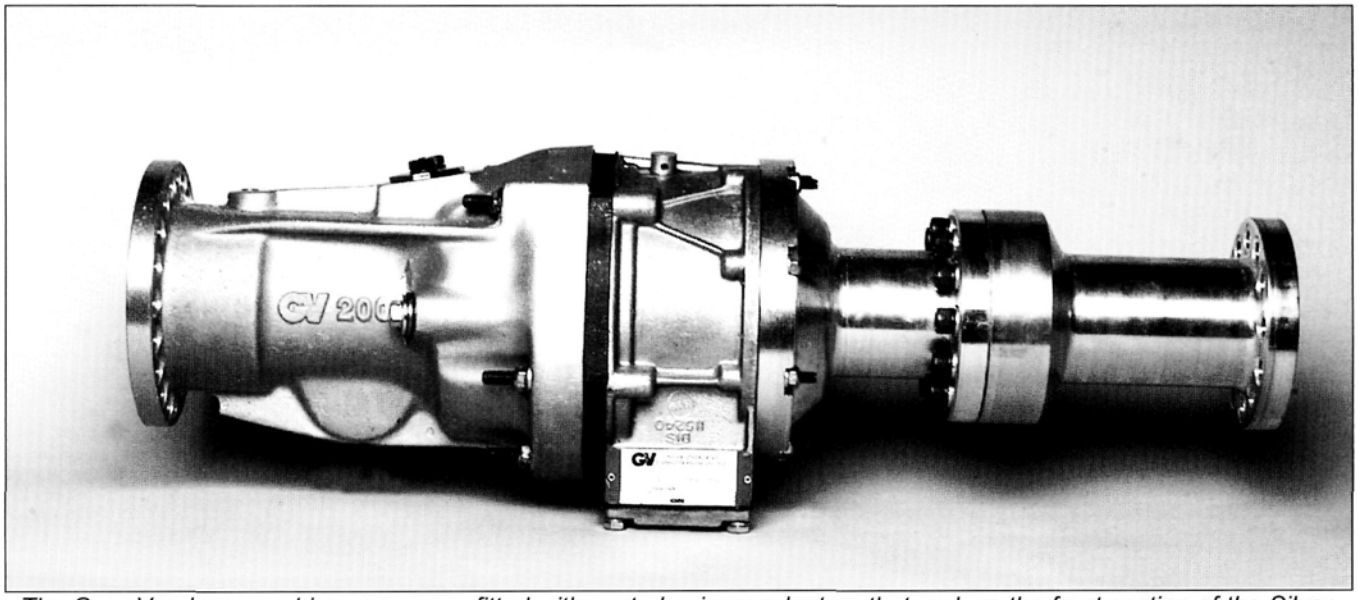
Installing the Gear Vendors Overdrive in the Silver Ghost

A compilation of advice from Dave Browne, Bob Jefferson, Bill Kennedy, Steve Litman, David Morrison, Jim Stroman, Bob Thompson, Doug White and Rick Johnson of Gear Vendors, Inc.

Text and photos by Gil Fuqua, Tennessee



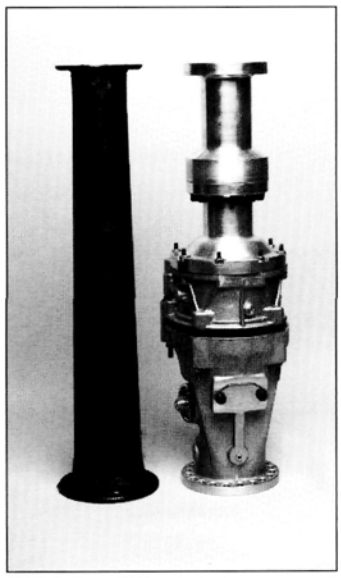
The Gear Vendors overdrive comes pre-fitted with cast aluminum adapters that replace the front section of the Silver Ghost's torque tube. The adapters are made to the exact length of the removable section of your Ghost's torque tube.

Gear Vendors[1] makes an electrically activated overdrive for the Silver Ghost that provides a 22% reduction in engine RPMs when engaged at a given speed (Table 1). The overdrive is based on a proven design created by Laycock Manufacturing and incorporates planetary gears that have been used for over a half century in drive trains by GM, Ford, John Deere and Detroit Allison. The Gear Vendors overdrive is rated to handle 30,000 pounds gross combined vehicle weight, more than enough reserve to handle the largest Ghost.

The advantages of the overdrive include lower engine and drive train noise, ability to achieve higher cruising speeds, and reduced RPMs at existing cruising speeds. Reduced RPMs mean less wear on your engine and transmission, lower stresses on crankshafts and bearings from high rotational speeds (stress varies as the square of the speed)[2] and may improve gas mileage. Since the higher gearing allows you to drive faster, it's important to remember you still have to stop your Ghost, and it takes longer to stop at higher speeds. Think ahead and drive accordingly!

The Gear Vendors overdrive provides about the same top gear performance for a standard 14/52 rear axle as an 18/52 ring and pinion. The costs of the overdrive and new gears are similar; however, the overdrive is easier and faster to install and does not require the services of an expert gear fitter. An advantage of the overdrive coupled with the 14/52 rear axle is the combination of low end pulling power of the original gears combined with the high speed cruising allowed by the overdrive.

The Gear Vendors overdrive comes pre-assembled with fittings that bolt directly to the Ghost's torque tube. No structural modifications are required to the Ghost's chassis or driveline and the overdrive installation can be easily reversed. The installation requires the torque tube to be unbolted from the sphere, and the axle backed out so that the front section of the torque tube can be removed and replaced with the overdrive unit (Photo next page). Once installed, a number of wires and switches are connected to the overdrive and control box to provide a means of control.



The overdrive is shown next to the torque tube section it replaces.

Table 1
Silver Ghost Rear Axle Gear Ratio Comparisons*

Adapted from data compiled by David Morrison

Four Speed Transmission

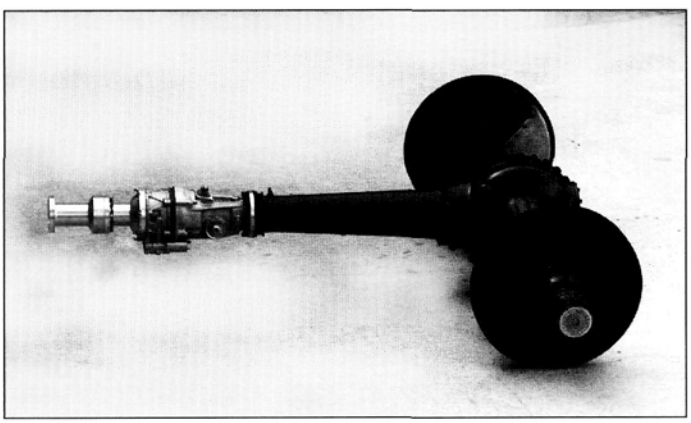
Rear Axle Ratio[1]	1st Gear	2nd Gear	3rd Gear	4th Gear	Overdrive
3.71 (14/52)	3.40	2.22	1.49	1.00	
3.71 (14/52 w/ OD[2])	3.40	2.22 1.73 od	1.49 1.16 od	1.00	0.78 od
3.47 (15/52)	3.17	2.07	1.39	0.93	0.73 od
3.25 (16/52)	2.98	1.94	1.30	0.88	0.68 od
3.06 (17/52)	2.80	1.83	1.23	0.82	0.64 od
2.89 (18/52)	2.64	1.73	1.16	0.78	0.61 od
2.74 (19/52)	2.51	1.64	1.10	0.74	0.57 od

