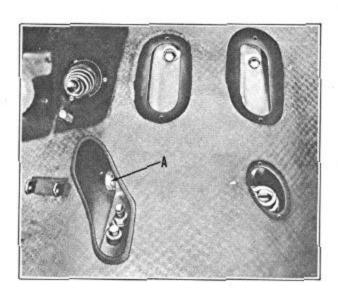


FIGURE 103

- Remove the two opening covers (held by sheet metal screws), and remove the two bolts attaching the flywheel housing to the engine.
- Raise car and if a twin post hoist is not available, support car on four jack stands.
- Disconnect the propeller shaft at the rear axle companion flange and at the transmission at (B), Figure 104.

NOTE: Use adhesive tape or rubber band to keep journal bearings assembled to the universal journal when removing the propeller shaft.

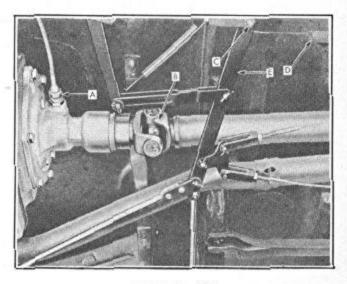


FIGURE 104

- Remove the center bolt attaching the propeller shaft center bearing housing to the center bearing support and slide propeller shaft to rear to allow clearance for the transmission.
- 10. Disconnect the speedometer cable at (A).
- 11. Disconnect transmission throttle rod (G), by removing cotter pin and clevis pin at throttle control lever (H), Figure 105, loosen screw (F) and remove the throttle lever.

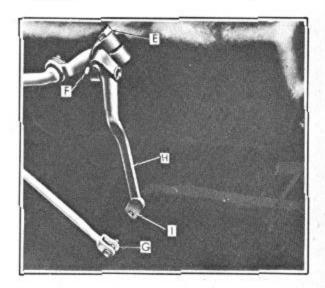


FIGURE 105

 Disconnect the selector lever control rod assembly (O) from outer shift lever (E), Figure 105.

- Remove the left hand side engine rear stone guard assembly. (4 self tapping screws.)
- Disconnect hand brake cable lever return spring (D) at the hand brake cable lever (E). Figure 104.
- Disconnect hand brake cable clevis (C) at pull rod slide link (E), Figure 104.

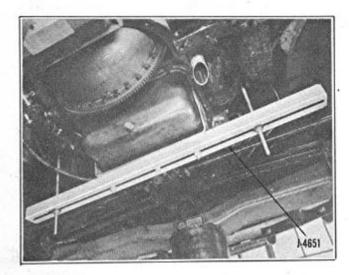


FIGURE 106

16. Install Engine Holding Fixture J-4651 by positioning the "U" shaped section around engine oil pan and enter one adjusting hook in open hole in frame just below steering housing support and the other

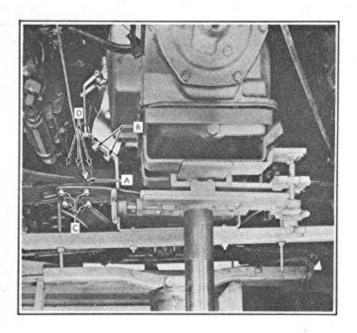


FIGURE 107

- hook in the corresponding hole in the opposite frame side rail, Figure 106.
- Remove the hand brake cable retainer clip (A) at No. 3 crossmember, Figure 107.
- 18. Pull hand brake cable towards front of car through crossmember.
- Remove the engine rear support bolts (B) attaching rear insulators to No. 3 crossmember. (Two each side.)
- 20. Using a suitable hydraulic hoist equipped with a tilt table and transmission cradle, position the jack and raise the transmission to relieve the weight from the rear supports.
- Remove the four screws at (C) and three screws at (D), Figure 107, each side of crossmember and remove crossmember.

CAUTION: Crossmember will drop when these 14 screws are removed.

- 22. With engine holding fixture installed adjust support hooks so that the front end of the oil pan will clear the center tie rod ends by approximately 1/2" and weight of engine is supported by the Engine Holding Fixture J-4651.
- Remove four screws attaching flywheel housing dust cover and remove the dust cover as an assembly.
- Drain torus unit fluid into a clean container.
- After draining the torus cover reinstall the torus drain plug.
- 26. With the transmission supported with a suitable hydraulic jack, remove the torus cover attaching screws.
- 27. Using a 5/8" universal socket and a 14" extension, remove the right hand lower flywheel housing bolt.

NOTE: This bolt cannot be removed freely. Allow the bolt to remain in the bolt hole of housing.

- 28. Using a 9/16" universal socket and a 14" extension remove the flywheel housing left hand lower bolt.
- 29. Determine that all bolts have been detached from the engine and pull transmission and hydraulic jack rearward until the pilot shaft of transmission clears pilot bushing in flywheel.
- Remove the transmission from car to the work bench for repairs.

HYDRA-MATIC TRANSMISSION DISASSEMBLY

REMOVING TORUS MEMBERS. TORUS COVER AND FLYWHEEL HOUSING

(Models H-50, H-51, J-51, H-52 and J-52)

- Remove oil level indicator from transmission case.
- 2. Place transmission and torus assembly in Transmission Holding Stand J-2541, Figure

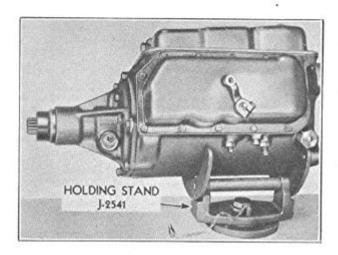


FIGURE 108

3. Move shift lever on side of transmission toward rear to reverse position, Figure 109.

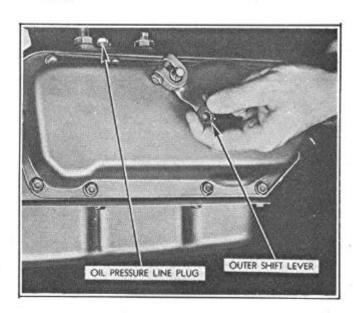


FIGURE 109

- 4. Straighten the main shaft nut lock washer using a chisel and a light hammer and remove the main shaft nut (1-7/16" socket).
- 5. Slide driven torus off front end of transmission main shaft.

NOTE: If torus sticks, tap end of main shaft lightly with a rawhide hammer, while pulling on torus member.

6. Remove driving torus snap ring, Figure 110 and remove the driving torus assembly.

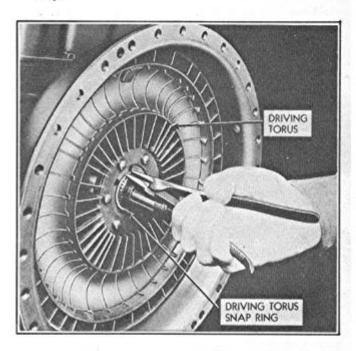


FIGURE 110

CAUTION: Do not try to remove the torus cover and driving torus together.

7. Remove the torus cover. Work hub of torus cover back through oil seals gently and then pull the torus cover forward with a quick jerk.

CAUTION: DO NOT attempt to remove torus cover by pulling and pushing on cover in a rough manner as this may result in a broken oil seal ring.

- 8. Remove four bolts and lock washers holding the flywheel housing to transmission case, using a 3/4" socket.
- 9. Remove the flywheel housing and gasket.

FRONT AND REAR SERVOS

REMOVAL: (Models H-50, H-51, J-51, H-52 and J-52)

 Move shift lever on side of transmission to "LO" position except H-52 and J-52; on these two models, move the lever to the "DR-3" position.

 Loosen shift lever to shift shaft clamp bolt (1/2" socket) and remove the lever.

 Remove oil pan bolts (1/2" socket) and remove oil pan with gasket.

 Remove the oil pan screen by lifting from rear oil pump intake pipe and slide screen toward rear from the front pump intake pipe.

 Straighten the two front oil pump intake pipe lock plates and loosen the pipe flange attaching bolts while lifting slightly on pipe to avoid dropping the bolts (7/16" socket).

 Remove the front oil pump intake pipe, bolts, lock plates and paper gasket from transmission, Figure 111.

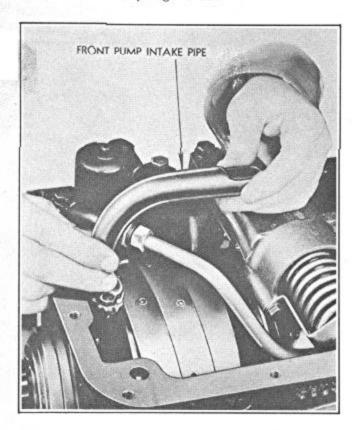


FIGURE 111

NOTE: On Models H-52 and J-52, the front pump intake pipe is a slip fit in the front pump. Loosenfront and rear band adjusting screw lock nuts (3/4" wrench) then loosen the adjusting screw approximately five turns each.

NOTE: On Models H-52 and J-52, the governor oil delivery pipe must be removed from the front servo and transmission case by prying the ends out with two screw drivers, Figure 112.

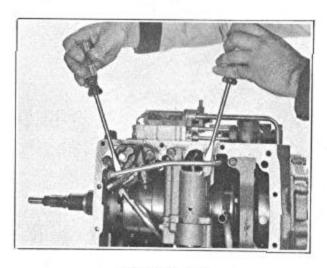


FIGURE 112

- Remove front and rear servo attaching bolts (9/16" wrench).
- 9. Remove both servos as one unit.

NOTE: As servos are lifted from transmission, rear pump discharge pipe will rotate in the front fitting and slide free.

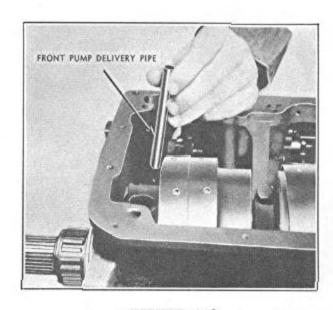


FIGURE 113

- Separate front and rear servos at oil transfer pipe. Leave pipe in servo in which it sticks.
- Remove the rear pump discharge pipe from rear pump.
- Remove front pump delivery pipe, Figure 113.

REVERSE SHIFTER BRACKET ASSEMBLY

REMOVAL: (Model H-50)

- 1. Remove side cover bolts (7/16" socket).
- 2. Remove side cover and gasket.
- Remove two reverse shifter bracket and crank assembly mounting bolts and lock washers (1/2" wrench).
- Remove reverse shifter bracket, shims, retracting spring and roller, Figure 114. Do not lose shims, springs and rollers.

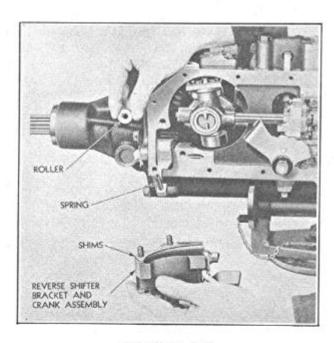


FIGURE 114

NOTE: Before removing the oil delivery sleeve, governor or control valve assembly, check "Governor Runout" as outlined on page 144.

CONTROL VALVE ASSEMBLY

REMOVAL: (Model H-50)

 Check position of inner detent control lever, so steel ball is in the "LO" range de-

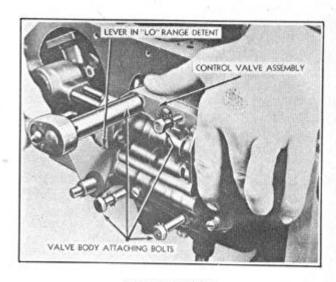


FIGURE 115

tent position, Figure 115; then remove four control valve assembly mounting bolts and lock washers (7/16" socket).

 Pull valve assembly and governor oil delivery sleeve out approximately 1/8" and rotate valve assembly counter-clock wise to clear case, Figure 116. Valve assembly can then be removed from governor oil delivery pipes.

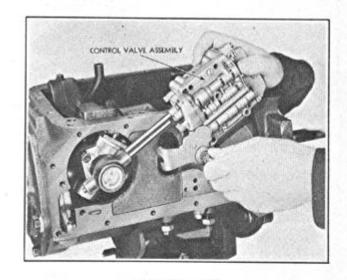


FIGURE 116

NOTE: Oil delivery pipes should be pulled out of the governor sleeve at this time. Do not damage the pipes in removal.

Wrap the control valve assembly in waxed paper or a clean rag and set valve aside to prevent damage.

CONTROL VALVE ASSEMBLY AND PARKING BRAKE BRACKET ASSEMBLY

REMOVAL: (Models H-51, J-51, H-52 and J-52)

- Back off the front and rear band adjusting screws six turns.
- Remove parking brake pawl support bolt
 (A) from rear of case and position parking pawl (B) down in case as far as it will go, Figure 117. (Pawl cannot be removed at this time.)

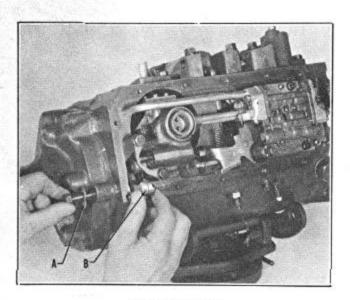


FIGURE 117

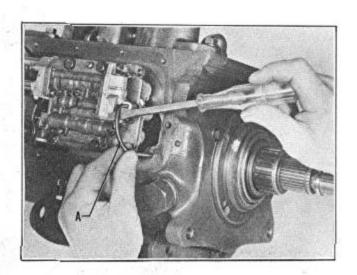


FIGURE 118

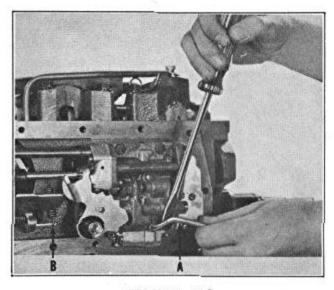


FIGURE 119

- 3. Using a screwdriver, remove the pressure regulator reverse oil pipe (A), Figure 118, for Models H-51 and J-51 and Figure 119 for Models H-52 and J-52. (Do not bend the pipe during this operation.)
- Loosen the two bolts (C), Figure 120, holding the parking brake bracket assembly to the transmission case.
- Unhook the parking brake release spring (G) from the pin assembly.
- Remove the four bolts attaching the control valve assembly to the transmission case.
- Work control valve assembly toward the front of the case sufficiently to remove the governor pipes and the reverse clutch pipe

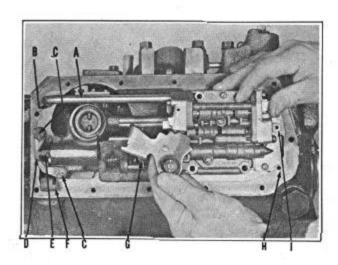


FIGURE 120

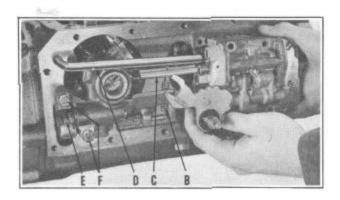


FIGURE 121

(A), Figure 120 for Models H-51 and J-51 and (C) and (D), Figure 121 for Models H-52 and J-52.

NOTE: Governor pipes may remain with either the control valve assembly or the parking bracket assembly.

CAUTION: After removing the control valve assembly, wrap the valve assembly in a clean rag and place valve where it cannot be damaged.

8. Remove the bolts attaching the parking brake bracket assembly to the case and remove the piston release spring stop (D) and spring (E), Figure 120, for Models H-51 and J-51 and the blocker piston pin retainer (E), Figure 122, for Models H-52 and J-52.

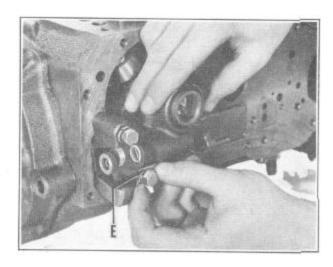


FIGURE 122

NOTE: Carefully remove the sleeve from the governor to avoid damage to the oil rings, Figure 123.

Remove the parking pawl from the transmission case.

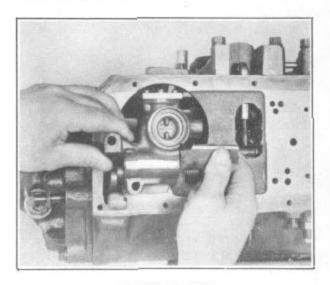


FIGURE 123

PRESSURE REGULATOR ASSEMBLY

REMOVAL: (Models H-50, H-51 and J-51)

1. Loosen pressure regulator valve plug in transmission case (1-1/4" wrench).

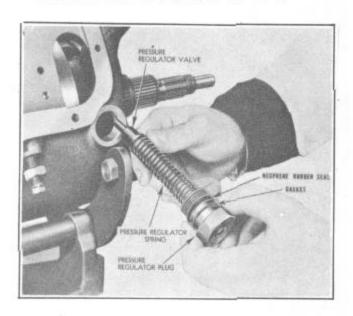


FIGURE 124

CAUTION: Pressure regulator valve assembly is under spring pressure.

2. Hold pressure against regulator plug while unscrewing plug by hand, Figure 124.

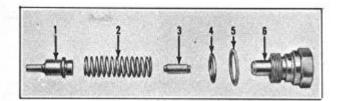


FIGURE 125

LEGEND

- 1. Pressure Regulator Valve
- 2. Pressure Regulator Spring
- 3. T.V. Pressure Plug
- 4. Pressure Regulator Plug Seal
- 5. Pressure Regulator Plug Gasket
- 6. Pressure Regulator Plug

NOTE: The pressure regulator assembly used on the H-51 transmission can be identified by the two oil passages drilled in the plug. One passage (the T.V. passage) is located above the groove machined on the plug for the neoprene seal. The other passage located below the groove is for the reverse booster pressure, Figure 126.

The H-50 Regulator plug has only one drilled passage (the T.V. passage) and has a groove machined for the neoprene seal, Figure 125. This neoprene ring prevents throttle pressure from passing the plug threads and dumping into the inside of the transmission case.

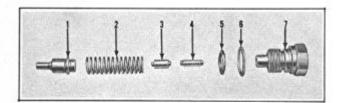


FIGURE 126

LEGEND

- Pressure Regulator Valve
- 2. Pressure Regulator Spring
- 3. Reverse Booster Plug
- 4. T.V. Pressure Plug
- 5. Pressure Regulator Plug Seal
- 6. Pressure Regulator Plug Gasket
- 7. Pressure Regulator Plug

The J-51 regulator plug also has only one drilled passage (reverse booster pressure) but does not have the groove machined for the neoprene seal, Figure 127.

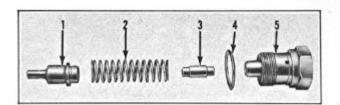


FIGURE 127

LEGEND

- 1. Pressure Regulator Valve
- 2. Pressure Regulator Spring
- 3. Reverse Booster Plug
- 4. Pressure Regulator Plug Gasket
- 5. Pressure Regulator Plug

The H-50 and H-51 regulator springs are interchangeable with each other but cannot be interchanged with Models J-51, H-52, J-52 or vice-versa.

CAUTION: Pressure regulator plugs and springs must be used in the model transmissions they were intended for and none other.

PRESSURE REGULATOR VALVE

REMOVAL: (Models H-52 and J-52)

1. Loosen pressure regulator valve plug in transmission case. (1-1/4" wrench.)

CAUTION: Pressure regulator valve assembly is under spring pressure.

Hold pressure against the regulator plug while unscrewing plug by hand, Figure 128.

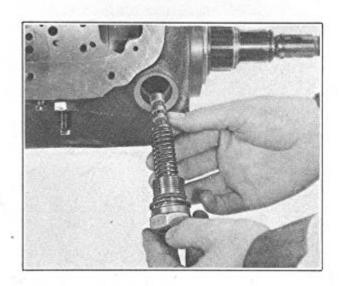


FIGURE 128

 Remove the regulator plug, T.V. plug, reverse booster plug, spring and valve, Figure 129.

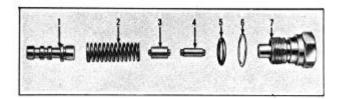


FIGURE 129

LEGEND

- 1. Pressure Regulator Valve
- 2. Pressure Regulator Spring
- 3. Reverse Booster Plug
- 4. T.V. Plug
- 5. Pressure Regulator Plug Seal
- 6. Pressure Regulator Plug Gasket
- 7. Pressure Regulator Plug

NOTE: Models H-52 and J-52 use the same pressure regulator valve assembly, however, the pressure regulator for the H-52 or J-52 is of a new design to conform with the new design front pump and should not be used on the H-50, H-51 or J-51 transmissions or viceversa.

GOVERNOR AND REAR PUMP ASSEMBLY

REMOVAL: (Models H-50, H-51, J-51, H-52 and J-52)

- Position the governor so that the large round governor weight is toward the front of the transmission, Figure 130.
- On Model H-50, remove the governor oil delivery sleeve and plug.

CAUTION: Do not lose the plug.

NOTE: On Models H-51, J-51, H-52 or J-52, remove the parking bracket and sleeve assembly.

- To remove governor and rear pump assembly from transmission, position one reverse center gear and drive flange attaching bolt up (at 12 o'clock).
- Remove the two bolts and lock washers (1/2" wrench), that attach the rear pump and governor assembly to the transmission case.

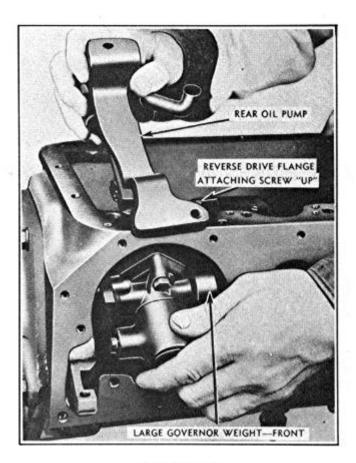


FIGURE 130

 Remove the rear oil pump and governor as an assembly by moving the pump assembly toward the control valve side of the transmission case and raise the pump to clear the case, Figure 131.

CHECK END CLEARANCE OF MAIN SHAFT

(Models H-50, H-51, J-51, H-52 and J-52)

 On Model H-50, start driven torus opentype snap ring from the main shaft using Remover Tool J-1458, Figure 132.

CAUTION: Hit the tool with a sharp blow, using care not to damage the main shaft with the special tool. Hit the snap ring just enough so that the snap ring can be pried off with a screwdriver.

NOTE: On Models H-51, J-51, H-52 and J-52, this snap ring can be removed with KMO-630 Snap Ring Pliers.

 Install Main Shaft End Play Guide J-2587 over main shaft and front planet carrier splined shaft.

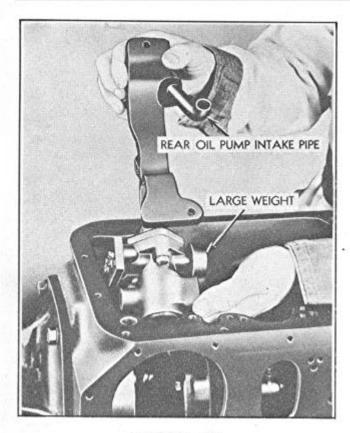


FIGURE 131

Set up the dial indicator KMO-30 on Indicator Extension Rod J-1465, Figure 133.

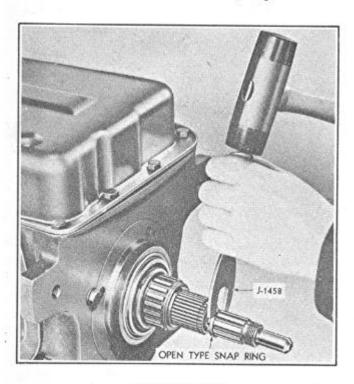


FIGURE 132

- 4. Insert a screw driver between the front clutch and center bearing cap, holding the front planet unit forward. The screw driver should be placed at an angle to prevent damage to the oil delivery sleeve.
- Grasp Guide Tool J-2587 and move the main shaft back and forth. End clearance should be .004" to .015". Be sure to get just the float.

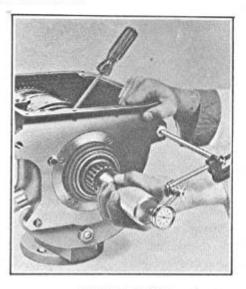


FIGURE 133

NOTE: Record amount of end clearance so that the proper selective washer can be installed when the transmission is reassembled.

- Remove the screw driver from between the front clutch drum and center bearing cap.
- Remove the dial indicator and indicator extension rod.

FRONT OIL PUMP ASSEMBLY AND FRONT DRIVE GEAR ASSEMBLY

REMOVAL:

(Models H-50, H-51, J-51, H-52 and J-52)

 With Snap Ring Pliers KMO-630, remove the snap ring holding the front drive gear on front end of the front planet carrier assembly, Figure 134 and remove the steel and bronze thrust washers.

NOTE: These washers have a smaller outside diameter than similar washers used in the transmission and should be tied together and kept with the front oil pump to avoid confusion when reassembling.

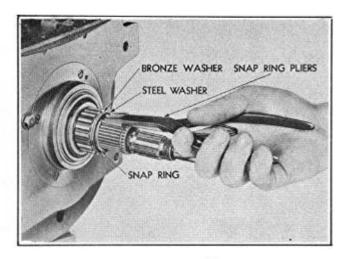


FIGURE 134

 Remove two front oil pump covers to transmission case bolts and flat washers, using a (1/2" wrench).

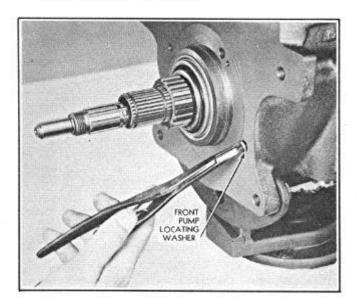


FIGURE 135

- Remove the front oil pump locating washer from its counterbore with Snap Ring Pliers KMO-630, Figure 135.
- Remove the front oil pump assembly, gasket, and front drive gear as an assembly.

NOTE: Do Not use the front drive gear as a ram to remove the front oil pump. If the pump cannot be removed with a straight steady pull, tap the pump lightly from the rear of pump with a light hammer and a brass drift.

Remove the bronze thrust washer from front end of planet carrier.

REVERSE ASSEMBLY AND MAIN SHAFT

REMOVAL: (Model H-50)

- With the oil pan, front and rear servos, and rear oil pump and governor assemblies removed, loosen the five rear bearing retainer to reverse internal gear support attaching bolts. This aids in disassembly after the rear bearing retainer and reverse assembly is removed from the transmission case.
- Remove the rear bearing retainer oil seal dust shield.
- Using a blunt chisel, remove the rear bearing retainer oil seal.
- Remove six reverse center gear and drive flange attaching bolts (1/2" wrench), Figure 136.

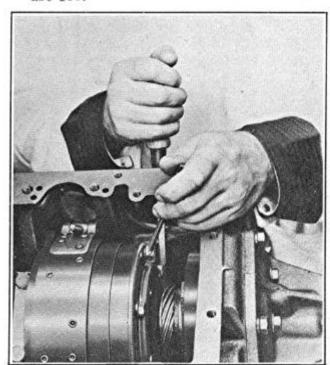


FIGURE 136

 Straighten the reverse anchor support bolt lock. Then remove the reverse anchor support bolt (9/16" socket) and remove reverse anchor, Figure 137.

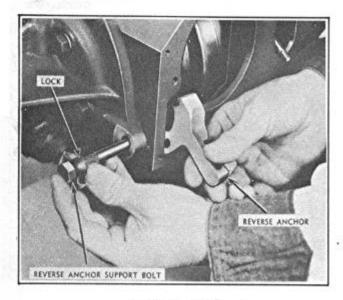


FIGURE 137

- Remove the five rear bearing retainer to transmission case attaching bolts and lock washers (9/16" socket).
- Remove the reverse assembly from transmission case, Figure 138. If the assembly sticks, do not rock the unit up and down but tap lightly on the front end of main shaft with a rawhide hammer to assist removal.

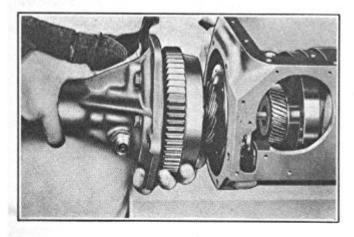


FIGURE 138

NOTE: The selective washer may stick to the main shaft or it may remain in the counter-bore of the output shaft. Be sure to remove this washer when the reverse assembly is removed.

- Remove the main shaft from front planet carrier through rear of transmission.
- Remove the bronze thrust washer from the rear unit clutch hub.

REVERSE ASSEMBLY

REMOVAL: (Models H-51, J-51, H-52 and J-52)

- Remove the rear bearing retainer oil seal dirt shield.
- 2. Remove the rear bearing retainer oil seal.
- Remove the six reverse center gear and drive flange attaching bolts, (1/2" wrench).

NOTE: Insert a screwdriver between the front clutch and center bearing cap, holding the front planet unit forward, Figure 139.

 Remove the rear bearing retainer to transmission attaching bolts and the parking brake pawl support bolt.

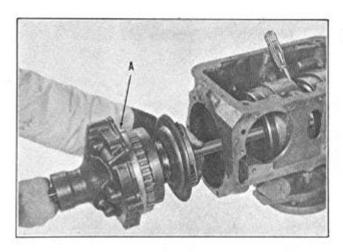


FIGURE 139

Remove the reverse assembly from the transmission case.

NOTE: If the assembly sticks in transmission case, do not rock the unit up and down but tap end of mainshaft while pulling on rear bearing retainer. Also do not lose locating key (A), Figure 139.

- Remove the selective washer and mainshaft.
- Remove the bronze thrust washer from the rear unit clutch hub.

FRONT AND REAR UNITS

REMOVAL FROM TRANSMISSION: (Models H-50, H-51, J-51, H-52 and J-52)

NOTE: The front or rear unit cannot be removed from the case until the oil pan, front and rear servos, rear oil pump and governor

assembly, front oil pump and front drive gear assembly, reverse assembly and main shaft are removed.

 Install the Rear Hub Retaining Tool J-2174 to the rear unit drum using one of the reverse drive flange attaching bolts, Figure 140.

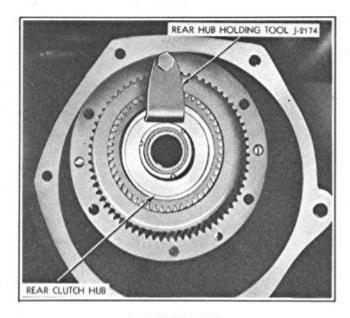


FIGURE 140

- Using a light hammer and chisel, bend back the edges of the lock plate under the two center bearing cap attaching bolts.
- Remove the two center bearing cap to case bolts and lock plate (5/8" socket).

NOTE: Use a blunt screw driver as a pry between the bearing cap and front or rear drum to equalize the distance by moving the front and rear clutch drum to allow the socket wrench to seat on bolt head.

 Remove the rear band and strut assembly. Lift the rear unit slightly to allow the rear band to slide clear of the rear unit drum.

NOTE: Models H-52 and J-52 are equipped with a rear band release spring. DO NOT lose this spring.

- Install a Wheel Cylinder Clamp, KMO-145 or a suitable spring to hold the front band on the front unit drum, Figure 141.
- Lift both front and rear planet assemblies with front band from transmission case, Figure 142.

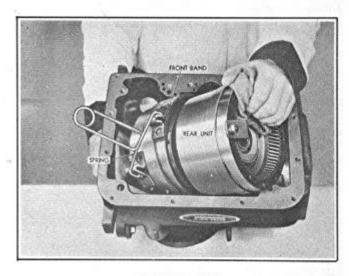


FIGURE 141

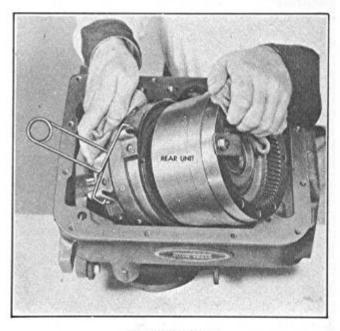


FIGURE 142

FRONT AND REAR UNITS

REMOVAL FROM PLANET CARRIER: (Models H-50, H-51, J-51, H-52 and J-52)

- Remove front band.
- Place planet carrier with front and rear planet assemblies into Holding Fixture J-2187, Figure 143.
- Remove the rear clutch hub snap ring, Figure 144.
- 4. Lift the rear unit from planet carrier.



FIGURE 143

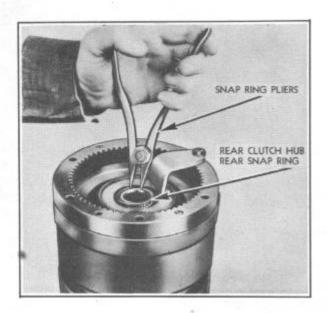


FIGURE 144

 Remove the rear clutch hub front snap ring from planet carrier, Figure 145.

NOTE: This snap ring may be concealed by the oil delivery sleeve at the time the rear unit is removed. If this happens, use the Ring Compressor J-1537 and compress the exposed oil delivery sleeve into the bore of the front clutch drum to expose the rear clutch hub front snap ring. See Figure 316 for "Oil Delivery Sleeve Installation", page 151.



FIGURE 145

- Remove the center bearing cap from the oil delivery sleeve.
- Remove the oil delivery sleeve from the planet carrier.
- Remove the snap ring from recess in front unit, Figure 146.



FIGURE 146

CAUTION: Hold snap ring open during removal to avoid damage to the bearing surface.

- Lift the front unit assembly from the planet carrier.
- Remove the steel and bronze thrust washers from recess of front unit.

DISASSEMBLY, CLEANING, INSPECTION, REPAIR AND ASSEMBLY OF INDIVIDUAL UNITS

FRONT UNIT

DISASSEMBLY: (Models H-50, H-51, J-51, H-52 and J-52)

 Place the front unit in a suitable press and remove the clutch drum snap ring, Figure 147.

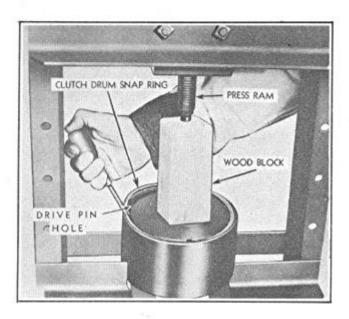


FIGURE 147

Remove the center gear from the front unit by tapping the front face of the center gear with a rawhide hammer, Figure 148.

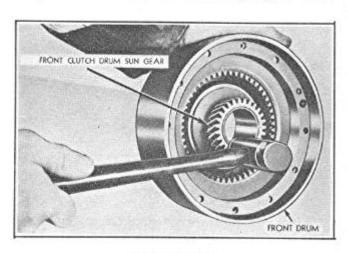


FIGURE 148

NOTE: Use care not to lose clutch release springs.

- Remove six inner and six outer front clutch release springs from front unit drum.
- Remove the composition clutch drive and steel clutch driven plates from drum.

NOTE: The H-50, H-51 and H-52 transmission models use four composition and four steel plates. The J-51 and J-52 Models use three composition and three steel plates.

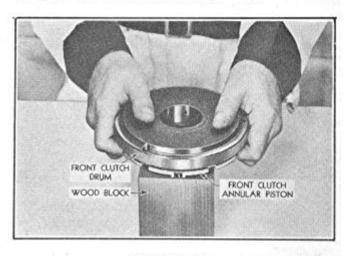


FIGURE 149

 Remove the front unit clutch annular piston from the clutch drum by bumping the front face of the outer gear on a soft wood block, Figure 149.

NOTE: Because of the difference in thickness of the clutch packs the annular piston for Models J-51 and J-52 transmission front unit is much thicker than the annular piston used in the front unit of Models H-50, H-51 and

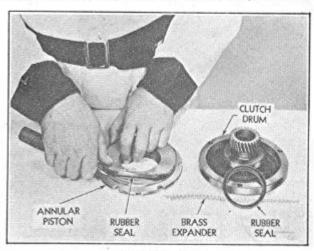


FIGURE 150

H-52. The front unit annular piston for Models H-50, H-51 and H-52 can be identified by casting number 8611259 which number is cast on the bottom of the piston. Casting number 8611261 covers Models J-51 and J-52.

 Remove the rubber piston seals and expanders from the annular piston and clutch drum piston. Use a blunt edge screw-driver, Figure 150.

CLEANING AND INSPECTION: (Models H-50, H-51, J-51, H-52 and J-52)

- Clean all parts thoroughly in a good clean solvent.
- Inspect clutch drive pins in the front unit drum. If the pins are scored, loose or distorted, replace the drum and drive pins as an assembly. Drive pins are not furnished separately.
- Inspect the drum for deep grooves or scores at band surface and clutch plate surface.
- Inspect clutch release springs for distortion or collapsed coils.

NOTE: Slight wear, "bright spots," on side of outer release springs indicating slight contact with drum is permissible.

Inspect the clutch drive plates for damaged or loose facings.

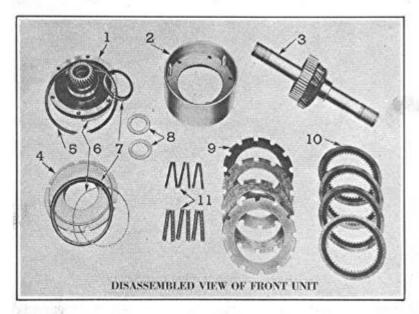
NOTE: Discoloration of drive plates (composition) is not an indication of failure. If flakes of facing material can be removed by lightly scratching the surface with the thumb-nail, the drive plate should be replaced.

- Inspect clutch driven plates for scored surfaces. (Driven plates must be flat.)
- Inspect annular clutch piston for scores.
 Be sure oil seal grooves are thoroughly clean.
- The front clutch drum should be inspected for scores in the piston bore, oil delivery sleeve bore and oil seal grooves. Inspect gear teeth and thrust faces for damage.
- Inspect front planet carrier gears for damaged teeth and excessive roller bearing wear, bearing surfaces of planet carrier shaft.
- Check the steel and bronze washers for distortion and wear. See "Specifications", page
- Clean all parts that are to be reused; remove all traces of solvent used as cleaner

ASSEMBLY OF FRONT UNIT: (Models H-50, H-51, J-51, H-52 and J-52)

- Place the front planet carrier assembly in Holding Fixture J-2187.
- Place the front unit drum over front clutch hub so that the drum flange rests on pinion gears and the drive pins are up, Figure 152.
- Install the drive and driven plates into the front drum, alternating the plates.

CAUTION: Start with a drive (composition) plate and finish with a driven (steel) plate. Assemble the driven plates with the square



FRONT UNIT LEGEND

- 1. Front Clutch Drum Assembly
- 2. Front Drum and Pin Assembly
- 3. Planet Carrier Assembly
- Clutch Annular Piston
 Casting Number 8611259 for
 Models H-50, H-51 and H-52.
 Casting Number 8611261 for
 Models J-51 and J-52.
- 5. Retaining Ring
- 6. Oil Seal Expanders
- 7. Oil Seals
- 8. Steel and Bronze Thrust Washers
- 9. Clutch Driven Plates
- 10. Clutch Drive Plates
- 11. Clutch Release Springs

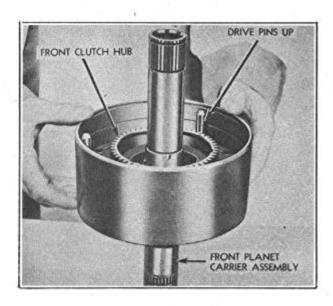


FIGURE 152

notches over the drive pins. Apply Hydra-Matic fluid to the face of each surface as assembled.

 Install six outer clutch release springs and then six inner clutch release springs through plates into spring holes of drum, Figure 153.

