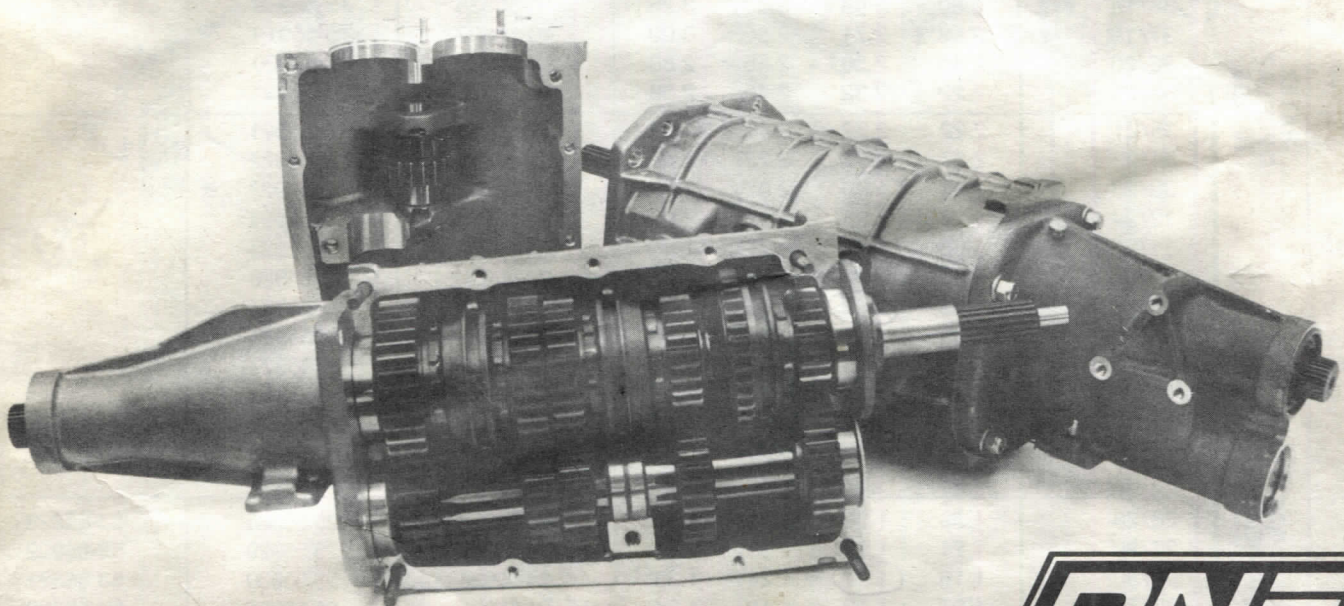


# “4 + 1” QUIK-CHANGE TRANSMISSION

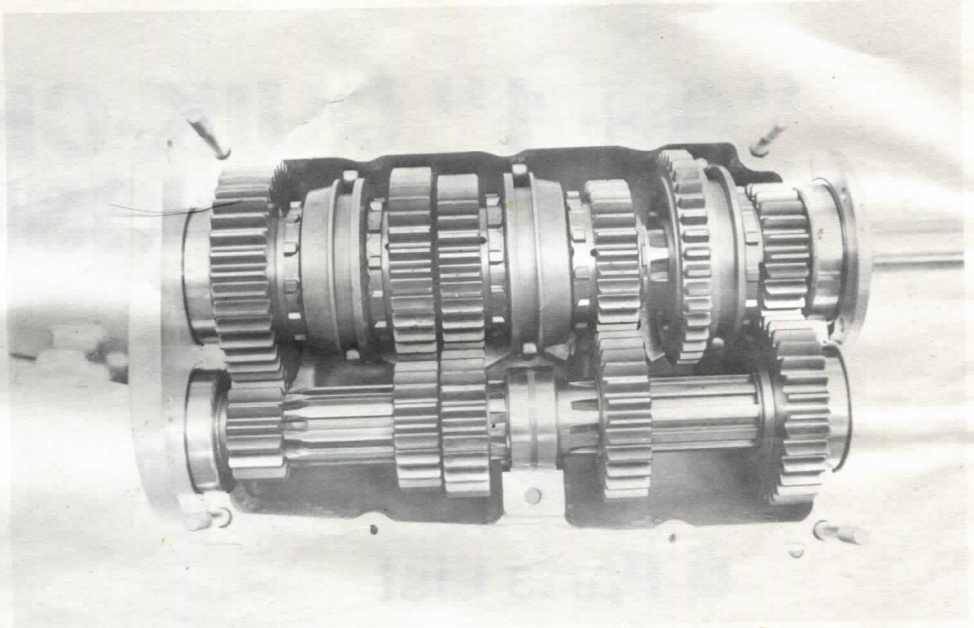
- Technical Description
- Ratio Chart
- Parts List
- Exploded Drawing
- Assembly Description
- Torsion Bar Cluster Shaft



The 4 + 1 Quik Change racing transmission was specially designed to provide maximum strength, quick and easy serviceability and optimum versatility. Shifting mechanisms are similar to the tried and proven Borg-Warner Super T-10, but all gears are Pro Shifted so that gear changes can be made with maximum speed.

Although originally designed for drag race usage, the 4 + 1 has proven to be highly desirable in IMSA GT and SCCA Trans-Am road racing. The wide selection of ratios insures that virtually any engine/chassis can be properly geared for the conditions which are unique to particular race courses.