Three Speed Transmission

Rear Axle Ratio[1]	1st Gear	2nd Gear	3rd Gear	Overdrive
3.71 (14/52)	2.86	1.51	1.00	
3.71 (14/52 w/ OD[2])	2.86	1.51 1.18 od	1.00	0.78 od
3.47 (15/52)	2.67	1.41	0.93	0.73 od
3.25 (16/52)	2.50	1.32	0.88	0.68 od
3.06 (17/52)	2.36	1.24	0.82	0.64 od
2.89 (18/52)	2.22	1.17	0.78	0.61 od
2.74 (19/52)	2.11	1.11	0.74	0.57 od

**Tables assume a 14/52 gear ratio is the standard drive ratio; resulting in direct 1:1 drive in top gear. All data is used to compare relative differences in gear ratios to a standard 14/52 rear axle. For example, the 4th gear of the 14/52 rear end provides direct drive at 1.00, or one engine revolution per revolution of the drive shaft. With the overdrive engaged, the engine rotates at .78 times the drive shaft RPMs. Note that a 14/52 rear axle with a 22% overdrive provides a final drive of .78, or about the same gearing as an 18/52 without an overdrive.*

[1]Ring and pinion gears shown in parenthesis.
[2]A 3.71 rear axle "w/ OD" is listed to show the potential for 'gear-splitting.' In effect, you can engage the overdrive to create half steps between gears to more optimally match engine RPMs with the terrain.



The overdrive replaces the front section of the torque tube on a bolt-for-bolt basis

The Gear Vendors overdrive for the Silver Ghost is available from Sports Classics Ltd[3] (Bob Jefferson), Jim Stroman[4] and Gear Vendors, Inc.

The Mathematics of an Overdrive, or How a 22% Overdrive Boosts Top Speed by 28%

A conventional gearbox provides a straight-through output in top gear with a one-to-one relationship between engine revolutions and the output shaft of the transmission. An overdrive provides a mechanical advantage with an output that is greater than one-to-one. The Gear Vendors overdrive has an output of one revolution for each .778 input revolution from the transmission and is normally referred to as a 22% overdrive (1.000 - 0.778 = .222 or 22.2%).

Simple logic would indicate that a 22% overdrive allows you to go 22% faster at the same engine speed – Not True! Road speed is the reciprocal of the overdrive's output (1.000 divided by .778 = 1.285). The Gear Vendors 22% overdrive extends your cruising speed by 28% at the same RPMs compared with top gear without overdrive. For example, if your Ghost's optimum cruising speed in top gear is 60 mph, it will increase to approximately 77 mph with the Gear Vendors overdrive (60 mph x 1.285 = 77.1 mph) based on the same engine RPMs of 2,136.

Tire revolution, which is proportional to ground speed, is affected by three factors: (1) the revolutions of the drive shaft, (2) the rear axle ratio, and (3) the diameter of the tires. For example, a Silver Ghost with 35" diameter tires (a 33 x 5 tire standard on a late Ghost has a 35" tire diameter) travels 9.161' per tire revolution (35" (tire diameter) divided by 12" = 2.917' x pi (3.141) = 9.161'). In one mile, the Ghost's tires revolve 576.4 times (5,280' (feet in a mile) divided by 9.161' = 576.4 tire revolutions per mile) and it is also equal to the number of tire revolutions per minute at 60 mph.

A Ghost with a 14/52 ring and pinion has a rear axle ratio of 3.71 (52 tooth ring gear divided by 14 tooth pinion gear = 3.71). Traveling at 60 mph, engine RPMs are approximately 2,136 and can be calculated by multiplying the rear axle ratio of 3.71 times 576.4 revolutions per minute of the rear tires. With the Gear Vendors overdrive engaged, engine RPMs will be approximately 1,662 at 60 mph (.778 x 2,136 (RPMs at 60 mph without overdrive) = 1,662), or 22% less. Alternatively, RPMs in overdrive at 60 mph can be calculated by multiplying the effective rear end ratio in overdrive (2.89 for a 14/52 ring and pinion) times 576.4 RPMs of rear tires = 1,662. In effect, engine RPMs at 60 mph in overdrive are the same as engine RPMs at 46.7 mph in normal high gear (.778 x 60 = 46.7) without overdrive. See Table 2 for comparison of engine revolutions per tire rotation.

Table 2
Engine Revolutions Per Tire Turn*
(Assumes 35" diameter tires)

Four-Speed Transmission

Rear Axle Ratio[1]	1st Gear	2nd Gear	2ndOD	3rd Gear	3rdOD	4th Gear	RPMs[2] at 60 mph	4thOD	RPMs[2] at 60 mph
3.71 (14/52)	12.61	8.24	6.42	5.53	4.30	3.71	2,136	2.89	1,662
3.47 (15/52)	11.80	7.70	6.00	5.17	4.03	3.47	1,998	2.70	1,554
3.25 (16/52)	11.05	7.22	5.62	4.84	3.77	3.25	1,871	2.53	1,456
3.06 (17/52)	10.40	6.79	5.29	4.56	3.55	3.06	1,762	2.38	1,371
2.89 (18/52)	9.83	6.42	5.00	4.31	3.35	2.89	1,664	2.25	1,295
2.74 (19/52)	9.32	6.08	4.74	4.08	3.18	2.74	1,577	2.13	1,227

Three-Speed Transmission

Rear Axle Ratio[1]	1st Gear	2nd Gear	2nd OD	3rd Gear	RPMs[2] at 60 mph	3rdOD	RPMs[2] at 60mph
3.71 (14/52)	10.61	5.60	4.38	3.71	2,136	2.89	1,662
3.47 (15/52)	9.92	5.24	4.09	3.47	1,998	2.70	1,554
3.25 (16/52)	9.30	4.91	3.84	3.25	1,871	2.53	1,456
3.06 (17/52)	8.75	4.62	3.61	3.06	1,762	2.38	1,371
2.89 (18/52)	8.27	4.36	3.41	2.89	1,664	2.25	1,295
2.74 (19/52)	7.75	4.14	3.23	2.74	1,577	2.13	1,227

**Table 2 shows the number of engine revolutions for each revolution of the rear tires. For example, with a four-speed transmission in first gear (3.71 rear axle ratio), the engine revolves 12.61 times for each revolution of the rear tires. The fourth gear output (high gear) is directly proportional to engine RPMs times the rear axle ratio, or 3.71 in this example. With the Gear Vendors overdrive engaged, engine revolutions drop to 2.89 per rear tire revolution, or approximately 22% less than top gear without overdrive.*

[1]Ring and pinion gears shown in parenthesis.
[2]Approximate RPMs at 60 mph are shown for each rear axle ratio in top gear with and without overdrive.

