TECH SEZ:

HERE’S A NEW TYPE OF DRIVE

Yes, Sir! I mean the Hy-Drive for Plymouth. It’s a honey! What is it? Hy-Drive is a combination of the engine-fed torque converter and the Plymouth synchro-silent three-speed transmission. It makes driving a Plymouth just about the easiest thing you ever tried.

But ease of driving is only the half of it. The other half is where you mechanics come in—ease of servicing the new Hy-Drive unit.

That’s why this month’s session is right down your alley. It gives you the complete story on Plymouth Hy-Drive, from how to drive it to how to service it.
This month you're going to find out how to—but what am I wasting your time talkin' about it for! Here's the index that'll tell you the Hy-Drive information you'll find in this book.

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ADVANTAGES OF HY-DRIVE

The advantages of the new Plymouth Hy-Drive are immediately apparent when you drive the car. It enables you to operate the car in high, or direct gear, under practically all forward speed conditions. Hy-Drive also has many advantages that make for greater comfort in driving.

Hy-Drive is a combination of the torque converter and a Plymouth synchro-silent transmission.

As its name implies, you can operate the car in high or direct gear under practically all forward speed conditions. You can do all of your stop-and-start traffic driving without shifting gears or using the clutch pedal.
Hy-Drive’s superior torque multiplication will give you smooth getaway power when you need it most. Maximum torque multiplication is available for starting. As you continue to accelerate in high gear, torque multiplication decreases. When you reach forty miles per hour the torque transmitted is the same as it would be with the conventional transmission in high gear.

It has other advantages, too. When you stop on a hill you can leave the car in high gear and keep it from rolling backwards just by increasing the speed of the engine.

**DETAILS—PLYMOUTH HY-DRIVE**

Hy-Drive is not just the standard transmission with a fluid coupling added. It is a torque converter of the engine-fed type, capable of multiplying the engine torque more than two-and-one-half times. In addition, there are quite a few other points that are entirely new.
NEW HIGH-PRESSURE CLUTCH

There's a new high-pressure clutch, eight-and-one-half inches in diameter. The clutch disc has a solid hub. The torsion springs found in the hub of the regular clutch disc are not found in the new high-pressure Hy-Drive clutch.

The solid drive between the engine and the clutch has been eliminated through the use of the torque converter. This new clutch is necessary because it has to transmit the greater torque made possible by the use of the torque converter.

A new low-friction type clutch linkage is used to provide easier clutch pedal operation with the new high-pressure clutch. This linkage incorporates the large over-center spring, the knife-edge pivot and rolling action joints throughout.
TRANSMISSION GEARS

The teeth of the main drive pinion and of the constant-mesh gear and the reverse gear of the cluster assembly have been made stronger to transmit the greater torque load. When replacing new gears in a transmission of a car equipped with Hy-Drive, be sure to use the proper gears.

The splines for the clutch hub of the main drive pinion have been increased from the ten found in the conventional transmission to sixteen for the Hy-Drive transmission. This is another reason why the clutch for the Hy-Drive is not interchangeable with the clutch for the conventional drive.
TRANSMISSION NEUTRAL SWITCH

A transmission neutral switch has been added as a protection to prevent starting the engine with the transmission in gear. It is assembled in the gearshift housing on the transmission, and is operated by the movement of the gearshift lever shaft.

This neutral switch is in the starter-switch-to-solenoid circuit. It is there to break the starting circuit except when the gearshift lever is in the neutral position. The switch is identical with the switch used as the back-up light.
CARBURETOR SLOW-THROTTLE DEVICE

The Hy-Drive carburetor has a mechanically operated dashpot to provide a slow-throttle return to prevent engine stalling when it drops down to idle speed.

There is an adjustment for this slow-throttle device. It is made with the adjusting screw found in the top of the bowl cover.

When the accelerator is released and the throttle starts to close, this hook on the outer end of the throttle shaft arm draws the plunger lifter link and plunger down into the cylinder by means of the pick-up arm and link.
The fuel, which has filled the cylinder, resists this downward travel because it can escape only through the small orifice in the lower end of the plunger rod.