For both drag competition and road racing, the optional Torsion Bar Cluster Shaft can be an invaluable aid. Complete details are included elsewhere in this catalog.



## 4 + 1 RATIO SELECTION

	Main Shaft Gear	Cluster Shaft Gear	Input Drive Set Input Gear/ Front Cluster Gear				Part Numbers		
			24/32	23/32	23/33	22/34	Mainshaft Gear	Cluster Gear	Rev. Idler
			Tooth Count				Gear Ratio :1		
1st	→	39/16	3.25	3.39	3.50	3.76	10-50839	15-55516	
		39/17	3.05	3.19	3.29	3.54	10-50839	15-55917	
		38/17	2.98	3.11	3.21	3.45	10-50838	15-55517	
		38/18	2.80	2.93	3.05	3.26	10-50838	15-55918	
		37/19	2.58	2.71	2.80	3.00	10-50837	15-55919	
		36/20	2.40	2.50	2.58	2.80	10-50836	15-55920	
		35/21	2.22	2.32	2.40	2.58	10-50835	15-55921	
2nd or 3rd	→	35/21	2.22	2.32	2.40	2.58	23-50935	25-55921	
		34/22	2.07	2.15	2.22	2.40	23-50934	25-55922	
		33/23	1.91	1.99	2.07	2.22	23-50933	25-55923	
		32/24	1.77	1.85	1.91	2.07	23-50932	25-55924	
		31/25	1.65	1.72	1.77	1.91	23-50931	25-55925	
		30/26	1.53	1.60	1.65	1.77	23-50930	25-55926	
		29/27	1.43	1.49	1.53	1.65	23-50929	25-55927	
4th	→	28/28	1.33	1.39	1.43	1.53	23-50928	25-55928	53-55823
		27/29	1.24	1.29	1.33	1.43	24-50927	25-55929	53-55822
		26/30	1.16	1.21	1.24	1.33	24-50926	25-55930	53-55821
		25/31	1.07	1.12	1.16	1.24	24-50925	25-55931	53-55820
		24/32	1.00	1.04	1.07	1.16	24-50824	25-55932	53-55819
		23/33	.93	.97	1.00	1.07	24-50923	25-55933	53-55818
		22/34	.86	.90	.93	1.00	24-50922	25-55934	53-55817
5th			1.00	1.00	1.00	1.00			

# DNE DRAG RACE FIVE-SPEED

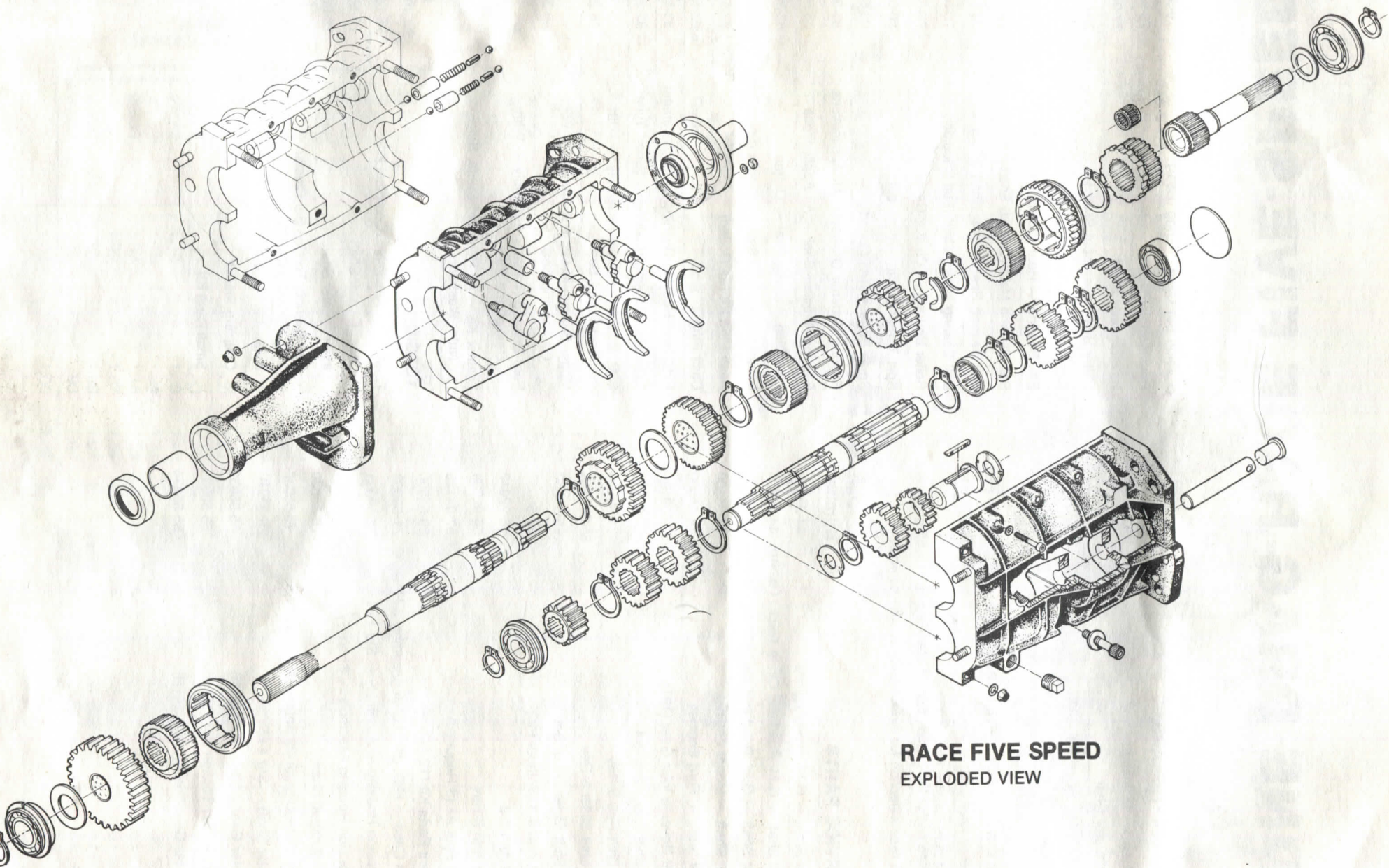
<b>PRO SHIFT GEARS</b>	<b>Part Number*</b>
1st Gear — Mainshaft	10-50×××
1st Cluster Gear	15-55×××
2nd or 3rd Gear — Mainshaft	23-50×××
4th Gear — Mainshaft	24-50×××
2nd, 3rd, or 4th Cluster Gear	25-55×××
Input Drive Gear (5th) — Take Apart Type	45-50×××
Reverse Idler Gear — Rear	53-55×××
Input (5th) Cluster Drive Gear (See below for Torsion Bar Cluster Gears)	55-55×××