Disconnecting the Torque Tube from the Sphere

Prior to unbolting the torque tube from the sphere, disconnect all of the items between the rear axle and chassis, including the brake cables, shocks and springs. You need about 10' behind the chassis to roll out the rear axle and torque tube once disconnected.

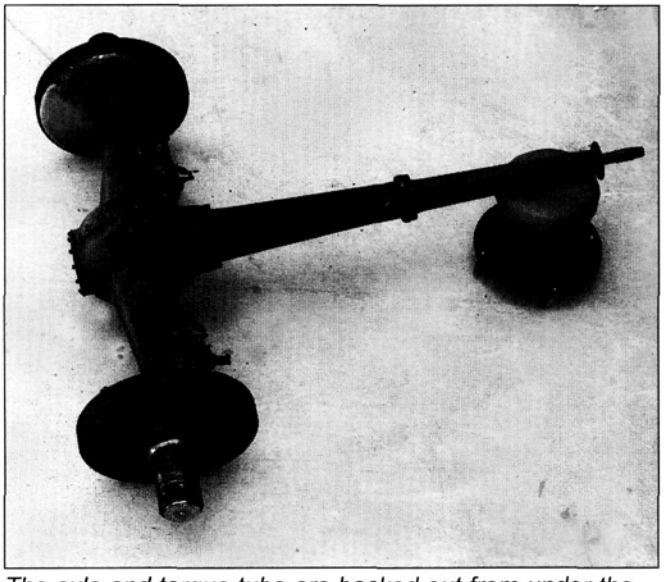
1. Jack up the rear of the chassis. Use a jack with rollers so that you can support the rear axle when you roll out the axle and torque tube from under the chassis. The chassis should be raised high enough so that the rear axle can pass under the petrol tank. (Measure the height of the jack at its lowest point combined with the height of the rear axle to determine clearance required under the petrol tank. Also check for clearance of brake drums under rear fenders.) Chock the front wheels and place heavy-duty jack stands under the chassis rails near the center point of the springs. (You will need jack stands that extend at least 24".) Also place a second set of stands under the chassis near the transmission as a safety measure. Lower the chassis on to the jack stands.
2. Remove the rear wheels.
3. Disconnect the rear brake cables.
4. Disconnect the rear springs by removing the safety bolt at the rear end of each spring.
5. Disconnect the rear shock absorbers. Be sure the axle is supported by the jack.
6. Disconnect the torque tube. David Morrison suggests removing the floorboards to provide better access to the area where the torque tube bolts to the sphere. He also suggests using a board set across the window sills with a block and tackle attached to the board to support the weight of the torque tube and lower it once removed.

   Remove the ring of 12 - 5/16" BSF nuts and washers that connect the torque tube to the sphere. Clean up the nuts with a tap. This allows the nuts to be installed finger tight when refitting and makes the job easier. You will need to support the front of the torque tube once it is removed. Consider tying a safety rope across the chassis rails to catch the torque tube in the event it falls.
7. Be sure the rear axle is disconnected from the brake cables, shock absorbers and springs before proceeding.
8. Lower the rear axle till the springs just clear the carrier on the axle at the rear of the springs and pull back the axle/torque tube to clear the spring assembly. Lower the rear axle. Roll the axle/torque tube from under the chassis using the brake drums or jack as wheels. CAUTION: Support the front end of the torque tube to keep oil from running out. A rolling seat (lower left photo) provides an ideal support to hold the front of the torque tube in an elevated position and aids the removal and reinstallation process.

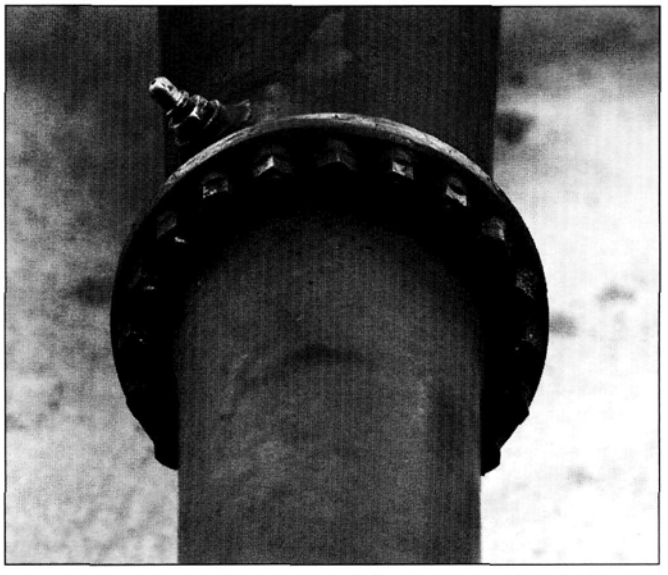
   With the axle/torque tube removed, you now have easy access to the rear of the chassis. Take the opportunity to check shocks, exhaust lagging, wiring at rear of chassis, sphere, petrol tank, etc. Dave Morrison suggests this is a perfect opportunity to clean and rebuild the rear springs since you have to pull out the axle to disconnect the springs at the rear from the axle. He also noted that he had to remove the rear fenders and running boards on his RRCCW body in order to remove the springs from the chassis.

Removing the Front Section of the Torque Tube

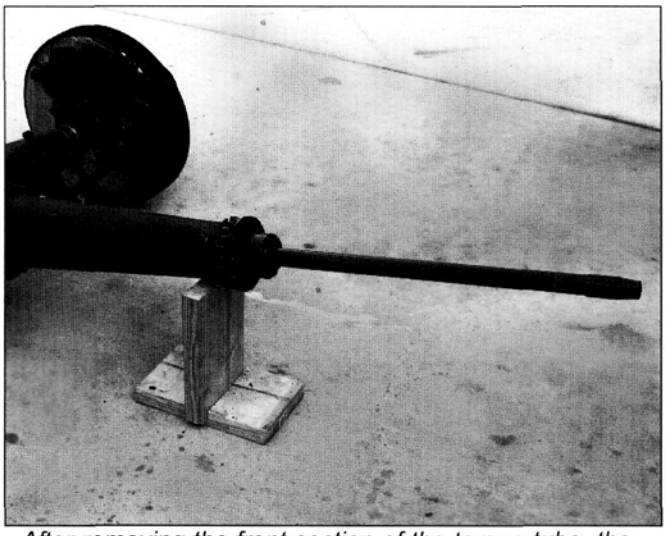
1. Remove the front section of the torque tube. The front section of the torque tube has a ring of 20 – 5/16" BSF nuts and bolts (photo below) that connects it to the rear section of the torque tube.



The axle and torque tube are backed out from under the chassis on the brake drums and supported by a rolling jack under the differential. Also support the front of the torque tube to keep oil from running out of the differential. You need about 10' behind the chassis to accommodate the roll back of the axle and torque tube assembly.



