Best Results From Overdrive

part one of a tech series

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OVERDRIVE WAS NOT a Hudson "first" — which is perhaps a bit surprising in view of the company's well-known enterprise in engineering matters, along with its equally well-known affinity for "performance" axle ratios and long-stroke, high-torque engines. But the fact is that Hudson did not offer this particular option until the 1940 models, six years — and more than six Brand X's — after it was originally introduced.

Very likely there were sufficient reasons, mechanical or otherwise, for not bringing out an overdrive Hudson (or Terraplane) back during the Electric Hand era. But this much is certain: Hudson's overall automotive design, and the optional overdrive feature, once they were united, quickly proved to be uncommonly well suited to each other. With practically any model 1940 and up, as Hudsonuts know, this single option can make all the difference between a merely excellent road car and a superb one. Today, surviving Hudsons with overdrive remain the favorites, and many good ones somehow born without it have already been converted by owners (with surprisingly few reliability problems, considering all those sets of well-used components summarily hauled out of "retirement" and put back to work). Certainly there is no other possible modification to these cars which can offer such benefits in addedriveability, performance, quiet, engine life — yes, and gas mileage — along with complete retention of authenticity.

Then too, overdrive combines especially well with two other Hudson options: either the Vacumotive Clutch or the complete Drive-Master (clutch plus gearshift), all of these working together with the standard 3-speed gearbox to give the driver a flexibility of control not offered by any other system. Indeed, a restored Hudson so equipped may still be the ideal transition vehicle for anyone trying to make the change from automatic to stickshift or vice versa, as it responds quite obediently to either set of reflexes of a mixture thereof. The optional combination of vacuum clutch plus overdrive (but with manual gearshifting), though a bit simpler mechanically than the "Super-matic" or complete Drive Master plus overdrive, was not as popular a seller (nor was it ever given a special "package" anme of its own); yet, it, too, is a very agreeable combination to drive, and in fact was available for a time both on Chrysler products and on Packard as well as on Hudson.

OVERDRIVE AS WE know it had its origin as a joing Chrysler/Borg-Warner development for the 1934 (Airflow) models, though the offering of a 4th or auxiliary top "cruising gear" in one form or another wasn't new then. What was new was the layout: a planetary gearset mounted on the rear of a conventional 3-speed box, and fitted with a centrifugal clutch so that it would upshift itself at a predetermined car speed as soon as driving torque was momentarily released. Below the preset speed it would downshift, and could also be locked out via hand cable. It was soon adopted by several other carmakers as well, including Nash.

Conspicuously missing, however, was any provision for a "kickdown" back to direct drive above the cut-in speed when needed. About all one could do for an approximate "passing gear" was to downshift into second by hand while the OD remained engaged.

B-W moved to remedy this for the '37 models with a new version which offered a purely mechanical "kickdown" by means of a springloaded pawl that would flip under sufficient load, thus temporarily restoring direct drive. But Hudson didn't buy that version either . . . for some reasons not too difficult to discern.

In 1939 however, came another new type, called "semi-electric" because, though normal engagement/disengagement was still done mechanically by the centrifugal clutch inside, an external electric solenoid had been added which would, regardless of speed or load, temporarily restore direct drive for passing when needed, by responding to the familiar pushbutton "kickdown switch" set underneath accelerator pedal. It was an entirely workable (if cumbersome) design, promptly adopted by Packard for 1939, Chrysler & DeSoto for 1939-40; and then by Hudson as well, for its 1940 models. Nash and Studebaker (most series) retained it 1939 through early 1946. As with earlier types, its normal cut-in speed could be altered somewhat by carefully adjusting the two centrifugal clutch weights through a small access hole.

But there was an obvious need for simplification, and the next new type, though it looked quite similar, eliminated the centrifugal clutch, using instead the smaller side-mounted centrifugal governor, which merely operates electric contact points at the appropriate speed. This was B-W's first "full-electric" type overdrive, with all engagement and disengagement now being done electrically by the solenoid, controlled both by the governor and the kickdown switch through a relay. It was successfully adopted by Hudson for 1941-47, along with Packard for 1940-48 and others.

Finally, one more redesign after the war further reduced bulk and mechanical complexity, though without any change in the traditional gear ration (0.7 to 1) or other operating features. This second type full-electric overdrive, after introduction on a few makes in late '46, was adopted by Hudson in 1948 along with the new Step-Down bodies; and in 1949 and thereafter was used on all other makes as well.