\*See ratio selection for individual gear part numbers.

<b>SERVICE PARTS</b>	<b>Part Number</b>
Input Shaft — G.M. Drag Engines	44-25500
Input Shaft — G.M. Road and Circle Track (1½"-10)	44-25010
Input Shaft — G.M. Road and Circle Track (1½"-26)	44-25026
Input Shaft — Mopar Engines	44-35500
Input Shaft — Ford Engines	44-45500
Front Reverse Idler Gear (19T)	52-55919A
Pro Shift Hub 1-2 or 3-4	61-90012
Pro Shift Hub 5-Rev	61-90034
Pro Shift Slider 5-Rev	65-50938A
Pro Shift Slider 1-2 or 3-4	65-90500
Shift Arm 3-4 (Without Pin)	66-55034
Shift Arm 1-2	66-92012
Shift Arm 5-Rev	66-92034
Shift Fork All (3 Required)	67-94123
Detent Parts Kit (12 PC)	69-55500
Main Case — H.D. (W/O Shift Assembly & Hdware)	71-59003
Extension Housing — Assembly — Std 4+1	72-59003
Extension Housing Assembly — Short Type	72-21003
Main (Output) Shaft	75-55030
Main (Output) Shaft (32 spline 6M) Short Type	75-55032
Cluster Shaft — Std 4+1	76-55010
Cluster Gear Torsion Bar (32TH)	55-56932
Cluster Gear Torsion Bar (33TH)	55-56933
Cluster Gear Torsion Bar (34TH)	55-56934

Torsion Bar Case Bearing (Rear)	78-55207
Reverse Idler Hub	79-55052
Reverse Idler Shaft	77-94114
Roller Bearing — Input Shaft I.D.	78-55112
Ball Bearing — Front Cluster Shaft	78-55207
Ball Bearing — Rear Cluster Shaft (Std)	78-55306
Ball Bearing Main (Output) Shaft	78-94307
Ball Bearing Rear Cluster Shaft (H.D.)	78-55066
Ball Bearing Inpsut Shaft (Full Shoulder)	78-55607
Roller Bearing — Cluster Center	78-55716
Split Thrust Collar — 4th Gear	80-55400
Small Parts Kit (As Coded)	80-55500
Bearing Retainer Gasket — All Applications	81-95086
Bearing Retainer Seal — All Applications	55-56932
Extension Housing Seal — Output	82-55130
Extension Housing Seal — Output (Short Type)	82-55132
Case Plug Kit (As Coded)	82-55500
Case Plug 3" Dia.	82-56300
Extension Housing Bushing — Replacement	83-55723
Extension Housing Bushing — (Short Type)	82-25732
G.M. Bearing Retainer Assembly — With Gasket and Seal	86-25911
Mopar Bearing Retainer Assembly — With Gasket and Seal	86-35307
Ford Bearing Retainer Assembly — With Gasket and Seal	86-45912
Fastner Kit — All Required Studs, Bolts, Nuts, Washers	90-55500

<b>TORSION BAR</b>	<b>Part Number</b>
Torsion Bar Assembly (Complete Kit)	76-56600
Outer Cluster Shaft	76-56610
Inner Cluster Shaft	76-56605
Ball Bearing, Torsion Bar Cluster (Extension Housing)	78-56304
Extension Housing	72-56601
Coupling Sleeve	79-56855
Small Parts Kit	80-56100



**RACE FIVE SPEED**  
EXPLODED VIEW

# ASSEMBLY OF THE DNE 4+1 RACING FIVE-SPEED TRANSMISSION

Proper assembly of the 4+1 Quik Change Racing five-speed is critical but not difficult. Use the exploded view on pages 22 and 23 as a reference while following these instructions and you'll find the "4+1" the most straightforward transmission you've ever worked on.

**NOTE:** It's most important to clean and inspect all parts before starting the assembly procedure. Use solvent or degreasing fluid, and blow dry with an air gun.