The front section of the torque tube is connected to the rear section by a ring of 20 – 5/16" BSF nuts. Loosen the nuts with an open face wrench and then use a 5/16" BSF socket turned down to fit the tight clearance and speed removal.



After removing the front section of the torque tube, the inner drive shaft is exposed. A serrated nut with an internal locking ring secures the inner drive shaft to the splined coupling.

Jim Stroman suggests turning down a 5/16" BSF socket to fit the tight clearance between the nuts and torque tube. A ratchet wrench will greatly speed the removal of the 20 nuts that have to be removed. Clean up the threads of the nuts and bolts to ease reinstallation.

2. Slide the outer tube off to expose the inner drive shaft (upper left photo).
3. The inner drive shaft is secured to the rear half by a serrated nut with an internal locking wire ring. Remove the locking wire ring from inside the serrated nut.
4. Remove the serrated nut (right-handed).
5. Withdraw the inner drive shaft from the splined coupling.

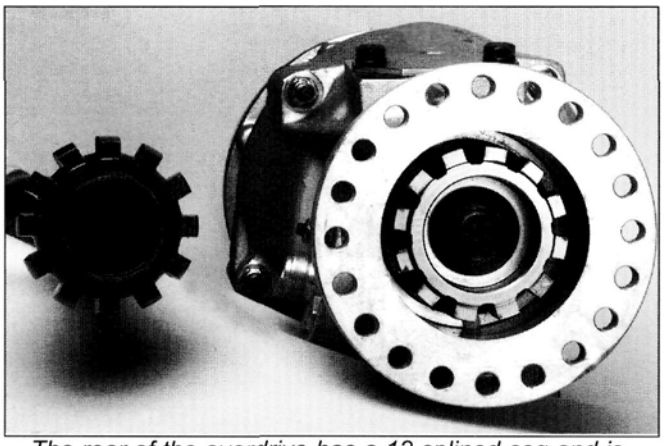
Checking Universal Joint and Bearings

Check the universal joint in the sphere for wear. If the wear in the sphere indicates a rebuild is in order, this is a good opportunity to tackle the job since the torque tube is already removed (and also doubles the time required to get the car back together.)

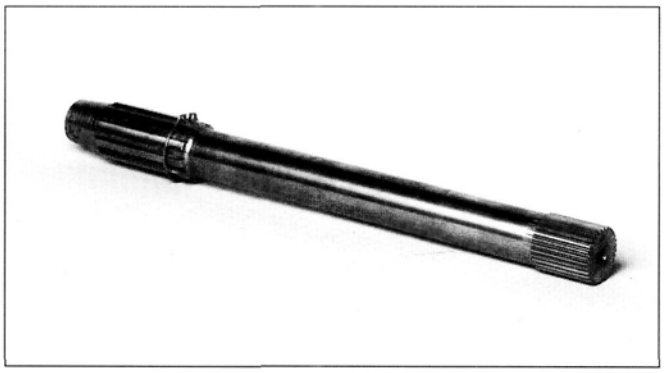
Check the bearing behind the spline in the torque tube. If the bearing is suspect, this is a good opportunity to replace it. Bob Jefferson recommends replacing it with a sealed bearing.

Installing Overdrive in Drive Line

1. Trial fit the overdrive unit to the torque tube by mating the splines in the overdrive with the torque tube (upper right photo). It should fit flush on the torque tube without excess pressure. Gear Vendors provides two different couplings to fit early and late Ghosts. The early Ghost coupling is deeper and will not mate properly to a later Ghost's torque tube. Bob Thompson suggests you trial fit the overdrive to the torque tube with a piece of plastigage on the end of the splined shaft to be sure there is end clearance between the overdrive unit and the torque tube.



The rear of the overdrive has a 12 splined cog and is similar to the end of the original inner drive shaft. Note: Gear Vendors makes a cog for the early and late series Ghost that are different lengths.

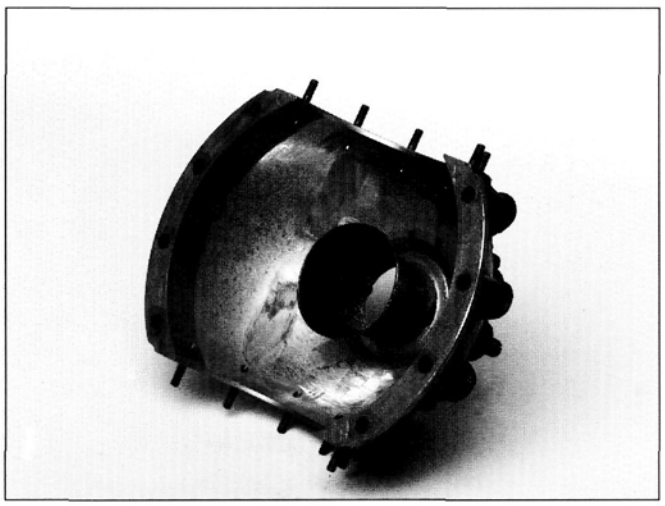


A splined shaft comes with the Gear Vendor's overdrive. The small splines fit into the front of the overdrive. The large splines mate with the sphere. Note the circlip that prevents the splined shaft from shifting forward into the sphere and slipping out of the overdrive unit splines.

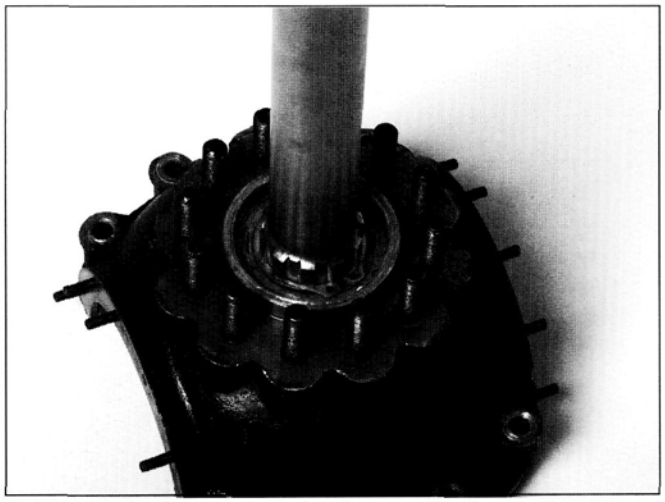
2. Bolt the overdrive unit to the torque tube (photo pg 941). You may find it easier to substitute short 5/16" BSF nuts in place of the long, original Rolls-Royce nuts in a few positions due to interference with the overdrive case.
3. Trial fit the coarse splined end of the shaft (photo above) provided with the overdrive to the sphere. Be sure the splines mate easily with a slip fit. The shaft should seat deep enough into the sphere so that the splines are completely inside the sphere. If the splines are visible outside the sphere, check the following:

   A. The shaft supplied by Gear Vendors may bind in the sphere and require light filing for a slip fit. The author's shaft could only be inserted about ½" and would bind. Layout blue was sprayed on the coarse splines and refitted. The layout blue indicated the grooves between the splines were binding in the sphere. Light filing in each of the grooves eliminated the problem.

