Master Technicians Service Conference

TORQUEFLITE TESTING TIPS

plymouth - dodge - chrysler - imperial - dodge truck
It's better to know for sure...

Depending on the point of view, TorqueFlite diagnosis can be helpful or a waste of time. Some technicians feel that nothing is gained by diagnosis because an overhaul will automatically put everything in order. Others would rather pinpoint the source of trouble so they can be sure that all contributing factors are cleared up.

Now, there's no arguing the fact that diagnosis often takes a back seat when the need for overhaul is obvious. A burn-out tells its own story directly, and hardly needs detailed diagnosis. But even here, it's important to know if the initial cause of trouble is in the transmission or elsewhere. For instance, the whole thing may be the end result of a neglected, off-spec linkage adjustment, so you'll want to check its setting to complete the job.

Another defense for diagnosis rests on the fact that testing can locate the causes of many operating irregularities which can be corrected without completely tearing down the transmission. And, equally important, early diagnosis of off-standard TorqueFlite operation often makes it possible to correct minor conditions before they damage the transmission enough to require overhaul.

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PRELIMINARY CHECKS

Continued improvement of TorqueFlite design and materials has eliminated the need for periodic fluid changes and band adjustments where our cars are used in average service. This means that maintenance can be as simple as checking the dipstick and inspecting the control linkage every six months. It also means that these simple checks should be made regularly so any below-standard condition can be detected early, possibly before it can harm the transmission.

When a car is used for trailer towing, or in taxicab, police, or other heavy-duty service, the fluid and filter should be changed, and the bands adjusted at the intervals specified in the Service Manuals. This requirement also applies to the TorqueFlite used in Dodge Trucks.

CHECKS ARE DUAL-PURPOSE

Regular maintenance service then, is the first application of the dipstick and control linkage checks. Equally important for trouble-shooting, the fluid and linkages should be checked as a preliminary to diagnosing any TorqueFlite service job.

ELIMINATE THE OBVIOUS

If the transmission passes these preliminary checks, your road-test diagnosis will be greatly simplified. For example, if you eliminate linkage adjustment as a possible cause of trouble before you road-test the car, you can localize a condition in the transmission more easily.

And, as often happens, restoring the proper linkage setting may be all that’s needed to correct the condition. Of course, a burnout is beyond correction by adjustment, but even here, it’ll help to know if a faulty linkage adjustment started the breakdown on its way.

SEARCH FOR CLUES

When a car comes in for TorqueFlite service, ask the customer about the circumstances behind the condition to help you in determining the cause. For example, a sudden change in shift timing can be the result of other servicing which has upset the transmission throttle control linkage setting. On the other hand, a gradually worsening slip condition may be due to neglect or unusually heavy usage.

In addition, if you have any doubt as to the exact nature of the trouble, try to get the customer to demonstrate or point out the condition on a short test ride.

NEGLECT IS A DIRTY WORD

As you know, purely mechanical failure is seldom a TorqueFlite problem. Where the mechanism does break down, it is usually the result of neglect which causes deterioration that might have been prevented by regular maintenance service.

Slipping is a common example of a neglect condition. All too often, a slipping band is ignored until it’s too late to correct by simple adjustment, so a costly overhaul is the result.

LOOK FOR SIGNS OF HEAVY USAGE

A trailer hitch can tip you off to the possibility that a band adjustment may be needed. Another obvious clue is odometer mileage which is much higher than average for the age of the car. Either condition can mean that the transmission has been exposed to heavier than average usage.

POWER COMES FIRST

Because TorqueFlite operation and engine
performance go hand in hand, the engine must be putting out before we can expect the transmission to operate properly. And, as you might expect, this relationship also works the opposite way. Even the highest engine power output can’t go anywhere if the transmission bands are slipping.

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**DIPSTICK CHECKING**

As mentioned earlier, the dipstick check is important in trouble diagnosis. Both the level of the fluid and its condition can give you valuable clues to the general condition of the transmission.