## TOOLS

The only special tools required are a pair of large retaining ring (Truarc) pliers, a 1/4" and 7/16" Allen wrench and a brass drift. You'll also need a tube of RTV sealant.

## ORGANIZING THE GEARSET

To avoid confusion during assembly, match the mating mainshaft and cluster gears. Using the gear ratio selection chart on page 24, make sure the total number of teeth between each pair is 56 . . . and 51 teeth between the 4th cluster gear and rear reverse idler. Also match the three Pro Shift sleeves with their respective hubs as shown below.

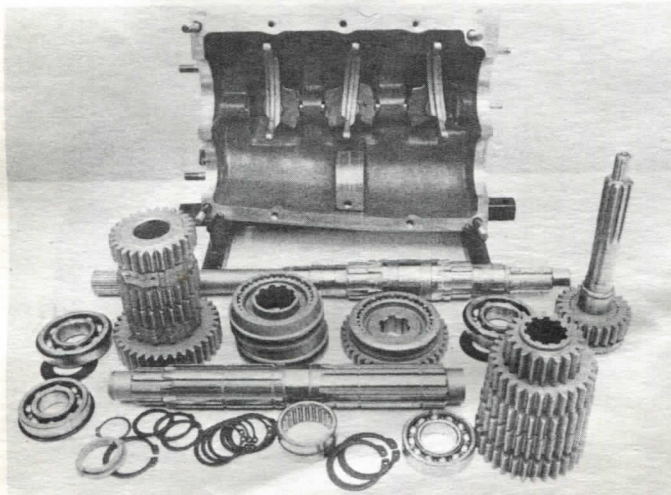
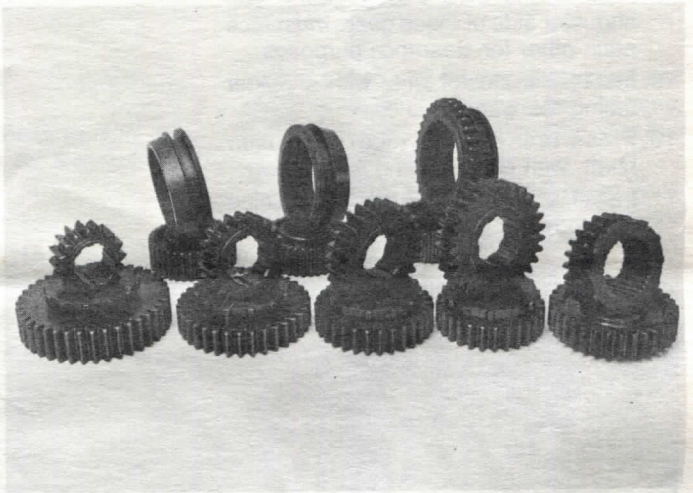
**WARNING:** To prevent the spring loaded detent system from coming apart, leave the nuts and washers on the shift arm studs. Re-assembly is difficult.

B. Reverse Idler Sub-Assembly - Slide the front reverse idler gear (rounded teeth forward towards shoulder of idler hub) and the rear reverse idler gear over the 1/4" x 3/16" key. Retain with the 1 3/8" thin retaining ring. Position the gears and hub between the two bosses in the right case half. Insert the shaft through the access

hole in the front face, and press it through the two bosses after positioning the thrust washers at the front and rear. Lightly tap the end of the shaft to firmly set it in place. Spin the gears to check for free rotation.

C. Front Bearing Retainer Studs - The bolt pattern for Mopar applications differs from GM and Ford. Use the retainer to choose correct 4 holes (with oil slot downward as shown) and install coarse thread end of the four 5/16" x 1 1/4" studs. Apply Loctite sealer to all four studs.

*Assembly is considerably easier if mating main shaft and cluster shaft gears is done prior to beginning.*



## PREPARING THE MAIN CASE

A. Check Shift Detent System - The shifting mechanism has been fit at the factory for proper function. Each shift arm should rotate from the center neutral position to the two engagement positions, while locking out simultaneous engagement with the other two shift arms.

*Before beginning assembly, all parts should be thoroughly cleaned and inspected.*

