



# TRAINSMART Training Booklet

---

PREPARED UNDER THE DIRECTION  
— OF —  
PRO-CUT BRAKE SOLUTIONS

UNITED STATES OF AMERICA  
NEW HAMPSHIRE : 2020

# Welcome to TrainSmart

Welcome to the Pro-Cut online training module. Here you will learn not only how to use a Pro-Cut, but WHY!

Over time and after thousands of miles, pads and rotors wear out. Replacing the pads and rotors can be a relatively simple and inexpensive task. However, servicing rotors properly requires skilled hands, precision equipment and practice. This Pro-Cut TrainSmart course will explain the skills required to eliminate lateral run-out, and produce superb rotor surfaces using the Pro-Cut Rotor Matching System.

Since 1997, Pro-Cut has been named the required, essential or approved brake lathe for dealership service departments by almost every domestic, European and Asian vehicle manufacturer. More recently, Pro-Cut has been named an essential tool for many national service chains as well. That's your assurance of the quality results you can anticipate now that this machine is in your shop.

Please follow along as we take you through the proper and safe use of the latest machines from Pro-Cut!

## ***LESSON 1: Understanding Pro-Cut's Rotor Matching System***

### ***STEP No. 1: LATERAL RUN-OUT (LRO)***

The amount of “wobble”, or side to side movement as a rotor completes one revolution. The lateral run-out specification for each vehicle varies depending on how much the caliper piston retracts when your foot is off the brake pedal. If the amount of run-out exceeds the amount the piston retracts, then the brake pad will make contact with the brake rotor once each side per revolution at 180°. Over time, this scuffing will either build up material on the high spot of the rotor, as in the case of many adhesive type pads, or remove material from the high spot of the rotor, as in the case of more abrasive metallic pads. NOTE: On many vehicles, the LRO spec is .002” (two thousandths of an inch), but some manufacturers are reducing acceptable LRO to less than .001”! For reference, .001” is 1/4 the thickness of a US dollar bill.

Suggested Videos:

<https://youtu.be/osRRVT67keM>

<https://youtu.be/9P2y52tQBK0>

### ***STEP No. 2: DISC THICKNESS VARIATION (DTV) - AKA BRAKE PEDAL PULSATION***

The DTV spec for most vehicles is less than .0006” (6 ten thousandths) of thickness variation. DTV is usually the result of excess LRO which directly causes the rotor to scuff the brake pads each rotation of the rotor. In simplest terms, not compensating for LRO during brake rotor installation can lead to DTV which is eventually felt as brake pedal pulsation by the driver.

No Suggested Videos

**STEP No. 4: SURFACE FINISH ROUGHNESS AVERAGE (Ra)**

This measurement represents the average height of the surface profile of the rotor, after machining. With sharp Pro-Cut cutting tips and a lathe in good working order, any Pro-Cut OCL should leave a Ra between 30-60 micro-inches on a rotor surface after match-machining. Lower Ra reduces unwanted brake noises and beds brake pads in quicker, so care should always be taken to achieve the best surface finish possible. Pro-Cut lathes are designed to give high quality surface finishes in “1 pass” when used properly. Unlike bench lathes, Pro-Cut PFM on-car lathes machine a non-directional surface finish, so no additional swirl sanding is required to interrupt a machining pattern. For best results, use Pro-Cut 50-742, 50-778, or 50-743 cutting tips only and wash rotor with soap & warm water after machining.

No Suggested Videos

**STEP No. 5: ROTOR MATCHING**

The process of custom match-machining a brake rotor to a vehicle hub to eliminate stacked LRO to below OE specification with a Pro-Cut PFM on-car lathe. The rotor is considered “matched” when the assembled LRO of all components as measured at the outside edge of the rotor with a dial indicator is at or below .001” after the machining process is completed. Pro-Cut PFM on-car lathes do not pass final QC at our factory without compensating consistently to .001” or less to meet all OEM specs. Simply put, once the lathe is compensated, the cut trues the rotor.

Suggested Videos:

<https://youtu.be/oWfFR42zW40>

<https://youtu.be/AOWBLUA7k5s>

## **LESSON 2: The 3Cs: Connect**

### **STEP No. 1: VEHICLE SET-UP**

- Vehicle should be in neutral if possible
- Parking brake must be disengaged
- Traction control should be disengaged if possible
- Vehicle should be racked with center line of wheel hub waist high
- Remove both wheels on axle being match-machined
- Both calipers on axle should be removed and hung with S-hooks (37-034)
- Caliper brackets do not need to be removed, in most cases

No Suggested Videos

### **STEP No. 2: SPECIAL SET UP PROCEDURES FOR SOME VEHICLES & SOME BRAKE LATHE MODELS**

- Hybrid cars with regenerative braking – see manufacturers procedures for on-car lathe use
- Locking rear axles – ¾ ton GM pick-ups mostly – axle ½ shaft may need to be removed for some Pro-Cut models; indexing is usually not required as they are typically symmetrical. For X9D lathes with variable speed, set the speed at 50% power to avoid engaging the locking axle.
- Posi-traction or AWD cars/trucks with tight viscous coupling – drive shaft may need to be disconnected at rear universal joint if resistance is too great for some Pro-Cut OCL models. Be certain to index driveshaft with crayon provided in tool kit to reinstall in correct position.

