

Borg Warner R10 Wiring Instruction

originally posted on

www.classictruckshop.com

on their "early burbs" page at:

www.classictruckshop.com/clubs/earlyburbs/projects/how_to.htm

This reprint is furnished to compliment the pages listed above and designed for the easier printing of the information. Please visit the above site often.

Due to printing constraints concerning color pictures, the above web site may have clearer pictures than offered herein. Other than that, the text was taken word for word. Many thanks to the author for taking the time to document his work!



Borg Warner Overdrive Wiring

If you are lucky enough to land your mitts on a T-85N tranny, this page is for you! These were used in Studebakers, GM, and Ford cars and trucks. It gives your truck a semi-automatic tranny setup, and you will have a 3/4 split shift unit. The diagram below is for those of you who get a tranny without all the relays etc. that are in the vehicle. If you already have one, you may consider rewiring it for split shifting.

This tranny setup can be operated in several ways.

In town, I take off in 2nd, then let it shift itself into 2nd over. I can redline at over 70 in 2nd over, so it's more than enough gearing for in town. (with a 3:96 rear end) I never touch the gear shift doing it this way, and use the clutch only when I have to stop completely.

On the road, I use the clutch and shift normally through the three gears, then let it glide up into overdrive. It's like a 4 speed then. When towing, I split-shift thru all six from a dead stop.

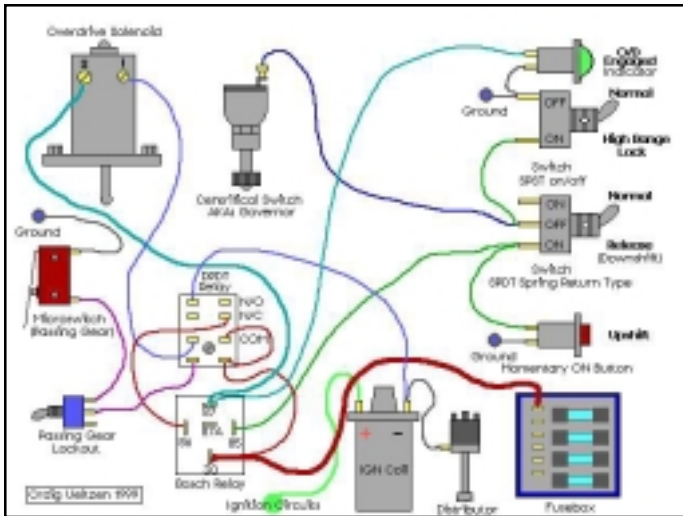
I can also use the high range lock switch to run a high set of gears as a normal three speed, but with about a 2:56 rear end instead of it's normal 3:96. 1st will take me to about 35 MPH, then 2nd will do almost freeway speed, then 3rd runs 1900 RPM at 70 MPH.

It's hard to get used to with it's freewheel clutch. When I first installed it, I would forget to declutch at a stop sign. After it was almost stopped, it would chug and stall. (oops) You can take off, then shift without using the clutch at all. It also gets rid of the first gear grind when coming to a stop, because the tranny's output shaft is unloaded from the driveshaft.

If you need to be towed, put the T-handle **IN** for freewheel. The tranny's output shaft won't even turn while it's towed. The only thing that will spin is the ring gear/clutch assembly in the overdrive unit.

Some cautions:

Some things you **HAVE** to remember: The tranny has a one-way freewheeling clutch. When parking, put it in **REVERSE** and/or set the brake!! If you leave it in any other gear, the truck will roll away on you!! The only time it won't do this, is when the freewheel clutch is locked out. Also, lockout the freewheel clutch when going down mountain passes!! The truck will idle as it rolls downhill and will have **NO** engine braking whatsoever *unless the overdrive is engaged*. If you downshift the O/D while going downhill, **you will lose all engine braking, and you will gain speed getting it shifted back into O/D!!** I usually lock it out on gravel roads so I can have engine braking also. This is what the T-handle on the dash is for. **IN** is for overdrive, and/or freewheel operation, and **OUT** is normal transmission operatio



This is a diagram for wiring a split shift control setup for your T-85N transmission. This can be used for one you've bought outright and have no original circuits for, or modifying the one you already have. The DPDT relay is a **Double Pole Double Throw** relay. Radio Shack carries them. The passing gear lockout switch is for when you want to run flat out without it dropping out of top gear.

