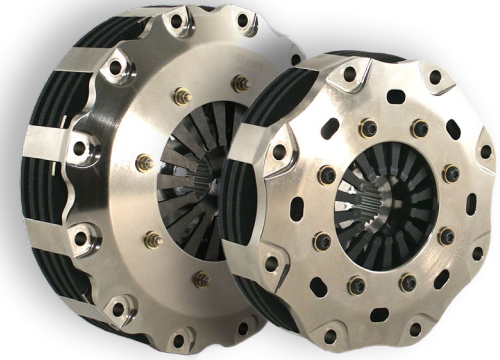


5.5" (140 mm) and 7.25" (185 mm) Carbon Clutches

Tilton Engineering invented the carbon clutch and patented the drive system in the mid 80's. Tilton also holds a patent on its pressure ring locating system, which is unique to Tilton carbon clutches. Tilton's carbon clutch was the first ever to win a Formula One Grand Prix (Ayrton Senna's Lotus-Honda at the 1987 US Grand Prix in Detroit). Since that time Tilton has produced thousands of carbon clutches, with multiple victories in races worldwide, from the 24 Hours of Le Mans to the Baja 1000.

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 Tilton carbon clutch follows the same rigorous build, test and documentation process. Each clutch is tested for clamp load, torque capacity, and release characteristics and every component within an individual clutch is recorded in our database. 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.



INSTALLATION

- 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" (152 mm) diameter. The TIR in this position must not exceed .010".
- 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.
- The drive hub should slide smoothly on the input shaft. An application of anti-seize compound is acceptable if very little is used.
- 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.
- 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 8mm bolts should be torqued to 18 lb-ft with 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.
- 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, 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.
- When installing the gearbox, do not allow its weight to be supported by the clutch.
- 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**.

“...Tilton's carbon clutch was the first ever to win a Formula One Grand Prix (Ayrton Senna's Lotus-Honda at the 1987 US Grand Prix in Detroit).”

Table 1

Carbon Clutch size:	5.5"	7.25"
Release bearing contact diameter (radius face).	38 mm	44 mm
Maximum stroke of clutch diaphragm spring.	.200" (5.1mm)	.250" (6.4 mm)
Recommended master cylinder bore* when using Tilton hydraulic release bearing.	5/8"	3/4"
Theoretical maximum master cylinder stroke** with recommended master cylinder.	.840" (21.3mm)	.730" (18.5 mm)

* Except: sprint, midget, & silver crown package

**Assumes .040" cut-off port travel.

Diagram 1

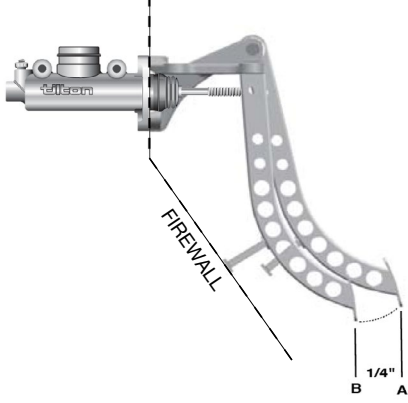
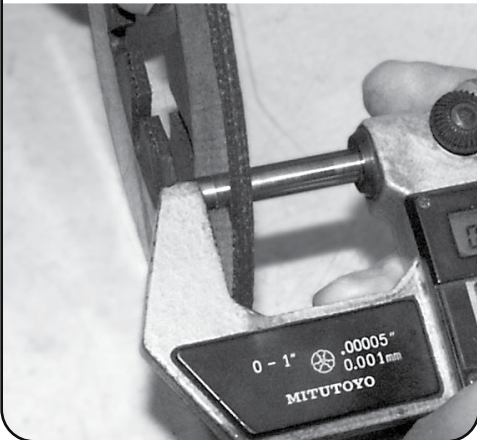


Diagram 2

Pressure Plate Measurement Diagram



Diagram 3



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

Diagram 4



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**).

