P 4007912
November, 1979

Bulletin #7
Cost $1.00

RACE BULLETIN
TUNE-UP TIP

CHRYSLER CLUTCHES & MANUAL TRANSMISSIONS

CHRYSLER
CORPORATION

Revised November, 1979 Bulletin #7

PN P4007912

MOPAR MANUAL TRANSMISSIONS AND CLUTCHES

I. INTRODUCTION

The manual transmission has been produced in automobiles much longer than the automatic has. But the 3-speed manual transmission is not considered a high performance or race unit. The 4-speed manual transmission is the high performance piece, and Chrysler introduced its 4-speed in 1964. The model name for the 4-speed is the A-833. The majority of this manual will deal with the 4-speed in its various forms and related parts.

The 3-speed manual has been the standard or base transmission in most A-E-B body cars since the early 60's. It has been changed several times since the 4-speed was introduced and updated to its current level as a very reliable, all-synchro, 3-speed transmission. See Section IX for further details on the Chrysler 3-speeds.

The A-833 4-speed has had a very distinguished history in racing and high performance applications. It has been used with all the different Chrysler engines from the Slant Six to 440-6 BBL and 426 Hemi. It was an excellent design when originally produced in 1964, and although it has been refined many times since, it is still the strongest, most dependable 4-speed production transmission available in assembly-line built passenger cars. Rules changes in the last few years have decreased the use of the A-833 because the Nash 5-speed manual transmission built on the aftermarket specifically for racing is allowed as a replacement.

This manual will not cover 4-cylinder engine packages such as the Omni-Horizon (Bulletin #45) and the Colt-Arrow (Bulletin #24). The slant six and small V8 (273-318) will get limited coverage since the large V8's are what is raced. If the smaller 6-V8 engines are raced, it is assumed that they will use the same pieces as the large V8's which will be covered in detail.

This manual will also cover transmission related items such as bellhousings, flywheels, clutches and linkages. Before considering manual transmissions themselves, these related items should be considered first. Before changing any one item between the end of the crankshaft to the driveshaft, its effect upon the other related items should be considered. All these items work as a team. How these parts work together as a team, we will discuss in the following sections. See Figure 1 for general layout. The discussion is limited to high performance applications. Standard assembly and disassembly information is covered in the proper service manual. This Bulletin will not try to duplicate the service manual information. Therefore, if you do not have a service manual covering your transmission and/or car, we recommend that it be obtained BEFORE starting your project.

II. CLUTCHES

The clutch transfers the power from the engine to the transmission. It requires frequent adjustment and maintenance to operate with perfection in the racing environment. As such it is most likely to be responsible for the majority of shifting problems in racing. For this reason we will cover the clutch first. We'll discuss the production clutches first and then the racing recommendations. See Figure 2 for general clutch layout.

There have been several different production clutches: 9 1/4", 9 1/2", 10", 10 1/2" and 11". The 9 1/4" is the 6-cylinder clutch, the 9 1/2" is the old 273 unit and the 10" unit is the up-to-1978, 6-cylinder, heavy-duty piece. The 10 1/2" and 11" clutches are the only high performance production clutches. The 10 1/2" and 11" production clutch usage is as listed below:

10 1/2" Flywheel bolt pattern	All 340, 360
	All 1970-1971 383
	All 1972-1974 400
	All 1970-1972 440
	All 1970-1971 Hemi
	1967 & earlier 383
	1974-1978 318