Operation:

For a full six gear split shift: take off in 1st like normal, push the Upshift button. (This is the only time you need the upshift button, the governor does it after 27MPH) Let up on the gas, then step on it again. It's now in 1st over. Shift to 2nd while holding the release switch. Now you're in 2nd, let go of the release switch then let the gas pedal up and step down again. Now you're in 2nd over. Hold the release switch and shift to 3rd. Let the release switch up, and do the gas pedal trick again, and you will be in top gear.

For passing, there's two ways. Use the release switch then let up and reapply the gas pedal, or stomp it down far enough to operate the microswitch on the throttle linkage. The microswitch acts like an automatic transmission during 2nd gear kickdown.

Notes: The electric shift solenoid will stay in and/or out of gear until the engine torque is almost nil. The solenoid puts spring pressure on a set of locking dogs, so it just waits for a let up in torque. You can work the shift switches, but it won't do anything until the gas pedal is let up then reapplied. If you shift the tranny using the clutch, coastdown torque will make it hold position too. Kind of like an override over the electric controls.

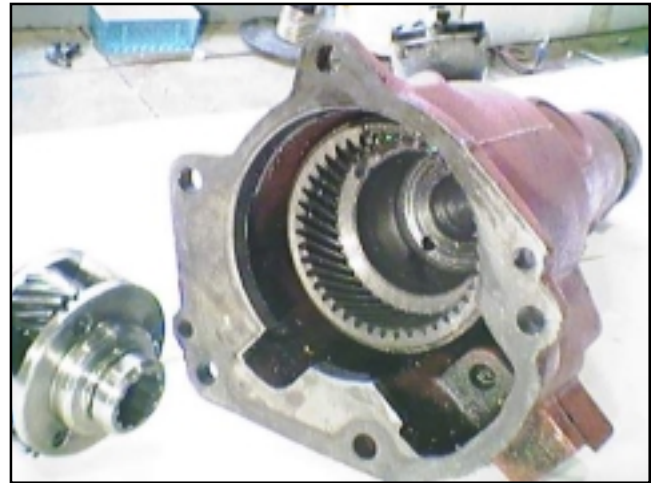


This is the split-shift control box in my 'Burb. The left button is SHIFT-UP, the middle is RELEASE, and the right is HIGH-RANGE. The engaged indicator is on the dashboard. I added rubber grommets to isolate it from the gearshift shaft to eliminate transmission noise from the cab.



This is a Borg Warner T-85N case with the components removed. The hole on the left is for the freewheel clutch lockout. The right hole is for the speedometer. These photos are of my spare overdrive unit.

Here's a view of the planetary gear set and sun gear, and the ring gear is in the case. The center section is removed. This case mounts to one side of the center section, and the tranny to the other. The stepped down part behind the ring gear is for the freewheel clutch roller bearings. The T-85N is a very stout unit!!



The overdrive solenoid with the cover removed. When powered, the shaft puts pressure on locking dogs until engine torque is released, then the locking dogs engage the planet set case, and the ring gear then rotates 27% faster than the input shaft. The large terminal is the (S)olenoid line, and the (I)gnition terminal has a short to ground when the shaft is in the engaged position.

This is to cause the engine to shut off long enough for the solenoid to release during passing gear downshifts. The solenoid actually has two coils. One is a "slam-in" coil and it is disconnected after the shaft moves in, then a low current "holding coil" keeps it in place.