**IT’S SOMEWHERE IN BETWEEN**

Your service manuals tell you that the fluid level is okay if it’s between the Full and Add One Pint marks on the dipstick. This inspection alone is simple, but make sure the checking conditions are right so you’ll get a true level measurement.

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**Fig. 2** Follow the specified procedure

*Before you pull out the dipstick, be sure to wipe off the protective cap and the top of the filler tube to keep loose dirt from entering the transmission through the tube. After checking, make sure the dipstick cap is fully seated on the filler tube to seal out dirt and water.*

**WARM IT UP FIRST**

For most dependable checking, the fluid must be at normal operating temperature so it will be fully expanded. Cold checking is not reliable, but where it is used, the fluid level must be at, or slightly below the bottom mark on the dipstick.

Fluid temperature is usually high enough for accurate checking if the car was driven a short time before. However, if the car has been standing overnight, or long enough to cool off, it’s best to warm up the fluid before you check the level.

**DON’T BE FOOLED**

When a car is parked twelve hours or more, normal drain back from the torque converter will raise the fluid level higher than normal. This means that a dipstick check which is made before the converter has had a chance to refill will be inaccurate. And, remember that converter filling is slower when the selector is in Park position, so make sure the transmission is in neutral during the warmup.

As a final checking precaution, especially after the transmission is drained and refilled, slowly move the selector through all the ranges and back to neutral to make sure the operating circuits are completely filled.

**LEAKS ARE EASY TO SPOT**

If the fluid level is down, the low level may be the result of an external leak or improper filling. Of course, the possibility of a leak becomes greater as time and mileage pile up. But even if the transmission is new, a low level on the dipstick and fluid on the floor can only add up to a leak.

**SOMEBODY GOOFED?**

If there’s no external leak, a low fluid level probably means that someone did not bring the fluid up to proper level when refilling the transmission. As you know, this is possible if the dipstick is checked before the torque converter and the hydraulic control circuits are completely filled.

**ENOUGH IS ENOUGH**

Improper filling can also raise the fluid level too high. Fluid may be added by mistake, or incorrect filling procedure may be used after the transmission is drained. To refill with new fluid at room temperature, bring the fluid up to the bottom mark on the dipstick after you
make sure the torque converter and control circuits are filled. When the transmission fluid is at normal operating temperature, the level should be somewhere between the two dipstick marks.

THE LEVEL MAKES A DIFFERENCE
Correct fluid level is as important to proper TorqueFlite operation as correct float bowl level is to good carburetion. In fact, you'll notice in your Service Manuals that low fluid level can cause 10 of the 19 conditions listed under TorqueFlite Diagnosis.

As in any hydraulic system, air bubbles make the fluid spongy and compressible, so pressure builds up slowly in the transmission hydraulic system.

The most noticeable effects of low fluid level are delayed engagement in Drive and Reverse, and slipping on upshifts. In addition to poor operation, you can also get disturbing noises, such as pump whine and governor buzz.

LOW LEVEL MEANS TROUBLE
Slipping and noises are bad enough, but unfortunately, the slipping also causes overheating and rapid wear of clutches and bands. Also, if the low fluid level starves the pump so it can't provide adequate lubrication, other transmission parts will also wear out.

LOW LEVEL ADMITS AIR
The main problem with low fluid level is that the oil pump takes in air along with the fluid.

HIGH LEVEL CAUSES VARNISH
At the other extreme, when you have high fluid level, the transmission gears can churn up air bubble foam and cause the same slipping and overheating conditions you get with low fluid level. But even worse than this, the combination of foam and overheating will cause the fluid to oxidize if the condition persists. Oxidizing the fluid causes it to form varnish, which can make the transmission valves sticky, even in a new transmission.

CONDITION TELLS THE TALE
As mentioned earlier, we are also interested in the condition of the fluid whenever the fluid level is checked. If the fluid is discolored,
FOAM AND OVERHEATING CAUSE VARNISH

Fig. 6 Varnish makes valves sticky

or shows signs of foreign material, the transmission may need an overhaul, or a complete cleanout to get rid of varnish.