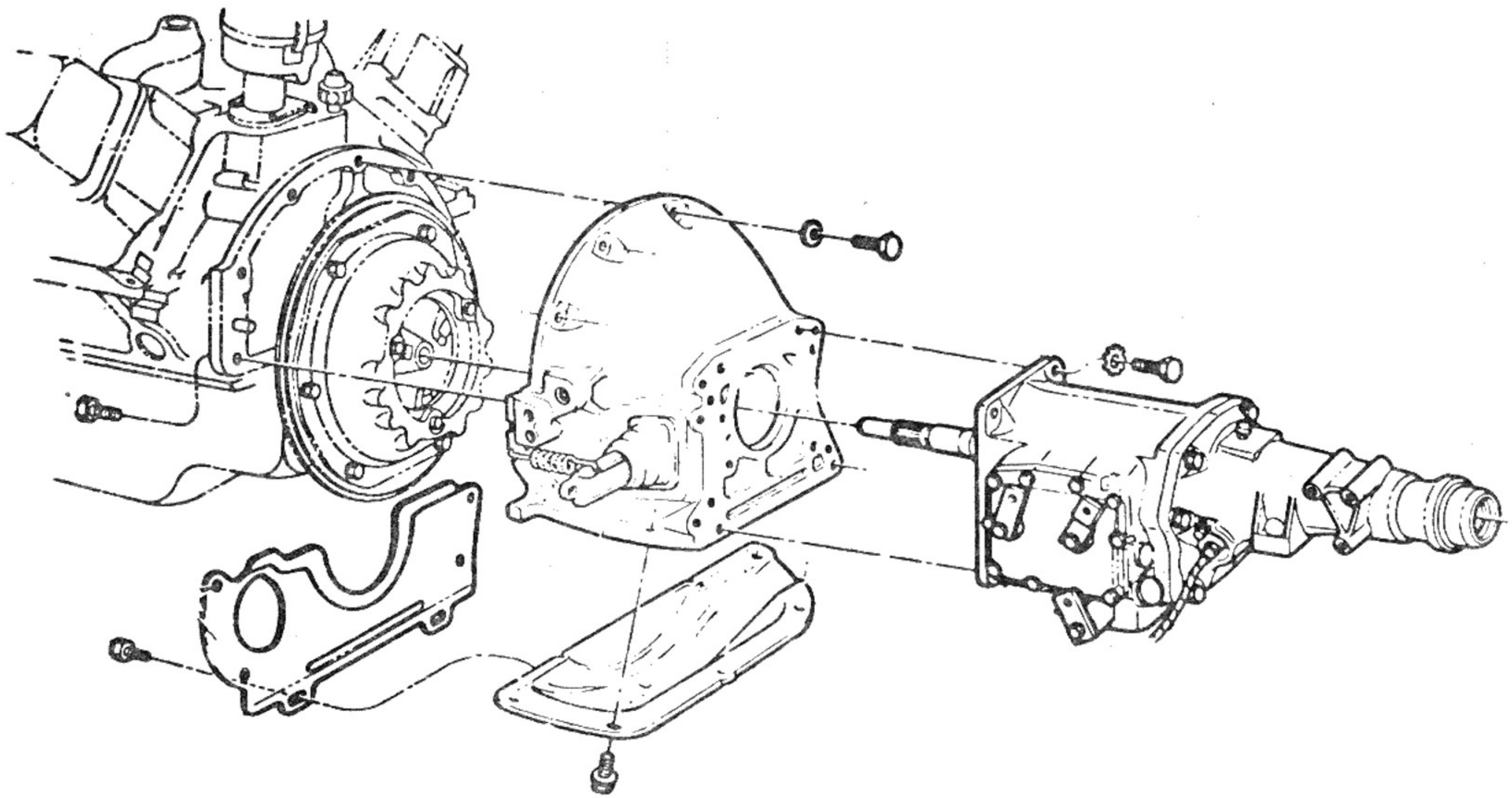


Figure 1
General A-833 Transmission Layout

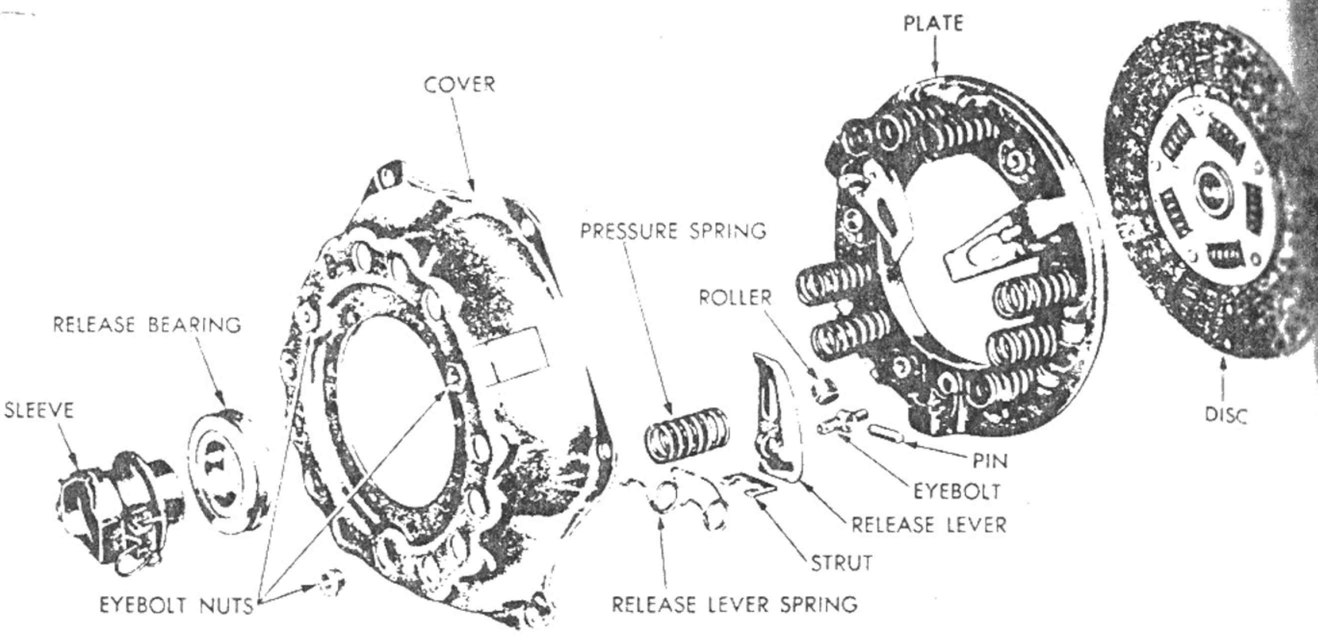
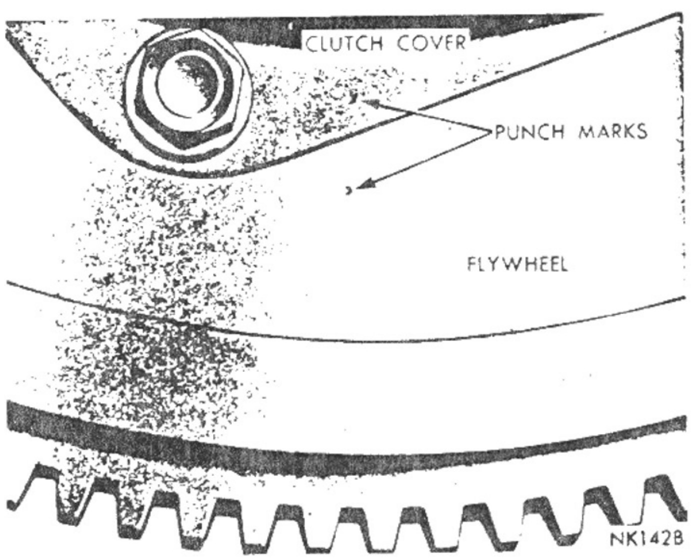