At the same time, pressure against the check ball holds it against its seat and prevents fuel from being ejected through the intake passage. This combined action retards the closing of the throttle, and prevents engine stalling.
TORQUE CONVERTER

The torque converter is bolted to the crankshaft flange, and is enclosed in an aluminum housing. Located between the converter housing and the rear face of the engine block is an aluminum adapter plate.

The clutch and the transmission are then assembled behind the torque converter in the usual manner.

This torque converter receives its supply of oil directly from the engine main oil gallery through drilled passages in the adapter plate and converter housing.
DIFFERENCES—FLUID COUPLING AND TORQUE CONVERTER

There are many differences between the fluid coupling and the torque converter. The fluid coupling has two units—an impeller and a turbine—enclosed in a housing that is nearly filled with oil.

The impeller, which is turned by the engine, moves the oil in the housing, throwing it over against the turbine.

As the engine speed increases, this oil, thrown from the impeller to the turbine, starts turning the turbine, and the car begins to accelerate.
Like the fluid coupling, the torque converter has an impeller and a turbine, enclosed in a housing. However, the oil in this housing is under pressure from the engine oil pump. That oil is supplied under pressure to make sure that the converter is always full. Also, by keeping pressure in the converter, its excellent performance is maintained. In addition, pressure helps to circulate the oil and keep it cool so it won't vaporize and create air bubbles in the oil.

The greatest difference between the fluid coupling and the torque converter is the addition of two units, called stators, in the torque converter. They are located in the oil circuit between the impeller and the turbine.
When the engine turns the impeller, oil is thrown against the turbine, just as in the fluid coupling. Then, after the oil passes through the turbine, it is directed back to the impeller by the stators.

This oil enters the impeller in the direction the impeller is already turning. So, when the oil leaves the impeller the next time it has added force to impart to the turbine.

Torque increase, or multiplication, takes place while the car is moving at slow speeds. This is why you have increased torque when you need it, for acceleration and hill climbing.
The fluid coupling, on the other hand, simply transmits the turning force from one unit to the other without increasing the torque output.

An oil pressure regulator valve located in the turbine shaft maintains engine oil pressure at approximately twenty pounds for idle speed. If the pressure goes above twenty pounds, the regulator valve moves off its seat. This permits the oil to return to the crankcase.

The valve consists of a small steel ball, a coil spring, and a steel plug which is pressed into the rear end of the turbine shaft. This ball is held against a seat machined in the turbine shaft.

A restriction passage in the turbine shaft limits the flow of oil from the converter at high speed, building up the pressure in the converter to equal the oil pressure in the engine.

Oil returns to the engine through passages in the converter housing, the adapter plate and in the rear wall of the engine, just to the right of the crankshaft. A pipe is screwed into the end of this passage, directing the oil to the oil pan.
The lower end of the pipe is located below the normal level of the oil in the oil pan to prevent the return oil from splashing and foaming as it enters the pan.

There is a small saw-cut or slot in this pipe, up near the block, which breaks up the vacuum that may develop in the pipe and the return passage when the engine is not running. Vacuum there would set up a syphoning action and drain some of the oil out of the converter.
There are two spring-loaded rubber seals, one on the converter hub, and the other near the rear end of the turbine shaft, to prevent oil from leaking out of the converter.

In addition, "O" rings are placed in the oil passages where the adapter joins the engine block, and where the torque converter housing joins the adapter.
OIL PUMP

The oil pump is externally mounted in the same position as formerly. The pump has a new cover incorporating a by-pass valve. This by-pass valve recirculates the oil within the pump, and prevents it from being dumped back in the pan where it might create bubbles in the oil. This valve, through its by-passing action, regulates oil pressure in the engine.

The oil pressure regulator valve in the side of the block now functions as a by-pass valve for the oil filter, controlling the flow of oil through the filter.
CAUTION

When replacing the pressure spring in the side of the block, be sure you use the correct spring. For Hy-Drive-equipped cars, the spring is longer and softer than the spring used for cars not equipped with Hy-Drive.

OIL CHANGE PERIODS AND CAPACITY

When the engine is equipped with the torque converter, the normal oil change requirement is ten quarts. The normal change requirement of the engine without the torque converter is five quarts. An extra quart is needed in each case when the filter is changed.

