

GV GEAR VENDORS UNDER/OVERDRIVE

727 & 904

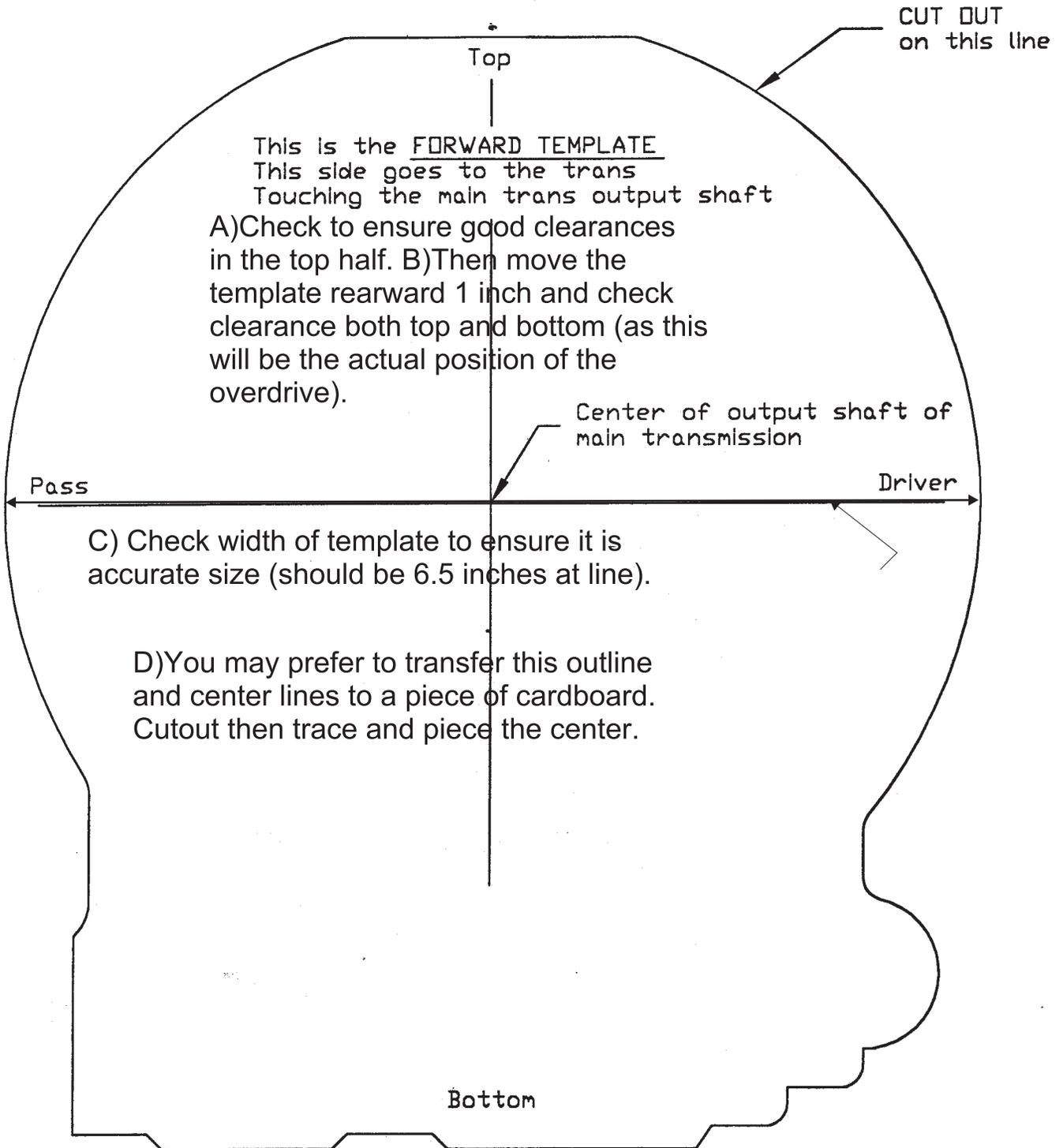
Operators/Installation Instructions



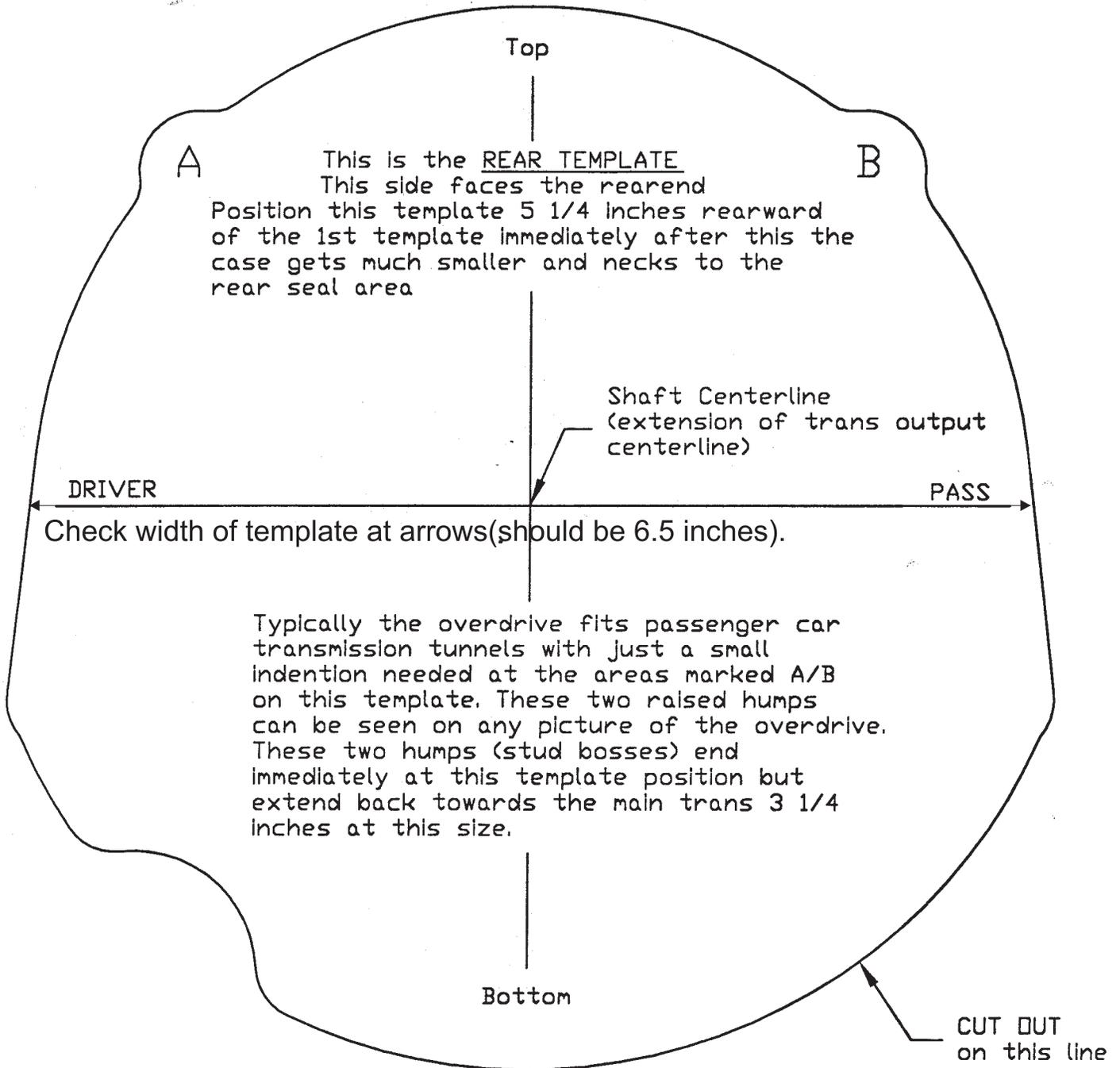
Customer Copy

Serial # _____

Gear Vendors Overdrive Template Front



Gear Vendors Overdrive Template Rear



WARNING, CAUTIONS, UPDATES AND NOTES

Warning NOTE: The GV unit is an auxiliary transmission that works in conjunction with your present automatic transmission.

#1 You should always **set your emergency brake** as vehicle could roll forward or backward if there were problems with the Gear Vendors overdrive.

#2 Should you experience any transmission related problem call GV technical assistance department at 1-800-999-9555 prior to seeing your dealer or transmission center for diagnosis.

CAUTION: Only use recommended fluids. Never use friction modifiers or molly, commonly used in posi-traction rearends.

NOTE: During installation of the GV-727 you are instructed to remove the parking pawl from the factory tail housing and reinstall it in the GearVendors extension housing.

NOTE: Due to in-tolerance run out of matching components the coupler may resist sliding on the transmission's output shaft. If coupler resists going on to the output shaft, remove coupler and rotate 90^adegrees and try again. Do not force coupler onto output shaft.

NOTE: Lubricate all seals and bushings during installation to facilitate initial start-up lubrication.

CAUTION: When installing new Gear Vendors extension housing to main transmission -Check to make sure bolts do not bottom in transmission and/or that the bolts are long enough as Gear Vendors casting could be different thickness than original tail housing.

CATION: When mounting Autodrive the driver side kick panel or floorboard is common, but be sure nothing is behind the panel, i.e. vehicle's computer system. Also do not mount Autodrive near any heat source. Do not mount unit in engine compartment.

NOTE: After installation, insure initial component lubrication by driving vehicle 1 mile before activating the overdrive.

NOTE: Replacing speedo housing seal. Insert small end of seal into speedo housing. Push seal into housing until large end of seal is flush with housing. Do not bottom seal into housing cavity. Lubricate seal and driven gear shaft before installation.

NOTE: Have driveline modifications performed by a specialist with drive shaft balancing capabilities.

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OPERATING INSTRUCTIONS: CARS & SPORT TRUCK

DASH/FLOOR CONTROLS

These instructions are for cars and sport trucks with 3 speed automatic transmissions and the Gear Vendors Overdrive using our electronics package. RV and towing type instructions are also available.

Warning – Always set your park brake when parked. The Gear Vendors is a transmission and if something was wrong with it your vehicle it could move even in park unexpectedly.

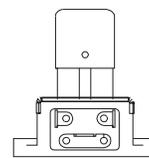
Important! The overall concept of our electronics is to allow you to do most anything you want in the manual mode but understand that you are in control of turning on and off the overdrive in manual and we do not want the overdrive on at speeds below 30mph or in reverse. Some racers want to use the overdrive in the burnout box in high gear and because we want it shut off before your rear wheel speed gets down 30 that would seem like more effort than it is worth for the burnout. Another common mistake is that a racer will leave the overdrive “on” in manual and let it shut itself off down at 15mph – if that happens once in a while because you forgot to shut it off you are not likely to damage the overdrives clutch but done repeatedly would add significant wear.

Understand that the overdrives planetary adds thrust when you are on the gas – so you can hit it (turn it on at 20 because you are on the gas and we are getting some assist with the mechanical pressure. But when you are off the throttle and slowing down we do not get the added thrust and therefore recommend the higher out-shift point of 30mph.

Read below for operation in detail but understanding the only time you let the overdrive automatically shift “off” is when you are using the “Auto” position.

Prior to operating your vehicle, acquaint yourself with the location and feel of the two newly installed control switches, which operate your **GEAR VENDORS UNDER/OVERDRIVE**.

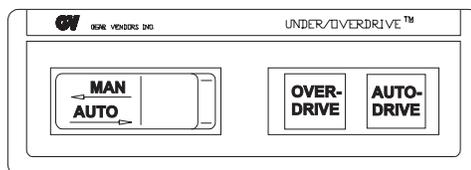
A floor button (dimmer switch) or shift knob with latching button. Along with that, a control panel is located on or at the bottom of the dashboard. This panel consists of a rocker switch (MAN/AUTO), a red indicator light (**AUTODRIVE/AutoLaunch**), and a green indicator light (**OVERDRIVE**). If your dashswitch style is not labeled auto/man then the red half moon is AutoDrive. If the dashswitch is unplugged or never installed you have all the manual, AutoLaunch, and AutoOff features only.



Floor Switch



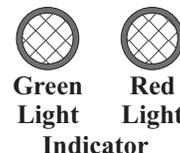
Shifter Switch



Dash Switch



Autodrive Switch



Green Light

Red Light

Indicator

The two switches, in conjunction with the main transmission shift lever, are all that is needed to operate and enjoy the economy of overdrive, and the performance of ratio gear-splitting.

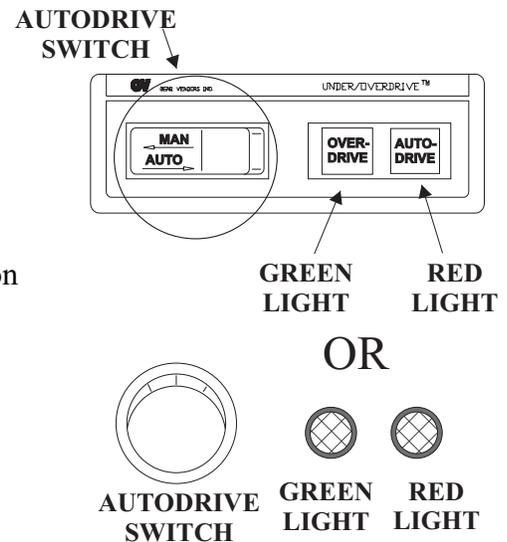
OPERATING INSTRUCTIONS: CARS & SPORT TRUCK

Electronics

The electronic controls installed in your vehicle to operate the **UNDER/OVERDRIVE** provide several significant benefits.

(1) Regardless of which condition you set the dash control rocker switch, or floor/shift switch, or any light – the **UNDER/OVERDRIVE** will automatically turn off at all stops. This means that when you take off from a stop, you will always have the lowest gear possible (1st). And this feature also prevents the accidental use of the **UNDER/OVERDRIVE** in reverse. The overdrive cannot work in reverse (damage to the overdrive could result).

(2) The electronics also control certain automatic features of the **UNDER/OVERDRIVE (AUTODRIVE)** as follows: the **MANUAL/AUTO** switch sets two operating thresholds available within the electronics, which prevents the **UNDER/OVERDRIVE** from engaging until the selected threshold is reached. In the **MANUAL** position the in-shift threshold is about 20 miles per hour. In the **AUTO** position the in-shift threshold is about 47 miles per hour. The red light illuminates any time you have the overdrive selected but are not yet up to threshold speed. It informs you that you have not yet reached the particular threshold for the dash switch setting. When your speed increases and you reach the in-shift threshold, the red light will extinguish and the green light will illuminate, letting you know that you are in overdrive.



(3) The electronics also include out-shift thresholds of 15 miles per hour on the **MANUAL** side, and 25 miles per hour on the **AUTO** side. This allows two other significant benefits when you are driving. First, the overdrive, once engaged, will not hunt (in and out-shift), because the in-shift thresholds are so far apart from the out-shift thresholds, that once you engage the overdrive it will stay in overdrive, not dropping out if you slightly reduce speed or increase throttle pressure. These threshold differences also mean that if you have selected **AUTODRIVE** (automatic overdrive) and later you want manual control or gear splitting, you do not need to manually switch ranges on your dash switch. You can operate the manual control button on the floor or shift lever and gear-split all the way down to 25 miles per hour.

Operation

For just everyday cruising many enthusiasts leave the dash switch on **AUTO** and leave the floor/shift switch on. With the main trans shift selector in drive, the vehicle will go through its normal three gears (first, second, and third), and then will shift into overdrive automatically between 45 and 50 miles per hour. When you come to a stop, you will notice that the overdrive will go off about 25 miles per hour, and the red light will come on – indicating that the electronics are on, controlling the system. We shift the Gear Vendors in at about 47mph so that in those cases where you are accelerating pretty quickly it will automatically shift in on top of second gear and push third gears engagement up another 28% in road speed.

Auto-off

When you park the vehicle, and turn off the ignition key, the electronics will automatically turn off. There is no need to turn off the **AUTODRIVE** when parking the vehicle. When you come back to the vehicle at a later time, and turn on the ignition key, the system will automatically return to the **AUTODRIVE** condition if that is how you left it (red light on).