Figure 2
General Clutch Layout



Mark clutch cover and flywheel to maintain their same relative positions when reinstalling clutch assembly.

Figure 3
Clutch and Flywheel Marking

11" Flywheel Bolt Pattern

1966-1969 Hemi
1967-1969 440
1968-1969 383

Recent production clutch usage and general specs are as follows:

Engine		Clutch	Mounting Bolt Circle Dia.	Centrifugal Assist Roller
1974-1980	6-cylinder	9 1/4	10 5/8	0
1974-1977	6-cyl. H.D.	10	10 5/8	0
1974-1978	318	10 1/2	11 5/8	3
1974	360	11" Scalloped	11 5/8	3
1974	400	11" Scalloped	11 5/8	3

Production clutches that have centrifugal assist rollers use these rollers to increase the load at high RPM. The high performance engine, production clutches have the following number of assist rollers.

Hemi	-	3 rollers	340	-	6 rollers
440	-	6 rollers	400	-	3 rollers
383	-	6 rollers	360	-	3 rollers

All 1970-1974 360, 383, 400, 440 and Hemi clutches are known as 11" scalloped pressure plates, but they have a 10 1/2" flywheel bolt pattern. To use an 11" scalloped clutch pressure plate in a regular 10 1/2" clutch installation such as a 1968 340 -- clearance must be filed on the starter pilot boss on the inside of the clutch housing to provide the clutch cover clearance. You also must use the special scalloped clutch attaching bolts (PN 6029071) which have a smaller head diameter than the standard bolt.

The 1964, 1965 and 1968 Race Hemi's with 4-speed transmission used a 10 1/2" clutch.

Currently there is only one race clutch that is available from the Direct Connection for use with the 10 1/2" or 11" scalloped flywheels.

10 1/2" Race H.D. P3515678 (Pro Stock, Super Sto

The above is a clutch cover and pressure plate assembly only.

There are also clutch discs available for use with these race clutches that can be purchased with the cover and pressure plate assembly. The clutch discs available are as follows:

23 tooth spline 10 1/2" Dia. PN P3690463

18 tooth spline 10 1/2" Dia. PN P3690462

The production 11" scalloped clutch used in 1970-1974 has the most rigid clutch cover and has stronger eye bolts and release levers. The street hemi 11" scalloped clutch PN 3410158 has the highest load of this family of clutches.

The 340 4-speed manual clutch is a 10 1/2" unit with 6 rollers. If a heavy duty clutch is desired, the first step would be a 1970-1971 383 11" scalloped clutch which has more lining area. The next step would be a 1972-1974 400 cu. in. 11" scalloped clutch which has an increased load over the 383 unit. This 1972-1974 400 unit is also a good replacement for the 1970-1971 383 11" scalloped where a heavy duty clutch is desired. The next step up the performance scale for all these engines is the street hemi unit mentioned above.