But remember, this larger capacity does not mean more expense for the owner. Because of the large quantity of oil circulating through the engine, the change period is only twice a year, in the spring and fall.
OIL FILTER

With the Hy-Drive-equipped Plymouth engine a by-pass type oil filter is used, with a replaceable element. The normal filter element replacement period is five thousand miles for all engines equipped with Hy-Drive.

But you want to remember this, too—when the car is used in extremely dusty areas, or is driven infrequently and then only for short distances, the filter may have to be changed more often.

HY-DRIVE SERVICE INFORMATION

CLUTCH LINKAGE:

Adjustments of the clutch linkage are made to provide proper tension of the over-center spring, and to assure correct clutch pedal free-play.
If the pedal is sluggish in returning to position, or if it seems to require more pressure than it should to operate the pedal, you’ll need to adjust the tension of the over-center spring. This adjustment is made by turning the sleeve nut on the spring eyebolt. If the pedal is soft and sluggish on return, back off the sleeve nut. If pedal action is hard, tighten the sleeve nut until the desired action is obtained.

If the clutch pedal doesn’t return all the way, the position of the over-center spring bracket will have to be changed. This is done by moving the rear bracket for the over-center spring either up or down on the brake master cylinder mounting plate.

Clutch pedal free-play is adjusted at the sleeve nut on the clutch fork rod. There should be one-eighth- to five-thirty-second-inch of free-play at the outer end of the fork. This will give one inch free-play at the pedal pad.

This adjustment is very important because, if the clutch pedal does not have the proper amount of free-play, it may produce a rattle in the clutch release bearing.
CARBURETOR SLOW-THROTTLE DEVICE

To check the dashpot action, first warm up the engine to normal operating temperature. Then check the engine idle speed to be sure it is between four-fifty and five hundred rpm.

Set the hand brake, and hold the foot brake with the left foot. With the right foot, snap the throttle open and let it close immediately. When you do this, the dashpot should check the throttle closing and the engine should not stall.

If the engine does stall, the dashpot action should be increased by turning the adjusting screw out to increase the plunger travel.
Once in a great while you may have an extremely slow throttle closing which cannot be corrected by adjusting the stroke. This condition is probably due to a restriction in the bleed orifice in the plunger rod.

To clean the bleed orifice, remove the bowl cover, disconnect the lifter link from the plunger rod and remove the plunger. Then blow air through the orifice to clean it out.

Do not use a wire to clean out this orifice. This will increase the size of the orifice and cause stalling.
If the throttle returns too quickly, and adjusting the plunger travel doesn’t correct the stalling condition, it probably means that the plunger leather is shrunk or deteriorated. If that proves to be the case, you’ll have to replace the plunger and rod assembly.

If the engine still stalls, the cause can be a number of things—faulty plugs, carburetor idle mixture out of adjustment, or binding of the throttle linkage. You’ll have to do some more checking to find out what’s causing the condition.
THE TORQUE CONVERTER

STALL TORQUE TEST—

If you suspect that there is excessive slippage in the torque converter, a stall torque test should be made to verify this condition. The test is made with the use of a tachometer.

First, warm up the engine to normal operating temperature. Then, connect the tachometer to the distributor and ground. Adjust the engine to an idle speed between 450-500 rpm. Set the parking brake and hold down the brake pedal with the left foot.

Next, depress the accelerator to the wide-open throttle position. The engine should stall at about 1300 rpm. If the stall occurs at higher than 1300 rpm, excessive slippage is taking place. This may be due to insufficient oil in the converter, caused by a restriction in the oil passages to the torque converter. It could also be caused by difficulty inside the converter.

A quick check for restricted passages can be made by draining the oil from the torque converter only. Then, check the oil level in the crankcase and mark it. Next, pour the oil drained from the converter into the crankcase and recheck the oil level. Be sure the drain plug has been reinstalled in the converter.

Next, run the engine for five minutes at fast idle. Then, shut off the engine and recheck the oil level. If the level has not dropped to the normal level in the five minutes time, there is some restriction in the passages and they should be checked. This will involve removing the converter housing and the adapter plate from the engine.

