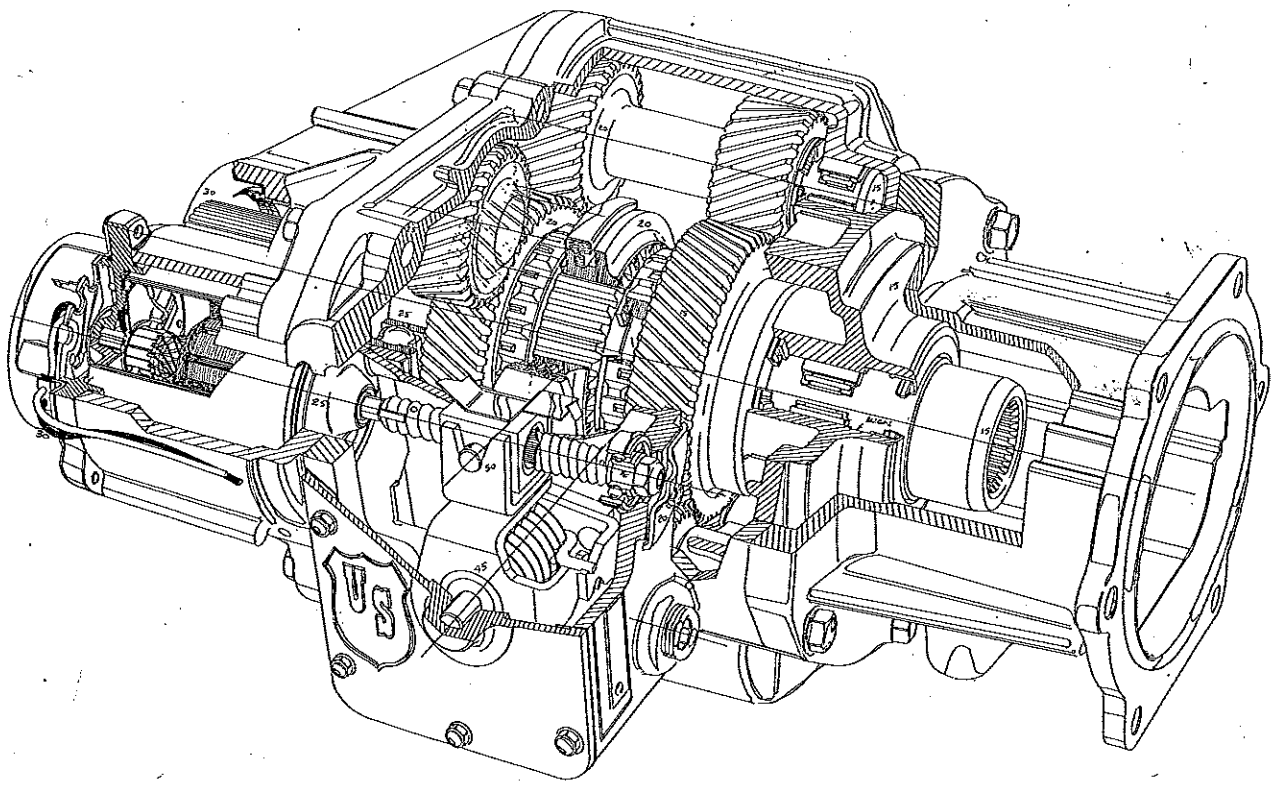
DUAL RANGE™

Auxiliary Transmission

INSTALLATION INSTRUCTIONS AND REPAIR MANUAL



READ THIS MANUAL BEFORE ATTEMPTING TO INSTALL THE DUAL RANGE.

PLEASE REGISTER SERIAL NUMBER OF UNIT
BY SENDING WARRANTY CARD TO U.S. GEAR CORP.

Model #_____ Serial #_____

US GEAR

OPERATION OF THE U.S. GEAR DUAL RANGE™ AUXILIARY TRANSMISSION

The U.S. Gear Dual Range™ Auxiliary Transmission is a highly versatile unit offering a variety of separate and distinct final drive ratios while providing the necessary strength requirements that are mandatory in many vehicle applications. The 20% Overdrive OR Underdrive ratios are uniquely designed to complement the driveline of your vehicle while, at the same time, retaining the existing factory, direct-drive ratios.

The Dual Range is designed to offer you the option of selecting up to twice the number of forward and reverse driving ratios. However, unlike many auxiliary transmissions, the Dual Range offers you these ratios **WHEN YOU NEED THEM!** And, by maintaining a 35,000 lb. GCVW (Gross Combined Vehicle Weight) rating, the Dual Range sets the standard as the heaviest unit in the industry.

The Dual Range is an electronically-controlled, mechanically-shifted transmission which when operated properly, can provide a controlled shift between auxiliary and direct ratios. This shift can be accomplished at ANY speed; however, because the unit requires a certain level of gear rotation to ensure proper gear alignment, **THE UNIT SHOULD NEVER BE SHIFTED WHILE THE VEHICLE IS STOPPED!**

Although the unit is adaptable to both manual and automatic transmissions, the methods of operation of these two, distinct types of transmission applications are very different.

AUTOMATICS — In automatic applications, the main shift from direct to auxiliary range (or vice versa) is accomplished through the utilization of a high-torque spring lever assembly. This spring assembly which is loaded by the electronically-controlled shift motor rotating a worm gear (drive scew assembly), then forces a collar gear (slider), which couples the output shaft to the direct input gear, to mesh with the auxiliary ratio output gear. This complete action is induced when the control module inside the vehicle is actuated.

To shift the Dual Range:

1) While the vehicle is moving and the driveline is under load (the accelerator is depressed), push the control module button on the transmission control lever.

2) **WAIT APPROXIMATELY 2 SECONDS!** This will allow the spring assembly to load the Dual Range shift mechanism.

3) Quickly, relax the pressure on the accelerator pedal and then re-apply full pressure. This action will NOTrequire the removal of your foot from the accelerator pedal.

It should be noted that the quicker this complete action can be accomplished the more likely the unit will be to shift smoothly. If properly shifted, a CLUNK should be noticeable upon gear change along with an obvious change in engine RPM.

When using the Dual Range to split-shift from 1st O/D to 2nd Direct, or similar change, it is strongly suggested that the automatic transmission be shifted to the higher gear prior to shifting the Dual Range from HIGH to LOW. This will allow for more flexibility in driveline stress and ensure proper load transferral to the subsequent gear.

MANUALS — As with automatics, the internal shift design of the unit (and the mechanics of the shifting) remain the same; however, the method of electronically inducing the shift mechanism does, in fact change.

To shift the Dual Range:

1) While the vehicle is moving and the driveline is loaded, either pull UP or push DOWN on the shift actuation switch connected to the transmission lever.

2) **WAIT APPROXIMATELY 2 SECONDS!** This will allow the Dual Range shift assembly to load.

3) Quickly, flash the clutch pedal to briefly relax the driveline pressure. Complete depression of the clutch pedal is not required and can cause substantial momentum loss.

Again a small CLUNK and a change in engine RPM should be noticeable upon the gear change.

***** NOTE *****

If using the Dual Range to split-shift in the manual applications, at least 2-seconds should still be given for the spring assembly to load prior to clutch depression. However, because the clutch depression during the shift of the manual transmission will completely relax the driveline, it is not necessary that the primary transmission be shifted to the higher gear before the Dual Range is engaged.

It is very important in any application that the shift assembly of the unit be allowed to load before the driveline pressure is relaxed. Failure to do so will cause all of the shift load to be transferred to the shift motor which is not designed to accept this load on a prolonged basis.

By providing for the use of additional gearing with minimal effort, the Dual Range Auxiliary Transmission offers complementary driving ratios to, in most cases, an already over-taxed driveline. By using gearing as a "partner" with your engine's horsepower, properly operated, the Dual Range can give you miles of worry-free service and substantial gains in both performance and economy.

PLEASE READ THE INSTRUCTIONS THOROUGHLY BEFORE STARTING THE INSTALLATION.

DRIVESHAFT ANGLE WORKSHEET

IF YOUR VEHICLE HAS EXCESSIVE DRIVETRAIN VIBRATION OR NOISE PRIOR TO THE INSTALLATION OF THE DUAL RANGE, AND THE PROBLEM IS NOT CURED DURING THE INSTALLATION, IT MAY STILL EXIST AFTERWARDS . . . REQUIRING A DUPLICATION OF EFFORT.

IMPORTANT: This worksheet should be completed before disassembly of drivetrain. The proper documentation of stock driveline angles will allow the modified components to be as close as possible, to the original specifications.

TOOLS NEEDED: Spirit level (bubble type) protractor, measuring tape or ruler, and string slightly longer than driveshaft (for two and three piece shafts only).

Fill in proper angles and measurements on the diagram (A, B or C) that represents your vehicle's driveline (one, two, or three piece shaft).

USING PROTRACTOR: When angles are read from the 0 degree mark record and use the angle shown on the protractor, when using the 90 degree mark, treat it as 0 degree. For example, a protractor reading of 85 degrees is actually 5 degrees (see figs, 1 and 2).

All angles should be read within ½ degree and should be measured with protractor held exactly vertical on a clean, flat surface.

NOTE: If possible, always face the same side of the vehicle when reading all driveline angles to avoid confusion.

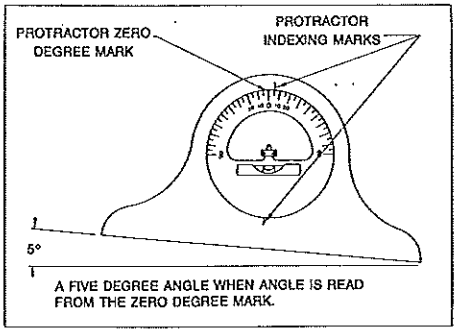


Fig. 1 Angle Read From Zero Mark - Horizontal Position

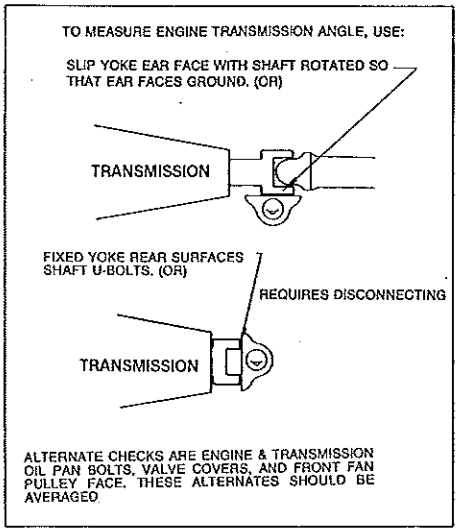


Fig. 3 Measuring Engine/Transmission Angle

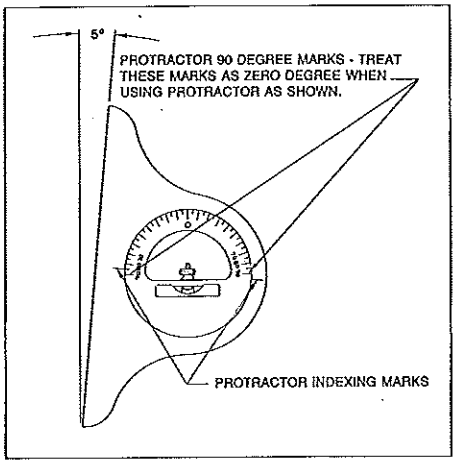


Fig. 2 Angle Read From 90° Mark - Vertical Position

1. Raise vehicle and support with adequate axle stands. It is important to support vehicle at rear axle in a loaded position. (As if tires were on the ground.) This will insure driveline angles are represented as actual.

