

# GENERAL TECHNICAL QUESTIONS & ANSWERS

**Q: Should I use an aluminum or steel flywheel?**

**A:** Aluminum flywheels with their lighter weight, are typically used in oval track and road race applications and are also popular in high-horsepower, light weight drag cars. These vehicles rely on engine horsepower to drive the wheels. Steel flywheels are used in applications that require additional engine torque for performance. A heavier flywheel can help acceleration from a standing start and keep the engine's RPM and power up through shifting. These are characteristics needed in street, most drag race and other high-torque applications such as tractor pulling.

**Q: How should I adjust my clutch?**

**A:** First of all, be sure all mounting fasteners are torqued correctly, this is very important. The actual adjustment will vary depending on the type of pressure plate being used. With the clutch pedal completely depressed, a diaphragm should have .030-.040 air gap between the disc and flywheel, for a Borg & Beck the air gap should be .040-.050 and for a Long-Style pressure plate it should be .050-.060. On vehicles with mechanical linkage, with the pedal released, an air gap of .250" should exist between the throwout bearing face and pressure plate fingers. On cable and hydraulic applications, the throwout bearing face should rest lightly on the pressure plate fingers.

**Q: What is the difference between Neutral (internal) Balance and Detroit (external) Balance Flywheels?**

**A:** Neutral (internal) Balance engines and flywheels are each balanced as an individual unit. In other words, the engine and flywheel are in balance with or without the flywheel mounted to the crankshaft. A Factory Balanced (external), or Detroit Balanced engine uses the flywheel to balance the engine assembly. With the flywheel off of the engine, both the engine and flywheel are out of balance.

**Q: Should my new Hays Clutch be balanced before installation?**

**A:** No, all Hays pressure plates and flywheels are dynamically balanced to extremely close tolerances. However, if you are having an engine assembly re-balanced, it would be a good idea to include the clutch components to insure tolerances be as tight as possible.

**Q: What is static pressure?**

**A:** Static pressure, also referred to as base pressure, is the amount of spring pressure (in pounds per square inch) that is exerted by the pressure ring to the clutch disc when the clutch is engaged.

**Q: What is centrifugal or roller assist?**

**A:** Certain Hays pressure plates feature centrifugal assist for increasing pressure plate load to prevent slipping and high RPM plate/disc separation. The Borg & Beck design utilizes rollers inside the cover that are forced to the outside under centrifugal force to increase plate load as RPM increase. Certain Long-Style pressure plates use levers that have extra weights on the levers to provide centrifugal assist.

**Q: I am in the process of building a car strictly for the track, I need some further information on exactly how to set up the clutch?**

**A:** No matter what type of racing you are involved in, oval track, drag racing, off road, speed boat, tractor pulling etc., the Hays Tech Services Line is there to get you the answers and information you need. For ordering, pricing and technical information, we are available between the hours of 8:30 a.m. and 5:00 p.m., Monday through Friday EST at 216.688.8300.

**Q: Can my Hays clutch be rebuilt?**

**A:** Hays can rebuild most Borg & Beck and Long style pressure plates, clutch discs and flywheels. See question above for calling details.

Visit [www.haysclutches.com](http://www.haysclutches.com) for warranty information.

# CLUTCH INSTALLATION GUIDE

**PLEASE READ THOROUGHLY BEFORE INSTALLATION.  
CONSULT REPAIR MANUAL FOR SPECIFIC INSTRUCTIONS FOR YOUR VEHICLE.**

## I. CLUTCH REMOVAL

- A. Mark drive shafts so that the marks are matched up on reassembly. This will keep the drive system in balance.
- B. Fully support transmission, making sure that it is securely fastened to transmission stand. Do not allow gearbox to hang on the input shaft.
- C. Remove gearbox. Replace the two mounting bolts with studs that will act as a guide during re-assembly.