OPERATING INSTRUCTIONS: CARS & SPORT TRUCK

Passing Performance

The **GEAR VENDORS UNDER/OVERDRIVE** greatly enhances passing performance. Typically without the **UNDER/OVERDRIVE**, passing gear, or second gear, is too low to be of value at highway speeds even with a conventional overdrive transmission. With the **UNDER/OVERDRIVE** on, simply pressing the accelerator all the way to the floor, engages “second-over” (that gear right in between second and third).

As the vehicle’s speed increases, the transmission will automatically shift to “third-over”. When that occurs, if you are still wanting to increase speed, depress the shift switch to turn off the **OVERDRIVE** in order to grab third direct or just leave it on to run in 3rd overdrive.

If you happen to be cruising with the **UNDER/OVERDRIVE** off, and want to pass, depress the floor switch and push the accelerator to the floor to engage second-over.

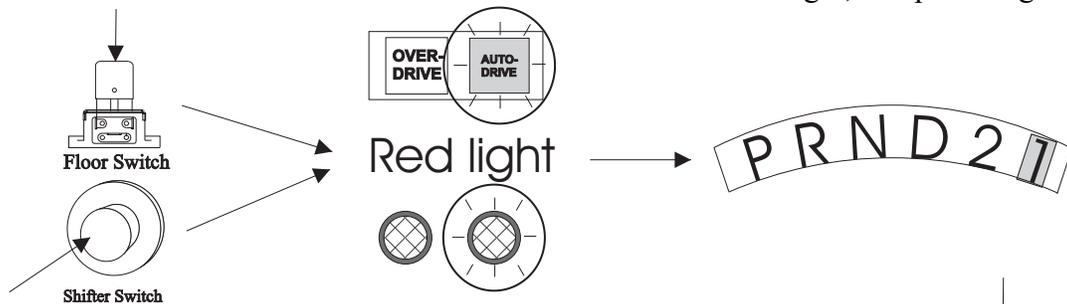
Dash Control Panel – Manual

Though the AutoDrive feature is nice, many enthusiasts prefer to control the overdrive manually so they can grab the overdrive gear any moment they want. The only time you will find the need for the **MANUAL** setting on the dash control panel is when you want to gear split from a complete stop. This is a very cool because it offers a lot more torque than shifting to 2nd gear from 1st. ie: when you grab 1st-over with a 3.55 diff you are hitting a ratio that is equivalent to what a 4.56 diff gear car has for 2nd. Way more bark.

To use this feature, set the dash control panel on **MANUAL**,

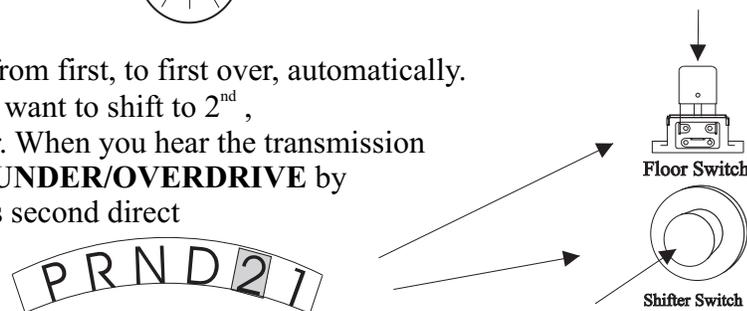


turn the **UNDER/OVERDRIVE** floor/shift switch on to illuminate the red light, and pull the gear shift selector to low.



As you take off, your vehicle will go from first, to first over, automatically.

Once your engine’s rpm is where you want to shift to 2nd, move your shift lever into second gear. When you hear the transmission shifting into second gear, turn off the **UNDER/OVERDRIVE** by depressing the shift switch, and this is second direct



Once the engine again revs up, press the shift switch for second over. For third direct, move the gear shift lever to drive, wait until you hear the transmission changing gears, then turn off the **UNDER/OVERDRIVE** (this would be third direct).

OPERATING INSTRUCTIONS: CARS & SPORT TRUCK

General Comments

It will take a day or two to become fully acquainted to the new gear selection capabilities of the **GEARVENDORS OVERDRIVE**. The best way to learn is by doing. Do not be afraid to operate the buttons, as there isn't anything you can do that would hurt the **UNDER/OVERDRIVE**. The **UNDER/OVERDRIVE** is intended to shift under any throttle condition – including full throttle. It is designed with a mechanical helix aiding the hydraulically actuated clutch, so that firmness is automatically dictated by torque and load. For smoothest shifts you will let off the gas when shifting into overdrive and do the opposite (go on the gas) when shifting out of overdrive. But when you want speed you will shift under whatever throttle you are at without concern for shift firmness.

If you find the shift at all harsh then you will want to see why this torque multiplication is rotating your diff – you may want a lower link or traction bar to stop that rotation and instead put it to the ground. The other benefit of preventing the rotation of the diff (diff wrap) is that the shifts from the overdrive will be much smoother.

For performance shifting there are a couple things good to know:

The Gear Vendors shifts at 700 psi which is why we can handle extreme amounts of horsepower on the dragstrip (it is also why we prefer long chain petroleum based ATF as opposed to synthetic). Our pump is driven by the output of the main transmission so in 1st gear the pump is running 2.5 times slower than it does in 3rd gear. To you this means when you command a shift in 1st it will take 2.5 times as long to occur – this is actually a benefit mentioned later. But, remember this and when you hit the gas in 1st - if you want overdrive just hit the shift button right away (as soon as you hit the throttle). You cannot get 1st over too early as it has so much torque and you will find the AutoLaunch feature automates it and prevents it from coming on too soon.

2nd over is faster but still has a slight delay – just think of the speed of the driveshaft and the overdrive in-shift speed will always be directly related to that to nearly the milesecond regardless of throttle or temperature it is very consistent. Most importantly for gear-splitting is that the out-shift (turning off the overdrive) is instant at all speeds because it is a mechanical dump of the hydraulic pressure. Because it outshifts so fast be sure to move your shift lever up to the next gear before you hit the button. Timing the split shift is easy once you try it a couple times.

The benefits of the pump system are several. One and most importantly is that this relief valve system is super low in parasitic loss. The overdrive can run in an off road race truck for continuous duty at 900+ horsepower all day and night for a week in FIA cross country events with only 27 ounces of fluid. We could not do that if we were converting your horsepower to heat and friction losses. The solenoid on the overdrive draws only 2 amps and is typically the largest heat factor besides the main transmissions transference of heat to the Gear Vendors case.

The hydraulic delay at low speed also offers us the ability to automate the timing of the shift even though you select it early. We use a 20mph actuation to the green light and then based on the driveshaft speed the overdrive will shift at the appropriate time. In this way it automatically compensates for the differences in rear end ratio so that a 4.56 rear car and a 3.55 rear car both shift correctly.

Thirdly (is that a word) the overdrive makes many cars at full throttle step out when it shifts so it is handy that both your hands are easily back on the wheel on not on the shift lever at that moment.

OPERATING INSTRUCTIONS: CARS & SPORT TRUCK

Drag Racing do's and dont's:

Gear Vendors Overdrives are very popular in drag racing for a bunch of reasons. We are in many competition vehicles and if the vehicle is also street driven it is a no-brainer that you want a Gear Vendors overdrive. Super low parasitic loss and you get to run the best main trans for your application.

Here are some tips to get you started correctly.

A) One big benefit of the Overdrive is now you can use whatever diff gear gives you the best 60ft time and regardless you will have the correct gear at the big end. Without the Gear Vendors a guy with a 2speed or 3speed auto may find he gets to looking at the whole run and ends up with a rear end gear that is not the best 60ft. You have a Gear Vendors so work on the 60ft first – you don't even care to run the track just shut down at couple hundred and change the diff and see what works for your chassis and your typical track conditions. Once that is the best it can be now work the big end. Truly, running and looking at the whole run can be misleading. Not many cars lose after leading the 60 and with a Gear Vendors you certainly will not. You are going to have choices at the big end with overdrive on 2nd or 3rd or both but you won't know which until you get the best rear gear for the first 60.

B) One thing to keep in mind is that the Gear Vendors is like half a gear. The ratio is like a close ratio manual so we can effect some good things in the torque converter at a lower inshift rpm than you normally have to be at for a full gear change in your automatic. This means you want to try grabbing the overdrive shift probably 1,000 rpm lower than you would a full gear change up in 2nd or 3rd. Try it also near your redline but be sure to check this out because many cars are faster even if they go through the lights right on peak hp without the overdrive – they are faster grabbing the overdrive for that last 200ft and getting some work out of the converter. Depending on the rear gear you may need 2nd-over instead of 3rd over. Go 1-2 then over (try it a 1000 or 1500 early here also) and shift to 3rd and turn it off. Make sure you get the shift up before you hit the button – shift then hit the button. On outshift we shift faster than the main trans so move the shifter first – it doesn't have to be seamless (meaning if you can hear it backshift that is fine – will not matter on the timeslip and if you ever lose 3rd it will save your engine)..

C) Most cars are not faster at the dragstrip using 1st-over. As fun and fast as it is on the street (letting us driveout of burnouts and grab power at half or full throttle on street tires etc) the torque converter does its job particularly well on the 1-2 shift at full tilt with anything over 500hp. Sure a stock small block will want to use this gear (and all the splits of ratio) but for the modified cars with a tire on them you will typically be running just 4 gears (or 3 in the case of a powerglide twospeed, 1-2 then over).

D) On race cars over 1200hp we typically do not run our electronics. From 1200-2500hp there is too much EMF and other electronic noise that can interfere so we recommend direct hook up with a autometer shift light parallel to the shift switch. Remember to turn the overdrive off before you speed gets below 20mph and do not turn it on in reverse as you do not have our electronics managing this.

E) When you shut down at the end of your run either turn the overdrive off when the speed is below 50mph or go on the gas when you turn it off at higher speeds. This will keep the overdrive from slapping hard into direct and extend the life of a critical snap ring on the clutch.

F) If you race often and are in the points for a championship you should drain and refill the overdrive after each race weekend. Keep some portion of last 2 changes of fluid in clear water bottles so you can compare. If a problem is developing you will see it most likely in the fluid before you will feel it on the track – a gradual darkening. We use a Raybestos semi-metallic clutch so the fluid typically gets a lot more dark color when something is wrong and may also vent a little fluid out of the top vent on the overdrive. We fully expect the overdrive to outlast a few or several transmissions in your race car.

SERVICE

Service: Car/Sport Truck

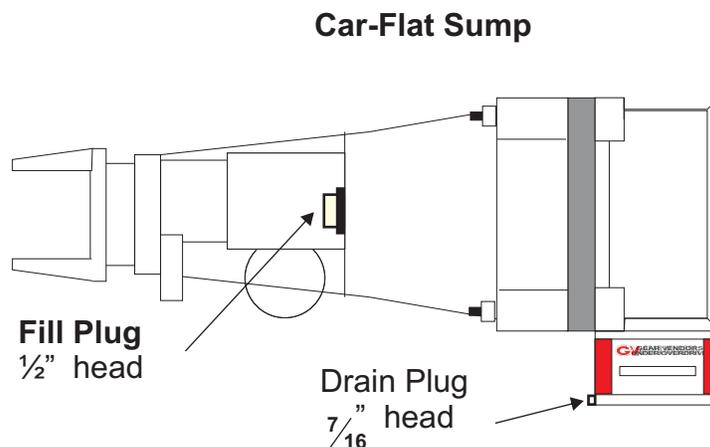
Drain and refill the overdrive with Dexron III ATF. The drain plug is the 6 point bolt on the very bottom of the sump pointed rearward. The fill plug is a 6 point half inch – it is on the rear case pointed rearward about half way up the passenger side of the overdrive. Fill with fluid until it runs back out the hole. The overdrive holds just about 27 ounces. **Drain and refill every 10,000 miles.**

When first installed do not run the overdrive with the rear wheels off the ground as there is lubrication that needs to occur in both the rear case of the overdrive and main transmission.

If you ever suspect you have a transmission problem (reverse or forward) call our tech line first and let us diagnose that it is not a problem with the overdrive before you take your vehicle in for service or pull your main trans.

For the race car, we recommend changing the fluid after each race weekend. It is also a good idea to keep a small sample of each drain. This can help indicate if a problem is developing in the overdrive.

If you have any questions on the operation of the **GEAR VENDORS UNDER/OVERDRIVE**, Call **GEAR VENDORS Customer Service Department** toll free at 1-800-999-9555.



OPERATING INSTRUCTIONS: TRUCKS & RV'S

DASH/FLOOR CONTROLS

These instructions are for Trucks and Motorhomes with 3 speed automatic transmissions and the Gear Vendors Under/Overdrive.

Warning – Always set your park brake when parked. The Gear Vendors is a transmission and if something was wrong with it your vehicle could move even in park unexpectedly.

Prior to operating your vehicle, acquaint yourself with the location and feel of the two newly installed control switches, which operate your **GEAR VENDORS UNDER/OVERDRIVE**.

A floor button (similar to a dimmer switch) is positioned to the left of the steering column for convenient use by your left foot. Along with that, a control panel is located on or at the bottom of the dashboard. This panel consists of a rocker switch (MAN/AUTO), a red indicator light (**AUTODRIVE**), and a green indicator light (**OVERDRIVE**).

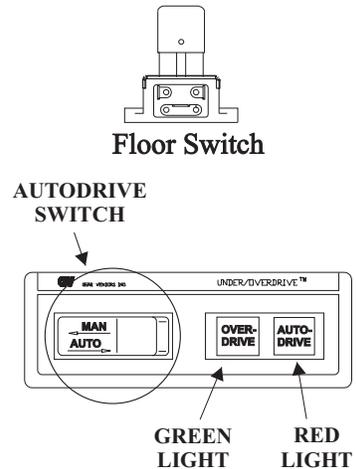
The two switches, in conjunction with the column shift lever, are all that is needed to operate and enjoy the economy of Overdrive, and the performance of gear-splitting.

Electronics

The electronic controls installed in your vehicle to operate the **UNDER/OVERDRIVE** provide several significant benefits.

(1) Regardless of which condition you set the dash control rocker switch, or floor switch, or any light – the **UNDER/OVERDRIVE** will automatically turn off at all stops. This means that when you take off from a stop, you will always have the lowest gear possible (1st). And this feature also prevents the accidental use of the **UNDER/OVERDRIVE** in reverse.

(2) The electronics also control certain automatic features of the **UNDER/OVERDRIVE (AUTODRIVE)** as follows: the MANUAL/AUTO switch sets two operating thresholds available within the electronics, which prevents the **UNDER/OVERDRIVE** from engaging until the selected threshold is reached. In the MANUAL position the in-shift threshold is between 15 and 20 miles per hour. In the AUTO position the in-shift threshold is between 45 and 50 miles per hour. You set the in-shift threshold by first activating the red (AUTO) dash light. The red light illuminates any time you have selected overdrive by pressing on the floor switch. It informs you that you have not yet reached the particular threshold for the dash switch setting. When your speed increases and you reach the in-shift threshold, the red light will extinguish and the green light will illuminate, letting you know that you are in overdrive.



OPERATING INSTRUCTIONS: TRUCKS & RV'S

(3) The electronics also include out-shift thresholds of 15 miles per hour on the MANUAL side, and 25 miles per hour on the AUTO side. This allows two other significant benefits when you are driving. First, the overdrive, once engaged, will not hunt (in and out-shift), because the in-shift thresholds are so far apart from the out-shift thresholds, that once you engage the overdrive it will stay in overdrive, not dropping out if you slightly reduce speed or increase throttle pressure. These threshold differences also mean that if you have selected **AUTODRIVE** (automatic overdrive) and later you approach a hill where gear-splitting is needed, you do not need to manually switch ranges on your dash switch. You can operate the manual control button on the floor and gear-split all the way down to 25 miles per hour. We do recommend shutting off the overdrive when you are on the manual side no later than 25mph as it is hard to hold 700psi at very low speeds and this could cause clutch wear in the overdrive.