2. All driveline angles are read horizontal relative to the frame angle. Therefore, measure frame angle (angle 1) by taking a protractor reading on part of frame that would be parallel with the road if vehicle were in normal position. Record angle on diagram. The protractor readings for driveline components are added to the frame reading. The products of these angles are the angles to duplicate during installation (see fig. 5)

3. Check and record the engine-transmission angle (angle 2) see fig. 3.

4. Check and record the coupling shaft angle (angle 5), If you have a two piece shaft, or angles (angles 5 and 6), if you have a three piece shaft.

5. Check and record the driveshaft angle (angle 4).

6. Check and record pinion angle (angle 3). Take reading as shown in fig. 4.

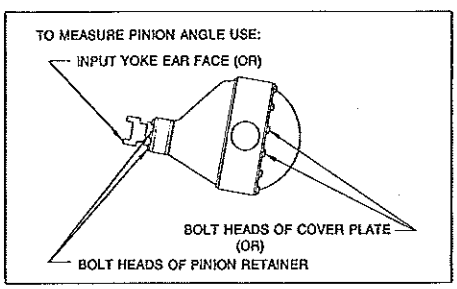
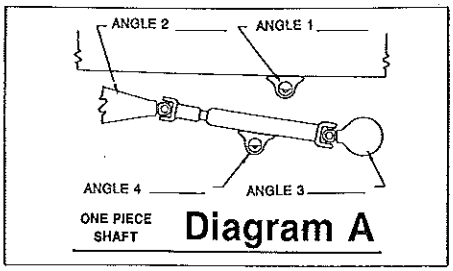
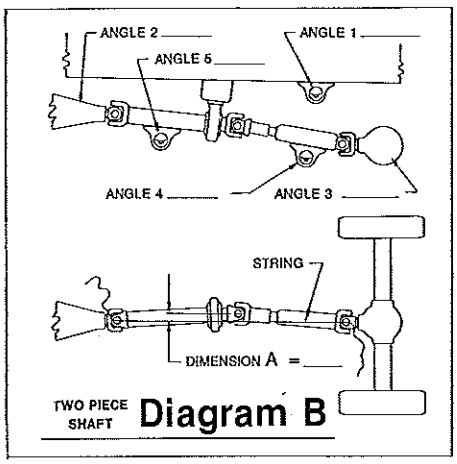
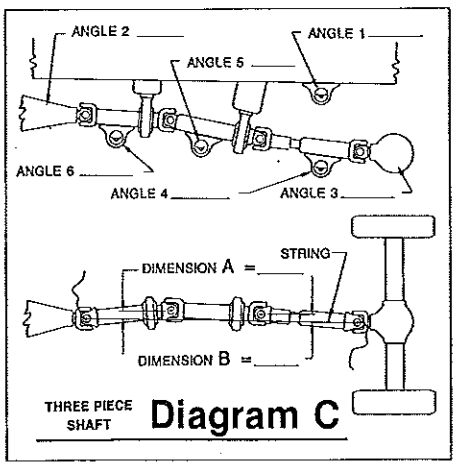


Fig. 4 Measuring Pinion Angle



7. On two and three piece shafts only; stretch a string from center of transmission output yoke to center of pinion input yoke. Then measure distance(s) between string and center of middle u-joint(s) (dimensions A & B). Dimensions are to be read to the nearest 1/8 inch and recorded on diagram.





ENGINE ANGLE = Angle 1 + Angle 2 = _____
PINION ANGLE = Angle 1 + Angle 3 = _____
DRIVESHAFT ANGEL = Angle 1 + Angle 4 = _____
COUPLING SHAFT ANGLE = Angle 1 + Angle 5 = _____
COUPLING SHAFT ANGLE = Angle 1 + Angle 6 = _____

Fig. 5 Computing Driveline To Frame Angles

DRIVELINE INFORMATION

The installation is essentially the same on all vehicles with a few drive shaft variations. It is impossible to plan ahead because of the combination of drive shafts offered.

Vehicle manufacturers use different sized U-Joints. However, we highly recommend using the series 1350 1 3/16" U-Joint. This U-Joint is very common on heavy duty GM applications, and is very strong and trouble free.

Since the drive shaft has to be modified, the proper tube yoke (1 3/16") can be installed with the transmission or adapter kit.

	Transmission Bolt-on Yoke	Supplied in adapter kit
2-pc. Drive Shaft	U-Joint	Supplied in adapter kit
	Tube Yoke (Determined By Tube Size)	Not supplied

Note: Finished drive shaft length should not be less than 12".

Because many of the vehicles use a very short front half of the drive shaft, it is possible to substitute a 1-pc. shaft. A 1-pc. shaft is *always* desirable, when possible. Remember, when using a 1-pc. shaft, drive line slip must be built into the drive shaft. To substitute a 1-pc. shaft, use the following:

	Transmission Bolt-on Yoke	Supplied in adapter kit
1-pc. Drive Shaft	U-Joint	Supplied in adapter kit
	Slip Stub (3 1/2")	Not supplied
	Drive Shaft Slip Yoke	Not supplied

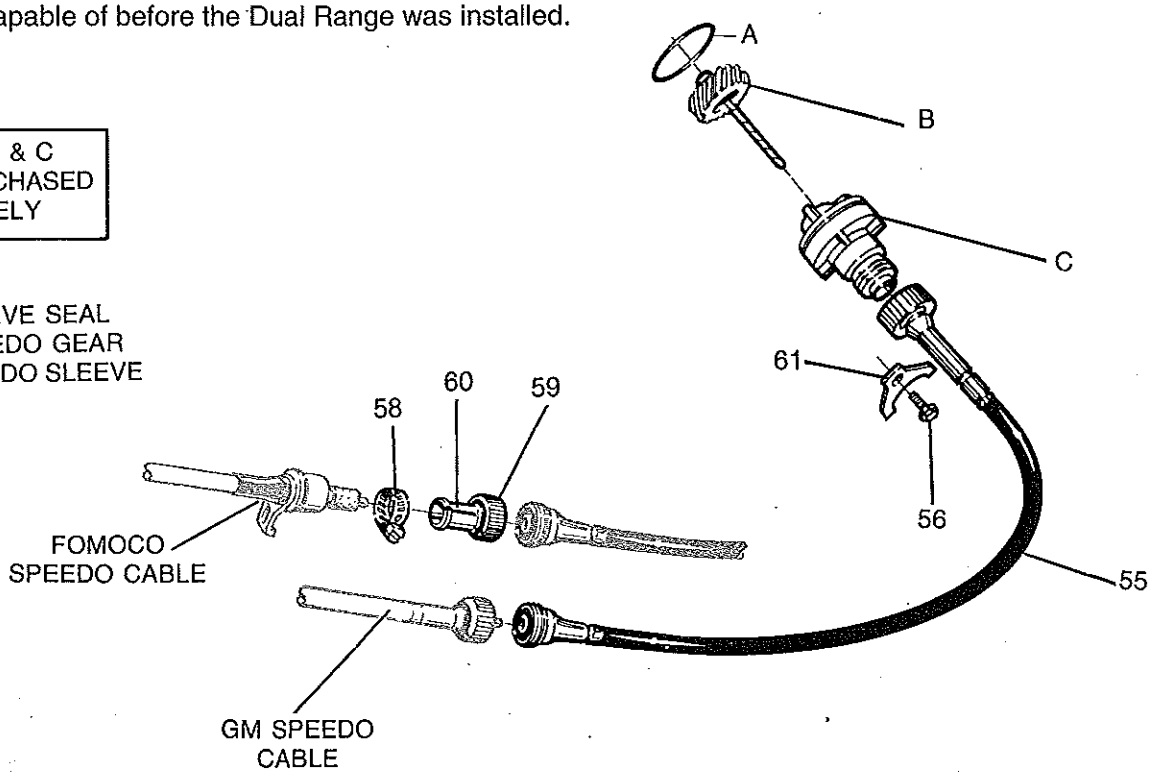
Note: Finished drive shaft length should not be more than 63".

MECHANICAL SPEEDO INFORMATION

The selection of speedometer parts needed for the installations are listed on page 5 (items B and C). Please notice when determining the drive ratio needed, that all driven gears (item B) from 34-39 tooth, use a different sleeve (item C) than the 40-45 tooth gears. It is important to make sure the sleeve is proper for the gear that will be used. The large selection of driven gears should allow an even more accurate speedometer reading than the vehicle was capable of before the Dual Range was installed.

ITEMS A, B & C MUST BE PURCHASED SEPARATELY

ITEMS A SLEEVE SEAL
B SPEEDO GEAR
C SPEEDO SLEEVE



SPEEDOMETER CORRECTION PROCEDURE

The Dual Range has a 15 Tooth Speedo Gear on the Output Shaft.

Since the speedometer cable is now connected to the speedo gear in the auxiliary transmission, it may be necessary to change the driven gear to make the speedometer read accurately. Follow these instructions. (Some GM vehicles and all other vehicles require a new speedo gear.)

Drive vehicle to a highway with mile markers. Record odometer reading at a mile marker, drive (10) ten or more miles, then record odometer reading again. Calculate miles traveled according to the odometer, including tenths of a mile.

Use the formula below to find the number of teeth needed on your speedometer driven gear.

B = Miles traveled according to odometer
A = Actual miles traveled (per mile markers)
T = Number of teeth on driven gear used to calculate miles traveled

$\frac{B}{A} \times T =$ Number of teeth needed on driven gear (round off to nearest whole number)

Example B = 16.4
A = 17
T = 41

$\frac{16.4}{17} \times 41 = 39.55 = 40$ (rounded off)

When rounding decimals off: .50 or less, round down
.51 or more, round up

METHOD FOR DETERMINING NEW DRIVEN GEAR

When attempting to duplicate an existing speedometer cable drive ratio, (assuming it was correct in it's original form) count the drive gear teeth. (This is the gear on the transmission output shaft). Then count the driven gear teeth. Divide for an existing ratio as in the following example:

Old Drive Gear	= 17 tooth
Old Driven Gear	= 45 tooth (45 ÷ 17) = 2.65
New Drive Gear	= 15 tooth (2.65 x 15) = 39.75
New Driven Gear	= 40 tooth

SPEEDOMETER DRIVEN GEARS

SLEEVE USED GM PART # (ITEM C)	SEAL GM PART # (ITEM A)	TEETH	SPEEDO GEARS GM PART # (ITEM B)	COLOR
1362294	15562374	34T	9774413	Lt. Green
		35T	9780628	Pink
		36T	1359270	White
		37T	1359271	Red
		38T	1359272	Blue
		39T	1359273	Brown
1362293	15562374	40T	1362048	Black
		41T	1362195	Yellow
		42T	1362049	Green
		43T	1362196	Purple
		44T	9780470	Gray
		45T	9775187	Lt. Blue

For ITEMS A, B and C, see pages 4, 5, 12 and 13.
Please note that the above parts are listed with General Motors part numbers and should be available at most GM dealers. If the speedo gear required has less than 34 Teeth, then a compound speedo set, GM #3950350, is required.