### **STEP No. 3: FOR ALL VEHICLES**

- Profile the rotor: Profiling the rotor means measuring it in several places with a micrometer to determine the thinnest part and comparing that to OEM spec. or as stamped on the rotor itself. NEVER machine below manufacturer's specification.
- Use a mirror to inspect the back side of the rotor for irregular wear or rust, and for any parts of the vehicle that may interfere with the travel of the cutting head and tool arms. Determine if caliper bracket will need to be removed for clearance.
- Inspect and determine if large ridges are on the inside or outside that may need to be removed first before completing the final machining process.
- Remove excessive rust buildup from the rotor before beginning machining process.

No Suggested Videos

### **STEP No. 4: SELECT THE CORRECT ADAPTER AND INSTALL**

- To find the correct adapter go to the SuperTech app and look for the adapter search button, and look up the vehicle by year, make, and model. The adapter search will tell you the bolt pattern and part number of Pro-Cut adapter(s) that will work best (past and present).
- Be certain all mating surfaces of the hub, rotor, and Pro-Cut adapter are clean and free of rust, dings, or burrs before installing adapter. Use 37-996 or 37-997 abrasive tools from Pro-Cut.
- Install the adapter on side A of the vehicle (where the brake caliper is to your right).
- Select the best nuts for the application. Some OEM wheel nuts will not fit well with the Pro-Cut adapters, and you may need to use the nuts provided in either the 50-179 kit that comes with every lathe, or the optional Pro-Cut 50-175 Speed Nut kit. European cars with bolts usually work fine with our adapters.
- Evenly tighten all nuts/bolts in a star pattern by hand to no more than 35 ft. lb.
- Attach the machine to the adapter by lining up the raised circular guide in the center of the adjustment flange with the center hole of the adapter. Spin the rotor by hand to line up the small guide pin on the adapter into one of the matching holes on the adjustment flange.

**STEP No. 4 (continued): SELECT THE CORRECT ADAPTER AND INSTALL**

- If you are having trouble connecting the lathe to the adapter, adjust the height and camber of the lathe by holding the handles on the lathe and trolley. The vertical and camber shocks are designed to work with the handles on the lathe to give you the range you need to attach the lathe correctly. If you are outside the range of the trolley, then adjust the lift.
- When the machine and adapter are in alignment, tighten the drawbar by hand firmly.
- Center cutting head over the rotor and lock the rear lever.
- Set shut off cam so machine will stop when cutting head clears the outer edge of the rotor.

Suggested Videos:

[https://youtu.be/Ru\\_oK\\_ScQzE](https://youtu.be/Ru_oK_ScQzE)

[https://youtu.be/4\\_YGzoTcZ6c](https://youtu.be/4_YGzoTcZ6c)



### ***LESSON 3: The 3Cs: Compensate***

#### ***STEP No. 1: STARTING THE COMPENSATION PROCESS***

1. Start the machine by turning the motor switch on
2. Push the START button to compensate the machine for LRO. You will hear a series of clicks as the machine compensates.
3. When the lathe achieves a compensation value of .001” or less, the clicking will stop and the green light(s) will indicate that the compensation is complete and you are ready to move to the cut, or machining step.

No Suggested Videos

#### ***STEP No. 2: IF A NO COMPENSATION, OR TIME-OUT CONDITION EXISTS, CHECK THE FOLLOWING***

- The adapter fits correctly and the lug nuts are tightened correctly.
- The car is in neutral and traction control is off.
- Any factory retaining clips are removed from the wheel studs.
- The caliper on the opposite side is removed and the rotor is tightened down evenly.
- The face of the flange is flush with the face of the adapter.
- The wheels of the trolley are not jammed in any way blocking free motion of the trolley.
- The trolley shock is not all the way topped or bottomed out – there should be some range of motion left in the shock to allow the lathe to compensate freely.
- Emergency brake is disengaged.

Suggested PDF'S:

[https://www.procutusa.com/pdf/pc\\_compensationissues.pdf](https://www.procutusa.com/pdf/pc_compensationissues.pdf)

## **LESSON 4: The 3Cs: Cut**

### **STEP No. 1: MACHINING THE ROTOR : SIDE A**

- Now index the tips just off the face of the rotor by rolling the cutting head with the clutch knob counterclockwise and adjust the tool arm dial knobs until the cutting tips are just clear of the rotor face.
- Now select the correct position rotationally for the cutting process where there are no obstructions that the tool arms will encounter when you wind them in to the start position on the inside edge of the rotor, and, where there is enough room to install the correct chip deflector. Rotate the lathe on the trolley by loosening the disc-lock lever and re-tightening. Do not overtighten.