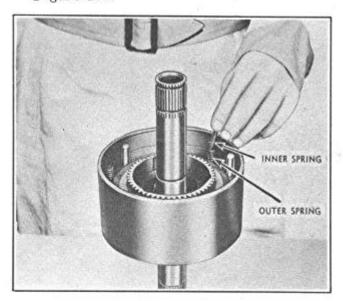


FIGURE 153

5. Install a new brass expander into the clutch drum ring groove. While holding the expander with the expanding lips down, Figure 154, work the new inner piston rubber seal into the ring groove with the rubber lip down over the brass expander. NOTE: To facilitate assembly of the rubber seal, dip the seal in Hydra-Matic fluid. Work the expander well back into position under the rubber seal so brass edges of the expander are not exposed. Before replacing the large outer seal on clutch piston, install the piston into the clutch drum to insure proper installation and sealing of the new inner rubber seal and expander. Remove the clutch piston from the clutch drum and inspect the inner seal.

- Place a new rubber seal (large) over the front annular piston beyond the seal groove.
- Install a new brass expander (large) in annular piston groove with lips up.
- While holding the brass expander in position, work the rubber seal well into piston groove with lip up, Figure 154.

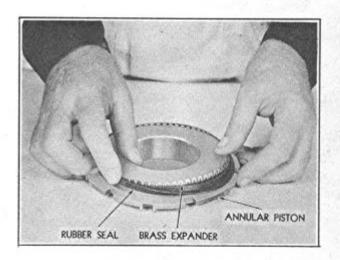


FIGURE 154

NOTE: Work the brass expander well back into position under the seal so brass edges are not exposed.

- 9. Install the annular piston into the clutch drum while resting on the outer rubber seal, align the square notches in the piston with the holes in the drum. Apply slight hand pressure to the piston, guide the lip of the seal into the bore with the flat side of a blunt screw driver, Figure 155.
- Install the clutch drum and piston assembly over the front planet carrier into front unit drum, gear end into drum.

NOTE: Be sure clutch release springs enter into recesses of the annular piston.

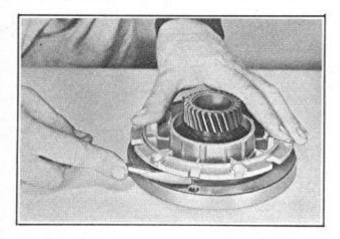


FIGURE 155

11. Lift the front unit assembly off of the planet carrier, place the unit in a suitable press and compress the clutch drum below the snap ring groove. Install the clutch drum snap ring so that the gap of the ring is equal distance between two drive pin holes.

CAUTION: Snap ring must be well seated into groove to prevent interference with ledge on drum.

 Release the press slowly and remove the front unit assembly.



FIGURE 156

 Tap front face of center gear lightly with a rawhide hammer so that the clutch

- drum will seat properly against the snap ring, and the snap ring is seated properly in the groove of the drum. See "Insert", Figure 156.
- 14. Remove the planet carrier from the holding fixture and insert planet carrier into the clutch drive plates and clutch drum by rolling the drum on bench while pressing the planet carrier firmly into the plates, Figure 157.
- Place the planet carrier and drum assembly into the Holding Fixture J-2187.



FIGURE 157

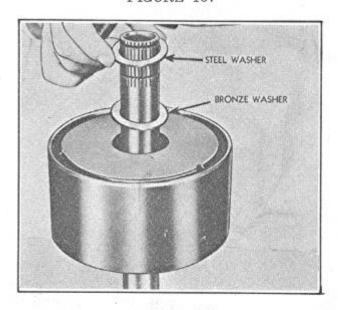


FIGURE 158

- 16. Install a bronze then a steel washer over planet carrier into recess of clutch drum, Figure 158. Locating lug on the steel washer must fit over the flat position of the planet carrier.
- Install a snap ring over the planet carrier into the ring groove above steel washer.

CAUTION: Keep snap ring open; DO NOT allow the snap ring to score the bearing surface of planet carrier.

REAR UNIT

DISASSEMBLY: (Models H-50, H-51, J-51, H-52 and J-52)

- Remove the rear clutch hub retainer tool J-2174 from the rear unit drum.
- Remove the rear clutch hub and bronze thrust washer.
- Remove two fillister head screws attaching the rear internal gear to the rear clutch drum, Figure 159 and remove the rear internal gear.



FIGURE 159

- Remove the clutch release springs and guide pins.
- 5. Remove the clutch drum snap ring.
- Remove the clutch drum from the band drum by tapping lightly on the rear thrust face of the clutch drum using a block of wood, Figure 160.

NOTE: Do not damage teeth of composition clutch plates.

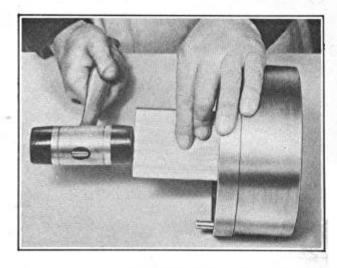


FIGURE 160

Remove the composition and steel clutch plates.

NOTE: The H-50, H-51 and H-52 transmission models use seven composition and seven steel plates. The J-51 and J-52 models use six composition and six steel plates.

 Remove the annular piston from the clutch drum by tapping the clutch drum rear thrust face on a block of wood, Figure 161.

NOTE: The annular piston for Models J-51 and J-52 transmission rear unit is thicker than the annular piston used in the rear unit of Models H-50, H-51 and H-52. The rear unit annular piston for Models H-50, H-51 and H-52 has the casting number 8611520 cast on the bottom of the piston. Casting number 8611258 covers Models J-51 and J-52.

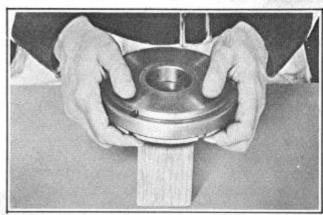


FIGURE 161

Remove the rubber seals and brass expanders from the annular piston and the clutch drum.

CLEANING AND INSPECTION: (Models H-50, H-51, J-51, H-52 and J-52)

- Clean all parts thoroughly in a good clean solvent.
- Inspect the rear internal gear for damaged teeth.
- Inspect the clutch drive pins in the rear unit drum. If pins are scored, loose or distorted, the rear drum and drive pin assembly must be replaced as a unit. Pins are not furnished separately.
- Inspect the rear unit drum (2) for deep groove or scores at band surface and

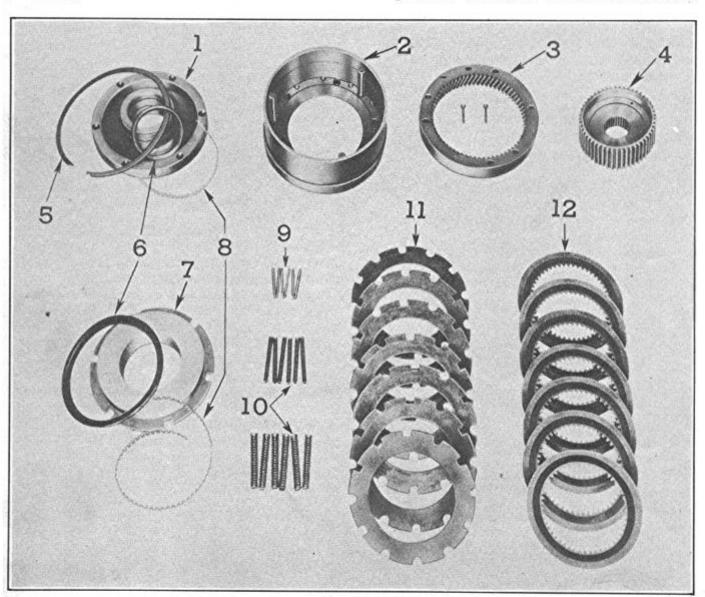


FIGURE 162

LEGEND

- 1. Rear Unit Clutch Drum Assembly
- 2. Rear Unit Drum and Pin Assembly
- 3. Rear Internal Gear
- 4. Rear Clutch Hub
- 5. Rear Clutch Drum Retaining Ring
- 6. Rear Clutch Drum Oil Seals

- 7. Rear Clutch Drum Annular Piston **
- 8. Rear Clutch Drum Oil Seal Expanders
- 9. Clutch Release Spring Guide Pins
- 10. Clutch Release Springs
- 11. Clutch Driven Plates
- 12. Clutch Drive Plates
- ** Casting Number 8611520 for Models H-50, H-51 and H-52. Casting Number 8611258 for Models J-51 and J-52.

clutch plate surface.

Inspect drive plates for damaged or loose facings.

NOTE: If flakes of facing material can be removed by lightly scratching the facing surface with the thumbnail, the drive plate should be replaced. Discoloration of drive plate (composition) is not an indication of failure.

- Inspect the driven plate for scored surfaces. (Driven plates must be flat.)
- Inspect the rear unit clutch drum for scores in the piston bore and thrust face surface. Also check the surface of the babbit bushing.
- Inspect the annular clutch piston for scores. Be sure the oil seal grooves are thoroughly clean.
- Inspect the clutch release springs for distortion or collapsed coils. Slight wear, "bright spots" on side of outer release springs indicating slight contact with drum is permissible.
- Inspect clutch release spring guide pins for distortion and length (1-5/8" ± .010").
- Inspect front and rear thrust faces, internal and external splines and blow out drilled passages on rear clutch hub.
- Clean all parts that are to be reused. Remove all traces of solvent used as cleaner.

ASSEMBLY OF REAR UNIT: (Models H-50, H-51, J-51, H-52 and J-52)

 Place the rear unit drum and pin assembly on the bench with drive pins up. Be Sure bench surface is clean.

NOTE: Models H-52 and J-52 rear unit drums have a larger outside diameter and a smaller flange than the rear drums for Models H-50, H-51 and J-51 as shown in Figure 163. Always check these dimensions when making replacement.

 Install the drive and driven plates into the drum, alternating plates. Start with a drive (composition) and finish with a driven (steel) plate, Figure 163. Assemble driven plates with square notches over the drive pins.

NOTE: Apply Hydra-Matic fluid to face of cork plate at assembly.

Position a new inner rubber seal on inner piston of clutch drum above the grooves.

- In stall a new small brass expander into the ring groove of the clutch drum with expanding lip down.
- While holding the brass expander in position, work the rubber seal into the ring groove with lip down over the brass expander, Figure 164.

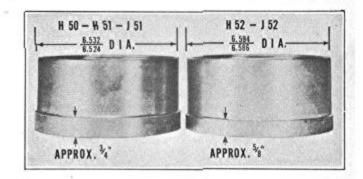


FIGURE 163

NOTE: To facilitate assembly of the rubber seal, dip the seal in Hydra-Matic fluid. Work the expander well back into position under the rubber seal so brass edges of the expander are not exposed. Before replacing the large outer seal on clutch piston, install the piston into the clutch drum to insure proper installation and sealing of the new inner rubber seal and expander. Remove the clutch piston from the clutch drum and inspect the inner seal.



FIGURE 164

- Place a new large rubber seal over the rear annular piston beyond the seal groove.
- Install a new large brass expander in the piston groove with the lips up.
- 7. While holding the expander in this position, work the rubber lip up well into the groove of the annular piston. Expander should be well back into position under the rubber seal so that the brass edges are not exposed.
- 8. Place the annular piston into the clutch drum, aligning square notches in annular piston with holes in clutch drum. While applying slight hand pressure to the piston, guide the rubber seal into drum bore using a blunt screw driver.
- Install the clutch drum and piston assembly over drive pins in drum, Figure 165.

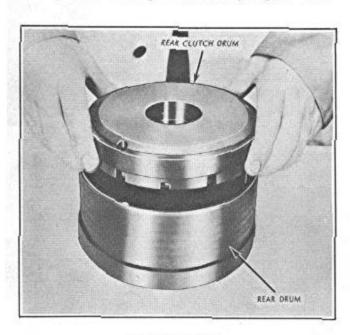


FIGURE 165

Install the clutch drum snap ring positioning gap of ring between two drive pin holes.

NOTE: With a wood block and hammer, tap clutch drum rear thrust face until the clutch drum seats against snap ring, Figure 166.

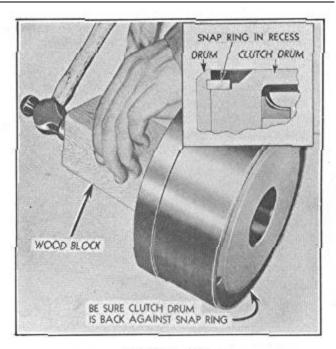


FIGURE 166

- Install six outer and six inner clutch release springs into recesses in piston.
- Install six clutch release spring guide pins, Figure 167.

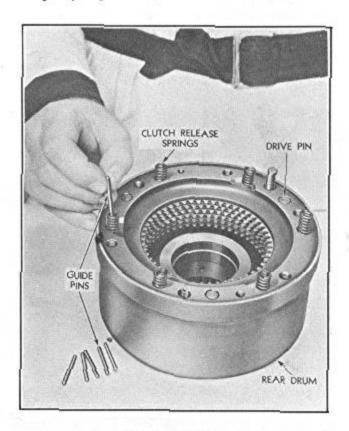


FIGURE 167

- Assemble the rear unit internal gear to the rear unit drum.
- Install and tighten two fillister head screws, Figure 168.



FIGURE 168

15. Install the front bronze thrust washer into the deep counterbore in the rear clutch hub, Figure 169. Retain the washer in the bore with petrolatum.

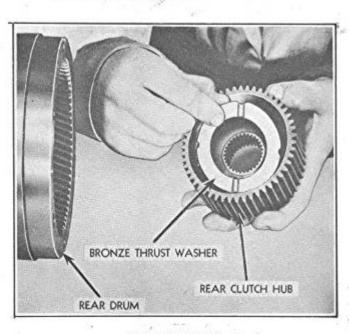


FIGURE 169

Install the rear hub and thrust washer into the clutch plates. Rotate hub and drum to mesh splines with teeth of clutch plate, Figure 170.

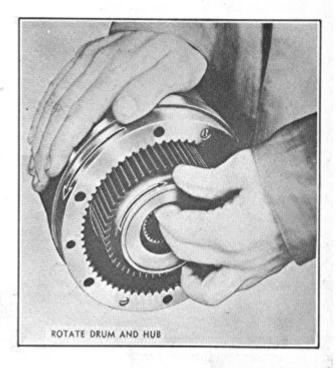


FIGURE 170

17. Install the rear clutch hub holding tool J-2174 on the rear unit drum to hold the clutch hub in place. Use one of the reverse drive flange attaching bolts to hold the tool in place, Figure 171.

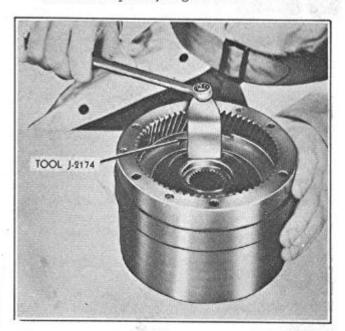


FIGURE 171

REVERSE UNIT

DISASSEMBLY: (Model H-50)

- Remove the speedometer driven gear and sleeve assembly from the rear bearing retainer using a 1" wrench.
- Remove four reverse internal gear support bolts and copper washers (9/16" Socket).
- Remove the rear bearing retainer by tapping the end of the output shaft on a hard wood block, Figure 172.

CAUTION: Position the hands in a manner so that the fingers will not be pinched between the reverse internal gear and the rear bearing retainer when removing the rear bearing retainer.

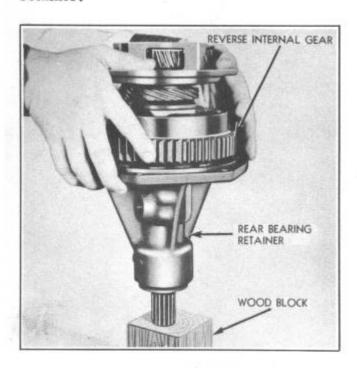


FIGURE 172

 Remove the large open type snap ring retaining the ball bearing to the output shaft using Remover Tool J-2182, Figure 173.

NOTE: Place a rag beneath the snap ring to prevent loss of ring. Do not damage the output shaft with the remover tool during this operation.

With the snap ring removed, remove the speedometer drive gear from the output shaft by bumping the end of the output shaft on a wood block. The weight of the reverse internal gears and support will force the speedometer drive gear off the output shaft, Figure 174.

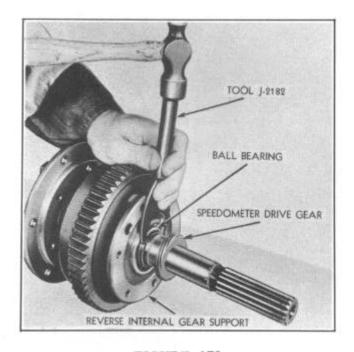


FIGURE 173

CAUTION: Rap a rag around the output shaft below the speedometer gear to protect the hands so that the retainer will not cause injury when loosened.



FIGURE 174

Remove the reverse gear support snap ring and remove the internal gear, Figure 175.



FIGURE 175

- Remove the ball bearing from the internal gear support by tapping the bearing out with a rawhide hammer.
- Remove the reverse planet carrier from the output shaft.
- Remove the reverse planet carrier snap ring from the output shaft, Figure 176.

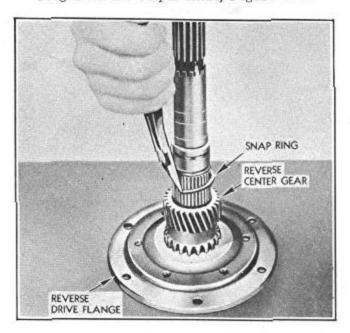


FIGURE 176

CAUTION: Keep the snap ring spread to avoid any damage to shaft splines.

 Remove the reverse center gear and drive flange assembly from the output shaft.

NOTE: The reverse center gear and drive flange are serviced only as an assembly and should not be disassembled.

- Remove the steel and bronze thrust washers from the output shaft.
- Remove the oil seal from the rear bearing retainer.

DISASSEMBLY: (Models H-51, J-51, H-52 and J-52)

- Remove the speedometer driven gear and sleeve assembly and oil seal assembly from the rear bearing retainer.
- Remove the snap ring on output shaft inside of the rear bearing retainer at ball bearing, Figure 177.

NOTE: This snap ring is smaller than other snap rings used in the transmission.

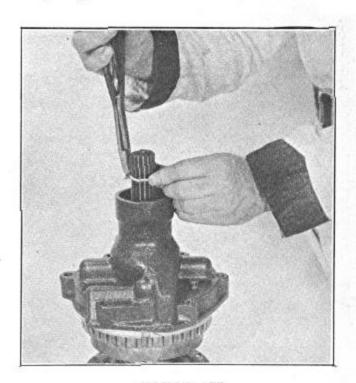


FIGURE 177

- 3. Remove bearing retainer from output shaft by tapping the output shaft with a rawhide hammer while holding the rear bearing retainer, Figure 178.
- Remove the reverse internal gear (B) and the reverse stationary cone (A) from the rear bearing retainer by compressing the stationary cone by hand, Figure 179.

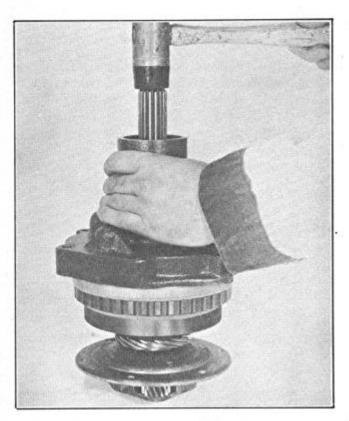


FIGURE 178

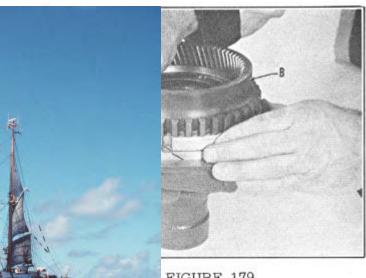


FIGURE 179

ball bearing locating snap ring ar bearing retainer by prying out with a screw driver.

earing from the rear bearing may be necessary to tap vith a hard wood block toward

7. Using Clutch Spring Compressor Tool J-4670, compress reverse cone clutch

rear of bearing retainer.)

release coil springs and remove the large snap ring, Figure 180.

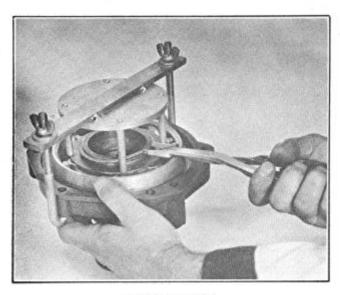


FIGURE 180

- 8. Slowly release wing nuts of the Spring Compressor Tool J-4670 until spring tension has been relieved and remove tool and coil spring retainer.
- 9. Remove the six coil release springs.

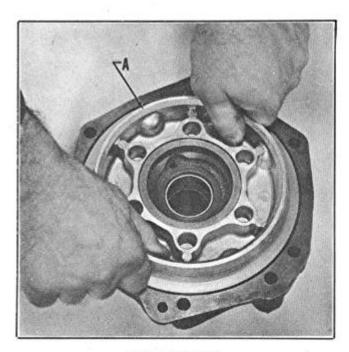


FIGURE 181

10. Remove the reverse piston (A) by pulling piston straight out, Figure 181. (The piston is located by four dowels and cannot be turned.)

NOTE: It may be necessary to apply air pressure behind the piston, through the small hole in the face of the rear bearing retainer to assist removal. If air pressure is used, apply air very carefully.

 Remove the reverse piston outer oil seal (A) from reverse piston (B), Figure 182, by pulling the seal off with fingers.

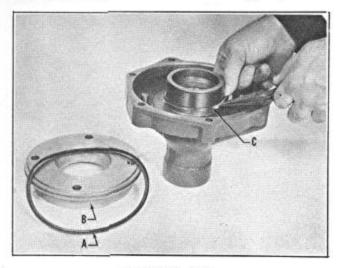


FIGURE 182

- 12. Remove the reverse piston inner oil seal (C) from the hub on the rear bearing retainer by pulling lip up with fingers and removing with needle-nose pliers.
- Remove the large bronze thrust washer (A) from the reverse internal gear, Figure 183.
- 14. Remove the reverse stationary cone (A) from the reverse internal gear cone (B) by using snap ring pliers to expand the reverse stationary cone, Figure 184.

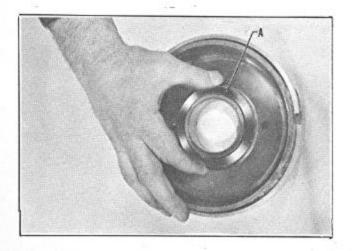


FIGURE 183

CAUTION: The stationary cone should not be spread more than is necessary to assist removal.

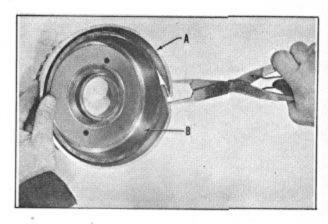


FIGURE 184

 Remove the reverse clutch release flat spring retainer and wave spring (A), Figure 185, from the reverse internal gear by lifting straight out. (Retainer has two tangs.)

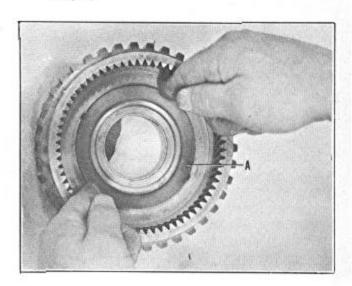
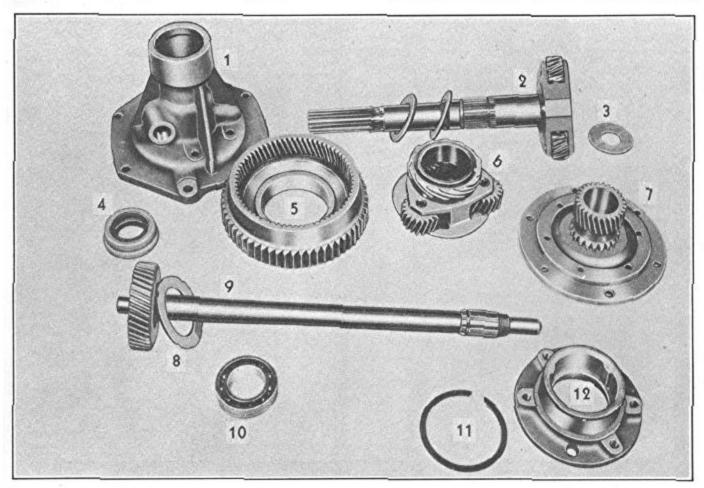


FIGURE 185

Remove snap ring that holds the reverse planet carrier to the output shaft.

NOTE: Speedometer drive gear is integral with the output shaft. (Teeth are cut into the output shaft.)

- Remove the reverse planet carrier from the output shaft.
- 18. Remove the reverse planet carrier locating snap ring from the output shaft, sun gear and drive flange assembly from output shaft and steel and bronze thrust washers from output shaft.



REVERSE ASSEMBLY - DISASSEMBLED (MODEL H-50)

FIGURE 186

LEGEND

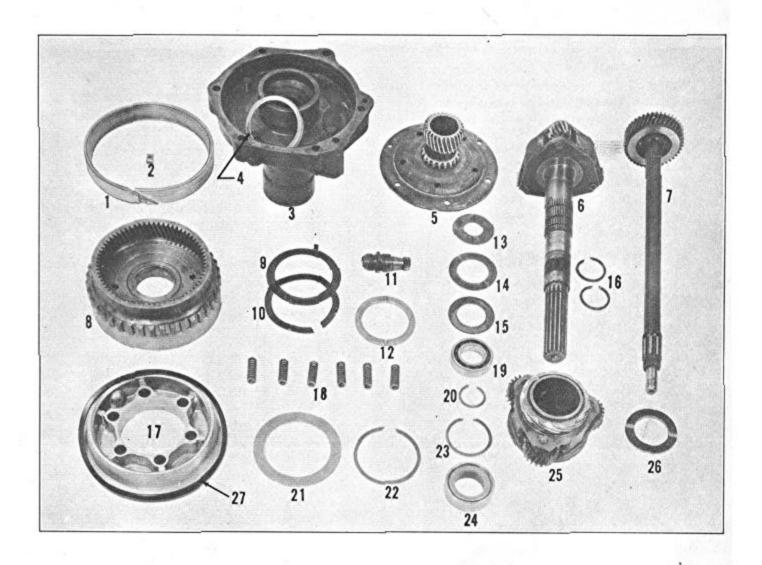
- Rear Bearing Retainer
- 3. Selective Washer
- 4. Rear Oil Seal
- 5. Reverse Internal Gear
- 2. Output Shaft Assembly 6. Reverse Planet Carrier
 - 7. Reverse Drive Flange Assembly
 - 8. Clutch Hub Thrust Washer
- 9. Main Shaft
- 10. Rear Bearing
- 11. Support Snap Ring
- 12. Reverse Internal Gear Support

REVERSE ASSEMBLY

CLEANING AND INSPECTION: (Model H-50)

- 1. Thoroughly clean and oil the ball bearing (10), Figure 186; then rotate the bearing slowly by hand, checking bearing for roughness or excessive looseness. Do Not spin bearing with air.
- 2. Inspect the outer bearing surface of the reverse internal gear support (12).
- 3. Inspect the reverse internal gear (5), for damaged teeth and scored inside bearing Surface.
- 4. Inspect the reverse planet carrier (6) for

- damaged gear teeth on planet pinions and for worn pinion roller bearings. Also inspect the bronze oil pump drive gear for damage or excessive wear. Refer to page 98 for "Removal and Installation of the Rear Oil Pump and Governor Drive Gear."
- 5. Inspect splines of reverse planet carrier (6) for damage.
- 6. Inspect gear in reverse center gear and flange assembly (7) for damaged teeth or worn bushing. If necessary to replace the gear, replace the reverse center gear and flange as an assembly.
- 7. Inspect the output shaft (2) for scored thrust and bearing surfaces. Also check



REVERSE ASSEMBLY - DISASSEMBLED (MODELS H-51, J-51, H-52 and J-52)

FIGURE 187

LEGEND

- 1. Reverse Clutch Stationary Cone
- 2. Reverse Stationary Cone Key
- 3. Rear Bearing Retainer
- 4. Reverse Piston Inner Seal
- 5. Reverse Drive Flange Assembly
- 6. Output Shaft Assembly
- 7. Main Shaft
- 8. Reverse Internal Gear Assembly
- 9. Reverse Clutch Release Spring Retainer
- 10. Reverse Clutch Release Spring
- 11. Speedometer Driven Gear
- 12. Reverse Internal Gear Thrust Washer
- 13. Selective Thrust Washer
- 14. Reverse Center Gear Thrust Washer

- Reverse Center Gear Backing Thrust Washer
- 16. Reverse Carrier to Output Shaft Snap Rings
- 17. Reverse Piston
- 18. Reverse Piston Release Springs
- 19. Rear Bearing
- 20. Rear Bearing to Shaft Snap Ring
- 21. Spring Retainer Washer
- 22. Piston to Rear Bearing Retainer Snap Ring
- 23. Bearing to Retainer Snap Ring
- 24. Rear Oil Seal
- 25. Reverse Carrier Assembly
- 26. Rear Clutch Hub Thrust Washer
- 27. Reverse Piston Outer Seal

the output shaft splines for nicks and burrs and the output shaft pinion gears for damaged teeth or worn bearing rollers.

 Inspect all the bronze and steel thrust washers for excessive wear. Refer to "Thrust Washer Specifications", page 195.

9. Inspect the rear bearing retainer (1) bushing for excessive wear (oil holes in bearing retainer must be open).

 Inspect mainshaft (9) for damaged gear teeth, thrust and bearing surfaces.

Clean all parts that are to be re-used.
 Remove all traces of solvent cleaner.

REVERSE ASSEMBLY

CLEANING AND INSPECTION: (Models H-51, J-51, H-52 and J-52)

- 1. Clean all parts with a good clean solvent.
- Inspect the rear bearing (19), Figure 187, by first thoroughly cleaning and oiling, then rotate slowly by hand, feeling for roughness. Do not spin bearing with air.

 Inspect reverse internal gear (8) for damaged parking teeth and scored, burned or damaged surfaces.

 Inspect reverse planet carrier (25) for worn or damaged teeth and worn roller bearings.

Inspect splines of reverse planet carrier for damage.

6. In spect bronze oil pump drive gear for damage or excessive wear. See that bronze gear is tight on carrier and that pump drive gear ball is in place.

NOTE: If the gap in the ring is not over the ball, move the ring around until the ball can be seen.

- In spect reverse center gear and drive flange assembly (5) for damaged teeth or worn bushing. If replacement is necessary, replace assembly. (The center gear is not furnished separately.)
- Inspect output shaft assembly (6) for scored thrust and bearing surfaces.
- Inspect output shaft splines for nicks and burrs.
- Inspect output shaft speedometer drive gear surface for wear or damage.
- Inspect steel and bronze thrust washers for excessive wear. Refer to page 195 for specifications.

- Inspect internal gear thrust washer (12) for wear or scoring.
- Inspect reverse clutch release spring (10) and retainer (9) for signs of damage or burning.

NOTE: Spring (10) is used to centralize reverse internal gear cone when clutch is released.

The reverse clutch stationary cone (1) is held stationary by a key (2) which indexes with a slot in the transmission case.

NOTE: There is a dimple in the key (2) and a corresponding pimple on the stationary cone (1).

- Inspect reverse clutch stationary cone (1) for burning or excessive wear.
- 15. Inspect reverse piston coil release springs (18) for distorted or collapsed coils. Free length of these springs is 1-11/32".
- Inspect reverse piston (17) for burning on cone surface.
- Inspect reverse piston (17) for scores on piston. Be sure oil seal grooves are thoroughly clean.
- Inspect four reverse piston dowel pins for scoring, looseness or distortion.
- Inspect inner and outer piston seal operating surfaces for scoring or roughness.
- Inspect rear bearing retainer bushing for excessive wear and see that oil holes in retainer are open.
- 21. Inspect main shaft (7) for damaged gear teeth, thrust and bearing surfaces.
- 22. Clean all parts again after inspections just prior to assembly.

REAR OIL PUMP DRIVE GEAR

REMOVAL: (Models H-50, H-51, J-51, H-52 and J-52)

- 1. Remove the snap ring, Figure 188.
- Place the reverse planet carrier assembly in a vise equipped with soft jaws and saw the bronze gear, sawing between the teeth to within 1/32" of hub. DO NOT saw into hub.
- Using a blunt tapered chisel, remove the gear by splitting in the saw slot, Figure 189. Do not use a slender tapered chisel as hub may be damaged.
- After removing the bronze gear, remove the steel locating ball from hub.

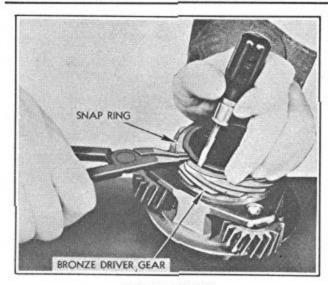


FIGURE 188

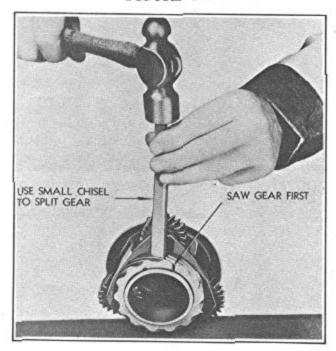


FIGURE 189

REAR OIL PUMP DRIVE GEAR

INSTALLATION: (Models H-50, H-51, J-51, H-52 and J-52)

- Clean all parts thoroughly. Make sure the snap ring groove is clean and free of burrs.
- Dip the locating ball in petrolatum and place the ball in notch in hub.
- Place the new drive gear on a clean metal plate; support the plate on two bricks. Heat the gear with a torch until it just begins to discolor or show traces of blue, Figure 190. Do Not overheat.

NOTE: The face of the gear having a deprestion (1/16" deep) goes down to contact the shoulder of the planet carrier assembly hub.

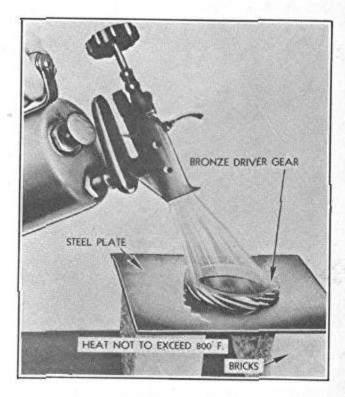


FIGURE 190

- 4. Using suitable tongs and heavy asbestos gloves, pick up the gear and drop it quickly over the reverse planet carrier with the groove in gear over the locating ball. Push the gear all the way down against the shoulder of the planet carrier.
- Install snap ring. Determine that snap ring enters hub groove.

REVERSE UNIT

ASSEMBLY: (Model H-50)

- Install the steel and then the bronze thrust washer into the thrust washer retainer on reverse gear and flange assembly, Figure 191. Retain washers in place with petrolatum.
- 2. In stall the output shaft into the reverse center gear and drive flange assembly seating output shaft planet flange against washers. While holding the output shaft firmly against the thrust washers and reverse center gear and flange, stand output shaft on pinion carrier end.

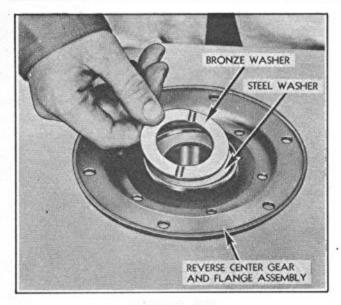


FIGURE 191

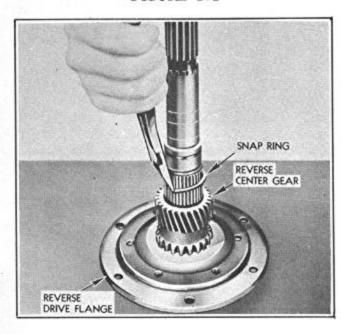


FIGURE 192

Install the reverse center gear snap ring, Figure 192.

NOTE: This snap ring is slightly larger than the other snap rings used in the transmission.

- Install the reverse planet carrier over the output shaft with the bronze oil pump driving gear down while carefully meshing planet pinions with the reverse center gear, Figure 193.
- 5. Assemble the reverse internal gear on the

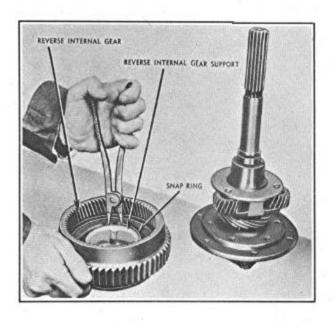


FIGURE 193

gear support and install the large snap ring.

- Place the internal gear and support over output shaft carefully meshing the internal gear teeth with planet pinions.
- Install the ball bearing over the output shaft and tap the bearing into the reverse internal gear support counterbore with J-2995-1 Driver, Figure 194.

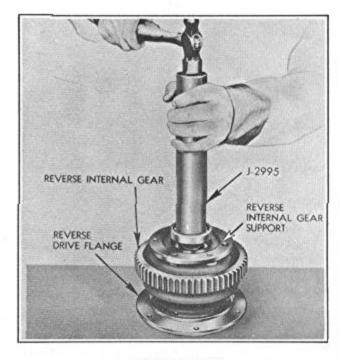


FIGURE 194

 Install the open type snap ring in the groove of the output shaft. This snap ring can be installed by using a flat punch and hammer, Figure 195.

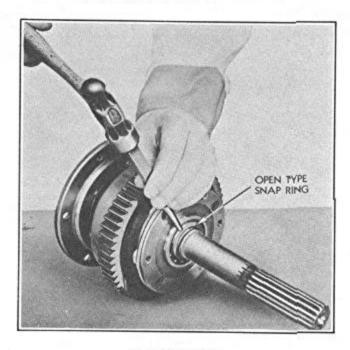


FIGURE 195

NOTE: The reverse unit should be supported on a hard wood block when installing this "Open Type" snap ring to avoid damage to spline and gear teeth.

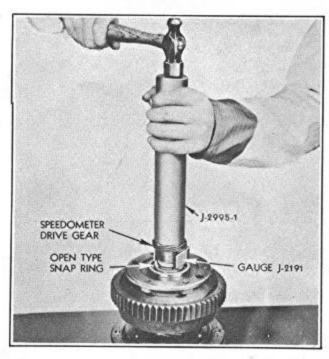


FIGURE 196

 Place the speedometer drive gear over output shaft and drive the gear into place using J-2191 Spacer Gauge, and J-2995-1 Driver, Figure 196.

NOTE: When the speedometer drive gear is properly positioned the "Spacer Gauge" can be removed with light finger pressure. Perform this operation carefully to avoid damage to the spacer gauge and eliminate the necessity of reinstalling the gear.



FIGURE 197

- 10. Paint the outside surface of the oil seal with red lead sealer or Permatex No. 3 and install the oil seal in the rear bearing retainer using J-1354 Oil Seal Installer, Figure 197.
- 11. Install the rear bearing retainer over the output shaft (lining up bolt holes in rear bearing retainer with bolt holes in reverse internal gear support). Tap housing in place with a rawhide hammer.
- 12. Install the four reverse internal gear support attaching bolts. (Dip the bolt threads into sealing compound Permatex No. 3. Aviation Form-A-Gasket.) Replace all damaged copper washers. Tighten bolts finger tight. Final tightening of these bolts is done after the rear bearing retainer is installed into the transmission case.
- Install the transmission speedometer drive pinion and sleeve assembly.

REVERSE UNIT

ASSEMBLY: (Models H-51, J-51, H-52 and J-52)

- Hold the reverse center gear (5), Figure 187 in the left hand with the drive flange up; install the steel thrust washer (15) and then the bronze thrust washer (14) in the recess of the drive flange.
- Still holding the reverse center gear in the left hand, pick up the output shaft (6) with the right hand; insert the output shaft end through drive flange and center gear until carrier bottoms on the two thrust washers.
- Holding the drive flange and center gear tightly against the planet carrier to keep the thrust washers from moving out of position, set the output shaft and planet carrier on the repair bench on the planet carrier end.
- Install the reverse planet carrier locating snap ring.

CAUTION: DO NOT pick up this unit until assembly has been completed, to prevent washers from slipping out of position.