## II. INSPECTION

- A. **FACINGS**  
Check for oil on old facings. Oil leaks near the clutch must be repaired before installing the new clutch kit.
- B. **CLUTCH DISC**  
Check splines for wear. Uneven wear of the splines is a sign of misalignment. Check for flywheel run-out.
- C. **FLYWHEEL**  
Inspect for signs of overheating cracks, scoring and warping. If any of these conditions are present, the flywheel must be resurfaced or replaced.
- D. **INPUT SHAFT**  
Check Splines for wear or nicks. Apply a thin film of grease (supplied in kit). Wipe off any excess. Ensure that the new disc slides smoothly on the splines before fitting.
- E. **RELEASE BEARING RETAINER**  
Check for wear, nicks or scratches. The new bearing must slide freely. Remove old grease and apply thin film of new grease. Lightly grease fork pivot and fingers. Ensure smooth operation.

### FOR BEST RESULTS:

- Install new release bearing and pilot bearing / bushing whenever installing a new clutch.
- Replace clutches as sets:
- DO NOT install a new pressure plate (cover assembly) with a used friction disc.
- When it is necessary to install a new friction disc with a used cover assembly, make certain that the pressure plate is perfectly flat and free of heat scoring, and that the friction surface is perfectly clean.

## III. INSTALLATION

- A. Make certain that the flywheel, pressure plate and friction disc surfaces are absolutely clean.
- B. Use a clutch alignment tool to correctly align the friction disc.
- C. Assemble cover to flywheel. Ensure that the cover matches with locating dowels. Tighten cover bolts opposite each other and evenly, one turn at a time. Torque to spec.
- D. Install transmission into place using the guide bolts. Input shaft should slide smoothly and easily through hub into pilot bearing. DO NOT FORCE or use the tightening of the bellhousing bolts to draw the transmission to the engine block. Rotate input shaft if necessary to align splines. Never allow the transmission to hang without the support of a transmission jack during installation.
- E. Refer to the vehicle manufacturer's specifications for correct adjustments of the clutch.

# DIAGNOSIS OF CLUTCH PROBLEMS

<b>PROBLEM</b>	<b>CAUSE</b>	<b>PROBLEM</b>	<b>CAUSE</b>
Slippage	Worn facings Cover bolts loose Oil on facings Improper linkage adjustment Weak or broken diaphragm/springs Glazed facings	Grabbing	Oil on facings Worn facings Warped pressure plate Too much pressure
Chatter	Glazed facings Oil on facings Worn facings Bad motor mounts Improper linkage adjustment Worn throwout bearing Worn fork Warped pressure plate Broken pressure plate Pressure plate levers out of adjustment	Clutch Drag	Improper linkage adjustment Hub binding on input shaft Broken pressure plate Warped disc
		Noise	Pilot bearing worn out or dry Throw-out bearing worn out Transmission input shaft bearing worn out Fork pivot worn or dry



# CLUTCH INSTALLATION TIPS

When installing any clutch, there are certain, definite procedures you should follow. Paying attention to these details can help prevent time consuming and potentially costly repairs or premature product failure.

