INSTALLATION INSTRUCTIONS

5.5" (140 mm) and 7.25" (185 mm) Carbon Clutches

The patented Tilton Carbon (C/C) clutch provides the best combination of light weight, low moment-of-inertia, smooth engagement, and durability. It is also an excellent value when properly maintained. Every clutch is tested for clamp load, torque holding capacity, and clean release prior to shipping. Records of the test results are included with the clutch. Tilton maintains a file on every C/C clutch they build. This file includes all of the original build and testing information and all service/rebuild history performed by Tilton. Save the build sheet provided with the clutch. It includes critical maintenance information.

A) Installation

1. Proper alignment of the input shaft with the crankshaft is critical for long clutch life. Use the following procedure if your gearbox uses a separate bell housing. Bolt the housing onto the engine. Place a magnetic base dial indicator on the end of the crankshaft. Sweep the transmission register diameter on the inside of the back of the bell housing. Total Indicated Runout (TIR) must not exceed **.010"**. Sweep the back face of the bell housing at a **6" (150 mm)** diameter. The TIR in this position must not exceed **.010"**.
2. Install a new pilot bearing. A prematurely worn pilot bearing indicates a bent input shaft or an input shaft that is otherwise not properly aligned. Misalignment can be caused statically (see Step 1) or dynamically, like when the weight of an unsupported gearbox causes a weak bell housing to flex under racing conditions.
3. The drive hub should slide smoothly on the input shaft. An application of anti-seize compound is acceptable if very little is used.
4. The drive hub can usually be installed in one of two directions. The clutch will work either way as long as the hub clears the flywheel bolts and the hub's splines fully engage the input shaft splines. The hub will move towards the flywheel as the clutch wears.
5. With the flywheel bolted to the crankshaft, place the clutch on the flywheel. Using an alignment tool or spare input shaft, align the hub. Tighten the bolts in a star pattern turning each one less than one full revolution at a time. 5/16" and 8 mm bolts should be torqued to **18 lb-ft** *with oil or thread locking compound*. Threaded aluminum flywheels may require less torque to prevent stripping the threads. Once the bolts have been tightened, the diaphragm spring fingers should appear nearly flat. If the fingers appear to be inverted, you may not have the proper pressure plate installed in the clutch or the pressure plate may not be seated in the top floater plate (5.5" clutches).
6. Set the bearing clearance. If you are using a Tilton hydraulic release bearing the recommended clearance is **.170"–.230" (4.3 mm–5.8 mm)**. Depending on your particular clutch configuration **(Table 2)**, the bearing clearance loss will be four to five times the amount of the clutch wear. You need to have enough bearing clearance to allow the full wear range of the clutch.

Table 1

Carbon Clutch	5.5"	7.25"
Release Bearing Contact Diameter (Radius Face)	38 mm	44 mm
Maximum Stroke of Clutch Diaphram Spring	.185" (4.7 mm)	.250" (6.4 mm)
Recommended Master Cylinder Bore when Using Tilton Hydraulic Release Bearing* * Except: Sprint, Midget, & Silver Crown Package	5/8"	3/4"
Theoretical Maximum Master Cylinder Stroke with recommended Master Cylinder *Assuming .040" cut-off port travel.*	.780" (19.8 mm)	.730" (18.5 mm)