The only improvement over these units for racing purposes would be the 10 1/2" units for the Hemi which require the large diameter throw-out bearing (PN P3690245). The hemi clutch can be used on the small plot bearing transmissions (340, 383), if the large throw-out bearing and sleeve are used with a bronze bushing on the inside of the sleeve so that the proper inside diameter is obtained. (I.D. on the installed bushing should be the same as that on the stock bearing that came with the trnsmission.) The race hemi 10 1/2" clutch (P3515678) can also be improved by installing high strength material eye bolts and shafts. This is done for durability and strength. The good eye bolts can be swapped from old clutches to new ones as the pressure plates wear out. The part number for these good eye bolts is P3690183.

One of the most important characteristics in the proper performance of a clutch is the clutch adjustment. The two main items in clutch adjustment are plate departure and free play. The clutch plate departure should be measured by a dial indicator, which could be impractical for an average 4-speed operator. An easier measurement, that approximates the final result of setting total plate departure is the thickness of the gap between the disc and the clutch face or the flywheel. This can be measured easily by inserting a feeler gauge between the disc and pressure plate or between the flywheel and the disc. The proper adjustment is approximately .060. The clutch pedal free play should be adjusted to 1/2" to 1" for racing applications or power shifting. This should be checked frequently.

For racing purposes, we do not recommend the use of 11" clutches (except for the 11" scalloped which is really a big 10 1/2"). The green-cover clutch (P3515678) is the best race unit. We also do not recommend metallic disc materials since they have different coefficients of friction cold to hot.

Before installing a new clutch that has centrifugal assist rollers, check to see that the correct number of rollers has been installed and that their movement is free (not stuck). This can be done by shaking the clutch and listening for the rollers to rattle.

If the clutch is going to be used for racing applications, it is highly recommended that the finger height be set. Especially important for <u>all</u> clutches is that all three fingers be at the same height. One finger at a different height will cause the clutch to grab and operate poorly. To check the finger height, a fixture is needed. See Figure 4. The 1.700" finger height shown is the stock height. See recommendations below.

For shift speeds up to 8000 rpm- use the race-green clutch P 3515678 as is. Finger height - 1.700"

For shift speeds over 8000 rpm - install the good eye-bolt package P 3690183 <u>and</u> increase the finger height .100".