MAINTENANCE

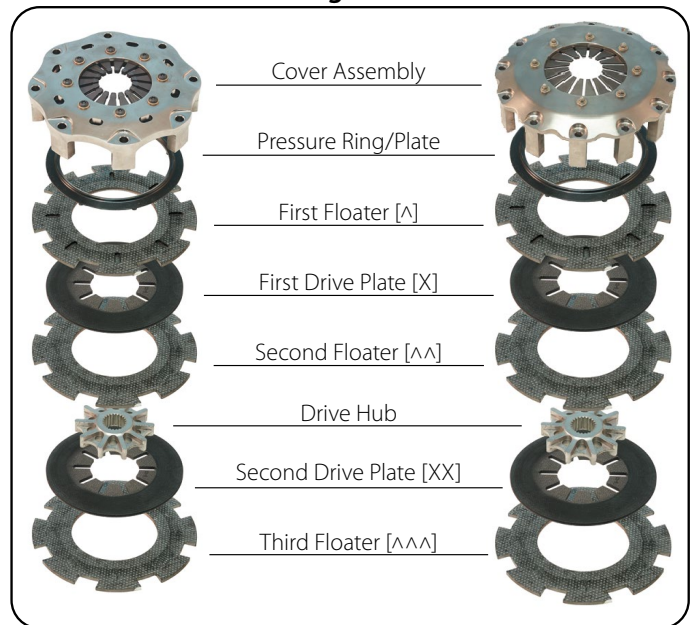
1. Thicker replacement pressure plates, in .010" (.25mm) increments, are available to compensate for clutch wear (5.5" clutch: **Table 2**, 7.25" clutch: **Table 3**). Even though the clutch is usually capable of withstanding .040" (1.02mm) or more of wear before clutch slippage will occur, it is recommended that pressure plates be changed at .020" (.51mm) increments to keep clutch near peak clamp load and torque capacity. If maintaining consistent pedal action for the driver is important, it is recommended that pressure plates be changed at .010" (.25mm) intervals. The most accurate method is to measure the thickness of the individual plates with a micrometer (**Diagram 3**), not calipers, to the nearest .0005" (.01mm) and compare them to the dimensions of the plates listed on the build sheet supplied with the clutch. Once you determine how much total wear there is in the carbon stack, select the appropriate pressure plate thickness to install. Do not install a pressure plate that is too thick. Otherwise, the stack height underneath the clutch cover will be too tall and will cause release problems and/or damage the clutch.
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 temperatures 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.



Scan to watch a video on Tilton Carbon/Carbon Clutches: How to Measure and Shim For Clutch Wear or visit www.tiltonracing.com/technical/technical-videos/

SCAN ME

Diagram 5



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 "A" symbol is used to indicate alignment marks for floater plate order; "A" being the first floater closest to the pressure plate, "AA" 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. 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.



Scan to watch a video on Clutch Pedal Stop: How to Set a Clutch Pedal Stop or visit www.tiltonracing.com/technical/technical-videos/

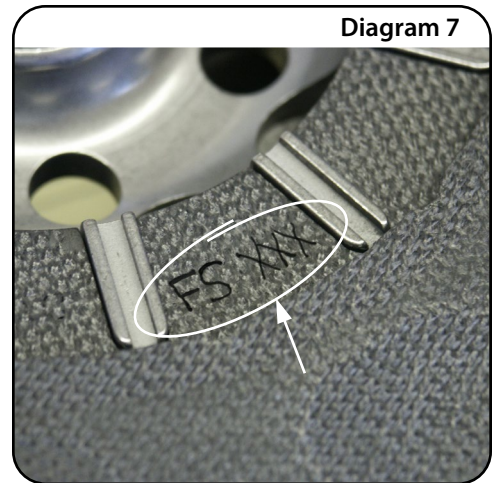
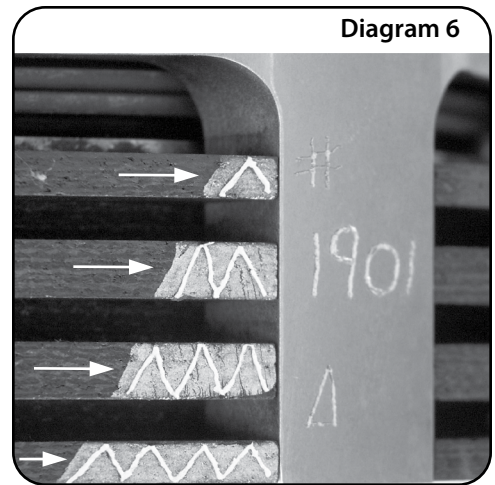