GENERAL
INSTALLATION INSTRUCTIONS

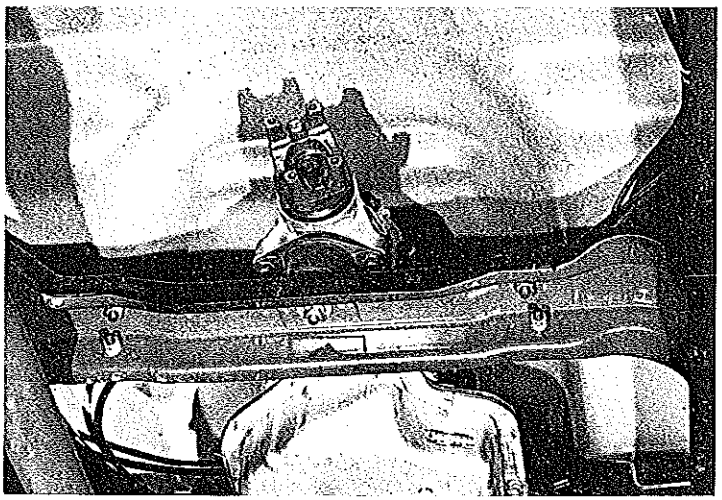


FIGURE 1

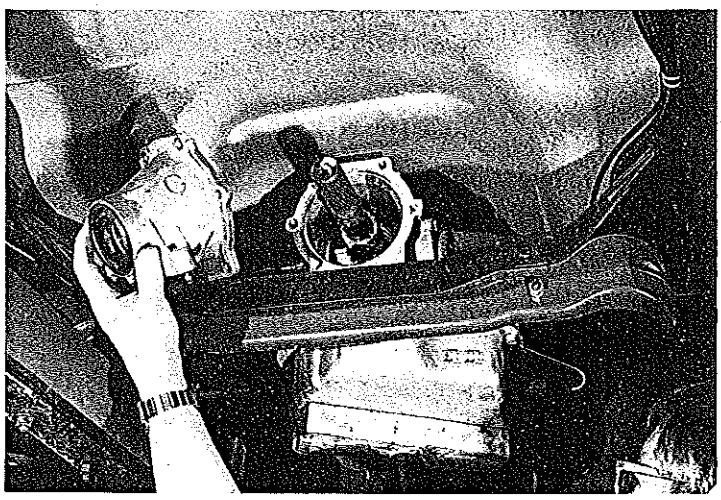


FIGURE 2

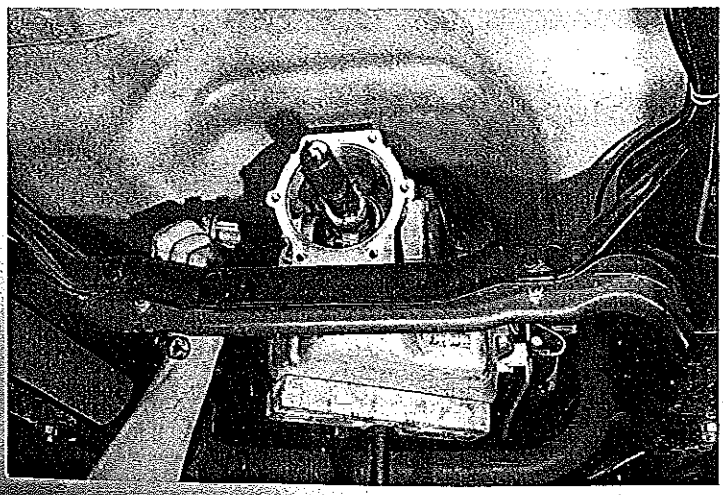


FIGURE 3

Raise vehicle and support with adequate axle stands. It is important to support rear axle in a loaded position...(As if tires were on the ground). This will insure driveline angles are represented as actual.

Using driveshaft work sheet, record all stock angles. This will establish a reference for the reworked driveline.

After recording all important angles, remove driveshaft. Most vehicles will have multi-piece driveshafts. If so, the front half is the only piece necessary to remove. (Figure 1).

Place jack under automatic transmission pan with wood to prevent damage. Remove mount bolts, then jack transmission to remove load from crossmember. (If rear mount has fixed stud with nuts and washers, it may be necessary to remove crossmember.) Remove speedo cable. Remove rear yoke from output shaft of transmission. Disassemble rear mount and remove tailhousing (the mount will be used on the range box adapter). (Figure 2).

Remove speedo adapter with driven gear. (Figure 3) Count teeth of both drive and driven gears to calculate new speedo gear. On GM vehicles a plug is supplied for the existing hole. Apply sealer on diameter of plug and install. Be very careful **NOT** to damage speedo hole in transmission case.

Clean transmission flange surface. Apply sealer to flange gasket and install range box adapter.

Install crossmember, if removed, and start mount bolts. Lower transmission and tighten bolts.

Clean adapter flange and apply sealer and gasket. (Figure 4). Slide range box onto the output shaft and forward to the adapter. Bolt range box to adapter. Torque to 30-35 lbs. *Dual Range should never be drawn into place by bolts.* (Figure 5). Check for clearance around the Dual Range. There must be 3/4" clearance between the floor pan and the Dual Range. Some installations may require floor board modifications.

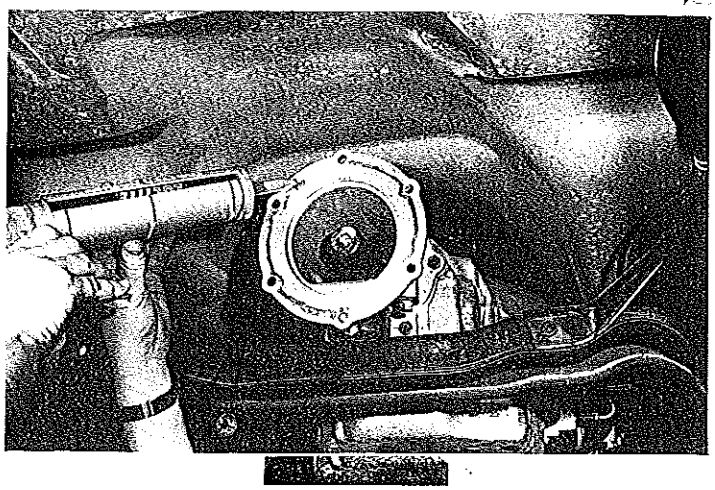
Install rear yoke. Torque to 90-95 lbs. The yoke on the output shaft of the Dual Range must be bolted to the output shaft using the bolt, lock washer and yoke washer supplied in the adapter kit. Install speedo parts and cable extension. Refer to page 5. Be sure cable is routed to clear exhaust system and has no obstructions. (Figure 6).

Establish new driveshaft dimensions. If the vehicle has extremely short front half, it may be more appropriate to use a new 1-piece shaft.

With new driveshaft, adjust driveline angles as close as possible to the original specifications. This can usually be accomplished by shimming the mount. If a 1-piece shaft is replacing a 2-piece, the angles may not be as critical.

Fill range box with 80-90 wgt. gear lube or equivalent. (Approximately 32 ounces.) Recommended oil change is (1) year or every 20,000 miles. A clearance is required for the exhaust system. A heat shield may be needed for further protection. *Remember: no metal-to-metal contact.*

CONTINUE INSTALLATION, USING INSTRUCTIONS PROVIDED WITH WIRING HARNESS.



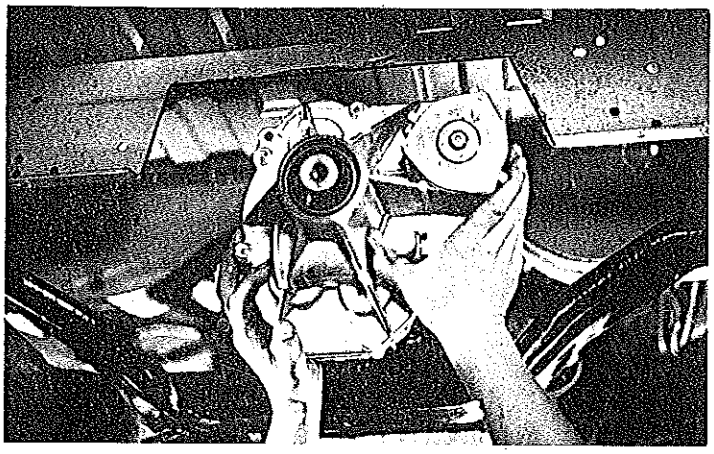


FIGURE 5

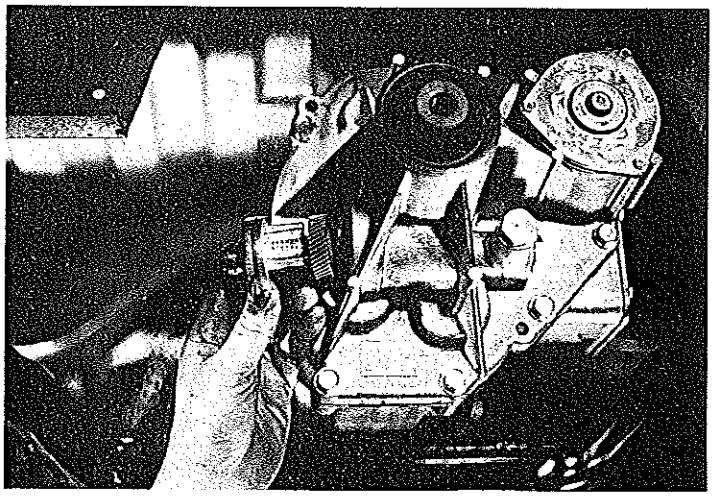


FIGURE 6

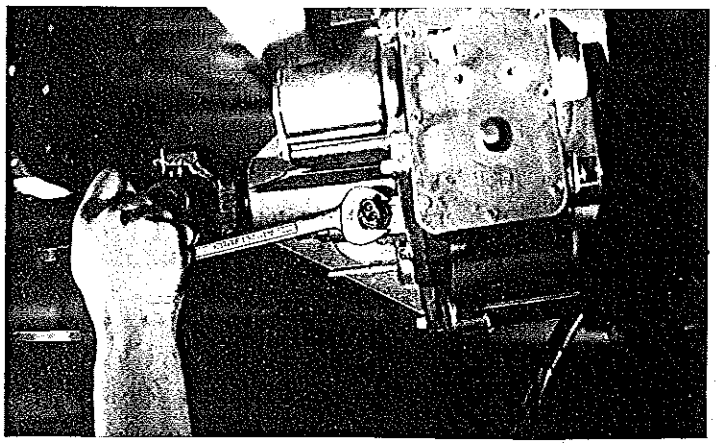
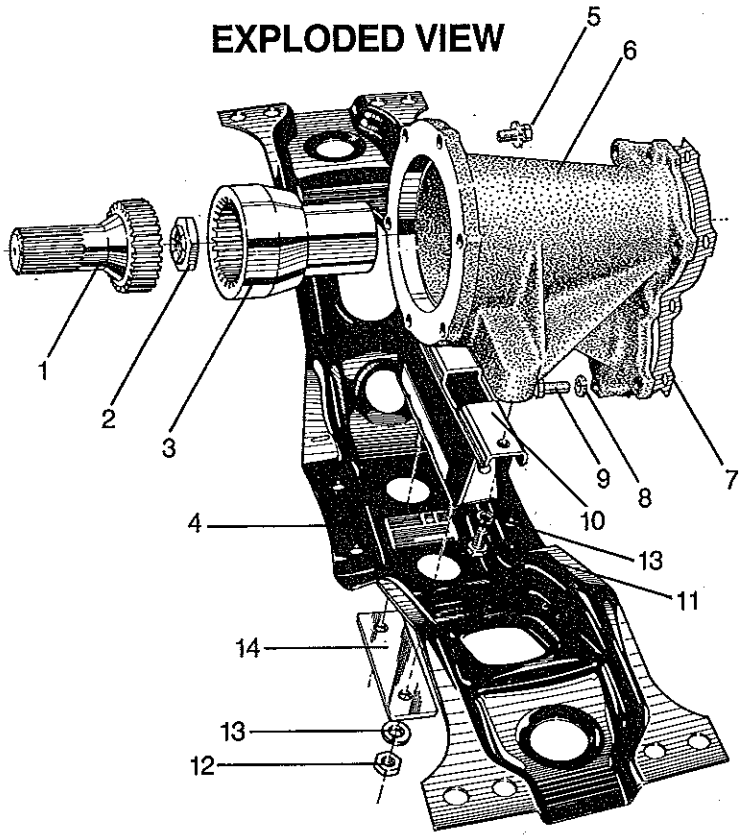