Operation

Normally you will leave the dash switch on AUTO and leave the floor switch on for all of your flat land cruising. With the column selector in drive, the vehicle will go through its normal three gears (first, second, and third), and then will shift into overdrive automatically between 45 and 50 miles per hour. When you come to a stop, you will notice that the overdrive will go off about 25 miles per hour, and the red light will come on – indicating that the electronics are on, controlling the system.

Auto-off

When you park the vehicle, and turn off the ignition key, the electronics will automatically turn off. There is no need to turn off the **AUTODRIVE** when parking the vehicle. When you come back to the vehicle at a later time, and turn on the ignition key, the system will automatically return to the **AUTODRIVE** condition. You should always set your emergency brake when parked because the overdrive is a transmission and if it were to malfunction it could slip and let the vehicle roll if the park brake is not set.

Passing Performance

The **GEAR VENDORS UNDER/OVERDRIVE** greatly enhances passing performance. Typically without the **UNDER/OVERDRIVE**, passing gear, or second gear, is too low to be of value at highway speeds. With the **UNDER/OVERDRIVE** on, simply pressing the accelerator all the way to the floor, engages “second-over” (that gear right in between second and third).

As the vehicle’s speed increases, the transmission will automatically shift to “third-over”. When that occurs, if you are still wanting to increase speed, depress the floor switch to turn off the **UNDER/OVERDRIVE** in order to return to third direct.

If you happen to be cruising with the **UNDER/OVERDRIVE** off, and want to pass, depress the floor switch and push the accelerator to the floor to engage second-over.

OPERATING INSTRUCTIONS: TRUCKS & RV'S

Climbing Grades

For the best performance on grades, you will want to keep the engine rpm between 3000 and 3500 rpm (gas engines) at all times. To accomplish this, you will use the **UNDER/OVERDRIVE** as a gear-splitter. Most commonly, you will be approaching the grade at highway speed in third-over; simply move the gear shifter selector lever to second gear to engage second-over. If you were not in 3rd overdrive, turn the **UNDER/OVERDRIVE** on and move the gear shifter selector lever into second gear. If while climbing, your tachometer, or engine speed, drops below 3000 rpm, you will want to downshift a half-a-gear to second; so depress the floor switch to turn off the overdrive. This will bring our engine speed back up to 3500 rpm. If the grade were to steep and your engine speed again drops below 3000 rpm, the next half-gear down would be first over. Activate this gear by turning on the overdrive, and moving the gear shifter selector lever down to first (in that order). Gear splitting like this on grades is a great benefit to the life and reliability of your engine and your engine driven accessories, including the transmission. No longer are you lugging and over revving the engine, or trying to maintain speed through too few forward gears.

Dash Control Panel – Manual

The only time you will find the need for the **MANUAL** setting on the dash control panel is when you want to gear split from a complete stop. This is a very useful feature when tackling a steep on-ramp to a freeway where you will want to come up to speed quickly, or virtually anytime you are pulling out on a grade from a stop.

To use this feature, set the dash control panel on **MANUAL**, turn the **UNDER/OVERDRIVE** floor switch on to illuminate the red light, and pull the gear shift selector to low. As you take off, your vehicle will go from first, to first over, automatically, at about 20 mph. Once your engine's rpm is approximately 3500, move your shift lever into second gear. After you hear the transmission shift into second gear, turn off the **UNDER/OVERDRIVE** by depressing the floor switch, and this is second direct.

Once the engine again revs to 3500 rpm, press the floor switch for second over. For third direct, move the gear shift lever to drive, wait until you hear the transmission change gears, then turn off the **UNDER/OVERDRIVE** (this would be third direct).

OPERATING INSTRUCTIONS

4X4 Instructions

Gear Vendors bolts onto the back of the transfer case in most applications. Because of this, when Gear Vendors is engaged, it changes the rear axle ratio in comparison to the front. If the vehicle has 4.10 axle ratio, when Gear Vendors is engaged, the rear axle will now be 3.20 ratio while the front axle stays 4.10. This is why you can **NEVER** use Gear Vendors while in four wheel drive.

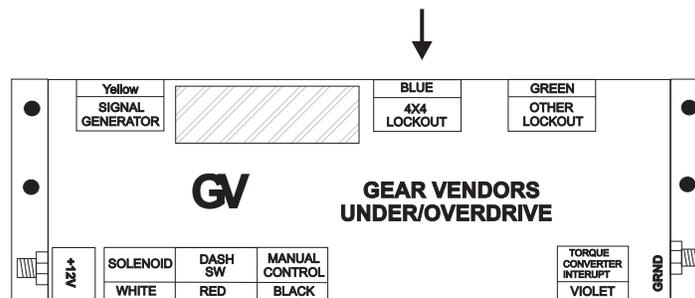
4X4 Lockout

As part of the electronics package, there is a 4X4 lockout. This is a built in safety so Gear Vendors can never accidentally be shifted in while the truck is four wheel drive. The lockout is designed to lockout Gear Vendors until the ignition has been cycled. If the truck has been shifted into four wheel drive, the vehicle must be shut off and restarted in 2 wheel drive, in order for Gear Vendors to be operational again.

To test wether this feature is working correctly. Turn vehicle ignition on, shift transference into four wheel drive. Once the 4x4 indicator illuminates on the dash board, shift transference back into 2 wheel drive. Now depress Gear Vendors foot switch while looking at Red Autodrive light. Nothing should change. If the red light turns on and off with the foot switch, something is not correct. If everything is wired correctly, the ignition must be shut off and turned back on in order for Gear Vendors to work.

NEVER shift Gear Vendors while driving in four wheel drive. Doing so could cause an accident and damage to vehicles drivetrain.

If there are any questions call Gear Vendors Tech line 1-800-999-9555.



OPERATING INSTRUCTIONS: TRUCKS & RV'S

General Comments

It will take a day or two to become fully acquainted to the new gear selection capabilities of the **GEAR VENDORS UNDER/OVERDRIVE**. The best way to learn is by doing. Do not be afraid to operate the buttons, as there isn't anything you can do that would hurt the **UNDER/OVERDRIVE**. The **UNDER/OVERDRIVE** is intended to shift under any throttle condition – including full throttle. It is designed with a mechanical helix aiding the hydraulically actuated clutch, so that firmness is automatically dictated by torque and load. For smoothest shifts you will let off the gas when shifting into overdrive and do the opposite (go on the gas) when shifting out of overdrive. But when you want speed you will shift under whatever throttle you are at without concern for shift firmness

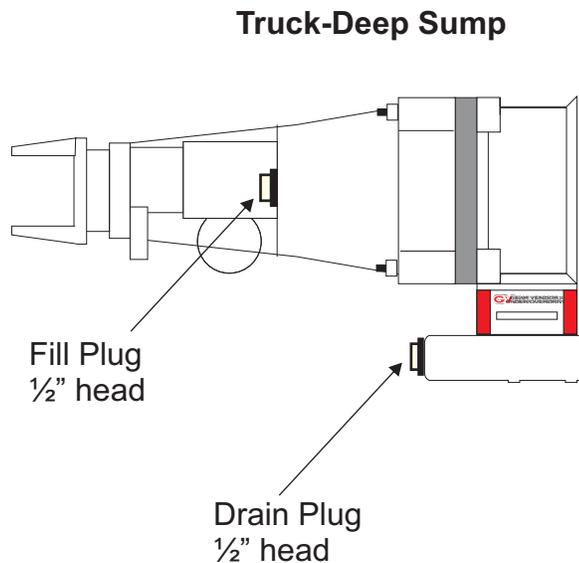
On steep down grades where engine braking is beneficial, this helix assists the direct drive gearing. For this reason, **is is recommended on all steep down grades the UNDER/OVERDRIVE be turned off**. Use your brakes to reduce your vehicle speed, then select either second or low on your shift lever to help maintain that speed with only intermittent braking.

Service

Drain and refill the overdrive with Lucas Oil 75-90 synthetic or Lucas Oil 80-90 non synthetic diff and manual trans lubricant. The drain plug is the half inch 6 point bolt on the bottom pointed rearward. The fill plug (fill until it runs out the hole is also a 6 point half inch) it is on the rear case pointed rearward about half way up the passenger side of the overdrive. **Drain and refill every 10,000 miles**. The overdrive holds just about 1.3 quarts new and typically just at a quart (some fluid remains) on changes.

If you ever suspect you have a transmission problem (reverse or forward) call our tech line first and let us diagnose that it is not a problem with the overdrive before you take your vehicle in for service.

If you have any questions on the operation of the **GEAR VENDORS UNDER/OVERDRIVE**, call **GEAR VENDORS Customer Service Department** toll free at 1-800-999-9555.

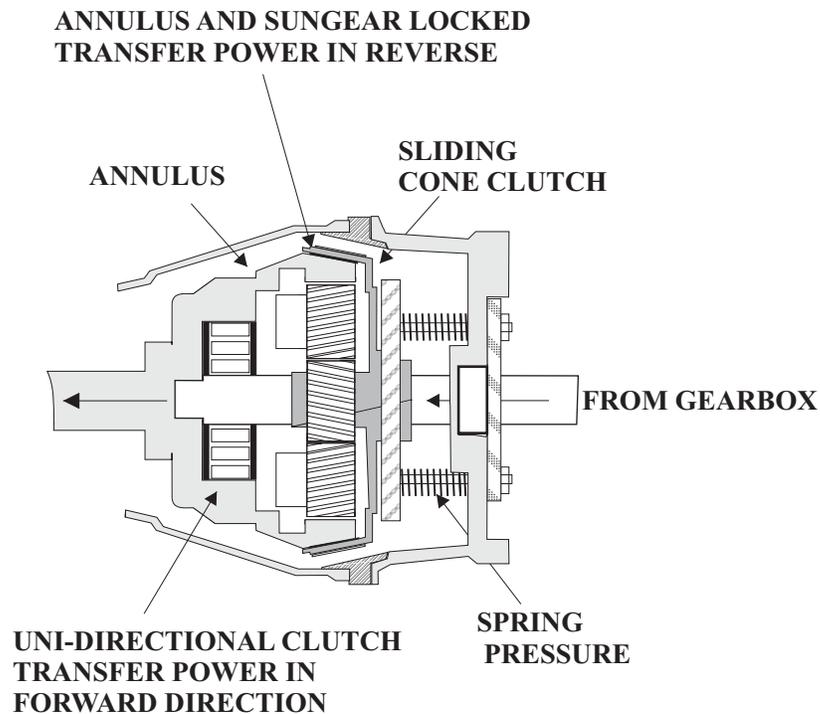


WORKING PRINCIPLES

HOW THE UNIT WORKS

The Overdrive unit consists of a planetary gear activated by a common vertex (cone) clutch. The overdrive gears are epicyclic and consist of a central sun gear meshing with three planet gears (encased in a planetary carrier) which in turn mesh with an internally toothed annulus (ring gear). All gears are in constant mesh. The planet carrier is attached to the input shaft and the annulus is integral with the output shaft.

The transmission main shaft is mated to the overdrive input shaft by means of a coupler. In direct drive, power is transmitted from the input shaft to the inner member of a unidirectional clutch and then to the outer member of the clutch assembly (caged roller). The rollers are driven up the inclined faces of the inner member and wedged between the clutch assembly and the annulus. The annulus and the output shaft are integral. The planetary gears are inoperative. Power transmitted directly from the transmission through the Gear Vendors to the drive shaft at a 1 to 1 ratio. A cone clutch is mounted to the externally spline extension of the sun gear and is loaded on to the annulus by four springs which react against the casing of the overdrive unit. The spring load is transmitted to the clutch through a thrust ring and ball bearing. This causes the inner friction lining of the cone clutch to contact the outer cone of the annulus and rotate 1 to 1 with the annulus while the springs and thrust ring remain stationary against it. Since the sun gear is spline to the cone clutch, the planetary gear assembly is locked permitting overdrive and reverse torque to be transmitted. Additional load is imparted to the clutch, during reverse, by the sun gear, which due to the helix angle of its gear teeth, thrust rearward and reacts against the cone clutch.



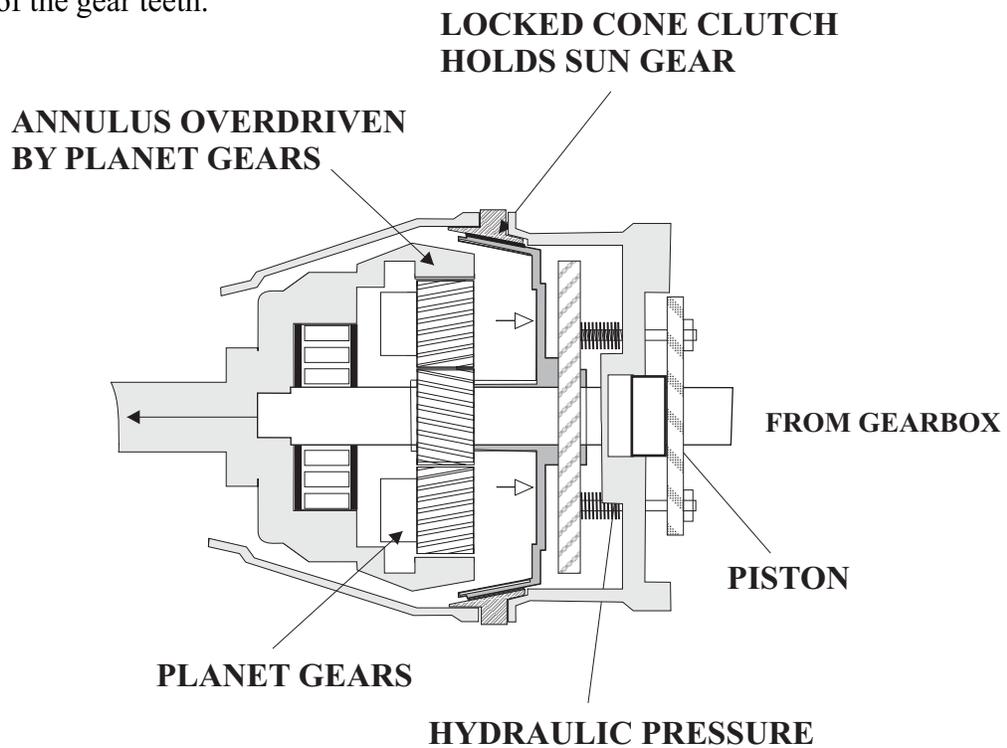
OVERDRIVE IN DIRECT DRIVE

WORKING PRINCIPLES

DURING OVERDRIVE

The cone clutch is no longer in contact with the annulus but has moved forward so that its outer friction lining is in contact with a brake ring which is part of the overdrive casing. Because the cone clutch is held stationary, the sun gear (to which the cone clutch is attached) is held stationary. The planet carrier rotates with the input shaft and the planet gears are caused to rotate about their own axes and drive the annulus/output shaft at a faster speed than the input shaft. The uni-directional clutch allows this since the outer member can overrun the inner member.

Movement of the cone clutch in a forward direction is accomplished by means of hydraulic pressure which acts upon two pistons when a valve (the solenoid) is opened by the driver controlled selector switch. This hydraulic pressure over-comes the springs and moves the cone clutch forward against the brake ring with sufficient load to hold the sun gear at rest. Additional load is again imparted to the clutch on forward direction due to the helix angle of the gear teeth.



OVERDRIVE ENGAGED

HYDRAULIC SYSTEM

Hydraulic pressure is developed by a plunger type pump, cam activated from the input shaft. The pump draws oil from an air-cooled sump through a suction filter and delivers it via a non-return valve through a pressure filter to the operating, solenoid valve and relief valve. Incorporated in the relief valve is a spring dash pot which ensures smooth overdrive engagement and disengagement under varying conditions. In direct drive, a residual pressure of 35-40 psi is maintained within the system.

When the overdrive is engaged, this increased to a predetermined operating pressure.