Diagram 1

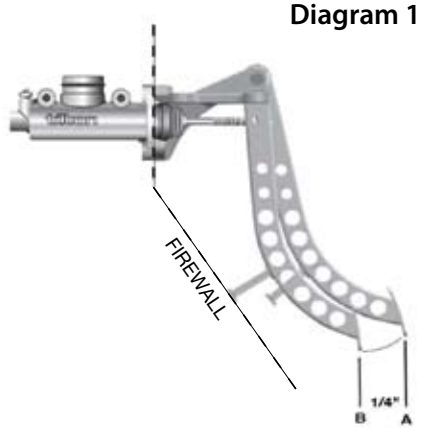


Diagram 2

Pressure Plate Measurement Diagram

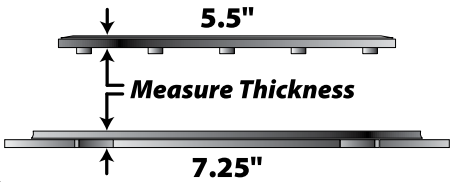
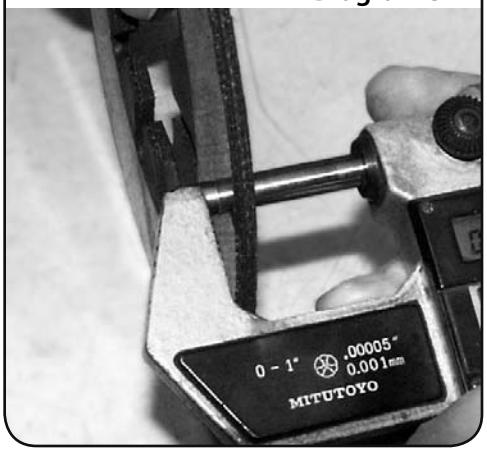
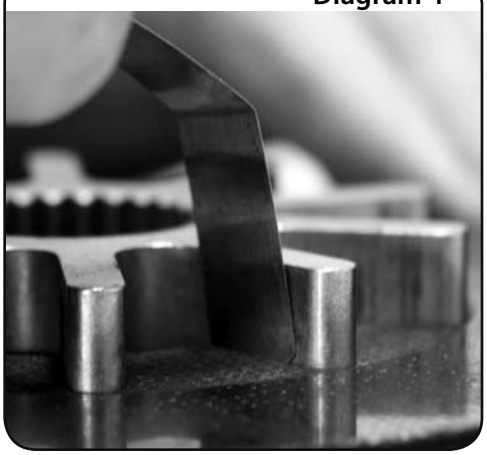


Diagram 3



Measure at least three different places within the wear area, and take the average of all measurements.

Diagram 4



7. When installing the gearbox, do not allow its weight to be supported by the clutch.
8. The clutch diaphragm spring must not be stroked beyond the maximum amount listed in **Table 1**. A pedal stop may be required to prevent damaging the clutch **(Diagram 1)**. Overstroking the clutch during the bleeding process can be prevented by applying a light force to the pedal and opening the bleed screw ***before*** stroking the pedal. Close bleed screw before pedal is returned to it's original position. Master cylinder sizing recommendations are also listed in **Table 1**.
9. Set the pedal stop. **Table 1** lists a theoretical maximum master cylinder stroke. There is another more preferred method. Place the car on jack stands. With the engine off, and the transmission in first gear, slowly depress the clutch pedal while having another person trying to rotate a drive wheel or driveshaft until the point where the clutch releases. Measured at the footpad, give the pedal an additional 1/4" (6 mm) of travel and set the pedal stop there **(Diagram 1)**.

B) Maintenance

1. Measuring the stack height (total height of pressure and carbon plates). Measurements must be taken with a micrometer, not calipers, to the nearest **.0005" (.01 mm).**
   a. Transfer the numbers from the "Carbon Clutch Data" sheet for the new clutch or the last time that it was rebuilt (whichever was last) into **Column A of Table 3**. "Stack height as built" now becomes "Stack height upper limit". Floater plates turn with the clutch cover. Driven plates turn with the input shaft. "1" is farthest from the flywheel. You will not fill all blanks if your clutch has less than four driven plates.
   b. In **Column A**, subtract **.025" (.64 mm)** from "stack height upper limit" to determine "stack height lower limit". The clutch will hold torque beyond this point. However, this is the minimum stack height that must be allowed before reinstalling the clutch.
   c. Measure the pressure plate in three locations and enter the average in the next available column. (**Diagram 2**)
   d. Measure each friction disc in three locations across the wear area only and enter the average in the same column. (**Diagram 3**)
   e. Add all of the numbers in the column together and enter the sum under "Stack Height" at the bottom of the column.
   f. "Stack Height" before clutch assembly reinstallation must be between the upper and lower limits noted at the bottom of **Column A**. If the worn stack height is below the lower limit, install a thicker pressure plate to compensate for the wear and recalculate the stack height based on the thicker pressure plate. Never install a stack that is above the maximum limit.
   g. If the clutch is worn beyond what can be corrected with available thicker pressure plates, send the clutch back to Tilton Eng. for rebuilding. Carbon plates are not considered worn out until they have worn **.025"** from their new thickness. *See step 9 for instructions related to returning a clutch for rebuilding.*
2. Check the clearance between drive hub fingers and the slots in the driven plates **(Diagram 4)**. The slots must not be more than **.025" (.64 mm)** wider than the drive hub's fingers. This is best checked with a feeler gauge. Premature wear of the slots is usually an indication of input shaft misalignment with respect to the crankshaft.
3. Check hub float. With the clutch installed on the flywheel the drive hub should be able to float at least **.010" (.25 mm)** on the input shaft. Once the axial float disappears the clutch will start to slip.
4. Check for signs of excessive heat. A blue-colored hub is a sign of high tempera-