- 5. Install the reverse planet carrier (25) over the output shaft with the bronze drive gear down, meshing pinions with the sun gear. (Determine that the unit is bottomed against the reverse planet carrier snap ring.)
- 6. Install the snap ring on the output shaft to position the reverse planet carrier.
- Install the reverse clutch release flat (wave) spring (10) and spring retainer (9)

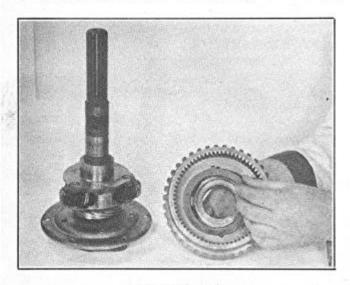


FIGURE 198

on the reverse internal gear (8) on the internal gear side, Figure 198.

NOTE: Retainer tangs should enter holes in gear freely.

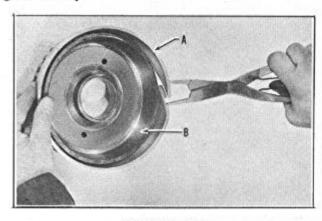


FIGURE 199

 Install the reverse stationary cone (1) on the reverse internal gear cone (8). See Figure 199.

CAUTION: The stationary cone should not be spread more than is necessary to make the installation.

 Install the large bronze thrust washer
 (A) over collar of the reverse internal gear and retain with petrolatum, Figure 183.



FIGURE 200

10. Apply a light coat of Hydra-Matic fluid over the outer surface of the reverse cone piston inner seal (A) and install the seal with the lip down on rear bearing retainer hub, Figure 200. Work seal well into groove.

NOTE: After the seal has been installed, install the piston (less the outer seal) over the inner seal to determine if the seal is properly seated. Remove the piston and inspect the inner seal.

 Install the outer seal (A) on the reverse cone piston with the seal lip toward flat side of piston and work seal well into the piston flange groove, Figure 201.

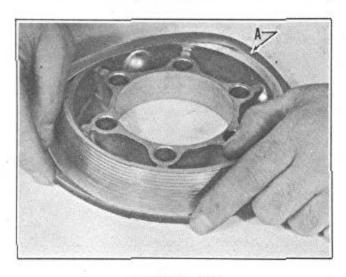


FIGURE 201

- 12. Apply Hydra-Matic fluid to the surface of the outer seal and place the reverse cone piston on the rear bearing retainer so that the dowel pin holes are on underside of piston. Do not align with the four dowel pins in the rear bearing retainer.
- 13. Install Positioning Tool J-4752 in the rear bearing retainer between the piston outer seal and the inner surface of the bearing retainer. DO NOT permit tool to slip below ledge on inner surface of the bearing retainer. Firmly seat the feeler stock against the ledge in the rear bearing retainer, Figure 202. Hold ends of installing blade to keep blade from snapping up.

CAUTION: Use extreme care when installing to prevent damage to the seal. Rotate piston until dowel pin holes on underside of piston align with dowel pins in the rear bearing retainer. Push piston into place until bottom seats in retainer

NOTE: To make sure the piston is fully seatted, lay a straight edge across the face of the piston and measure from the straight edge to

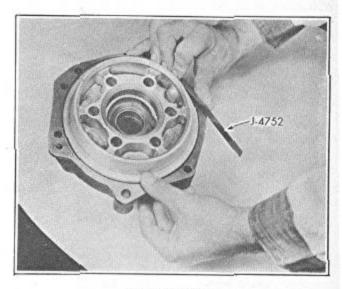


FIGURE 202

face of rear bearing retainer. This measurement should be 3/8" to 13/32".

- Install the six reverse clutch release coil springs.
- Install the reverse clutch coil spring retainer and compress the springs with the Clutch Spring Compressor Tool J-4670. See Figure 180.
- 16. In stall the large snap ring holding the spring retainer in place and after ring is properly seated remove the Compressor Tool.
- 17. Install ball bearing in the rear bearing retainer using Jacket Tube Bearing Replacer Tool J-2952. (Tap bearing gently to be sure that bearing is fully and squarely seated.)
- 18. Install the large type snap ring in rear bearing retainer. Use a NEW snap ring. This snap ring locates the ball bearing in the bearing retainer.
- 19. Install the reverse internal gear and stationary cone into the rear bearing retainer, compressing the stationary cone by hand, Figure 203. Position key-way of stationary cone so it will line up with key-way in transmission case when installed.
- 20. Support the bearing retainer and install the output shaft to the retainer, carefully meshing planet carrier gears with the reverse internal gear.

NOTE: Use extreme care to prevent damage to the bushing and ball bearing in the rear bearing retainer.

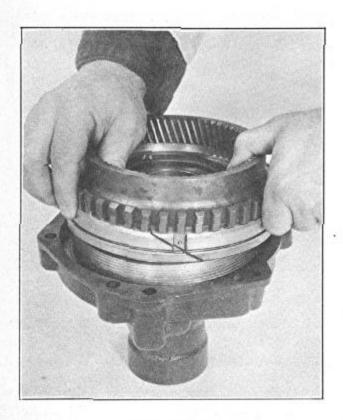


FIGURE 203

- 21. Tap output shaft into place and install snap ring on output shaft, locking the rear bearing retainer to the output shaft.
- 22. Install the speedometer drive gear in the rear bearing retainer.

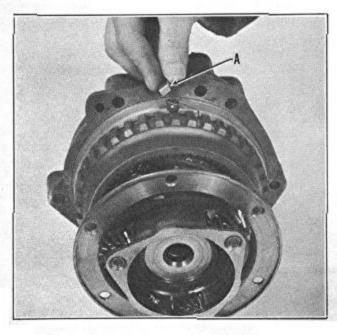


FIGURE 204

- 23. Install the rear bearing retainer gasket on the rear bearing retainer.
- 24. Install the stationary cone to case lock key, Figure 204. Use petrolatum to hold key in place.
- 25. Install main shaft and reverse assembly into the rear end of the transmission case, aligning stationary cone lock key (A) into machined key-way in case, Figure 205. Then align rear bearing retainer bolt holes to case and install attaching bolts and lockwashers.

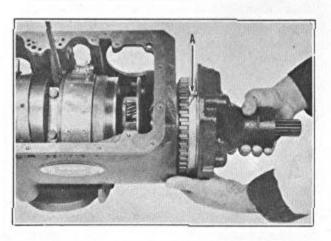


FIGURE 205

FRONT PUMP ASSEMBLY

(Models H-50, H-51 and J-51)

NOTE: The difference between the front pump used in the H-51 and J-51 transmissions and that used on the H-50 transmission is that the front pump in the H-51 and J-51 transmission has a greater volume and has better pressure regulation. The H-51 and J-51 model has thicker gears, requiring a new deeper front pump cover. The new pump cover will extend out of the transmission case much farther than the pumps used in the H-50 transmissions. The flywheel housing has been changed to accommodate the new pump cover.

CAUTION: The H-50 pump must NOT be used on the H-51 or J-51 transmissions.

DISASSEMBLY: (Models H-50, H-51 and J-51)

- Remove the front pump assembly from the front drive gear.
- Remove the gasket from the front pump cover.

 Using Holding Tool J-2184-1 and Screw Driver Socket J-2184-2 remove two 1" and one 5/8" long screws and copper washers from the front pump cover, Figure 206.

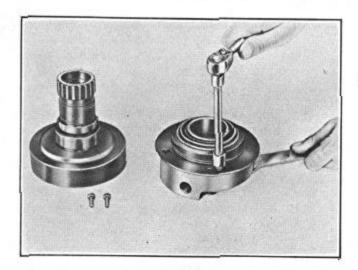


FIGURE 206

CAUTION: It is important that Holding Tool J-2184-1 be used while removing the pump cover attaching screws. DO NOT CLAMP OIL PUMP BODY IN A VISE OR TRY TO HOLD THE PUMP BODY BY INSERTING A BAR INTO THE INTAKE BORE OR PRESSURE REGULATOR PISTON BORE.

 Remove one 1-3/8" long screw and copper washer from rear of pump, Figure 207.

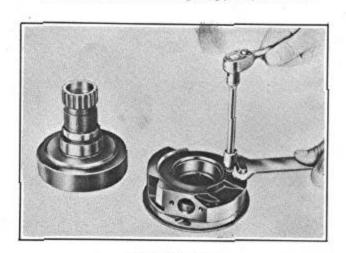


FIGURE 207

Remove front pump cover from pump body. NOTE: DO NOT PRY OFF OIL PUMP COVER WITH A SCREW DRIVER as this will damage lapped surfaces. Tap cover lightly with a rawhide hammer at dowel area to loosen.

Use care not to drop gears out of gear pockets in pump body when cover is removed.

Remove front pump relief valve and spring from the pump body, Figure 208.



FIGURE 208

NOTE: Mark top face of driven gear (outer) with a little Prussian Blue for identification when reassembling.

- 7. Remove both the drive and driven gears.
- Remove the pump cover oil seal using a small blunt chisel.

CAUTION: Clamp the pump cover to a wood block (4" wide). Position "C" clamps in a manner so as not to damage or distort the pump cover during oil seal removal.

NOTE: The oil seal can also be removed from the oil pump while the oil pump is assembled in the transmission after the torus cover, torus members and flywheel housing have been removed.

FRONT PUMP ASSEMBLY

DISASSEMBLY: (Models H-52 and J-52)

NOTE: The H-52 and J-52 front pump is a vane type employing paddles (vanes) in place of gears. The H-52 and J-52 front pump should not be used on H-50, H-51 or J-51 Model transmissions.

The H-52 and J-52 Front Drive Gear has a wider machined surface at the keyway slot, than the H-50, H-51 and J-51 Front Drive Gears. See Figure 209 for comparison.

NOTE: Do Not interchange gears.



FIGURE 209

- Remove the front pump and front drive gear from the transmission as an assembly.
- 2. Remove the front drive gear from the front pump.
- Remove the four pump cover to pump body attaching screws and washers using J-2184-A Front Pump Holding Tool and Socket set, Figure 210.



FIGURE 210

4. Lift pump body from the pump cover.

CAUTION: Never lift the cover from the body as this would permit the pump internal parts to drop out of the cover assembly.

 Remove the relief valve guide (11) from the body by pressing on the valve guide with a blunt screwdriver and slipping the relief valve pin (10) from the pump body (15), Figure 211.

NOTE: Hold the guide with finger pressure to prevent the guide and spring from popping out too fast.

 Remove valve guide (11), relief valve spring (12) and relief valve (13), Figure 211. Relief valve can be removed with KMO-630 Snap Ring Pliers.

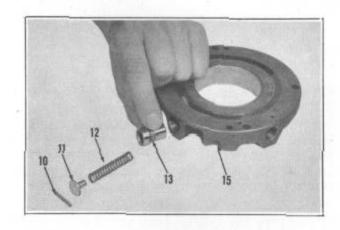


FIGURE 211

Remove the front pump intake seal from the front pump body intake port.

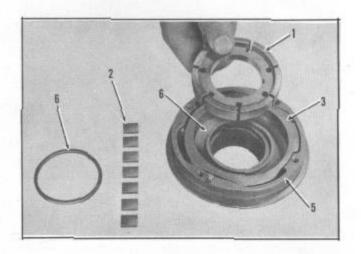


FIGURE 212

NOTE: Examine the seal by turning it inside out, stretching it and examining it for cracks. This seal should be replaced if there is any doubt as to its condition.

- 8. Mark face of rotor and slide with pencil or a light dab of Prussian Blue so that it will be returned to its same position.
- Remove the outer vane ring (6), rotor (1), seven vanes (2) and inner vane ring (6), Figure 215.
- Remove slide (3) and priming spring (4), Figures 213 and 215.

CLEANING AND INSPECTION: (Models H-50, H-51 and J-51)

- 1. Clean all parts thoroughly.
- Inspect pump drive gear and driven gear for damaged teeth or scored end surfaces

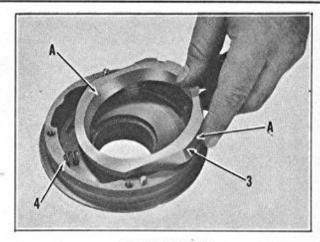
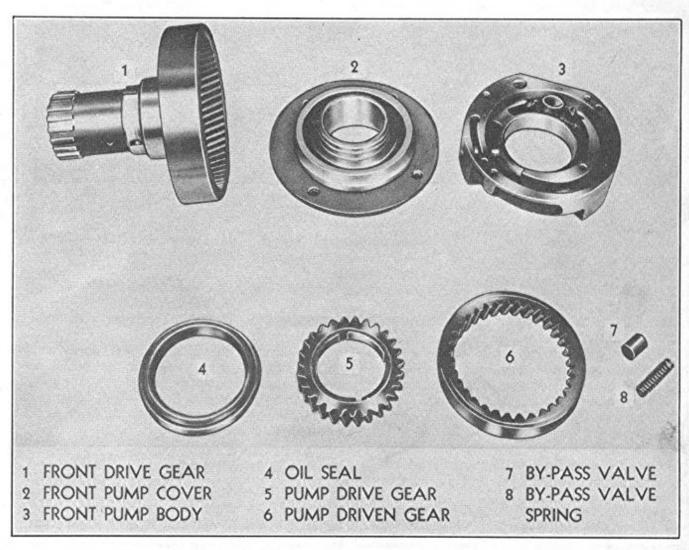


FIGURE 213

- and pump body for scored gear pocket, Figure 214.
- All oil passages should be checked for any obstruction.



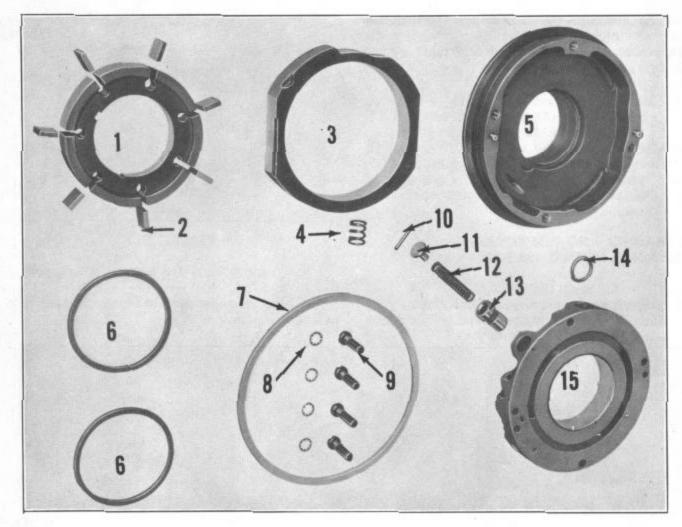


FIGURE 215 LEGEND

- 1. Front Pump Rotor
- 2. Front Pump Vanes
- 3. Front Pump Slide
- 4. Front Pump Priming Spring
- 5. Front Pump Cover Assembly
- 6. Front Pump Vane Rings
- 7. Front Pump Cover Gasket
- 8. Front Pump Cover Attaching Screw Washers
- 9. Front Pump Cover Attaching Screws
- 10. Pump Relief Valve Guide Pin
- 11. Pump Relief Valve Guide
- 12. Front Pump Relief Valve Spring
- 13. Front Pump Relief Valve
- 14. Oil Seal Ring
- 15. Front Pump Body Assembly

NOTE: The small drilled hole at the end of the pressure regulator bore must be open.

- Inspect pump cover for scored surfaces, loose dowels or obstructed passages.
- Inspect oil seal rings for damage and freedom in grooves.
- Inspect front drive gear for scored surfaces, worn bushing, or damaged teeth.
- Check Woodruff keys for wear and looseness of key in key slot.
- Check for freedom of the relief valve in bore and the spring for length (1-25/64").
- Inspect the bushing in the pump body for wear or scores. Slight wear of this bushing is permissible.

NOTE: If the bushing shows excessive wear on one side it is an indication that either the bushing is not concentric with the pump cover or the locating bore in the flywheel housing is not aligned with the pilot bearing bore in the crankshaft.

CLEANING AND INSPECTION: (Models H-52 and J-52)

1. Clean all parts thoroughly.

NOTE: Check slide to be sure the two bleed holes (A) are open and free of dirt, Figure 221. (A piece of fine tage wire should be pushed through the two holes to make sure they are open.)

- Front pump rotor vanes should not be scored or burred.
- Front pump slide should slide free in pump cover. (It must not bind under any circumstances.)
- Check freeness of pressure regulator valve in pump body bore.
- 5. Check freeness of vanes in rotor slots.
- Check to be sure oil seal ring in pump cover works freely and is not broken.
- Replace the front pump intake pipe seal ring if it is frayed or cracked or if there is any doubt as to its condition.
- Check pump bushing for scores or flaking. (Slight wear is permissible.)
- Check Woodruff key slot in rotor for burrs or wear.
- 10. Inspect all passages for any obstructions.
- Check freedom of relief valve in pump body bore.
- Inspect the front drive gear for scored surfaces, worn bushings or damaged teeth.
- Check Woodruff key for wear and looseness of key in key slot.

FRONT PUMP

ASSEMBLY: (Models H-50, H-51 and J-51)

 Install new oil seal rings in pump cover (if necessary), Figure 216.

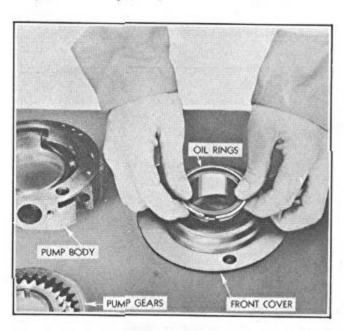


FIGURE 216

NOTE: Install new oil seal rings in torus cover and check ring gap before installing rings on pump cover (gap .001" to .007").

 Using Installer Tool J-2170, install a new oil seal in pump cover, Figure 217, (step side of seal up).



FIGURE 217

- Apply Permatex No. 3, Aviation Form-A-Gasket sealer around edge of cover and seal.
- Lubricate both pump gears with Hydra-Matic Fluid. Install both gears in gear pocket of pump body (Prussian Blue side of driven gear should be up), Figure 218.

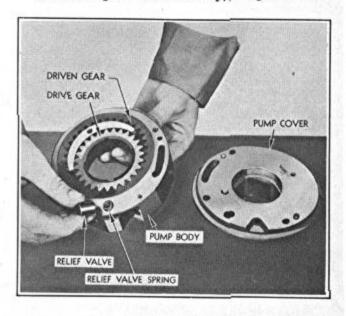


FIGURE 218

- 5. Install the relief valve spring, and relief valve into the pump body.
- Press down on relief valve and insert feeler stock in slot to hold valve down, Figure 219.

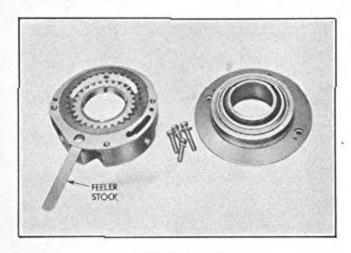


FIGURE 219

- Install pump cover to pump body, locating position of cover with the dowels.
- Apply Permatex No. 3 Gasket Cement under head of screws.
- Install 3 cover to body attaching screws with copper washers, (Replace damaged washers). Use tool J-2184A to hold pump and tighten screws to 12-15 ft. lbs., Figure 220.

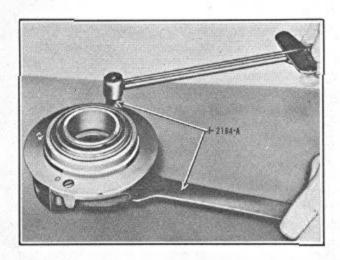


FIGURE 220

10. Remove feeler stock at relief valve, install the 1-3/8" long screw into the rear side of the pump assembly; torque to 12-15 ft. lbs.

 Assemble the front pump assembly over the front drive gear, aligning the key to one of the 4 keyways in the pump drive gear.

FRONT PUMP

ASSEMBLY: (Models H-52 and J-52)

 Install a new oil seal ring (14), Figure 215, in pump cover ring land.

NOTE: Check oil seal ring gap in bore of torus cover before installing the ring on pump cover (gap .001" to .007").

- If a new oil seal is to be installed use Installer Tool J-2170 (step side of seal up).
- Apply Permatex No. 3 Aviation Form-A-Gasket sealer around edge of cover and seal.
- Install relief valve (13), Figure 215, spring (12), spring guide (11) and retaining pin (10) in pump body.

NOTE: Use a blunt screwdriver to compress the guide and spring while installing retainer pin,

5. Install priming spring (4) and slide (3) in pump cover (5), Figures 215 and 221.

CAUTION: Determine that the priming spring is located properly by moving slide against the spring until the slide bottoms against the lower stop in the pump cover.

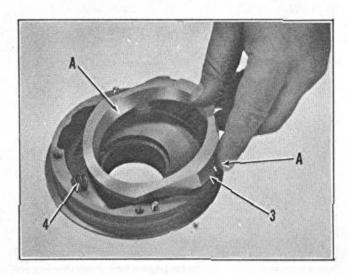


FIGURE 221

Install one guide ring (6) and rotor (1).
 Be sure marked face of rotor is up.

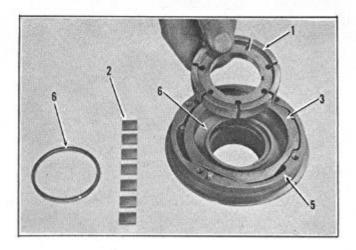


FIGURE 222

7. Install the seven rotor vanes (2) in the rotor slots. Be sure the vanes fit between the guide ring (6) and the slide (3).

NOTE: Check edges of vanes for wear pattern. One edge of the vane will be polished for its full length, this edge should face the pump slide.

Install the second guide ring (6).

NOTE: Outer guide ring can be installed easier if rotor (1) is centered within slide (3).

9. Place pump body (15) over dowel pins in pump cover (5).

NOTE: Pump body should fit freely on dowel pins.

- Install four pump covers to body screws (9) and washers (8) and tighten to 12-15 ft. lbs. using a torque wrench and Front Pump Holding Tool Set J-2184-A, Figure 210.
- With pump completely assembled move the rotor by hand to be sure rotor, vanes and slide operate freely.

NOTE: Be sure priming spring will return pump slide after spring is compressed. 12. Assemble the front pump assembly to the front drive gear before they are installed in the transmission. Be sure pump assembles to front drive gear freely.

CAUTION: Do not force the pump onto the drive gear.

GOVERNOR ASSEMBLY

DISASSEMBLY: (Models H-50, H-51 and J-51)

 Remove the oil delivery sleeve from the governor body.

NOTE: The governor oil delivery sleeve for the H-51 and J-51 transmissions is a component part of the parking brake bracket assembly and cannot be interchanged with the governor oil delivery sleeve used with the H-50 transmissions. See "Parking Brake Bracket Removal" for Models H-51, J-51, H-52 and J-52 transmissions, Page 64.

Remove governor plug from oil delivery sleeve.

NOTE: If the governor runout was within .005" limits when "Checking Governor Runout" page , mark edge of governor body and governor drive flange (if not previously marked) so they may be reinstalled in their original position.

 Using a 7/16" socket, remove two bolts and lock washers that attach the governor body to the rear pump drive flange, Figure 223.

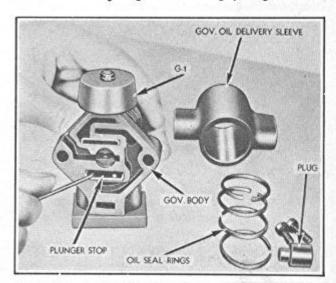


FIGURE 223

- Remove the screws and lock washers that retain the G-2 governor plunger and bushing to the governor body.
- Remove the G-2 small governor plunger stop.
- Remove the G-2 governor plunger and bushing assembly by pulling the plunger out of the governor body.

CAUTION: Do not remove the governor plungers or weights from either G-1 or G-2 plunger assembly.

Remove the four governor oil seal rings from the governor body.

DISASSEMBLY: (Models H-52 and J-52)

- Mark edge of governor body and drive flange so they may be reinstalled in their original positions.
- Remove the two bolts and lock washers that attach the governor body to rear pump drive flange and remove the governor.
- Remove the two screws (1) and lock washers that attach the governor bushing retainer (2) to the governor body (6), Figure 224.

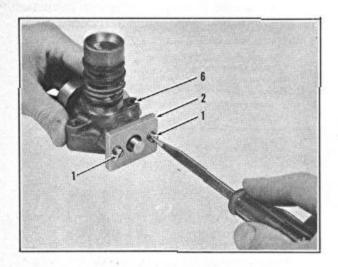


FIGURE 224

- Remove the governor bushing and G-2 plunger (3) from the governor body (6), Figure 225.
- Remove the G-2 plunger (4) from the governor bushing (3).
- 6. Remove four governor oil seal rings (5) from the governor body (6).

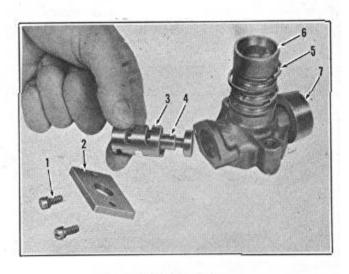


FIGURE 225

CLEANING AND INSPECTION: (Models H-50, H-51, J-51, H-52 and J-52)

- 1. Clean all parts thoroughly.
- Inspect governor ring lands and rings for freedom in grooves. If lands are damaged or worn thin, replace the complete governor assembly.
- Check freeness of governor plungers for freedom in their respective bores. The valves or bores must not be scored or nicked.

NOTE: Thoroughly clean the governor and plungers in a good cleaning solution and if after cleaning these units the G-1 plunger (large) still sticks, replace the complete governor assembly. If only the G-2 plunger sticks, then the G-2 plunger and bushing assembly should be replaced.

 Check the governor body for sand holes or blocked passages.

NOTE: Model H-50, inspect the governor oil delivery sleeve for ring scores and governor plug for freedom in its bore.

Models H-51, J-51, H-52 and J-52, see "Parking Brake Bracket Removal and Inspection", pages 74 and 143.

GOVERNOR

ASSEMBLY: (Models H-50, H-51 and J-51)

 Install the G-2 governor plunger and bushing assembly in governor body with slot in bushing for governor plunger stop up, Figure 226. Install and tighten the attaching screws and lock washers.

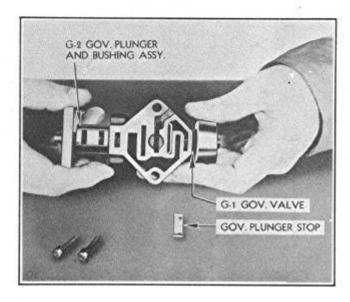


FIGURE 226

 While holding the G-2 plunger in, install the G-2 plunger stop with the two small holes up, Figure 227.

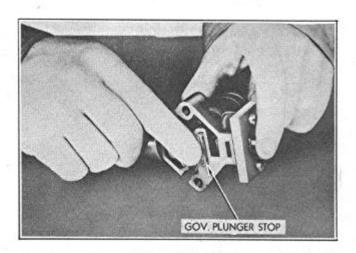


FIGURE 227

CAUTION: Stop must not extend above surface of governor body.

- If necessary to install governor oil seal rings on governor body, check the ring gap by installing the ring in the oil delivery sleeve. Gap to be .001" to .007".
- 4. Install the governor oil delivery sleeve with the chamfered end next to the governor body. Install sleeve carefully so as not to damage or break the rings when compressing them into the oil delivery sleeve.
- Position governor assembly on governor drive flange, lining up locating marks and install the two attaching bolts and lock washers. Tighten bolts to 6-8 ft. lbs.
- Install the governor sleeve plug, Figure 223, Model H-50 transmission.

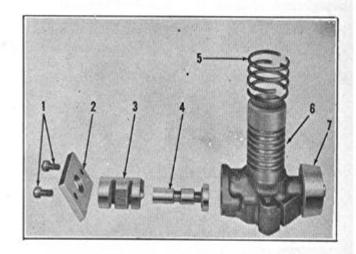


FIGURE 228

GOVERNOR

ASSEMBLY: (Models H-52 and J-52)

- 1. Install G-2 plunger (4) in governor bushing.
- 2. Install bushing (3) and plunger assembly (4) into governor body, Figure 228.
- Install governor bushing retainer plate (2) with two screws (1) and lock washers, Figure 224.
- While holding the G-2 plunger (4) in, install the G-2 plunger stop with the two small holes up, Figure 227.
- Shake governor body to be sure valves are free.
- 6. Install oil seal rings on governor body.

NOTE: If necessary to install new oil seal rings, check the ring gap by installing the ring in the oil delivery sleeve. Gap to be .001" to .007".

7. Assemble governor assembly on governor drive flange, line up locating marks and install the two cap screws and lock washers. Tighten to 6-8 ft. lbs.

REAR OIL PUMP

REPAIRS:

(Models H-50, H-51, J-51, H-52 and J-52)

NOTE: If it is found necessary to replace the governor drive flange, rear oil pump and governor driven gear, pump body or rear oil pump shaft assembly, proceed as follows:

- 1. Grind off one end of the lock pins that attach the governor drive flange and the oil driven gear to the oil pump shaft.
- 2. Place the J-2183-1 Rear Oil Pump Rivet Set Anvil in a suitable vise and hold the oil pump so that the drive flange or gear pin indexes with the hole in the anvil. Using a pin punch drive out either pin, Figure 229.



FIGURE 229

- 3. Remove the governor drive flange.
- 4. Remove any burrs from shaft at the pin hole.

- 5. Drive out driven gear to pump pin. See paragraphs "1 and 2" above for procedure.
- 6. Remove any burrs from shaft at driven gear pin hole and remove shaft through driven gear and pump body.
- 7. Clean pump thoroughly and check pump shaft and bushings for excessive wear.

NOTE: Pump bushings are not sold separately. Refer to your "Hudson Parts Manual".

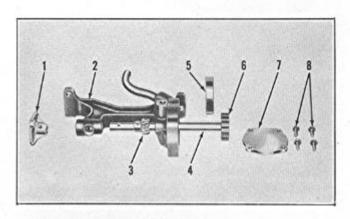


FIGURE 230

LEGEND

- 1. Governor Drive Flange
- 2. Rear Oil Pump Body · 6. Oil Pump Driven Assembly
- 3. Pump Shaft Driven Gear
- 4. Oil Pump Shaft
- 5. Oil Pump Internal Tooth Gear
- Gear
- 7. Oil Pump Cover
- 8. Cover Attaching Screws
- 8. Slide oil pump drive shaft with gear into pump end of body, Figure 231.

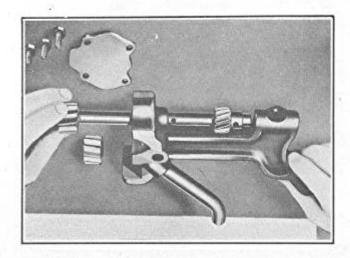


FIGURE 231

- Slide driven gear over shaft with teeth of gear toward pump end of body. Then enter shaft into the governor end of body.
- Line up holes in shaft and driven gear and install a new pin.
- Using the J-2183-1 Anvil and the J-2183-2 Peening Tool, Peen ends of pin in shaft and gear, Figure 232.

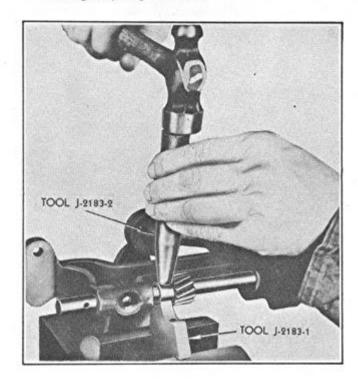


FIGURE 232

 Install governor drive flange in end of shaft and peen a new pin as outlined in operation 11.

CAUTION: Height of peened ends of pins must not exceed .070".

- Install oil pump driven gear. (Be sure Prussian Blue Markings index.)
- Install pump cover with four lock washers and mounting bolts. Tighten to 6-8 ft. lbs.

FRONT SERVO

DISASSEMBLY: (Models H-50, H-51 and J-51)

 Remove bolts (12), Figure 240 holding the front band release cylinder (11) to servo body (4) and remove the front band release cylinder, Figure 233.

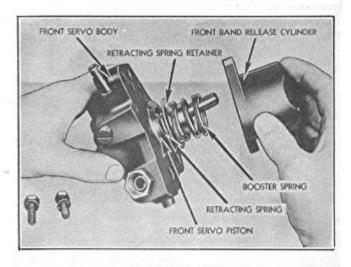


FIGURE 233

- 2. Remove the booster spring.
- 3. Remove the retracting spring retainer.
- 4. Remove the retracting spring.
- 5. Remove the pump tube sleeve from the servo body using a 25/32" wrench.
- 6. Remove the check ball and spring.
- Remove the front band release piston assembly (10), Figure 240, from the release cylinder, Figure 234.

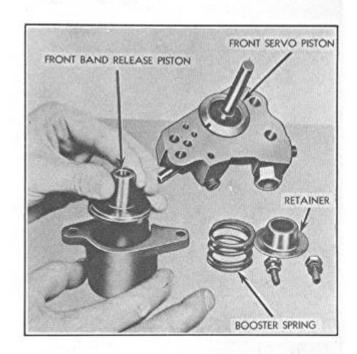
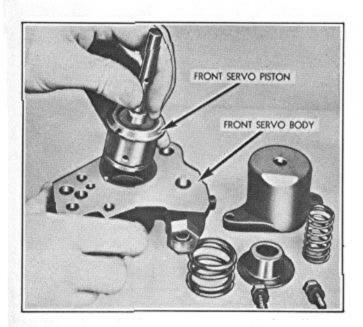


FIGURE 234

Remove the front servo piston assembly from the front servo body, Figure 235.

NOTE: Do not disassemble the servo piston as this piston is furnished as a complete unit.



116

FIGURE 235

 Remove the pipe plug and spring retainer holding the 4 to 3 downshift valve in place, Figure 236.

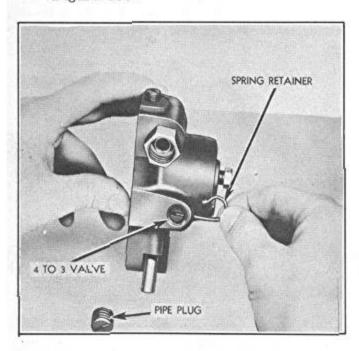


FIGURE 236

- Remove the 4 to 3 downshift valve from the servo body, Figure 237.
- Remove the front servo piston assembly dowel pin from the servo body if the pin is loose, to prevent loss while cleaning.

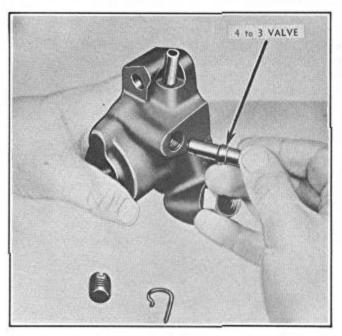


FIGURE 237

FRONT SERVO

DISASSEMBLY: (Models H-52 and J-52)

- Remove two release cylinder to servo body cap screws and lockwashers (14), Figure 241.
- Remove release cylinder body, front servo spring and gasket, Figure 238.

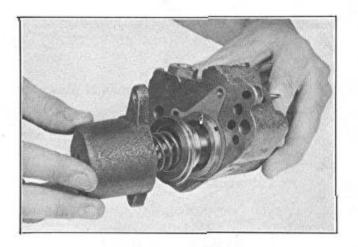


FIGURE 238

- Remove the servo piston assembly, Figure 239.
- Remove slotted head pipe plug and retainer spring holding 4-3 downshift valve in place, Figure 236.

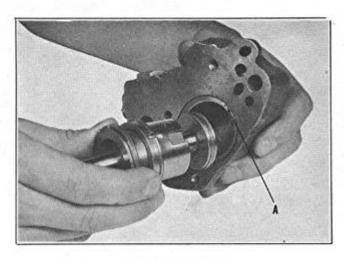


FIGURE 239

- 5. Remove 4-3 downshift valve, Figure 237.
- 6. Remove the rear pump check valve seat (1) check ball (4) and spring (6), Figure 241.
- 7. Use a mill file and round off the flattened end of the over-run control valve pin (17) and remove the pin.

NOTE: Place your hand over the valve port when removing the pin to prevent loss of the spring.

- Remove the over-run control valve spring (16) and valve (15), Figure 241.
- 9. Remove the 1/8" pipe plug (18).

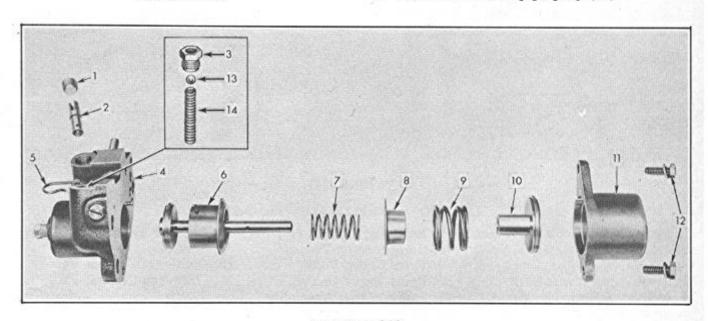


FIGURE 240

LEGEND - MODELS H-50, H-51 and J-51

- 1. Pipe Plug
- 2. 4-3 Downshift Valve
- 3. Tube Sleeve
- 4. Front Servo Body
- 5. Downshift Valve Retainer
- 6. Band Apply Piston Assembly
- 7. Retracting Spring
- 8. Retracting Spring Retainer
- 9. Booster Spring
- 10. Band Release Piston
- 11. Release Cylinder
- 12. Release Cylinder Screws
- 13. Rear Pump Check Ball
- 14. Front Servo Rear Pump Check Ball Spring

CLEANING AND INSPECTION: (Models H-50, H-51 and J-51)

- 1. Clean all parts thoroughly.
- 2. Inspect the servo body (4) Figure 240, for scores and obstructed passages.
- Inspect the band apply piston assembly (6) for scores, broken rings, freedom of rings in grooves and obstructed passages.
- 4. Inspect the front band release cylinder (11)

for scores.

- Check the front band release piston (10) for scores, broken ring and freedom of ring in groove.
- Inspect the 4 to 3 downshift valve (2) for scores or an obstructed orifice.
- Inspect the front servo springs for distortion or collapsed coils. Booster spring (9) free length 61/64". Retracting spring (7) free length 1-33/64".

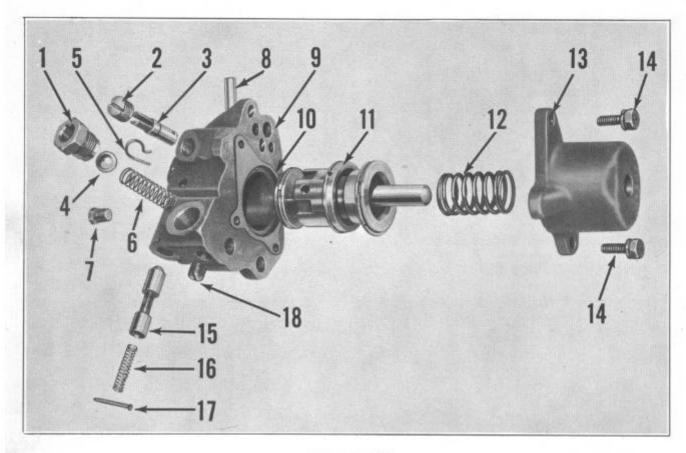


FIGURE 241

LEGEND - MODELS H-52 and J-52

- 1. Rear Pump Check Valve Seat
- 2. 4-3 Plug
- 3. 4-3 Valve
- 4. Rear Pump Check Ball
- 5. 4-3 Valve Retainer Spring
- 6. Rear Pump Check Valve Spring
- 8. Compensator Pipe
- 9. Front Servo Body
- 10. Front Servo Gasket
- 11. Servo Piston Assembly
- 12. Front Servo Spring
- 13. Release Cylinder
- 7. Band Adjusting Hole Plug 14. Release cylinder Attaching Screws
 - 15. Over-run Control Valve
 - 16. Over-run Control Valve Spring
 - 17. Over-run Control Valve Pin
 - 18. Pipe Plug

CLEANING AND INSPECTION: (Models H-52 and J-52)

- 1. Check machined surfaces of servo body (9) Figure 241, and release cylinder (13) for roughnéss or scoring.
- 2. Check servo body for blocked or interconnected passages, Figure 242.
- 3. Inspect front band release cylinder bore for scoring.
- 4. Check the front band release piston (11) for scores, broken ring and freedom of ring in piston groove.
- 5. Check 4-3 valve (3) for free movement in bore; make sure orifice is open.
- 6. Inspect the front servo spring (12) for distortion or collapsed coils (free length 1-33/64").