FIGURE 7

DUAL RANGE GM SM465 MANUAL TRANSMISSION

EXPLODED VIEW



PARTS LIST

ITEM NO.	DESCRIPTION	PART NO.	QTY
1	STUB SHAFT	DURJ01496	1
2	YOKE NUT	*	1
3	COUPLING	DURJ01789	1
4	CROSSMEMBER STAMPING	DURJ01798	1
5	BOLT	*	6
6	CAST IRON ADAPTER	DURJ01756	1
7	GASKET TRANS	81-80043	1
8	LOCK WASHER	*	8
9	BOLT	*	8
10	RUBBER TRANS MOUNT	92-80016	1
11	BOLT M10 x 1.5x30	90-80002	2
12	HEX NUT M10 x 1.5	90-80137	2
13	LOCKWASHER M10	90-80138	4
14	CROSSMEMBER PLATE	90-80136	1

* USE EXISTING PARTS

ELECTRICAL AND HARDWARE PARTS LIST

WIRING HARNESS	93-80043	1
SHIFT SWITCH	93-80029	1
ELECTRICAL CLIP	90-80144	2
BOLT 5/16-8	0000179817	1
HEX NUT 5/16-8	90-80139	1
SCREW & WASHER PACK	80-80027	1
SPEEDO EXTENSION CABLE	84-80007	1
YOKE KIT	80-80049	1
CONTROL MODULE	59-80012	1

INSTALLATION INSTRUCTIONS

NOTE: **SPEEDO GEAR AND SLEEVE ARE NOT PROVIDED (SEE SPEEDO SECTION OF MANUAL)**

Raise the vehicle and support with adequate axle stands. It is important to support the rear axle in a loaded position...as if the tires were on the ground. This will insure driveline angles are represented as actual.

Check the drive shaft angles. Using the drive shaft angle work sheet, record all stock angles.

This will establish a reference for the reworked drive line.
Remove the drive shaft. (The drive shaft will have to be shortened approximately $17\frac{3}{8}$".)

Place a jack under the transmission and remove the bolts from the transmission mount to the crossmember. Raise the jack to remove pressure from the crossmember.

Remove the speedo cable from the transmission.

Remove the crossmember, then remove the yoke bolt and yoke.

Drain the transmission.

Remove the tail housing of the transmission. (Figure 1).

NOTE: The speedo drive gear for the manual transmission must remain on the output shaft as a spacer for the coupler.

Install the Dual Range adapter and gasket. Torque the bolts to 35 foot lbs.

Install transmission mount on the adapter.

Position the new crossmember in place using the transmission mount studs and 2 of the previous holes in the frame from the old crossmember. Use a pry bar to raise the vehicle body slightly, if necessary, to remove the bolts from the old crossmember to upper frame rail. (Figure 2).

Drill the necessary 15/32 inch holes in the frame to match the new crossmember.

Replace the bolts in the lower frame rail if there is a reinforcement plate on the frame.

Fasten the crossmember to the frame, using the bolts that were on the old crossmember.

Release the jack under the transmission and attach the plate to the crossmember to secure the transmission mount.

Tighten mount nuts to 35 foot lbs. torque.

Install the coupler adapter on the transmission output shaft. Tighten the yoke lock nut to 90-95 foot lbs. on the shaft. (Figure 3 & 4).

Install the spline stub shaft into the coupler. (Figure 5).

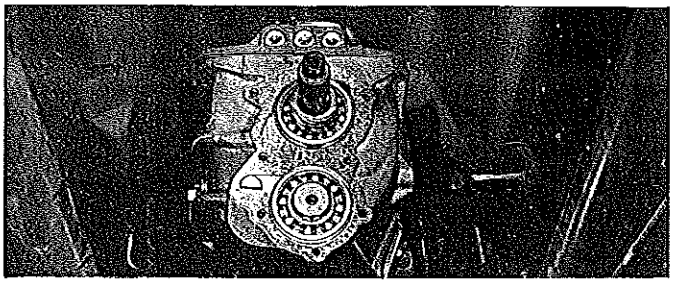


FIGURE 1

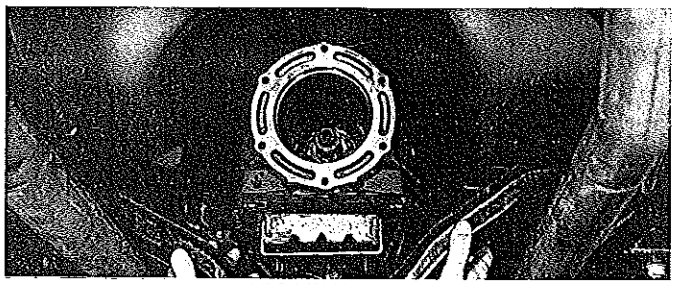


FIGURE 2

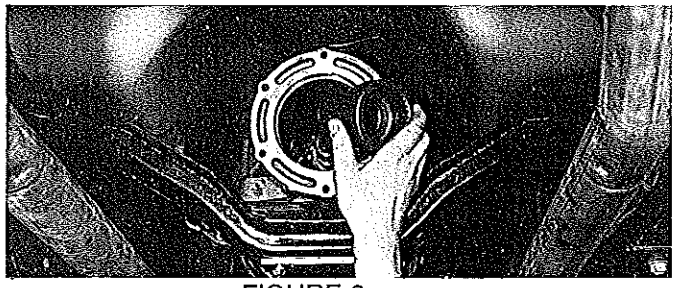


FIGURE 3

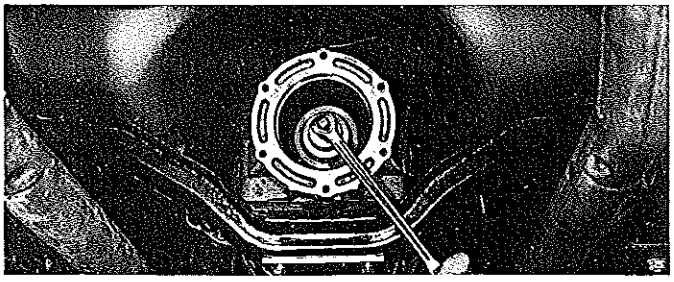


FIGURE 4

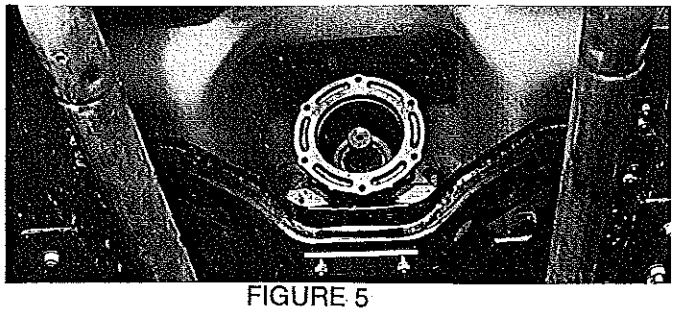


FIGURE 5

Apply sealant to the gasket and install the Dual Range to the adapter.

Tighten the bolts to 35 foot lbs.

Install the new yoke to the Dual Range and torque to 90-95 foot lbs. (Figure 7).

Install speedo parts and cable extension. (The sleeve and speedo gear are not provided). Be sure the cable is routed to clear the exhaust system and has no obstruction or sharp bends.

Install the shortened drive shaft and align it to get as close as possible to the original driveline angles.

Install wire harness. (It is necessary to remove the shift lever boot to install the harness on the shift lever).

Fill the range box and transmission with 80-90 wgt. gear lube or the equivalent. (Approximately 32 ounces) Recommended oil change is (1) year or every 20,000 miles.

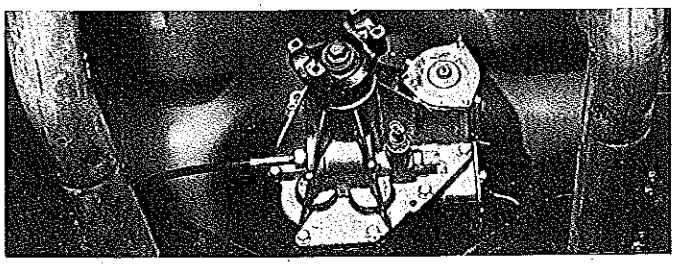


FIGURE 7

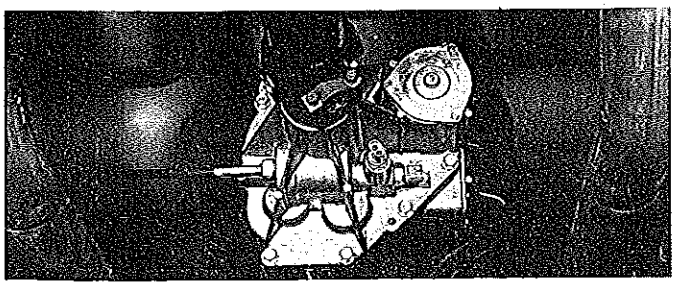
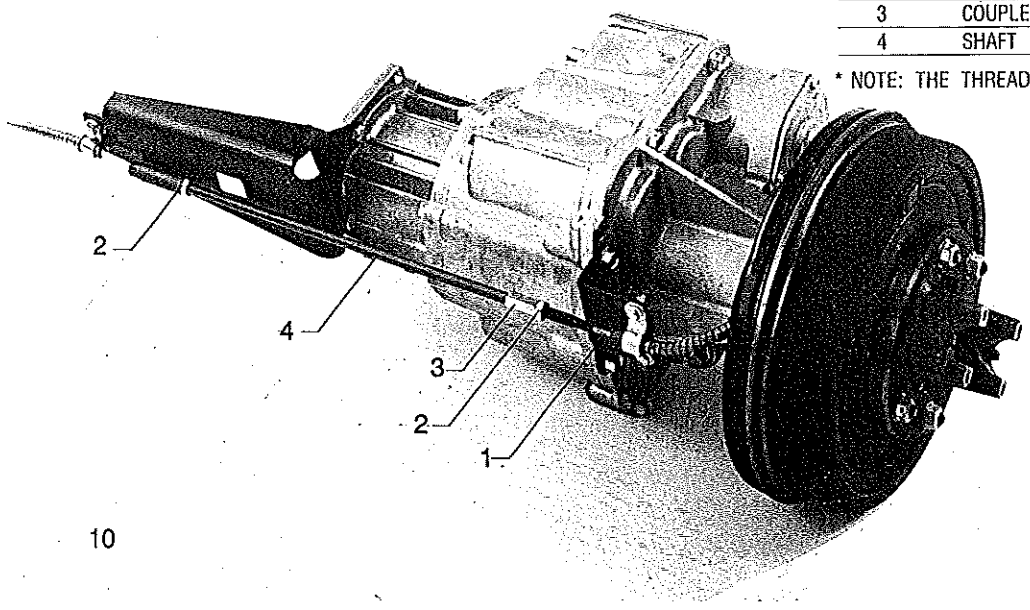


FIGURE 8

Check for clearance around the Dual Range. There must be 1/2" to 3/4" clearance between the floor pan and the Dual Range. Clearance is needed for the exhaust system. Heat shields may be necessary for further protection.