   B. On late English Ghosts, there is a bell-mouthed shaped oil baffle sweated into the rear sphere housing that was designed to retain oil in the sphere (photo pg 946). With the baffle fitted, the opening is too small to allow the overdrive shaft with the circlip attached (photo pg 946) to



The rear half of the sphere is pictured from its inside face and shows the bell-mouthed shaped oil baffle soldered in place. It is designed to keep oil in the sphere and from draining down the torque tube. It was fitted to the sphere of the late British Silver Ghosts and to the PI.

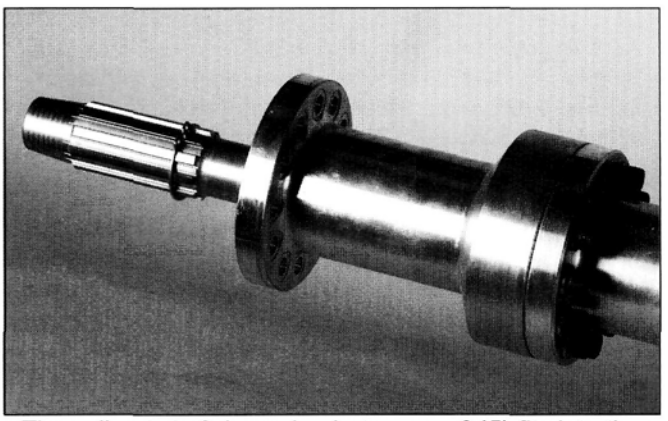


The back of the sphere is shown with the circlip of the overdrive shaft against the external face of the bell-mouthed oil baffle that is soldered in place. The oil baffle must be removed in order for the overdrive shaft with the circlip to fully seat in the sphere.

be fully inserted into the sphere. Jim Stroman encountered this problem on Jim Armstrong's Ghost, 74AU, and also found the remedy. The oil baffle is sweated in and can be accessed by removing the back half of the sphere. Apply heat to the edges of the oil baffle to melt the solder, and lightly tap the oil baffle out from inside the sphere. The author encountered this obstacle on 3AU.

To remove the back half of the sphere, remove the four 5/16" BSF nuts at the top and bottom of the sphere. Remove the 12 - 3/16" BSF nuts on each side of the sphere and the underlying washers. You should be able to withdraw the back half of the sphere to gain access to the oil baffle at the workbench. New leather washers designed to seal the floating edge of the sphere should be refitted and are available from Coldwell Engineering.[5] The leather washer seals (RR part # G6584) are designed to keep oil in the sphere and water out.

4. Push or pull the axle and torque tube back under the chassis while lining up the rear spring connections. Bill Kennedy used a rope to pull the axle and torque tube back under the chassis. If you roll the axle and torque tube assembly back under the chassis on the brake drums, note that the splined shaft in the overdrive rotates as the brake drums turn, making the final alignment with the fixed sphere difficult. Use the rolling jack to lift the brake drums off the ground and roll the axle and torque tube the last few inches on the jack to mate with the sphere. An assistant can turn a rear brake drum to precisely line up the splined shaft from the overdrive to mate with the sphere.

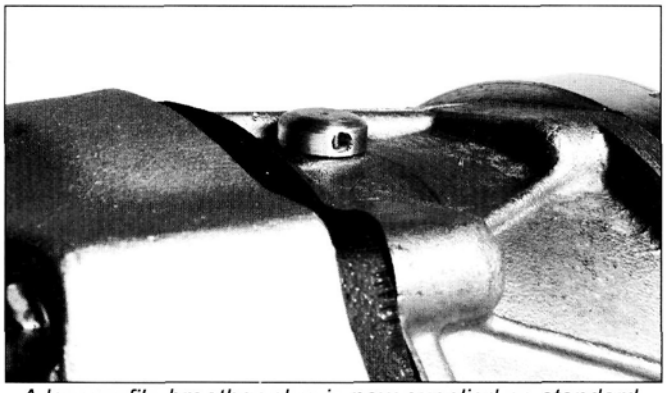


The splined shaft (seen in photo on pg 945) fits into the front of the overdrive and attaches directly to the sphere in place of the front section of the torque tube.

The front shaft of the overdrive should have a circlip (above photo) positioned near the shaft's end with coarse splines. Be sure the circlip is in place since it prevents the splined shaft from shifting forward into the sphere and slipping out of the overdrive unit splines. Bolt the front of the overdrive unit to the sphere with the splined shaft installed in the overdrive unit. The overdrive unit is heavier than the front section of the torque tube that was removed. You may need assistance in holding the unit up while it is reconnected to the sphere. David Morrison suggests using a block and tackle or 'come-along' to lift the torque tube and support it while refitting to the sphere.

5. Check the clearance between the overdrive and the brake equalizer bar. On some chassis, the breather plug on top of the overdrive is directly beneath the brake equalizer bar. Some installations have had the breather plug smash against the brake equalizer bar when the springs bottom out.

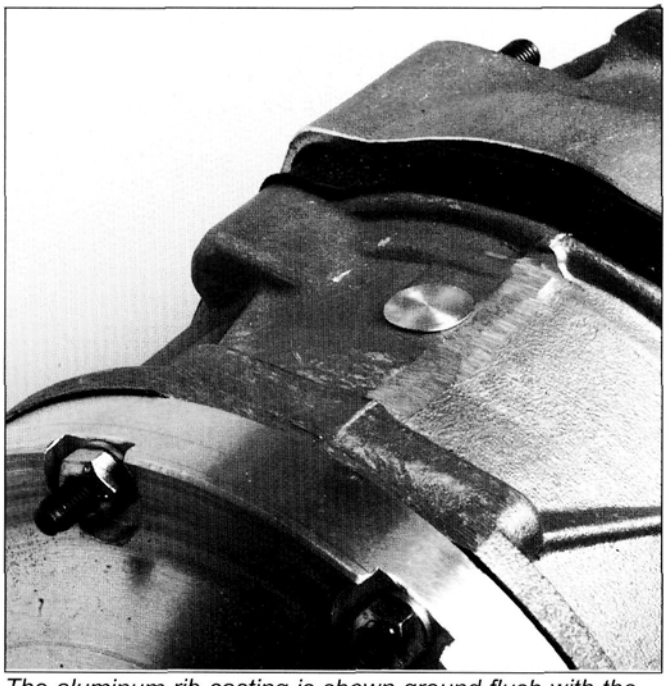
If your brake equalizer bar is directly above the breather, Gear Vendors suggests you remove the rear leaf springs and jack up the differential against the axle stops to check the clearance between the breather and brake equalizer bar. *WARNING: Contact between the overdrive and brake equalizer bar while driving could cause damage to the overdrive and affect the structural integrity of the driveline.* Gear Vendors recommends that taller axle stops be installed or the existing axle stops shimmed to limit the



A low-profile breather plug is now supplied as standard on the Gear Vendors overdrive to reduce the potential of interference with the brake equalizer bar.

travel if the overdrive case touches the brake equalizer bar.