INSTALLATION

Gear Vendors UNDER/OVERDRIVE Installation Instructions

***** WARNING *** It is recommended that installation be performed by a qualified mechanic.**

Always refer to Onesheet supplied with kit for specific Installation Instructions

INSTALLATION:

I. Pre Installation

- a. Most vehicles do not require any adjustment to driveline angles and rarely would we do those adjustments ahead of actually completely installing and driving the vehicle but there should be some understanding of proper driveshaft installation before you begin. Refer to section on driveline modifications and review modifications necessary for installation.
- b. Record original driveline angles. (refer to driveline modifications.)
- c. Raise vehicle and secure on safety stands.
- d. Place transmission shift lever in neutral and disengage parking brake.
- e. Remove driveline
- f. Disconnect speedometer cable from transmission.

II. Adapter Installation

- a. Raise transmission and remove transmission mount from crossmember and stock tail housing.
- b. Place drain pan under tail housing of transmission
- c. Remove inspection plate on bottom of transmission tail housing
- d. Remove the six bolts holding the tailhousing to the transmission
- e. Use snap ring pliers to spread snap ring while pulling tail housing off.
- f. Clean surface of Main transmission where stock tail housing was located.
- g. Remove parking pawl assembly from original tail housing.
- h. Install parking paw assembly into new G.V. extension housing.

INSTALLATION

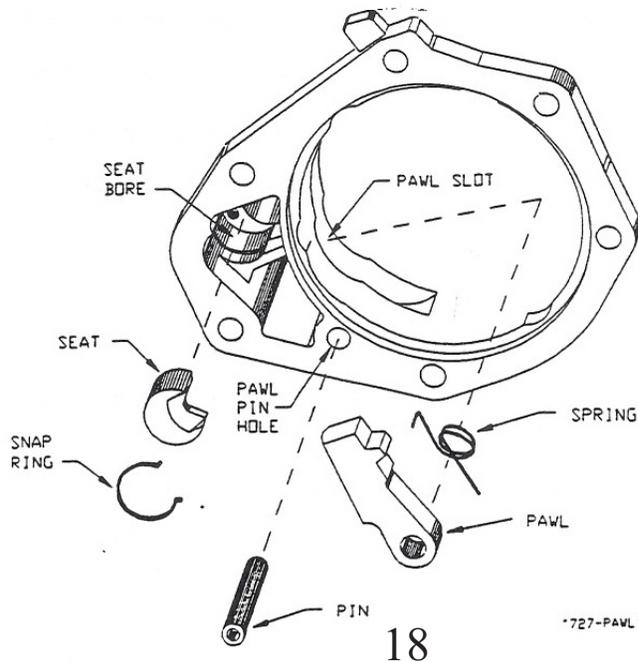
II. Adapter Installation

Parking Pawl Assembly Removal

1. Once tail housing is removed, remove snap ring holding parking pawl seat in housing.
2. Pull parking pawl seat from housing.
3. Hold housing up and tap assembly end of housing against the floor to dislodge the parking pawl pin.
4. Remove parking pawl spring, pawl and pin
5. Remove snap ring from center of stock housing

Parking Pawl Assembly Installation

1. To facilitate the parking pawl assembly lay the GearVendors housing on a flat surface. Position GV housing so transmission end of housing so the parking pawl assembly pocket lays flat on the surface (to your left). See drawing
2. Insert seat, removed from old housing, into GV adapter.
Note: Place seats roll pin into small hole in housings "seat bore". Secure seat in housing with the snap ring.
3. Install snap ring precisely removed from stock housing into supplied housing
4. Lay parking pawl pin in pawl slot. Pawl finger faces up (toward inside of housing).
5. Insert parking pawl pin into "pawl pin hole" and press pin in until face of pin is inside the pawl. Do not seat pin at this time.
6. Use your finger to pull the pawl towards you. Insert pawl spring by depressing it down in behind the pawl.
Note: Pawl spring has a 90 deg angle end laying across the pawl, and loop of spring face up (toward the inside of the housing). Hold spring in place (so the pawl pin passes through its loop) and press parking pawl pin into housing until it seats.



INSTALLATION

II. Adapter Installation

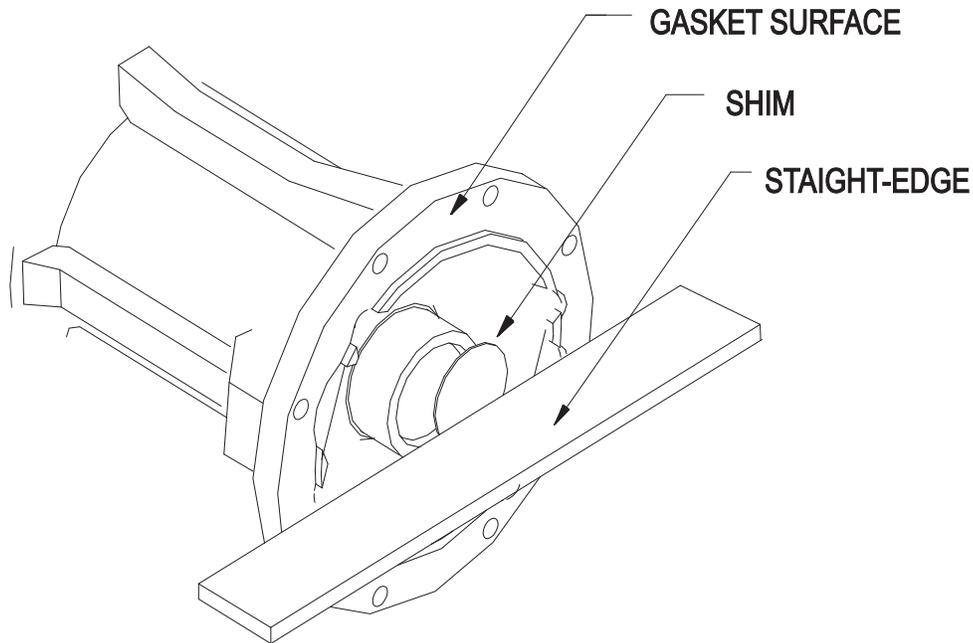
Parking Pawl Assembly Installation

7. Install parking pawl assembly into GV tail housing/adapter
 8. Position spring onto parking pawl with 90 deg bend laying on the pawl. The pawl notch facing inwards of the adapter.
 9. Insert pawl into pawl cavity in GV adapter. Secure assembly by pressing GV pivot pin into the adapter, and running it through the pawl.
 10. Insert parking pawl seat, positioning roll pin in inset of adapter and cure seat with circlip
- i. Lightly grease bushing and seal on adaptor before installing.
Caution: *Before positioning seat into GV adapter roll pin must be installed in seat to prevent the seat from rotating*
 - j. Position transmission to adapter gasket onto transmission
Note: *When installing extension housing, gearshift lever must be in 1st gear or L for low gear.*
 - k. Slide adapter over tail shaft. Use snap ring pliers to spread the snap ring allowing adapter assembly to go over bearing on transmissions output shaft. While sliding adapter on, guide parking rod so it seats in the pawl seat in adapter housing.
Caution: *Make sure snap ring is fully seated in bearing outer race ring groove.*
 - l. Secure adapter assembly with the six bolts previously removed.
Caution: *Check to make sure bolts do not bottom in transmission when tightening adapter.*
Warning: *From drivers seat, move gear selector through all gears to ensure all detents are available.*
 - m. Install snap ring access cover gasket and secure cover with original screws. Use a light thread locking compound on screws.
 - n. Install and secure rubber insulator to transmission and crossmember.
 - o. Lightly grease outside of coupler, bushing and seal, slip coupler onto transmission output shaft.
Caution: *Due to in-tolerance run out of the matching components the coupler may resist sliding on the transmissions output shaft. If coupler resists going on shaft, remove coupler and rotate 90 degrees and try again. DO NOT force coupler onto output shaft.*

INSTALLATION

III. Coupler Installation

- a. Install adapter to overdrive gasket, on the adapter face
- b. Measure coupler end play by placing a straight edge across the adapter's gasket surface and measure the distance between coupler and straight edge. (See figure 1)
- c. Adjust coupler end play by installing shims (supplied by G.V.) inside coupler (transmission output side.) until end play less than 0.020 inch is obtained.



IV. G.V. UNDER/OVERDRIVE Installation

- a. Position G.V. Overdrive adapter gasket onto overdrive.
Note: The gasket previously used for coupler adjustment
- b. Slide yoke onto output shaft of overdrive assembly.
- c. Position overdrive assembly using the eight 1/4-28 inch nuts and washers supplied by G.V.. You will turn the output yoke to line up the coupler splines to our input shaft as you go on with the overdrive. Make sure it goes all the way seated against the gasket surface which may take a little tap with a soft mallet on the output shaft or yoke as we fit that register tight for alignment of shaft centerline. (tighten 8 nuts to 8-9 ft-lb. using a criss-cross pattern.)
- d. If using a fixed yoke (bolt down truck style yoke) , secure yoke to G.V. using the bolt and thrust washer provided by G.V.. (when tightening bolt to-yoke apply "Blue" Loctite provided by G.V., insure that bolt is tightened to 140ft.lbs..) The locktite is for the threads – the yoke actually seals on an oring deep on the output shaft.

INSTALLATION

IV. G.V. UNDER/OVERDRIVE Installation

Speedometer drive installation

- e. Connect speedo extension supplied by G.V. to speedo output on overdrive assembly.
- f. Connect signal generator, supplied with the kit, in line with G.V. speedo extension and stock speedometer cable.

V. Driveline Installation

- a. Measure for drive shaft(s) modification. (Please review Driveline Modification Sheet.)
- b. Inspect "U"joint to insure proper fit. (The G.V. UNDER/OVERDRIVE uses a Spicer-1350 Yoke – give the yoke to your driveshaft person so they put the correct mating weld yoke on the driveshaft if it your vehicle did not already have 1350 size joints.)
- c. Install modified drive shaft(s). Do not over tighten u-bolts (common mistake)
- d. Fill Gear Vendors with fluid recommended in Service section. Also check vehicle transmission fluid and refill with proper fluid if necessary.
- e. Lower vehicle and road test unless there are issues regarding new driveline angles. (Please review Driveline Modification Sheet.) Adjust driveline angles if applicable.
Note: Virtually all muscle car installations (50's, 60's and 70's) will not need any adjustment to angles if the vehicle has stock suspension but most hot rodders do like to measure and know what they got.

VI. Electronics Installation

NOTE: Refer to one-sheet supplied with kit for specific electrical installation per vehicle

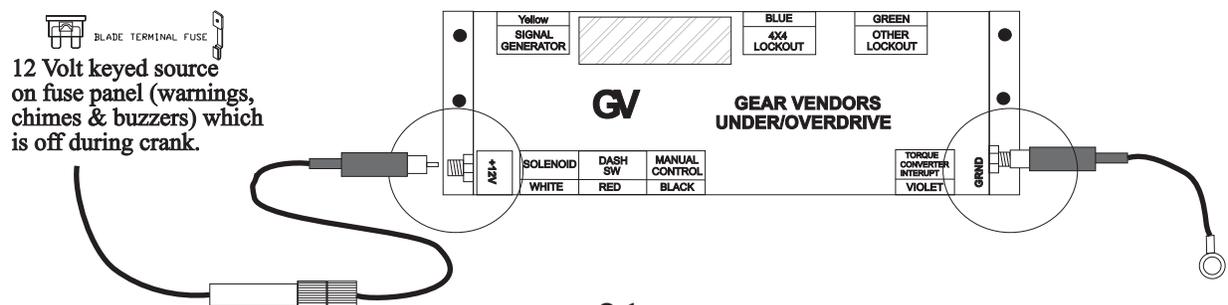
1. Mount the AUTODRIVE control box in cab of vehicle. Do not mount AUTODRIVE near any heat source, I.E. heater vent. Secure control box with two screws supplied.

Warning: Make sure you know what is behind where you are mounting so the screws don't damage another component.

2. Attaching power: Use fuse tap supplied by Gear Vendors to provide power to AUTODRIVE control box. The +12 volt supply line is red and has an in-line fuse connector. Connect this line to the fuse tap that you install in the vehicle fuse box. It should be connected to the source side of a fuse that powers an accessory which comes on when the key is in the on position. To find the source side of the fuse (to tap) unplug that fuse and turn the key on. Determine which terminal is power source using voltmeter or test lamp. The other end of the red supply line (RCA type jack) plugs into the side of the control box marked +12.

3. Connect AUTODRIVE's black ground wire to a good ground point.

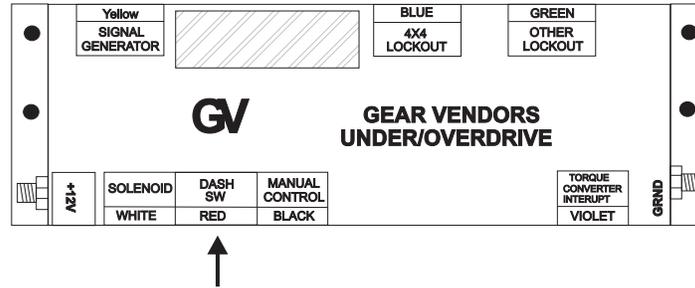
NOTE: The ground connection must be clean bare metal surface and grounding hardware must be snug.



INSTALLATION

VII. Electronics Installation

3. Connect cable with red band into connector jack designated DASH SWITCH/RED on AUTODRIVE control box.

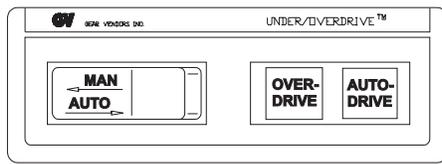


4. Connect cable with yellow band into jack designated SIGNAL GENERATOR/YELLOW in AUTODRIVE control box.

5. Connect cable with white band into connector jack designated WHITE/SOLENOID on AUTODRIVE control box.

6. Position overdrive rocker switch and bracket assembly onto dashboard convenient to operator (driver). Gear Vendors provides two methods of fastening the dash switch assembly, either two sided Velcro tape or with small screws.

If you have the small thumb rocker and LEDs, we can offer a few recommendations. Typically we mount the thumb rocker at the very bottom of the dash board where it wraps back underneath the face. Then find a spot for the two lights where they can be visible to the driver but not directly pointed at them. The green light tends to be a little bright when driving at night.



Dash Switch

OR



5/16 drill size
Red and Green Lamps



13/16 drill size
or wallered
out 3/4 with
small slot at
at 3 o'clock

Auto/Manual Dashswitch

7. Position manual foot switch on floorboard convenient to operators left foot. Secure on place with two self tapping screws (supplied). Manual transmission applications have hand switch. Use accompanying clamp assembly to mount switch in transmission shift lever for convenient operation.

8. Connect cable from foot switch (black) to jack designated MANUAL CONTROL/BLACK on AUTODRIVE.

10. Feed cables marked with YELLOW, and WHITE bands through the firewall of vehicle and run cables down and back towards the overdrive. Leave excess cable length inside cab and gather together with plastic tie-wraps.

NOTE: When running cables through firewall, avoid sharp edges and possible contact with areas that provide excessive heat.