Table 2

Thickness	5.5" Pressure Plates		
	Medium Ratio	High Ratio	Ultra-High Ratio
.187"	655-118M-187S	655-118H-187S	655-118U-187S
.197"	655-118M-197S	655-118H-197S	655-118U-197S
.207"	655-118M-207S	655-118H-207S	655-118U-207S
.217"	655-118M-217S	655-118H-217S	655-118U-217S
.227"	655-118M-227S	655-118H-227S	655-118U-227S
.237"	655-118M-237S	655-118H-237S	655-118U-237S
.247"	655-118M-247S	655-118H-247S	655-118U-247S
.257"	655-118M-257S	655-118H-257S	655-118U-257S
.267"	655-118M-267S	655-118H-267S	655-118U-267S
.277"	655-118M-277S	655-118H-277S	655-118U-277S
.287"	655-118M-287S	655-118H-287S	655-118U-287S
.297"	655-118M-297S	655-118H-297S	655-118U-297S
.307"	655-118M-307S	655-118H-307S	655-118U-307S

Table 3

Thickness	7.25" Pressure Plates
	Ultra-High Ratio
.360"	657-118U-360
.370"	657-118U-370
.380"	657-118U-380
.390"	657-118U-390
.400"	657-118U-400
.410"	657-118U-410
.420"	657-118U-420
.430"	657-118U-430
.440"	657-118U-440
.450"	657-118U-450
.460"	657-118U-460
.470"	657-118U-470
.480"	657-118U-480
.490"	657-118U-490
.500"	657-118U-500

Table 4

Number of Plates		5.5" Carbon Clutch				7.25" Carbon Clutch			
		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)	2.82 in (71.6mm)

Standard Clutch Configurations [inch(mm)]

Table 5

New or "As Rebuilt" Carbon Plate Thickness	Worn Carbon Plate Thicknesses			
Date: _____	Date: _____	Date: _____	Date: _____	Date: _____
Floater 1 _____	Floater 1 _____	Floater 1 _____	Floater 1 _____	Floater 1 _____
Drive 1 _____	Drive 1 _____	Drive 1 _____	Drive 1 _____	Drive 1 _____
Floater 2 _____	Floater 2 _____	Floater 2 _____	Floater 2 _____	Floater 2 _____
Drive 2 _____	Drive 2 _____	Drive 2 _____	Drive 2 _____	Drive 2 _____
Floater 3 _____	Floater 3 _____	Floater 3 _____	Floater 3 _____	Floater 3 _____
Drive 3 _____	Drive 3 _____	Drive 3 _____	Drive 3 _____	Drive 3 _____
Floater 4 _____	Floater 4 _____	Floater 4 _____	Floater 4 _____	Floater 4 _____
Drive 4 _____	Drive 4 _____	Drive 4 _____	Drive 4 _____	Drive 4 _____
Floater 5 _____	Floater 5 _____	Floater 5 _____	Floater 5 _____	Floater 5 _____
Total: _____ (A)	Total: _____ (B)	Total: _____ (C)	Total: _____ (D)	Total: _____ (D)
Wear since new or last rebuild	Wear (A-B)= _____	Wear (A-C)= _____	Wear (A-D)= _____	Wear (A-D)= _____

« *Build Sheet*