NOTE: See page 2 for proper shift procedure for manual transmission applications.

DUAL RANGE TRANSMISSION BRAKE CONFIGURATION
THIS UNIT IS PRIMARILY FOR THOSE VEHICLES WHICH HAVE 4 WHEEL DISC. BRAKES



ADDITIONAL PARTS REQUIRED

ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	BRACKET	63-80036	1
2	JAM NUT	90-80132	2
3	COUPLER NUT	90-80133	1
4	SHAFT	90-80134	1

* NOTE: THE THREADED SHAFT LENGTH MAY HAVE TO BE SHORTENED.

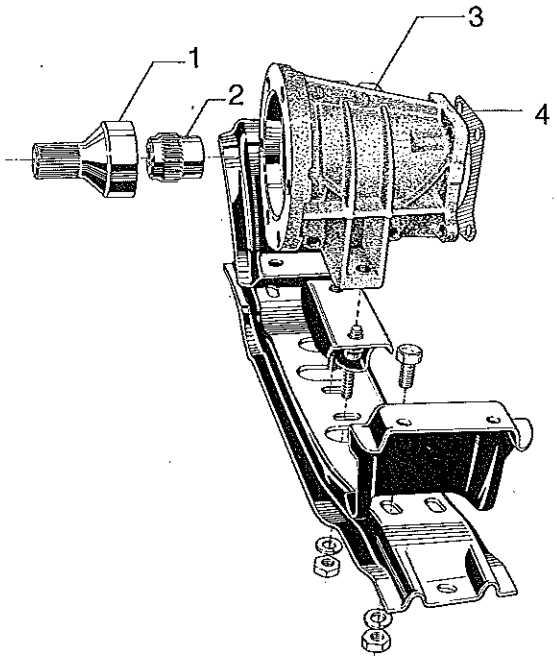
DUAL RANGE
FORD T18/19 STANDARD TRANSMISSION

PARTS LIST

ITEM NO.	DESCRIPTION	PART NO.	QTY
1	INPUT COUPLING	89-80003	1
2	OUTPUT SLEEVE	75-80013	1
3	ADAPTER	72-80031	1
4	GASKET TRANSMISSION	81-80044	1

ELECTRICAL AND HARDWARE PARTS LIST

WIRING HARNESS	93-80043	1
SHIFT SWITCH	93-80029	1
SPEEDO EXTENSION CABLE	84-80007	1
SCREW & WASHER PACK	80-80027	1
FORD SPEEDO ADAPTER KIT	84-80010	1
WASHER	90-80019	1
YOKE KIT		
BOLT-ON YOKE	89-80001	1
YOKE WASHER	90-80118	1
YOKE BOLT	90-80112	1
LOCK WASHER	90-80130	1
CONTROL MODULE	59-80012	1



INSTALLATION INSTRUCTIONS

NOTE: **SPEEDO GEAR AND SLEEVE ARE NOT PROVIDED (SEE SPEEDO SECTION OF MANUAL) — THE ORIGINAL TRANSMISSION MOUNT IS USED.**

Raise the vehicle and support with adequate axle stands. It is important to support the rear axle in a loaded position (as if the tires were on the ground). This will insure driveline angles are represented as actual.

Check drive shaft angles. Using a drive work sheet, record all stock angles. This will establish a reference for the reworked drive line.

Remove the drive shaft; shorten the shaft approximately 15 1/4". See the section of the manual "DRIVELINE INFORMATION" to determine parts needed for either a 1-piece or 2-piece drive shaft.

Place a jack under the transmission to support it and drain the transmission. Remove the crossmember, support brackets, yoke and tail housing.

Install the adapter. One of the (6) bolt holes has been machined and a standard 3/8" ID washer must be placed under the bolt to assure it would not crack the case if the bolt bottoms out. (This hole is located on a 9 o'clock position looking from the rear of tthe vehicle.

Mount the crossmember and the new support bracket. Install the transmission mount, place the input coupling on the output shaft and position the output sleeve on the input coupling. Install the Dual Range over the output sleeve. Using Loctite, tighten the bolts to 35 foot lbs.

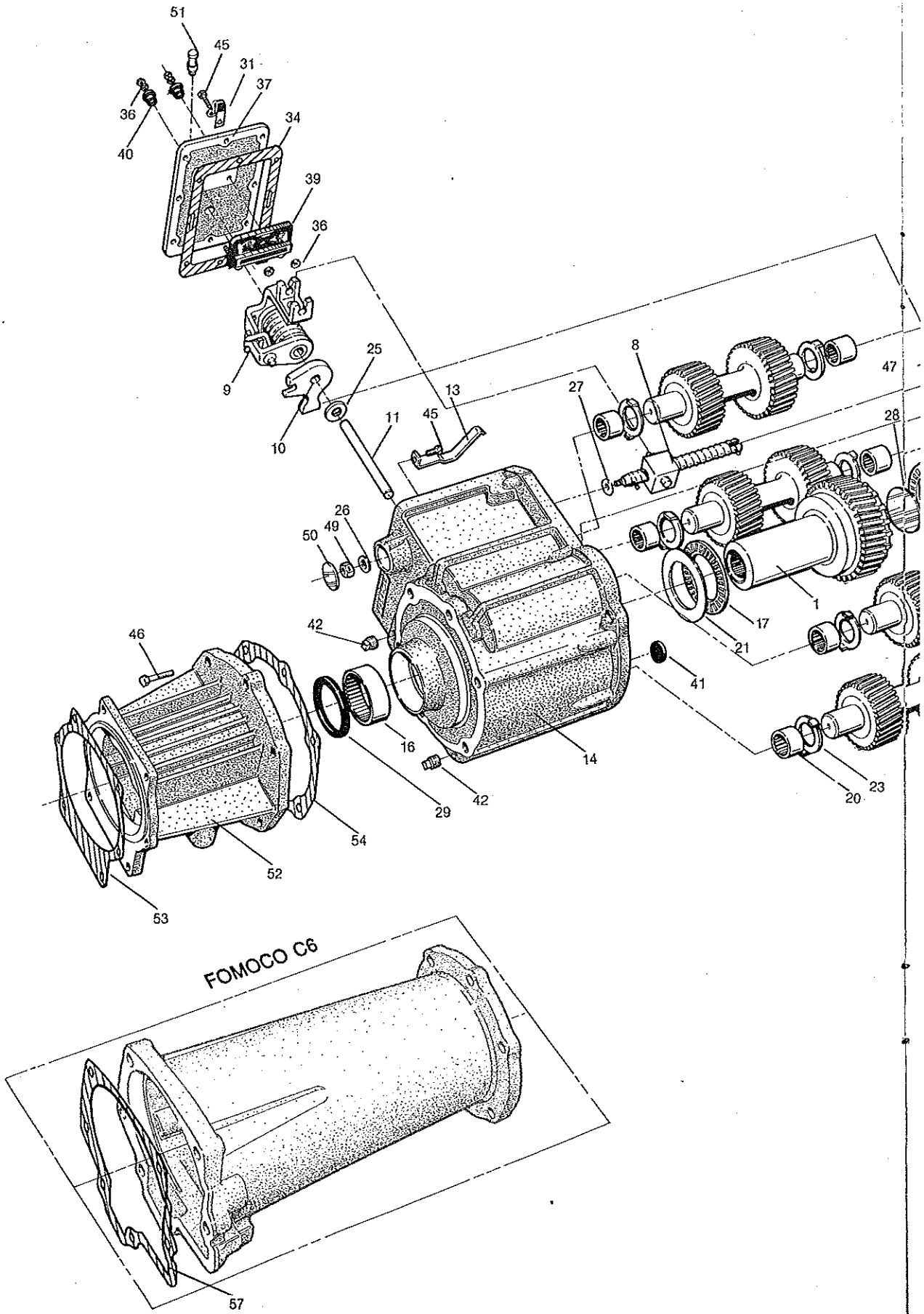
Install the yoke, torque to 90 foot lbs. Calculate the new speedo drive gear and place it in the Dual Range.

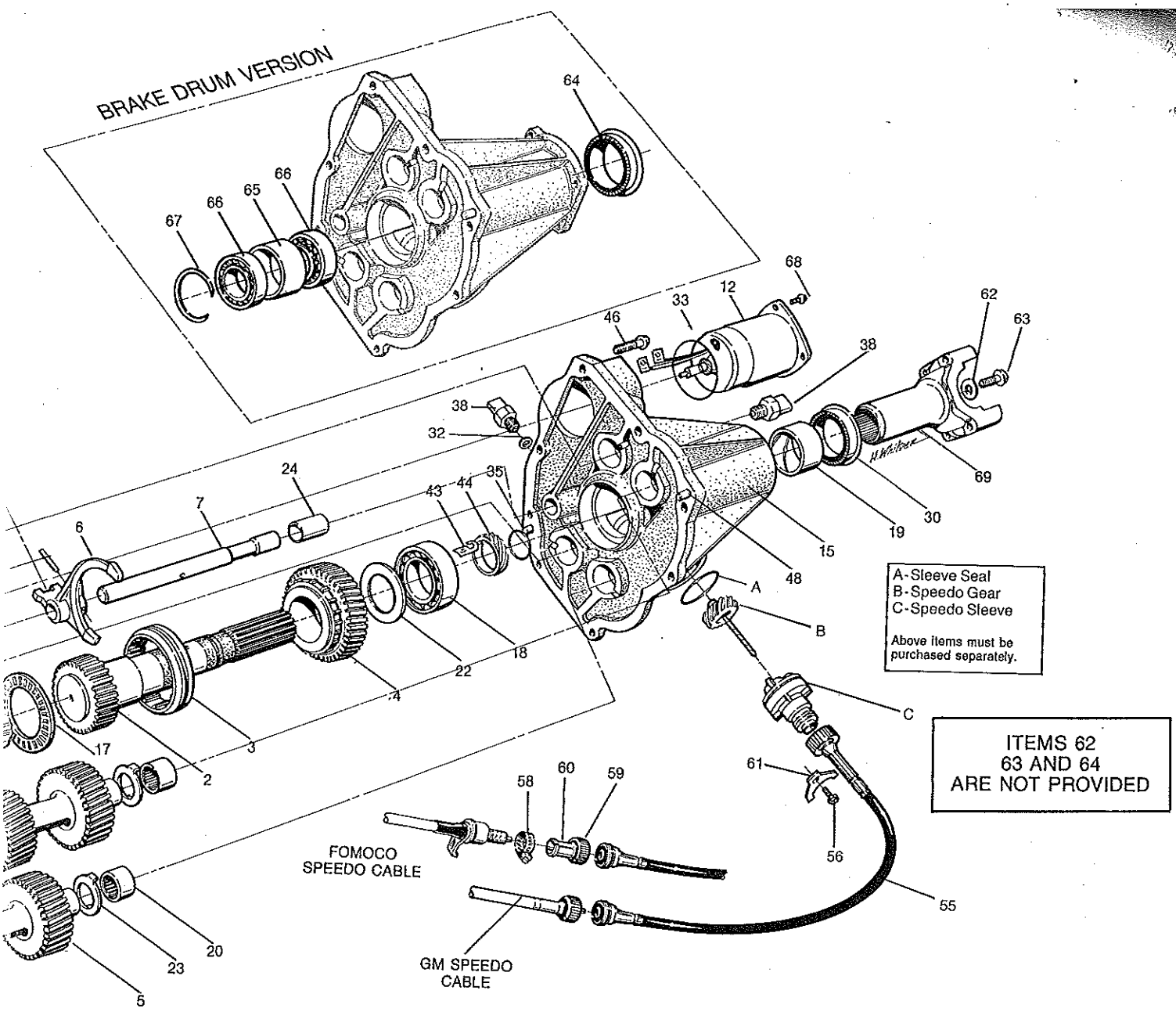
Fill the Dual Range with 80-90 wgt. gear lube or equivalent (approximately 32 ounces). Recommended oil change is (1) year or every 20,000 miles.

