

# The Kaiser-Frazer Overdrive

by "Kaiser Bill" Brown



## **General:**

Most Overdrive units built from 1935 to 1975 were built by Borg-Warner. These units were used by most all US car makers and they were very reliable. Many units and parts are interchangeable. The unit is a fairly simple one, very reliable and very effective.

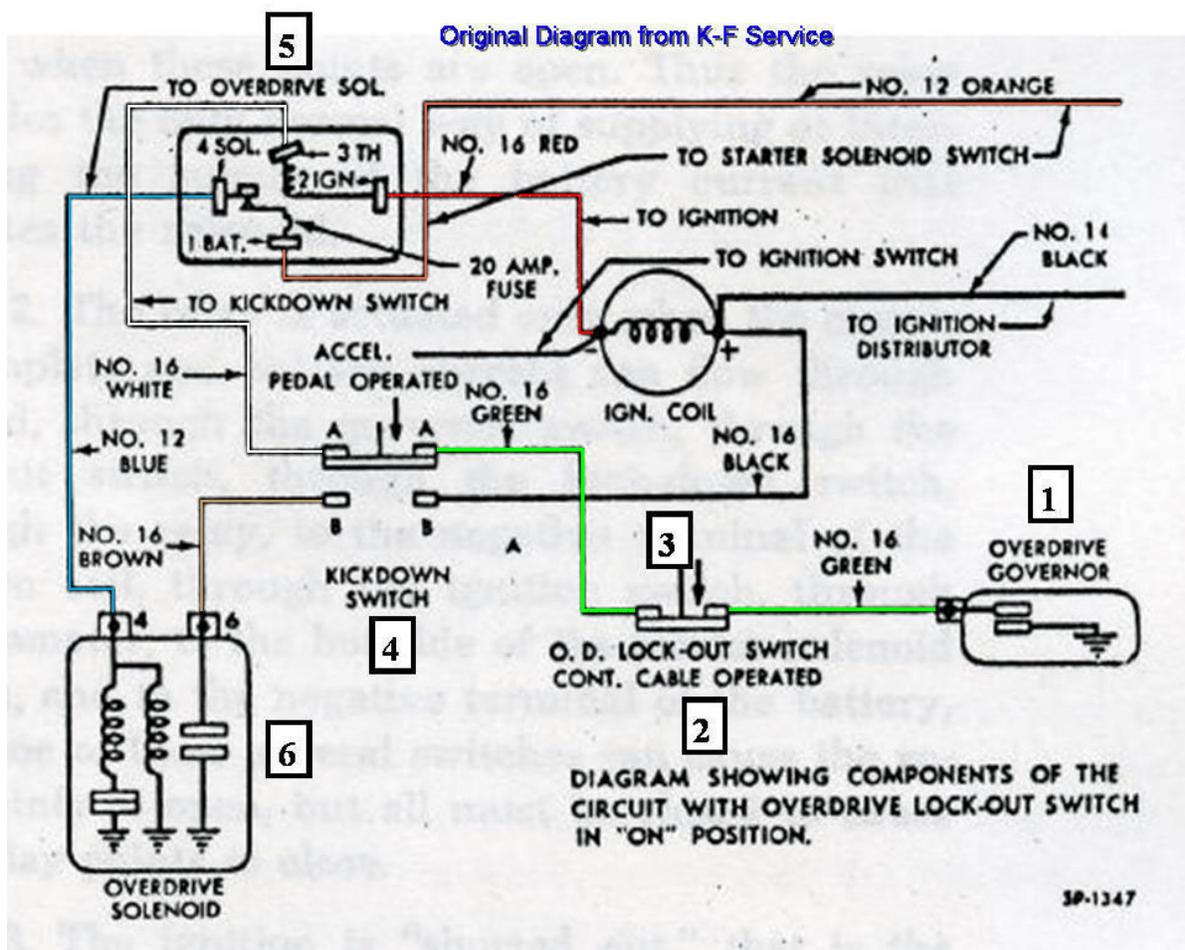
## **Why Overdrive?**

The Overdrive is designed to allow the engine to operate at a approximately 30% lower RPM when the Overdrive is engaged. The main purpose is to allow for better fuel economy and longer engine life.

## **How to Operate it:**

The unit is designed to automatically engage at approx 30 mph when the driver's foot is taken off the accelerator. The driver can disengage it by depressing the accelerator to the floor for increased torque when passing or hill climbing. Merely releasing the accelerator will re-engage the Overdrive. The unit will also automatically disengage when the car speed is reduced to approx 30 mph. The Overdrive will operate in any gear, low, 2nd or high.