Gear Vendors now supplies a low profile breather plug on new units (above photo) and does not recommend grinding down the rib adjacent to the plug since it weakens the structural integrity of the unit (photo below).



The aluminum rib casting is shown ground flush with the overdrive case to reduce interference with the brake equalizer bar with a flush plug inserted in the breather hole. Gear Vendors does not recommend grinding down the aluminum rib since it may affect the structural integrity of the casting. They recommend adding height to the rubber axle stops to eliminate any interference between the overdrive and the brake equalizer bar.

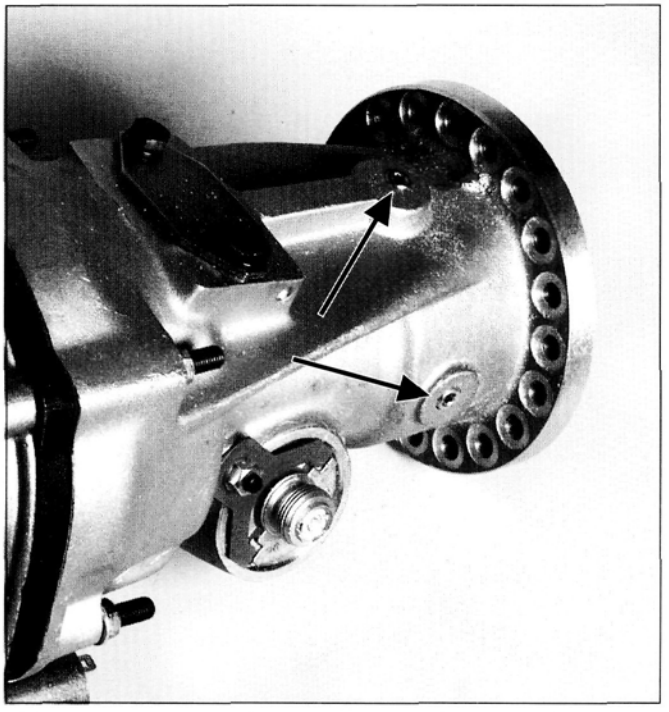
You can replace the rubber axle stops with taller ones (approximately 2" suggested by David Morrison), or extend the existing ones with a block of wood or aluminum.

6. Reconnect the shock absorbers, springs and brake cables.

Overdrive Lubrication

The overdrive is *shipped without transmission fluid* in the unit. Remove the 13mm fill plug on the back right side of the overdrive and add approximately 26 ounces of synthetic manual transmission fluid (GM part #12346190 or Mopar #0487-4459). Fill to the bottom threads of the plug. Gear Vendors specifically recommends GM# 12346190, or Mopar #0487-4459, and it should not be substituted.

Gear Vendors previously recommended Dexron II automatic transmission fluid for its overdrive units. It now recommends the GM synthetic manual transmission fluid for its overdrive units due to improved shift characteristics, and less thinning at temperature than Dexron automatic transmission fluid. Gear Vendors recommends that current installations of the overdrive change to the GM or Mopar synthetic manual transmission fluid.



There are two 1/8" plugs at the rear of the overdrive case for lubricating the splined coupling and the center bearing in the torque tube. Consider adapting an Enot's or Alemite fitting, or extending the oil line on a late Springfield Ghost, to one of the plugs to aid in periodic lubrication.

Lubricate the splined coupling at the rear of the overdrive housing. There is a 1/8" plug on top of the unit and one on the right side of the housing at the 9 o'clock position (above photo). Add gear oil through the top plug until it reaches the level of the plug on the side. This should be added to your routine chassis lubrication since the installed overdrive prevents oil from the sphere reaching the splined coupling and intermediate bearing behind the overdrive.

Steve Litman made a copper pipe assembly that extends the flexible oil line on a Springfield Ghost from its original location on the torque tube to the top of the overdrive housing. The line was connected through the existing 1/8" pipe plug on top of the overdrive.

Connecting Speedometer and Electric Controls

Gear Vendors control unit serves as a junction box for all the wiring. The unit senses the speed of the car and prevents the overdrive from being engaged in reverse or at slow speeds that would damage the overdrive.

The overdrive is shipped with an *analog* electronic control unit (above photo) that serves as a junction box for all wiring. The control unit also prevents the overdrive from being engaged at speeds slower than 20 mph and prevents the overdrive from being operated in reverse. The electronic control includes provisions for additional external lockouts to be hooked into the system. The Gear Vendors overdrive can be installed without the control box and there are strong advocates for the simplified installation.

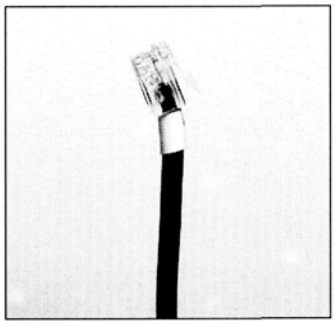
Some installations experienced problems with the *digital* control units that were supplied by Gear Vendors in the past, such as dropping out of overdrive. This problem may be related to RF (radio frequency) interference generated by the Ghost's unshielded ignition system or the digital unit's voltage sensitivity. The magneto is particularly suspect since it generates an inordinate amount of RF. If the *digital* control box is used, it should be placed as far away from the ignition components as possible to minimize the problem.

Gear Vendors *recommends that their analog control box* be used on the Silver Ghost due to the reduced potential for RF interference and the fact that the analog unit is less susceptible to voltage variances than the digital unit. A Ghost may experience a drop in voltage when the car is started or when lights are turned on, potentially damaging the voltage sensitive *digital* control box. Gear Vendors will substitute an analog control box for the digital controller.

The overdrive can be connected and energized *without the control box;* however, Gear Vendors requires dealer installed units to have the control box installed in order to retain the manufacturer's warranty. Bill Kennedy and Steve Litman installed an overdrive solely with a switch wired to provide power to the solenoid, thereby engaging the overdrive. This installation eliminates the potential problems of the electronic control unit and simplifies the installation. *Without the electronic control box, it's important to install some form of lockout where the overdrive cannot be engaged in lower gears or in reverse.* The overdrive is not designed to work in reverse; and at speeds slower than 20 mph. At slow speeds, the overdrive's internal hydraulic pump does not create enough pressure to hold the overdrive clutch tight and will result in the clutch slipping. If you are the least bit forgetful, you should install the control box to eliminate any chance of leaving the overdrive engaged in slow speeds or in reverse.

Hooking up the Electronic Control Box

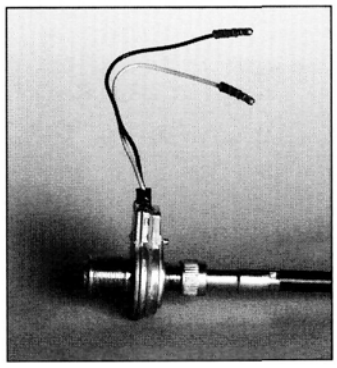
Wiring to the control box is straight forward and is simplified by color coded connectors that use telephone style RJ-11 jacks to plug into the control unit. Be sure cables avoid sharp edges and possible contact with areas of excessive heat.