tures from a clutch having been slipped excessively. High temperatures can cause the diaphragm spring to lose clamp load. Send the assembly back to Tilton for inspection if damage is suspected.

5. Increased wear at the release bearing contact area is a sign of a heavy left foot or a bearing that needs to be replaced. Many clutches have been lost to the failure of an inexpensive bearing that was run one race too many.
6. Whenever inspecting a clutch, be sure to replace all of the plates in the same position and orientation **(Diagram 5)** in which they were originally installed. The "^" symbol is used to indicate alignment marks for floater plate order; "^" being the first floater closest to the pressure plate, "^^" the second, and so on. Orientation is defined by the alignment of the individual floater plate marks and the corresponding cover marks **(Diagram 6)**. The letter "X" is used to indicate alignment marks for driven plate order; "X" being the driven plate closest to the pressure plate, "XX" the second closest, and so on. Because the driven plates do not share alignment marks with the cover, (FS=Flywheel Side) is added before each "X" to clarify the correct orientation of the individual driven plates **(Diagram 7)** with respect to the flywheel or flexplate.
7. Blowing out a clutch cover with an air nozzle is acceptable. Cleaning the clutch cover in a solvent tank is not recommended as this removes the grease from the internal diaphragm spring pivot locations.
8. Always start a 12 or 24-hour race with a new or freshly rebuilt clutch.
9. A Carbon clutch rebuild usually costs around 10% of the cost of a new Carbon clutch. If the clutch is used too far beyond recommended wear (pressure plate change) intervals, the clutch may slip excessively and result in total clutch loss. Carbon clutches are rebuilt at Tilton and can be sent directly or through your distributor. If you send it directly, call first to obtain a Returned Merchandise Authorization (RMA) number. It is to your benefit to supply information on the type of car, type of racing, and any other particulars concerning the reason for the return. You will be provided with a quote before work is performed. All rebuilt clutches are tested for clean release, torque capacity, and clamp load before being returned to the customer.