## Typical Circuit Layout



### Trouble-Shooting - Here is how it works:

When the car reaches a speed above 30 mph the Overdrive Governor [1](smaller round thing sticking out from OD Unit) contacts make to ground. This ground is routed thru the OD Lockout Switch [2](left top of OD Unit) that is operated by the OD Cable[3], then thru the normally-made contacts in gas pedal "kick-down switch" [4](under the gas pedal on the floor), then to the firewall-mounted OD Relay[5]. The relay operates and sends 6-volt BAT to the OD Solenoid [6] (the larger round thing sticking out of the OD unit). To test this function, remove the single wire from the OD Governor [1] and test for -6 volts on the wire when you turn on the key. If voltage is there, then all of this is OK. If not, then one of the items mentioned above has a problem. Use the schematic and trace the problem.

If -6volts is there, your problem is probably your OD Solenoid [6]. Refer to Page 4 for rebuilding this unit.

The Solenoid [6] is kept from operating once the Governor [1] grounds the circuit by the force within the OD unit under stress. Merely taking your foot off the gas pedal will remove this stress and the OD Solenoid [6] will snap in causing the OD unit to activate and go into the OD gear. When you press the gas pedal all the way to the floor, you are actually temporarily grounding out (shorts out) your ignition circuit and breaking the ground circuit from the Governor [1] to the OD Relay [5]. The OD Relay [5] releases and breaks the battery circuit to the Solenoid [6] causing it to release which takes the OD out of gear. The ignition is only grounded momentarily since once the Solenoid [6] releases, it removes the ground from the ignition coil allowing the ignition to again provide -6 volts to the coil. Once your foot is again removed from the gas pedal the process is repeated.

If all of this tests OK, the problem is probably in the OD cable operated "pawl" that puts it into free-wheeling and activates the internal OD unit itself.

Note: The switch under the foot feed is referred to as the Overdrive "kick-down" switch. When you push the accelerator pedal all the way down above 30 MPH and in Overdrive, that switch will kick the transmission out of Overdrive for extra acceleration - for passing, on hills, or just to get it going! It works by temporarily shorting out your ignition. The small OD Lockout Switch [2] on the OD unit itself is activated by the OD cable [3] to put the transmission in OD mode. When this cable is pulled out it the OD unit is deactivated and the transmission is returned to "normal" mode and the OD free-wheeling is disabled. (Note: In order to push-start a car with Overdrive, you will need to pull out the OD Cable [3] and disable the OD free-wheeling)

### **Maintenance Considerations:**

Most Overdrive units built from 1935 to 1975 were built by Borg-Warner. These units were used by most all US car makers and they were very reliable.

**Oil Level:** Most failures occurred due to poor maintenance practices, especially from neglecting to maintain proper oil level in the Overdrive unit itself. Most owners and mechanics falsely thought that the oil in the transmission was shared by the Overdrive unit which it did not. The transmission and the Overdrive units have separate oil fill plugs and the oil level in each unit must be check separately through the fill plug hole.

**Switch Contacts.** Another common problem is dirty contacts in the various switches.

**Leaking Oil:** If your Overdrive is leaking oil, check that the rear seal has been properly installed. Many leaking seals are replaced only to leak again due to improper installation. There is no shoulder or "stop" in some overdrive housings and it is possible for the seal to be driven in flush with the housing. This allows the sealing lip of the seal to ride on the tapered end of the companion flange and permit leakage. Proper installation allows 1/4 inch of the seal to protrude outside the housing. Some newer seals have a "stop" built in to avoid this mistake.



**Defective Solenoid:** The Overdrive Solenoid [6] is one of the important ingredients in a full-functional Overdrive. It seldom fails, but when it does nothing works. The Solenoid is that round thing sticking out from the side of your Overdrive. Some are mounted on the driver's side and some on the passenger's side depending on your specific model. There are two wires attached. The terminals are usually marked No.4 and No.6. The Overdrive unit itself is bolted to the rear of your transmission and appears to be a part of the transmission itself. The Solenoid is a large electromagnetic unit with a long central plunger that activates the Overdrive by driving the plunger against a pawl inside the Overdrive. On the Kaiser Darrins there is not sufficient space for this unit to protrude if

mounted in it's normal fashion so it is mounted under the Overdrive unit and the plunger is attached to an enclosed lever that operates the Overdrive unit itself.