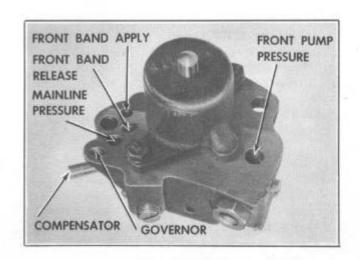


FIGURE 242

7. Inspect rear pump check valve seat (1) ball (4) and spring (6).

NOTE: The H-52 and J-52 rear pump check valve seat has a small spot face in the seat face. This spot face acts as a bleed. Be sure this check valve seat has this bleed.

- 8. Be sure over-run control valve (15) is free in its bore and is not scored.
- Check free length of the over-run control valve spring (16), (approximately 1-9/64").
- Compensator piston must work freely in its bore, within the servo piston assembly.
- 11. Be sure the two oil passage sealing plugs are in place in the servo body (2 steel plugs).
- The servo piston locating pin should fit snugly in place and should not extend beyond servo body machined face, (A), Figure 239.
- Check band release cylinder and servo body contacting faces for scores and flatness by using surface plate and crocus cloth.

FRONT SERVO

ASSEMBLY: (Models H-50, H-51 and J-51)

- Install check ball spring (14), Figure 240, check ball (13) and pump tube sleeve (3) into servo body.
- 2. Install the 4-3 downshift valve (2) into bore

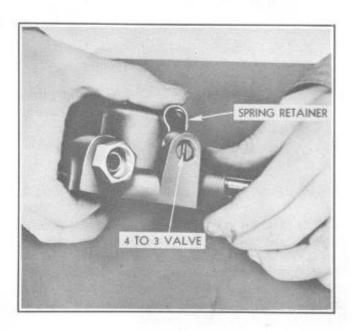


FIGURE 243

- of servo body, Figure 243. Align slot with hole for spring retainer and install retainer (5). Valve must operate freely with retainer in place.
- Install and tighten screw plug over 4-3 valve.
- Install the band apply piston dowel pin in servo body if previously removed.
- Install the front servo apply piston assembly into servo body. Align slot in sleeve over dowel pin, Figure 244.



FIGURE 244

- Install the front band release piston into cylinder, using care when compressing the ring.
- Install the booster spring over the front band release piston.
- Place the retracting spring retainer over the piston stem, on booster spring, Figure 245.

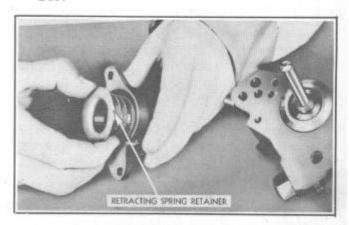


FIGURE 245

- Install the retracting spring over piston stem.
- Install the band release cylinder assembly on servo body. Cylinder should seat squarely on body before bolts are installed, Figure 246.

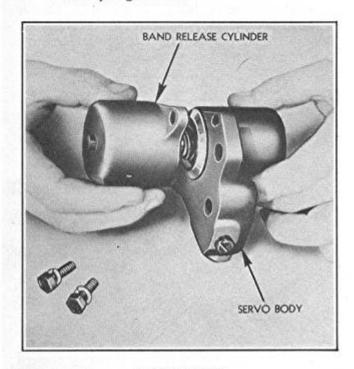


FIGURE 246

 Install the two attaching bolts and lock washers. Tighten to 6-8 ft. lbs.

FRONT SERVO

ASSEMBLY: (Models H-52 and J-52)

- Install the rear pump check spring (6), check ball (4) and check ball seat (1), Figure 241.
- Install the 4-3 valve (3), spring retainer (5) and pipe plug (2). Valve must operate freely with retainer in place.
- 3. Install the over-run control valve (15), spring (16) and a new stop pin (17).
- 4. Flatten end of pin (17) to hold pin in place.
- 5. Install the servo piston assembly (11) into the servo body (9). (Use care when compressing and starting the oil ring.) Locate piston groove on positioning pin as indicated by arrow (A), Figure 247.
- 6. Install the servo release spring (12).
- Install a new front servo gasket (10).

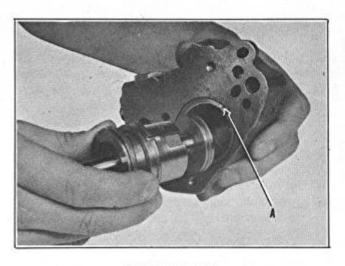


FIGURE 247

Install the servo release cylinder (13), using care when starting the release piston oil ring into the release cylinder, Figure 248.

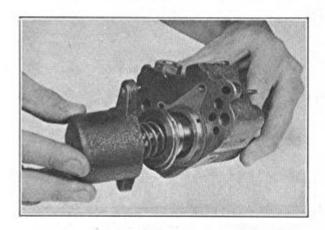


FIGURE 248

 Install the two servo release cylinder to servo body cap screws and lock washers. Tighten to 6-8 ft. lbs.

REAR SERVO

(Models H-50, H-51 and J-51 Except as Noted)

NOTE: The reverse blocker piston oil passage in the rear servo accumulator body on the H-50 Model transmission is not used on the H-51 or J-51 transmissions. Oil pressure previously used to activate this piston when the rear unit clutch was applied came from the main line pressure circuit.

On the H-51 and J-51 transmissions, governor pressure is used to hold the reverse blocker piston (now located in the parking brake bracket assembly) forward (outward) when car speed is above approximately 10 miles per hour.

DISASSEMBLY:

 With the rear servo assembly installed in a suitable press, bring press ram down to rest on the rear servo spring retainer but do not distort the retainer, Figure 249, and remove the two retainer to body bolts and lock washers.

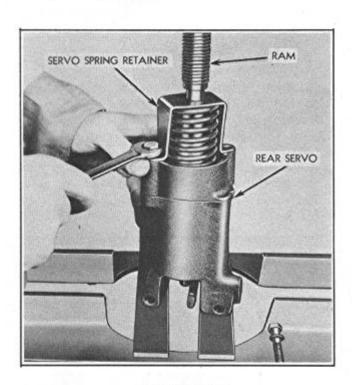


FIGURE 249

- Release press slowly until springs are free.
- Remove spring retainer, servo spring, compensator piston and the two servo springs inner and outer, Figure 250.

NOTE: The later H-51 and J-51 Rear Servos do not have the inner spring.

 Remove the accumulator body with the accumulator piston from the servo body.

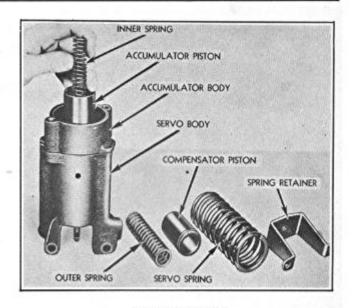


FIGURE 250

 Hold the accumulator body, Figure 251, on a vise equipped with soft copper jaws and using a brass drift, tap accumulator piston through the accumulator apply spring and accumulator body.

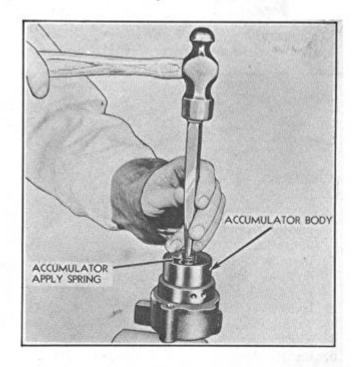


FIGURE 251

Remove the booster spring and the booster piston from the servo body, Figure 252. Do not cock piston in bore.

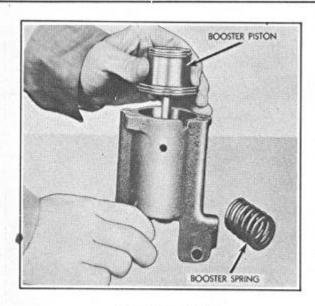


FIGURE 252

DISASSEMBLY: (Models H-52 and J-52)

 Place the rear servo assembly in a suitable press and bring the ram to rest on the rear servo spring retainer, Figure 249.

NOTE: Do not distort the retainer.

- Remove the two retainer bolts and lock washers.
- 3. Release the press slowly until spring

- pressure has been relieved and remove the spring retainer, servo spring, compensator piston and spring, Figure 250.
- Remove the accumulator body and piston assembly, Figure 253.

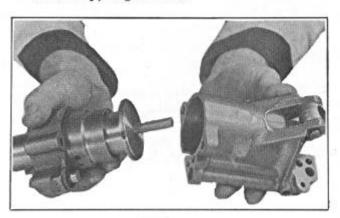


FIGURE 253

- Remove rear servo exhaust valve (5) and spring (6), Figure 258.
- 6. Remove the rear servo gasket (2).
- Rest the accumulator body on a vise with soft jaws and using a brass drift, tap accumulator piston through the apply spring and accumulator body, Figure 251.
- 8. Remove the booster piston (3) and spring (4) from the servo body (1), Figure 252.

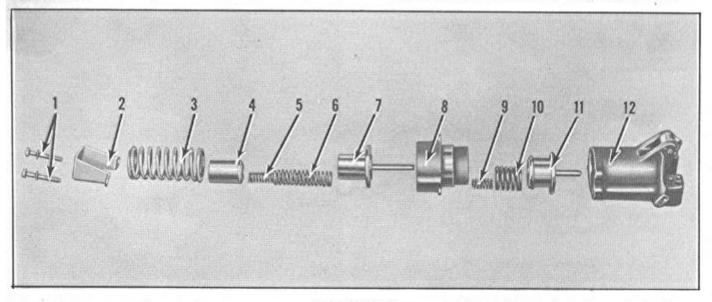


FIGURE 254

LEGEND

- 1. Spring Retainer Bolts
- 2. Spring Retainer
- 3. Rear Servo Spring
- 4. Compensator Piston
- 5. Servo Spring Inner
- 6. Servo Spring Outer
- 7. Accumulator Piston
- 8. Accumulator Body
- 9. Accumulator Apply Spring
- 10. Booster Spring
- 11. Booster Piston
- 12. Servo Body

CLEANING AND INSPECTION: (Models H-50, H-51 and J-51)

- Clean all parts thoroughly in a good clean solvent.
- Inspect the servo body for scores and obstructed passages, Figure 255.

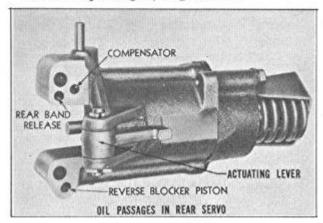


FIGURE 255

- Check the actuating lever for wear and free operation.
- Inspect the booster piston (11), Figure 254, for scores, broken rings and freedom of rings in ring grooves.
- Inspect accumulator piston (7) for scores, damaged rings, freedom of rings in grooves or obstructed passage in stem of piston.
- Check compensator piston (4) for scores, damaged ring and freedom of ring in groove.
- Inspect all springs for damage, distortion or collapsed coils. Rear servo spring free length 4-1/4", compensator piston servo spring inner 3-25/32", outer 3-15/32", accumulator apply spring 1-16/64" and booster spring 1-19/32".
- 8. Inspect the accumulator body (8), for scores or obstructed passages. Examine check valve for damage, be sure check valve plunger is free. Check to see that hole in check valve is open and valve seats flat on accumulator body.

ACCUMULATOR BODY CHECK VALVE

REPLACEMENT: (Models H-50, H-51, J-51, H-52 and J-52)

NOTE: If the check valve is broken, make the replacement as follows:

- Support the accumulator body on a hardwood block and using a pin punch, drive out the check valve rivet, Figure 256.
- 2. Remove check valve and plunger.
- Clean all parts and oil passages thoroughly.
- 4. Install the check valve plunger.
- 5. Install the check valve with the notch in valve entered over groove in plunger.



FIGURE 256

Insert a new rivet through valve and into accumulator body, Figure 257.

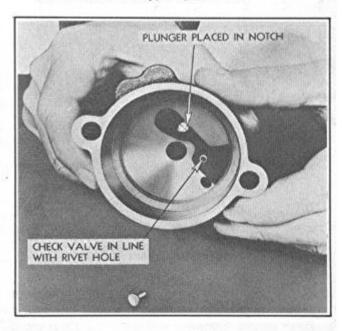


FIGURE 257

- 7. Peen Rivet.
- Check installation by working plunger to be sure the plunger and check valve work freely.

CLEANING AND INSPECTION: (Models H-52 and J-52)

- Clean all parts thoroughly in a good clean solvent.
- Inspect servo body (1), Figure 258, for scores and obstructed or interconnected passages.
- Inspect the exhaust valve (5) and bore in servo body for scores and freeness of valve in bore.
- Inspect actuating lever for free operation, worn socket and excessive wear at actuating lever pin.
- Inspect booster piston (3) for scores, broken rings and freedom of rings in grooves.
- 6. Check servo gasket (2) for damage.
- Inspect the accumulator body (8) for scores or obstructed passages. Be sure check valve is not broken or rivet is not loose.

Check to see that check valve plunger works freely. Hole in check valve must be open and valve should seat flat on accumulator body.

NOTE: If necessary to replace the check valve, see page 123 for procedure.

- Inspect accumulator piston (9) for scores, damaged ring, freedom of ring in groove or obstructed passage in accumulator piston stem.
- Inspect all servo springs for damage, distortion or collapsed coils.

REAR SERVO

ASSEMBLY: (Models H-50, H-51 and J-51)

- 1. Wipe all parts clean of cleaner solvent.
- 2. Install booster spring into booster piston.
- Install the accumulator piston into accumulator body. Do not damage piston ring or scuff body bore.

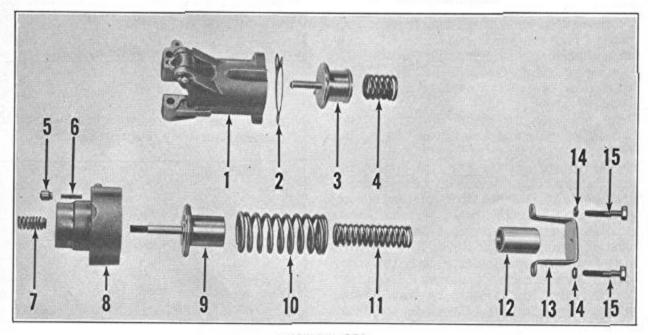


FIGURE 258

LEGEND

- 1. Servo Body
- 2. Servo Body Gasket
- 3. Booster Piston
- 4. Booster Spring
- 5. Rear Servo Exhaust Valve
- Rear Servo Exhaust Valve Spring
- 7. Accumulator Apply Spring
- 8. Accumulator Body
- 9. Accumulator Piston
- 10. Rear Servo Spring
- 11. Compensator Spring
- 12. Compensator Piston
- 13. Spring Retainer /
- 14. Retainer Attaching Bolt Washers
- 15. Retainer Attaching Bolt

 Install the accumulator apply spring over the piston stem, (small tapered end seated against shoulder of piston stem). Accumulator piston should be supported on a wood block during this operation, Figure 259.



FIGURE 259

Install booster piston into the accumulator body. Install the accumulator body and piston into the servo body.

NOTE: Use care not to break piston rings or scuff servo body bore during this operation.

Align bosses on accumulator body with the bosses on servo body, Figure 260.

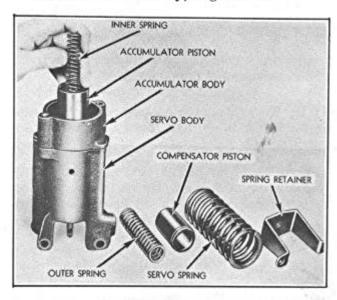


FIGURE 260

- Place the two servo springs inner and outer in the bore of the accumulator piston, Figure 260.
- Install the compensator piston over the two servo springs.
- Install servo spring and retainer with attaching bolts and lock washers in position and place the complete assembly into a suitable press.
- Slowly compress springs and tighten mounting screws.

CAUTION: Use extreme care during this operation to align compensator piston and oil seal ring to avoid breaking the oil ring.

NOTE: The late Model H-51 and J-51 rear servos do not use an oil ring on the compensator piston.

 After compensator piston has been entered satisfactorily, remove the assembly and tighten the two attaching bolts to 10 to 13 ft. lbs.

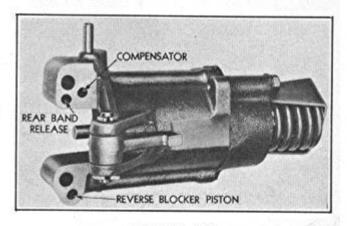


FIGURE 261

12. Test operation of the rear servo by applying air pressure in the rear band release passage, Figure 261, while holding the reverse blocker piston passage closed. Booster piston will move upward and compress the springs.

ASSEMBLY: (Models H-52 and J-52)

- Install accumulator piston in the accumulator body, using care not to damage the piston ring.
- Install the accumulator apply spring over the piston stem with the small tapered end of the spring seating against the shoulder, Figure 259.

NOTE: The accumulator piston should be supported on a wood block during this operation.

- Install the rear servo gasket on the accumulator body. Determine that gasket is properly positioned.
- Install the booster spring in the booster piston.

NOTE: Be sure that spring fits snugly in the bottom of the booster piston.

 Install the booster piston and spring assembly in the accumulator body assembly, Figure 262.

NOTE: Use care not to break the piston ring or scuff the accumulator body bore during this operation.

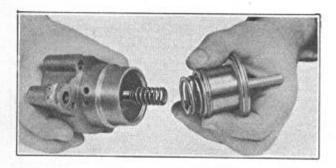


FIGURE 262

 Install the accumulator body assembly and booster piston assembly into the rear servo body, Figure 263.

NOTE: Be sure accumulator body is properly positioned on the rear servo body to prevent damaging the gasket or exhaust valve.

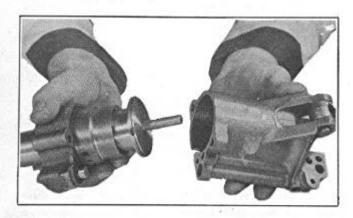


FIGURE 263

- Install the rear servo exhaust valve spring and valve in the accumulator body assembly and at the same time move the accumulator body against the servo body.
- Install the compensator spring, compensator piston in the accumulator piston.
- Install the rear servo spring and spring retainer with the two attaching bolts and lockwashers in position.
- 10. Place the complete assembly in a suitable press and while slowly compressing the rear servo spring, tighten the attaching bolts to 10 to 13 ft. lbs.
- Test operation of the rear servo by applying air in the rear band release passage, Figure 264.

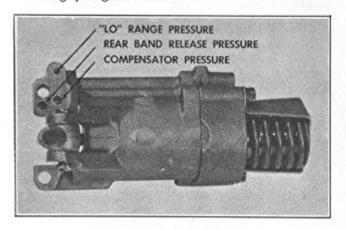


FIGURE 264

CONTROL VALVE ASSEMBLY

DISASSEMBLY: (Model H-50)

 Place the control valve assembly flat on a clean paper for disassembling.

NOTE: Never grip the control valve body assembly in a vise or use force in removing or installing valves or plugs.

- Move the inner detent control lever slowly counter-clockwise while holding a clean rag below the lever to catch the detent tension spring and detent steel ball, Figure 265.
- 3. Remove the manual control valve.
- Remove the manual control shaft rubber seal and manual shaft seal spring washers from shaft.

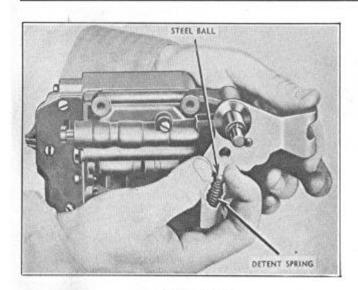


FIGURE 265

 Remove the three screws that hold the inner and outer valve bodies together, Figure 266. Separate the inner and outer valve bodies and remove the valve body spacer plate.

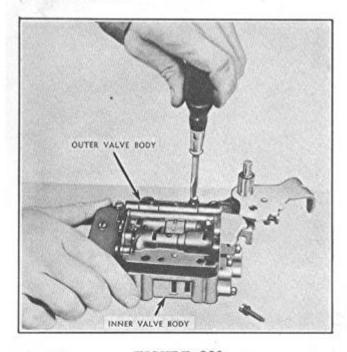


FIGURE 266

Remove the three screws that hold the valve body rear cover to valve body and remove the rear cover and inner valve body rear plate, Figure 267.

NOTE: Keep screws with the correct part and in the proper hole of the part removed to facilitate assembly.

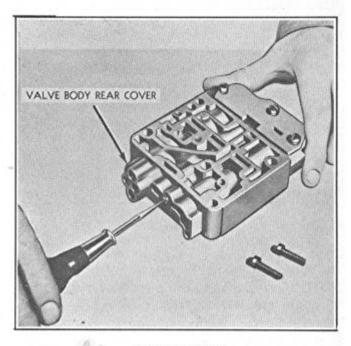


FIGURE 267

 Remove the three screws holding the front valve body plate to the front valve body and remove the plate, Figure 268.

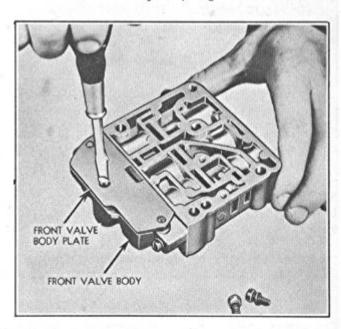


FIGURE 268

 Remove three screws holding the front valve body to the inner valve body and remove the front valve body, Figure 269.

NOTE: Hold the front valve body and inner valve body together while removing the screws to avoid springs jumping out of place.

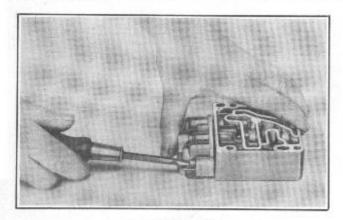


FIGURE 269

 Remove the 1-2 regulator plug spring, 2-3 valve spring, 2-3 regulator plug spring and 3-4 valve spring, Figure 270.

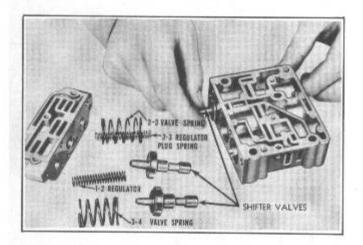


FIGURE 270

10. Remove the three shifter valves.

NOTE: Valves should be free to move from valve inner body by lightly pushing on opposite ends against governor plugs with a brass rod.

- Remove the three governor plugs by bumping the inner valve body on palm of hand if necessary.
- Remove the three regulator plugs from valve body.
- Remove the three screws holding the detent ball retainer to the outer valve body and remove the retainer, Figure 271.

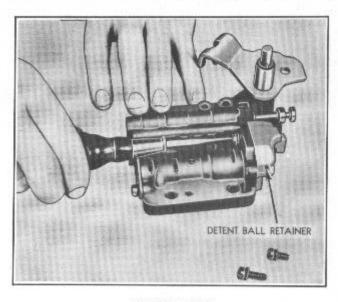


FIGURE 271

 Remove three screws that hold the outer valve body front plate to outer valve body and remove plate, Figure 272.

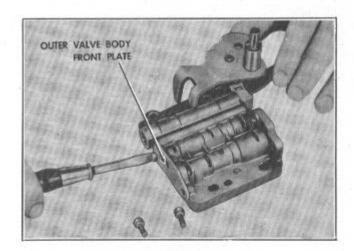


FIGURE 272

- Remove the compensator valve, compensator valve spring and detent plug from outer valve body, Figure 273.
- Remove double transition valve and spring.
- Remove "T" valve, throttle valve spring and throttle valve.
- 18. Remove the stop pin, holding compensator auxiliary plug in place, Figure 274.

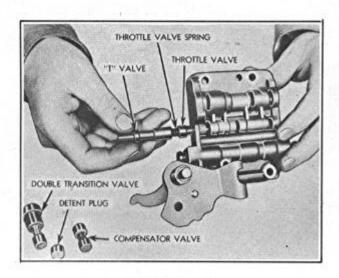


FIGURE 273

19. Remove the compensator auxiliary plug by inserting a 1/8" brass rod in the hole of the plug and use another small punch

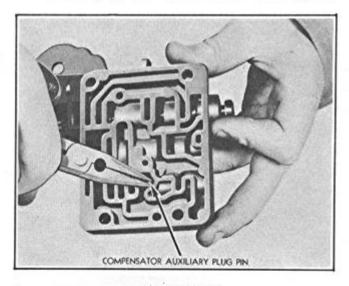


FIGURE 274

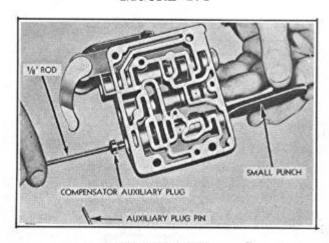


FIGURE 275

to push the plug from the outer valve body, Figure 275.

CAUTION: Do not allow the auxiliary plug to drop from the aligning brass rod as this is a short plug and may become lodged in the valve body.

CONTROL VALVE ASSEMBLY (Models H-51 and J-51)

The control valve assemblies used in the H-51 and J-51 transmission can be identified from the H-50, H-52 and J-52 control valve assemblies as follows:

- a. The H-51 and J-51 control valves 2 and 3, Figure 276, have a front servo exhaust valve assembly and spacer plate at the front of the outer valve body, as indicated by arrow (A). The H-50 (1), H-52 (4), and J-52 do not have this valve assembly.
- b. The H-51 and J-51 manual valve (B) has a conical end; the H-50, H-52 and J-52 manual valves are machined flat.
- c. The H-51, J-51, H-52 and J-52 detent plunger is of the round nose bullet-type (C). The H-50 control valve has a round ball.
- d. The H-51, J-51, H-52 and J-52 detent plunger retainer (D) is thicker than the H-50 models.
- e. The H-50 outer valve body front plate (E) cannot be installed on the H-51, J-51, H-52 or J-52 outer valve bodies. The front servo exhaust valve (A) cannot be installed on the H-50, H-52 or J-52 outer valve bodies.
- f. The H-50, H-51 and J-51 outer valve bodies are held to their inner valve bodies by three attaching screws (F); the H-52 and J-52 outer valve bodies use only two attaching screws.

NOTE: The H-51 or J-51 control valve assemblies MUST NOT be interchanged with the control valves used in the H-50 or H-52 and J-52 transmissions.

CAUTION: The H-51 control valve can be distinguished from the J-51 by a milled or ground flat on the corner of the front valve body as shown in circle at (3), Figure 276, and a drilled passage through the front valve body as shown in Figure 277. The J-51 control valve does not have this hole drilled and the front valve body is not milled. Never use an H-51 control valve assembly to replace a J-51 control valve assembly in place of an H-51 control valve assembly.

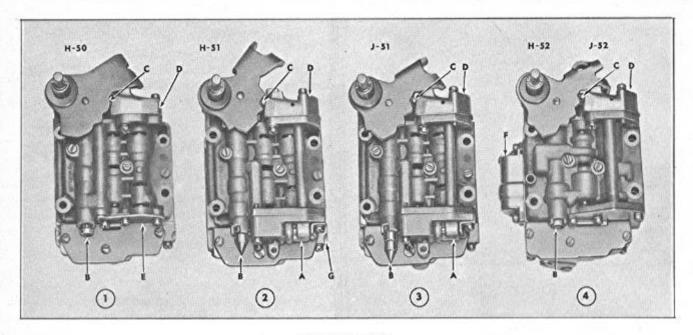


FIGURE 276

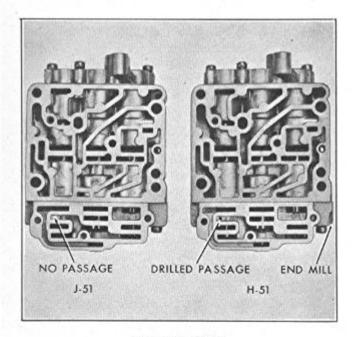


FIGURE 277

DISASSEMBLY: (Models H-51 and J-51)

- Pick out a clean area on your work bench and remember that cleanliness is important in the disassembly and assembly of the control valve assembly.
- Move the inside detent control lever slowly counter-clockwise and remove the detent tension spring and plunger, Figure 278.
- Remove the manual shaft rubber seal and outer and inner manual shaft shield washers from the manual shaft, Figure 279.

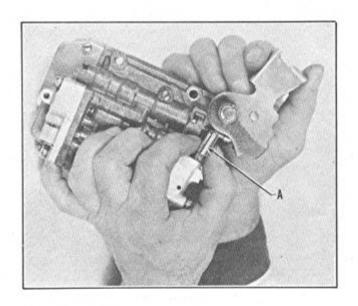


FIGURE 278

 Remove the three screws that hold the inner and outer valve bodies together, Figure 266. Separate valve bodies and remove the valve body spacer plate.

CAUTION: Keep screws with the correct part and in the proper hole of the part removed.

- Remove the three screws that hold the valve body rear cover to the valve body and remove the rear cover and inner valve body rear plate, Figure 267.
- Remove the three governor plugs from the inner valve body.

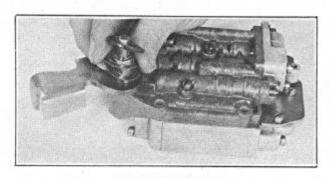


FIGURE 279

- Remove the three screws that attach the front valve body plate to the front valve body and remove the plate, Figure 268.
- Remove the three screws that hold the front valve body to the inner valve body and remove the front valve body, Figure 269.

NOTE: Hold the front valve body and inner valve body together while removing the screws to keep the springs from jumping out of place.

- 9. Remove the 1-2 regulator plug spring, 2-3 valve spring, 2-3 regulator plug spring and 3-4 valve spring, Figure 270.
- 10. Remove the three shifter valves.

NOTE: The valves should be free to move from body by pushing from opposite ends with a 1/8" brass rod.

- Remove the three regulator plugs by bumping front valve body on palm of hand.
- Remove the three screws from the detent plunger retainer (A) and remove the retainer and plate, Figure 280.

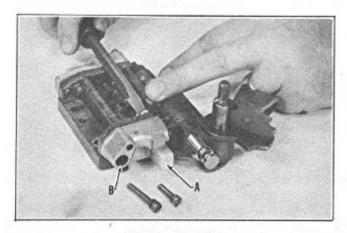


FIGURE 280

 Remove the "T" valve (A), the throttle valve spring (B) and the throttle valve (C), Figure 281.

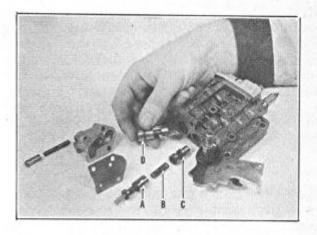


FIGURE 281

- Remove the double transition valve and spring (D).
- 15. Remove the three screws holding the front servo exhaust valve assembly over the compensator valve and detent plug in outer valve body, Figure 282, and remove the front servo exhaust valve assembly.

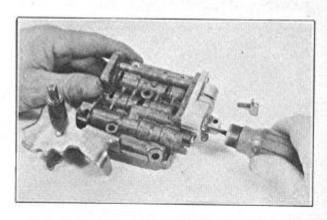


FIGURE 282

- 16. Remove the compensator valve, compensator spring and detent plug from the outer valve body (8), Figure 297.
- Remove the stop pin that holds the compensator auxiliary plug in place, Figure 274
- 18. Remove the compensator auxiliary plug by inserting a 1/8" brass rod in hole in plug and use another small punch to push the plug from the outer body.

CAUTION: Since this plug is short, do not let it drop from the rod to become lodged in the valve body.

CONTROL VALVE ASSEMBLY

(Models H-52 and J-52)

NOTE: The H-52 and J-52 control valve assemblies incorporate the new 3-2 detent plug in the front valve body assembly, the 3-2 timing valve body and the 3-4 lockout valve assembly. The H-52 and J-52 control valves are identical; they can be distinguished from the H-50, H-51 and J-51 control valves by the 3-2 timing valve body attached to the inner valve body shown as (F), Figure 276.

CAUTION: Do not use the H-52 and J-52 control valves on the H-50, H-51 or J-51 transmissions and do not use the H-50, H-51 or J-51 control valves on the H-52 or J-52 transmissions.

DISASSEMBLY: (Models H-52 and J-52)

 Move the inside detent control lever counter-clockwise and remove the detent plunger and spring, Figure 283.

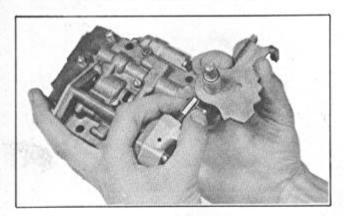


FIGURE 283

- 2. Remove the manual valve.
- Remove the manual control shaft rubber seal and outer and inner shaft seal washers.
- Remove the two screws attaching the outer valve body to the inner valve body.
- Separate the inner and outer valve bodies and remove the spacer plate (18), Figure 298.

- Remove the two screws attaching the timing valve body assembly (53) to the inner valve body assembly, Figure 284.
- Remove the timing valve plug retainer pin (49), timing plug (50), spring (51) and timing valve (52).

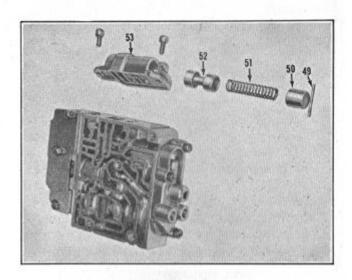


FIGURE 284

 Remove the three rear valve body to inner valve body attaching screws and remove the rear valve body (19) and spacer plate (20), Figure 285.

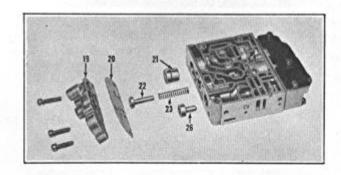


FIGURE 285

- 9. Remove the 3-4 governor plug (21), 2-1 detent plug, (22), 2-1 detent plug spring (23) and the 2-3 governor plug (26).
- Remove the front valve body plate to front valve body attaching screws and remove the front valve body plate, Figure 286, and the "T" oil ball check valve (44) and spring (45), Figure 288.

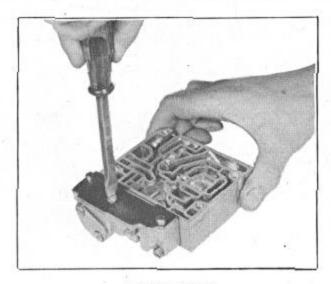


FIGURE 286

 Remove the three screws attaching the front valve body assembly to the inner valve body assembly and remove the front valve body assembly and separator plate, Figure 287.

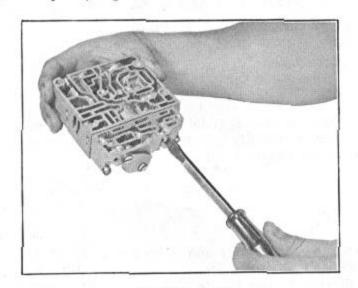


FIGURE 287

- Remove the 3-4 regulator plug (38), 1-2 regulator plug (39), T.V. Regulator valve (40), T.V. regulator valve spring (41) from the front valve body, Figure 288.
- 13. Remove the two screws (48) and the 3-2 detent plug plate (47) and remove the 3-2 detent plug (48) from the front valve body (43), Figure 289.

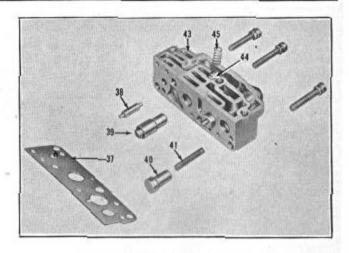


FIGURE 288

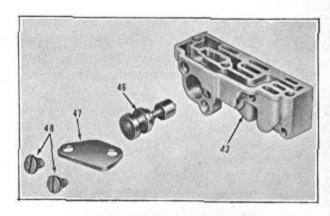


FIGURE 289

14. Remove the 3-4 shift valve spring (36), 3-4 lockout valve assembly (35), 3-4 auxiliary shift spring (31), 3-4 shift valve (28), 1-2 regulator plug spring (32), 1-2 shift valve (29), 2-3 shift valve spring (33), 2-3 spring guide pin (34) and the 2-3 shift valve (29), Figure 290.

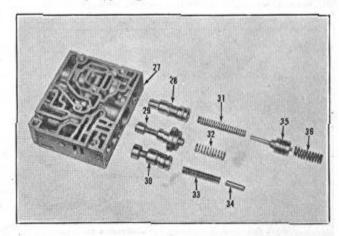


FIGURE 290

15. Remove the 2-3 governor sleeve (26) and the 2-3 auxiliary valve (25) by pushing them out of inner valve body with a 1/4" brass rod, Figure 291

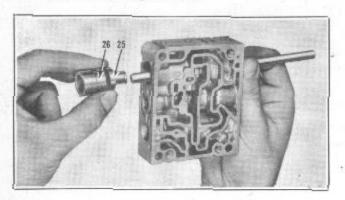


FIGURE 291

 Remove the three screws attaching the detent retainer to the outer valve body, Figure 292, and remove the retainer and plate.

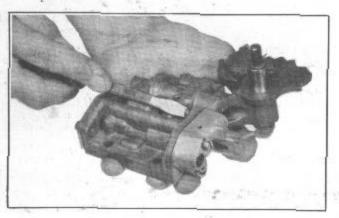


FIGURE 292

17. Remove the "T" valve (7), throttle valve spring (9), throttle valve (11) and double transition valve (10), Figure 293.

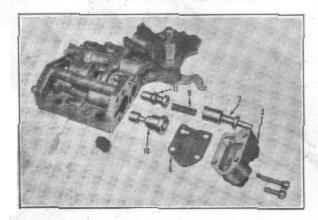


FIGURE 293

 Remove the three outer valve body front plate screws, the front plate (16), compensator valve (15), compensator valve spring (13) and detent plug (14), Figure 294.

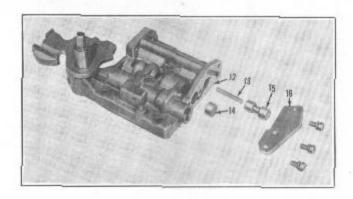


FIGURE 294

NOTE: DO NOT remove the compensator stop pin from the outer valve body.

CONTROL VALVE ASSEMBLY

CLEANING AND INSPECTION: (Models H-50, H-51, J-51, H-52 and J-52)

 Thoroughly clean valve bodies and valve in a CLEAN solvent.

NOTE: All valve bodies and valves should be handled carefully during this cleaning process to insure against damage.

 Inspect all valve bodies for scores in body bores and to see that they are free from burrs.

NOTE: Valve body and valve bores should be free of all scratches and scores. Burrs can be removed by the careful use of a fine crocus cloth.

CAUTION: This type of valve has sharp corners to prevent dirt from wedging between the valves and valve body. When removing any burrs, do not round off the square edges of valves.

 With the valves and valve bodies both clean and dry, check each shifter valve, governor plug and regulator plug for free movement in their respective bores and operating positions. NOTE: All valves can be assumed to be operating freely if they will fall of their own weight in their respective bores when the valve body is shaken slightly. Do not drop valves.

NOTE: The manual control valve is the only valve furnished separately. If it becomes necessary to replace one of the other valves or the inner or outer valve bodies, the complete control valve assembly should be replaced.