Check for clearance around the Dual Range. There must be 1/2" to 3/4" clearance between the floor pan and the Dual Range. Clearance is needed for the exhaust system. Heat shields may be necessary for further protection.

Install the wiring harness. It is necessary to remove the shift lever boot to install the harness on the shift lever.

NOTE: See page 2 for proper shift procedure for manual transmission applications.


51
45
31
37
36
40
34
39
36
9
25
10
11
13
45
8
27
47
28
26
49
50
1
17
21
42
46
41
16
14
29
42
23
20
54
52
53
FOMOCO C6
57



AUXILIARY TRANSMISSION

EXPLODED VIEW

PARTS LISTED PAGE

AUXILIARY TRANSMISSION PARTS LIST

O.D. — OVERDRIVE **U.D. — UNDERDRIVE**

ITEM NO.	DESCRIPTION	PART NO.	QTY
1	INPUT SUN GEAR		1
	10 SPLINE U.D.	DURJ01735	
	GM O.D. 32 SPLINE	DURJ01740	
	FORD O.D. 31 SPLINE	DURJ01742	
	FORD U.D. 31 SPLINE	DURJ01743	
	GM U.D. 32 SPLINE	DURJ01745	
	GM U.D. 27 SPLINE	DURJ01746	
	GM O.D. 27 SPLINE	DURJ01747	
	10 SPLINE O.D.	DURJ01770	
	DODGE 518 4x4 U.D. 23 SPLINE	DURJ01823	
	DODGE 518 2x4 U.D. 30 SPLINE	DURJ01900	
	DODGE NV4500 4x4 O.D. 29 SPLINE	DURJ01909	
	DODGE NV4500 2x4 O.D. 31 SPLINE	DURJ01910	
	DODGE NV4500 4x4 U.D. 29 SPLINE	DURJ01924	
	DODGE NV4500 2x4 U.D. 31 SPLINE	DURJ01925	
	DODGE 518 2x4 O.D. 30 SPLINE	DURJ01937	
	DODGE 518 4x4 O.D. 23 SPLINE	DURJ01824	
2	OUTPUT SHAFT		1
	32 SPLINE	DURJ01739	
	27 SPLINE	DURJ01748	
	31 SPLINE	DURJ01749	
	10 SPLINE	DURJ01850	
	29 SPLINE	DURJ01908	
	23 SPLINE	DURJ01928	
3	SLIDER	DURJ01432	1
4	OUTPUT SUN GEAR (OD)	DURJ01741	
	OUTPUT SUN GEAR (UD)	DURJ01744	
5	PLANET GEAR	DURJ01429	4
6	SHIFT FORK	DURJ01448	1
7	SHIFT RAIL	DURJ01435	1
8	DRIVE SCREW ASSEMBLY	98-80086	1
9	SPRING (LEVERS ASSEMBLY)	62-80039	1
10	SHIFT FINGER	66-80022	1
11	SHIFT SHAFT	DURJ01449	1
12	SHIFT MOTOR	93-80040	1
13	LEAF SPRING	62-80034	1
14	MAIN HOUSING ASSEMBLY	71-80031-A	1
15	STD. TAIL HOUSING ASSEMBLY	72-80015-A	1
	TAIL HOUSING (BRAKE) ASSEMBLY	72-80012-A	1
16	INPUT SUN BEARING	78-80023	1
17	THRUST BEARING	78-80025	2
18	BALL BEARING	78-80029	1
19	OUTPUT BUSHING	83-80008	1
20	PLANET BEARING	78-80022	8
21	THRUST WASHER	86-80027	1
22	THRUST WASHER	86-80029	1

ITEM NO.	DESCRIPTION	PART NO.	QTY
23	PLANET THRUST WASHER	86-80025	8
24	BUSHING BRONZE	83-80006	1
25	WASHER FLAT	90-80119	1
26	WASHER 5/16 I.D. FLAT	90-56500	1
27	WASHER FLAT (DRIVE SCREW)	90-80123	1
28	EXPANSION PLUG (INPUT SUN)	82-80091	1
29	INPUT SEAL	82-80090	1
30	OUTPUT SEAL	82-55132	1
31	WIRING HARNESS CLIP	92-80013	1
33	'O' RING	82-80117	1
34	SIDE COVER GASKET	81-80037	1
35	'O' RING	82-80096	1
36	NUT #8-32	90-80102	6
37	SIDE COVER	96-80008	1
38	LIGHT SWITCH	59-80004	2
41	MAGNETIC	93-80001	1
42	PLUG (Fill & Drain)	82-80116	2
43	CLIP SPEEDO GEAR	84-80004	1
44	SPEEDO DRIVE GEAR	10-00002	1
45	SCREW #10-24x¾	90-80116	9
46	SCREW 3/8-16x1-½	90-80126	14
47	PIN (SHIFT FORK)	10-00-043-016	1
48	DOWEL PIN	79-80029	1
49	LOCKNUT BALL SCREW	90-80100	1
50	EXPANSION PLUG	96-80002	1
51	BREATHER PLUG	82-56375	1
52	ADAPTER, GM THM 400	DURJ01750	1
	ADAPTER, FORD C6	DURJ01751	1
53	GASKET (ADAPTER, TURBO 400)	81-80036	1
54	GASKET (MAIN HOUSING)	81-80038	1
55	SPEEDO EXTENSION CABLE	84-80007	1
56	SCREW (SPEEDO BRACKET)	90-80112	1
57	GASKET (ADAPTER FD C6)	81-80039	1
58	CLAMP	90-80124	1
59	SPEEDO CABLE NUT	84-80011	1
60	SLEEVE (SPEEDO CABLE ADAPTER)	84-80012	1
61	BRACKET (SPEEDO SLEEVE)	63-80034	1
62	WASHER (OUTPUT YOKE)	90-80118	1
63	SCREW (YOKE)	90-80112	1
64	OUTPUT SEAL (BRAKE)	82-80092	1
65	BEARING SPACER	79-80028	1
66	BEARING	78-80028	2
67	SNAP RING	80-80020	1
68	SCREW	90-80151	3
69	YOKE	89-80001	1

DISASSEMBLY/ASSEMBLY PROCEDURE AND SERVICE INSTRUCTIONS

DISASSEMBLY

Remove (8) #10-24 x ¾'' screws which are torqued at 7 ft. lbs. (Figure 1) holding the electric cover in place.

Remove (2) #8-32 nuts holding the red and black electric motor wires to the electric switch. It is important that the wires to the switch are positioned just as shown (Figure 2). The red wire is on the left terminal and the black wire is on the right when facing the opening.

Remove (3) #10-24 x ¾'' screws holding the electric motor to the case.

Remove (8) ⅜ x 1½'' bolts (torqued at 35 foot lbs.) holding the main housing to the tail housing. Slight pressure must be applied to the tail housing to separate the unit as silicon was used as a sealant. Once the unit is separated the four (4) planet thrust washers will be located on the planet gears. They should be inspected to insure that the tabs are not broken.

To remove the spring assembly it is best to position the race of the ball screw at its top most position (nearest the slot in the ball screw). The shaft for the spring assembly is a slip fit into the case and should be easy to remove. (Figure 3).

The ball screw can next be removed by removing the plug in the main housing and then removing the leaf spring.

Removal of the output shaft assembly is done by lifting the shaft out of mesh with the planet gears.

The input sun needle bearing is next removed. It is placed in the center of the slider on the face of the input sun gear.

To remove the slider you must grasp the shift shaft and raise it. Move the slider off the pads of the fork and then raise the fork to its upmost postition. By tilting the slider it can then be removed. (Figure 4).