MECHANICAL OVERHAUL of these units, though well-described and illustrated in MOTOR's and other books for years, has not been found necessary by many Hudson owners to date. This can largely be credited to the mechanical design itself — actually a quite liveral overdesign for most applications short of a full-house 7X — so that real breakdowns have been few, and at the same time it has usually been easier to find and install another good complete used transmission assembly from the junkyard rather than to bother with internal rebuilding. (Favored replacement beargoxes have been those from Pacemakers, due to their undoubtedly lower-torque first existence, plus complete interchangeability with the other stepdowns.)

But with fewer of these left, and with the many surviving overdrive Hudsons continuing to roll up years and mileages far beyond any statistical expectations, there now is more often a need for internal overdrive repairs. This generally means higher costs, though still well below the cost of automatic-transmission work. Also, parts availability for these overdrives, for obvious reasons, is not likely ever to become quite the problem that it may be for many "one-make," or sometimes even "one-year," components. Note that even the simi-electric type OD, which was a one-year item on Hudson, was used for a much longer time on several other makes.

A complete list of overdrive part interchanges, Brand X to Hudson and year to year, will have to await the efforts of some of our readers who have access to the various listings — or who perhaps have tried some of these interchanges with success — and are willing to share their information with us via Lou Backhus' regular column here in WTN. The general rule, however, is that for any one type of overdrive — the "second type full-electric" used on all Hudson stepdowns and many other cars, for exampel — nearly all mechanical parts will interchange except perhaps the "adapter plate" (thick piece between OD and main gearbox); and often the transmission mainshaft, since it extends back from whichever type of 3-speed is being used, into the overdrive. External cases of the overdrives used on certain makes also look quite different in some instances because they are to be used with torque-tube drive instead of an open shaft); but internal parts remain much the same.

ELECTRICAL SERVICING of these overdrive units is generally of much more practical interest to Hudson and Brand X owners. There is more often a need for it, and, unlike internal gearbox work, it is usually simple and accessible enough to be handled successfully at home. The electrical components of overdrive are all externally mounted, on gearbox or underhood, and are connected by their own wiring harness (independent, though often bound in with engine or Drive-Master wiring). Overdrive wiring diagrams are shown in MOTOR's and other books. They may have a rather confusing look at first because, although the two full-electric types of overdrive could be operated by identical circuitry, there usually were variations according to car make and from year to year — sometimes in actual circuitry; sometimes merely in the wire terminals or connector plugs used. Hudson overdrives, despite the mechanical change for '48, used essentially the same electrical layout 1941 through 1949 (with 6-terminal relay, 4-terminal solenoid; 2-terminal kickdown switch); but a revised and somewhat simplified arrangement — with 4-terminal relay, 2-terminal solenoid, and 4-terminal kickdown switch — was used thereafter (1950 & up on Hudson, along with flat-prong instead of round-pin connector plugs). Only the governor (except for connectors used with Drive-Master) and the 2-terminal shift-rail or reverse lockout switch remained the same.

Evolution since that time has been relatively minor — mainly the change to 12 volts, although this in

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turn has also permitted a few systems to be designed without relays, due to the lower amperages involved. And some Brand X's have placed the kickdown swith underhood (on throttle linkage, much as with Hudson vacuum-clutch throttle switch) rather than underfoot.

B-W overdrive "trouble charts," reprinted in MOTOR's and elsewhere, outline all of the more common overdrive complaints along with test procedures and appropriate corrections in easy-to-follow format.

THE MOST FREQUENT source of overdrive malfunction is probably the governor. When overdrive will not engage, merely freewheeling at all car speeds instead, the cause could be an electrical break nearly anywhere in the system, but it usually is oily, dirty, or ixidized governor contact points, since they are smaller than the others in system, and may also receive some transmission oil if leather seal on rotor shaft is not perfect. Most owners of an older car with OD are accustomed to occasional removal and cleaning of governor for this reason, and models with vacuum clutch or Drive-Master generally require it as well. Lacquer thinner, or a pressurized solvent such as carburetor choke cleaner, can be used to clean contacts without injuring them. Dry carefully with airblast, or lintless cloth or paper strip. In extreme cases a fine ignition "point file" can be used, followed by rewashing, but it is better to avoid most abrasives such as sandpaper. Be sure that movable contacts are free enough on their pivots so that they will always snap over instantly to one side or the other (much like a household light switch) without ever "hanging up" somewhere at midpoint when operated by rotor; otherwise cut-in speed may be quite erratic, and they also will soon arc and fail again. Sometimes, in addition, the governor rotor and shall need to be washed out with solvent, and allowed to dry before reassembly. Rotor can be twirled by chucking shaft end in an electric drill — to speed drying, and also for testing purposes.