All the wiring connections are made with telephone style, RJ-11, jacks that are color-coded and plug into the Gear Vendor's control box. These connectors are not waterproof and the control box should not be exposed to potential water contamination

Wiring the overdrive and electronic control box:

A. Mount the electronic control box in a location that will not be exposed to the weather and has good air circulation.
B. Hook up the wires to the solenoid (no polarity) and control box (white color coded connector.)

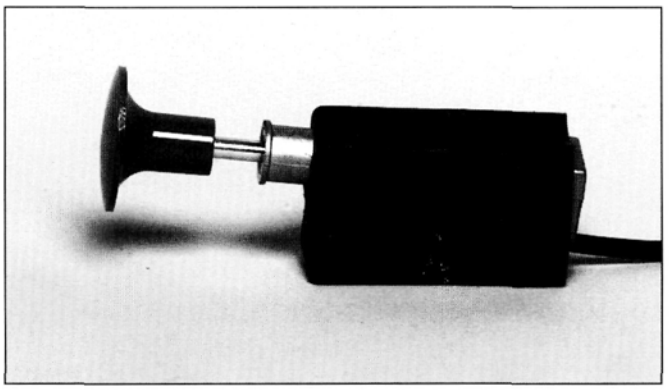


The signal generator sensor is connected to the front of the speedometer cable extension that is supplied with the overdrive. The sensor provides the control box with a signal that indicates speed and is used to mate the Ghost's speedometer cable to the extension speedometer cable connected to the overdrive.

C. Hook up the wires to the signal generator sensor (above photo) and control box (yellow color coded connector.) The signal generator wires have no polarity.

The master switch is used to provide power to the control box. A green light on the switch provides visual indication that the overdrive can be activated.

D. Hook up the master on/off switch (red color coded connector - photo lower right, pg 948). The master switch includes a green light that illuminates when the overdrive can be activated. It can be mounted under the dash.



A manual switch is used to engage the overdrive unit. A SPST switch can be substituted for the one supplied by Gear Vendors to turn on the overdrive, including a foot switch or smaller switch that is more concealable.

E. Hook up the manual overdrive switch (large red knob with a black color coded connector - above photo). The manual overdrive switch can be mounted under the dash or on the gear shift lever. Alternatively, you can install a foot switch or other less conspicuous switch to turn on the overdrive. A simple single pole single throw (SPST) switch can be substituted to fit your installation requirements. Steve Litman substituted a switch with a push-pull mechanism that had a knob that illuminates when the overdrive is activated. The author used a toggle switch with a handle that lights when the overdrive is activated.

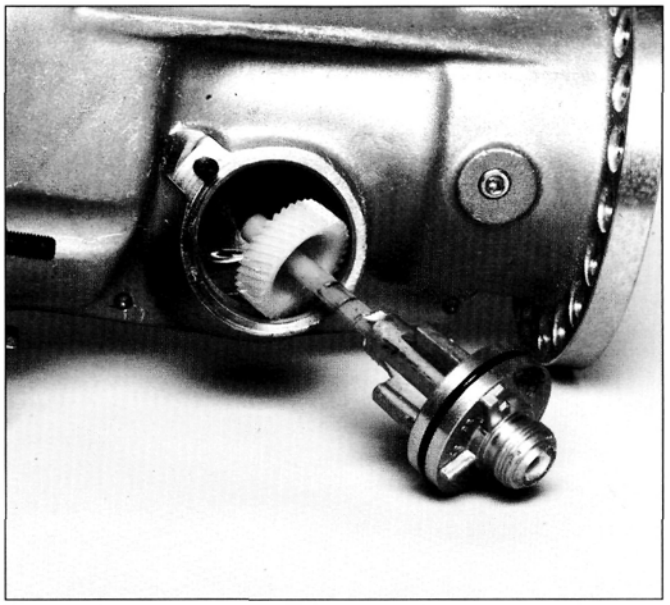
F. Connect electronic control box to a source of *switched 12 volts* (red color coded RCA plug) using the in-line 5 amp fuse provided. (NOTE: add a box of 5 amp AGC fuses to your spares kit.) For 6-volt cars, an inverter can be used to boost the voltage to 12 volts for the control box.

G. Connect ground wire (black color coded RCA plug) to a good ground point on chassis.

Install lockout switches as desired. Some installations have placed micro-switches in the first, second and reverse gear gates to assure that the overdrive cannot be engaged in these positions. According to Gear Vendors, the lockouts are unnecessary with the control box since the signal generator sensor detects the vehicle's speed. The combination of the signal generator and control box are designed to prevent the overdrive from being engaged in reverse and at speeds slower than 20 mph.

Hooking up Speedometer and Calibrating Output

The overdrive unit is supplied with an extension speedometer drive cable. Disconnect the speedometer cable from the Ghost's transmission and attach it to the extension cable using the signal generator sensor (photo pg 948) to mate the two cables. You may have to fabricate an adapter to mate the Ghost's speedometer cable to the overdrive cable. This is a good opportunity to check and lubricate the speedometer cable.



A ratio specific replaceable plastic gear is located behind the speedometer drive in the overdrive and can be changed to match the Ghost's tire size and rear axle ratio for accurate speedometer readings. See Table 3.

The speedometer should read correctly at all speeds, both in overdrive and without overdrive, since it is connected directly to the output shaft of the overdrive. The plate behind the speedometer coupling on the overdrive houses the speedometer drive gears and can be changed to match tire size and rear axle ratio (above photo). Gear Vendors uses standard plastic speedometer gears designed for a GM turbo 400 transmission (Table 3, pg 956). Note: Gear Vendors overdrives sold prior to December 2000 have a different internal drive gear and Table 3 is not applicable. Contact the author for information regarding speedometer gears for units sold prior to December 2000.

The Overdrive in Operation

Take your Ghost for a test drive after double checking wiring and lubrication. Before activating the overdrive, drive your car for a few miles to check for any vibration in the driveline and to insure initial component lubrication in the overdrive.

If you installed the control box, turn on the master power switch (bottom photo, pg 948). With your Ghost traveling at least 20 miles per hour, the green light on the master switch should illuminate providing visual indication that the overdrive can be activated. (Never reverse the car if the green light is illuminated, to avoid damaging the overdrive.)

Engage the overdrive by depressing the clutch and activating the overdrive's solenoid through the manual switch (left photo above). In addition to extending your top end cruising speed, the overdrive can be used as a "split-gear system," providing a half-step between existing gears. For example, you may have encountered terrain where engine RPMs were too low in fourth gear and too high in third gear. The overdrive

continued on page 956

continued from pg 949

Table 3

Overdrive Speedometer Gears for the Silver Ghost

compiled by Gil Fuqua

Rear axle Gears	Gear Ratio	Approx RPMs at 60 MPH[1]	Tire Diameter[2]	Multiplier Gears[3]	# Teeth[4]	Gear Color	GM Part #
14/52	3.71:1	2,136	35"	—	36	White	1359270
15/52	3.47:1	1,998	35"	—	34	Lt. Green	9774413
16/52	3.25:1	1,871	35"	1.11	35	Pink	9780387
17/52	3.06:1	1,762	35"	1.25	37	Red	1359271
18/52	2.89:1	1,664	35"	1.25	35	Pink	9780387
19/52	2.74:1	1,577	35"	1.25	34	Lt. Green	9774413

[1]Approximate RPMs based on 35" tire diameter in top gear.