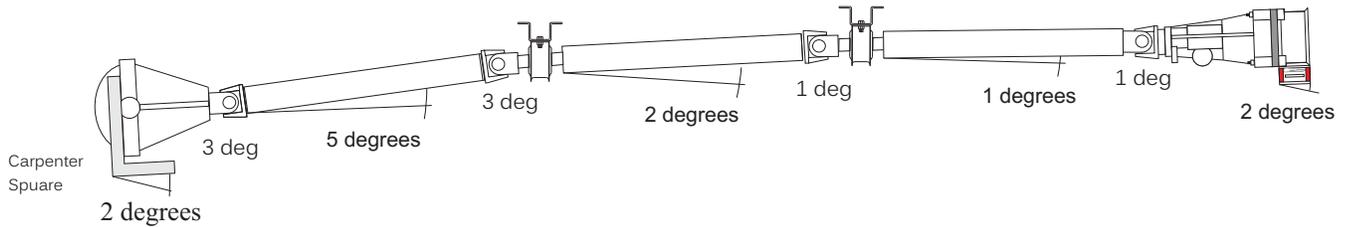
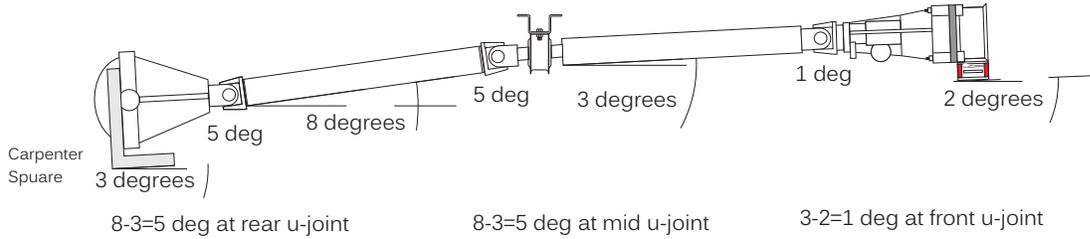
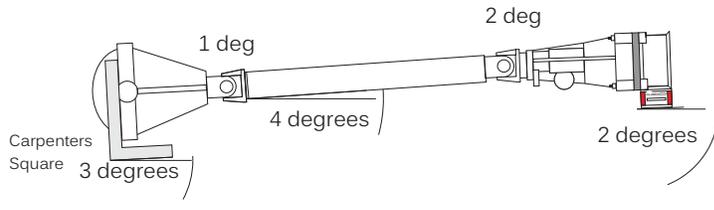
11. Connect flat type connectors on cable banded with a WHITE band to solenoid on the overdrive. Solenoid has no polarity.

12. Connect bayonet type connectors on cable banded with YELLOW to signal generator (electronic speedo assembly). No polarity

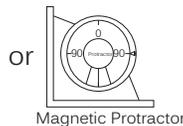
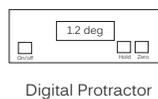
DRIVELINE SAMPLE

Always measure from the same plane
 These number are examples only.
DO NOT DUPLICATE

DO NOT TAKE
 MEASUREMENT FROM
 MAIN TRANSMISSION OIL
 PAN



Tools needed



RULES:

- (1) U-joint cancellation should be within 1 deg
- (2) Keep operating angle less than 3 deg
- (3) At least 1/2 of one degrees continuous operating angle

**"Down" indicates that the components is lower at the rear than a the front

NOTE: When slopes are in the same direction on two connected components (Down & Down) or (UP & UP), subtract the smaller number from the larger to find the u-joint operating angle. When the slopes are in the opposing directions on two connected components, add the (Down & UP) or (UP & DOWN) measurements to find the U-joint operating angle.

DRIVELINE

A. Before removing drive shafts use paint or scratch alignment marks on matching yoke/shaft assemblies at the differential and in the case of long wheelbase motorhomes there will be a second bolt together assembly that you will also want to mark. This allows shafts to be returned to their original position relative to each other.

TIP: A couple punch marks work best because the driveshaft shop commonly repaint the shaft.

B. Before removing drive shafts use angle meter to record driveline angles. An inclinometer or protractor is needed to determine driveline angle. Driveline angle is the slope of the driveline components, measured in degrees. Most Do it yourself installs will not record these angles – preferring to adjust if required later and that is fine as long as you have enough knowledge to know you are being safe

Basic rules of driveline operation angle are:

1 Attempt to maintain stock shaft cancellation theory. Use inclinometer before removing original shafts and record readings. Use readings as a reference after driveline modifications.

A. Determine driveline operating angle by placing an inclinometer engine starter or a carpenters square on the harmonic balancer - Record reading.

B. Place inclinometer on forward drive shaft and record the reading.

C. Place inclinometer on the rear sections of shaft (if more than 1pc driveline) and record the reading (s).

D. Place inclinometer on the differential and record reading.

2.The modified shafts should retain at least ½ of one degree continues operation angle. This means if the transmission reads 3 degrees then the forward shaft reading should read at least 3.5 degrees or less than 2.5 degrees. This difference causes the needles in the u-joint to move in the grease as otherwise they would just pack grease between them and not completely around them.

3.Operating angles between any two opposing driveline components (transmission & forward shaft, or forward shaft & rear shaft) should remain less than 3 degrees. EX: forward shaft reads 4 degrees and next length of shaft reads 7 degrees. NOTE: Many modified lifted trucks will exceed this guideline and still perform properly

C. install the modified driveline, begin installing the forward section and work to the rear. Suburban installation see step P

D. Check driveline angles and record readings after installation. Attempt to duplicate original cancellation angles. To do so may require shims (spacers) placed under the carrier bearing or transmission, between the transmission and crossmember mount.

E. Every vehicle chassis can differ slightly in driveline component configuration. For this reason each vehicle has to be dealt with individually. These recommendations are offered as guidelines to assist in achieving proper driveline angle and balance. Many variables exist in driveline angles, therefore, the recommendations are meant as guidelines and are not hard fast rules.

F. Understanding the importance of proper driveline angle and balance is crucial to satisfactory performance. Have driveline modifications performed by a qualified driveline specialist.

G. If the original front shaft is 26 inches or greater, from eye of transmission yoke to center of carrier bearing, you will modify this shaft in most cases for the installation.

H. If the original front shaft is 26 inches or less, from eye of transmission yoke to center of carrier bearing, then there is likely a preferred solution to just shortening the front shaft; IE new one piece shaft (if it is less than 59 inches) or carrier bearing plate to relocate and take some length from the rear shaft or both shafts. Sometimes it may be necessary to fabricate a cross member to relocate the front carrier bearing. Call us at the factory for any questions as we have recorded details of virtually all applications.

I. As a general rule no section of finished driveline should be less than 12 inches on length., measured eye-to-eye of yokes, or from center of yoke eye to center of carrier bearing.

DRIVELINE

J. It is not generally recommended that any finished length of driveline be over 59 inches, however some exceptions exist. Call us before making the shaft to be certain it is what is recommended in your application.

K. All sections of driveline should be balanced at the time driveline modifications are made. Having said that, total indicated runout is actually more important than balance of driveline components.

L. When measuring for driveline length have overdrive permanently mounted and all wheels on the ground supporting the vehicles weight. If you are going to utilize a one piece driveline with a slip yoke, the yoke should have 5/8 of an inch of travel. Push the yoke all the way into the Gear vendor, now measure for the drive shaft from center of ujoint hole in the yoke to center of the ujoint hole in the diff (put one of the straps on so you can see center) and subtract 5/8 from that total length number. Tell your driveshaft shop the new length is center to center on the ujoints.

M. Test drive vehicle and check for proper operation. If vibration or shudder on take-off exist, shimming of the transmission or carrier bearing may be required. When determining driveline problems: shutter on take-off generally means improper operating angle problem. A high speed vibration is generally a balance problem.

N. Gear Vendor retains the vehicle manufactures original driveline support. Do not install additional cross member to the rear of our unit.

O. Suburban 2-wheel drive vehicles require installation of a T-bracket which moves the driveline carrier bearing back 7 ¼ inches and down ½ inch. (Installation instructions come with T-bracket)

Driveshaft Vibration Troubleshooting

Overdrive Yoke plunge:

Gear Vendors standard slip yoke models should have just 5/8 inch plunge. Meaning if the vehicle had the weight on the axle and you took the u-joint straps off the diff you would only be able to move the driveshaft 5/8 forward until the yoke bottomed out in the overdrive. Checking this after install is simple by measuring from the rear seals metal surface on the Gear Vendors to the center of either of the ujoint caps in the overdrive yoke where this measurement should be 3 inches or less.

Note: This is an involute spline slip yoke so it will wiggle when no load is against it. The moment torque hits this to move the vehicle weight it then centers.

Fixes: If you driveshaft is too short by ½ inch or less than a new Dana 3-3-2431x yoke could be installed as it has .450 more spline engagement as it does not have the o-ring cleanout bore of our standard yoke from Neapco and other suppliers.

Contact of the overdrive or adapter to body or crossmember:

With a new install of the overdrive we want to make sure there is no contact somewhere under load. If there areas you cannot see then you a thin piece of cardboard or paper hard stock to slide around the components. You can wiggle the overdrive by shaking it from the rear seal area by hand with some force to make sure you can hear no contact. Many mopars have the 4 holed crossmember where there is a welded sheet across the top – these welds can be contact points with the adapter – make sure it clears.

DRIVELINE

Driveshaft Vibration Troubleshooting

Fitment of rear u-joint in diff yoke:

There are two common problems with diff yokes.

Worn – the u-joint simply slides in with no pinch or resistance into the diff yoke. Whether a mopar with internal clips or a Ford or Chevy. The u-joint should have to be pushed firmly (or on brand new yokes taped with soft hammer) in order to get it seated all the way in the diff. If it just slides in it may offer a little wiggle room that means centers are not perfect depending on where you tightened it down.

Secondly – If your diff yoke has u-bolts with nuts as apposed to straps with bolts be careful. U=bolts only need to be tightened a ¼ turn after new lockwashers are fully compressed (call it about 12-14 ft lbs). Commonly u-bolts are way overtightened and this can cause distortion of the cap and vibration at speed.

180 at Diff yoke or any fixed yoke not marked during balance:

Any bolt on yoke has the potential for run-out. Ideally before you remove a proper running (no vibration) driveshaft you would mark the fixed yokes and their position relative to the driveshaft weld yoke so they would go back in the same spot. If you did not then, you may need to 180 the driveshaft to be sure you have not stack runouts of the two components ie: 7 thou runout of the diff yoke and 7 thou on the weld yoke could be 0 in one orientation or 14 thou in the other worst case senario.

Balance: Once you have ensured that the length, tightening, and 180 at the diff yoke are not responsible for a vibration then balance will be worth checking. Most driveline shops do a good job on balance (though we would say total indicated runout (TIR) is more important than balance) but they do not have your diff yoke in their equipment and may not be running at the speed most sensitive in your vehicle. So typically we find if there is an error with balance it is just too little or too much weight. Don't head back to balance again – do a fine balance on the road instead. Using a hose clamp simply start with the largest weight on the driveshaft and add the head of the clamp right on top of this tack welded washer. Go for a drive and if it is worse move the head of the clamp so it is directly opposite the weight (strap for the hose clamp is going directly over the weight but head of clamp is 180 now and retest by driving. We are looking for significant change – if it is not obvious then move on to the next location. Typically there is a weight both front and rear of the driveshaft. If there is no weight in one of these positions then simply mark 4 lines on the driveshaft at 90 degree intervals and try each location – make these marks 1 inch from the weld on the weld yoke of the driveshaft as the farther you move a weight towards the center of the shaft the more the weight weighs in balance. Only leave on clamps that made a noticeable improvement.

Use the Overdrive to determine whether balance or cancellation are the vibration:

Go for a road test in the vibration speed (MPH) and notice if you turn on the overdrive does it change the vibration. If the vibration requires you to go 1.286 faster when the overdrive is on in order to get the vibration back then the problem is in front of the overdrive (engine or transmission). If you have a driveline balance or canellation issue the overdrive should make no difference in the vibration speed. If turning on the overdrive does make a difference then see if this same engine speed in neutral or park can duplicate the vibration. Simply rev up the motor within 500 rpms of the vibration speed and then increase the rpms 100 at a time leaving in each spot for 5 seconds or more for the harmonics to develop and go all the way up through 500 more rpms than the vibration speed noted in your incremental test.

DRIVELINE

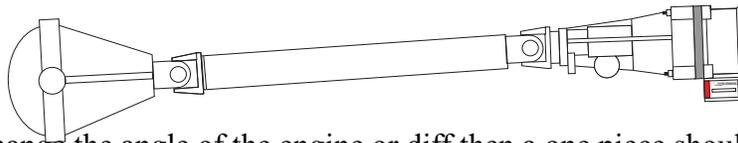
Driveshaft Vibration Troubleshooting

Driveline Cancellation:

U-joint cancellation is needed because two caps (the overdrive yoke and the diff yoke caps) travel in a perfect circle where the weld yoke driveshaft caps move in a circle plus inside and outside of the fixed circle of the overdrive yoke and diff yoke. So if you were to track the path of the weld yoke caps in inches per second you would find they have to speed up when they are traveling both in the circle and moving in a horizontal requirement and thus slow down at other moments when just circular movement is required. Twice in every revolution u-joints on the weld yoke then speed up and slow down. By having an equal and opposite partner these non-constant velocities can be cancelled.

Typically non-cancelled velocities tend to be heard by the diff gear as a wa-wa sound whereas balance makes more of a buzz with no audio. Both balance and cancellation can have narrow disturbance areas like from 60-70 and then fade away because the driveline acts somewhat like a guitar string and has resonate frequencies it will be very efficient at transferring. Below we will go a little deeper into how to check your cancellation.

One Piece driveshafts: (typical of cars and short wheelbase trucks).



Since we did not change the angle of the engine or diff then a one piece should not typically need any angle adjustment because of our overdrive installation. Exceptions would be chevy A bodies where the mount was lowered or mopar B bodies where the transmission crossmember was slotted 1/10th inch. It is possible but rare that these applications would need 1 degree more diff angle to compensate and put it back to as close to parallel as it was but not common.

When the vehicle was built it would typically have within 1 degree the same diff angle as the engine angle. Measurement is typically of the bottom of the overdrive sump plate or off the harmonic balancer with a carpenter square. For the diff you can either use a carpenter square of the rear cover bolts (ensure they have the same washer stack) or off the diff yoke itself positioned at 12 and 6 with not driveshaft). When using a meter that reads out the angle you will want to make sure you stay on the same side of the vehicle for all readings (meaning if you are on the drivers-side looking at the meter towards the passenger side then stay that way all throughout the measurements). In this way we do not need or care about zeroing the meter because we only care about the differences in measurement s not the actual value of the measurement against the road surface or horizon (so no need to concern yourself with true zero). Using a carpenters square also lets us keep the meter in relative small area of degrees so as not to exploit errors from the meter.

Ideally the diff will be the same number as the crankshaft angle of overdrive sump. Having said that there can be commonly as much as two degrees difference without a noticeable noise of vibration.

Measure the driveshaft and notice whether the arrows on the meter jump from down angle to up angle. By this we mean that all angles you are measuring should be in the same plane (the front of the component is higher than the rear). But, some slammed in the weeds (lowered) vehicles can end up with a driveshaft that actually goes uphill to the diff instead of down and this would not be ideal though it can be dealt with mathematically. IE : A 3 degree engine down angle to a 5 degree up angle would be 8 degrees of work where a 3 degree down angle to a 5 degree down would only be 2 degrees of working angle.

DRIVELINE

Driveshaft Vibration Troubleshooting

Theory: Vehicles typically have down engine angles because the transmission output shaft is going to end up higher than the diff gears input. In this way the driveshaft angle will be minimized and thus so will the u-joint velocities. So a typical arrangement would be 3 degrees down on the engine, 3 degrees up on the diff yoke (note – this is still a down angle relative to cancellation math because it is lower in the rear than in the front). And say a driveshaft that falls somewhere between 1 degree down to 8 degree down. If it was 8 degrees than the cancellation would be 5 at the overdrive yoke and 5 at the diff yoke so perfect) 5minus 5 in cancellation. If you envisioned this same vehicle with 0 degrees of crankshaft centerline angle and 0 on the diff yoke than the driveshaft angle would go way up and though you could still have perfect cancellation there would be such huge non-cancelled velocities to start with that you would greatly increase the work of the u-joints and the likelihood of noticeable noise, vibration or harshness (NVH). Please note: When measuring angles that it is a common mistake to think the driveshaft is going uphill to the diff anytime it has less angle than the transmission so look at the arrows on your meter or slowly drop the rear side of the meter and notice if the number gets greater or smaller – if it is actually uphill the number will get smaller as you drop the rear of the meter slightly.