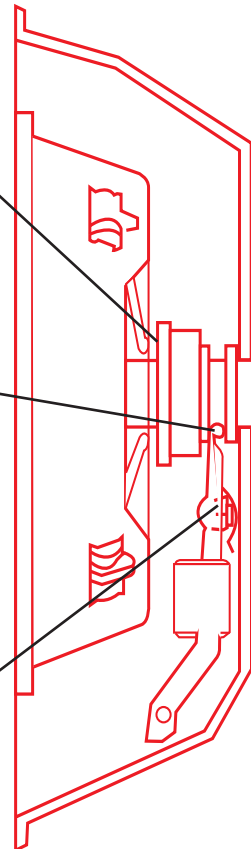
1. Be sure your hands and all parts are clean and free of oil and grease prior to and during installation.
2. **ALWAYS** use a new disc with a new pressure plate.
3. Double check the fit of the throwout bearing and clutch disc on the transmission input shaft prior to installation.
4. Hays recommends installing a new pilot bushing or bearing whenever replacing a clutch assembly.
5. If a new flywheel is not being used, check your old flywheel for cracks, hot spots, high or low areas and other inconsistencies. If any of these conditions exist, have the flywheel resurfaced or replaced before installing a new clutch unit.
6. Install the flywheel on the crank hub and torque flywheel bolts to specification in a criss-cross pattern.
7. Insert alignment tool through clutch disc and into the pilot bushing with the sprung center hub away from the flywheel.
8. After aligning the disc, install the pressure plate and attaching bolts finger-tight, then torque progressively around the pattern to the torque specs listed.
9. Remove spacers from levers (if included) only after the pressure plate is torqued to the flywheel. If you do not torque the bolts in sequence with the lever spacers in place, the cover can be distorted or bent resulting in a clutch that cannot be properly adjusted. (Does not apply to Diaphragm Pressure Plates.)
10. Install a new throwout bearing, being careful it is mounted correctly in the clutch fork. Locate and attach the bearing/fork unit inside the bellhousing and align bearing surface with clutch evers. Insert the transmission input shaft through the throwout bearing and into the disc and pilot bearing, tighten the transmission to the bellhousing. Do not allow the transmission to hang on the disc hub, as this will result in a bent or broken disc.
11. Re-attach the clutch linkage and with the clutch pedal depressed to the floor, adjust the air gap (between the clutch disc and flywheel) to the specifications listed. Release the pedal and check that throwout bearing clearance is at least .250" between the throwout bearing face and pressure plate levers, regardless of floor to pedal clearance.

After the air gap between the disc and flywheel is set, allow at least .250" clearance between the pressure plate levers and throwout bearing when the pedal is fully released. If the clearance is not present, re-adjust. If there is still not adequate clearance the throwout bearing is likely too long, or the clutch release fork angle is incorrect.

Be certain the throwout bearing is correct and installed properly on the clutch fork. Having a wrong or improperly installed bearing can result in inaccurate clearances, excessive pedal pressures or premature clutch wear. If the bearing is too long, replace with a shorter one. **Throwout bearing problems are responsible for 85% of clutch wear and warranty questions.**

The angle of the clutch fork is also very important, if not adjusted properly, problems similar to an incorrect throwout bearing can result. When the pressure plate is properly disengaged (pedal in), the fork should be in a position parallel to the rear face of the engine block. If the fork is not in the correct position, proper leverage will not be present and undue pressure and wear will result on all clutch components. This can be addressed by changing the length of the throwout bearing and/or installing an adjustable pivot ball, Lakewood Part No. 15501 in GM applications.

Air Gap Measurement	
Diaphragm	.030-040
Borg & Beck	.040-050
Long-Style &	
12 Bolt	.050-060



This shows the proper way for the throwout bearing to be installed onto the clutch fork. Lightly grease the outside sleeve of the throwout bearing before installation. This will allow it to slide into the fork.