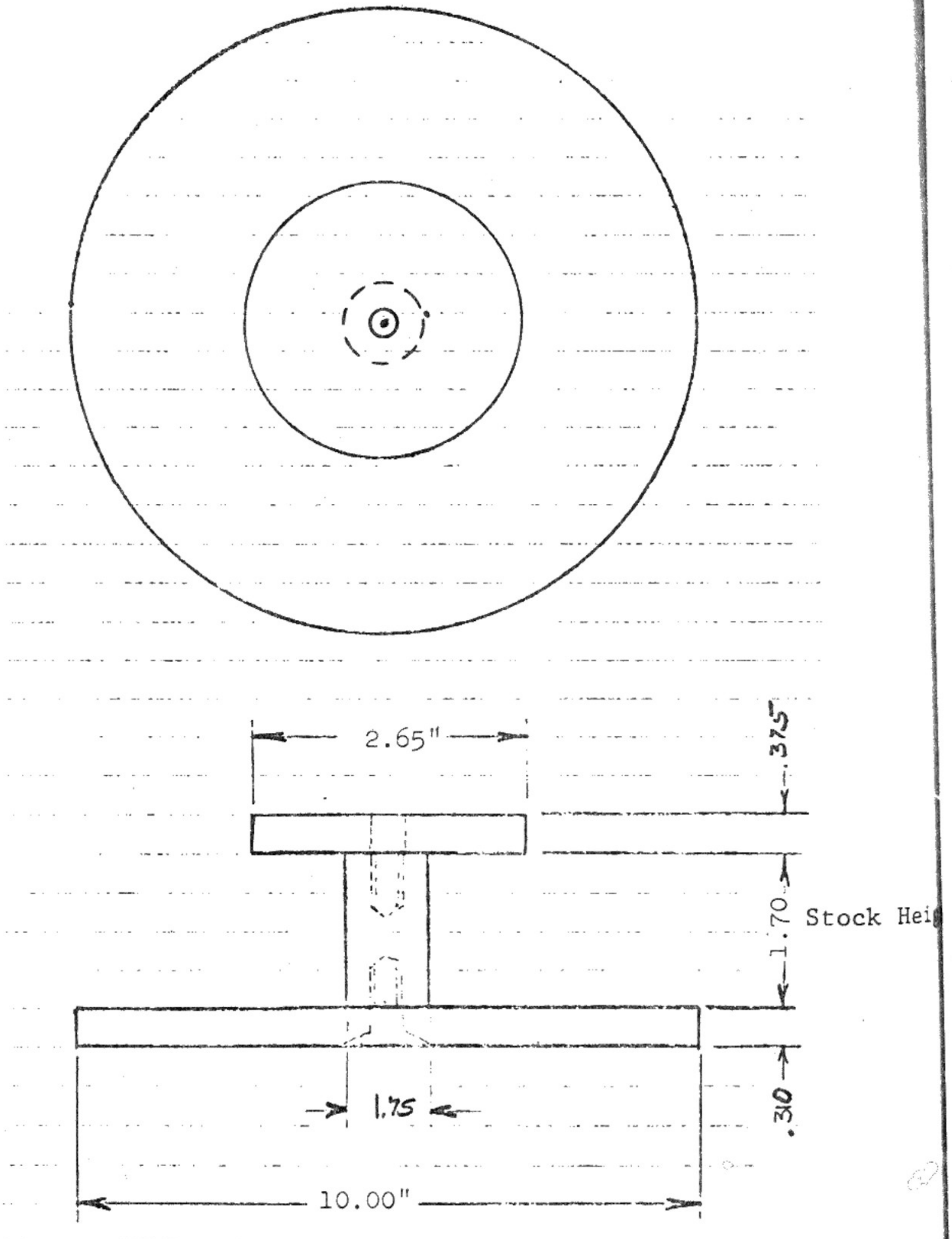


Figure 4
Clutch Finger Height Checking Fixture

III. CLUTCH LINKAGE

The best clutch in the world will work poorly if the clutch linkage isn't beefed up. There are several areas that need close attention. See Figure 5 (clutch pedal) and Figure 6 (bell crank and linkage) for reference.

High static load clutches will cause high clutch pedal effort. Increasing the static load even higher to offset the removal of the rollers in the clutch will greatly increase the clutch pedal effort. The over-center spring on the clutch linkage is used to decrease the pedal effort and if it is removed a similar increase in pedal effort will occur.

Clutches with rollers will cause high loads at high rpm which in turn will cause a standard clutch linkage to deflect while attempting to power shift. Stiffening the standard clutch linkage will, therefore, help high-speed shifting. Also, firewall bracing is sometimes required to minimize the deflection of the firewall which is added assistance to high-speed shifting.

The serious racer should install a torque strap. This keeps the engine from rocking over and causing the clutch linkage to get out of adjustment or alignment.

Some Clutch linkage items that should be checked are as follows:

A. <u>The Clutch Fork</u>

The clutch fork pivot should be held securely in place. The clutch fork should be checked to be sure that it doesn't interfere with the bellhousing throughout its travel. The clutch linkage bellcrank (torque shaft) should be checked for rigidity to be sure that no bending is occurring especially if a high load clutch has been installed in place of the standard unit. The linkage should also be able to provide the necessary clutch plate departure (see clutch section). The clutch linkage should also be checked to make sure that the bellcrank, rods, etc., don't interfere with the frame or the exhaust system (headers if installed). It is suggested that the steel washer and rubber insulator on the end of the clutch fork adjusting rod be replaced with a metal swivel (PN 2401740). All 1971 cars have this metal swivel.

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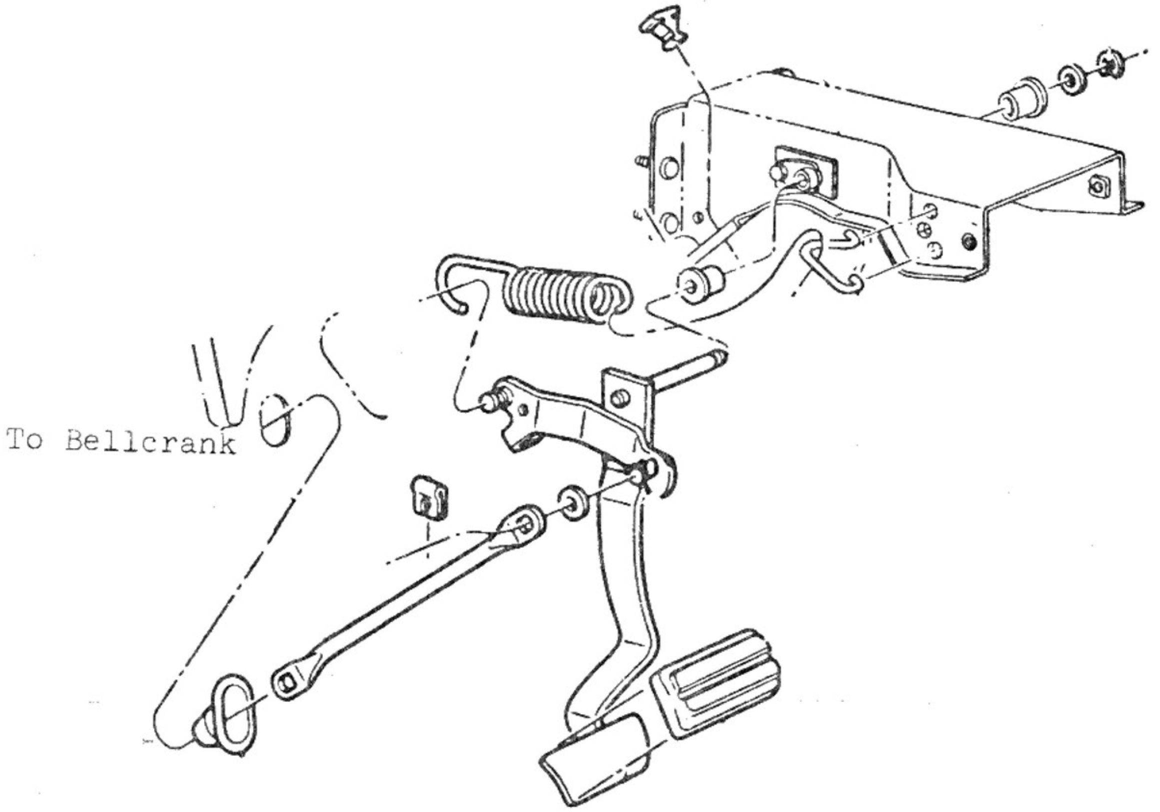