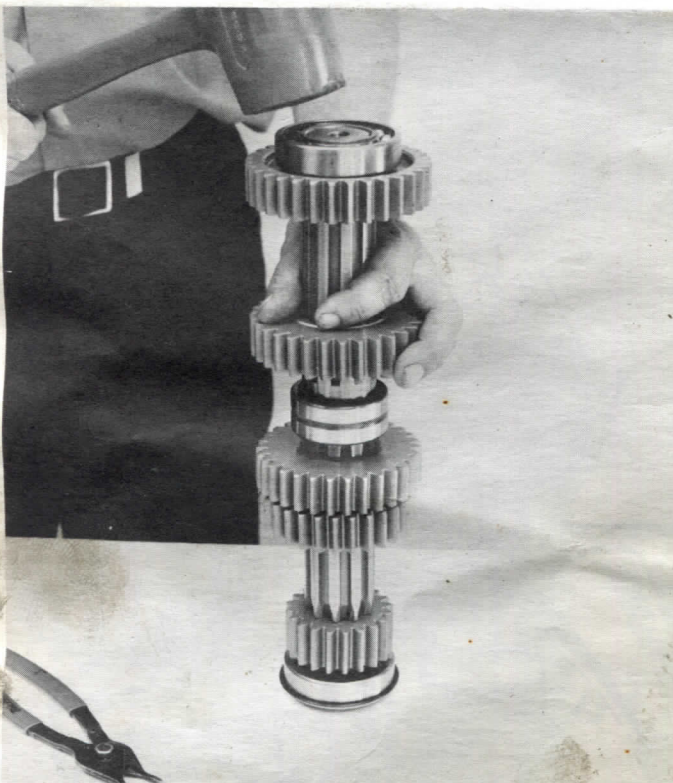
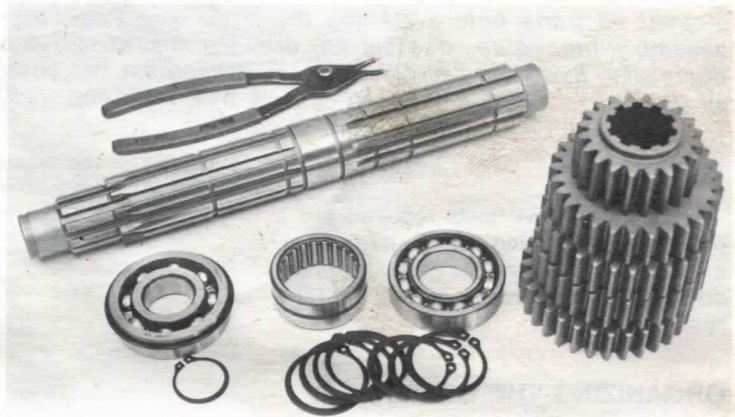
*Reverse idler sub-assembly must be installed in case with grooved side of thrust washer facing gears.*



## CLUSTER ASSEMBLY

1. Install roller bearing in center of cluster shaft with 1 $\frac{3}{4}$ -inch retaining rings in grooves on both sides of bearing.
2. Install light duty (1 $\frac{3}{4}$ -inch) retaining ring to retain fourth cluster gear.
3. Install fourth cluster gear with thin shoulder forward.
4. Install light duty (1 $\frac{3}{4}$ -inch) retaining ring on front side of fourth cluster gear.
5. Install light duty (1 $\frac{3}{4}$ -inch) retaining ring in front groove of cluster shaft.
6. Install front cluster gear with undercut toward front and shoulder facing rear.
7. Press front bearing (207) on cluster gear shaft, with retaining ring groove of bearing facing forward. (Retaining ring is *not* used in bearing O.D.)
8. Install light duty (1 $\frac{3}{4}$ -inch) retaining rings, front and rear, together with second and third cluster gears. The shoulder side of these gears *must* face each other for clearance purposes.
9. Install first cluster gear with shoulder facing rearward as shown.
10. Press rear bearing (306) on cluster shaft, with retaining ring toward rear.
11. Install light duty (1 $\frac{3}{16}$ -inch) retaining ring to retain bearing.

*A good pair of retaining ring pliers is a must. Rings are used to locate gears on cluster shaft.*



*Front and rear cluster bearings should be pressed on. A rubber mallet may be used for final bearing seating.*

## MAINSHAFT ASSEMBLY

1. Check I.D. of each gear and O.D. of matching surface of mainshaft. There should be .002 to .005-inch clearance to allow free spinning.

2. Install heavy duty (1 $\frac{15}{16}$ -inch) retaining ring in groove behind second gear position, near middle of mainshaft.
3. Pre-lube first gear O.D. of mainshaft with moly or gear lube.
4. Install first gear from rear of mainshaft, with engagement teeth forward.
5. Install thrust spacer and press on bearing (No. 307 non-shielded) with snap ring groove of bearing to rear.
6. Install snap ring (1 $\frac{3}{8}$ -inch) behind bearing to locate first gear on mainshaft.
7. Check end clearance between first gear and 1-2 hub; .010 to .020-inch is acceptable.
8. Install 1-2 slider with beveled nose to rear.
9. Pre-lube second and third gear O.D. of mainshaft with moly or gear lube.
10. Install second gear with engagement teeth to rear.
11. Install third gear with engagement teeth forward.
12. Install heavy duty (1 $\frac{15}{16}$ -inch) retaining ring in front of third gear.
13. Check end clearance between second and third gear, .015 to .025-inch is acceptable.
14. Install 3-4 slider with beveled nose forward.

15. Pre-lube fourth gear O.D. of mainshaft with moly or gear lube.
16. Install fourth gear and split ring thrust collar in groove in front of fourth gear. Retain with heavy duty (1 $\frac{3}{4}$ -inch) retaining ring.



*After 1-2 hub is installed, first gear should be placed on mainshaft from rear.*

17. Check clearance between fourth gear and thrust collar. .008 to .012-inch is acceptable.
18. Install fifth-reverse hub (6 splines) and slider with shoulder facing to rear. Fork groove in slider should be forward.
19. Install heavy duty (1 $\frac{3}{8}$ -inch) retaining ring in front of fifth-reverse hub.