IF FLUID SMELLS BURNED . . .

When the fluid is dark and smells burned, you can be pretty sure that something is burned out in the transmission. The transmission may still work fairly well in this condition, but the color and smell of the fluid usually means that an overhaul will be needed to replace worn friction material, plus a complete cleanout to remove any varnish that has formed.

DARK, BURNED FLUID MEANS BURNOUT

Fig. 7 Worn friction material darkens fluid

DARK ALONE IS DIFFERENT

If the fluid is dark, but does not smell burned, the discoloration may be caused by ethylene glycol antifreeze. Usually, when engine coolant leaks into the transmission cooling system, the transmission fluid becomes milky. However, if the leak is slight, and high transmission temperature causes the water to boil off, the glycol which remains will cause the fluid to appear dark.

WATER AND OIL DO NOT MIX

Milky fluid may indicate coolant leakage, probably at the oil cooler unit in the radiator, or plain water in the fluid. If leaks do not show up in a cooling system pressure test, road splash or rain water may have entered the transmission past a raised dipstick sealing cap. ALWAYS MAKE SURE THE DIPSTICK CAP IS FULLY SEATED.

MILKY FLUID CAUSES DAMAGE

Engine coolant or plain water mixed with transmission fluid swells transmission seals and softens friction material, so a contaminated transmission will need a complete cleanout and reconditioning after any leaks in the cooling system are corrected.

MILKY FLUID = COOLANT LEAKAGE

Fig. 8 Water causes seal damage

A LITTLE BIT IS TOO MUCH

You'll know that varnish is forming if the dipstick is tacky and doesn't wipe clean. Once varnish starts forming, it builds up in all the valves, servos, and clutches and causes sticking. As you know, sticking parts can cause erratic transmission operation, especially when the valves are affected.
Eventually, the varnish formation will clog the filter and pump pressure will drop. When this happens, the torque converter will not fill so the transmission cannot operate, even in an erratic manner.

**CLEAN-OUT IS THE ONLY ANSWER**

To get rid of varnish, the complete transmission assembly, including the torque converter, must be cleaned out. Don’t forget that fluid overheating is a major cause of varnish. Include the transmission oil cooler and the connecting lines in your clean-out, and make sure the engine cooling system is in good condition.

If the factory fill fluid is replaced for any reason, the fluid and filter must be changed and band adjustment checked every 36 months or 36,000 miles afterward. Make sure that only specified fluid is used for changing or for correcting fluid level.

**DO NOT USE TYPE “F” FLUID**. The characteristics of this fluid are not suited to our TorqueFlite friction materials and will result in rapid wearout.

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**CONTROL LINKAGE ADJUSTMENT**

The remaining part of our preliminary checking concerns the transmission range selector and throttle linkages. If either linkage needs adjusting, it should be done before you road-test the car with the customer.

**YOU CAN TELL RIGHT NOW**

The most obvious sign of improper selector linkage adjustment is failure to start unless the selector is moved slightly off the Neutral or Park detents.

**NO CREEP ALLOWED IN NEUTRAL**

Another indication of improper adjustment is creeping when the selector is in neutral. When the manual lever is in neutral, the selector detents position the transmission manual valve between the drive and reverse hydraulic passages in the valve body. This prevents fluid from entering either passage so there’s no power flow to the wheels. If the linkage adjustment is off far enough, the manual valve will be moved to admit line pressure into the drive or reverse passage and the car will creep.
PARTIAL ENGAGEMENT CAUSES WEAR
If the selector linkage adjustment is off only a small amount, the fluid bleeding past the manual valve can cause a clutch to partly engage and slip without causing creep. If this condition is allowed to continue, the slipping clutch will wear out prematurely.

USE THE SAFETY SWITCH
The selector linkage can be checked quickly from the driver's seat, by taking advantage of the normal operation of the neutral safety switch. This switch is designed to allow the engine to start only when the selector is in Neutral or in Park position, and is not adjustable. This means that a variation from normal switch operation is probably the result of improper linkage adjustment.