If the converter fills up within the five-minute time limit and slippage still occurs, the difficulty is due to some internal condition, and the converter should be replaced.
LOW OIL PRESSURE—

During normal engine operation the engine oil pressure is about 40 to 60 pounds per square inch. At idle speed, the pressure reading on the gauge is normally 25 to 30 pounds per square inch.

If there should be a noticeable reduction in oil pressure reading during engine idling, it probably is a condition known as a “low-pressure leakage.” However, under normal operating conditions, there is sufficient oil pump capacity to provide normal pressure gauge readings. The pump will also deliver sufficient oil to prevent slippage.

When checking a report of low engine oil pressure at idle, allow the engine to idle about five minutes. Then, with the gearshift lever in high gear position, accelerate the car and observe the rate of acceleration.
If the acceleration is not up to standard it is probably due to excessive slippage in the converter. Such a condition can sometimes be traced to breakage of the ring between the turbine shaft and the reaction shaft, or between the reaction shaft and the converter hub. This permits oil being delivered to the turbine to become mixed with the oil returning to the engine. To inspect for broken rings it is necessary to remove the converter from the engine.

Another cause of low engine oil pressure is a leaking pressure regulator valve. This leakage may be caused by foreign matter on the seat, by a broken valve spring, or even by an improperly positioned regulator valve plug which does not allow sufficient spring pressure to be built up.

To correct this condition, remove the regulator valve spring plug, using Removing Tool C-3179. After removing the plug, spring and ball, clean the inside of the turbine shaft with mineral spirits and examine the valve ball seat. If the seat is damaged, the turbine shaft must be replaced. Do not attempt to repair the seat.

When replacing the valve ball, spring and plug, use Installing Tool C-3178 to drive the plug into the shaft to the proper depth.
TIPS ON DRIVING
HY-DRIVE-EQUIPPED CAR
Actually there are only two things to remember when driving the Plymouth equipped with Hy-Drive.

**FIRST,** the transmission has to be in neutral before you can start the engine.

**SECOND,** you start off in high gear, and don’t use the clutch after you once shift to high.

To start the engine by pushing the car, place the gearshift lever in low gear, turn on the ignition switch and hold the clutch pedal down. When the car reaches a speed of about ten to fifteen miles per hour, engage the clutch.
Don't tow a Hy-Drive-equipped Plymouth to start it. When the engine catches, that quick acceleration may cause you to run into the rear of the towing car.

Don't keep pushing the car if it refuses to start after the normal amount of pushing. Too much pushing with the clutch engaged may cause the oil in the converter to throw away from the center and starve the stator bearings and hub thrust washers so they'll burn or score. If the car has to be towed or pushed any great distance, be sure the gearshift lever is in neutral position.

Don't park your car just by leaving the gearshift lever in reverse or direct drive. Remember—there's no solid connection between the engine and the rear wheels, so the engine can't be used to hold the car. Set the parking brake instead.
USE THE NEW TECH QUESTIONNAIRE
FOR SESSION NO. 66
WHEN RECORDING YOUR ANSWERS
TO THESE TEN QUESTIONS

A new, high-pressure clutch is necessary with Hy-Drive because it has to transmit less torque than with the standard transmission.

The Hy-Drive torque converter receives its oil directly from the engine main oil gallery.

Oil is supplied, under pressure, to the torque converter to make sure that the converter is always full.

The oil pressure regulator valve in the turbine shaft maintains engine oil pressure at approximately forty pounds for idle speed.

The new high-pressure clutch disc used with the Hy-Drive has no torsion springs at the hub to absorb torque impulses.

The oil pump on cars equipped with Hy-Drive has a new cover incorporating a bypass valve.

When the engine is equipped with the Hy-Drive torque converter, the normal oil change requirement is ten quarts.

Clutch pedal free-play is adjusted by adjusting the tapered-sleeve nut on the clutch fork rod.

An extremely fast throttle closing which cannot be corrected by adjusting the stroke of the dashpot plunger is due to a restriction in the bleed orifice in the plunger rod.

Engine oil in Hy-Drive-equipped cars should be changed twice a year, spring and fall.

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