To be sure trouble is not elsewhere in system, touch OD wire at governor to ground on car (with lockout cable pushed in, gears in any position but reverse, and, on '50 & up, with engine running). There should be an audible responding snap from OD solenoid (and from relay underhood).

IF NO SNAP is heard, the next logical checkpoints are: a) blown fuse (most models), 30-amp. size; b) damaged wiring or corrosion at terminals; and c) main contact points inside solenoid, for "traction" or puller coil winding, inoperative due to dirt, oxidation, etc. Touch heavy jumper wire from battery to the terminal on solenoid marked "4" (the larger terminal on some models). If there still is no snap, these contacts are probably at fault, since the windings themselves rarely fail. Unbolt solenoid from car, remove end cap, and carefully clean the two large contact points found at one side. Test again with pair of heavy jumpers, touching the #4 terminal (or #4 and #3 simultaneously, on pre-'50's); then replace on car. Recheck once again by grounding governor wire, and finally test on road.

If OD still doesn't work, when governor, solenoid, and wiring are OK, the relay should also be tested. Simplest way to do this is to unplug it (without removing) and temporarily connect a spare good one to the harness instead. Although relays were not meant to be repaired internally, it is often possible, when cover is removed, to find and correct such things as a poor connection, contacts dirty or improperly spaced or under wrong spring tension, etc. (compare with a good unit).

AN IGNITION interrupter circuit is used along with the kickdown on all three electric types of overdrive. When kickdown switch is depressed, it cuts off current to the relay and thus to the solenoid, so that all magnetic thrust is removed and the spring inside solenoid can try to pull the overdrive out of engagement. However, the spring, internal overdrive pawl, etc. are like manual gearshift linkage in that they are not designed to jerk the mechanism forcibly out of gear while there is a torque load on it — that is, while engine is actively propelling the car. Hence if downshift is to take place without requiring use of clutch pedal, the engine must be made to relax its pull momentarily (despite wide-open throttle), simply by missing a few explosions. A quick flip of the ignition key will accomplish this manually, of course, but normally it is done automatically by the ignition-interrupter circuit, which temporarily grounds out the primary wire between coil and distributor points (so that coil remains energized but no sparks are produced). With load on gears thus momentarily relaxed, the spring quickly pulls OD out of engagement, and instantly the ground connection is broken (by another pair of contacts inside solenoid, at terminal marked "6"), so that engine can resume firing, now with transmission in direct drive. It is claimed that all of this can often take place without engine missing for more than a single revolution (3 or 4 explosions).

When it is desired to resume overdrive operation, driving torque must again be relaxed, this time by releasing the accelerator; and then with governor permitting relay to energize both windings in solenoid (the heavy "traction" coil as well as the lighter "holding" coil), overdrive will be pushed back into engagement as soon as transmission and driveshaft speeds are well enough matched (at 0.7 to 1) to permit it. As OD engages, the traction coil is switched off (via heavy contacts in solenoid), and mechanism is thenceforth kept in gear by the lighter holding coil alone, until kickdown switch is again used or governor drops below the overdrive speed.

INTERRUPTER WIRE can be seen at ignition coil on all OD models. On 1941-49 Hudsons, which have a two-unit (6-terminal) OD relay, the wire connects to one of these relay units, which automatically grounds it for a brief instant each time the series circuit through 2-terminal kickdown switch, lockout switch, and governor is broken at any point (provided OD solenoid is in "engaged" position at the time). The later systems, however, use only a single-unit (4-terminal) OD relay along with a 4-terminal, 2-circuit kickdown switch, so that here the ignition is grounded directly by driver's foot on kickdown, through the extra (lower) circuit built into switch — but again, only if OD solenoid is in "engaged" position at the time. This latter arrangement is a bit simpler, and has possibly offered somewhat better reliability over the years.