## INPUT SHAFT ASSEMBLY

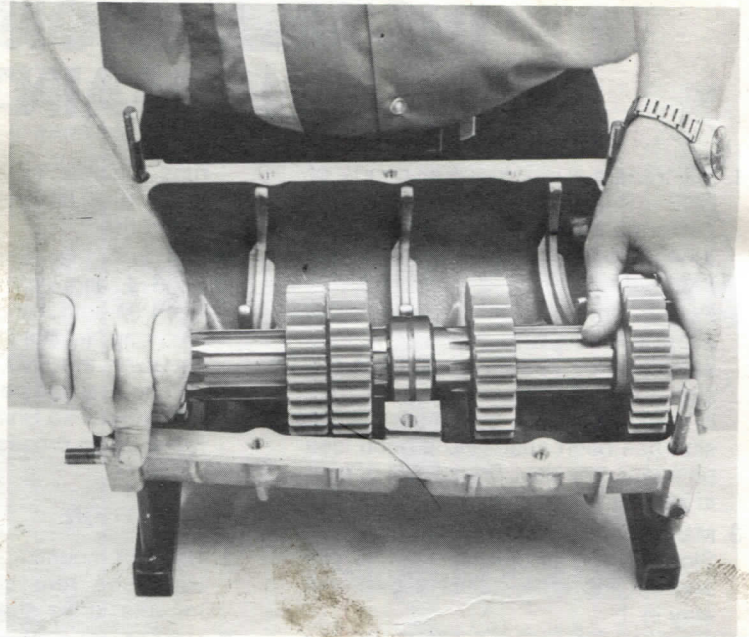
1. Install light duty (2-inch) retaining ring.
2. Install fifth drive gear with engagement lugs to rear.
3. Install .060-inch spacer washer to rear of bearing.
4. Press bearing (No. 307 shielded) on input shaft, with retaining ring groove of bearing forward.
5. Install heavy duty (1 $\frac{3}{8}$ -inch) retaining ring in front of bearing to position it on input shaft.
6. Pre-lube caged roller bearing and install on nose of mainshaft.

## FUNCTIONAL CHECKS:

### Input Shaft and Mainshaft Assembly

Spin each gear and check for free rotation. Move each slider sleeve forward and rearward, while checking for free engagement in each gear position.

*Cluster shaft should fit securely in case and should rotate freely.*



## INSTALLING GEARS IN LEFT CASE HALF

1. Install shifter forks in vertical position. Each fork is symmetrical and fits in any shifter arm. Install cluster shaft in lower bearing saddles.
2. Set input-mainshaft assembly into upper bearing mounts. Be sure each Pro Shift sleeve is in the neutral position so as to align with shifter forks. Also make sure that the retaining rings on front and rear bearings clear end of case.

## FUNCTIONAL CHECK:

Pour gear lube over gears, work in, and again check each gear for free rotation and free engagement.

## ASSEMBLING CASE HALVES, EXTENSION HOUSING AND BEARING RETAINER

1. Apply  $\frac{1}{16}$ " wide bead of RTV sealant around perimeter of each case half and around front cluster bearing hole

and set cluster bearing plug in left half of case. Rotate input shaft to mate reverse idler gears, slip right case half over studs of left case.

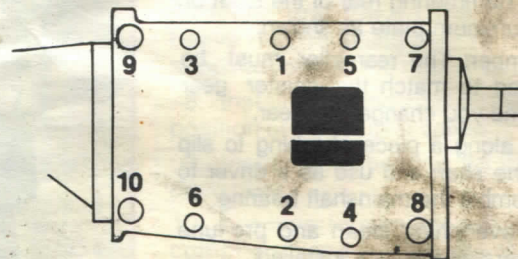
2. Apply RTV sealant to extension housing, slip over mainshaft and install four  $\frac{7}{16}$ "  $\times$  20 nuts and flat washers. Torque each nut to 25-30 ft.-lbs.
3. With proper flat washers in place, install four  $\frac{3}{8}$ "  $\times$  24 nuts, one  $\frac{7}{16}$ "  $\times$  2 $\frac{1}{2}$ " socket head bolt and five  $\frac{5}{16}$ " socket head screws. Tighten.
4. Torque  $\frac{5}{16}$ " socket head capscrews to 15-20 ft.-lbs.,  $\frac{7}{16}$ " bolt to 45-50 ft.-lbs., and  $\frac{3}{8}$ " nut to 25-30 ft.-lbs. in sequence shown.
5. Assemble gasket and front bearing retainer to case, being sure to line up drain slot with hole in case. If slot in gasket does not align with hole, cut hole in gasket. Retain with  $\frac{5}{16}$ "  $\times$  24 nuts and small flat washers. Torque to 15-20 ft.-lbs.

*Clearance between second and third gears should be .015" to .025".*

*Proper sequence should be followed when bolting case halves together.*



## TORQUE SEQUENCE



## FINAL FUNCTIONAL CHECK:

Install exterior shift arms and check for free engagement and rotation in each gear position. If satisfactory, wipe off any excess RTV sealant and prepare to install transmission in car.

# INSTALLATION, OPERATION AND MAINTENANCE

1. Fill transmission with 2½ quarts of DNE "Pro Shift Lube" (90 weight high performance gear lubricant). Other lubes, additives, etc. are *not* recommended.
2. Prior to driving, give the transmission a brief run-in with the rear wheels jacked up by operating the transmission a few minutes in each gear. This is *mandatory* each time the transmission has been apart and a good idea on every race day. *Do not idle or tune in neutral for prolonged periods.*
3. Make shifts with quick positive motion. Slow shifting is difficult. For the pits and staging area, select a gear and stay in it.
4. Pro Shift teeth wear-in during the initial

runs. Change the lube after the first 8 to 10 runs and every 30 to 40 runs thereafter.