DON'T FORGET THE BRAKE
With the engine shut off, place the selector lever in the Reverse or Drive position. Then, apply the brake while you hold the ignition key in the Start position. As you move the selector lever slowly toward neutral, the starting motor should cut in as the shift detent bottoms. Repeat the same check in the opposite direction, and adjust the selector linkage if necessary.

THE VALVE MOVES TOO FAR
As we mentioned earlier, the engine must be able to produce normal power output before we can adjust the throttle linkage properly. If the engine is not putting out enough power, the gas pedal must be pushed down farther to accelerate. When the pedal moves farther, the extra travel moves the transmission throttle valve far enough to raise throttle pressure and line pressure higher than normal. The throttle pressure increase delays upshifting and the high line pressure makes shifting harsh.

THERE'S ANOTHER WAY
You can also check for creep in neutral with the engine idling. Simply force the selector against the reverse gate detent while you apply the brake to prevent car movement. If the selector linkage is okay, you're ready for the throttle linkage adjustment.

Fig. 12 Starter operation checks linkage

Fig. 13 Incorrect adjustment permits creeping

Fig. 14 Pedal affects throttle valve movement

Fig. 15 Moving detent pot恒检查
ACCELERATOR CABLE CAN INTERFEREE
The throttle linkage adjustment can be checked quickly as described in your Service Manuals.

Make sure that the flexible cable to the accelerator pedal is properly adjusted so it will not interfere with the transmission throttle linkage adjustment.

ROAD TESTING

You can also make a rough check of throttle linkage adjustment when you road-test the car. First, put the selector in Drive position and accelerate the car gradually. If the linkage is too long, it moves the transmission throttle valve too far, so upshifts are delayed and harsh because the extra valve travel raises throttle pressure higher than normal.

When the throttle linkage is too short, it does not move the throttle valve far enough, so upshifts are early because the throttle pressure is lower than usual. Another obvious indication of short linkage travel is the lack of full-throttle kickdown action.

CHECK EACH RANGE
On your road test you should operate the transmission in each range to note how the shifting feels and to check the upshift and downshift speeds. The performance of the transmission under test should compare well with other acceptable units which you have tested previously.

SLIPPING MEANS TROUBLE
The main thing to check for on your road test is slip. As you know, slipping in any gear means band or clutch trouble. If not badly worn, bands can be adjusted, but a slipping clutch calls for a transmission overhaul to replace the friction material. Where only one band or clutch acts up, it’ll be easy to diagnose. If you note the range where slipping
occurs, you can usually pick out the ailing band or clutch.

CHECK THE CHART
Once you have noted where slipping occurs, you can determine which band or clutch is applied in each range by referring to the chart shown in your service manuals or in this reference book.

FORWARD GEARS = REAR CLUTCH
On either chart you’ll notice that the rear clutch is engaged in the low, second, and direct drive ranges. It’s obvious from this that any slipping in all forward gears points to the rear clutch.

REVERSE & DIRECT = FRONT CLUTCH
You’ll also notice that the front clutch is engaged only in reverse and direct. If there’s slipping in these two ranges, but not in the others, the front clutch is probably the source.

NO KICKDOWN APPLY = 1-3 UPSHIFT
It’s easy to spot kickdown band trouble because this band applies only in second. If the band does not apply at all, you’ll get a one-three upshift which skips second completely. Here, in place of the kickdown band, the overrunning clutch holds in breakaway until the road speed is high enough for the upshift to direct.

KICKDOWN SLIP = DELAY & THUMP
If the kickdown band slips a little before it applies, there’ll be a short delay and then a thump as the kickdown band takes over from the overrunning clutch.
L & R SLIP = NO ENGINE BRAKING

Checking the low and reverse band is a bit different. Here, when the band slips, the overrunning clutch takes over so you can't check out the band under power. Instead, you speed up the car to about 25 MPH and move the selector from Drive to Low. If the low and reverse band is slipping, you won't feel any engine braking when coasting down.