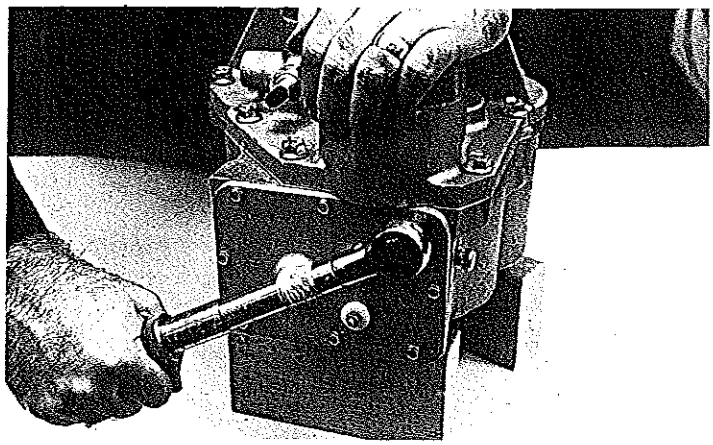


FIGURE 1

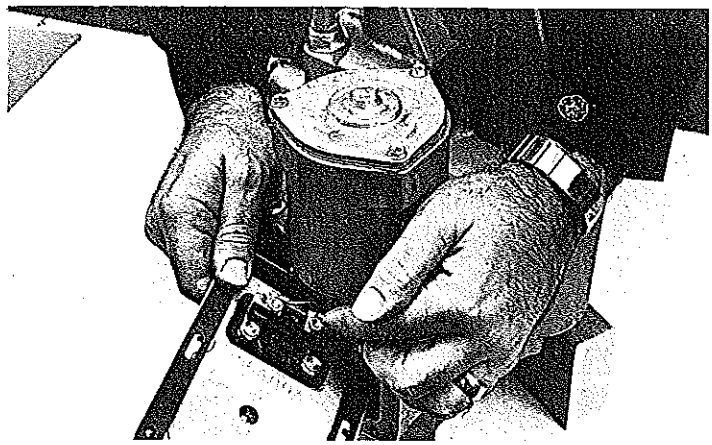


FIGURE 2

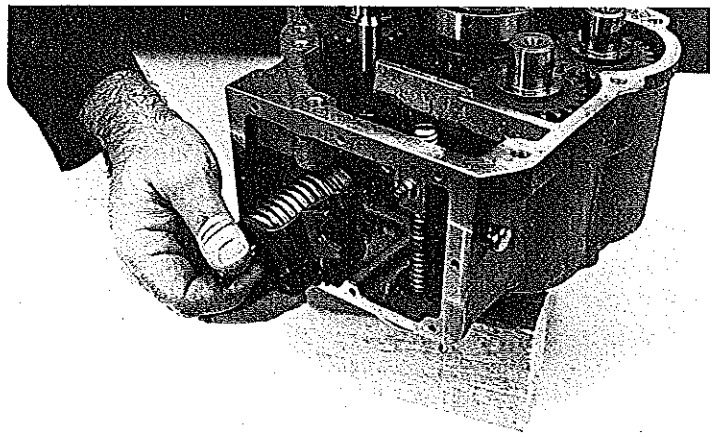


FIGURE 3

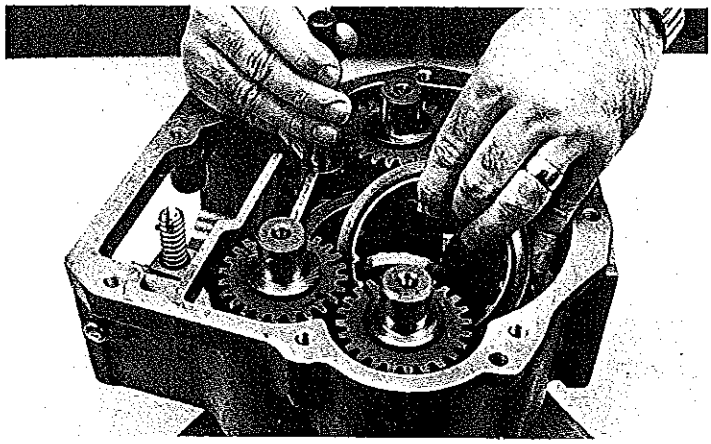


FIGURE 4

DISASSEMBLY CONTINUED

Removing the fork and shift shaft is done by tilting it as shown in Figure 5. The planet gears are removed by lifting them upward. The planet washers may be attached to the planets because of the oil film and should be positioned to the main housing, with the tabs in the slots prior to re-assembly.

Removal of the input sun is simply done by pulling it from the bearing pocket.

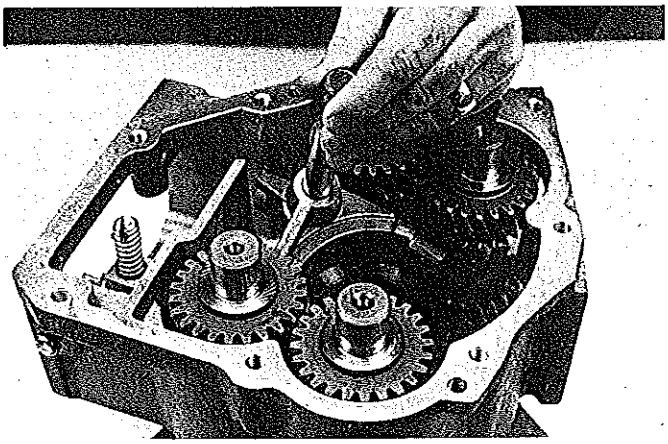


FIGURE 5

Removal of the needle bearing reveals a thin thrust washer. (Figure 6).

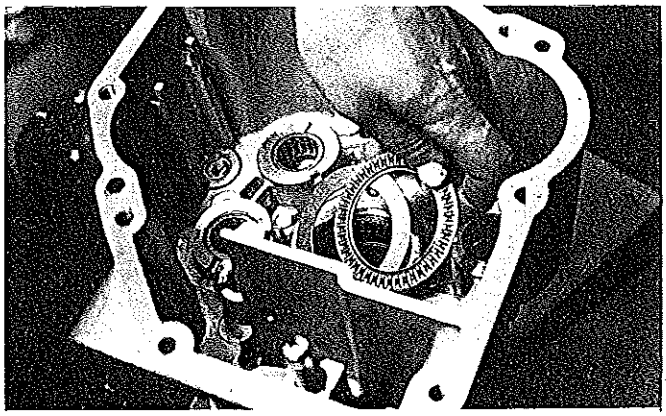


FIGURE 6

ASSEMBLY

The assembly of the unit is simply the reverse of the disassembly.

If the ball screw has been removed then position it through a washer into the main housing. A hardened washer is placed on the ball screw on the opposite side. A lock nut is torqued on the ball screw at approximately 7 ft. — lbs. The small hard fiber plug on the race of the ball screw must be positioned facing the case opening to assemble the unit properly. (Figure 7). The welch plug is pressed into the ball screw cavity to seal the unit.

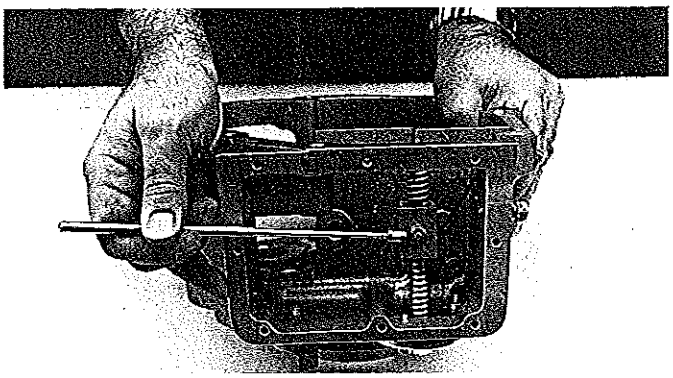


FIGURE 7

Position the thrust washer and the input sun gear needle bearing into the sun gear bearing pocket.

The planet gear thrust washers are positioned to the main housing with the tabs in the slots. (Figure 8).

The input sun gear is now placed in the main housing.

Caution: All fastners are self-tapping. Do not over Torque!

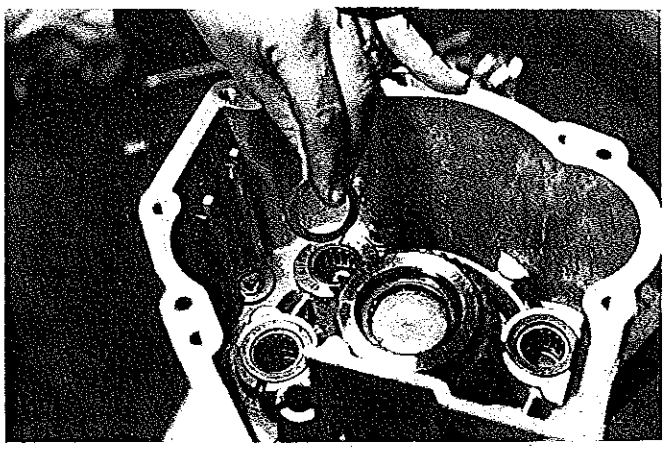


FIGURE 8

ASSEMBLY CONTINUED

Figures (9) through (12) show the steps in positioning the planet gears. It should be noted that these gears are in matched sets and should not be interchanged with other gears unless authorization is obtained from the manufacturer.

The planet gears are positioned in an X pattern. Place the upper left gear into position and then the lower right gear making sure the timing marks of the two (2) gears are on the same line as drawn through the centers of the two (2) planet and input sun gears (Figures 9 and 10).Next position the upper right gear. The timing mark should be in a direction toward the outside bearing diameter of the adjacent gear. (Figure 11).

The last gear is now set into position. Again, the timing machine is in a direction toward the outside bearing diameter of the adjacent gear. (Figure 12).

The fork and shift shaft are now placed into the the main housing. Raising the shift shaft as high as it will go in a vertical direction will allow the clearance necessary to position the slider. Check to ensure the slider is on the pads of the fork.

The needle bearing is now placed on the inside of the slider against the face of the input sun gear.

The spring is now assembled into the case. Place the hardened shaft through the spring, the shift finger and standard 3/8'' ID washer. The race on the ball screw should be about 3 turns from its upper limit. The fiber tip on the ball screw race should be positioned to the side opening of the case.

The spring assembly fingers are placed over the tabs on the ball screw race and the shaft positioned into the hole of the main housing with the shift finger positioned into the shaft fork. While inserting the shaft into the case, slowly rotate the ball screw to allow easier entry of the shift shaft into the hole in the case.

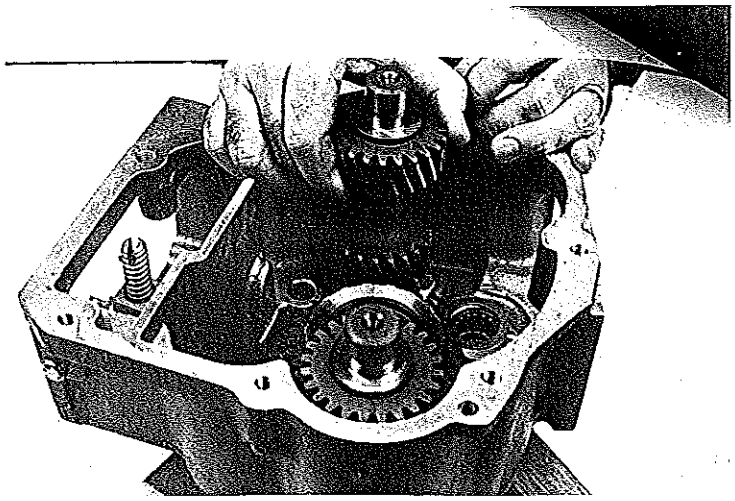


FIGURE 9

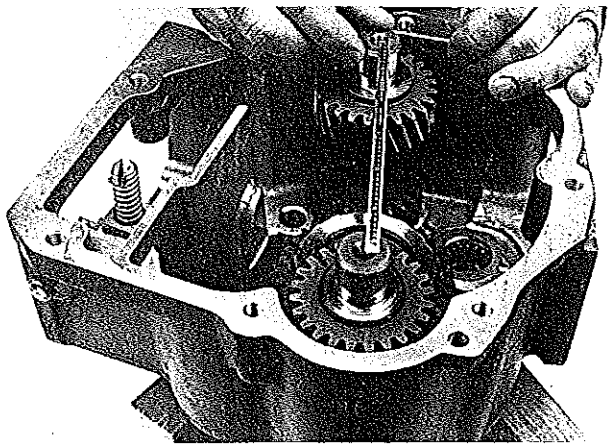


FIGURE 10

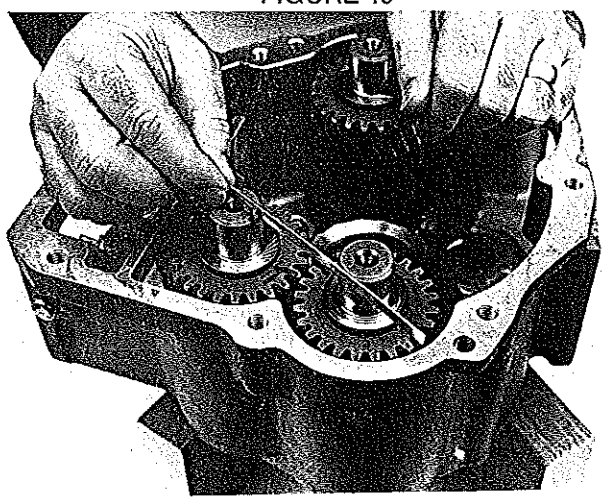


FIGURE 11

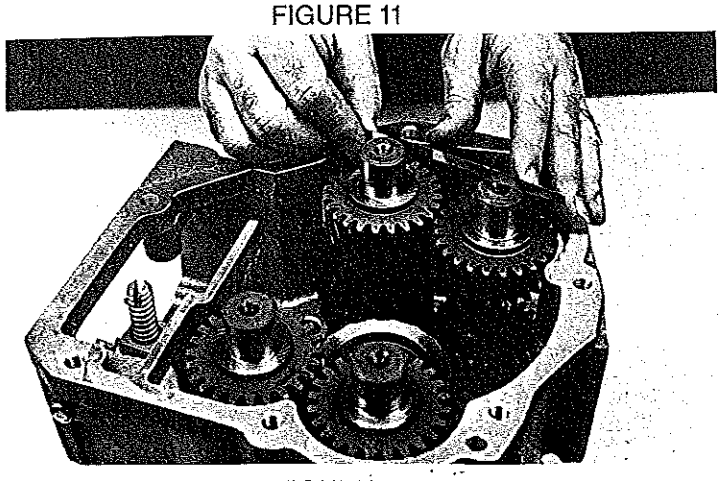


FIGURE 12

ASSEMBLY CONTINUED

The output shaft assembly is now positioned in mesh with the planet gear teeth. If the output shaft had been disassembled make sure the output gear is positioned on the shaft with the clutch teeth adjacent to the (36) teeth gear on the shaft. (Figure 13).