5. With a proper functioning clutch and good driving technique, the Pro Shift teeth on both the sleeve and gear will give long life. But they do wear. If burrs occur on the O.D. of the tooth, they can be dressed periodically with a file or grinder. Pro Shift gear teeth can be replaced as process No. 00-90200.

## INSTALLATION

1. Use the mounting specifications illustrated on rear cover, to fabricate mounts, drive shafts, etc.
2. Use of solid engine and rear trans-

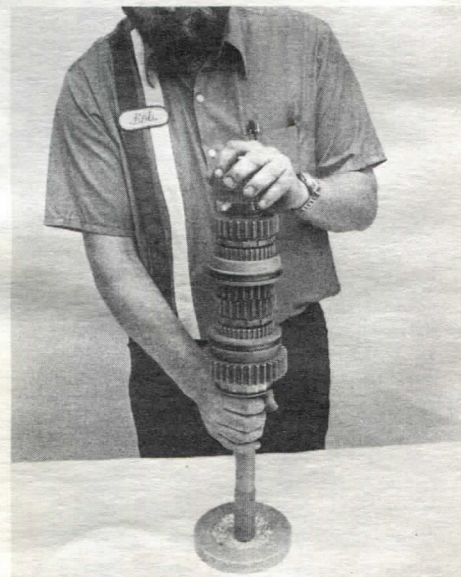
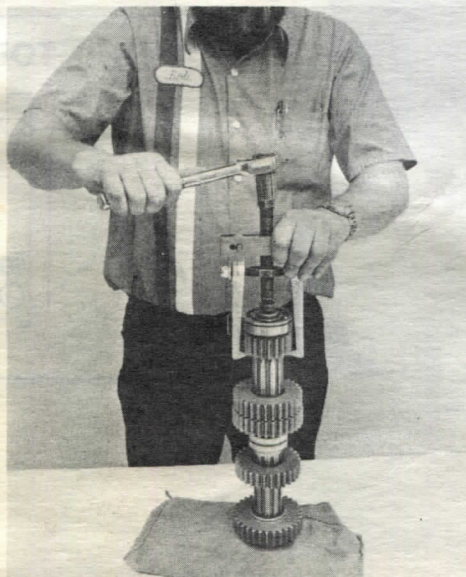
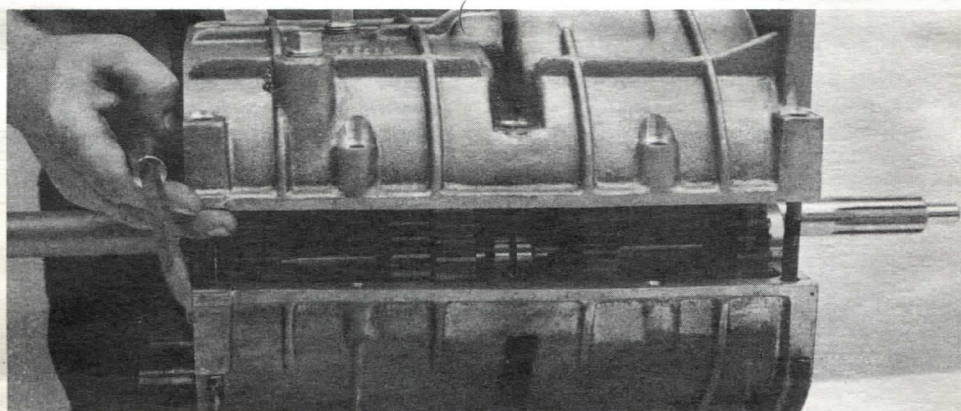
mission mounts is recommended to minimize clutch linkage deflection caused by torque reaction.

3. The Hurst and Mr. Gasket shifters and mounting kits specially developed for the "4+1" are recommended. Adjust per shifter instructions. Use of the stops is *mandatory*.
4. Use only top quality clutch components and be sure to eliminate all slop and deflection in the linkage. Poor clutch release is the major cause of shifting problems and premature wear with Pro Shift components.
5. If the transmission will be subjected to wet salty atmosphere, paint it with epoxy paint to prevent corrosion of the magnesium.

## "QUICK CHANGING" RATIOS AT THE TRACK

With a little practice, you can make a ratio change at the track in about 30 minutes by following these tips.

1. Use the prying bosses to separate the case halves. Be careful not to damage mating surfaces.
2. Keep your gear pairs organized and disassembled only as much of the cluster and mainshaft as required to make the change.
3. Remove 1st, 2nd and 3rd cluster gears from the low gear end of the shaft and 4th and 5th from high gear end of shaft. Use a standard gear puller in order to remove the press-fit rear bearing as illustrated.
4. Remove the press-fit mainshaft bearing by hammering rear of the shaft on soft aluminum plate as shown.
5. Remember: The rear idler must be changed to match the cluster gear any time you change 4th gear.
6. Carry along a piece of tubing to slip over the shaft and use as a driver to reassemble the mainshaft bearing.
7. Keep everything clean and pre-lube the gears as they are installed.