Clutch Pedal

Figure 5
Clutch Pedal Linkage

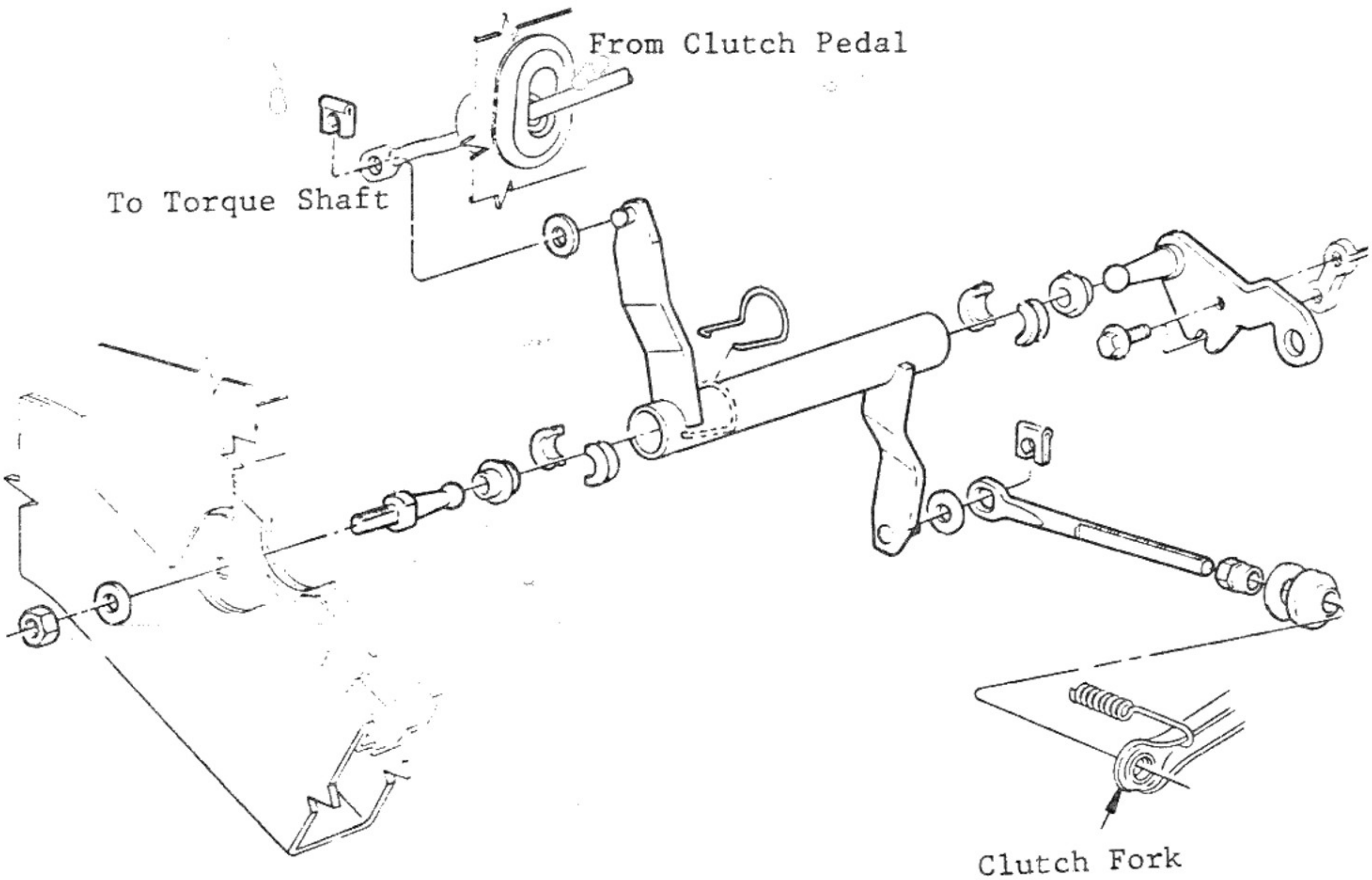

Figure 6

Bellcrank (Torque Shaft) and Linkage

The clutch fork pivot located inside the bellhousing is often overlooked. It must hold the fork correctly to enable it to move the throwout bearing to properly disengage the clutch. In the newer production bellhousings, two different pivots are used in the same bellhousing. The A/F-Body uses PN3743928 while the B-Body uses PN3743929. Each is held in place by two screws (PN6022225). All 1979 models use pivot PN4058859.

B. Changing the Clutch Linkage

The clutch linkage on the A-Body (Duster, Dart) can be changed to aid the high speed shifting of these cars with 340 engines and manual transmissions. This can be done by lengthening the lower arm on the clutch bellcrank 3/4" which will increase the clutch pedal effort slightly, but will provide for more plate departure which makes for a better power shift. Too much plate departure will cause the clutch fingers to hit the clutch disc which is not desirable either. This item is often overlooked by many racers. It also overstresses the eye bolts in the clutch. See Figure 7.