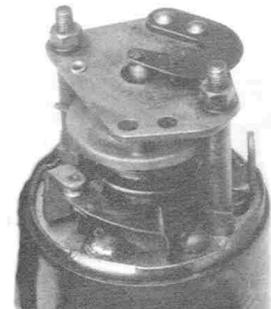
There were three type of Solenoids used on the Kaiser-Frazer cars. They all appear similar and all operate in the same manner although they are not totally interchangeable. Some of the mounting tabs and wiring terminal locations vary between the different types but they all perform the same function and are wired the same.

If you suspect your Solenoid is defective after performing the tests as outlined above in "How it Works" you can test it further in the following manner.

**Testing your Solenoid** - To perform a test on your Solenoid, it must be removed from the car. First, disconnect the wires and mark them with tape or a tag so you know which terminals they were attached to. Leave the two wire terminal screws out. Remove the two mounting screws that attach the Solenoid to the Overdrive unit. **Note: It will not pull straight out.** You will need to rotate the Solenoid clockwise about 1/3 rd turn. You can then pull the Solenoid out of the Overdrive unit. The end of the plunger has a round bulb that is ground flat on two sides. A common problem I find in many non-working Overdrives is the plunger was not engaged properly by the last person that installed it. If the plunger is not rotated and "seated" properly into the Overdrive pawl it will not function properly. If your Solenoid pulls out easily without requiring rotation, this may be one of your problems.

Next lay the Solenoid on your work bench and attach the body of the Solenoid to a 6-volt positive ground (+) and the No. 4 terminal to the battery hot side (-). The Solenoid plunger should quickly snap outward firmly. Caution: Do not apply 12-volts or you may destroy the Solenoid. If the plunger does not snap out firmly, is slow to move, or doesn't move at all, disassembly will be required.

Remove the two nuts holding the cap on the Solenoid. Take care when removing the cap. Inside you will see two sets of contacts. The top set is used to momentarily ground out your ignition upon "kick-down." The bottom set provides a path for full 6-volt current to pull up the plunger (push it out). If either of these contacts are rusted and broken beyond



repair you will need to send your unit out to a professional shop for replacement of the contacts. If the contacts are intact you should be able to salvage the unit. There is also a small insulated bumper on the tip of the top contact strip. It must be in place for proper operation. If it is missing you'll have a hard time locating a replacement and will probably have to send the unit out for professional repair.

If all appears okay so far, next remove the two nuts holding the top contact plate. Take care to retain all the parts, including the large spring, in the correct sequence for reassembly later. Remember, you have to put it back together. Remove the plunger. You may find that the plunger is stuck in the housing. Push it out by pressing the tip (bulb end) against a piece of wood. Now clean the unit and the plunger very good in some mineral spirits or other non-aggressive parts cleaner. If the plunger shows signs of rust, take some fine emery cloth and shine it. You can also use the emery cloth to clean the inside of the housing where the plunger fits. Just be careful not to be too aggressive. Test that the plunger will easily fit into the housing and move freely in and out. I take a small amount of pure silicone grease and lightly coat the plunger and the inside of the housing. Use a rag to remove any excess. The grease is not required and may even attract dirt quicker than just leaving it a bare, but it has worked well for me.

Next take a points file, or a small piece of very fine emery cloth, and gently clean the bottom set of contacts. (Caution: Do not use sandpaper) Be sure there is some tension on them. The emery cloth should drag. Also clean the set of contacts on the top plate. Then clean both sets with some contact cleaner.

Now take your ohmmeter and test the windings. The unit has two windings. One primary winding thru the bottom set of contacts and the second which is active all the time. Insulate both set of contacts with a piece of slick cardboard or plastic and check for continuity from the case to terminal No. 4 and to both sides of the contacts. If you have continuity your windings are probably good. The final test will verify that. Clean the spring and the top plate. Reassemble the plunger in the housing, with the spring and other parts, and check that the contacts will be forced open (not touching each other) when the plunger is pushed down. If not, adjust the contacts.

Reassemble the unit, making sure the little tab on the large spring washer is engaged onto the side pawl. A little dab of silicone grease may also be applied there if desired. Install the nuts and lock washers and tightened firmly. Check that the top set of contacts are open (not touching each other). The spring should be holding the plunger at the top which will open the top set of contacts. Be sure the bottom set of contacts are made (touching together).

Now re-test the unit. Again lay the Solenoid on your work bench and attach the body of the Solenoid to a 6-volt positive ground (+) and the No. 4 terminal to the battery hot side (-). The Solenoid plunger should quickly snap outward firmly.

As a finishing touch, clean the outside of the unit with laquer thinner and spray it with the color of your choice. Eastwood (800-345-1178) sells some gas tank paint (part number **10030Z**) that looks like the original zinc coating. Use new screws and washers for the wiring terminals and you have a "show" unit that works!

*Have fun!*