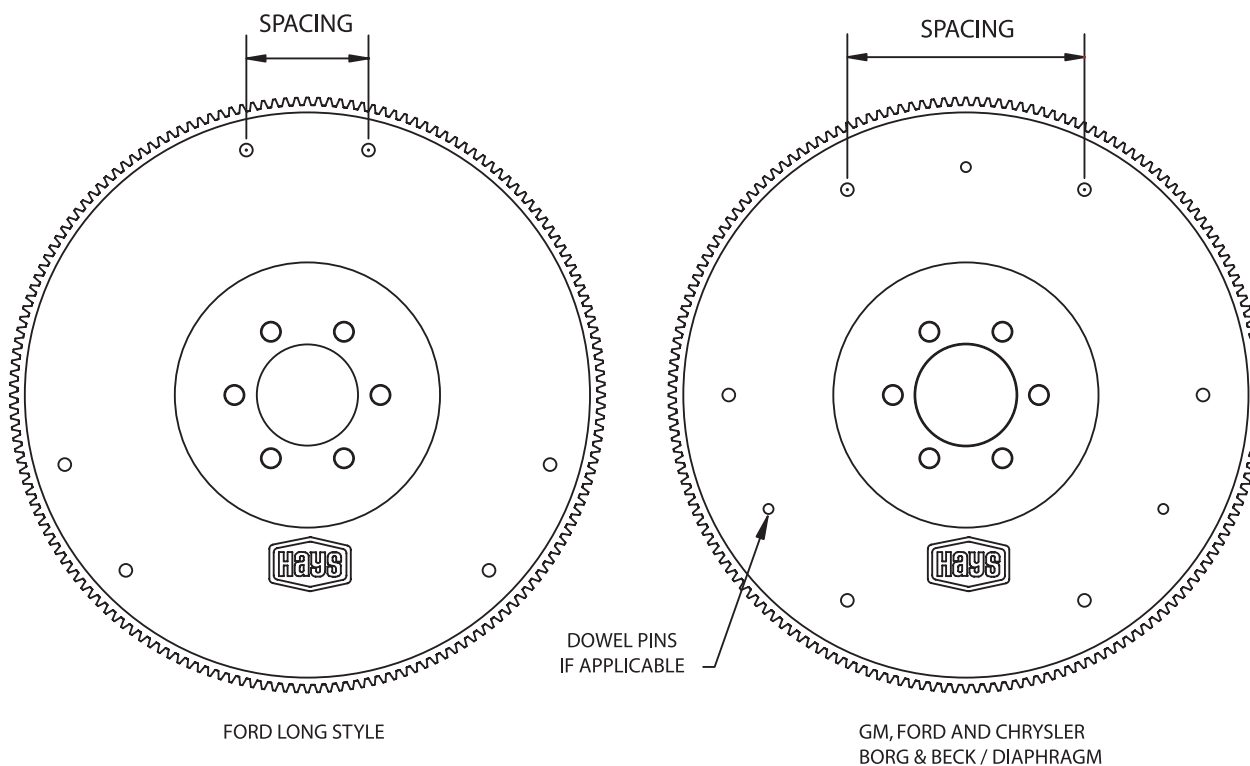
## FASTENER TORQUE SPECIFICATIONS

## TECH TIP

Bolt Size	Torque
5/16-18x1"	25 ft/lbs.
3/8-16x1"	35 ft/lbs.
7/16-20x1"	70-80 ft/lbs.
1/2-20x1"	100-110 ft/lbs.
1/2-20x3/4"	100-110 ft/lbs.



# PRESSURE PLATE MOUNTING HOLE SPECIFICATIONS



Make	Clutch Diameter	Clutch Style	Bolt to Bolt Spacing	Mounting Bolt Thread Size	Dowel Pins Required
Chrysler	10" or 10.4"	BB/D	5-13/16"	3/8-16 UNC	No
Chrysler	11" or 12"	BB/D	6-5/16"	3/8-16 UNC	No
GM	10" or 10.4"	BB/D	5-13/16"	3/8-16 UNC	No
GM	11" or 12"	BB/D	6-5/16"	3/8-16 UNC	No
GM LS-1	11" or 11.5"	BB/D	6-5/16"	10mm x 1.50	Yes
GM LT-1	11" (Pull Type)	BB/D	5-13/16"	3/8-16 UNC	No
Ford	10" (Long Pattern)	D	3-1/8"	5/16-18 UNC	No
Ford	10" or 10 1/2"	Long	3-1/8"	5/16-18 UNC	No
Ford 1986 -Up	10.4" (Mustang)	D	5-5/8"	8mm X 1.25	Yes
Ford	11"	Long	3-3/8"	5/16-18 UNC	No
Ford	11"	D	6-3/16"	3/8-16 UNC	No
Ford 4.6L	11" (Mustang)	D	6-3/16"	8mm X 1.25	Yes
Ford	11 1/2"	Long	3-9/16"	5/16-18 UNC	No

BB = Borg & Beck    D = Diaphragm

*Note: Bolt to bolt spacing is shown to the nearest fraction of an inch for reference only and may not be exact.*