A similar problem (that of not enough plate departure) will exist if a 6-cylinder Dart/Duster clutch linkage is used. When converting a 6-cylinder Dart/Duster to a V-8, the clutch linkage from a 1971-1973 340 or 1974 360 should be used.

C. Installation of Special Steel Bellhousing

When a special steel bellhousing like Lakewood is installed, the clutch fork should be checked for proper operation throughout its travel. The torque shaft should be mounted straight across from frame to bellhousing in any view. If it is not straight across when located in the car, the bellhousing pivot end should be relocated so that it is straight across from the frame pivot.

D. Fabrication of Clutch Linkage

If the clutch linkage is being fabricated, a serious attempt should be made to put all the linkage pivots in double shear. This means that the force input to the pivot through one rod should be received by a rod or arm with support on both sides of the input rod. See Figure 8. This method of construction is much stronger and "bind" free. This is not required using a production car linkage as discussed earlier.

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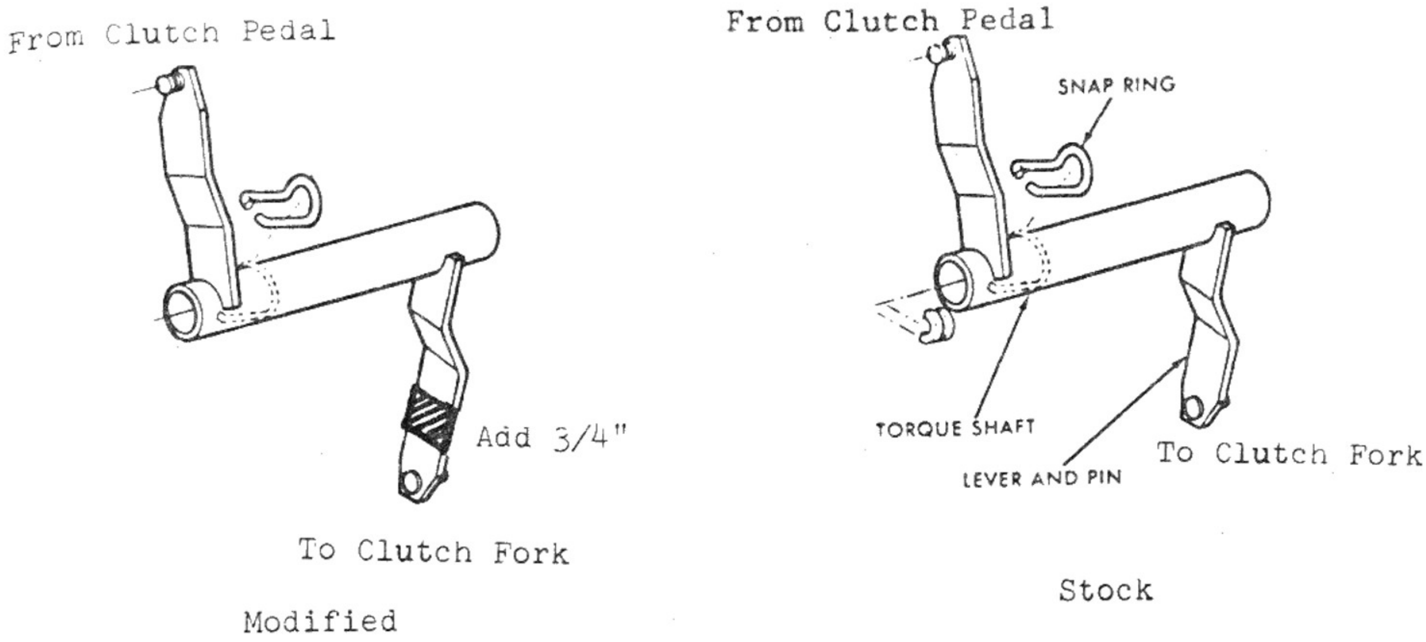