This is the passing gear microswitch on my old carburetor. I didn't use the circuit with the built up 400 small block. It puts out way too much torque for the tranny gears to survive the slamming of very many passing gear kickdowns. I use the release switch and ease it down a gear instead.



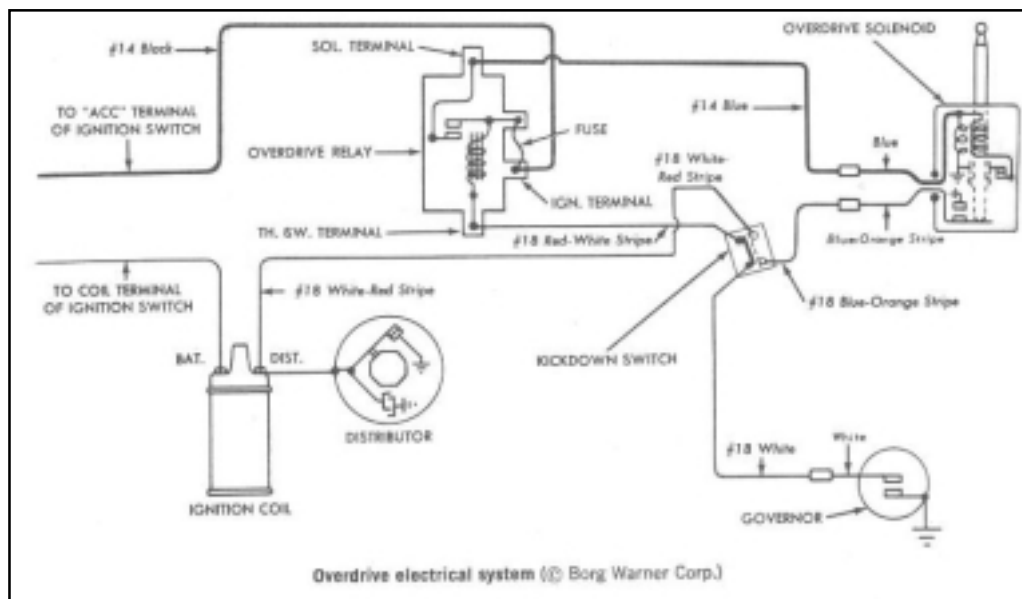


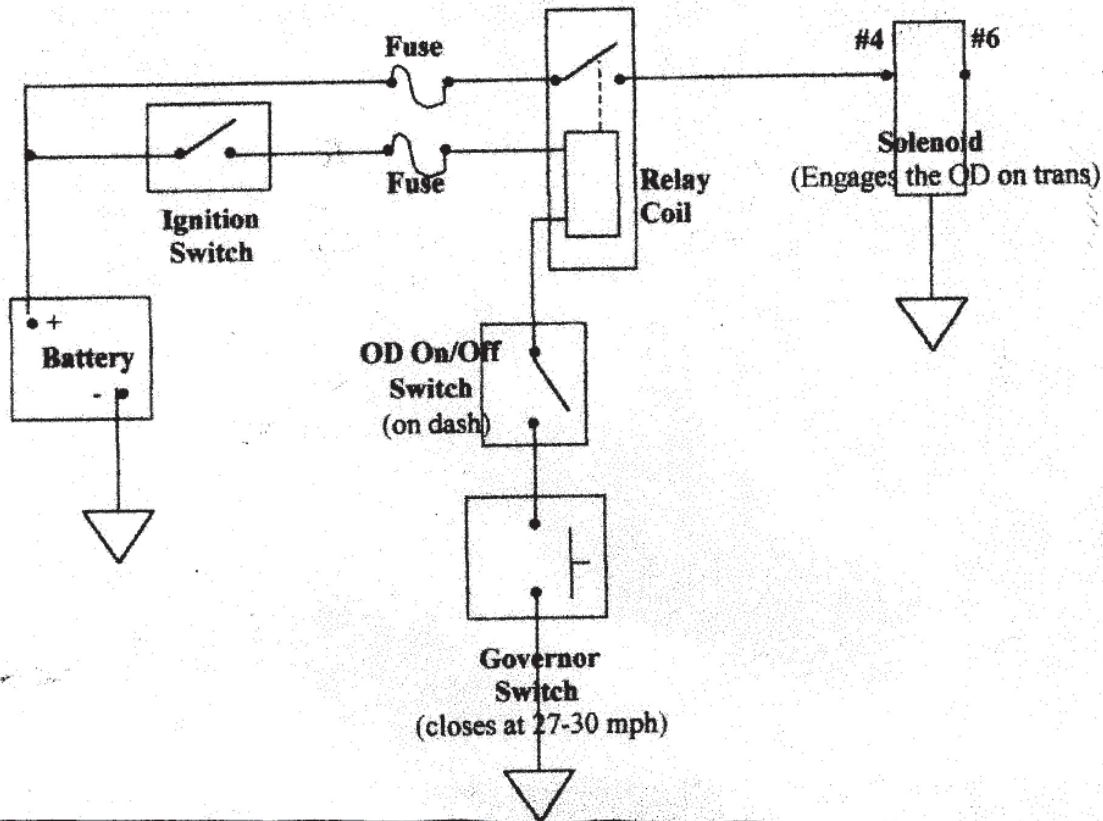
This centrifugal switch (Borg Warner calls it a governor) is a key part of the O/D setup. It switches to ground at 27 MPH, and releases at 21 MPH. They put thought into the speeds at which it operates. If you are in 2nd, it will shift up at 27 MPH. You let up on the gas, then step on it again for 2nd over. When you turn a corner, it will automatically downshift back to 2nd as you make the turn. It's GREAT!!

This is the cable for the freewheel clutch lockout. I didn't quite catch the lever it attaches to in the photo, but it's on the right just out of view. Run a T-handle cable to somewhere on the dashboard. You will use this to lock out the one way clutch. The solenoid is mounted in the center section. The tranny is a standard 3 speed except for two extra holes. One is for the reverse-O/D lockout rod, and the other is an oil flow hole.



This is Borg Warner's original wiring diagram scanned from a 1965 Chilton's manual. If you have an all original truck with the overdrive, this diagram should be usable. The DPDT relay in my circuit substitutes for the special kickdown switch that mounts above the gas pedal in the old vehicles.





Electrical Connections

- Locate a source of "switched" power (only powered while running). Normally this will be the ignition switch terminal that is connected to the ignition coil.