- 4. Check the fit of the throttle valve inside lever and shaft in the hub of the inside detent control lever and in the outer valve body. If the shaft binds in the hub or the shaft is excessively worn or the oil seal is missing or damaged or if the lever is loose on the shaft, the shaft and oil seal can be replaced as follows:
 - Drive out the throttle valve shaft pin, Figure 295.

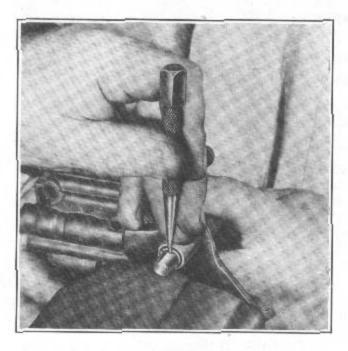


FIGURE 295

NOTE: Support the valve shaft on a lead plate in a manner so as not to damage the detent control lever at the outer valve body during operation.

b. Install a new throttle valve inside lever and shaft through the outer valve body and through detent lever and hub.

- c. Install a new oil seal over valve shaft and into counterbore of detent lever sleeve.
- d. Install oil seal retainer washer and shaft retaining pin. See "Note".
- e. Check the throttle valve inside shaft for freedom of movement.

CONTROL VALVE ASSEMBLY

ASSEMBLY: (Model H-50)

- Carefully assemble the compensator auxiliary plug (7), Figure 296, into the outer valve body (6), using a 1/8" brass rod to hold the plug in position and install the auxiliary plug pin (8), Figures 275 and 296.
- 2. Install the throttle valve (12) throttle valve spring (11), "T" valve (10) and detent plug (4). Check valves for free movement.
- 3. Install the compensator valve (5) with compensator spring (32) and double transition valve spring (33) and double transition valve (9). Check both valves for free movement in bores.
- Position the outer valve body front plate (3) on the outer valve body and install the three attaching screws and lockwashers.
- Install the detent ball retainer (16) on the outer valve body (6). Check to be certain that the inner throttle lever is inside of stop of the retainer (16).
- Install the three screws attaching the detent retainer to the outer valve body.
- 7. Install the manual control valve (13). Make sure the manual control lever pin engages between the two bands at the end of the manual valve. This can be done as follows:
 - (a) Rotate the inside detent control lever counter-clockwise past the reverse position.
 - (b) Insert the manual valve detent spring (15) in bore of the detent ball retainer (16).
 - (c) Insert detent ball (14) over spring (15).
 - (d) Push ball (14) and spring (15) into bore of detent retainer (16) with your finger while rotating the manuar control lever inner (34) clockwise into "LO" position.
- Install regulator plugs 1-2 (19), 2-3 (18) and 3-4 (20) in front valve body (17). Check plugs for free movement.

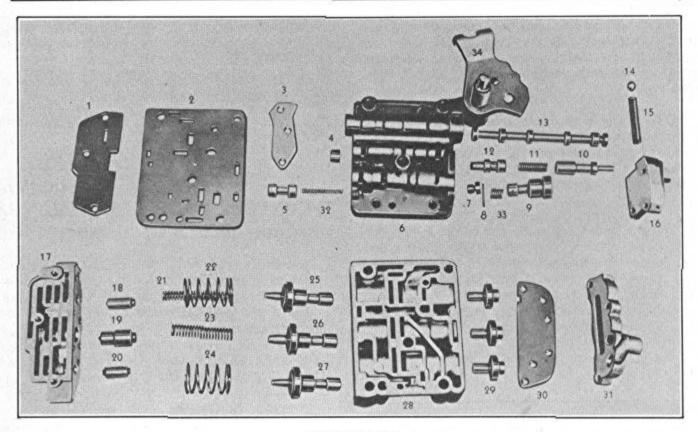


FIGURE 296

LEGEND

- Front Valve Body Plate
- 2. Valve Body Spacer
- 3. Outer Valve Body Front Plate 15. Detent Spring
- 4. Detent Plug
- 5. Compensator Valve
- 6. Outer Valve Body
- 7. Compensator Auxiliary Plug
- 8. Auxiliary Plug Pin
- 9. Double Transition Valve
- 10. "T" Valve
- 11. Throttle Valve Spring
- 12. Throttle Valve

- Manual Valve
- 14. Detent Ball
- 16. Detent Ball Retainer
- 17. Front Valve Body
- 18. 2-3 Regulator Plug
- 19. 1-2 Regulator Plug
- 20. 3-4 Regulator Plug
- 21. 2-3 Regulator Plug Spring
- 22. 2-3 Valve Spring
- 23. 1-2 Regulator Plug Spring 34. Control Lever Inner

- 24. 3-4 Valve Spring
- 25. 2-3 Shifter Valve
- 26. 1-2 Shifter Valve
- 27. 3-4 Shifter Valve
- 28. Inner Valve Body
- 29. Governor Plugs
- 30. Inner Valve Body Rear Plate
- 31. Valve Body Rear Cover
- 32. Compensator Spring
- 33. Double Transition Spring

- 9. Install the three governor plugs (29) in the inner valve body (28). Check for freeness in bores.
- 10. Install shifter valves 1-2 (26), 2-3 (25) and 3-4 (27) in inner valve body. Check valves for free movement.
- 11. Position the inner valve body plate (30) and valve body rear cover (31) on inner valve body (28).
- 12. Install and tighten the three attaching
- 13. Install 1-2 regulator plug spring (23) in inner valve body (28).

- Install 2-3 valve spring (22) and 2-3 regulator plug spring (21) in inner valve body.
- Install 3-4 valve spring (24) in valve body.
- 16. Lay front valve body (17) and inner valve body (28) on a clean surface; line up regulator plug springs in the inner body with the regulator plugs in front body. Compress springs with the front body and install the three attaching screws.
- 17. Position the front valve body plate (1) on front valve body (17) and install the three attaching screws. Be sure plate (1) does not extend over face of inner body (17).

18. Position the valve body spacer plate (2)

on the inner valve body (28).

19. Position the outer valve body on spacer plate (2) and insert the four valve body to transmission case attaching bolts through both valve bodies and spacer plate to hold the spacer plate in position while starting and tightening the two inner and outer valve body attaching screws.

CAUTION: Make sure all assembly screws are tight in the valve body by double checking with a small screw driver.

- 20. Install the manual shaft seal inner washer with the small inside diameter over the manual control shaft (with the dish up).
- 21. Install the manual shaft seal outer washer with the large inside diameter over the manual control shaft (with the dish down).
- 22. Install the rubber oil seal over the shaft with the lip of seal extending into the inside diameter of the outer washer.

CONTROL VALVE ASSEMBLY

ASSEMBLY: (Models H-51 and I-51)

- Carefully assemble compensator auxiliary plug (20) Figure 297, into the outer valve body (8), using a brass rod to hold plug. Install auxiliary plug pin (needle bearing roller) (21) in outer valve body locating compensator auxiliary plug.
- 2. Install throttle valve (17), throttle valve spring (18), "T" valve (19) and check the valves for freeness in bore.
- 3. Install double transition valve spring and valve, (22) and (23).
- 4. Install detent plunger retainer spacer (24) and retainer (25) to outer valve body. Be sure to use the three correct screws and have inner throttle lever (28) inside of stop in detent retainer.
- 5. Install compensator valve (5) with spring
- 6. Install throttle valve detent plug (6).
- 7. Install front servo exhaust body (3) with spacer (4) to outer valve body. Install servo release plug lock and screw (2) at small end of servo exhaust valve body. Install two screws at other end of servo exhaust valve body, and tighten the three screws.

- 8. Install the manual control valve (16) making sure manual valve operating pin engages valve correctly:
 - a. Rotate inside detent control lever counter-clockwise past the reverse position.
 - Insert manual valve detent spring (27) in bore of detent plunger retainer (25).
 - c. Insert detent plunger (26) over spring.
 - d. Push plunger and spring into bore with finger while rotating manual control lever clockwise into "LO" position.
- 9. Install manual shaft seal inner washer (15) with small inside diameter over manual control shaft (dish up).
- 10. Install manual shaft seal outer washer (14) with large inside diameter over manual control shaft (dish down).
- 11. Install the rubber manual shaft seal (13) over the shaft with lip extending into the inside diameter of outer washer.
- 12. Install the three governor plugs (42) in the inner valve body.
- 13. Position inner valve body plate (43) and valve body rear cover (44) on body. Install and tighten the three screws.
- Install the three regulator plugs (31), (35) and (38) in front valve body (30) and check for freeness in valve bores.
- 15. Install shifter valves 1-2 (37), 2-3 (34) and 3-4 (40) in inner valve body (41) and check for freeness in valve bores.
- 16. Install 1-2 regulator plug spring (36), 2-3 valve spring (33) and 2-3 regulator plug spring (32) and 3-4 valve spring (39) in valve body.
- 17. Lay front valve body (30) and inner valve body (41) on clean surface, line up regulator plug springs in inner body with regulator plugs in front body.
- 18. Compress springs with front body (30) and install three attaching screws.
- 19. Position front valve body plate (1) on front valve body and install three attaching screws. Be sure plate does not extend over face of inner body.
- 20. Position the valve body spacer plate (29) on the inner valve body.

NOTE: The spacer plate can only be installed in one way.

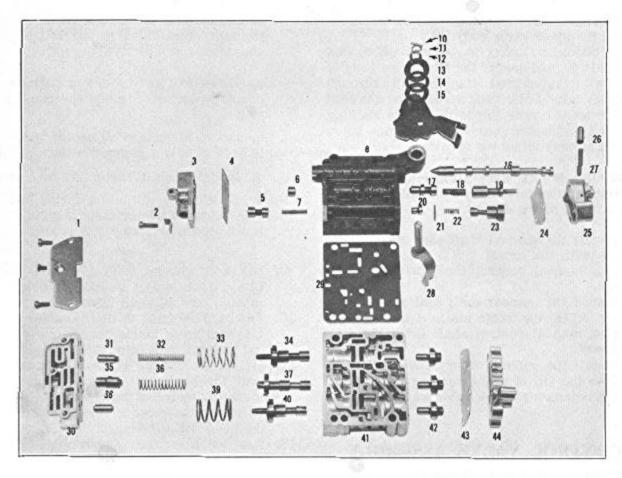


FIGURE 297

LEGEND

- 1. Front Valve Body Plate and Screws
- 2. Servo Release Plug Lock and Screw
- 3. Front Servo Exhaust Valve Body
- 4. Front Servo Exhaust Valve Body Spacer
- 5. Compensator Valve
- 6. Detent Plug
- 7. Compensator Valve Spring
- 8. Outer Valve Body
- 9. Manual Shaft
- 10. Inner Control Lover Pin
- 11. Inner Control Lever Washer
- 12. Inner Control Lever Seal
- 13. Manual Shaft Seal
- 14. Manual Shaft Seal Outer Washer
- 15. Manual Shaft Seal Inner Washer

- 16. Manual Control Valve
- 17. Throttle Valve
- 18. Throttle Valve Spring
- 19. "T" Valve
- 20. Compensator Auxiliary Plug
- 21. Compensator Auxiliary Plug Pin
- 22. Transition Valve Spring
- 23. Double Transition Valve
- 24. Detent Plunger Spacer
- 25. Detent Plunger Retainer
- 26. Detent Plunger
- 27. Manual Valve Detent Spring
- 28. Inner Throttle Lever
- 29. Valve Body Spacer Plate
- 30. Front Valve Body

- 31. 2-3 Regulator Plug
- 32. 2-3 Regulator Plug Spring
- 33. 2-3 Shifter Valve Spring
- 34, 2-3 Shifter Valve
- 35. 1-2 Regulator Plug
- 36. 1-2 Regulator Plug Spring
- 37. 1-2 Shifter Valve
- 38. 3-4 Regulator Plug
- 39. 3-4 Shifter Valve Spring
- 40. 3-4 Shifter Valve
- 41. Inner Valve Body
- 42. Governor Plugs
- 43. Inner Valve Body Plate
- 44. Valve Body Rear Cover

21. Position outer valve body on spacer plate and insert the four valve body to transmission case attaching bolts through valve bodies and spacer plate to hold spacer plate in position while starting and tightening the three inner and outer valve body attaching screws.

NOTE: Make sure all assembly screws are tight and in right location in valve body by double checking, using a small screwdriver.

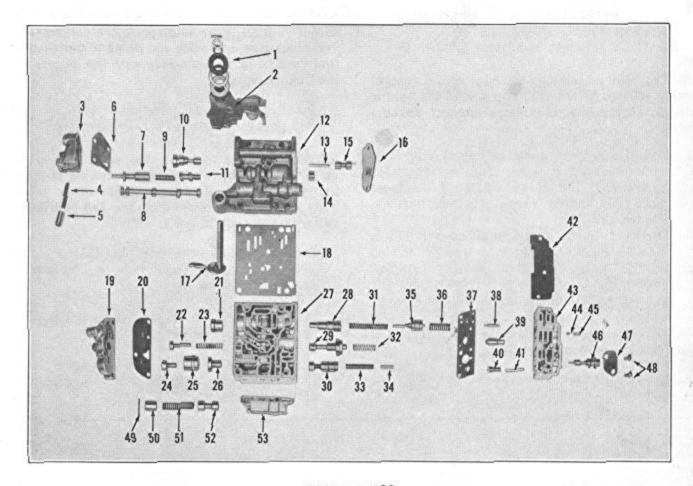


FIGURE 298

LEGEND

- 1. Rubber Seals and Washers,
- Manual Shaft and Detent Control Lever
- 3. Detent Plunger Retainer
- 4. Detent Plunger Spring
- 5. Detent Plunger
- 6. Detent Plunger Retainer Plate
- 7. "T" Valve
- 8. Manual Valve
- 9. Throttle Valve Spring
- 10. Double Transition Valve
- 11. Throttle Valve
- 12. Owier Valve Body
- 13. Compensator Valve Spring
- 14. Detent Plug
- 15. Compensator Valve
- 16. Outer Valve Body Front Plate
- 17. Inner Throttle Lever

- 18. Valve Body Spacer Plate
- 19. Rear Valve Body
- 20. Rear Valve Body Spacer Plate
- 21. 3-4 Governor Plug
- 22. 2-1 Detent Plug
- 23. 2-1 Detent Plug Spring
- 24. 2-3 Governor Plug
- 25. 2-3 Governor Sleeve
- 26. 2-3 Auxiliary Valve
- 27. Inner Valve Body
- 28. 3-4 Shift Valve
- 29. 1-2 Shift Valve
- 30. 2-3 Shift Valve
- 31. 3-4 Auxiliary Shift Spring
- 32. 1-2 Regulator Plug Spring
- 33. 2-3 Shift Valve Spring
- 34. 2-3 Shift Valve Spring Guide Pin
- 35. 3-4 Lock-out Valve Assembly

- 36. 3-4 Shift Valve Spring
- 37. Front Valve Body Separator Plate
- 38. 3-4 Regulator Plug
- 39. 1-2 Regulator Plug
- 40. T.V. Regulator Valve
- 41. T.V. Regulator Valve Spring
- 42. Front Valve Body Plate
- 43. Front Valve Body
- 44. "T" Oil Ball Check Valve
- 45. "T" Oil Ball Check Valve Spring
- 46. 3-2 Detent Plug
- 47. 3-2 Detent Plug Plate
- 48. 3-2 Detent Plug Plate Screws
- 49. 3-2 Timing Valve Plug Retainer Pin
- 50. 3-2 Timing Valve Plug
- 51. 3-2 Timing Valve Spring
- 52. 3-2 Timing Valve
- 53. 3-2 Timing Valve Body

- 22. Install the manual shaft seal inner washer with the small inside diameter over the manual control shaft (with dish up), Figure 300.
- 23. Install the manual shaft seal outer washer with the large inside diameter over

the manual control shaft (with the dish down).

24. Install the rubber oil seal over the shaft with the lip of seal extending into the inside diameter of the outer washer.

CONTROL VALVE ASSEMBLY

ASSEMBLY (Models H-52 and J-52)

NOTE: Before reassembly of the control valve, compare the springs with the spring chart, Figure 299, to assure correct assembly.

- Install the throttle valve detent plug (14), compensator valve (15), compensator spring (13), the outer valve body front plate (16), and the three attaching screws, Figure 289.
- Install the double transition valve (10), throttle valve (11), throttle valve spring (9), "T" valve (7), detent plunger retainer plates (6), detent plunger retainer (3) and the three attaching screws, Figure 293.

NOTE: Be sure inner throttle lever (17) is in position in the detent retainer.

Install the manual valve (8), detent spring
 and plunger (5).

NOTE: Align the manual valve with the inside detent control lever and rotate the control lever clockwise to index the plunger on the detent control lever assembly with the groove in the manual valve.

 Install the 2-3 auxiliary valve (26) and the 2-3 governor sleeve (25), Figure 291.

NOTE: Be Sure to guide the auxiliary valve stem into the bore and to prevent cocking on the sleeve counterbore. Shake inner valve body assembly to make sure the 2-3 auxiliary valve (26) is free in bore.

- Install the 3-4 governor plug (21), Figure 298. Use a brass rod in hole in plug to assist installation.
- Install 2-3 governor plug (24), 2-1 detent spring (23) and detent plug (22).
- Install the rear valve body spacer plate (20), rear valve body (19) and the three atattaching screws.

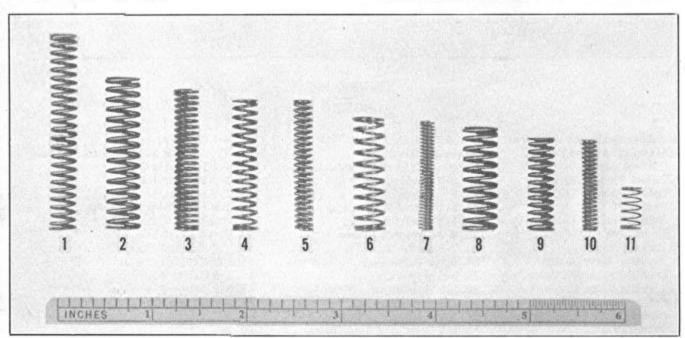


FIGURE 299

LEGEND

- Auxiliary Shift (3-4)
- 2. Timing Valve
- 3. Shift Valve (2-3)
- 4. Detent Plug (2-1)
- 5. Detent
- 6. Regulator Plug (1-2)
- 7. Compensator Valve
- 8. Shift Valve (3-4)

- 9. Throttle Valve
- 10. T.V. Regulator Valve
- 11. "T" Oil Ball Check Valve

NOTE: The detent plug can be held in position with the spacer plate and rear valve body while starting the three attaching screws.

- Install the 2-3 shift valve (30), 2-3 shift valve spring (33) and spring guide pin (34), Figure 290.
- Install the 1-2 shift valves (29) and shift valve spring (32).
- Install the 3-4 shift valve (28), the 3-4 auxiliary shift valve spring (31), the 3-4 lock-out valve (35) and the 3-4 shift valve spring (36).
- Install the 3-2 detent plug (46), the 3-2 detent plug plate (47) and the two plate attaching screws (48), Figure 289.

NOTE: Make certain the detent plug plate correctly covers the bore in the front valve body (43).

- Install the T.V. regulator valve spring, (41), the T.V. regulator valve (40), the 1-2 (39) and 3-4 (38) regulator plugs in the front valve body assembly, Figure 288.
- Install the spacer plate (37) and the three screws in the front valve body.
- 14. While holding the front valve body (43) and plate assembly with one hand and with the inner valve body assembly on a clean flat surface, bring the two assemblies together.

NOTE: It will be necessary to start the 3-4 lock-out valve (35) into the inner valve body before the attaching screws can be installed.

CAUTION: All springs should line up with the respective valves and bores and screws should be tightened alternately to bring the two valve body assemblies together evenly.

 Install the "T" oil ball check valve (44) and spring (45), Figure 288.

- Install the front valve body cover (42) and the three attaching screws and lockwashers.
- 17. Install the 3-2 timing valve (52), valve spring (51), 3-2 timing valve plug (50) and plug retainer pin (49), into the 3-2 timing valve body (53), Figure 284.
- Install the 3-2 timing valve body assembly and attaching screws on the inner valve body assembly.
- 19. Install the spacer plate (18) and the outer valve body assembly (12) on the inner valve body (27). Use the control valve to transmission case attaching bolts to line up the inner and outer valve body assemblies before installing and tightening the two attaching screws.
- 20. Install the manual shaft seal inner steel washer over the manual control shaft (with dish up), Figure 300.

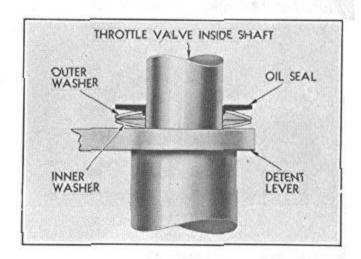


FIGURE 300

- 21. Install the manual shaft seal outer washer with the large inside diameter over the manual control shaft (with the dish down).
- 22. Install the rubber oil seal over the shaft with the lip of seal extending into the inside diameter of the outer washer.

PARKING BRAKE BRACKET ASSEMBLY

DISASSEMBLY: (Models H-51 and J-51)

- Remove the parking blocker piston (1), Figure 301. It may be necessary to tap the bracket assembly on the palm of the hand to remove the piston.
- Round off head of stop pin (4) with file and pull pin out of bracket.
- Remove the reverse blocker piston (5) and spring (6) from bracket.

NOTE: The parking brake bracket sleeve, lever and pin, crank or parking brake lever spring should not be disassembled. These parts are not furnished separately and in the event they have to be replaced, it will be necessary to replace the parking brake bracket assembly complete with pistons, springs and stop pin.

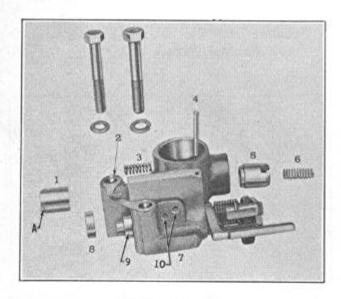


FIGURE 301

LEGEND

- 1. Parking Blocker Piston
- Parking Blocker Piston Release Spring Stop
- 3. Parking Blocker Piston Release Spring
- 4. Reverse Blocker Piston Stop Pin
- 5. Reverse Blocker Piston
- 6. Reverse Blocker Piston Spring
- 7. Parking Bracket and Crank Assembly
- 8. Crank Roller
- 9. Crank Pin
- 10. Drill Passage Plugs

PARKING BRAKE BRACKET ASSEMBLY

DISASSEMBLY: (Models H-52 and J-52)

- Remove the parking blocker stop pin (1), Figure 302, with needle nose pliers while holding your thumb over the blocker piston bore in parking bracket.
- Remove the spring (2) and parking blocker piston (3) from the parking brake bracket (7).
- 3. Remove the reverse blocker stop pin (12) by grinding or clipping end of the pin.

CAUTION: Place your hand over the piston bore while removing pin to prevent spring from flying out.

 Remove the reverse blocker piston spring (11) and blocker piston (10) from the bracket assembly.

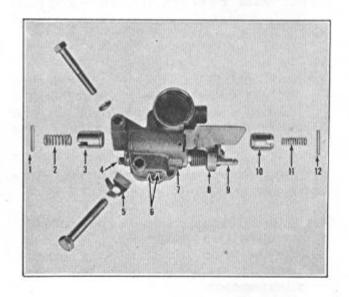


FIGURE 302

LEGEND

- 1. Parking Blocker Piston Stop Pin
- 2. Parking Blocker Piston Spring
- 3. Parking Blocker Piston
- 4. Parking Pawl Crank
- 5. Parking Blocker Stop Pin Retainer
- 6. Parking Bracket 1/4" Plugs
- 7. Parking Brake Bracket
- 8. Reverse Lever
- 9. Reverse Lever Return Spring Dowel
- 10. Reverse Blocker Piston
- 11. Reverse Blocker Piston Spring
- 12. Reverse Blocker Piston Stop Pin

INSPECTION: (Models H-51 and J-51)

 Inspect the bracket and crank assembly (7), Figure 301, to determine that crank operates freely in the bracket without binding and does not show signs of unusual wear.

NOTE: If the bracket, crank assembly, or piston bores are unusually worn, the bracket assembly should be replaced as a complete unit.

Check the crank roller (8) for wear; replace if unusually worn.

 Inspect the crank pin (9) to see that there are no visible cracks at the point where the pin joins the crank.

Clean and inspect the oil passages to the two blocker pistons. Use a tag wire to

check openings in passages.

- 5. Inspect the two blocker pistons and bores in the bracket to see that both are free of scores and burrs. Check the fit of the two blocker pistons in their respective bores to insure a non-binding, non-leaking fit. This can readily be checked by placing one finger over the oil hole in the sleeve, pulling the piston outward and observing if a slight vacuum is created. Excessive leak may be caused by plugs (10) omitted from bracket.
- Inspect the parking pawl for cracks or signs of unusual wear. Be sure the parking pawl crank is securely welded in place.
- Check springs for distortion or collapsed coils.
- Check oil delivery sleeve (7) for score marks or excessive wear.

NOTE: The three possible factors contributing to governor ring land wear are:

- a. Sloppy fit between the rear pump shaft and bushings.
- b. Loose governor flange on rear pump shaft.
- c. Misaligned governor flange.

INSPECTION: (Models H-52 and J-52)

 Inspect the bracket and crank assembly (7), Figure 302, to determine that the crank operates freely in the parking brake bracket and does not show signs of unusual wear.

- 2. Check the crank roller for wear; replace if unusually worn.
- Be sure the parking brake pawl crank (4) is securely welded in place.
- 4. Check to see that the reverse lever return spring dowel (9) is securely fastened to the reverse lever (8).
- Inspect blocker pistons (3) and (10) and their bores in the bracket for scores or burrs. Check freeness of pistons in their bores.
- Be sure center hole in the governor oil delivery sleeve is plugged with a 1/4" plug (A) and that plug is firmly staked in place, Figure 303.
- Check that both 1/4" plugs (6), Figure 302, are in place in the drilled blocker piston passages.
- 8. Check the feed to governor passage (C), Figure 303, to be sure it is open. Use a light gauge tag wire.

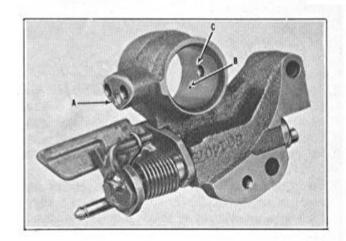


FIGURE 303

- Insert a tag wire through the small G-1 blocker piston passage (B) in the governor oil delivery sleeve. Look through the reverse blocker piston bore to check for tag wire.
- 10. Inspect springs for distortion or collapsed coils. Parking blocker piston spring (2) should have a free length of approximately 1-1/16"; the reverse blocker piston spring (11) approximately 15/16".
- Check oil delivery sleeve (7) for score marks or excessive wear. See "Governor Run-Out Checking", page 144.

CHECK GOVERNOR RUNOUT

Mount dial indicator on side of transmission case so that spindle of indicator rests against governor oil delivery sleeve, Figure 304. Use one reverse shifter bracket attaching bolt as steady rest for the indicator clamp.

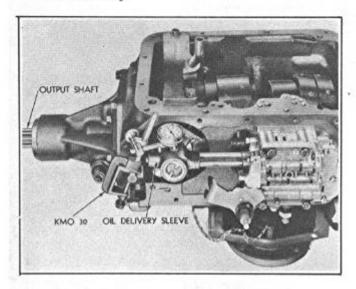


FIGURE 304

- Rotate output shaft several revolutions and note runout of governor oil delivery sleeve as measured on dial indicator. Total runout should not exceed .005".
- If governor runout is within the .005 "limit, no further check need be made.
- 4. If governor runout exceeds .005", mark position of governor body on drive flange. After control valve assembly is removed, see control valve "Removal", page 73, remove two bolts holding governor body to drive flange and remove governor body and governor oil delivery sleeve as an assembly.
- Relocate dial indicator on transmission case so that spindle of indicator rests against face of flange, Figure 305.
- Rotate output shaft several revolutions and note runout of drive flange as measured on dial indicator. Runout should not exceed .002".
- 7. If runout of drive flange exceeds .002", correct condition by replacing one or all of the following parts -- governor drive flange, rear oil pump drive gear and rear oil pump and governor drive gear as a set.

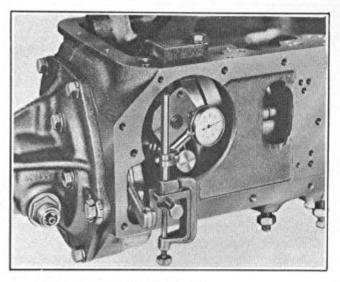


FIGURE 305

See page 114 for "Rear Oil Pump Repair" and page 98 for "Replacement of Rear Oil Pump and Governor Drive Gear" or replace the complete rear oil pump assembly. See page 77 for "Rear Pump Removal".

- If the runout of governor drive flange is less than .002", rotate governor body 180° from the original position and reinstall governor body on flange.
- Relocate dial indicator on governor sleeve and check runout as described in operation 2.
- If governor body oil delivery sleeve runout still exceeds .005", replace governor.

CHECK GOVERNOR RUNOUT (Models H-51, J-51, H-52 and J-52)

- The following checks can be made with the rear oil pump secured in the case, but with the governor removed from the flange:
 - a. Check the shaft fit by trying to tip the shaft back and forth in the rear pump housing. If the shaft rattles freely, the rear pump should be repaired or replaced. b. Check the flange to shaft fit by trying to wobble the flange on the shaft. If any free play is observed, repairs are required.

NOTE: It is possible to obtain spring movement by forcing the flange. This should not be confused with flange play.

- c. Check drive flange runout by locating dial indicator on the transmission case so that spindle of the indicator rests against face of flange on the outer edge of the face. Rotate output shaft several revolutions by turning a rear wheel. If runout of drive flange exceeds .002", correct condition by replacing one or both of the following parts governor drive flange, or complete rear oil pump assembly.
- After performing operation "c" above, check governor runout as follows:
 - a. Install a dial indicator and check governor runout at governor tower about 1/4" from the end of the governor tower. Runout should not exceed .005".
 - b. If runout still exceeds .005", rotate governor 180° on flange and recheck. If runout still exceeds .005", and governor flange runout did not exceed .002", replace governor tower assembly.

LINE EXHAUST VALVE

DISASSEMBLY: (Models H-52 and J-52)

 Remove the sleeve from the transmission case using J-5177 Line Exhaust Sleeve Remover Tool. To enter the tool, the end of handle should face the operator; when tool

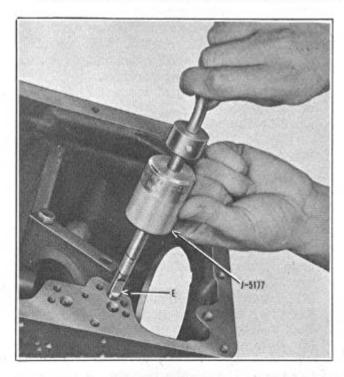


FIGURE 306

- bottoms against end of sleeve, turn handle 180° and use slide hammer to pull the sleeve out of case, Figure 306.
- 2. The line exhaust valve can be removed by pushing it down against spring pressure with a 1/8" brass rod and quickly releasing the rod so that the spring tension will force out the valve. The spring may also jump out during this operation, if not, spring can be hooked out.

INSPECTION:

- Inspect the line exhaust valve (B), Figure 307, and valve bore (D) in transmission case for nicks or score marks. The valve should work freely in bore of case.
- Inspect the line exhaust valve sleeve (A) for damage.
- Check the valve spring (C) for collapsed coils or distortion. Free length should be approximately 2-27/64".

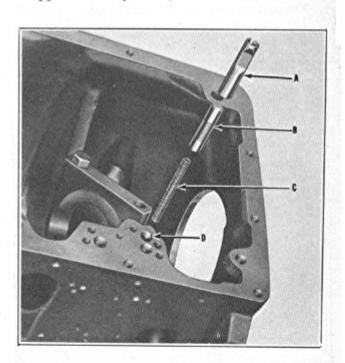


FIGURE 307

ASSEMBLY: (Models H-52 and J-52)

 Install the line exhaust valve spring (C) and valve (B) in bore (D) of transmission case. Use a 1/8" brass rod and work valve up and down several times against spring pressure to insure that the spring is bottoming in the valve bore. 2. Install the line exhaust valve sleeve (A) in bore (D) of the transmission case by tapping it in carefully with a clean soft hammer. The relieved side (E), Figure 306, of the sleeve should be toward the front servo side of the case, Figure 307, to provide clearance for the front servo to case attaching bolt.

CAUTION: The sleeve should bottom in the bore with the edge of the sleeve just inside of being flush with the machined surface of the case. It is possible to force the valve sleeve deeper than the bottoming shoulder in the transmission case which condition would impair the line exhaust valve operation.

TORUS CHECK VALVE

DISASSEMBLY FROM DRIVEN TORUS: (Models H-50, H-51, J-51, H-52 and J-52)

 Bend locks of torus check valve retainer (D) away from attaching bolts (E), Figure 308.

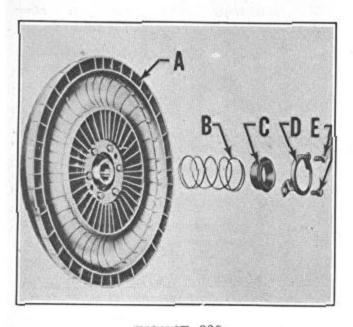


FIGURE 308

Remove the two bolts (E), torus check valve (C) and torus check valve spring (B).

CLEANING AND INSPECTION: (Models H-50, H-51, J-51, H-52 and J-52)

 Clean all parts thoroughly in a good clean solvent.

- Inspect the face of the check valve (C) (bearing surface) for scores.
- Check the inside bearing diameters of check valve for scores.
- Check free movement of check valve over hub of driven torus member.
- Check torus check valve spring for distortion.
- Check end of planet carrier shaft for nicks or burrs that would damage or restrict the operation of the check valve.

ASSEMBLY: (Models H-50, H-51, J-51, H-52 and J-52)

- Install the torus check valve spring (B), Figure 308, torus check valve (C) and retainer (D).
- Install mounting bolts (E), tighten to 6-8 ft. lbs. Position lock plates against bolts.

NOTE: After the bolts have been locked in position, check for free movement of the check valve.

TORUS COVER

INSPECTION: (Models H-50, H-51, J-51, H-52 and J-52)

- Inspect inner and outer diameter of the torus cover oil seal hub for score marks.
- Inspect grooved gasket surface for nicks or burrs. Two continuous ridges should appear on the sealing surface.
- Inspect the splines of torus hub for wear or damage.
- 4. Check torus cover hub runout as follows:
 - (a) Assemble the torus cover to the flywheel using four attaching bolts (two adjacent to the flywheel to torus dowel bolts and two 180° apart). Tighten to 20-25 ft. lbs.
 - (b) Install the Torus Member Indicator Holding Tool J-4638 into the lower right hand flywheel housing attaching hole, Figure 309.
 - (c) Install Dial Indicator Clamp with Indicator Extension Rod J-4659 to Holding Tool J-4638.
 - (d) Assemble the KMO-30 dial indicator to Extension Rod J-4659 so that the hole attachment contacts the hub of the torus cover about 1/4" from edge of hub.

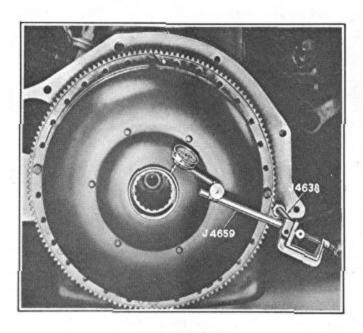


FIGURE 309

- (e) Rotate the engine with a suitable flywheel turning tool and observe hub runout which must not exceed .005".
- (f) If hub runout exceeds .005", rotate torus cover 180° on the dowel pins and recheck. If torus cover runout is still excessive, check flywheel runout. If flywheel runout does not exceed .005" replace torus cover.
- (g) If flywheel runout does not exceed .005" and torus hub runout exceeds .005", replace torus cover.

INSPECTION OF FLYWHEEL

(Models H-50, H-51, J-51, H-52 and J-52)

- Inspect the inner raised sealing surface to the flywheel for nicks or burrs. (This surface bears against the torus cover to flywheel gasket and forms a positive seal.)
- Inspect the flywheel gear teeth for damage.
- 3. Check flywheel runout with Dial Indicator KMO-30 mounted on J-4638 Indicator Support so that stem will contact the sealing surface just inside the row of torus cover bolt holes, Figure 310. Flywheel runout should not exceed .005" total indicator reading.

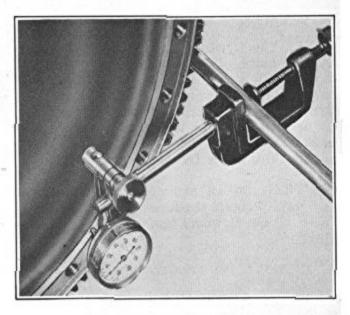


FIGURE 310

REMOVAL OF FLYWHEEL (Models H-50, H-51, J-51, H-52 and J-52)

1. With transmission removed, straighten the ears of the flywheel bolt nut lock plate (6), Figure 311. (Use a blunt chisel.)

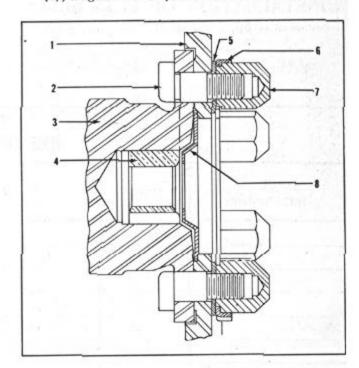


FIGURE 311

Remove the six flywheel bolt nuts (7), lock plate (6) and flat washers (5). 3. Remove the flywheel (1).

NOTE: The flywheel is a snug fit on the flywheel bolts. If the flywheel can not be removed with a straight hand pull, a slight prying action between the front surface of the flywheel and cylinder rear support plate may be necessary. (Use two small pry bars, one each side of the crankshaft flange, to eliminate cocking of the flywheel.)

CAUTION: Do not hammer on the flywheel in any way. Protect the torus cover gasket surface of the flywheel against nicking or burring.

- Remove the crankshaft bushing retainer (8).
- Clean the crankshaft flange face and mating surface of flywheel. Acetone may be used as a solvent for the Pliobond sealer.

CAUTION: Do not scratch or nick the crankshaft or flywheel mating surfaces.

INSTALLATION OF FLYWHEEL (Models H-50, H-51, J-51, H-52 and J-52)

 Check transmission mainshaft pilot bushing (4), Figure 311, for tightness in bore of crankshaft.

- Check inside diameter of bushing (4) for excessive wear.
- Apply a thin film 1/2" wide of Pliobond sealer on the crankshaft flange at the bolt circle diameter. Smooth the sealer around flange toward outer edge and allow the sealer to dry for two minutes.
- 4. Install the crankshaft bushing retainer (8).
- Install flywheel on crankshaft flange. Use care when entering flywheel bolts (2) in flywheel holes to prevent binding of the flywheel on the flywheel bolts.

NOTE: The flywheel bolt holes are so spread that the flywheel can be installed in the correct position only.

- In stall the flywheel bolt flat washers (5) and lockplate (6).
- Install the six flywheel bolt nuts (7).
 Tighten the bolts diametrically opposite in a uniform manner to 40-45 ft. lbs. torque.

NOTE: Lockplate ears must be bent securely against flat of flywheel bolt nuts as shown at (6).

REFERENCE

Source of Information	Date	Subject
-		
COLUMN TO THE REAL PROPERTY.		