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PRESSURE TESTING

If the kickdown and the low and reverse bands are not badly worn, adjustment will probably restore normal transmission performance. However, it's also possible that a band doesn't hold because its operating servo isn't working properly, or because servo operating pressures are not correct.

PRESSURE TEST FIRST

Obviously it's a waste of time to adjust the bands before you know whether the servos are working or that the transmission operating pressures are okay. You'll have to get inside the transmission to check servo operation, but the hydraulic circuit pressures can be checked simply by connecting gauges to the external pressure test points.

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OPERATING SYSTEM PRESSURES

There are three hydraulic pressure tests that are related to slipping. We're concerned with Accumulator Line Pressure, Kickdown Servo Release Pressure, and Low-Reverse Servo Apply Pressure.

CHECK PRESSURE SOURCE

First of all, if you get the specified pressure at one of these test points, you'll know that the main pressure source is working properly. In other words, you'll know that the transmission oil pump and the pressure regulator valve are working properly.

LEAK OR BLOCKAGE DROPS PRESSURE

When you're sure that the source or line pressure is correct, low pressure at any other test point means there's an internal leak or a blockage causing a pressure drop in that part of the system.
LOW AT SOURCE = LOW EVERYWHERE
In the event that the pressure is low at all test points there's trouble somewhere in the pressure source circuit. This could mean a worn pump bushing which allows a pressure drop, but low supply pressure is more likely to be the result of a clogged filter, an internal leak, or a stuck valve in the supply system.

WORN PUMP CAN BUILD PRESSURE
Even if pumping volume is low because of worn pump parts, pressure can still build up in the hydraulic system if the filter is clear and there are no leaks at the torque converter, or inside the gear housing.

CLOGGED FILTER LOWERS VOLUME
Pump output volume lowers gradually as the filter clogs, so shifting action takes longer. Even though a pump may be able to produce pressure, the low volume caused by a restricted filter delays band application and clutch engagement, especially in reverse. Of course, the hydraulic system volume and pressure can also drop if the pump is badly scored or worn by foreign material.

WHICH ONE'S STUCK?
There's no easy way to tell whether low pressure is caused by a stuck pressure regulator or torque converter control valve. If the pressure regulator valve sticks it can bypass fluid directly back to the sump. A torque converter control valve stuck open bypasses enough fluid through the converter and cooler circuit to keep the pressure low.

VARNISH MAKES 'EM STICK
The pressure regulator or converter control valve usually stick because there's varnish in the system. When you find signs of varnish on the dipstick, and line pressure is low, it's reasonable to suspect that either or both of these valves are stuck.

LOW PRESSURE = LEAKY SEAL
If your pressure test shows that the accumulator line pressure is lower than specs, and you have already noted slipping in all forward speeds in your road test, the pressure drop is probably caused by a leaky rear clutch seal.

ACCUMULATOR LEAK = PRESSURE DROP
Besides the possibility of a leaky clutch seal, the line pressure can also be low if there's a
leak at the small diameter seal in the accumulator itself. Here, the accumulator does not cushion the kickdown band application in the normal manner, so the pressure drop may show up in a harsh one-two upshift.

PRESSURES SHOULD MATCH
Kickdown servo release pressure should follow right along with accumulator line pressure. Since the servo release system and the front clutch apply system are tied together, we can pressure-test them both at the same point.

SERVO SEAL CAN LEAK, TOO
Another possible cause of low kickdown servo pressure is a leak at the servo seal. However, a servo leak is hard to spot because both sides of the kickdown servo are pressurized in direct drive. If there's any doubt about the servo seal, you can test it with air pressure when you get inside the transmission.

CHECK L & R APPLY PRESSURE
If the previous pressure tests indicate that the front clutch seals are holding, we then check the low and reverse servo apply pressure. Here, a leaky servo seal causes low pressure at the test point and slipping in reverse on the road test. There'll be no pressure build-up at the servo if the front clutch seals are leaking.