- Connect a 14 gauge wire with terminal lug from the ignition switch terminal to one side of an in-line 2 amp fuse.
- Connect the other side of the fuse to the coil of the relay.
- The relay coil will be connected to one open contact of the manual On/Off switch.
- The other side of the open switch is connected to the transmission governor and then to ground.

Note: This is the control circuit for the OD with relatively low current. Looking at the diagram, it is the path for current through the ignition switch, etc.

- The purpose is to energize the relay when the OD switch is turned on and the speed is over 27-30 mph as determined by the governor.

- Using another 14 gauge wire, connect a 12 volt source of power to a 10 amp in-line fuse.
- The other side of the fuse is connected to the normally open relay contact.
- Connect the other side of the normally open relay contact to the transmission solenoid, terminal #4. (Leave terminal #6 unconnected as you don't have the kick-down switch or circuit.)
- The solenoid is internally grounded, so no need for an separate ground wire
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Note: This is the controlled circuit for the OD with considerably higher current. Looking at the diagram, it is the path for current through the relay contact to the OD solenoid.

- The purpose here is to engage the OD solenoid when the OD relay is energized.

My relay, switch and in-line fuses were purchased from Radio Shack. I don't remember the part numbers and my truck is off to the body shop now, so I can't look. The switch and relay should be rated for 10 amps to be safe with the appropriate sized fuses.