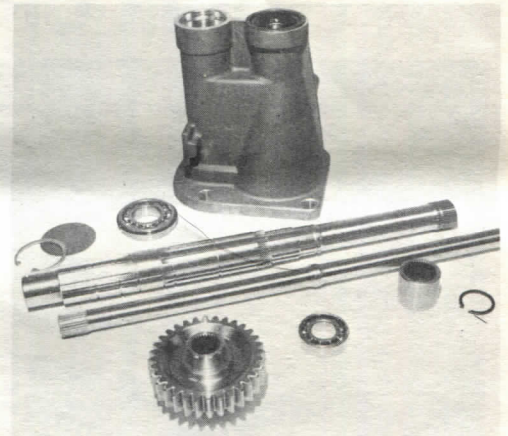
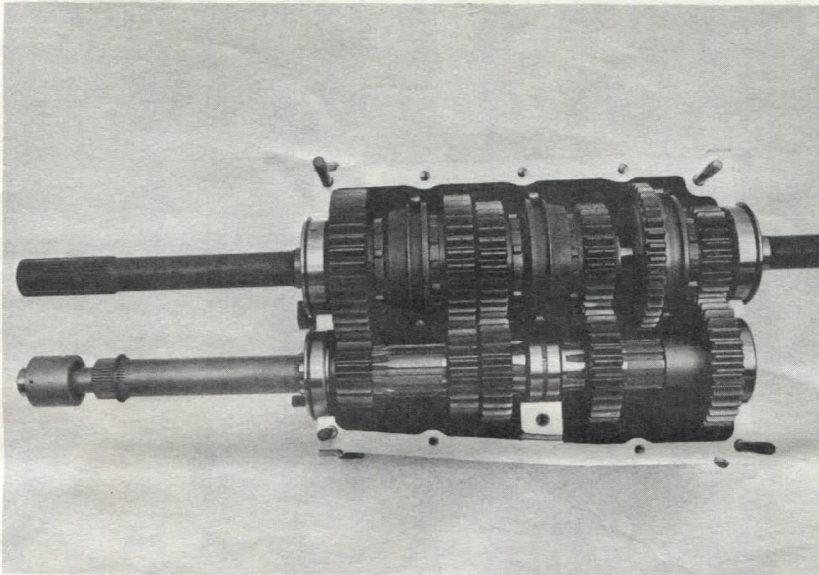
Use of a proper gear puller is suggested whenever bearings are removed from shafts.



# TORSION BAR CLUSTER SHAFT

Originally designed to absorb the tremendous shock loads inherent in clutchless shifting, the Torsion Bar Cluster Shaft is equally effective when used in conjunction with a regular DNE five speed transmission. DNE's ingenious engineers created this special cluster shaft to absorb a significant amount of shock load, thereby increasing the life span of all drive line components. Reduced violence at gear change also enhances safety.

For the road racer, the Torsion Bar Cluster Shaft reduces drive line shock when downshifting, smoothing entry into corners and improving lap times. Drag racers find that upshifts are smoother, directional stability is improved during gear changes and elapsed times are more consistent. Complete retrofit kits are available to update existing transmissions, or a DNE five speed may be ordered with the torsion bar assembly included.



## ASSEMBLY OF CLUSTER SHAFT

All transmissions that are being converted to torsion bar clusters, must have the first gear (cluster) bored approximately .090 (finished I.D. to be 1.378 to 1.380).

1. Install roller bearing in center of cluster shaft with  $1\frac{3}{4}$  inch retaining rings in grooves on both sides of bearing.
2. Install light duty ( $1\frac{3}{4}$  inch) retaining ring to retain fourth cluster gear.
3. Install fourth cluster gear with thin shoulder forward.

4. Install light duty ( $1\frac{3}{4}$  inch) retaining ring on front side of fourth cluster gear.

5. Install light duty ( $\frac{3}{4}$  inch) retaining ring on the front side of third gear positions. Install third and second gears with the shoulders facing each other. The gears *must* be installed in this manner for clearance purposes. Install rear retaining ring behind second gear.

6. Install first cluster gear with shoulder facing rearward as shown.

7. Install spacer supplied (.080) between first gear and the rear case bearing. Be sure the chamfer is toward the gear. Install rear case bearing with O.D. retaining ring toward the rear. Install heavy duty retaining ring (#1370 .093" supplied) behind the rear case bearing.

8. Install retaining ring in the forward position of the coupler spline.

9. Install front bearing on the cluster drive gear.

10. Pre-lube torsion bar with anti-sieze compound and install into the cluster tube.

11. Install cluster drive gear on the front spline of the torsion bar. Be sure to lube the inside of the gear before installing on the front of the cluster tube.

12. Index the rear splines and slide the coupler on. Install the thrust washer (.100). The cluster shaft assembly is now ready to be installed into the case.

## TORSION BAR (SHOCK BAR) PARTS LIST

Torsion Bar Assembly (Kit)	76-56600
Torsion Cluster Shaft	76-56605
Torsion Cluster Tube	76-56610
Extension Housing	72-56601
Coupling Sleeve	79-56855
Bearing (Rear Extension Housing)	78-56205
Aluminum Plug (Extension Housing) 2 $\frac{1}{4}$ " diameter $\times$ .090" thickness	82-56225
Gear Front Cluster	55-56932
Gear Front Cluster	55-56933
Gear Front Cluster	55-56934
Bearing (Rear Transmission Case)	78-55207
Hardened Spacer (1st Cluster Gear to Bearing)	79-56085
Spacer (Coupler Thrust Washer, .100 Thickness)	79-56100
Retaining Ring (Tru-arc N5000-225)	80-56225
Retaining Ring (Tru-arc N5160-137)	80-56237