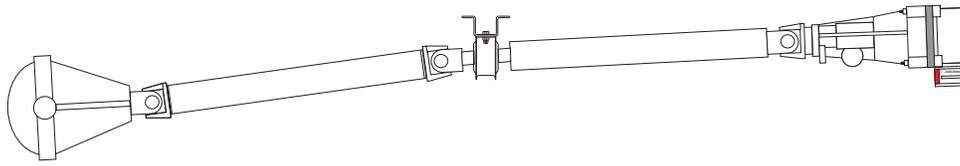
As we like to lower our cars into the weeds then it becomes that we are far better off going to zero on a new build – meaning if we set the motor in the car with zero on the crankshaft centerline and the diff in the car are zero and their relative positions mean we end up with a driveshaft that is just 1-3 degrees up or down we will have perfect cancellation and low working angles (working angles are the difference between two matted components or what work the u-joint is actually doing). In driveshaft engineering you typically try to lower the work and then promote the cancellation – in that order – because the higher the work the more cancellation is required. A common mistake on street rod build is the builder puts the carburetor base plate at zero not realizing that 3 degrees of down angle were built into the base plate assuming that it was going in a factory height typical vehicle. So you may need to remachine the base plate or manifold to correctly set up an in the weeds drivetrain. On an existing muscle car however you are not going to re-engineer the engine angle because unless its a pretty unlimited budget deal you are stuck with the existing motor mounts and trans-tunnel and to effectively put the engine at zero one of those two items has to change - Ie: the transmission has to go up high in the tunnel or the engine need to set lower on the mounts.

So – regarding Gear Vendors in muscle car and truck applications of short wheelbase installations there is typically no need to adjust any angles but we list these one piece driveshaft details for knowledge of those with 2 piece and 3 piece driveshaft because it is helpful to first understand the basics of driveline engineering and then build on the multi-piece differences.

DRIVELINE

Driveshaft Vibration Troubleshooting

Two piece driveshaft with carrier bearing:



Important – first read Driveline cancellation above fully – it has one piece theory and methods of cancellation and using meter suggestions that are important to two piece driveshaft knowledge. Then proceed here:

A two piece driveshaft is a little bit of a stepchild in that there are three u-joints and so no correct way to cancel all velocities of the u-joints. What is important is to record the original angles so you can see what theory was used. In most cases one of the three joints is operating with very little angle and cancellation is achieved on the two others.

You will notice in most cases the carrier bearing itself is directly behind the transmissions output shaft – so that if you were looking down the drivetrain from the front bumper the engine, trans, 1st section of driveshaft and carrier bearing are all in a straight line and the 2nd (rear) driveshaft has dogleg over to the diff as in most cases the diff is not centered in the vehicle.

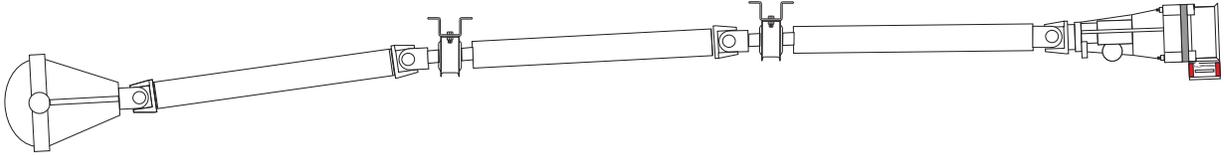
Common mistakes are people trying to straighten-out this dogleg – the dogleg keep a position of thrust to one side for the carrier bearing rubber so it does not shake as it could with no predetermined thrusting point. So.. keep the dogleg always if there was one present stock.

Carrier bearing shimming: Because we have lengthened the centerline of the crankshaft by adding the Gear Vendors and the crankshaft centerline is typically at less angle than the two rear driveshafts then it stands to reason that we may need to put a couple 3/8 shims between the carrier perch and the carrier bearing to reestablish the original type of angle on the first ujoint. If you recorded original numbers then you will add shims to keep some near the original working angle on the first joint. If you did not record angles it is still pretty straightforward as typically you are shortening a driveshaft 14 inch for our install and the difference between 14 inches at 3 degrees and your driveshaft is probably about 2 shims worth. Note – If you are making your own shims that these go all the way across the carrier as most carriers are open on top so if you just used washers the shim it down the carrier would flop around. You may need longer bolts (our truck kits usually provide this) because you want full thread engagement of the complete nut to keep the driveline safely attached. If you notice any shudder on take off (the typical symptom of too much angle through the carrier you may want to add one 3/8 shim to the tranny mount between the metal of the Gear Vendors or factory adapter and the metal of the top of the trans mount. This will have the effect of putting more angle on the first driveshaft and less on the 2nd.

DRIVELINE

Driveshaft Vibration Troubleshooting

Three piece driveshaft with two carrier bearings:



Important – first read Driveline Cancellation above fully – it has one piece theory and methods of cancellation and using meter suggestions that are important to three piece driveshaft knowledge. Then proceed here: Three piece driveshafts look complex but really are quite simple. If you take your readings of the stock angles you will most often easily notice the cancellation theory used.

Typically the middle shaft is at the same angle as the crankshaft center line (overdrive sump) and the diff angle and the front and rear shaft fall where they may with perfect cancellation because they are both mounted to components of equal angle (even though first and 3rd shaft are completely differing angles. So you see the cancellation by cancelling in pairs as shown in the diagram. Most often two 3/8 inch carrier bearing shims on top of the transmission mount (between the metal of the mount and the metal of Gear Vendors adapter or the factory housing) will restore the original driveshaft numbers.

Ideally you will measure the stock numbers and then see how cancellation was achieved. Any concern please call out tech department with your chassis length (center of front wheel to center of driving rear wheel) so we can look in our records at your exact chassis and help you with this subject. But overall most installs are done without a calling us and simply knowing that a couple washers need to be put between the transmount and the extension housing to restore the original angle on the first driveshaft.

TROUBLE SHOOTING

Symptom Trouble-shooting

No overdrive – green light does stay on but overdrive does not shift at all:

With green light on at 50mph or above, let off the gas and then turn off the overdrive – did you feel it shift-out? If so the clutch would appear to be not holding – perform decell and fluid check below and call Gear Vendors.

Decell Test:

While going 50mph in high gear (or whatever is a safe speed for downshift described here) turn on the overdrive so that the green light is on. Now let off the gas and shift down your factory shifter to the next lower gear (leaving the overdrive green light on) and see if your engine drops to idle or in fact has deceleration compression engine braking. Then shut off the overdrive green light after noticing the deceleration. If the engine drops to idle and then picks rpm up to the high level when you shut off the overdrive then that suggests the overdrive's clutch has moved and it is just not holding. Check fluid below and call Gear Vendors.

Fluid level:

Fill cars with ATF (trucks and motorhomes use 75/90 Lucas oil) until it runs out the fill hole (located half way up on the passenger side of the tail case). Do not overfill as that can lead to venting – let the fluid drain until it is level with the plug. Easiest method is the finger pump the auto parts stores sell for a one quart bottle – it is a little lube pump with a hose that costs on the order of 7 dollars.

Solenoid check:

Later electronics flash the overdrive light when you initially turn on the key (if you have this style) you should hear a click of the solenoid when the green light flashes. That proves the overdrive's solenoid wire is good. If in doubt or an earlier style that does not flash the green then you can take a little 9volt battery like the old calculators and garage door remotes used and just put the positive on one solenoid terminal and the negative on the other (just unplug our solenoid wire so you have access to the terminals and you can bend those terminals slightly to match the 9 volt spacing. You should hear the solenoid click the first time you hit it with the battery. Note – the solenoid may not click repeatedly because it has no ground to get rid of the stored current field (decay). Hook the solenoid wire back up and then remove if you want to recheck for the click with the battery again. The most common problem with the solenoid would be the potting (plastic with the two terminals) working its way out of the solenoid (the potting and terminals should be flush with the metal can of the solenoid housing).

No Reverse:

Can you roll vehicle forward in park – if so it is the overdrive causing the no reverse condition – call Gear Vendors immediately and always set your emergency brake when parked.

On larger vehicles like motorhomes instead of trying to roll the vehicle to perform above check – park momentarily on a steep grade and see if the vehicle will roll forward. If no steep grade is available you could rev up vehicle in reverse if slipping completely and quickly move to park (assuming vehicle is not moving – don't do this if vehicle is moving) and quickly move the shift lever to park. If the overdrive's reverse is bad the park pawl in the main transmission will make a ratcheting/grinding noise proving that the output of the main transmission is turning.

TROUBLE SHOOTING

Overdrive is erratic – sometimes drops out and loses green light or control of red light but if you restart the vehicle it is commonly good for a while.

Erratic operation is usually caused by low voltage when cranking the motor (starting). The Gear Vendors control box is supposed to be on an electrical circuit that is “off” during crank. Typically the radio fuse on the panel is a good source for off during crank. Look at the control box itself when cranking and ensure the lights and power go off during crank (not just dim) and turn on when the key comes back to run. If you suspect this to be the problem but cannot find an off during crank fuse position you can disconnect the power from Gear Vendors and then after you start the vehicle restore the power and prove out that the system now works properly – if that is the case then you can put a switch in the power lead so you can arm the Gear Vendors after the vehicle is started for correction of the problem.

Overdrive in-shift speed and/or out-shift speed is inconsistent or too low.

The Gear Vendors when set to Auto operation should be shifting in between 40-47mph (depending on year assembled – latest are all 47mph). In Auto it should shift out between 25-30 mph. If you find that this is not consistent it could be that the speedometer cable is binding at the signal generator causing the speedo cable to bounce (this bounce may or may not show at low speed on your speedometer head). To check simply unscrew both speedo cables a full revolution from tight on the signal generator and see if that fixes the issue. If it does than shorten either one of the drive tips going through the signal generator as they are probably too long and running into each other.

Dancing Lights – red then green then red then green etc – lights keep going on and off multiple times per minute.

This is typically a high energy EMF or IMF interference issue. Just to be sure that it is not speedo cable bind unscrew the cars original speedo cable from the signal generator and retest (obviously you will not have speedometer during this test). If that cures the problem shorten the tip on the speedo cable by a quarter inch and reinstall – could be binding by being too long). If speedo cable did not fix the issue then EMF (electro magnetic field) issues could be the problem so ensure that the Gear Vendors control box is not near the distributor , power module, or their power sources. If the problem is on a new install we should discuss our direct wire kit to eliminate the control box and just give you an autometer light that is on whenever the overdrive is on. Our control box work in 95% of all vehicles but that 5% is best served with direct wire hookup and it is free to you in exchange for the control box.

Cannot control red light :

With the vehicle idling but parked – you should be able to turn on and off the red light. If you cannot then the button operating it needs to be checked that it is switching – do you feel a click? Check continuity between the two wires or terminals it should go from no continuity to full continuity if it is working. Most common problems would be, foot switch does not click or threaded knob has been threaded too deep onto the shifter stalk and is actually shorting to ground by smashing against the wires in the shifter knob.

Lamp testing:

If you have no red light or green light and you suspect the bulb you can simply unplug the green and put the wires from the red on it or vice versa to see if the problem switches to the other bulb – and in this way prove the bulb is good. Both lights could not burn out at the same time so this is an effective test.

Vehicle grounds:

Grounds are a common problem on all electrics. It is a good idea to take a second chunk of wire from wherever you grounded you control box and run a wire from there to the chassis or negative terminal or wire that goes to the negative terminal (though not distributor or control module for distributor).

TROUBLE SHOOTING

General

In the event the overdrive fails to shift, determine whether low fluid level, or an electrical problem exists.

Electronics

If the unit fails to shift in or out of gear, notice if the green dash light (Overdrive) is on – or blinking on and off. It is this light that tells the overdrive to shift. If the light doesn't illuminate, it would indicate an electrical problem. However, the green light can illuminate and an electrical problem could exist beyond the green light.

Fluid Level

Slow shifting can indicate low fluid pressure. Make regular fluid level checks. The fill hole is located on the rear tail case, opposite the speedometer gear housing. (See Fluid: Type, Level & Servicing, for proper fluid level)

***CAUTION:** Extended use without oil will damage the **GV** unit. Check fluid level at the first sign of trouble. If low fluid level is suspected, operate vehicle with overdrive off.*

Current Flow

The **AUTODRIVE** control box is fed a signal by the signal generator attached to the speedometer cable. From the **AUTODRIVE** control box, a signal is sent to the dash-mounted green light, and then to the manual on/off foot switch; the signal's final destination is to the solenoid on the **GV** unit.

Make a quick check of the electrical connections at the solenoid, speed signal generator, and at the control box. Look for any wiring defects. See Test #8.

If the green dash light (indicating Overdrive) is illuminating at the proper road speed, and extinguishing as the vehicle stops, then the input side of the system is working properly. If the unit is not activating, with the green light on, is there power and ground to the solenoid through the solenoid wire.

Trouble-shooting Procedures

Refer to trouble shooting quick reference index and find heading that agrees with your symptoms, and follow the flow chart. Your digital display control box can also help determine electrical issues, and there is a digi-drive trouble shooting flow chart available to determine the correct trouble-shooting procedure from the original symptom.

When you reach a box on the trouble-shooting chart that says to perform a certain test, then refer to test explanations found on table-of-contents page. If you reach a box that says call **GV**, call 1-800-999-9555, and ask for the Technical Department.

TROUBLE SHOOTING

Test Drive (test #1)

Start the engine with the vehicle's transmission in Park (or Neutral). Locate **GEAR VENDORS UNDER/OVERDRIVE** dash mounted switch. The switch assembly consists of a green light (**OVERDRIVE**), a red light (**AUTODRIVE**), and a two-position rocker switch, which designates manual (**MAN**), or automatic (**AUTO**) operation mode. Manual transmission dash switches will still have both the red and green lights, but will have a dash switch labeled on (**ON to the left**), and off (**OFF to the right**).

Red Light Test (test #2)

With the ignition on the red light should be on, if not, depress foot switch (or the manual control switch on your shifter for manual transmission applications) near steering column, and the red light will come on. If no red light, see Test #9.

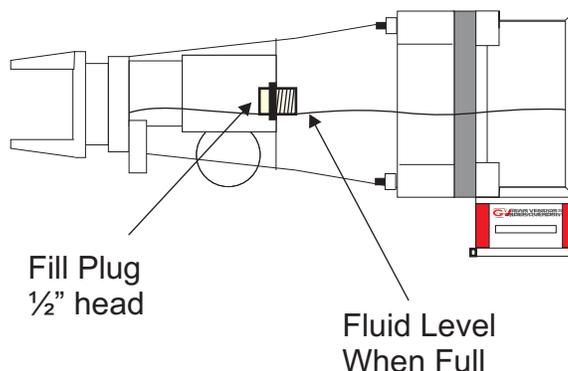
With the red light on, depress dash mounted rocker switch to AUTO position and move shift lever into the drive position. Drive the vehicle and as you accelerate, the **GV**, will shift on automatically at approximately 47 mph. The green light will come on and a gear change occurs. For manual transmission applications, the dash switch will be in the ON position, and once above 20 mph, the green light will come on and a gear change occurs.

If the green light does not come on, and no gear change occurs, go to trouble shooting chart titled: "No Green Light, No Overdrive".

If green light comes on, and no overdrive, then refer to trouble-shooting chart titled: "Green Light On, No Overdrive".

Check Oil and Road Test (test #3)

Level should be at the bottom of the fill hole, located opposite speedometer assembly.



TROUBLE SHOOTING

Decel Road Test (test #4)

With the gear selector in Drive, and Overdrive on, travelling approximately 50 mph, check for deceleration by letting off the throttle and moving the gear selector into the next lower gear. You should have good deceleration (engine braking).

If the vehicle freewheels (NO ENGINE BRAKING), turn overdrive off by depressing the foot switch (or manual control switch for manual transmission applications) near steering column. Now notice if the engine braking occurs. If unit has no decel in this position, call **GEAR VENDORS** Technical Service Department at 1-800-999-9555.

NOTE: Do not perform the decel test in first gear on automatic transmissions (or second gear on manual transmissions).

Reverse Test (test #5)

Putting the vehicle's gear selector in reverse, and giving the vehicle a short burst of hard throttle, will determine the reverse clutch's condition.

If vehicle freewheels (no engine braking) in direct drive, chatters on decel, or has no reverse, call **GEAR VENDORS** Technical Service Department at 1-800-999-9555.