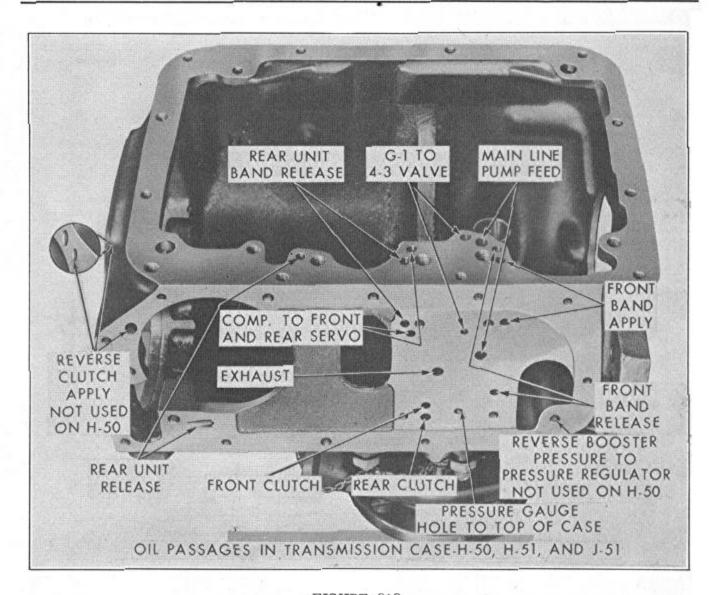


FIGURE 312

INSTALLING UNITS IN TRANSMISSION CASE

(Models H-50, H-51, J-51, H-52 and J-52)

- Remove the band adjusting screws and the oil pressure line plug.
- Thoroughly clean the transmission case with a good clean solvent.
- Blow out all oil passages (from underside side of case to outside).

NOTE: The H-51 and J-51 Transmission cases have two more oil passages than the H-50 transmission cases. One passage, located at the front upper left hand of the case is for the pressure regulator reverse oil pipe, Figure 312. The other passage at the rear lower end of the case is for the reverse clutch oil pipe. The H-51 and J-51 cases can not be used as a replacement for the H-50 models or viceversa.

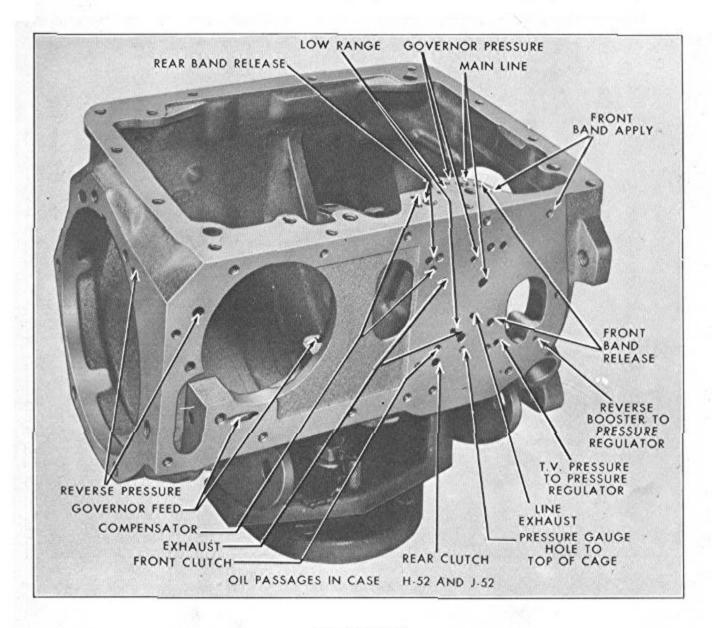


FIGURE 313

NOTE: The H-52 and J-52 transmission cases have been modified to provide new oil passages. See Figure 313. The main line passages in the transmission case have four openings. The main line passage (the hole for the main line exhaust valve and sleeve) has a small drilled hole at the bottom to allow exhaust oil to be dumped inside the case. In addition, this passage opens to the main line hole and to the line exhaust hole in the side of the case.

When applying air to the main line hole

(at the bottom of the transmission under the front servo) to check main line passages, it will be necessary to block all other holes in this passage except the one passage you are checking.

The H-52 and J-52 transmission cases cannot be used on the H-50, H-51 and J-51 transmission or vice-versa.

4. Inspect transmission case for cracks.

 Insert a wire through both oil delivery sleeve holes to check for open passages into the opening between the oil seal grooves, Figure 314.

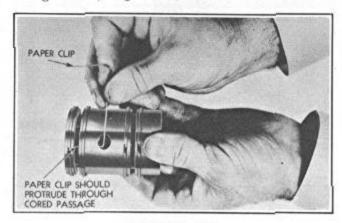


FIGURE 314

- Check the oil delivery sleeve oil seal rings for freedom in grooves; inspect grooves for damage.
- Check oil delivery sleeve ring gap in either the front or rear unit clutch drum bore (.001" to .007").
- 8. Install the oil delivery sleeve with the dowel hole toward the case.
- Install the cap with dowel of cap in one of the two oil holes in the oil delivery sleeve, tighten to 40-50 ft. lbs.
- Apply Hydra-Matic fluid on each side of the bearing cap. Apply air pressure to the front clutch and rear clutch oil holes in side of case, Figures 315, 313 and 312.

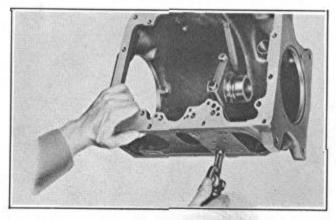


FIGURE 315

NOTE: If movement of oil on delivery sleeve is observed, leakage is indicated. Attempt correction by installing a new oil delivery sleeve. Recheck the new oil delivery sleeve in the same manner; if the new sleeve leaks, check the bearing cap and transmission contact surfaces for burrs and steel chips.

- After inspection of sleeve has been proven satisfactory, remove the bearing cap and oil delivery sleeve from case.
- Inspect the band adjusting screws and threads in case. Inspect lock nuts for damage.
- Inspect both front and rear bands for burned or worn linings.
- Inspect both steel bands for distortion or cracks.
- 15. Check strut on the rear band for alignment and free pivoting. The rear band is furnished with strut attached.
- Check anchor ends of front band for broken welds or worn sockets.

CAUTION: Do not pry either band open or distort band in any manner as they are surface-ground at the factory for drum fit.

17. Install the oil delivery sleeve over the planet carrier with long bearing up. Compress exposed oil delivery sleeve rings with Ring Compressor J-1537 and tap oil delivery sleeve into bore of front clutch drum with a rawhide hammer, Figure 316.

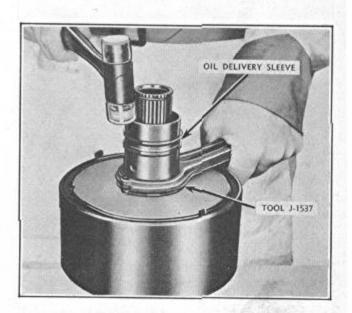


FIGURE 316

 Install the rear clutch hub front snap ring into the second groove on the planet carrier, Figure 317.



FIGURE 317

- Compress the exposed oil delivery sleeve rings with Ring Compressor J-1537, and install the rear drum assembly on planet carrier.
- Install the rear clutch hub rear snap ring, Figure 318.



FIGURE 318

NOTE: Both the front drum and rear drum should be free to rotate under slight force. If either drum binds, the unit should be disassembled and the cause of the trouble corrected.

21. Remove the front and rear units from the Holding Fixture J-2187 and position the front band over the front of front unit

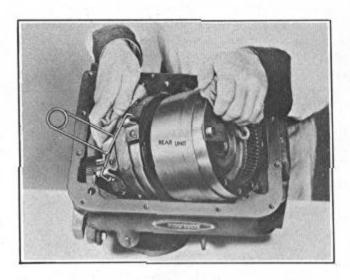


FIGURE 319

drum so that the short anchor end will be positioned to fit over the front band adjusting screw when front and rear units are placed in the case. Install one KMO-145 Compressor to hold the front band on the front drum, Figure 319.

INSTALLING FRONT AND REAR UNITS IN CASE

(Models H-50, H-51, J-51, H-52 and J-52)

 Install front and rear units with planet carrier into transmission case by lowering front end of planet carrier into case first, Figure 320.

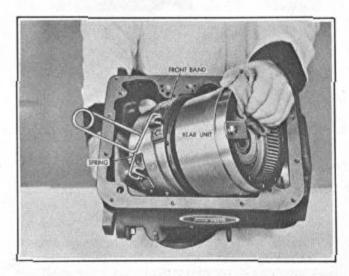


FIGURE 320

NOTE: The single hole in the oil delivery sleeve must be centered between the center bearing cap attaching bolt holes and the hole should be facing up.

- Remove the KMO-145 Compressor spring and position anchor end of band over front adjusting screw.
- Install rear band on rear unit drum and position anchor end of band over rear adjusting screw.
- Position center bearing cap over oil delivery sleeve with dowel registering with single dowel hole in sleeve. Lightly tap bearing cap in place.
- Install a new center bearing cap lock plate under attaching bolts and tighten bolts to 40-50 ft. lbs. torque.
- Bend lock plate up around bolts using large pliers.

CAUTION: Do not use a screw driver to pry corners of lock plate up, as this may damage lapped edges of transmission case.

- 7. Install screw driver between the center bearing cap and rear clutch drum to prevent the drum from moving forward, Figure 329. The screw driver should be placed at an angle to prevent damage to the oil delivery sleeve.
- 8. Remove the Rear Clutch Hub Holding Tool J-2174 from the rear drum.
- Position the rear clutch hub rear thrust washer in the counterbore of the rear hub and retain with petrolatum, Figure 321.

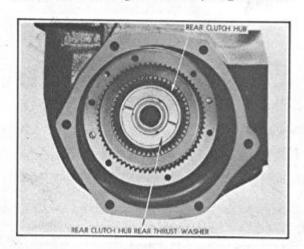


FIGURE 321

 Install the correct size selective washer in counterbore of output shaft and retain the washer in place with petrolatum, Figure 322.

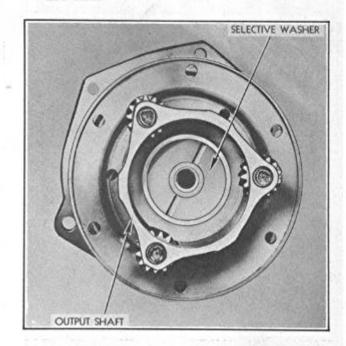


FIGURE 322

NOTE: If main shaft did not have correct end clearance prior to disassembly, select proper washer to bring end clearance within limits of .004" - .015". Selective washers are furnished in the following eight sizes:

MARK	SIZE *		
1	.055"059"		
2	.063"067"		
3	.071"075"		
4	.079"083"		
5	.087"091"		
6	.095"099"		
7	.103"107"		
8	.111"115"		

- 11. Install a new rear bearing retainer to transmission case gasket on the rear bearing retainer, align the holes and retain in place with petrolatum.
- Install the main shaft in output shaft, meshing center gear with planet pinion.
- 13. Install the main shaft and reverse assembly into rear end of the transmission case, Figure 323, Model H-50. For Models H-51, J-51, H-52 and J-52, align stationary cone lock key into keyway in transmission case, Figure 324.

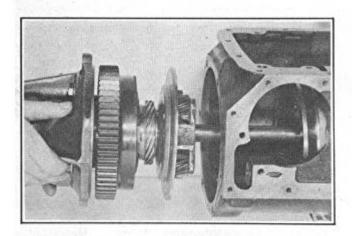


FIGURE 323

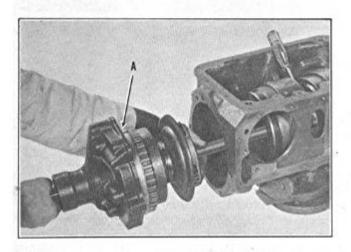


FIGURE 324

NOTE: Revolve the output shaft and main shaft to facilitate meshing planet gears with the main shaft center gear and rear drum internal gear.

 Just start the five rear bearing retainer to case attaching bolts and lock washers.

NOTE: The rear bearing retainer will not fit tightly against the case at this point.

15. Position the reverse anchor in the transmission case and install the reverse anchor support bolt and lock.

NOTE: Do not tighten the reverse anchor support bolt Model H-50, (parking pawl support bolt, Models H-51, J-51, H-52 and J-52).

16. Align the holes in reverse drive flange and rear drum and install six reverse drive flange bolts and lock washers, Figure 325. After two bolts are entered finger tight remove screw driver. CAUTION: Tighten the six bolts evenly to prevent distorting drive flange. While tightening bolts, test for freeness by turning main shaft, output shaft and front and rear unit drums.

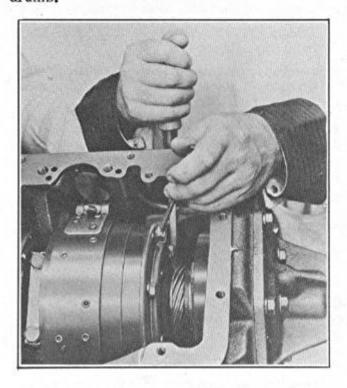


FIGURE 325

17. Push or tap the rear bearing retainer against case, then tighten mounting bolts and reverse anchor support bolt evenly to 28-33 ft. lbs. torque. Turn up reverse anchor support bolt lock, (Model H-50).

NOTE: On Models H-51, J-51, H-51 and J-52, do not torque parking brake pawl support bolt at this time.

- Test for freeness by turning main shaft, output shaft and front and rear unit drums.
- Tighten the four bearing retainer to reverse internal gear support bolts to 28-33 ft. lbs.

INSTALLING FRONT PUMP AND FRONT DRIVE GEAR IN CASE

(Models H-50, H-51, J-51, H-52 and J-52)

- Position bronze thrust washer over planet carrier, Figure 326.
- Position front oil pump cover gasket over front pump cover.

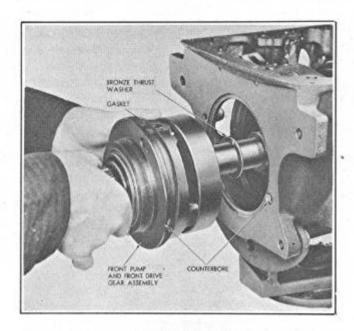


FIGURE 326

- Install the front pump and front drive gear as an assembly over planet carrier. Align locating counterbore in pump cover with the counterbore in the transmission case.
- Install pump cover locating washer in counterbore, Figure 327.

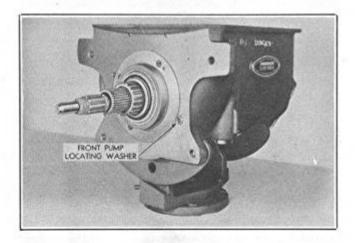


FIGURE 327

 Install two front pump attaching bolts and tighten bolts to 10-12 ft. lbs. torque.

NOTE: Cover should protrude .003" to .015" out of case. If cover protrudes less than .003" add a pump cover gasket to allow cover to protrude within limits. After this check has been completed, loosen attaching bolts. This is done to aid in positioning servo on the front pump discharge pipe.

- Install the bronze, then steel thrust washer over planet carrier, against front end of front drive gear. These washers were tied together during disassembly.
- Install the snap ring holding thrust washers in place, Figure 328.

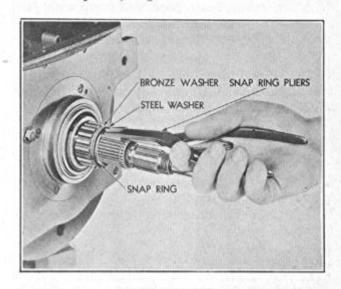


FIGURE 328

CHECK END CLEARANCE OF MAIN SHAFT: (Models H-50, H-51, J-51, H-52 and J-52)

- Install Main Shaft End Play Guide J-2587 over main shaft and front planet carrier to support the main shaft.
- Set up a dial indicator on transmission case using Dial Indicator Extension Rod J-1465, Figure 329.

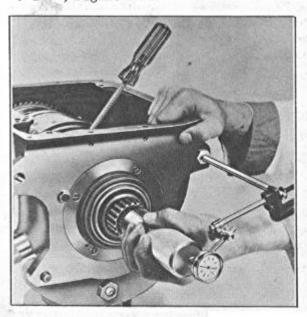


FIGURE 329

- Insert a screw driver between the front clutch drum and center bearing cap, this will hold the front planet unit forward.
- Position the dial indicator so that the spindle of indicator rests against end of Tool J-2587.
- Move main shaft back and forth with Tool J-2587. End clearance should be .004" to .015". Be sure to get just the float of main shaft.

NOTE: If end clearance is outside limits disassemble and install correct selective washer in counterbore of output shaft.

- If clearance is within limits, remove the screw driver from between front clutch drum and center bearing cap.
- Remove the dial indicator, extension and J-2587 End Play Guide.
- Install the snap ring in groove on main shaft.

INSTALLING GOVERNOR AND REAR PUMP ASSEMBLY IN CASE

(Models H-50, H-51, J-51, H-51 and J-52)

 Position the large round governor weight to the front of transmission and locate one reverse drive flange attaching bolt up to

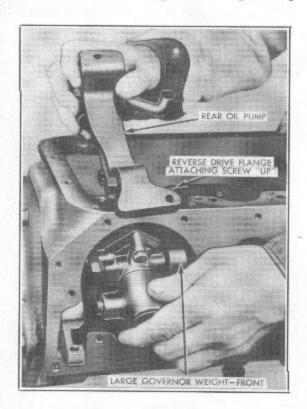


FIGURE 330

- provide clearance for pump and governor assembly to slide into transmission case, Figure 330, for Model H-50 and Figure 331, for Models H-51, J-51, H-52 and J-52.
- Slide the rear pump and governor assembly into position in the transmission case and install two attaching bolts and lock washers but do not tighten.

NOTE: These bolts must be left loose to facilitate installation of the rear pump discharge pipe and front and rear servos.

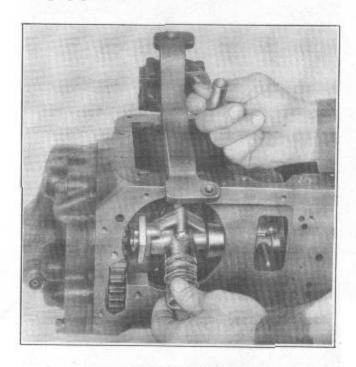


FIGURE 331

FRONT AND REAR SERVO

INSTALLATION: (Model H-50)

- Position the retracting spring and roller on the reverse bracket.
- Assemble the bracket and shims to transmission case, Figure 332.
- Install attaching bolts with lock washers.
 Tighten to 15 to 18 ft. lbs.
- Check backlash between the reverse internal gear and anchor as follows:
 - (a) Install Reverse Gear Backlash Gauge J-2650 and a dial indicator as shown, Figure 333.
 - (b) Place the inside detent control lever in reverse position.
 - (c) Place screwdriver under the reverse anchor and pry lightly to restrict up and down movement.

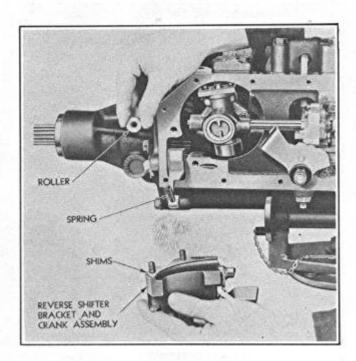


FIGURE 332

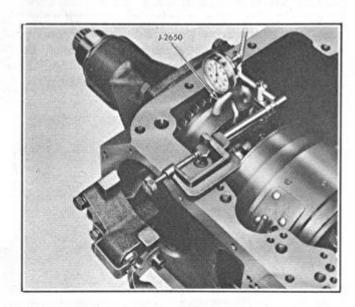


FIGURE 333

(d) Rock the reverse gear by turning the main shaft and take the reading on dial indicator. Steel shims to be either removed or installed between reverse bracket and transmission case to obtain correct backlash of .016" to .049". To increase backlash add shims, to decrease remove shims.

FRONT AND REAR SERVO INSTALLATION: (Models H-50, H-51, J-51, H-52 and J-52)

1. Install the front pump delivery pipe in front pump body at (A), Figure 334.

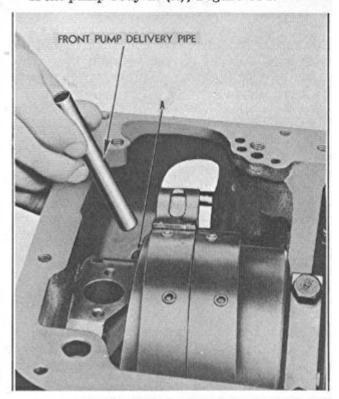


FIGURE 334

Insert end of rear pump discharge pipe into hole in rear pump, Figure 335.

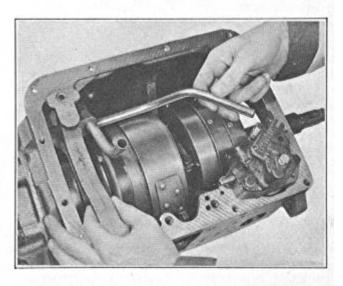


FIGURE 335

- Position front servo with piston stem in socket on end of front band; place servo on front pump delivery pipe; enter rear pump discharge pipe into fitting in servo as servo is installed in case.
- Enter front servo attaching bolts and lock washers. Do not enter more than 2 or 3 threads.

NOTE: On Models H-52 and J-52, install the rear band release spring between the struts of the rear band, Figure 336, before installing the rear servo.

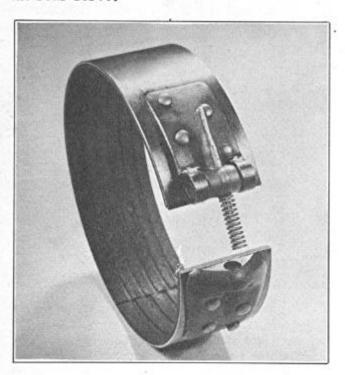


FIGURE 336

- Place the rear servo in position, engaging the rear band strut with actuating lever while entering oil transfer pipe from the front servo.
- Enter rear servo attaching bolts, then tithten all four servo attaching bolts to 23-28 ft. lbs. torque.
- On Models H-50, H-51 and J-51, install front pump intake pipe to front pump, using a new gasket and attaching bolt locks, Figure 337.

CAUTION: Do not drop gasket, bolts or lock plates into case.

8. Tighten attaching bolts to 10-12 ft. lbs. torque. Bend locks up against flat of bolts.



FIGURE 337

NOTE: On Models H-52 and J-52, the front pump intake pipe assembles through an oil seal ring in the front pump housing. When installing the intake pipe on these models, be sure to slide the pipe well down into the "O" seal ring at (A) in the front pump intake port, Figure 338.

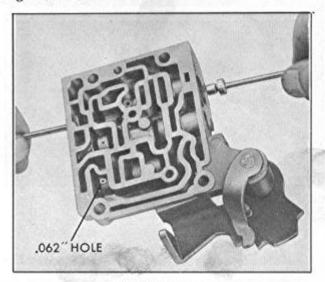


FIGURE 338

- 9. Tighten the two rear pump attaching bolts to 15 to 18 ft. lbs.
- 10. Tighten the two front pump attaching bolts with washers to 10-13 ft. lbs.

NOTE: Cover should protrude .003" to .015" out of case. If cover protrudes less than .003" add a pump cover gasket to allow cover to protrude within limits.

 Install dial indicator and check governor run out for Model H-50 as outlined on page 144.

To check governor runout for Models H-51, J-51, H-52 and J-52, proceed as follows:

- (a) Install the dial indicator so that spindle of indicator rests against the governor tower about 1/4" from the end of the governor. Runout should not exceed .005".
- (b) If runout exceeds .005", rotate governor 180° on flange and recheck.
- (c) If runout still exceeds .005", check flange runout at a point 7/8" from edge of shaft, Figure 339.

If flange run out is less than .002", replace governor. If runout exceeds .002", correct condition by replacing one or all of the following parts: governor drive flange, gear set or complete rear oil pump assembly.

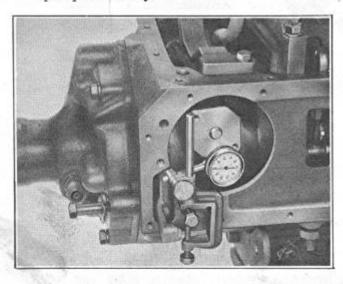


FIGURE 339

ADJUST FRONT BAND: (Models H-50, H-51, J-51, H-52 and J-52)

 Remove the pipe plug from the front servo using a 7/16" six-point socket. Loosen the 1/2" "hex" adjusting screw of gauge J-1693, until approximately 1/8" of threads are exposed above gauge body. Install gauge, tightening by HAND ONLY, Figure 340.

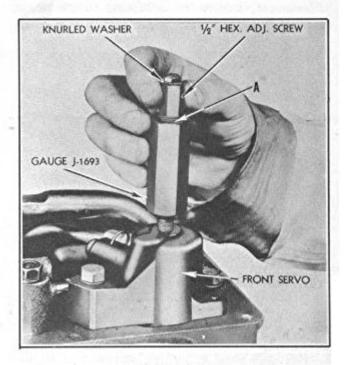


FIGURE 340

Tighten the "hex" adjusting screw with fingers until the stem of gauge is felt to JUST touch piston in the front servo.

NOTE: Before tightening adjusting screw, be sure band is lined up over drum.

- 3. Using a 1/2" wrench, tighten this 1/2" "hex" adjusting screw five complete turns from the point where it was felt by hand that stem JUST touched servo piston.
- Tighten the front band adjusting screw until knurled washer on top of the band adjusting gauge is just free to turn.
- 5. Hold band adjusting screw and tighten band adjusting screw lock nut securely to 40 to 50 ft. lbs. torque.
- Loosen the gauge adjusting screw at least six full turns and remove gauge. Install and tighten pipe plug.

ADJUST REAR BAND: (Models H-50, H-51, J-51, H-52 and J-52)

 With rear band centered on drum tighten band adjusting screw until actuating lever contacts face of gauge J-5071, Figure 341. CAUTION: Do not go beyond adjustment. If adjusting screw is accidentally turned beyond adjustment, loosen the adjusting screw two or three turns and repeat adjustment.

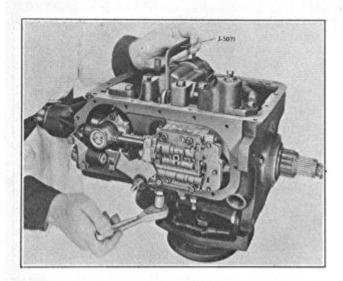


FIGURE 341

Hold the band adjusting screw and tighten adjusting screw lock nut to 40 to 50 ft. lbs. torque.

PRESSURE REGULATOR ASSEMBLY

INSTALLATION: (Model H-50)

 Inspect the pressure regulator valve, spring, rubber seal and gasket for damage.

NOTE: The pressure regulator valve must have a free fit in the bore of the front pump body; T.V. plug must be a sliding fit in the regulator plug. End coils of regulator spring must fit freely over regulator valve, Figure 342.

- Install a new gasket and rubber seal on the pressure regulator plug.
- Place a neoprene ring seal and copper gasket on the regulator plug, Figure 343.
- 4. Install the T.V. plug in the regulator plug (retain T.V. plug with heavy oil).
- Locate regulator valve on seat in the front pump and install regulator plug assembly, tighten to 40-50 ft. lbs. torque.

CAUTION: DO NOT use the H-50 pressure regulator on the H-51, J-51, H-52 or J-52 transmissions.



FIGURE 342

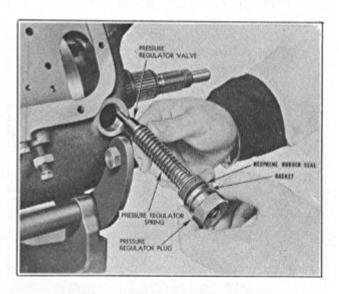


FIGURE 343

PRESSURE REGULATOR ASSEMBLY

INSTALLATION: (Models H-51 and J-51)

NOTE: The procedure for installing the H-51 and J-51 pressure regulator assembly is the same as instructions for installing the H-50 pressure regulator with the following additional information:

(a) The H-51 regulator has two plugs. The small plug T.V. plug has the same function as in the H-50 transmission. The

large plug (reverse booster plug) is new, Figures 344 and 345. In reverse, oil pressure enters the hole (in the threads) of the pressure regulator plug and forces against the reverse booster plug forcing the booster plug against the pressure regulator valve. The additional pressure is required to insure positive reverse clutch action. During forward operation of the car, oil is cut off at this point and the reverse booster plug acts as a spacer having no effect in the assembly.

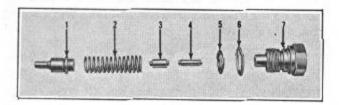


FIGURE 344

CAUTION: Do not use the H-51 pressure regulator assembly on the H-50, J-51, H-52 or J-52 transmissions.

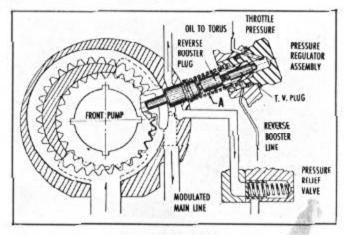


FIGURE 345

(b) The J-51 pressure regulator does not have the T.V. plug or the neoprene ring seal. See Figure 56, for comparison of the H-51 and J-51 pressure regulators.

CAUTION: Do not use the J-51 pressure regulator assembly on the H-50, H-51, H-52 or I-52 transmissions.

PRESSURE REGULATOR ASSEMBLY

INSTALLATION: (Models H-52 and J-52)

NOTE: The pressure regulator assembly for the H-52 and J-52 transmission is similar to the H-51 pressure regulator assembly, however, the H-52 and J-52 pressure regulator valve is of a new design to work with the new vane type front pump, Figure 346. For comparison of H-51, H-52 and J-52 regulators, see Figures 56 and 57 and pages 42 and 43 for principle of operation.

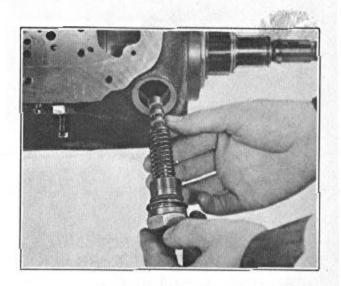


FIGURE 346

CONTROL VALVE ASSEMBLY

INSTALLATION: (Model H-50)

Install the oil delivery sleeve on the governor body. Place chamfered side of oil delivery sleeve over the end of the governor and carefully press the sleeve on guiding the rings with your fingers. (Be sure rings have the openings up to assist installation.)

 Install the three oil delivery pipes into the three holes in the governor oil delivery sleeve and pull oil delivery sleeve out 1/8".

 With inside detent control lever in "LO" position, push control valve assembly onto oil delivery pipes, Figure 347.

 Lower control valve assembly into position and push the delivery sleeve in to bring control valve assembly against case.

 Install four control valve assembly attaching bolts and lock washers. Tighten to 6-8 ft. lbs. torque.

NOTE: Be sure governor oil delivery sleeve is in place.

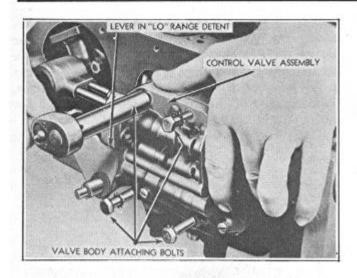


FIGURE 347

Recheck governor runout as outlined on page 144.

CONTROL VALVE ASSEMBLY AND PARKING BRAKE BRACKET ASSEMBLY

INSTALLATION: (Models H-51, J-51, H-52 and J-52)

- Remove the parking brake pawl support bolt from the transmission case.
- 2. Install the parking pawl into position in

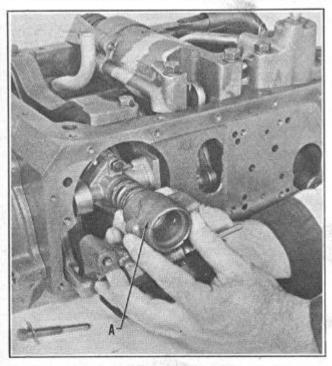


FIGURE 348

- transmission case, BUT DO NOT INSTALL parking brake pawl support bolt.
- Place the chamfered side of the governor oil delivery sleeve (A) over the end of the governor and install carefully guiding rings into the oil delivery sleeve, Figure 348
- Install three oil delivery pipes into the parking brake bracket assembly.

NOTE: Models H-52 and J-52 have only two oil delivery pipes. The center pipe is no longer required. Be sure the center hole in the governor oil delivery sleeve is plugged with a 1/4" plug.

 Install the parking blocker piston spring (C), Figure 349, piston release spring stop (B) and start brake bracket to case bolts into transmission case. Loosen rear pump attaching bolts.

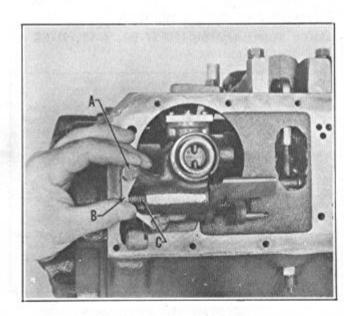


FIGURE 349

NOTE: On Models H-52 and J-52 the parking blocker piston spring is retained by the parking blocker piston stop pin. Position the parking blocker piston pin retainer with the large tang of the retainer (E) over the end of the pin so that the pin cannot drop out, Figure 350.

6. Install crank roller on parking brake pawl crank; raise pawl to position and install parking brake pawl support bolt. Tighten pawl bolt to 23-28 ft. lbs. torque. Bend lock plate over flat of bolt.

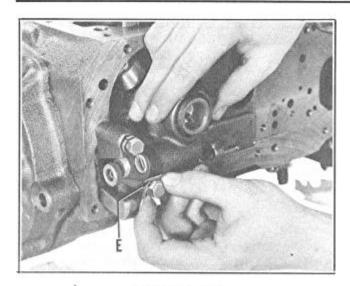


FIGURE 350

 Install the parking pawl return spring (B) over the inside oil delivery pipe (open end of hook out) and hook other end over the parking brake lever pin groove, Figure 351.

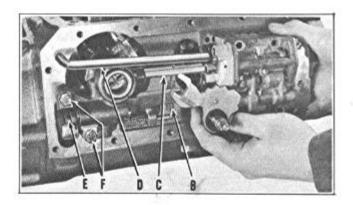


FIGURE 351

- Install the reverse clutch pipe (A), with "L" end in rear of transmission case.
- 9. In stall the control valve assembly over the three oil delivery pipes (C) for Models H-51 and J-51. (Only two pipes for Models H-52 and J-52) and reverse clutch pipe, (A) and start control valve attaching bolts. Place detent control lever in "LO" position and press valve body and parking brake bracket assembly against transmission case and tighten valve body bolts evenly to 6-8 ft. lbs.
- Install the pressure regulator reverse oil pipe, (A), Figure 119.

NOTE: Rotate the governor a full turn to make sure the governor weight will not strike the oil delivery pipe (B). (This pipe connects between the front servo and passage in case between rear servo and rear pump), Figure 352.

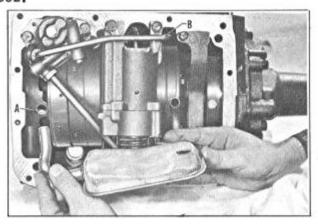


FIGURE 352

CHECKING PARKING BRAKE BRACKET TO GOVERNOR ALIGNMENT: (Models H-51, J-51, H-52 and J-52)

 With the rear pump bolts and parking bracket bolts loose, install the governor to sleeve aligning tool J-4731 over the governor, Figure 353. With alignment tool in place, tighten the rear pump bolts and parking bracket bolts. Tool should rotate freely and governor should rotate freely as much as gear backlash allows.

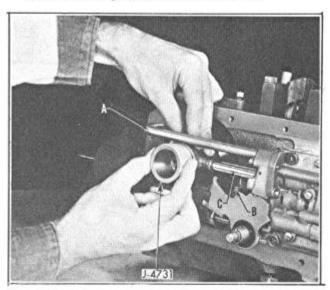


FIGURE 353

Rotate output shaft to turn governor 1/4 turn and check governor and tool again for freeness. If the governor or tool bind at any point, loosen bracket and/or rear pump and adjust as required to give governor free movement. After rechecking governor for freeness, each 1/4 turn for a complete revolution, remove aligning tool J-4731.

INSTALLING SIDE COVER AND OUTER SHIFT LEVER: (Models H-50, H-51, J-51, H-52 and J-52)

- Place a new gasket on side cover and retain in place with petrolatum.
- Position side cover and gasket assembly over manual shaft.
- Install the side cover attaching bolts with COPPER WASHERS finger tight. Shift cover to centralize manual shaft in hole and tighten bolts to 10-12 ft. lbs. torque.
- 4. In stall outer shift lever. Tighten clamp bolt to 10-13 ft. lbs. torque.

NOTE: The throttle control lever should be installed on the throttle shaft after the transmission is installed in the car. This procedure will prevent accidental damage to the throttle lever.

INSTALLING TRANSMISSION OIL SCREEN AND OIL PAN: (Models H-50, H-51, J-51, H-52 and J-52)

- Slide oil screen over front pump intake pipe and position the screw over the rear pump intake pipe.
- Place new oil pan gasket on transmission case.
- Position oil pan over gasket and align holes.
- Start attaching bolts with lock washers to line up pan. Then tighten bolts to 10-13 ft. lbs. torque.
- Install new oil pan drain plug gasket and tighten plug to 35-45 ft. lbs. torque.

INSTALLING FLYWHEEL HOUSING TORUS COVER AND TORUS MEMBERS: (Models H-50, H-51, J-51, H-52 and J-52)

 On Model H-50 only, install the transmission case to flywheel housing gasket against face of transmission, retain with heavy oil and align holes.

NOTE: Models H-51, J-51, H-52 and J-52 do not use a gasket at this point.

- Install the flywheel housing on front face of transmission case and install the four attaching bolts and lock washers using care to prevent damage to gasket. Tighten bolts to 40-50 ft. lbs. torque.
- Install the torus cover, aligning splines of torus cover hub with splines of the front drive gear. Push on torus cover evenly (without rocking cover) to prevent damage to the oil seal and rings.
- Install the drive torus in the splines of the front planet carrier and install the snap ring, Figure 354.

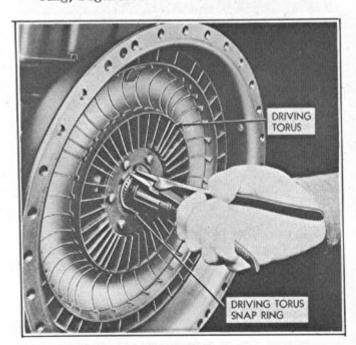


FIGURE 354

Install the driven torus on the main shaft so that the hub seats against the open type snap ring.

- Install a new main shaft nut, lock plate (ear over flat on torus hub) and install the main shaft nut.
- 7. Move shift lever into the reverse position and tighten the main shaft nut using a torque wrench and a 1-7/16" socket. Tighten to 50-60 ft. lbs. torque.
- Bend the lock plate against flat of main shaft nut.
- 9. Install the oil level indicator.

NOTE: The air cleaner in the oil level indicator cap, Figure 355, should be cleaned every 10,000 miles or twice a year.

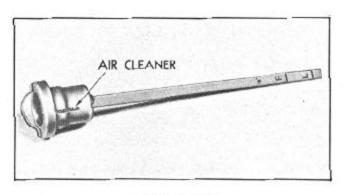


FIGURE 355

REFERENCE

Source of Information	Date	Subject	
	 		
	 		
	1		
			-
	. 5		
	 		
		130/20	
1196		8.50	

INSTALLING HYDRA-MATIC TRANSMISSION

(Models H-50, H-51, J-51, H-52 and J-52)

- 1. Raise car.
- 2. Thoroughly clean face of flywheel.
- Check flywheel pilot bearing retainer (8), Figure 311, to be sure it is properly positioned and that the pilot bearing (4) is tight in crankshaft.
- Tighten flywheel to crankshaft attaching nuts (7) to 40-45 ft. lbs. torque and turn up ears of flywheel nut retainer (6) against flats of attaching nuts.
- Install a new gasket on face of flywheel. Gasket should be held in place with petrolatum. Do Not use shellac or any other sealer.