With either layout, if interrupter doesn't work — so that overdrive will not kick down when switch is used unless ignigion key is flipped manually at the same time — check first for a broken wire, corroded connection, etc.; and second, check the small grounding contact points down inside solenoid (at #6 terminal) — these too may be corroded, dirty, or even broken. If they are not, next try plugging in a substitute relay (on models through '49) or a substitute kickdown switch (on '50 & up). Connect switch carefully, with terminals correctly in register, to avoid breaking plastic harness plug or crossing the two circuits.

On the other hand, if use of kickdown stalls engine, the interrupter is overdoing its job. Look first for a grounded short circuit at the #6 solenoid contacts or their terminal or wire. Second, try a substitute relay or kickdown switch exactly as suggested above. Third: if necessary, check complete interrupter and kickdown circuitry as outlined below. A fourth possibility, of course, is that overdrive has jammed mechanically in the engaged position — either because of internal damage, or because OD for some electrical reason has remained in gear below its normal cut-out speed . . . and then car is stopped on an upgrade. In this latter case, mechanism can be freed simply by giving car a slight forward push (or by temporarily unplugging relay so that engine can be restarted to move ahead a bit).

Overdrive can be engaged below the cut-out speed, for testing or other purposes, if circuit to governor is bypassed (grounded). This does no harm, except that driveshaft and rear wheels then can turn only in the forward direction. Never try to force them backward (by pushing car, for example) while OD is held in gear, or damage may result.

NEXT MONTH: Best gearing for use with overdrive.

A MYSTERIOUS ignition miss can occasionally be traced to the OD interrupter or kickdown circuits even when they are not in use, especially on models with the 1941-49 type system. If engine tends to misfire under heavy load at low rpm., as when starting out briskly in low gear; and carburetor, plugs, points, coil, etc. all seem OK, try disconnecting the interrupter wire. Since primary lead from coil to distributor is normally part of the OD harness, a short plain substitute wire with eyelet terminal at each end will be needed. Now test car on road (including a few fast takeoffs). If miss disappears or is much diminished, look for poorly insulated wire or wire terminals anywhere in these two overdrive circuits. Due to the inductances present, they are fairly sensitive to minor insulation breaks or slight carbonization which would probably cause no trouble in most other parts of a 6-volt system. If wiring and insulation are good, all the way from coil primary, to relay, to kickdown switch, to OD lockout switch, to governor . . . check also the grounding circuit to solenoid (#6 terminal). As last resort, try a substitute relay (6-terminal type), possibly one with slightly higher spring tension at contacts (specifically on the shorter of its two internal units). This will often eliminate the mysterious miss. Do not increase spring tension so much that interrupter does not work reliably, however. If relay cover must be removed, replace it using two sheetmetal screws in place of the rivets.

THE TWO-PIECE DRIVESHAFTS used on Hudson stepdowns changed very little 1948-54. All carried Spicer U-joints of a type which is still readily available, and the rear section of the shaft on all large models was of one basic length. Matching problems thus are usually confined to the front section, which was necessarily made in six different lengths (!) to accommodate the three available transmissions (plain 3-speed, overdrive, and Hydra-Matic) and two wheelbases (standard 124", and the shorter 119" for Pacemakers and some Wasps). Some of these shaft lengths differ by only an inch or two, but they are unfortunately not interchangeable.

Another small change appeared in 1950. Driveshafts before that year had the splined slip joint (necessary so that shaft length can vary slightly as rear axle moves up and down) located in the forward end of the rear section of driveshaft; but shafts after that time had the slip joint set into rear end of front section of driveshaft instead, just behind (and partly inside) the center ball bearing. This seldom causes any difficulty, since the early and late shafts (of a given length) are interchangeable as complete assemblies. Also, a late front section and an early rear section can safely be used together

(the resulting shaft, of course, will have two slip joints). However, the opposite combination (early front section with late rear) obviously cannot be used: it would have no slip joint at all.

A few early-'48 Hudsons had the center driveshaft bearing supported on three rubber cushion studs. All subsequent models used only two, although the slight difference (in mounting angle and hardness of rubber) between the two types of driveshaft cushion supports, one for use with standard shift, overdrive, Drive-Master, etc.; and the other for use with Hydra-Matic, is well known.