Electrical Connector Check (test #6)

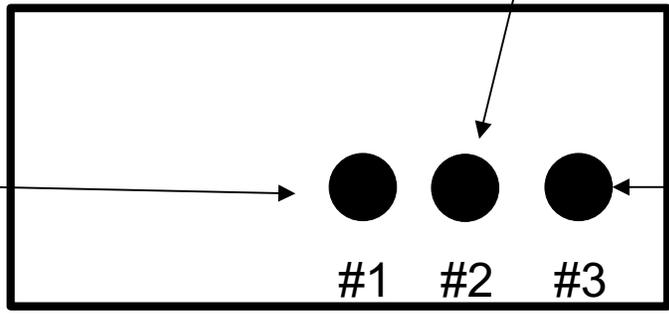
If you suspect an electrical problem: Check **AUTODRIVE** control box ground wire. Check system power; use voltmeter to confirm +12v is at blue wire on Rocker Switch assembly. Disconnect each of the **AUTODRIVE** control box electrical connectors (one at a time) and inspect connectors for corrosion. Inspect condition of each cable.

TROUBLE SHOOTING

DIGI-DRIVE TROUBLESHOOTING

Automatic: Autodrive On/Off Indicator
Manual: On when power supplied to box

Automatic: Foot Switch
On/Off Indicator
Manual: Hand Switch
ON/Off Indicator

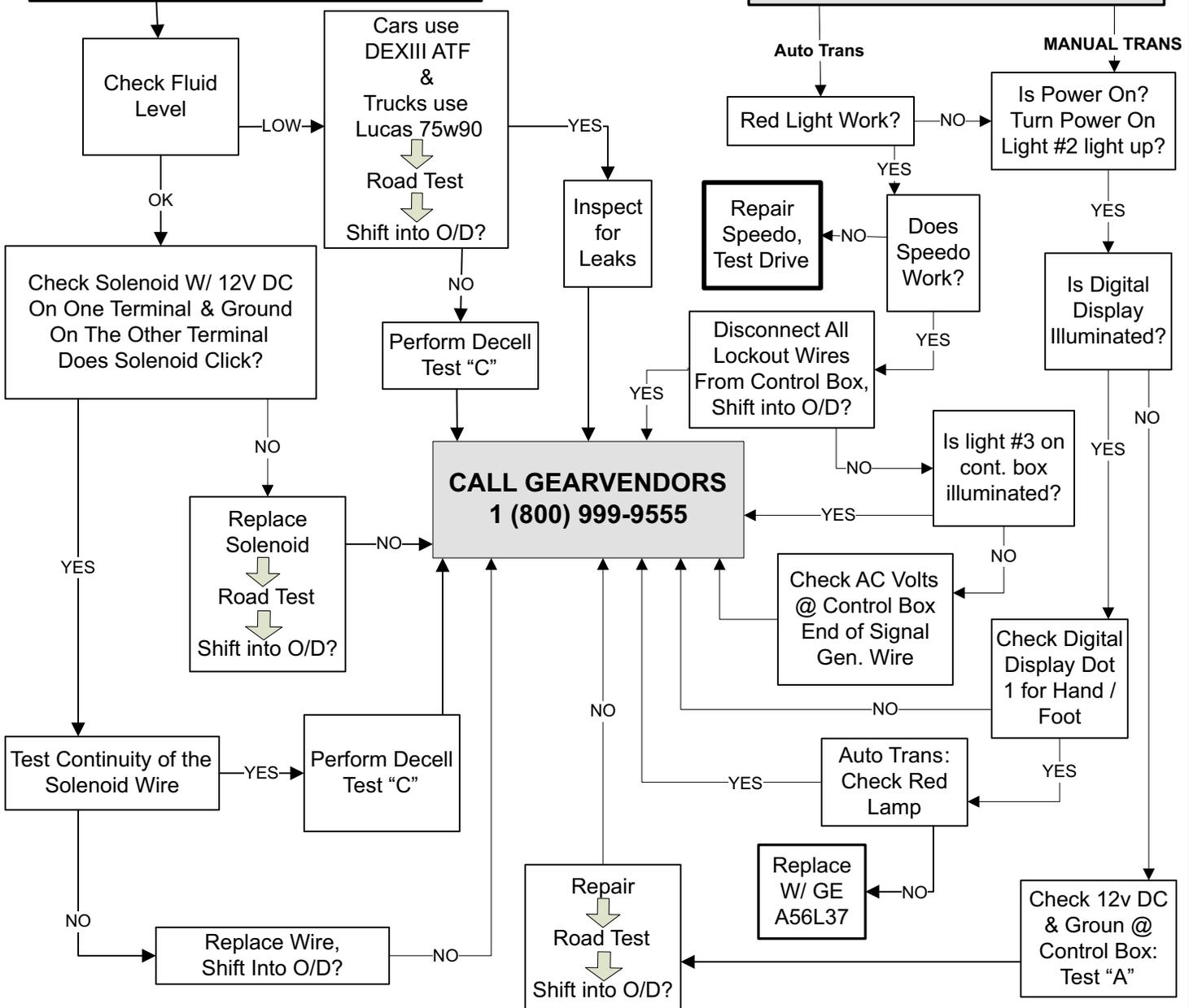


Illuminates @ 20 MPH

All three dots will illuminate in GV Overdrive, under normal operation.

#1 NO O/D – GREEN LIGHT DOES COME ON

#2 NO O/D – GREEN LIGHT WILL NOT COME ON



SPEEDOMETER GEAR

Gear Ratio	Drive Gear	23" Tire	24" Tire	25" Tire	26" Tire	27" Tire	28" Tire	29" Tire	30" Tire
		877 r/mile	840 r/mile	806 r/mile	776 r/mile	747 r/mile	720 r/mile	695 r/mile	672 r/mile
3.08	14T	38	36	35	42#	40#	39#	37#	36#
	15T	40	38	37	36	35	37*	36*	39#
	17T	41=	44	42	41	39	38	36	35
	VSSB	27.01	25.87	24.82	23.89	23.01	22.18	21.42	20.71
3.23	14T	39	38	36	35	42#	40#	39#	38#
	15T	42	40	39	37	36	35	34	36*
	17T	42=	41=	44	42	41	39	38	37
	VSSB	28.15	26.96	25.87	24.89	23.97	23.11	22.32	21.57
3.31	14T	40	39	38	36	35	37*	36*	35*
	15T	44	42	40	39	37	36	35	37*
	17T	44=	42=	40=	44	42	41	39	38
	VSSB	29.02	27.8	26.67	25.67	24.71	23.83	23.01	22.24
3.42	14T	42	40	39	37	36	38*	37*	36*
	15T	45	43	41	40	38	37	36	34
	17T	40==	43=	42=	45	43	42	40	39
	VSSB	29.99	28.72	27.56	26.54	25.55	24.62	23.77	22.98
3.50	14T	43	41	40	38	37	35	34	37*
	15T	41=	44	42	41	39	38	37	35
	17T	41==	44=	43=	41=	44	43	41	40
	VSSB	30.69	29.4	28.21	27.16	26.14	25.2	24.32	23.52
3.55	14T	43	42	40	39	37	36	35	37*
	15T	42=	45	43	41	40	38	37	36
	17T	42==	45=	43=	42=	45	43	42	41
	VSSB	31.13	29.82	28.61	27.54	26.52	25.57	24.69	23.87
3.73	14T	41=	44	42	40	39	38	36	35
	15T	44=	42=	45	43	42	40	39	38
	17T	44==	42==	40==	44=	42=	44=	44	43
	VSSB	32.71	31.33	30.06	28.92	27.85	26.86	25.93	25.07
3.90	14T	43=	40=	44	42	41	39	38	37
	15T	40==	44=	42=	45	44	42	41	39
	17T	41===	44==	42==	41==	44=	42=	41=	45
	VSSB	34.2	32.76	31.13	30.24	29.12	28.08	27.11	26.21
4.10	14T	45=	43=	41=	45	43	41	40	39
	15T	43==	41==	44=	42=	41=	44	43	41
	17T	43===	41===	44==	43==	41==	45=	43=	42=
	VSSB	35.95	34.44	33.04	31.8	30.63	29.53	28.51	27.56
4.56	14T	44==	42==	40==	44=	42=	41=	44	43
	15T	42===	45==	43==	42==	45=	44=	42=	41=
	17T	xxxx	xxxx	44===	42===	41===	44==	43==	42==
	VSSB	39.99	38.3	36.75	35.36	34.05	32.83	31.7	30.64
4.63	14T	45==	43==	41==	45=	43=	42=	45	44
	15T	43===	41===	44==	43==	41==	45=	43=	42=
	17T	xxxx	xxxx	xxxxx	43===	41===	45==	43==	42==
	VSSB	40.6	38.89	37.31	35.91	34.58	33.35	32.2	31.13
4.88	14T	42===	40===	43==	42==	45=	44=	42=	41=
	15T	45===	43===	42===	45==	43==	42==	45=	44=
	17T	xxxx	xxxx	xxxxx	45===	44===	42===	45==	44==
	VSSB	42.79	40.99	39.33	37.84	36.44	35.14	33.92	32.72
5.13	14T	44===	xxxx	xxxxx	44==	42==	41==	44=	43=
	15T	xxxx	45===	44===	42===	45==	44==	42==	41==
	17T	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxx	xxxx	xxxx
	VSSB	44.99	43.09	41.35	39.79	38.32	36.95	35.68	34.49

LEGEND:

= .89 Reducer Part # 1S0220
 * 1.11 Multiplier Part # 1S0221
 # 1.25 Multiplier Part # 1S0222

EXAMPLES:

- 3.55 Gear & 34" Tire = 17T Drive & 36T Driven
- 3.73 Gear & 31" Tire = 15T Drive & 36T Driven
- 5.13 Gear & 31" Tire = 15T Drive, 45T Driven & a .89 Reducer

SPEEDOMETER GEAR

Gear Ratio	Drive Gear	31" Tire	32" Tire	33" Tire	34" Tire	35" Tire	36" Tire	37" Tire	38" Tire
		651 r/mile	630 r/mile	611 r/mile	593 r/mile	576 r/mile	560 r/mile	545 r/mile	530 r/mile
3.08	14T	35#	42##	41##	40##	39##	38##	37##	36##
	15T	38#	36#	35#	34#	37*#	36*#	35*#	34*#
	17T	34	37*	36*	39#	38#	37#	36#	35#
	VSSB	20.04	19.41	18.82	18.27	17.75	17.26	16.79	16.35
3.23	14T	37#	35#	43##	42##	40##	39##	38##	37##
	15T	39#	38#	37#	36#	35#	34#	36*#	40##
	17T	35	38*	37*	36*	39#	37#	36#	35#
	VSSB	20.86	20.22	19.61	19.03	18.49	17.98	17.5	17.03
3.31	14T	38#	37#	35#	43##	42##	41##	39##	38##
	15T	36*	35*	38#	37#	36#	35#	34#	37*#
	17T	37	35	38*	37*	36*	38#	37#	36#
	VSSB	21.53	20.85	20.22	19.63	19.07	18.54	18.04	17.56
3.42	14T	35*	38#	37#	35#	43##	42##	41##	40##
	15T	37*	36*	35*	34*	37#	36#	35#	34#
	17T	38	37	36	43#	42#	39#	38#	37#
	VSSB	22.26	21.55	20.9	20.28	19.7	19.15	18.64	18.13
3.50	14T	36*	35*	37#	36#	35#	34#	42##	41##
	15T	34	34	36*	35*	38#	37#	36#	35#
	17T	39	38	36	35	34	42#	40#	39#
	VSSB	22.78	22.05	21.38	20.75	20.16	19.6	19.07	18.55
3.55	14T	36*	35*	38#	37#	36#	35#	38*#	37*#
	15T	35	34	36*	35*	34*	37#	36#	35#
	17T	39	38	37	36	35	41#	41#	40#
	VSSB	23.09	22.37	21.7	21.06	20.46	19.89	19.35	18.84
3.73	14T	38*	37*	35*	39#	38#	37#	36#	35#
	15T	36	35	34	37*	36*	35*	34*	37#
	17T	41	40	39	38	37	42#	43	42
	VSSB	24.26	23.51	22.79	22.12	21.48	20.9	20.33	19.79
3.90	14T	36	38*	37*	36*	35*	38#	37#	36#
	15T	38	37	36	35	34	36*	35*	34*
	17T	43	42	41	39	38	42#	36	35
	VSSB	25.36	24.57	23.83	23.12	22.47	21.85	21.26	20.69
4.10	14T	37	36	35	38*	37*	36*	35*	38#
	15T	40	39	38	36	35	34	34	36*
	17T	45	44	43	41	40	39	38	37
	VSSB	26.67	25.84	25.06	24.32	23.63	22.97	22.35	21.76
4.56	14T	42	40	39	38	37	36	35	38*
	15T	45	43	42	41	39	38	37	36
	17T	45=	43=	42=	41=	45	43	42	41
	VSSB	29.65	28.73	27.86	27.04	26.27	25.54	24.86	24.19
4.63	14T	42	41	40	38	37	36	35	38*
	15T	45	44	43	42	40	39	38	37
	17T	41==	44==	43==	42==	45	44	43	42
	VSSB	30.12	29.18	28.3	27.46	26.68	25.94	25.24	24.54
4.88	14T	44	43	42	41	39	38	37	36
	15T	42=	41=	45	43	42	41	40	39
	17T	43==	41==	45=	44=	43=	41=	45	44
	VSSB	31.74	30.74	29.81	28.94	28.11	27.34	26.6	25.89
5.13	14T	42=	45	44	43	41	40	39	38
	15T	45=	43=	42=	41=	44	43	42	41
	17T	xxxx							
	VSSB	33.38	32.33	31.35	30.43	29.56	28.74	27.96	27.23

LEGEND:

= .89 Reducer Part # 1S0220
 * 1.11 Multiplier Part # 1S0221
 # 1.25 Multiplier Part # 1S0222

EXAMPLES:

- 3.55 Gear & 34" Tire = 17T Drive & 36T Driven
- 3.73 Gear & 31" Tire = 15T Drive & 36T Driven
- 5.13 Gear & 31" Tire = 15T Drive, 45T Driven & a .89 Reducer