NOTE: To provide a good seal it is very important that the gasket be in perfect condition and that flywheel gasket surface (A) be free of all burrs, Figure 356.

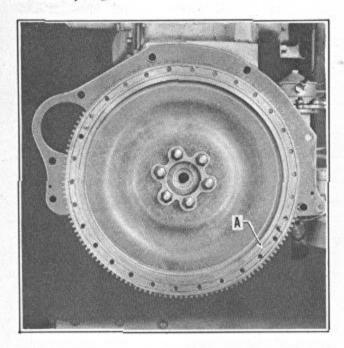


FIGURE 356

- Using Transmission Eye Bolt J-4660, Figure 357, lift transmission into position using a hydraulic jack with cradle and tilt table attached, and with handle of jack to rear of car, Figure 358.
- While raising transmission with the hydraulic jack, guide the transmission mainshaft pilot into flywheel pilot bearing.

CAUTION: Careful use of the hydraulic jack tilt table will eliminate scraping or damage to the flywheel when installing the transmission.

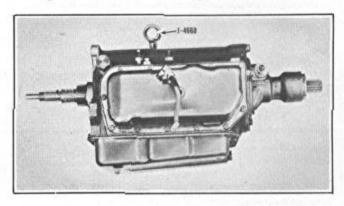


FIGURE 357

- Lower engine into approximately normal position by turning the two adjusting screw nuts of the Engine Holding Fixture J-4651.
- Position the torus cover on flywheel so that the dowel pins on flywheel and holes

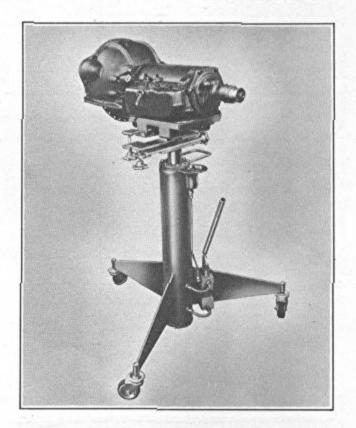


FIGURE 358

in torus cover (or punch marks on dowel

and torus cover) correspond.

 Push transmission forward until dowels of cylinder block and engine rear plate enter flywheel housing and dowels in flywheel enter into dowel holes of the torus cover.

 Install the two upper flywheel housing bolts working through the two openings in driver's compartment, Figure 359. Tighten bolts finger tight.

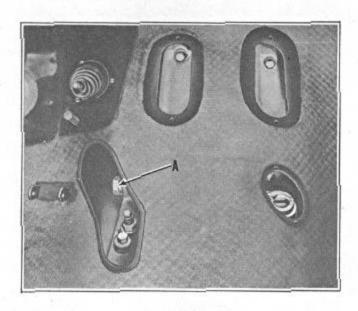


FIGURE 359

 Install the lower flywheel housing attaching bolts. Tighten all bolts securely to 40-50 ft. lbs. torque.

 With the transmission still supported by the hydraulic jack, install torus cover to flywheel attaching screws.

NOTE: After all bolts are installed, tighten two bolts adjacent to the flywheel dowels to 12-15 ft. lbs. and then tighten two bolts located 90° from dowels to 12-15 ft. lbs. Then tighten all bolts in rotation to 20-25 ft. lbs. Follow again with tightening all bolts in rotation to 26-31 ft. lbs. Use a flywheel turning tool and a torque wrench, Figure 360.

- Determine that torus cover drain plug is tight.
- In stall flywheel housing dust cover assembly and four attaching screws.

NOTE: Raise engine approximately 1/2" above its normal operating position to facilitate installation of the No. 3 crossmember.

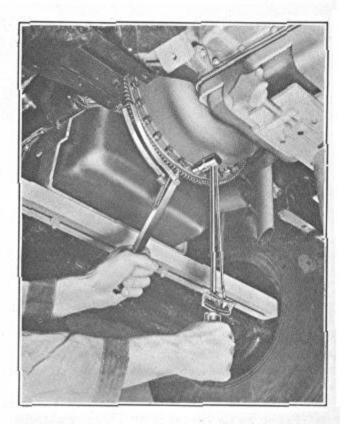


FIGURE 360

 Install No. 3 crossmember, Figure 361, start one bolt at each side to hold member in position.

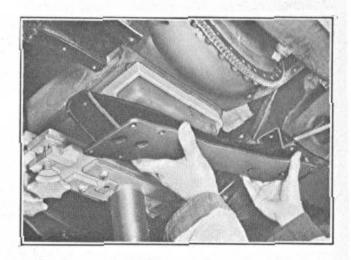


FIGURE 361

- 17. Install bolts (C) and (D), Figure 362, attaching No. 3 crossmember to frame (both sides) but do not tighten bolts.
- 18. Install the engine rear support bolts (B) attaching the rear insulators to the No. 3 crossmember (two each side). Lower the

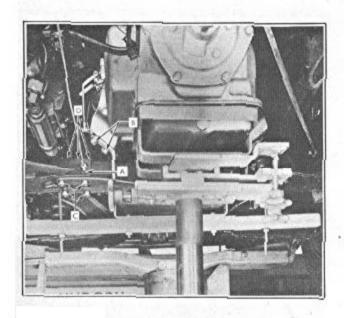


FIGURE 362

engine while tightening the rear support bolts securely.

- Tighten bolts (C) and (D) securely and lower hydraulic jack to place transmission in its normal position.
- Enter hand brake cable through hole provided in No. 3 crossmember and install retainer (C).
- Connect hand brake cable clevis (C) at support (E), Figure 363.
- 22. Connect hand brake cable lever return spring (D) at the hand brake cable lever (E).
- Install propeller shafts and center bearing by reversing procedure of removal.
- 24. Connect speedometer cable at (A).
- 25. Remove Engine Holding Fixture J-4651 while transmission is supported with hydraulic jack. After support has been removed, release hydraulic jack.
- 26. In stall left hand side engine rear stone

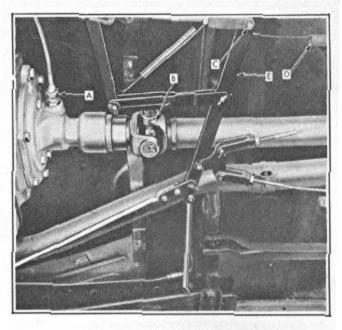


FIGURE 363

- guard assembly (4 self tapping screws).
- Connect selector lever control rod assembly and recheck adjustment. See pages 170 and 173.
- 28. Install outer throttle lever.
- 29. Connect transmission throttle rod at side of transmission control lever and recheck adjustment pages 169 thru 172.
- 30. Lower car and install valve cover breather pipe, pipe attaching bracket and starter motor.
- 31. Connect battery cable at starter motor and battery ground cable at battery.
- 32. Remove oil level indicator, Figure 81, and refill transmission as outlined on pages 55 and 56.
- Test main line pressure according to instructions on page 184.
- Install floor hole cover, mat and accelerator pedal.
- 35. Road test car using "Diagnosis Guide".

REFERENCE

Source of Information	Date		Subject	
100	VIANCE IN			
	_80.			
LPLU TO	and project.	5 8,	 woman Landa	do be industry

ADJUSTMENT WITH TRANSMISSION IN CAR

THROTTLE CONTROL LINKAGE ADJUSTMENT

(Models 5A, 6A, 7A, 8A, 6B, 7B and 8B with 262 or 308 Cubic Inch Engines)

 Adjust engine idle speed at 490-510 R.P.M. with engine at normal operating temperature, transmission warm and selector lever in the "N" (Neutral) position.

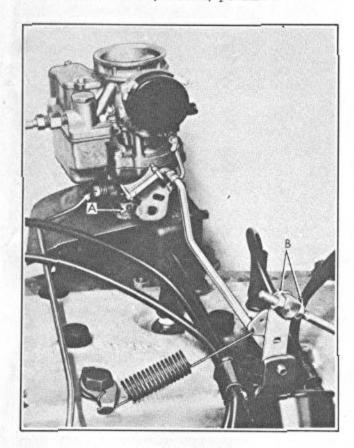


FIGURE 364

- 2. With the carburetor throttle idle screw (A), Figure 364, against its stop and carburetor off fast idle, adjust the accelerator cross shaft operating rod trunnion nuts (B), Figures 364 and 365, until gauge pin J-2544 can be installed freely into the accelerator pedal bellcrank lever (C) and the hole in the boss of the cylinder block at (D), Figure 365, for Models 5A, 6A, 6B, 7A, 7B or in the throttle bellcrank support assembly for Models 8A and 8B.
- Tighten the trunnion lock nuts (B) securely. Recheck this adjustment by removing and

installing the gauge pin into the bellcrank lever and boss hole. Pin should again enter both holes freely. After rechecking this adjustment remove the J-2544 Gauge Pin.

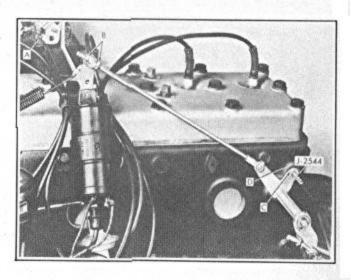


FIGURE 365

 Raise the car, disconnect the transmission throttle rod (G), Figure 366, at the transmission outer lever (H) by removing the cotter pin and clevis pin. Tighten outer throttle lever clamp bolt (F) if necessary.

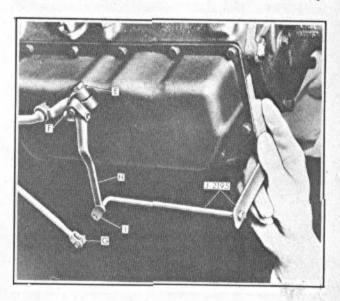


FIGURE 366

Check position of the outer throttle lever as follows: (a) Clean the machined surface at back of transmission case and place the Throttle Lever Checking Gauge J-2195 flat against the back surface of the transmission case with the edge of the checking gauge against the transmission side cover, Figure 366.

(b) With the transmission outer throttle lever held against its stop (toward rear of transmission), the outer throttle lever hole should be centered on the small diameter of the gauge pin (1) and the inside face of the throttle control lever should just touch the larger diameter of the gauge rod. Do Not Force the outer lever against its stop and Do Not try to bend this lever unless you have the proper bending tool.

NOTE: If the outer throttle lever lower hole does not center on the checking fixture pin as outlined in paragraph (b) use the Throttle Lever Bending Tool J-3310 to bend the throttle lever into proper alignment, employing the bending tool as illustrated in Figure 367, with pins facing outward to bend the lever rearward.

To bend the lever forward, reverse the bending tool (bending tool pins will now face toward transmission).

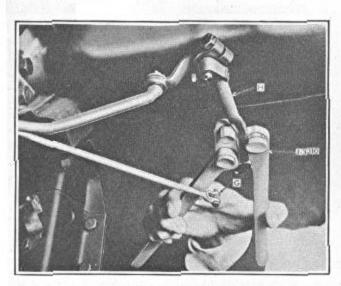


FIGURE 367

- (c) After properly aligning the throttle outer lever to the throttle checking fixture, install the transmission throttle rod (G), clevis pin, and cotter pin to the outer throttle lever (H), secure the cotter pin; lower car.
- Disconnect the transmission throttle rod trunnion (J) from the accelerator pedal

link bellcrank lever by removing the cotter pin and flat washer from the trunnion pin, Figure 368.

Install Gauge Pin J-2544 into accelerator bellcrank lever (C) and hole in boss.

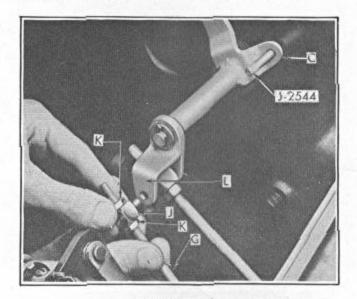


FIGURE 368

6. Holding the transmission throttle lever (H) against its stop in the transmission by pushing the transmission throttle rod rearward lightly by hand, Figure 368, adjust the transmission throttle rod so trunnion pin will slide freely into the accelerator pedal link bellcrank lever (L).

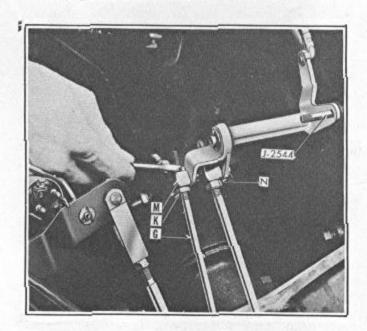
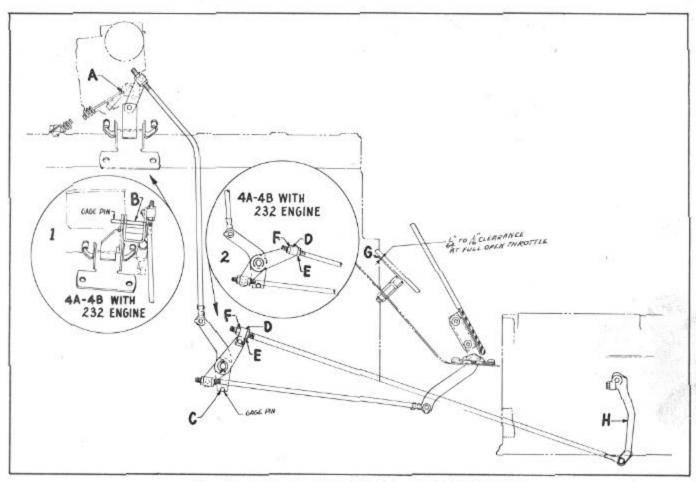


FIGURE 369



4A, 4B AND 5B THROTTLE ARRANGEMENT

FIGURE 370

- 7. Install the trunnion pin, flat washer and cotter pin and with the trunnion pin in position loosen the rear adjusting nut (E) approximately 1-3/4 turns or until a 1/16" shim can be installed between the rear lock nut and the trunnion; remove the shim and tighten the front lock nut (F) without turning the rear lock nut, (E). This will pull the throttle lever forward of the stop a distance equivalent to the thickness of the shim (1/16"). Remove gauge pin J-2544.
- 8. Loosen lock nut (N).
- 9. While holding the carburetor throttle wide open and with the accelerator pedal against its stop at the floor panel (driver's compartment), adjust lock nut (N) until it touches the trunnion; increase adjustment 1/4" further and tighten front lock nut. This will give approximately 1/16" clearance between bottom of accelerator and the stop.

THROTTLE CONTROL LINKAGE ADJUSTMENT

(Models 4A, 4B and 5B)

- Hook the throttle return spring in the lower hole of the cross shaft lever for Models 4B and 5B with the 262 engine at (A), Figure 370.
- Adjust the engine idle speed at 490-510 R.P.M. with engine at normal operating temperature, transmission warm and selector lever in the "N" (Neutral) position.
- 3. With the carburetor throttle idle screw against its stop and carburetor off fast idle (Model 4A, 4B with the 232 engine) adjust the throttle control bellcrank to carburetor rod so that gauge pin J-2544 will freely enter the two gauge pin holes in the throttle control bellcrank and the slotted hole in the throttle control bellcrank support bracket at (B). After making adjustment remove gauge pin J-2544.

4. Models 4A, 4B and 5B. With the carburetor idle adjustment screw against its stop, adjust the throttle bellcrank shaft operating rod (this is the cross shaft operating rod for Models 4B and 5B with the 262 engine) until the gauge pin J-2544 will freely enter the seat in the accelerator pedal link bellcrank lever and the gauge hole in the cylinder block at (C), Figure 370, (located at the end of the starting motor).

NOTE: Gauge pin J-2544 should work freely in throttle control bellcrank and gauge hole in block.

- Check the position of the outer throttle lever as follows:
 - (a) Clean the machined surface at back of transmission case and place the throttle Lever Checking Gauge J-2195 flat against the back surface of the transmission case with edge of the checking gauge against the transmission side cover as shown in Figure 366.
 - (b) With the transmission outer throttle lever held against its stop (toward rear of transmission), the throttle outer lever hole should be centered on the small diameter of the gauge pin (I) and the inside face of the throttle control lever should just touch the larger diameter of the gauge rod. Do Not Force the outer lever against its stop and Do Not try to bend this lever unless you have the proper bending tool.

NOTE: If the outer throttle lever lower hole does not center on the checking fixture pin as outlined in paragraph (b) use the Throttle Lever Bending Tool J-3310 to bend the throttle lever into proper alignment, employing the bending tool as illustrated in Figure 367 with pins facing outward to bend the lever rearward.

To bend the lever forward, reverse the bending tool (bending tool pins will now face towards transmission).

- (c) After properly aligning the throttle outer lever to the throttle checking fixture, install the transmission throttle rod (G), clevis pin and cotter pin to the outer throttle lever (H) and secure the cotter pin.
- For Models 4A, 4B and 5B. With gauge pin J-2544 in position at (C) in the throttle control bellcrank and the hole in the cylinder block, disconnect the transmission

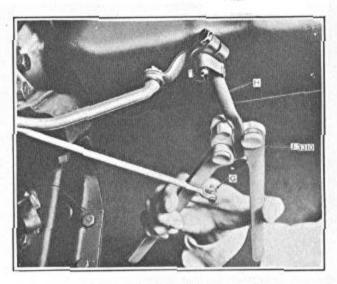


FIGURE 371

throttle rod at the accelerator pedal link bellcrank lever at (D). Lightly push the transmission throttle valve lever (H) rearward against its stop in the transmission, and adjust the throttle rod so that the trunnion pin will slide freely into the accelerator pedal link bellcrank lever.

Install the trunnion pin, flat washer and cotter pin and with the trunnion pin in position loosen the rear adjusting nut (E) approximately 1-3/4 turns or until a 1/16" shim can be installed between the rear lock nut and the trunnion; remove the shim and tighten the front lock nut (F) without turning the rear lock nut, (E). This will pull the throttle lever forward of the stop a distance equivalent to the thickness of the shim (1/16"). Remove gauge pin J-2544.

7. For accelerator pedal adjustment, with gauge pin removed, adjust the accelerator pedal to bellcrank rod to get from 1/64" to 1/16" clearance between the pedal and the pedal stop at full open throttle, shown as (G).

MANUAL CONTROL LINKAGE ADJUSTMENT

(Models H-50, H-51, J-51, H-52 and J-52)

 After determining that the upper and lower control tube brackets are tightened securely on the steering column jacket tube and that the selector lever tube is parallel with the steering gear jacket tube, disconnect the transmission shift rod (O) at the manual control lower lever (P).

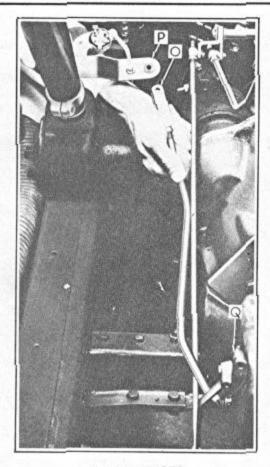


FIGURE 372

2. With the transmission shift rod (O) disconnected, place transmission shift lever (Q) (at transmission) in the reverse position by pushing the transmission shift rod (O) rearward as far as it will go (reverse position), Figure 372. Next pull shift lever rod (O) forward (one detent), placing transmission shift lever (Q) in "LO" position for Models H-50, H-51 and J-51 and to the "DR-3" position (two detents) for Models H-52 and J-52.

CAUTION: Move the transmission shift rod (O) slowly so that shift lever (Q) is moved only one detent (to "LO" position) for Models H-50, H-51 and J-51 and two detents ("DR-3" position) for Models H-52 and J-52.

Place the manual selector lever (at steering wheel) in the "LO" position for Models H-50, H-51 and J-51 and to "DR-3" position for Models H-52 and J-52, and pull the manual selector lever as far as it will go

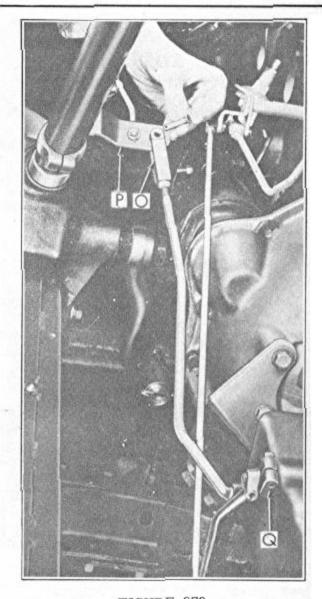


FIGURE 373

toward reverse without lifting the selector lever.

4. Adjust the length of the transmission shift rod (O) until the clevis pin holes in clevis align with the hole in the manual control tube lower lever (P), Figure 373. Do Not move either the transmission shift lever (Q) or the manual control lever (P) when making the rod adjustment. After determining that the pin enters freely, increase the length of shift rod (O) by turning the clevis one full turn. Install clevis pin, flat washer and cotter pin. Tighten clevis lock nut against clevis. Operate manual control shift lever to recheck that all positions of the control lever index properly on the indicator dial.

NEUTRAL SAFETY SWITCH ADJUSTMENT

(Models H-50, H-51, J-51, H-52 and J-52)

 Place the manual control lever in the "N" (Neutral) position.

 Loosen the safety switch adjusting screw (S), Figure 374, and adjust the switch to close at a position approximately midway between "N" (Neutral) and "DR" (Drive) on the selector lever indicator dial. Tighten adjusting screw securely.

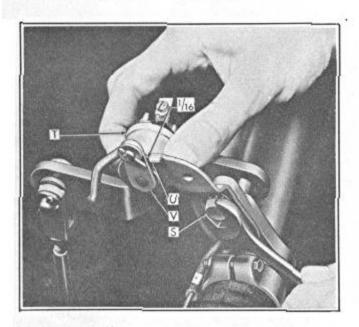


FIGURE 374

NOTE: With the manual control lever in the "N" (Neutral) position the starter should operate when the ignition switch is on and starter is engaged. The starter should not operate in any other position but "N" (Neutral).

ADJUSTING HYDRA-MATIC TRANSMISSION BANDS

(EXTERNAL ADJUSTMENT)

- Set hand brake firmly and block front wheels with wheel shocks to prevent car running forward during adjustment.
- Remove accelerator pedal, floor mat and adjusting hole cover.
- Connect an Electrical Tachometer to distributor and ground.

- Start engine and allow engine to run until normal operating temperature is reached. (Choke and fast idle off.)
- Position control lever in "DR" range for Models H-50, H-51 and J-51 and in "DR-4" range for Models H-52 and J-52.

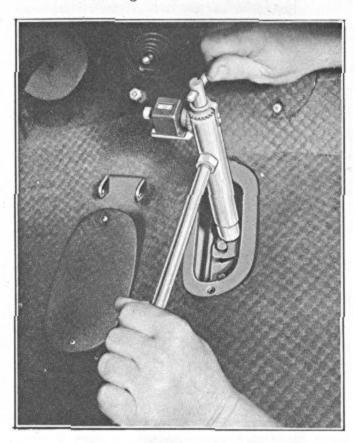


FIGURE 375

Adjust carburetor idle speed screw to give 700 R.P.M.

FRONT BAND:

- Using Band Adjusting Tool No. J-2681-A, loosen the front band adjusting screw lock nut, Figure 375.
- Loosen the front band adjusting screw (by turning top handle while holding lower handle of Tool J-2681-A) until the engine speed increases to 800-900 R.P.M. (Front drum is now spinning freely.)
- Tighten the front band adjusting screw slowly until engine returns to 700 R.P.M. (front drum has now stopped turning).
- 10. Once more loosen the front band adjusting screw until engine speed increases and tighten the screw again (slowly) until engine speed returns to 700 R.P.M.

NOTE: The object in loosening and retightening the screw is to locate the exact point at which the band stops the drum from spinning. At this point wait 30 seconds. If engine speed again increases, tighten screw 1/10 of a turn more. Repeat this procedure until engine speed remains at 700 R.P.M. for at least 30 seconds.

11. Set counter on tool to 00.

12. While holding lock nut stationary with long handle of tool, tighten adjusting screw exactly 6 turns with short handle (counter will read 6.0).

13. Hold the front band adjusting screw stationary with the short handle of Tool J-2681-A and tighten the adjusting screw lock nut by turning the outer body of the tool with the long (outer) handle.

NOTE: Adjusting screw must not move during this tightening operation. After the lock nut has been tightened the counter will read less than 6 by the amount the lock nut was tightened.

REAR BAND:

 With control lever in "DR" range, loosen the rear band adjusting screw lock nut, Figure 375.

Loosen the rear band adjusting screw until the engine speed increases to 800-900 R.P.M. (rear drum now spinning freely).

16. Tighten the rear band adjusting screw slowly until engine returns to 700 R.P.M. (rear drum now stopped).

 Loosen the rear band adjusting screw until engine speed increases and tighten again slowly until engine speed returns to 700 R.P.M.

NOTE: At this point wait 30 seconds. If engine speed increases, tighten adjusting screw 1/10 of a turn. Wait another 30 seconds and if engine speed again increases, tighten screw 1/10 of a turn more. Repeat this procedure until engine speed remains at 700 R.P.M. for at least 30 seconds.

18. Set counter on tool to 00.

19. Position manual control lever in the "N"

position.

20. While holding the lock nut stationary with the long handle of Adjusting Tool, tighten band adjusting screw exactly 2 turns using top short handle (counter will read 2.0).

- 21. Position control lever in "DR" range.
- 22. Hold adjusting screw stationary with the top handle and tighten the lock nut with the long handle.
- Reset engine idle at 490-510 R.P.M. (Control lever in "N" position).

24. Turn off ignition.

 Install floor hole cover, floor mat and accelerator pedal.

FRONT AND REAR BAND ADJUSTMENT

(Transmission Oil Pan Removed)

- 1. Raise front end of car.
- Remove the oil pan drain plug at (A) and drain the transmission fluid, Figure 376.

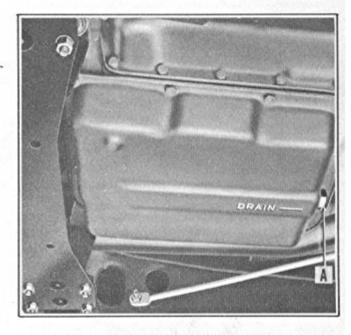


FIGURE 376

- 3. Remove transmission oil pan.
- Remove the accelerator pedal and raise the left side of the front floor mat.
- Remove band adjusting floor hole cover, Figure 377.
- Loosen both band adjusting screw lock nuts, Figure 377.

ADJUSTMENT:

- Loosen the front band adjusting screw approximately five (5) turns.
- 2. Remove the pipe plug from front servo.
- Loosen "hex" adjusting screw of Gauge J-1693, until approximately 1/8" of threads are exposed above gauge body at (A), Figure 378.



FIGURE 377

- Screw gauge into front servo, tightening by HAND only, Figure 378.
- Tighten the "hex" adjusting screw with fingers until the stem of gauge is felt to JUST touch piston in front servo.
- Using a suitable wrench continue tightening the adjusting screw 5 turns from the point where it was felt that stem of gauge JUST touched piston.
- 7. Tighten band adjusting screw until knurled washer on gauge is just free to turn.

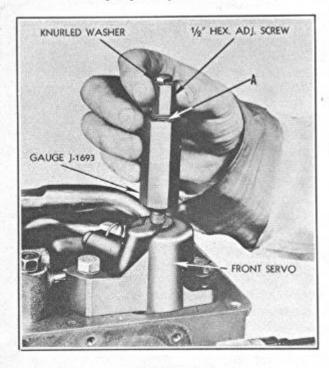


FIGURE 378

NOTE: While tightening screw be sure front band is lined up over drum.

- After adjustment has been made tighten the band adjusting screw lock nut securely while holding adjusting screw.
- Loosen the "hex" adjusting screw at least six turns and then remove gauge from servo.
- 10. Reinstall pipe plug in servo.

REAR BAND ADJUSTMENT:

 Place Servo Gauge J-5071 on finished surface of accumulator body, having leg of gauge resting on servo stem, Figure 379.

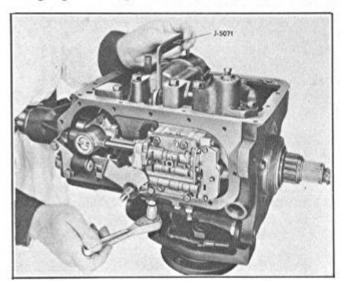


FIGURE 379

- Back off the adjusting screw until face of actuating lever is well away from face of gauge.
- Tighten band adjusting screw until face of band actuating lever just touches gauge.

CAUTION: Do not go beyond adjustment. If adjusting screw is accidentally turned beyond adjustment, loosen two or three turns and repeat adjustment.

 After adjustment has been made tighten the band adjusting screw lock nut securely while holding adjusting screw.

DIAGNOSIS AND TESTING

The procedures contained in this section are for use when testing a Hudson with Hydra-Matic for standard performance. Select the test required and perform it in the manner recommended. This will lead to accurate diagnosis of the trouble and minimize the need for complete disassembly of the transmission. Transmission oil level must be checked and Hydra-Matic fluid added if required, before any tests are conducted.

CHECKING OIL LEVEL:

- Set hand brake lever tightly, start engine. Place selector lever in "DP" range Models H-50, H-51 and J-51 ("DR-4" range Models els H-52 and J-52), and allow engine to idle continuously for a minimum of two minutes after oil is hot.
- 2. Place control lever in "N" position.
- Roll back front floor mat and remove transmission oil level indicator.
- Remove all gravel, sand or lint from floor and around oil level indicator and remove indicator.
- Wipe indicator and re-insert.
- 6. Remove indicator and note reading.

NOTE: Refer to pages 55 and 56 for procedure for refilling.

"STALL" OR TORQUE TEST

A "Stall" or Torque test may be made to determine engine and transmission performance. This test must be used with moderation to avoid overheating of the transmission.

To perform "Stall Test" proceed as follows:

- Connect electric tachometer.
- Start engine, place selector lever in "DR" range H-50, H-51 and J-51 ("DR-4" for Models H-52 and J-52).
- Allow engine and transmission to warm up to operating temperature.
- 4. With foot brake applied firmly, depress accelerator pedal to floor. Action here has placed transmission in first speed. Brakes are applied, therefore, the car cannot move. Opening the throttle and speeding up the engine is comparable to slipping

a mechanical clutch, as the driving torus is turning and trying to turn the driven torus which is held stationary by the transmission being in first speed and brakes locked.

The engine will speed up until the friction created between the torus members equals the power output of the engine. Engine speed will denote engine efficiency as indicated in the "STALL TEST" Chart, pages 180 and 181.

CAUTION: Extreme care must be used in making the "Stall Test". NEVER HOLD THROTTLE OPEN MORE THAN ONE MINUTE. If engine speed does not hold, close throttle immediately to avoid possible damage to transmission.

Sometimes it is desirable to know which band is slipping. After making test with selector lever in "DR" position, (Models H-50, H-51 and J-51) ("DR-4" position for Models H-52 and J-52), place lever in "R" position and test again. If slippage still occurs, fault is with front band or both. If slipping does not occur, then all slippage is in the rear band.

CHECK CAUSE FOR SLIPPING UNDER "STALL TEST":

- Set hand brake lever tightly.
- Start engine and run at a speed equivalent to 20 M.P.H. for approximately 1-1/2 minutes. Then, with engine IDLING, selector lever in the "N" position, check the fluid level in the transmission.
- See that fluid is at the "Full" mark on the indicator.
- 4. After level has been checked, shut off engine and wait 10 minutes. Recheck fluid level with engine shut off. If after 10 minutes, the fluid level in the transmission has not raised more than 1/2 inch, the driven torus check valve and front pump relief valve are operating satisfactorily.
- If check valve and relief valve are operating satisfactorily, adjust bands and test car using Diagnosis Guide, pages 177 through 184.

ROAD TEST USING HYDRA-MATIC DIAGNOSIS GUIDE

(Models H-50, H-51, J-51, H-52 and J-52)

The Hydra-Matic Diagnosis Guide for Hudson cars provides a uniform and systematic trouble diagnosis which is both accurate and thorough. During the road test place a check mark in the space provided after the various conditions when encountered.

The normal speeds at which the shifts should take place, and the Stall or Torque test specifications are listed on the Diagnosis Guide, pages 180 and 181.

Instructions for using the Diagnosis Guide follow.

The letters in the column headed "Possible Causes" refer to the units listed in the "Leg-end".

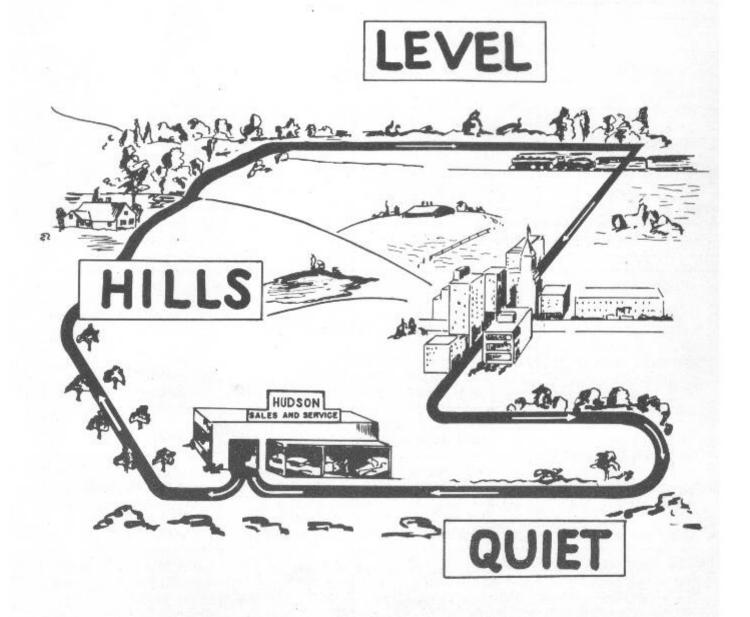
NOTE: Follow the instructions, perform a complete diagnosis.

INSTRUCTIONS FOR USING THE HYDRA-MATIC DIAGNOSIS GUIDE

- Before testing the car with this guide, pages 177 through 184, check the transmission fluid for proper level, the engine running and its slow idle speed at 490-510, (with gear shift control lever in "N" position). Either of these items will cause many different irregularities in transmission operation.
- 2. While driving the car, be on the alert for any indication of any improper engine performance. Correct them before making final diagnosis.
- The shift points shown in this guide are average and may vary slightly. One or two miles per hour either way is no cause for adjustment as long as the shifts are smooth.
- 4. The causes for these irregular operating conditions are necessarily general, pointing to the major assemblies. This permits the use of a concise diagnosis form.
- 5. The various causes of any particular condition are listed in order of the trouble. Over one-fourth of these can be remedied by external adjustments, and over three-fourths can be repaired with the transmission in the car. Never order the transmission removed from the car until the "on car" repairs have been completed, or until visual inspection of the transmission after removal of the oil pan and side cover (oil sediment, excessive backlash, burned drums, etc.) definitely indicates the need for complete disassembly. ALWAYS CHECK THE CAUSES IN THE SEQUENCE LISTED.
- The only exception to step 5 occurs when two or more conditions have one common cause; then fix that particular item first.
- When checking linkage, always inspect rods and levers for wear as well as for proper adjustment, because worn linkage will never hold proper adjustment.
- When checking for slippage, always use the "Stall Test" on page 177.
- 9. Obviously, the value of this diagnosis guide will be lost unless it is used properly. After the sheet has been filled out during the road test, the proper corrective measures for the repair order will be apparent. The sheet should then be attached to the shop copy of the repair order and remain with it throughout the shop, finally, accompanying it into the car records. This will enable the mechanic to know what specific condition his work is to correct and will provide definite information for future reference.

TEST ROUTE:

A predetermined test route should be established to save time and permit comparison of different cars over the same route. Where possible, the route should be laid out to include a hilly section to test for open throttle upshift, slippage and throttle downshifts, a level section for testing upshift points and a quiet section to test for the noise. When a chassis dynamometer is available, it may be used as a substitute for the road test.



SUGGESTED TEST ROUTE

HYDRA-MATIC SHIFT POINTS IN M.P.H. FOR MODELS H-50, H-51 AND J-51 SEE INSTRUCTIONS ON PAGE 178 FOR USING GUIDE

UPSHIFTS

	DRIVE	RANGE	"LO" RANGE		
SHIFT	MINIMUM THROTTLE	FULL THROTTLE	MINIMUM THROTTLE	FULL THROTTLE	
1-2	4-8	10-15		22-27	
2-3	10-14	26-35			
3-4	15-20	55-66			

DOWNSHIFTS

SHIFT	Di	RIVE RANGE		"LO" RANGE		
	CLOSED THROTTLE	FULL THROTTLE	FORCED	CLOSED THROTTLE	FULL THROTTLE	LOCKOUT
4-3	15-11	19-15	60-15			The sale sa
3-2	10-5	14-9				22
2-1	5-3	10-5		9-5	14-10	
4-2						48-39

STALL TEST

	232 ENGINE. ENG.		OVER 1600
TEST CONDITIONS	RPM 1300 to 1600 254 ENGINE, ENG. RPM 1450 to 1750	UNDER 1450 ENGINE RPM	OVER 1750 ENGINE RPM
	262 ENGINE, ENG. RPM 1450 to 1750	UNDER 1450 ENGINE RPM	OVER 1750 ENGINE RPM
	308 ENGINE. ENG. RPM 1600 to 1900	UNDER 1600 ENGINE RPM	OVER 1900 ENGINE RPM
With the engine at operating temperature, set control lever in "DR" position. Fully apply hand and foot brake and accelerate engine to wide open throttle.	NORMAL	Poor engine per- formance such as need of tune up, etc.	

HYDRA-MATIC SHIFT POINTS IN M.P.H. FOR MODELS H-52 AND J-52 SEE INSTRUCTIONS ON PAGE 178 FOR USING GUIDE

UPSHIFTS

	"DR-4"	RANGE	"DR-3"	"LO" RANGE		
SHIFT	MINIMUM THROTTLE	FULL THROTTLE	MINIMUM THROTTLE	FULL THROTTLE	FULL THROTTLE	
1-2	6-9	17-20	6-9	17-20	17-20	
2-3	11-14	32-36	11-14	32-36		
3-4	20-23	63-69				

DOWNSHIFTS

	"]	DR-4" RANGE		"DR-3" RANGE			
SHIFT	CLOSED THROTTLE	FULL THROTTLE	FORCED (Approx.)	CLOSED THROTTLE	FULL THROTTLE	FORCED (Approx.)	
4-3	16-14	21-17	20-60				
3-2	11-8	10-7	10-22	11-8	10-7	10-22	
2-1	7-5	10-7	0-10	7-5	10-7	0-10	
4-2			20-10				
3-1			10-7			10-7	

	"LO" RA		
SHIFT	FULL THROTTLE	FORCED	LOCKOUT
4-3			
3-2	*		49-41
2-1	10-7	0-10	
4-2			49-41
3-1			1

STALL TEST

TEST CONDITIONS	232 ENGINE. ENG. RPM 1300 to 1600 254 ENGINE. ENG. RPM 1450 to 1750 262 ENGINE. ENG. RPM 1450 to 1750 308 ENGINE. ENG.	ENGINE RPM UNDER 1450 ENGINE RPM UNDER 1450 ENGINE RPM UNDER 1600	OVER 1600 ENGINE RPM OVER 1750 ENGINE RPM OVER 1750 ENGINE RPM OVER 1900
With the engine at operating temperature, set control lever in "DR" position. Fully apply hand and foot brake and accelerate engine to wide open throttle.	NORMAL		Transmission slippage or excessive torus coupling slippage. (Do not hold throttle open).