In replacing the tail housing it is best to use a heavy grease or oil to place between the planet gear washer and tail housing. This will hold the washer in place when the tail housing is inverted for assembly. (Figure 14).

Notice the absence of a gasket. We use a very thin bead of silicon sealant in the assembly. This bead must be run on the inside of the bolt holes of the case and must be continuous. (Figure 15).

In positioning the tail housing slight pressure, tapping with a wooden mallet may be necessary to seat the bearing of the output shaft into the tail housing.

The (8) ⅜ - 16 X 1½" bolts holding the case halves are torqued at 35 foot lbs.

When installing the shift motor notice the end of the motor shaft. There is a lead point adjacent to the flat. In positioning the motor to the ball screw, rotating the screw will help to position the motor. Rotate the motor, so that the red and black leads are closest to the side cover.

The next step is to hook the red and black terminals to the electric switch which is mounted on the electric cover. In facing the opening of the case the red wire is on the left terminal and the black wire is on the right terminal.

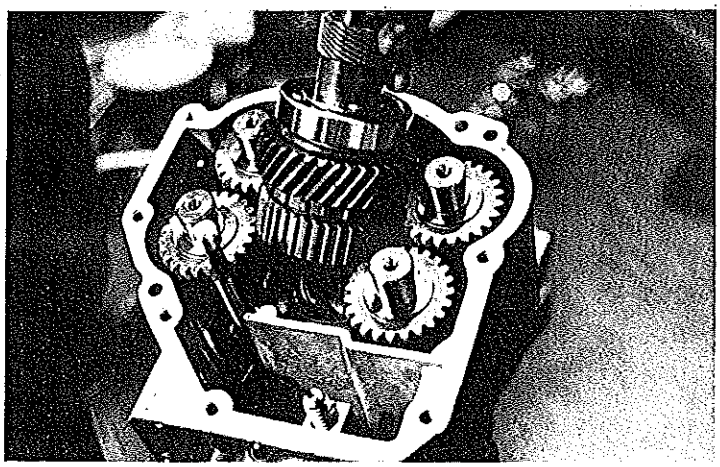


FIGURE 13

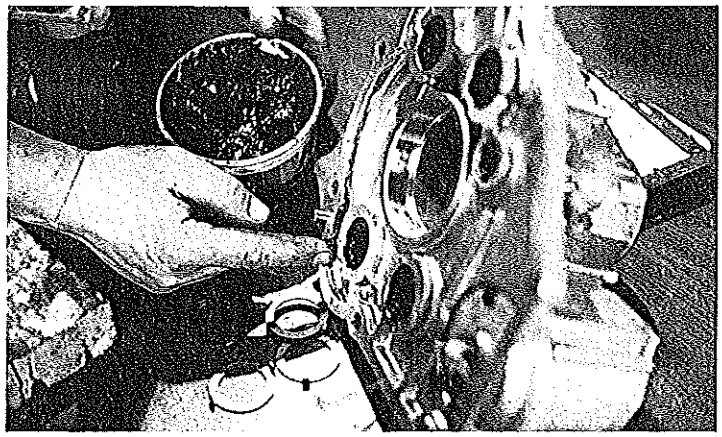


FIGURE 14

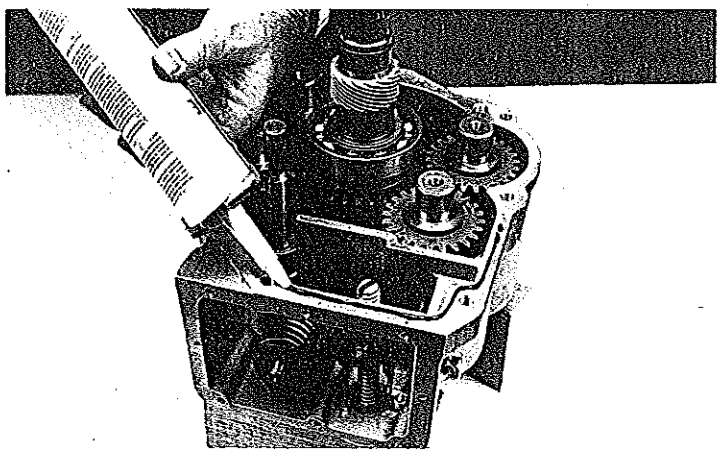
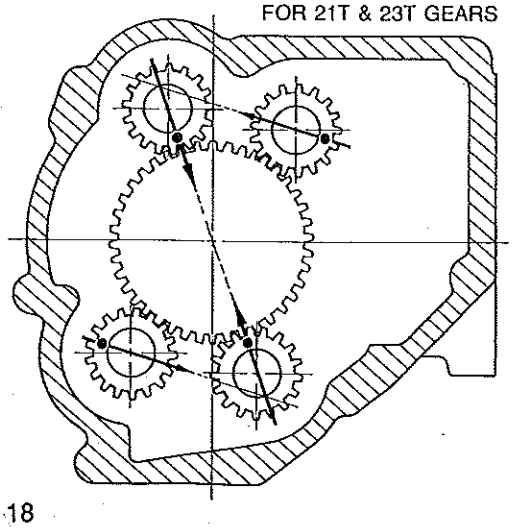


FIGURE 15

The (8) #10-24 x ¾" screws holding the electric cover to the case are torqued at 7 foot lbs.

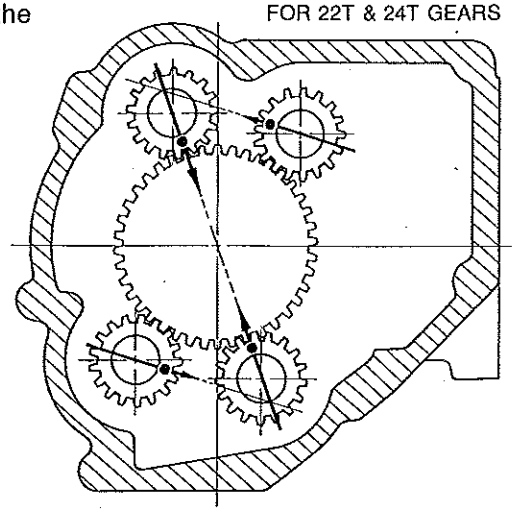
FOR 21T & 23T GEARS

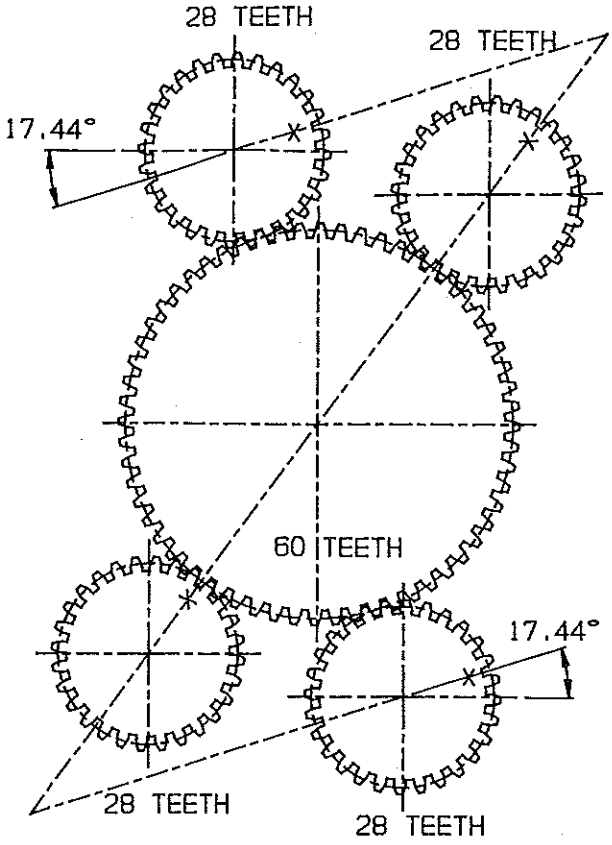


PLANET GEAR ALIGNMENT

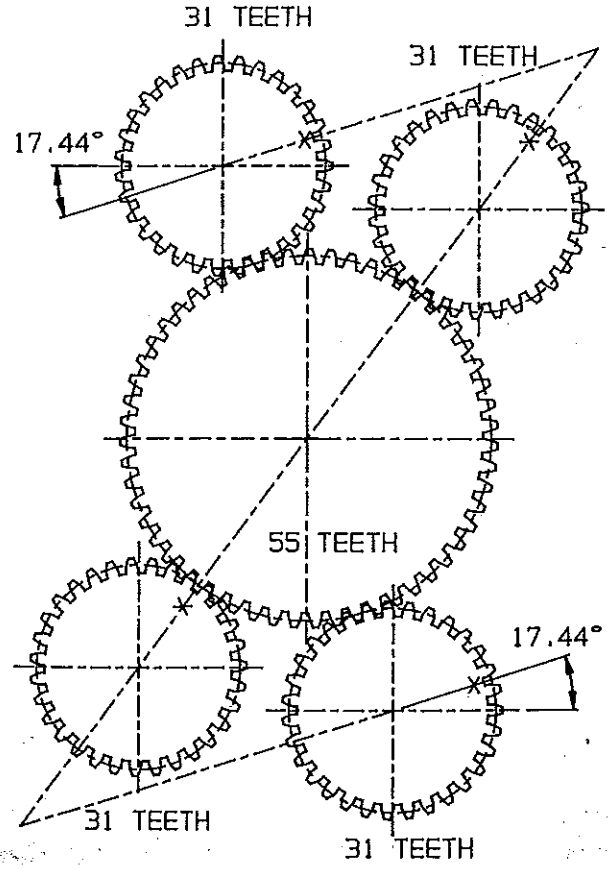
NOTE: MARKS SCRIBED ON PLANET GEARS (•) ARE TO POINT IN THE DIRECTION SHOWN (FOR BOTH UNDER AND OVERDRIVE)

FOR 22T & 24T GEARS




28 TEETH
28 TEETH
17.44°
60 TEETH
17.44°
28 TEETH
28 TEETH

16 PITCH


31 TEETH
31 TEETH
17.44°
55 TEETH
17.44°
31 TEETH
31 TEETH