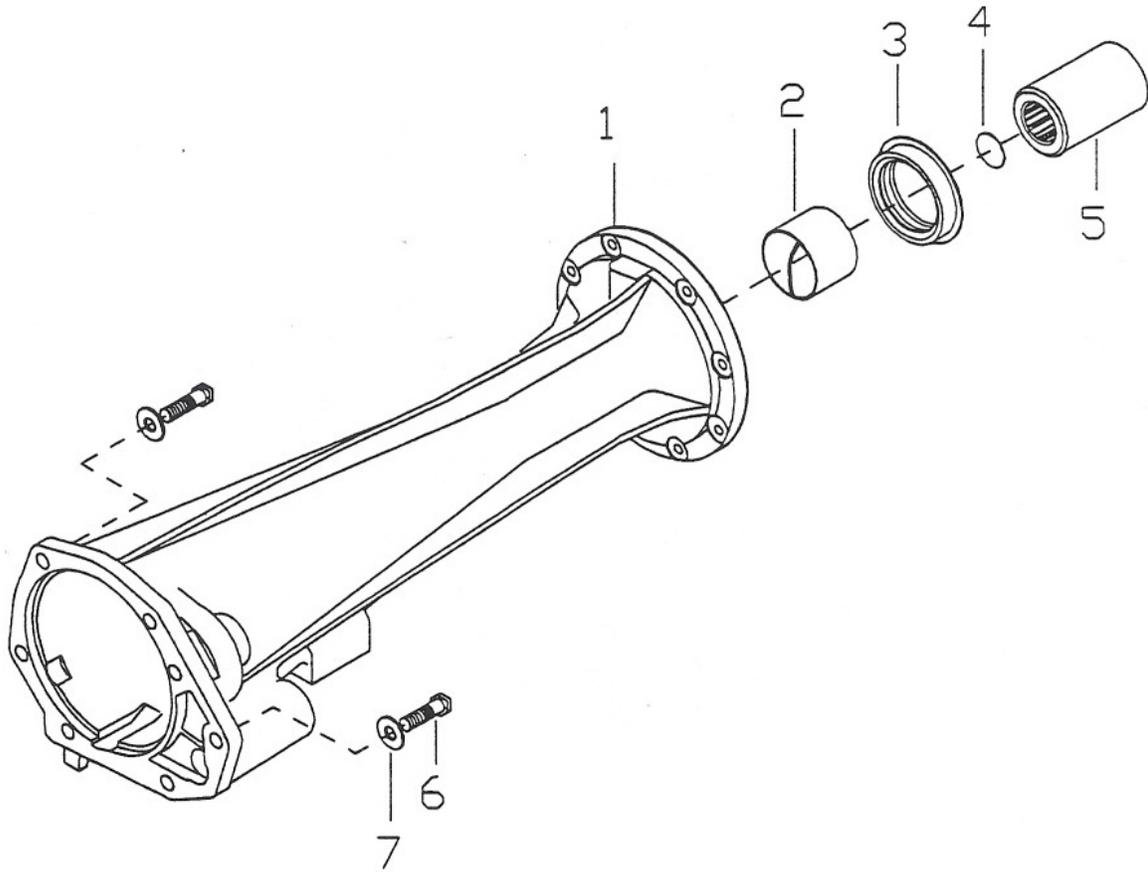
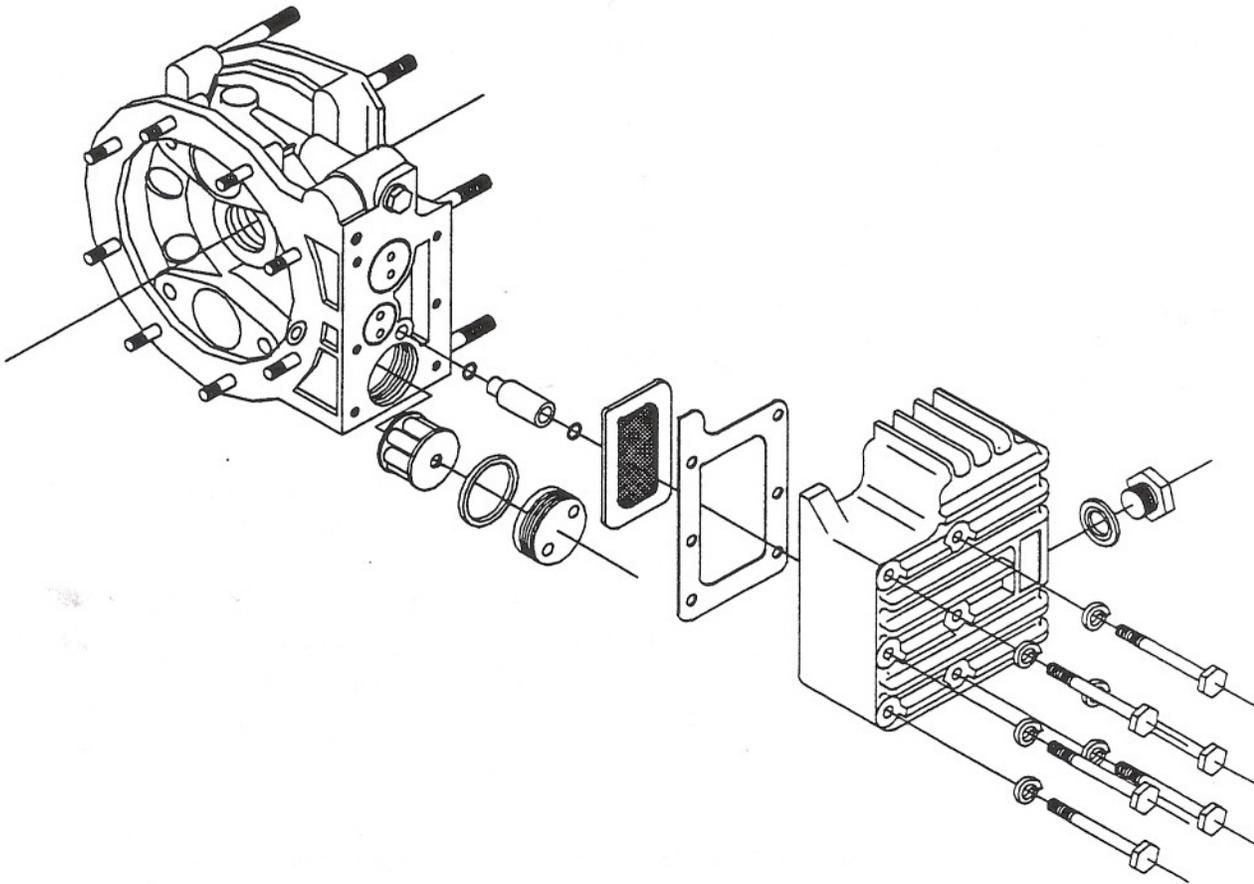


Figure 9-2 GV 727 Adapter assembly

- | | | |
|----|--------|----------------|
| 1. | 2Axxx | Adapter |
| 2. | 1B7000 | Bushing 34005A |
| 3. | 1S0009 | Seal (N 9449) |
| 4. | 1H0082 | Coupler Shim |
| 5. | 1Cxxx | Coupler |
| 6. | | OEM Bolt |
| 7. | | OEM Washer |



- i. Remove drain pan.
- j. Fill unit.

Torque Specifications

Nomenclature	Torque (lb. ft.)
Rear/Main case nuts	9- 13
Sump bolts	5- 7
Solenoid	30 - 40
Bridge Piece Nuts	6- 9
Front Face Studs	6-9

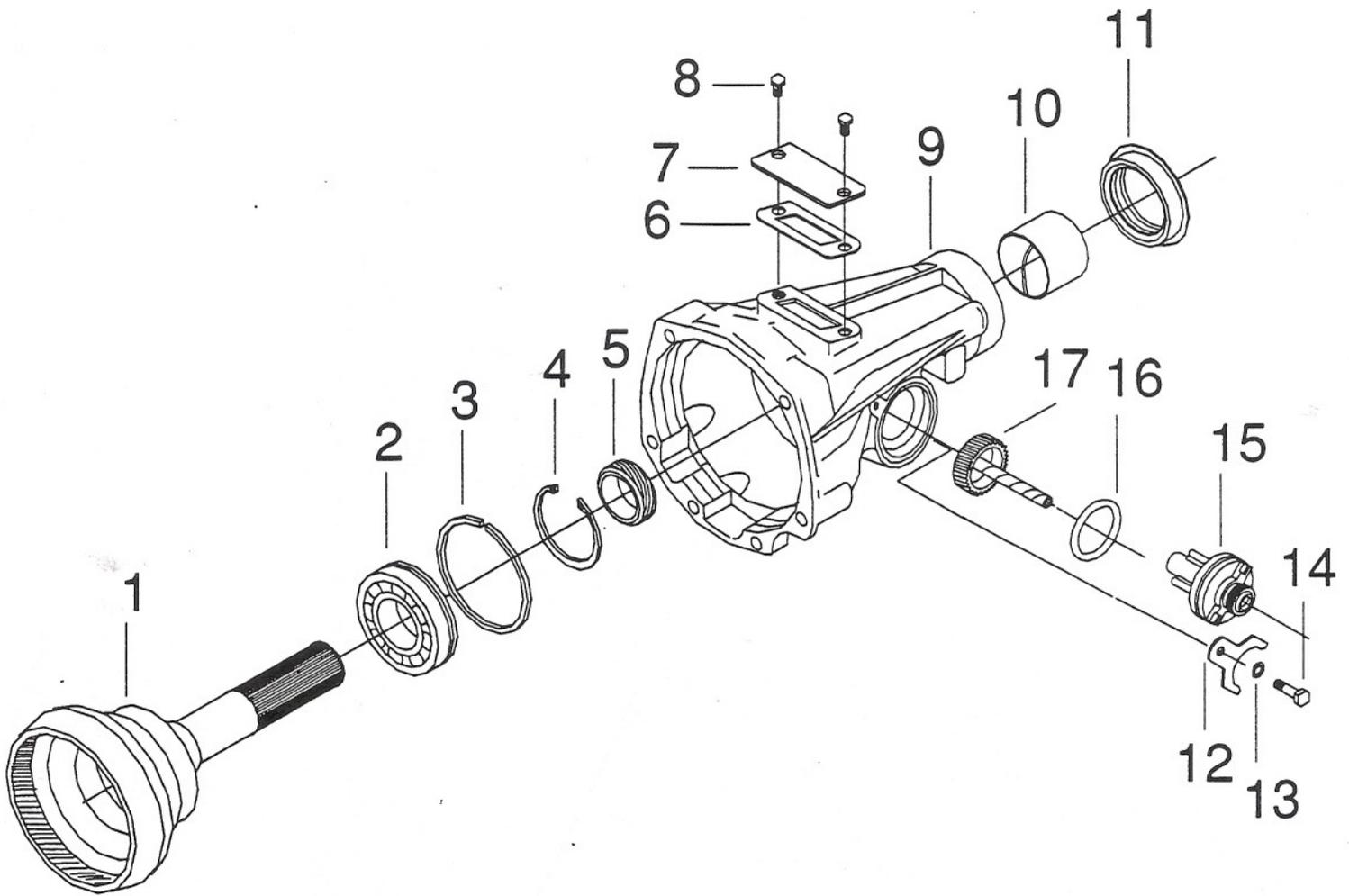
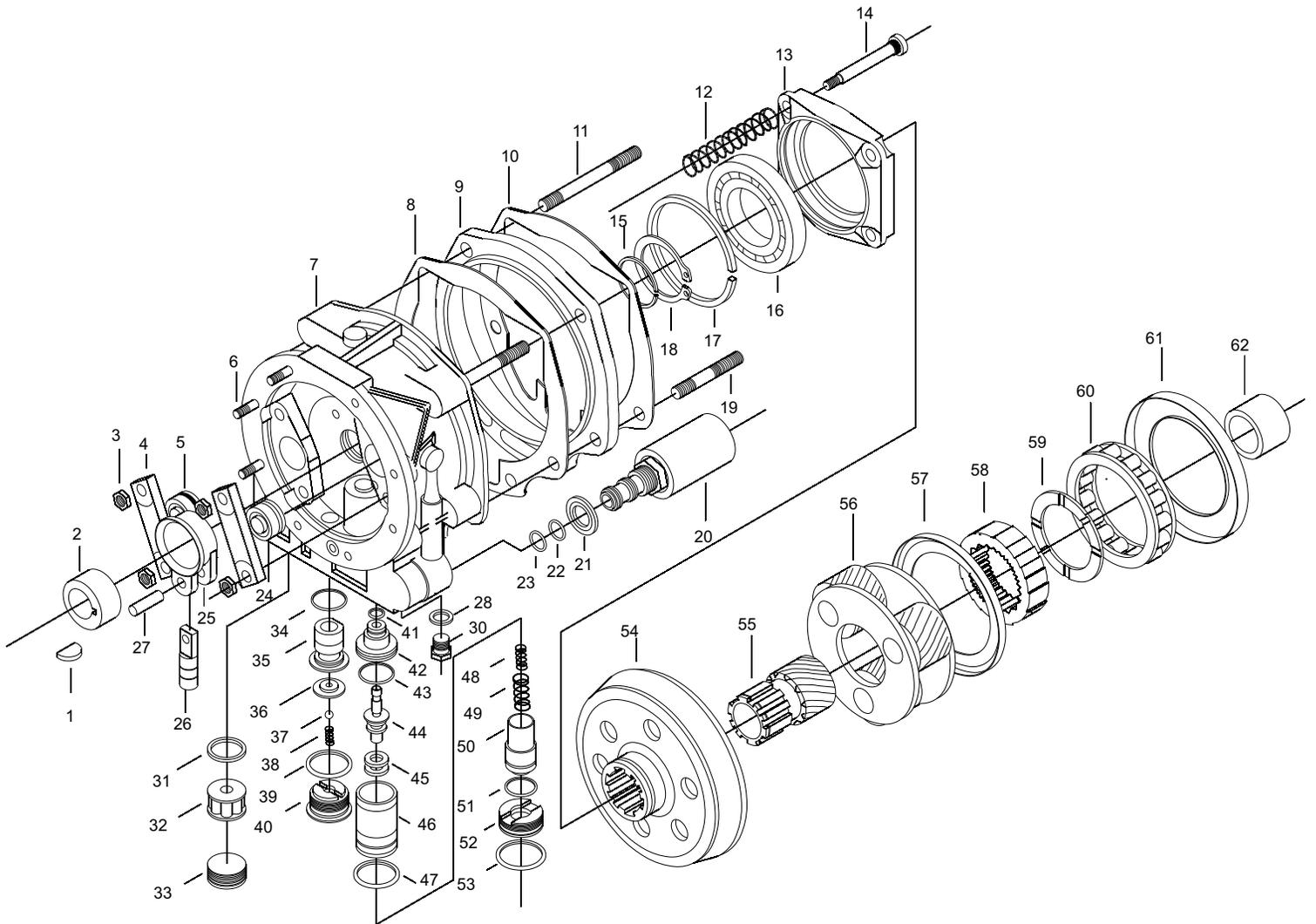


Figure 9-3 P-Type Tail Housing assembly

1	1D0070	Annulus	12	1R0011	Retainer
2	1B6208	Bearing	13	1H0002	Lockwasher
3	1R0015	Retaining ring	14	1H0070	6mm bolt
4	1R0005	Retaining ring	15	1S0217	Speedo sleeve lg.
5	1S0227	Speedo drive gear		1S0218	Speedo sleeve sm.
6	1G0015	Gasket	16	1S0031	O-ring 200-132
7	1D0080	Cover	17	1S0204	Speedo gear 34T through 1S0215
8	1H0103	8mm bolt			Speedo gear 45T
9	1D0076	Rear Case			
10	1B7000	Bushing			
11	1S0002	Seal			



1	1D0018 Woodruff Key	33	115294 Pressure Filter Plug
2	119492 Cam, Ball Type, input Shaft	34	115263 O-Ring
3	1D0020 Self Locking Nut	35	117917 Pump Body
4	60680 Bridge Bar	36	115307 Non-Return Valve Seat
5	119144 O-Ring, Laycock Big Piston	37	9811 Steel Ball
6	119148 Stud, O/D Front Face, Hardened	38	115308 Non-Return Valve Spring
7	119136 Main Case, Overdrive	39	115265 O-Ring
8	118906 Gasket Front Brake Ring	40	61177 Pump Plug
9	115220 Brake Ring	41	115291 O-Ring
10	118907 Gasket Rear Brake Ring	42	119060 Relief Valve Body
11	119150 Stud, Upper Main Case	43	115265 O-Ring
12	119125 Spring, Clutch Return 160#	44	119057 Relief Valve
13	115397 Clutch Bearing Housing	45	117848/01/00 Dash Pot Shims through
14	60720 Stud, Clutch Bearing Housing		117848/06/00
15	115395 Retaining Circlip	46	119058 Dash Pot Sleeve
16	115400 Clutch Bearing	47	115292 O-Ring
17	231/02/00 Retaining Clip	48	119145 High Pressure Spring
18	9027 Circlip, Sliding Member	49	117426 Residual Pressure Spring
19	11DD9149 Stud, Lower Case	50	119056 Dash Pot Piston
20	117719 Solenoid	51	117447 O-Ring
21	98175/10/00 Washer	52	119059 Dash Pot Plug
22	1S0020 O-Ring	53	115289 O-Ring
23	1S0020 O-Ring	54	119300 Clutch
24	119198 Piston Large	55	115393 Sungear
25	115245 Pump Strap	56	118980 Planet Carrier Assembly
26	115249 Pump Plunger	57	119159 Oil Catcher
27	115250 Pump Pin	58	118725 Uni-Directional Clutch Cam
28	98175/01/00 Washer	59	118728 Thrust Washer
29	130/12/00 Circlip	60	118737 Uni-Directional; Clutch Assembly
30	115260 Pressure Tapping Plug	61	118729 Oil Thrower
31	118930 Pressure Filter Washer	62	115347 Input Shaft Support Bearing
32	115294 Pressure Filter	63	1S0102 Input Shaft