[2]Tire diameter for a 33 x 5 tire on a late Ghost is 35". Note that a larger tire diameter will result in a lower speed reading.

[3]Multiplier gears part numbers:

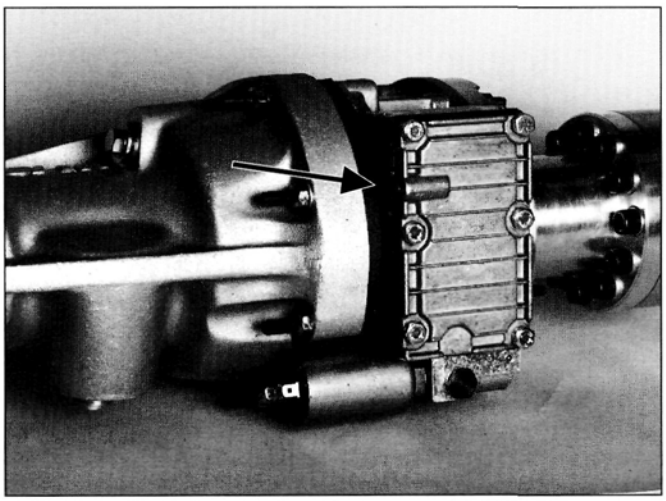
1.11 = GM 15635469

1.25 = GM 15636219

Note that multiplier gears are added externally at the overdrive.

[4]The higher the number of teeth, the slower the speedometer reads. If your tires are larger or smaller than 35" in diameter, you will have to fine tune the speedometer gear to match your actual speed. To determine the exact gear, take actual RPMs at 60 MPH in top gear and multiply by 0.017. This provides the correct number of teeth for the gear. If the number is less than 34, you have to add one or more multipliers in the drive line to end up with a gear with teeth between 34 and 45, the range of gears that is available.

For example: a 19/52 rear axle has 1,577 theoretical RPMs at 60mph. Multiply 1,577 x 0.017 = 26.81. Since the result is lower than the available range of gears available (34-45 teeth), you have to multiply by either 1.11 or 1.25 (the speed multipliers available) to determine the result that is closest to a gear that is available in the range of 34 to 45 teeth. In this example, 26.81 x 1.11 = 29.76 and 26.81 x 1.25 = 33.51. Since 33.51 is the closest result to an available gear, you would use a 34-tooth gear with a 1.25 multiplier.



The overdrive requires service every 15,000 miles. Drain the oil through the small hex drain plug located at the rear of the sump.

allows you to split the gears with an overdrive in third gear, providing a half step between third and fourth gears. The same would apply in top gear by downshifting from overdrive (at the flip of a switch) into fourth gear. (See Table 1, pg 542, that illustrates intermediate shift points for an overdrive mated to a 14/52 rear axle).

Overdrive Service

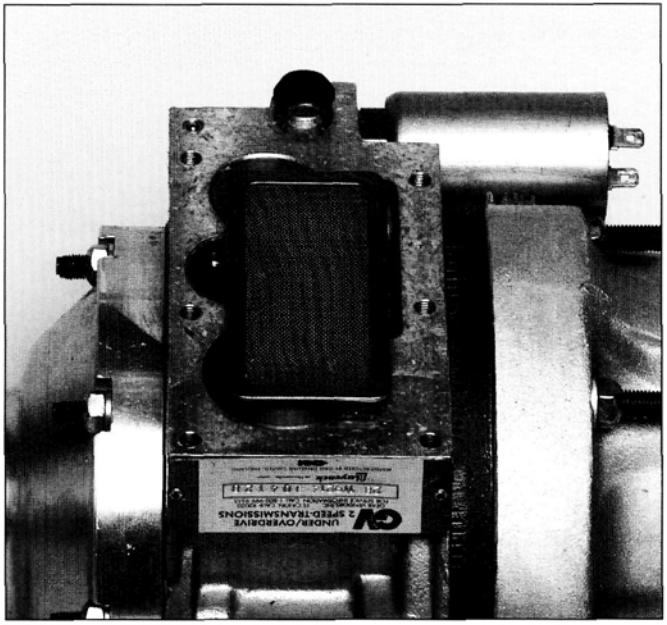
The fluid level in the overdrive should be checked periodically. The fluid should be changed every 5,000 miles.

The transmission fluid is drained by removing the small hex plug on the bottom rear of the sump (left photo). Refit drain plug. Refill with synthetic transmission fluid (GM part # 12346190 or Mopar #0487-4459) to the bottom threads of the drain plug (capacity – approximately 26 ounces).

Dave Browne suggests that you routinely remove the sump pan on the bottom of the overdrive to clean out the internal filter. The sump pan is held on by six 11mm bolts. Pull the suction filter (photo page 957) straight down, wash the screen and air dry. Install the suction filter by pressing in to seat. Refit sump pan cover and renew the gasket if damaged. Refit drain plug. Refill with synthetic transmission fluid.

Lubricate the grease fitting on the right angle speedometer multiplier adapter if fitted.

Check the wiring connections for integrity, particularly the two wires connecting the solenoid on the bottom of the overdrive unit since they are the most exposed to road debris.



The overdrive sump includes an internal filter that should be removed and periodically cleaned. Pull straight down on the filter to remove it.

Cruising in Overdrive

The overdrive is an easy solution to increasing the top end cruising range of the Ghost. Prior to installing the Gear Vendors overdrive, my Ghost's sweet spot for cruising was about 50 mph, it now purrs along easily at 55-65 mph with less noise and engine vibration. For cars fitted with original 14/52 rear axles, it's a significant improvement in extending the top end speeds. The mechanical noise from the engine and drive train is also much lower since the engine in not working as hard. The net result is a more pleasant ride.

Endnotes

[1]Gear Vendors, Inc., 1717 North Magnolia Ave, El Cajon, CA 92020, Tel: 800-999-9555, website: www.gearvendors.com, email: info@gearvendors.com

[2]Overdrive Explained, by Norris Allen, *Flying Lady*, page 2174.

[3]Sports Classics, Ltd., 4 Mel Lane, Brookfield, MA 01506, Tel: 508-867-6288

[4]Jim Stroman, 2643 Circle J, San Angelo, TX 76901, Tel: 915-949-3532, email: w5dhk@wcc.net

[5]Coldwell Engineering, Coldwell Lane, Sheffield, UK S10 5TJ, Tel: 01142 301541 Fax: 01142 630400 (International code: 44) email: coldwell@globalnet.co.uk