#### SCRATCH AND CUT PROCEDURE:

1. Your goal with the scratch is to reference the thinnest part of the rotor, as you will add your cut depth to this point. Generally you will be removing at least .004" per side, or .008" total from the rotor beyond your scratch depth. If there are gouges in the rotor, use the deepest gouge as the reference point. All Pro-Cut lathes use a positive rake cutting tip that works best when used at a cutting depth of .0025" to .015" per side.
2. With the cutting head centered over the rotor and the tool arms separated enough to clear the rotor, wind the cutting head in to about ¼"(6mm) over the outer edge of the rotor surface and make a light scratch cut on both sides. Your scratch should be light, but deep enough to contact the rotor 360°. If there is significant rust or ridges, then go in far enough to land on a smoother surface area before scratching.
3. Start your scratch on the inner side of the rotor first, and then on the outer side as you can hear the rear scratch but can't see easily. If there is a ridge to be removed on the outside edge, lock the tool arm lock lever(s) and engage the clutch to let the machine take off the ridge.
4. If the rotor is nearly evenly thick from outside to inside, back off the tool arms a set # of lines until the tips are no longer touching the rotor, then wind the clutch counterclockwise until the tips are advanced to within an 1/4" (6mm) from the inside starting point of your cut. Again, land on smooth, not rusty, surface area.
5. Repeat the scratch from the back side first, then front by dialing the depth knobs the same # of lines you backed off in the previous step. Slowly wind the clutch counterclockwise until the tips are advanced to the starting point (inside most point of friction mating surface). Do not hit the hat of the rotor! Contact between the cutting tips and anything other than the rotor could damage the lathe or the rotor.
6. Now set your cut depth. If you've followed the measuring & scratch cut reference procedure properly, you should only need to cut at a depth of .004" (.1mm) to .0075"(.2mm) per side beyond the thinnest part of the rotor to accomplish a superior finish in one pass. Lock the tool arm lock lever(s) firmly by hand.
7. TURN LATHE MOTOR OFF.

**STEP No. 1 (Continued): MACHINING THE ROTOR : SIDE A**

8. Install correct Pro-Cut chip deflector. All chip deflectors should be installed completely over the rotor with the grooves in the blocks over the cutting tip screw heads and the spring behind the cutting head lateral lock lever or knob.
9. Position chip tray as close under cutting action as possible.
10. Double check tightness of drawbar and all cutting head lock levers.
11. Start the lathe motor and depress the feed clutch knob to begin machining.

Suggested Videos:

<https://youtu.be/cBAoWNCR-us>

<https://youtu.be/IOr1tjwnm8>

**STEP No. 2: MACHINING THE ROTOR : SIDE B**

1. When the cut is complete on the first side and the lathe is shut off by the stop cam, carefully remove the lathe from the vehicle by loosening the drawbar. Use caution as to not crash the cutting tips into any parts of the vehicle as you remove the lathe.
2. Unless the rotor is completely captured in place, either install at least two nuts on the rotor you've just completed on side A, or index the rotor to the hub with the crayon from the tool box and remove rotor to make sure it won't fall on the floor when you start the machine on the opposite side.
3. Now rotate the clutch knob counter clockwise just until the stop cam is no longer in contact with the micro-switch. Next, open both tool arms enough so they will clear the rotor on side B.
4. Remove the adapter and re-install on the second side carefully following all cleaning procedures mentioned previously.
5. Loosen the disc-lock lever on the trolley and rotate the lathe so the cutting arms will feed in where the caliper was, and you select a position that will allow enough room for the chip deflector. Attach the lathe and follow all instructions as the same as the first side for the machining process.

Suggested Videos:

<https://youtu.be/at8u-js6Q1w>

**STEP No. 3: WHEN YOU ARE DONE MACHINING**

1. Wash the machined rotors with a soap and warm water solution and dry with a clean paper towel until machining debris is eliminated.
2. The lug nuts/bolts for the wheels must be torqued to manufacturers' specifications and in a star pattern order. DO NOT use an impact gun without the proper TorqStik or a torque wrench. Uneven torque of lug nuts/bolts will cause the rotor to deflect and will actually induce additional LRO.
3. Test drive the vehicle and follow brake pad manufacturer's recommendations for bed in of new friction material.

For more specifics on vehicle set up or if you are uncertain for any reason of correct set up, please call the Pro-Cut Service Department at 800-543-6618, option #2, from 8am to 5pm EST, M-F, or call your local Rep.

Suggested Videos:

<https://youtu.be/2qAx6l4W0XM>