Diagram 5

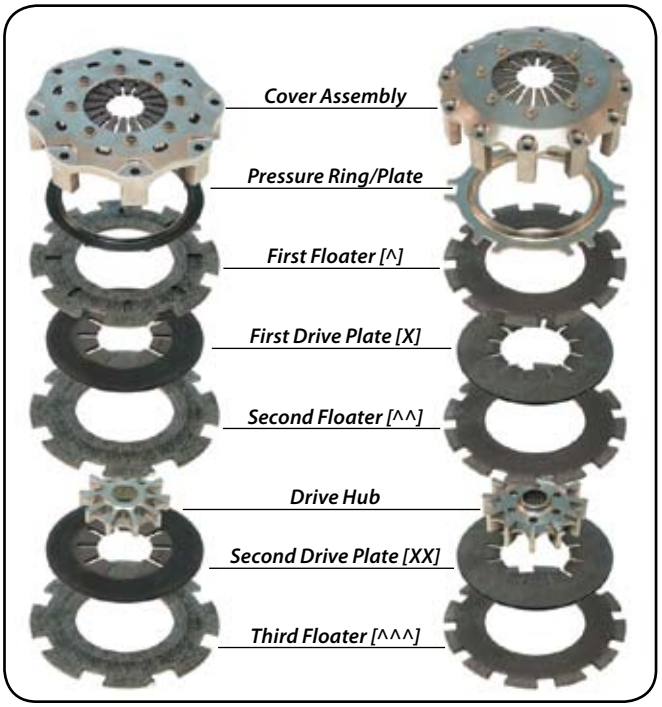


Diagram 6

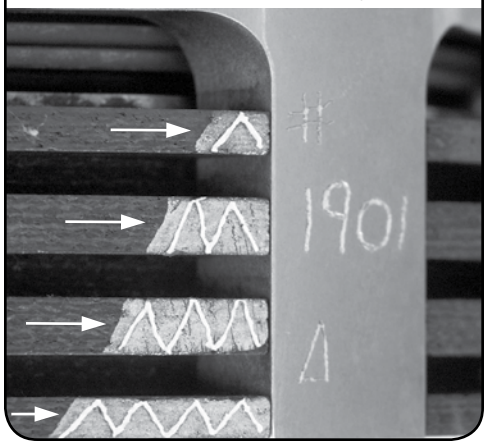


Diagram 7

Diagram 8

Table 2

		5.5" Carbon Clutch				7.25" Carbon Clutch			
Number of Plates		1	2	3	4	1	2	3	4
A. Bolt Grip Length	Pot Style	1.06 in (26.9mm)	1.36 in (34.5mm)	1.71 in (43.5mm)	1.98 in (50.3mm)	1.08 in (27.4mm)	1.38 in (35.1mm)	1.78 in (45.2mm)	2.18 in (26.9mm)
	Step Style	1.16 in (29.5mm)	1.46 in (37.1mm)	1.81 in (46.0mm)	2.08 in (52.8mm)	1.18 in (30.0mm)	1.48 in (37.6mm)	1.88 in (47.8mm)	2.28 in (57.9mm)
B. Set-up Height		.87 in (22.1mm)	1.17 in (29.7mm)	1.52 in (38.6mm)	1.79 in (45.5mm)	1.14 in (29.0mm)	1.44 in (36.6mm)	1.84 in (46.7mm)	2.24 in (56.9mm)
C. Overall Height		1.38 in (35.1mm)	1.68 in (42.7mm)	2.03 in (51.6mm)	2.30 in (58.4mm)	1.72 in (43.7mm)	2.02 in (51.3mm)	2.42 in (61.5mm)	2.84 in (72.1mm)

Standard Clutch Configurations [inch(mm)]

Table 3

New or "*As Rebuilt*" Carbon & Pressure Plate Thicknesses

Worn Carbon & Pressure Plate Thicknesses

A	B	C	D
Date: _____	Date: _____	Date: _____	Date: _____
Pressure Plate _____	Pressure Plate _____	Pressure Plate _____	Pressure Plate _____
Floater 1 _____	Floater 1 _____	Floater 1 _____	Floater 1 _____
Drive 1 _____	Drive 1 _____	Drive 1 _____	Drive 1 _____
Floater 2 _____	Floater 2 _____	Floater 2 _____	Floater 2 _____
Drive 2 _____	Drive 2 _____	Drive 2 _____	Drive 2 _____
Floater 3 _____	Floater 3 _____	Floater 3 _____	Floater 3 _____
Drive 3 _____	Drive 3 _____	Drive 3 _____	Drive 3 _____
Floater 4 _____	Floater 4 _____	Floater 4 _____	Floater 4 _____
Drive 4 _____	Drive 4 _____	Drive 4 _____	Drive 4 _____
Floater 5 _____	Floater 5 _____	Floater 5 _____	Floater 5 _____
Stack Height _____ *(Upper Limit)*	Stack Height _____	Stack Height _____	Stack Height _____
subtract .025 (.64mm)			
Stack Height _____ *(Lower Limit)*			

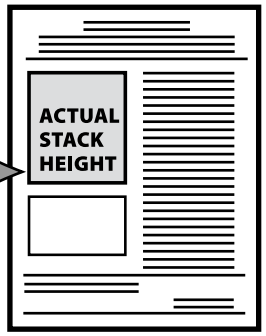


Diagram 10

Diagram 9

Clutch Plate Stack Height Range
Min: (5.5" Clutch) = Chart 1 (A) Total-.025"
Min: (7.25" Clutch) = Chart 1 (A) Total-.025"
Max: (5.5" Clutch) = Chart 1 (A) Total
Max: (7.25" Clutch) = Chart 1 (A) Total

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