Figure 7

A-Body Bellcrank Modification

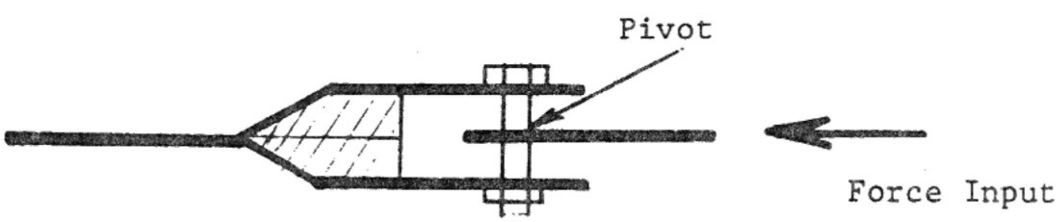

Figure 8

Double Shear Pivot

IV. FLYWHEELS

Up through 1969, flywheels were fairly straightforward - how m does it weigh; 10 1/2" or 11"? In 1970 the externally balance engines were first introduced and the flywheel area got much m complicated. The 1970-1972 440 and the 360 are the main trou spots because they have externally balanced flywheels (i.e. pa of the engine's dynamic balance is machined into the flywheel).

For the moment, ignoring the external balance, there are three basic types of production flywheels, one for the 10 1/2" and 11" scalloped clutches, and two for the older 11" clutches. For usage refer to the clutch section. All 426 Hemi flywheels are 8-bolt, while all the 318, 340, 360, 383, 400 and 440's have 6-bolt flywheels. Also the hemi flywheels are made of high strength alloy cast iron for increased burst resistance at high engine speeds. These pieces are obviously not interchangeable and must go with the crankshaft flange that they were designed for. The "A" engine (318, 340) and the "B" engine (383, 440-4 BBL) use common flywheels, but the "RB" engine (440-6 BBL) in 1970-1971 uses a different flywheel, although it is similar in appearance to the others. This difference in the 440-6 BBL flywheel is because the "RB" 440-6 BBL engine in 1970 and 1971 is externally balanced. Also, the 1971-1980 360 "A" engine is externally balanced which affects its flywheel. However only the 1974 360 had the 4-speed transmission in passenger car production. This externally balanced flywheel for the 360 is PN3410916. The 318 is not externally balanced and the 340 and 400 (1972-1974) were overlapping years for cast and forged cranks in these engines. The 4-speed transmissions got the forged cranks which do not require any external balance. The problem arises if any of these cast-crank engines are converted from automatic to manual.

Engine	Amount of Unbalance Added to Flywheel
340 Cast Crank	4.22 in. - oz.
440-6 BBL	6.5 in. - oz.
383-400 Cast Crank	12.9 in. - oz.
440 Cast Crank	12.9 " "
360	19.79 in. - oz.

Notes

All 360 engines have a cast crank.

The 383-400-440 cast crank engines can be identified by an "E" stamped on the engine numbering pad following the date built. Example, a cast crank 400 engine built on May 15 would have a number like H400-0515 E.

The 1970-1972 440-6 BBL and 4 BBL H.P. engines used a H.D. connecting rod forging which required external balance, but they do not have a cast crank. They do not have the "E" at the end of the number stamped on their number pad. They can be identified by an off-center weight cast in the vibration damper hub.

All 1978-1979 engines have a cast crank.

The 318 cast crank engines do not require external balance.

To convert a standard, symmetrically balanced flywheel to use with any of the externally balanced engines listed above, refer to figures 9, 10. 11, 12. The holes are drilled on the engine block side of the flywheel. For proper location of the balance holes, be sure to orient the flywheel by its crank flange bolt pattern as shown in Figure 13. This modification is only recommended for cast-iron and steel flywheels NOT aluminum.

An approximate weight for the standard 10 1/2" flywheel is 30# while the 11" weighs about 38#.