182

MODEL H-50 PRELIMINARY TEST

Bring fluid to proper level
Set engine idle at 490-510 (in Neutral)
Check oil pressure as outlined in Hydra-Matic Manual, Page 184

OPERATING CONDITIONS

SHIFT CONDITIONS	/	POSSIBLE CAUSES	OTHER CONDITIONS	~	POSSIBLE CAUSES
Too High		C-G-H	Excessive Creeping		B-O-P
Too Low		C-G-H	Slipping		A-C-D-E-F-G-I
Varies		C-F-G-H	****		J-M-O-P-R-U-V
Hunting		C-G	Jumps out of Reverse		C-N
Misses one or more shifts		G-H-O	No Drive Forward		A-C-D-F-E-I-M-K
Improper Throttle downshift		C-D-G-H-K	Locks up on reverse coast		D-F-G-J-K
Engine speeds up, Band apply rough	18	C-F	Moves forward when in reverse		P
Rough downshift to 1st		G-J	Noisy		See"Noise Section"
Violent shifting		C-G	Clashes when shifted to reverse		B-C-G-J-N-S
Shifts above 2nd in low range		G-H	No drive in reverse		E-N-S
No shifts-Stays in same gear	1 5	C-G-H	Drives in reverse only	-	C-N-T

ALWAYS CHECK CAUSES IN SEQUENCE GIVEN

LEGEND

A	Oil Level	I	Front Servo	R	Oil Delivery Sleeve
В	Engine Idle Speed	J	Rear Servo	S	Rev. Shifter Bracket
C	Linkage	K	Front Oil Pump	T	Manual Detent Lever
D	Oil Pressure	L	Rear Oil Pump	U	Restriction in Oil Circuit
E	Servo Bands	M	Fluid Coupling	V	Excessive Oil Leak in Circuit
F	Pressure Regulator	N	Reverse Unit	W	
G	Control Valve Assembly	0	Front Unit	X	
H	Governor	P	Rear Unit	Y	

OIL LEAKS

WHERE NOTICED	POSSIBLE CAUSE	~
Between Flywheel & Crankshaft Flange	Loose Flywheel to Crankshaft Bolts	
Fluid Coupling & Flywheel or Fluid Coupling Proper	Flywheel to Torus Cover Gasket—Flywheel Sealing Area, Drain plug or Dampener Rivets	
Front of Transmission	Front Cover, Gasket, Front Oil Seal or Oil Seal Rings	
Bottom Oil Pan	Oil Pan Gasket-Drain Plug Gasket	
Side Cover Pan—or left rear corner of transmission	Side Cover Pan Gasket—Throttle and Manual Shaft seals, Pressure line plug	
Rear of Transmission	Rear Oil Seal—Rear Bearing Retainer Gasket	

NOISE

OCCURS UNDER FOLLOWING CONDITIONS	POSSIBLE CAUSE	1
Neutral and all Gears whenever engine is running	Front Oil Pump	
Neutral, 1st and 2nd Gears only	Rear Unit Planetary Gears	
Neutral, 1st, 3rd and Reverse Gears only	Front Unit Planetary Gears	
Reverse Gear, Acceleration only	Reverse Unit Planetary Gears	
Reverse Gear, Deceleration only	Rear Unit Planetary Gears	
Metallic scraping at front of transmission	Excessive End-play—Torus Members	

MODELS H-51 AND J-51 PRELIMINARY TEST

	Bring	fluid	to	proper	level	
7	A4			1 100	1 411 - 20	1

Set engine idle at 490-510 Check oil pressure as outlined in Hydra-Matic Manual, Page 184

OPERATING CONDITIONS

CONDITION	1	POSSIBLE CAUSES	CONDITION	1	POSSIBLE CAUSES	
Upshifts not normal (highLow			NoDrive or slipping in reverse only		C-D-E-F-C	
varies misses one or more shifts)					B-F-G-0	
Slips in 1st, 3rd, and reverse (Front Band)		D-F-L-M-U-V				
Slips in 1st and 2nd only (Rear Band)		D-F-N-U-V	movement in Dr or Lo		E-F-0	
Slips in 2nd and 4th only (Front Clutch)		R-T-U-V	Low oil pressure		E-H-K-Q-V	
Slips in 3rd and 4th only (Rear Clutch)		S-T-U-V	Parking pawl will not engage			
Slips in all speeds or no drive forward Improper throttle downshift		B-C-P-U-V	when engine is shut off		**	
		B-C-F-J-Q			H	
Engine speed up, band apply rough		B-E-M	Locks up on reverse coast		C-E-F-N-G	
Shifts above second in low range		F-J				
Rough downshift (coasting to stop) Excessive creeping		F-N			See "Testing	
		A Noisy			For Noise"	
Moves forward in reverse		S			Page 189	
Cannot move lever to reverse (engine running)		H-J	Ratcheting noise when shifted to reverse with car moving		A-C-F-H	

LEGEND

A B C	Engine Idle Linkage Oil Pressure	J K	Governor Rear Oil Pump	Q	Fluid Coupling Front Oil Pump Front Unit
D E	Servo Bands Pressure Regulator	L M	Front Servo Front Servo 4-3 Valve	S	Rear Unit Oil Delivery Sleeve
G	Control Valve Assembly Manual Detent Lever Parking Brake Bracket		Rear Servo Reverse Unit		Restriction in Oil Circuit Excessive Leak in Oil Circui

OIL LEAKS

WHERE NOTICED	POSSIBLE CAUSE	1
Between Flywheel & Crankshaft Flange	Loose Flywheel to Crankshaft Bolts, or Insufficient Sealer	
Torus Cover and Flywheel	Flywheel to Torus Cover Gasket, Flywheel Sealing Area, Drain Plug or Dampener Rivets in Torus Cover	
Front of Transmission	Front Pump Cover or Screws, or Front Oil Seal	
Oil Pan	Oil Pan Gasket or Drain Plug	
Side Cover	Side Cover Gasket or Screws, Throttle & Manual Shaft Seals, Pressure Line Plug	
Rear of Transmission	Rear Oil Seal, Rear Bearing Retainer Gasket, Rear Bearing Retainer Bolts	-

NOISE

OCCURS UNDER FOLLOWING CONDITIONS	POSSIBLE CAUSES	~
Neutral and all Gears whenever engine is running	Front Oil Pump	
Neutral only (disappears when shifted to drive)	Rear Unit Planetary Gears	
Neutral, 1st and 2nd Speeds only	Rear Unit Planetary Gears	
Neutral, 1st, 3rd and reverse speeds only	Front Unit Planetary Gears	
Reverse Gear, Acceleration only	Reverse Unit Planetary Gears	
Reverse Gear, Deceleration only	Reverse Unit Planetary Gears	
Metallic scraping at front of transmission	Excessive end-play—Torus Members	
Vehicle coasting 20 to 35 MPH, Engine not running & Selector in Neutral	Rear Oil Pump Gears	

TESTING "MAIN LINE" PRESSURE (Models H-50, H-51, H-52 and J-52)

- Remove the accelerator pedal and front floor mat.
- 2. Remove the band adjusting screw floor hole cover (A), Figure 81.
- Start the engine and operate for several minutes to warm transmission oil to normal operating temperature (150° to 200° F.).
- Remove the pipe plug from the transmission case (between the two band adjusting screws). Use a 7/16" six point socket.
- Screw gauge fitting into transmission. (Use a pressure gauge calibrated to at least 200 P.S.I.).

NOTE: Tests 6, 7 and 8 can be made by road test or with car on jack stands as follows:

- 6. Zero Throttle Pressure Road Test -a. Depress accelerator pedal to give a car speed above 30 M.P.H. in 4th speed. b. Close the throttle and check pressure gauge reading as car speed drops to exactly 30 M.P.H. Gauge reading should be between 60 and 68 lbs.
- Full Throttle Pressure -- Road Test

 With car moving forward approximate 30 M.P.H. in 4th speed, depress the accelerator without going through the detent (forced 4-3 downshift).
 - b. Note pressure gauge reading when car speed reaches exactly 30 M.P.H. Gauge reading should be between 85 and 93 lbs.
- Full Throttle Pressure -- Car on Jacks

 Disconnect the T.V. rod at the transmission lever. Hold the T.V. lever at full throttle position; full throttle pressure should be 85 to 93 lbs.

NOTE: During this test obtain full throttle pressure without going through the detent (forced 4-3 downshift).

9. With engine running at idle speed, note pressure indicated on gauge with manual selector lever in "DR" and "LO" positions for Models H-50 and H-51 or in "DR-4", "DR-3" and "LO" positions for Models H-52 and J-52. Pressure should be 40 - 68 lbs. Then move selector lever to the "R" position. Pressure in reverse should be higher than the pressure in either drive or low.

10. If the pressures checked satisfactorily in step 9, place the manual selector lever in "R" position and apply the foot brake. Accelerate engine to approximately half throttle. For Model H-50 the pressure should be 75 - 90 lbs. For Models H-51, H-52 and J-52, the pressure should be a minimum of 125 lbs.

TESTING "MAIN LINE" PRESSURE (Model J-51)

Perform operations 1 through 5 under "Testing Main Line Pressure, Models H-50, H-51, H-52 and J-52" and proceed as follows:

- a. When the transmission oil is thoroughly warmed, check pressure in "N", "DR" and "LO" positions. Pressure should be between 75 90 lbs. at 1000 R.P.M. and should be equal in all three positions.
- b. With engine running at idle speed, note pressure on gauge with selector lever in "DR" and "LO" positions. Pressure should be 75 90 lbs. Move selector lever to the "R" position. Pressure in reverse should be higher than the pressure in either drive or low.
- c. If pressures were satisfactory in step (b), move manual selector lever to "R" position and apply the foot brake. Accelerate engine to approximately half throttle. The pressure should be a minimum of 125 lbs.

TESTING REAR PUMP PRESSURE (Models H-50, H-51, J-51, H-52 and J-52)

To check the operation of the rear pump only, drive the car at 45 M.P.H. in fourth speed. Then place manual selector lever in the "N" position and turn off ignition switch. Pressure should be at least 60 lbs.

NOTE: Low rear pump oil pressure should be corrected by replacement of the pump gears, by correcting excessive end play in the gears or by checking for leakage in other units of the transmission.

DIAGNOSIS

REVERSE UNIT (Models H-51, J-51, H-52 and J-52)

SELECTOR LEVER STICKS IN REVERSE POSITION

Inspect the detent plunger and detent control lever which may be the cause of sticking.

If the selector lever sticks in the "R" (Reverse) position when the car is parked and the selector lever cannot be moved to the "DR" (Drive) or "N" (Neutral) position, check the manual control linkage adjustment and if this is in proper adjustment, the trouble may be due to a bent or damaged parking brake pawl crank. In this case it will be necessary to replace the complete parking brake bracket and lever assembly.

To move the car, rock the car backward and forward manually until the selector lever can be moved.

SELECTOR LEVER WILL NOT GO INTO REVERSE POSITION (WITH ENGINE RUNNING)

- Check linkage adjustment.
- 2. The governor G-1 valve may be stuck in the open position restricting the selector lever from going into the reverse position with engine running, since governor pressure holds the reverse blocker piston in the lockout position. Clean governor thoroughly with a good clean solvent to free up the valve.
- Free-up blocker piston in bracket bore. Also check spring for freeness and distortion.

NOTE: A broken governor ring or excessive ring gap or groove clearance can cause main line pressure to leak between the governor lands into the reverse blocker piston oil circuit when engine is running. Also check for a defective governor oil delivery sleeve.

SELECTOR LEVER HARD TO MOVE

- Disconnect the manual control rod from the transmission outer shift lever and test linkage for free operation. Also check for lever binding at the transmission side cover and shaft binding at hole in side cover. (Seal on inside of cover could be improperly installed.)
- A distorted outer valve body. Free-up manual valve in outer valve body if possible, if not, replace complete control valve assembly.
- 3. On Models H-51 and J-51 the front servo exhaust valve body may be set too close to the manual valve at assembly. In this case loosen the front servo exhaust valve body attaching screws and reposition the front servo exhaust valve body.
- 4. If a binding condition still exists between the manual valve and the front servo exhaust valve, the front servo exhaust valve spring retainer plug may be pushed in too far restricting valve travel when the manual lever is shifted from reverse to drive range. Tap end of exhaust valve until lip of plug is positioned just flush with the exhaust valve body; then check for free operation of the exhaust valve in front exhaust valve body.

NO DRIVE IN REVERSE (SLIPPING)

- The pressure regulator reverse oil pipe or the reverse clutch pipe may be missing.
- The reverse booster plug may be missing from the pressure regulator assembly.
- Low line pressure. Check for leak in circuit and possible low pump output.
- 4. Hole in transmission case (pressure regulator reverse oil to pressure regulator) not drilled through (H), Figure 120. Replace transmission case.

- On Models H-51 and J-51 the front servo exhaust valve body spacer may be installed backward.
- Front servo exhaust valve body to pressure regulator pipe hole not drilled (I), Figure 120. Install a new front servo exhaust valve body.
- Reverse oil line hole (B), Figure 280, in valve body not drilled. Replace complete control valve assembly.
- Stationary cone lock key missing (A), Figure 204, stationary cone or cone clutch piston worn or stationary cone distorted when disassembled or assembled.

NO DRIVE IN REVERSE (LOCK-UP) WHEN SHIFTING FROM "DR" TO "LO" TO "R"

Rear band not releasing in reverse. Remove the control valve assembly and clean thoroughly. Make sure the .062" drilled hole in the outer valve body supplying oil for rear servo release is unobstructed, Figure 380. If the hole is not drilled a new control valve assembly will have to be installed.

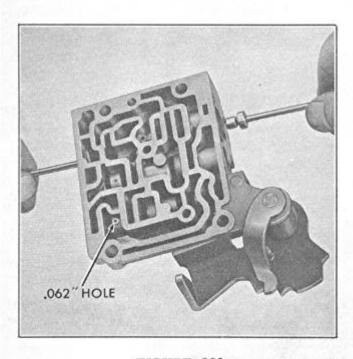


FIGURE 380

FORWARD MOVEMENT IN DRIVE OR LOW RANGE

- On Models H-51, H-52 and J-52, a damaged neoprene seal ring on the pressure regulator will allow T.V. pressure to leak into the reverse booster passage.
- Check to see that T.V. oil is not leaking past an improper fitting T.V. plug in the pressure regulator. Replace the complete regulator assembly if excessive looseness is found between plug and bore of plug.
- On Model J-51, make sure the proper control valve assembly has been installed.
 See Figure 276 for identification. An H-51 valve body on a J-51 transmission will result in interconnection of T.V. and reverse oils.
- 4. On Models H-51 and J-51 front servo apply oil is leaking past an improper fitting front servo exhaust valve or a damaged front servo exhaust body spacer. Replace front servo exhaust valve body assembly and/or spacer.
- 5. Two to three shift oil leaking from the end of the double transition valve past a damaged detent plunger retainer spacer into the reverse apply circuit. Replace the detent plunger retainer and/or spacer.

NO PARKING PAWL ENGAGEMENT WHEN ENGINE IS SHUT OFF WITH TRANSMISSION IN REVERSE

- Parking pawl may be binding on parking pawl support bolt or the parking brake pawl crank may be damaged or binding in the parking brake bracket. If the pawl crank is defective or if the parking brake lever spring is weak, damaged or broken, replace the complete parking brake bracket assembly.
- Inspect the parking blocker piston for binding in bore, free-up piston in bore. Also check blocker piston return spring. A weak or broken spring will not release the blocker piston.

RATCHETING NOISE WHEN PLACING THE SELECTOR LEVER IN THE "R" POSITION (WITH CAR MOVING)

 Rough or low engine idle. Set idle to 490-510 R.P.M.

NOTE: Excessively low engine idle speed may result in a low enough pressure to allow the parking blocker piston to release.

- If engine is idling properly, check for excessive leak in the oil circuit or low pump output which would result in low main line pressure.
- Parking blocker piston stuck. Check for a weak or broken blocker piston spring. Free-up blocker piston in parking brake bracket bore.
- 4. On Models H-51 and J-51 check the operation of the reverse check valve located in the detent plunger retainer (25), Figure 297. Valve should be firmly riveted to the detent housing. Bend the check valve at base so free end extends 1/4" above face of detent plunger housing, and make sure face of valve is flat against detent housing spacer when installed.

LOW OIL PRESSURE, SLIPPAGE, DELAYED ERRATIC UPSHIFT

These conditions will result when one or both of the passage plugs (6), Figure 302, are omitted from the parking brake bracket. If the plugs are loose or missing, replace the complete parking brake bracket assembly.

A loose or missing plug in the oil passage to the parking blocker piston will result in a drop in main line pressure to about half of normal. If the plug in the oil passage to the reverse blocker piston is missing, governor pressure will drop causing delayed and erratic upshifting.

TESTING FOR FLUID LEAKS

If a transmission fluid leak is detected, the following locations should be checked: Transmission fluid leaks can be divided into two groups, those which can be corrected without removing the transmission and those which require its removal.

The first group includes:

- 1. Torus cover drain plug.
- Side cover bolts or pressure line pipe plug.
- 3. Side cover at manual shaft seal.
- 4. Oil pan bolts.
- 5. Oil pan drain screw.
- 6. Rear bearing retainer bolts and seal.
- 7. Pressure regulator plug gasket.

Fluid leaks at any of the above points are easily located and should be corrected no matter how slight they may seem.

Fluid leaks that require removal of the transmission from the car include the following:

- 1. Crankshaft to flywheel seal and bolts.
- 2. Flywheel to torus cover gasket.
- 3. Dampener rivets in torus cover.
- Front oil pump cover screws.
- 5. Front oil pump cover casting (sand hole).
- 6. Front oil pump cover oil seal.
- 7. Front oil pump cover oil seal rings.
- Front oil pump cover to transmission case gasket.

NOTE: When replacing gasket, cover should protrude .003" to .015" out of case. See "Front Pump Installation".

9. Sand hole in transmission case.

Check for Fluid Leaks at Torus Cover and Flywheel.

- Run engine until transmission fluid is at operating temperature.
- 2. Remove flywheel housing bottom cover.
- Wipe fluid from flywheel and torus cover.
- Place a clean piece of white or brown paper under flywheel and transmission.
- Start engine and run at approximately 800 RPM for two minutes.
- Stop engine and examine paper for fluid leaks.

Fluid leaks, if present will be indicated by a fine spray on the paper usually directly in line with the leak.

LOCATING FLUID LEAKS AT TORUS COVER AND FLYWHEEL:

If fluid leaks are indicated, examine flywheel and torus cover for fluid.

 Fluid on the front face of the flywheel indicates a leak at the crankshaft to flywheel seal or bolts.

Remove transmission, remove flywheel, replace seal, as outlined in Engine Section 3.

NOTE: Do not confuse an engine oil leak at the rear main bearing with a flywheel fluid leak.

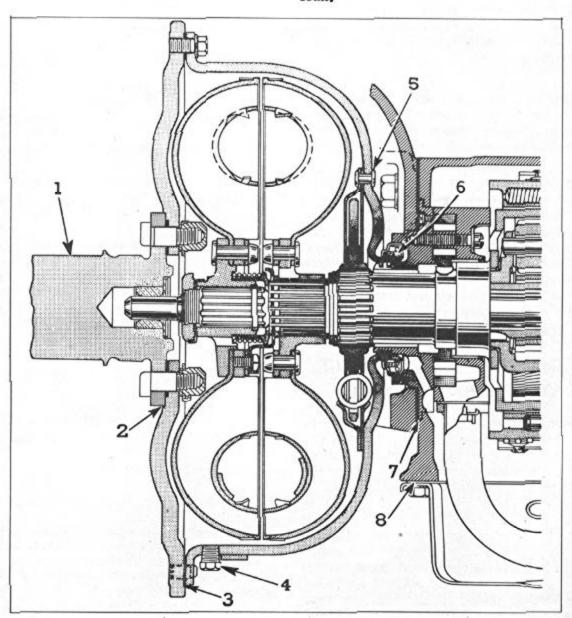


FIGURE 381

2. Fluid on the torus cover may be coming from the front cover oil seal rings (7), Figure 381, the front cover oil seal (6) or the dampener rivets (3).

If there is no fluid on either the flywheel or torus cover, the leak is at torus cover

to flywheel (2).

Tighten all bolts to 30 ft. lbs. torque and if leak continues, it is due to a broken gasket or insufficient or damaged sealing surface on the flywheel or torus cover. If damage cannot be corrected, install new parts.

If all parts ahead of the front of transmission are dry and fluid leaks between flywheel housing and transmission, the leak may be caused by -

(a) Loose pump cover screws (4) or dam-

aged copper washers.

(b) No sealer on pump cover screws.

(c) Sand hole in pump cover (5).

(d) Poor seal between front cover and case (8).

To correct above cause of leak proceed as follows:

Remove transmission from the car. Remove torus members and flywheel hous-

ing from transmission.

2. If pump cover attaching screws are loose, it will be necessary to remove the pump, remove the three pump cover screws and the one pump body screw, seal the screws with Permatex No. 3 cement and tighten to 12 to 15 ft. lbs. torque. Damaged copper washers should be replaced.

 If pump cover screws are tight but have no sealer remove the pump and reseal all screws. Tighten to 12 to 15 ft. lbs. torque. Damaged copper washers should be re-

placed.

 If a sand hole is present in pump cover casting, replace complete front pump as-

sembly.

5. The front pump cover should protrude .003" - .015" out of transmission case with pump cover gasket in place. If pump cover protrudes less than .003", add a pump cover gasket to allow the cover to protrude within limits.

TESTING FOR NOISES

Hydra-Matic transmissions are relatively quiet in operation. However, they do make a certain amount of noise, as will any such unit when operating. One should become familiar with these before testing the transmission for noise. Tune the engine to run smoothly before testing for noise.

FRONT OIL PUMP NOISE

(Models H-50, H-51 and J-51)

When noise is present it may be heard as a sharp shrill whine and is most noticeable when pump is under load. The pitch is steady when driving car and does not change like differential noise. Front pump whine may be heard with shift control lever in NEUTRAL and engine speed increased. To make a systematic check for front pump noise proceed as follows:

 With engine idling and selector lever in neutral, listen for whine.

Raise engine speed gradually. Front pump whine, if present, may be more pronounced at a certain engine speed.

3. Start the car in motion and increase car speed so that engine speed will be the same as when the whine was most pronounced. The front pump (if noisy will again be heard at the same engine speed as when the car was standing).

4. Drive the car 25 MPH to 35 MPH; listen to

pump whine.

(a) Turn ignition key off.

(b) Quickly move the selector lever into the neutral position. If whine was heard while shifting through all speeds, being loudest between 25 MPH to 35 MPH in fourth speed or in equivalent engine R.P.M. in other gear speeds, and disappeared when ignition was turned off (selector lever in neutral), the front pump is at fault.

REVERSE PLANET GEAR NOISE

Reverse planet gear noise, if present, will be heard in reverse, only when car is under ACCELERATION. In this case noise is in the reverse planet assembly.

NOTE: Due to the ratio of the reverse gears and engine speed when accelerating in reverse, it is doubtful that reverse gear noise will ever become objectionable. Reverse noise on DECELERATION ONLY, is caused by noisy rear unit planet gears (see rear unit planet gear noise).

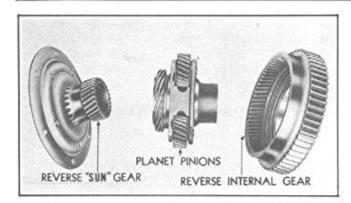


FIGURE 382

SCRAPING TORUS MEMBERS

Scraping torus members can be identified by a metallic scraping at the front of transmission. If this noise is present it may be caused by:

- Main shaft nut not tightened.
- Main shaft nut lock plate broken or not bent over. Either one of the above conditions may permit the driven members to strike the flywheel.

REAR OIL PUMP NOISE

(Cross Drive Noise)

Rear oil pump noise may be heard as a high pitched whine much like light axle noise, but not sensitive to throttle opening, drive, float and coast. REAR OIL PUMP WHINE in most cases will be heard at 20 to 35 MPH. It is seldom heard below 20 MPH. Rear axle whine may be audible at other speeds.

TESTS FOR REAR OIL PUMP (CROSS DRIVE) NOISE:

- Drive the car to determine at what speed noise is heard.
- After noise is first heard increase car speed approximately 10 M.P.H. above that point.
- Move selector lever to neutral, turn off the ignition and coast down through the range in which noise was heard.

NOTE: With the ignition off, the front oil pump is not running. If noise is still present and was not sensitive to engine speed, the noise is in the rear oil pump. If there is any doubt between axle noise and rear oil pump noise, the following test will eliminate the rear axle.

- 1. Disconnect the propeller shaft.
- 2. Lift right corner of front floor mat.
- 3. Remove transmission oil level indicator.
- Place manual selector lever in "DR" range position.
- Run engine to a speed where transmission shifts into 4th speed.

If noise is in the rear oil pump, it will be heard at approximately the same speedometer reading as when road testing the car. This test definitely eliminates the rear axle.

Inspection of the bronze driver gear can be made without removing transmission from car.

- Remove rear oil pump and governor assembly as described in "Minor Repairs", page 58.
- Examine bronze drive gear for deep running groove on drive side of gear. If drive side of gear shows a deep running groove, remove and disassemble reverse unit assembly and replace the bronze gear as outlined on pages 98 and 99.

TEST FOR REAR OIL PUMP INNER GEAR NOISE:

Rear pump inner gear noise is similar to cross drive noise but is heard in the form of a low growl and is usually heard at speeds above 35 MPH. If rear pump inner gears are noisy, the bushings may be worn permitting gears to contact bores in pump body. In this case, a new pump will need to be installed.

NOTE: Front pump noise is usually caused by the ends of the teeth on the drive gear interfering with the crescent, or by the omission of a 5/16" drill spot from the face of the pump cover.

REAR UNIT PLANET GEAR NOISE

Noisy rear planet gears may be heard as a low growl on idle which increases to a very high-pitched whine when engine speed is increased (selector lever in neutral).

TEST FOR REAR UNIT GEAR NOISE (CAR STANDING):

- Drive car to a reasonably quiet spot. Stop car.
- 2. Move selector lever into neutral position.
- 3. Listen for noise with engine idling.
- Accelerate engine to higher speed. Rear planet gear whine will increase to a very high pitch as engine speed is increased.

TEST FOR REAR UNIT GEAR NOISE (CAR IN OPERATION):

- Move selector lever into "Lo" range position.
- 2. Drive the car until transmission shifts into 2nd speed.
- Accelerate and decelerate in 2nd speed. Rear planet gear noise will follow car speed and if present will be very noticeable in second gear.

NOTE: Open the front door and listen. Rear planet gear noise will seem to be transferred down the propeller shaft.

4. Move the selector lever back into the "DR" range position and again accelerate through the gears. Rear planetary whine, if present, will be heard in 1st and 2nd speed, and will disappear after transmission shifts into 3rd or 4th speed (rear unit is then in direct drive).

NOTE: Where no objectionable low growl in neutral is heard while engine is idling and only a very slight whine is heard when engine speed is increased, which disappears when selector lever is placed in "DR" range position, no attempt should be made to eliminate the slight whine.

The three units responsible for rear planetary noise are the "Sun" gear on the main shaft, rear planet pinions on the output shaft and the rear unit internal gear, Figure 383.

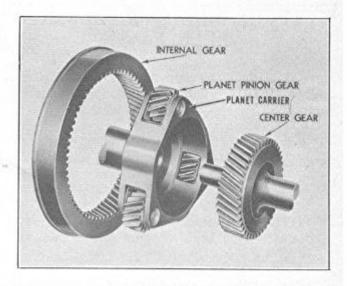


FIGURE 383

FRONT UNIT PLANET GEAR NOISE

Front unit planet gear noise is similar to front pump noise, but of a higher pitch. To test for front planet noise, start the engine, place the selector level in "LO" range position for Models H-50, H-51 and J-51, "DR-4" or "DR-3" position for Models H-52 and J-52. Start the car in motion. If front planet gears are noisy, whine will be heard in first speed and disappear after transmission shifts into second speed. The cause is probably worn or nicked planet pinion gears, "Sun" gear, front drive gear, worn pinion needle bearings, or thrust washers, Figure 384.

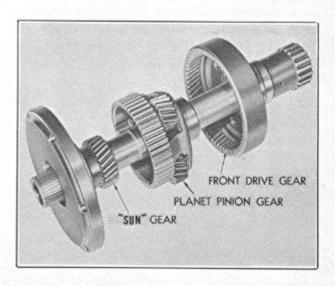


FIGURE 384

TEST FOR BROKEN REAR SERVO CHECK VALVE

When the rear servo check is broken the 3-1 shift is rapid and produces a severe clunk.

- With engine idling 490-510 RPM move selector lever from neutral to the "DR" range position. A broken check valve will cause rapid rear band application causing the car to lunge forward.
- With transmission cold, drive car to a speed where transmission shifts into 4th (direct).
- Coast to a stop. When the transmission is cold, no objectionable clunk will be noticeable during the 3-1 downshift.
- 4. Apply hand brake and foot brake.
- With selector lever in "DR" range, speed up engine for approximately one minute to heat oil in transmission.
- Make the same test as outlined under 2 and 3.

If the 3-1 shift occurs at above 8 to 3 M.P.H. and is severe, causing objectionable clunk, a broken rear servo accumulator check valve spring is indicated. No attempt should be made to eliminate a slight bump felt only when the transmission is cold and which disappears when the transmission is warm. See "Replacement of Rear Servo Accumulator Check Valve" on page 123.

If accumulator check valve is not broken check tightness of rivet. If rivet is loose replace valve and rivet as outlined on page 123. Check for free operation of plunger in body. If sticky, free up plunger.

TEST FOR MISSING OR STICKING TORUS CHECK VALVE OR FRONT PUMP RELIEF VALVE

A missing or sticking torus check valve will cause the engine to speed up excessively when starting away after the car has been standing.

A similar effect will be produced by the omission of a front pump relief valve or relief valve spring, or by the relief valve being stuck in the open position.

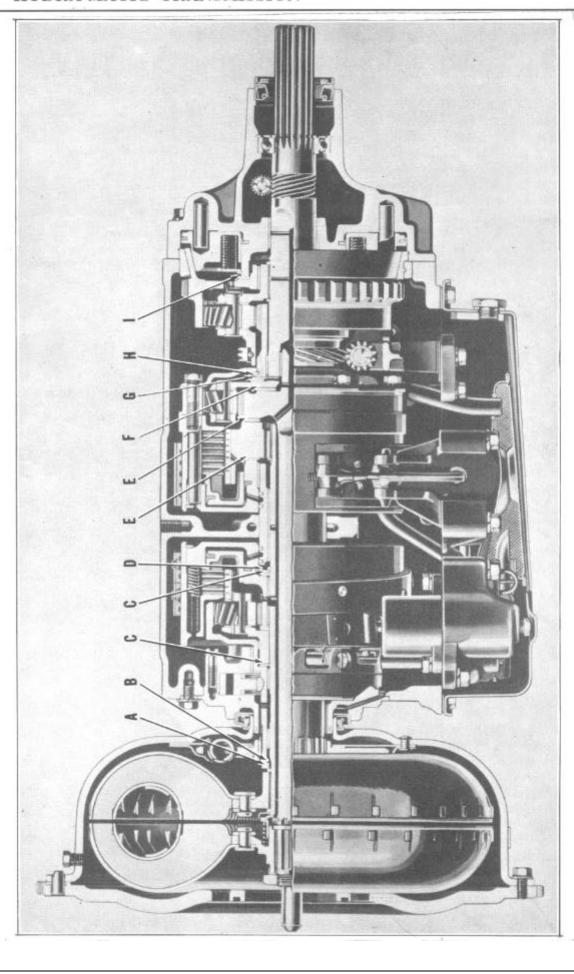
Determine the effectiveness of the torus check valve and pump relief valve by checking the rate at which fluid drains back from the coupling into the transmission.

- 1. Set hand brake lever tightly.
- Start engine and run at a speed equivalent to 20 MPH for approximately 1-1/2 minutes. Then, with engine IDLING, selector lever in "N" position, check the fluid level in the transmission with the oil level indicator.
- 3. See that fluid is at the "Full" mark on the indicator.
- 4. After level has been checked, shut off engine and wait 10 minutes. Recheck fluid with engine shut off. If after 10 minutes, the fluid level in the transmission has not raised more than 1/2 inch, the check valve and relief valve are operating satisfactorily. Should oil level be raised more than 1/2", the check valve or relief valve is not operating satisfactorily and should be replaced.

SPECIFICATIONS

RECOMMENDED TORQUE TIGHTNESS FOR BOLTS

RECOMMENDED TORQUE TION		
LOCATION:	Thread Size	Torque Ft. Lbs.
Internal Gear to Rear Drum		3-4
Front Body to Inner Body		3-4
Outer to Inner Valve Body		3-4
Rear Cover to Inner Body		3-4
Front Body Plate to Body		3-4
Front Plate to Outer Body		3-4
Governor Bushing Retainer to Governor Body		3-4
Detent Ball Retainer to Outer Valve Body		3-4
Front Servo Assembly		6-7
Torus Cover Drain		6-7
Case-Oil Pressure Take-Off		15-18
Front Servo Assembly		6-7
Front Pump Cover to Body		12-15
Intake Pipe to Front Pump		10-12
Governor Body to Drive Flange		6-8
Rear Pump Cover to Body	1/4-20	6-8
Control Valve Assembly to Case		6-8
Side Cover to Case		10-12
Servo Body to Cylinder	1/4-20	6-8
Blocker Piston Retracting Spring to Bracket		6-8
Gov. Plunger to Gov. Primary & Secondary Weights	1/4-28	6-8
Outer Throttle Valve Lever Bolt	1/4-28	10-15
Torus Check Valve Retainer Bolt	1/4-28	6-8
Trans. Mainshaft Nut	7/8-16	50-60
Flywheel to Crankshaft Nut		40-45
Torus Cover to Flywheel Bolt		Special*
Flywheel Housing to Transmission Bolt		. 40-50
Flywheel Housing to Cylinder Block Bolt		40-45
Flywheel Housing to Engine Rear Mounting Bolt		40-45
Engine Rear Mounting to Frame Bolt		40-45
Oil Pan to Transmission Case		10-13
Front Pump Cover to Transmission Case		10-13
Drive Flange to Rear Drum		10-13
Servo Spring Retainer to Body		10-13
Reverse Shifter Bracket to Case		15-18
Rear Pump to Case	- 40 40	15-18
Outer Shifter Lever		10-13
Front Servo to Case		23-28
Rear Servo to Case		23-28
Reverse Int. Gear Support to Rear Bearing Retainer		28-33
Rear Bearing Retainer to Case		28-33
Center Bearing Cap to Case		40-50
Reverse Anchor Support Bolt	7/16-20	23-28
Reverse Anchor Support Stud	7/16-20	15-20
Reverse Anchor Support Stud Nut		23-28
Band Anchor Stop Nut		40-50
Oil Pan Drain Screw		35-45
Pressure Regulator Valve Plug		40-50
*Tighten 2 Bolts Adjacent to Dowels to	12-15 Ft. Lbs.	
Tighten 2 Bolts Located 90° From Dowels to		
Tighten All Bolts in Rotation to		
Tighten All Bolts in Rotation to	26-31 Ft. Lbs.	



THRUST WASHER-SPECIFICATIONS, LOCATION AND PURPOSE

The following chart covers in detail the specifications, location and purpose of the various thrust washers used in the Hydra-Matic Transmission, Figure 365.

Ref.	Part No.	O.D.	I.D.	Thickness	Material	Location and Purpose
Λ	304988	1.812 1.822	1.374 1.379	.088 .092	Steel LD. tang	Between the bronze washer in front of the Front Unit Drive Gear and the snap ring on the Front Planet Carrier (Inter- mediate Shaft) behind the Drive Toruz, PurposeTo act as a bearing surface for the bronze thrust washer.
В	304997	1.815 1.822	1.377	.087 .091	Bronze	Between the front of the Front Unit Gear and the steel washer A. PurposeIt takes the forward thrust of the Front Drive Gear.
С	304996	1.910 1.917	1.377 1.384	.087 .091	Bronze	Between the rear of the Front Drive Gear and the front of the Front Planet Carrier. PurposeTo take the rear thrust of Front Drive Gear.
			g	ST.	1/2	Also useBetween the rear of the Front Unit Center Gear and the steel washer (with locating flat) on the Intermediate Shaft. PurposeTo take the rear thrust of the Front Unit Center Gear.
D	304977	1-15/16	1.374 1.377	.088	Steel - I.D. tang	Between the snap ring on the Front Planet Carrier (Intermediate Shaft), in front of the Oil Delivery Sleeve and the bronze thrust washer behind the Front Unit Center Gear. Purpose-To act as a bearing surface for the bronze thrust washer.
E	304993	2.872 2.878	1-15/16	.087	Bronze	Between the rear of the Rear Unit Clutch Drum and in front of the Rear Unit Clutch Hub. PurposeTo take the rear thrust of the Rear Clutch Drum and the forward thrust of the Front Planet Carrier (Intermediate Shaft).
						Also useBetween the rear of the Rear Clutch Hub and the front of the Rear Unit Center Gear. PurposeTo take the rear thrust of the Front Planet Carrier (Intermediate Shaft) and the forward thrust of the Main Shaft.
F	304960	2.247 2.253	1	-055 -059	Bronze	
	304961	2.247 2.253	1	.063 .067	Bronze	
	304962	2.247 2.253	1	.071 .075	Bronze	
		2.247 2.253	1	.079	Bronze	Selective. Between the rear of the Main Shaft and the front of the Output Shaft. PurposeTo take the rear thrust of the
	304964	2.247 2.253	1	.087	Bronze	Main Shaft. (Note: Main Shaft end play is controlled by this washer).
	304965	2.247 2.253	1	.095 .099	Bronze	
	304966	2.247 2.253	1	.103 .107	Bronze	
	304967	2.247 2.253	t	.111	Bronze	
G	304941	2.591 2.596	1-11/16	.087	Bronze	Between the steel washer in front of the Reverse Center Gear and the Output Shaft. PurposeTo take the forward thrust of the Rear Drum and Internal Gear.
Н	304945	2-7/16	1.499 1.504	.049 .052	Steel	Between the front of the Royerse Center Gear and the bronze thrust washer behind the Output Shaft. PurposeTo furnish a bearing surface for the bronze thrust washer.
1	305968	3-1/4	2.565 2.575	.087 .091	Bronze	Between rear of Reverse Internal Gear and flange on Rear Bearing Retainer. PurposeTo take the rear thrust of the Reverse Internal Gear.

GENERAL SPECIFICATIONS

Main Shaft End Clearance	004"	015"
Oil Seal Rings	d Gap .005" 001"	010" 00 7 "
Rear Pump Drive Gear Retaining Pin Height of peened end of pin must not exceed		.070"
Transmission Case Front Pump Cover With gasket in place and pump assembly installed in case, with attaching screetight, front pump cover should protrude beyond front of case		015"
Governor Runout Governor runout, taken with governor, governor sleeve and oil valve assembly installed must not exceed		.005"
Governor Flange Runout Flange runout, taken with the governor removed, must not exceed		.002" -
Throttle Lever Location With throttle lever installed (draw bolt tight) and lever moved to its extreme rear position dimension from rear machined face of transmission case to center of lever clevis pin hole must be 6-1/2" (Use Tool J-2195, See page 169, Adjustments)		
Torus Cover Hub Runout When mounted on Flywheel, Torus Cover hub runout must not exceed		.005"
Flywheel Runout The facial runout of the gasket seal surface of the flywheel, when mounted on crankshaft, must not exceed		.005"
Torus Member Clearance Clearance between Drive and Driven Torus members when assembled	.036" does not .015" facial	runout
Oil Capacity and Change Interval Drain oil pan and torus cover and refill Drain, disassemble, assemble transmission and refill Change transmission oil every		11 qts. 12 qts.
Band Adjustment Interval Initial band adjustment at 1,000 mile inspection. Thereafter no specific interval is established for band adjustment. Transmission bands should be adjusted any time malfunction indicates adjustment is necessary.		
Rear Axle Ratio All Models with H-50, H-51 and J-51 Hydra-Matic Transmissions All Models with H-52 and J-52 Hydra-Matic Transmissions		3.58-1 3.07-1