CONTROL SYSTEM PRESSURES
Operation of the bands and clutches provides the “muscle” which makes the upshift, downshift and reverse actions happen. As you know, this “muscle” depends on having the correct pressure to operate the servos and clutches. However, shift timing and smoothness depend on correct control pressures.

THROTTLE vs. GOVERNOR PRESSURE
To simplify the whole thing, we can say that shift timing is controlled by the balance between throttle pressure and governor pressure.

SHIFT VALVES ARE RELAYS
As their name suggests, the shift valves con-
Control the shifting, but they are actually only pressure-operated hydraulic relays. Each shift valve is moved toward its downshift position by a spring and throttle pressure. At the proper vehicle speeds, the valves are moved to the upshift position by governor pressure, so the shift can take place.

**Pressures Vary in Each System**
The throttle pressure increases as the gas pedal is pushed down, and the governor pressure increases as car speed goes up. Both control pressures must be correct or the shift timing will be off. Since the governor valve is not adjustable, getting the pressure balance right depends largely on correct throttle linkage adjustment. Just remember that high throttle pressure delays upshifting, while low pressure makes the shifts happen too soon.

**Stuck Valve Keeps Pressure Low**
If the throttle valve sticks, throttle pressure will probably stay low until the kickdown valve forces the throttle valve to move. When this happens, the valve breaks loose and the throttle pressure increases abruptly.

**No Positive Pressure Test**
There is no positive way to check throttle pressure, so you can't tie the cause of early upshifts to the throttle valve by pressure testing. All you can do in this case is make sure that the throttle linkage is properly adjusted.

**Governor Is Centrifugal Device**
On the opposite side of the pressure picture, the governor valve operates by balancing centrifugal force and spring pressure against governor hydraulic pressure. When the car is stopped, the valve holds in the "out" position and vents the governor hydraulic system. As the car picks up speed, the valve is gradually pulled inward by the governor weight to permit line pressure to operate the shift valves.

**Vented Valve = No Pressure**
If the governor valve is stuck in the out or vented position, it prevents pressure buildup in the governor system. When this happens, the transmission does not upshift.

**Closed Valve = High Pressure**
In the opposite direction, if the valve is stuck at the "in" position, governor system pressure will be too high. Here, the upshifts are early.
or erratic, and you probably won’t get normal downshifting action.

**STICKY VALVES = DELAYED SHIFTS**

In the same manner as the throttle and governor valve, sticky shift valves can also upset upshifts and downshifts. Since the shift valves work like hydraulic relays, sticky valves need more than normal governor pressure to make them move, so upshifts are delayed. In like manner, more throttle pressure is also needed to move sticky shift valves, so downshifts are slower than normal.

**NO PART-THROTTLE KICKDOWN**

You’ve probably noticed that the 2-3 shift valve assembly used in the TorqueFlite for our six-cylinder models includes a part-throttle kickdown plug. A stuck kickdown plug means that there will be no kickdown action until the gas pedal is pushed all the way down to the floor.

**IT KEEPS SHIFTING SMOOTH**

Finally we come to the shuttle valve. The main function of this valve is to control shifting smoothness. Again, as with the throttle valve, there’s no positive way of checking shuttle valve operation. However, if linkage adjustments and pressure tests do not help to clear up erratic shifting, a sticky shuttle valve may be the cause.

**DON’T OVERLOOK LUBE PRESSURE**

Following the operating system and control system pressure tests we still have to check the lubrication pressure. Simply connect a gauge into the lubrication line at the rear of the transmission. Lubrication pressure should be up to specs when you check line pressure and front servo release pressure. Inspect the condition of the lube system lines to the cooler in the radiator and make sure all connections are tight.

**USE PROPER PROCEDURE**

One final precaution to apply when making pressure tests will help you guard against damaging transmission or engine parts. Overspeeding the engine or running long tests can cause overheating at both the engine and the transmission. Always use a tachometer so you can keep engine speed within limits, and make your tests quickly.