

# 24 – PEDAL REMOVAL, REPLACEMENT, AND INSTALLATION

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## ABOUT THIS CHAPTER

This chapter is about removing and re-installing pedals, as well as installing replacement pedals. There are separate chapters about pedal-bearing service. After **PEDAL REMOVAL, REPLACEMENT AND INSTALLATION** is a section called **REPAIRING PEDAL-MOUNTING THREADS**. The mounting threads in the crank arm can be damaged, and this section enables repair of those threads. After **REPAIRING PEDAL-MOUNTING THREADS** is a troubleshooting chart.

## GENERAL INFORMATION

### TERMINOLOGY

**Pedal cage:** The plate or plates that support the foot on the pedal.

**Shoe cleat:** A device attached to the bottom of the shoe that helps fix the shoe to the pedal. There are two types. The traditional type is a block of metal or plastic that is slotted. The slot in the cleat engages the edge of the pedal-cage plate. A toe-clip and strap is used with this system to help retain the foot. The modern cleat snaps into a cleat-retention mechanism that is integrated into the pedal. No toe-clip or strap is used with this type.

**Cleat-retention mechanism:** The integral portion of the pedal that clips to a cleat on a shoe.

**Toe clip (and strap):** A cage attached to the front of the pedal that encloses the toe of the shoe. A strap goes through the pedal, over the arch of the foot, and through an eyelet in the top-end of the toe clip. This strap (called “toe strap”) secures the foot to the pedal.

### PREREQUISITES

There are no prerequisites to being able to remove and install pedals.

## INDICATIONS

### *Maintenance cycles*

The only maintenance needed in regard to pedals is to periodically check that they are secure.

New pedals often have problems with loose bolts that retain the cage or cleat-retention pieces. These should be checked and secured when pedals are new.

### *Crank-arm service*

Pedals must be removed when replacing crank arms. It is optional to remove pedals for crank-arm cleaning.

### *Chainring service*

It is optional to remove the right pedal if removing the chainrings.

### *Symptoms indicating loose pedals or pedal parts*

When poor installation technique fails to keep the pedal secure, the loose pedal may manifest itself by a once-per-crank-revolution click or clunk sound. The same symptom can be caused by a loose pedal-cage bolt or a loose cleat-retention mechanism. This symptom can also be caused by bottom-bracket, crank-arm, and chainring problems. If securing the pedal and the pedal-cage-retention bolts does not solve the problem, be sure to consult the appropriate chapters regarding these other possible causes.

### *Symptoms indicating bent pedal shafts*

A pedal shaft can be bent in a crash, or from abusive jumping. The symptom of a bent pedal shaft is an oscillating sensation in the ankle while pedaling. This oscillation may feel like the ball of your foot is twisting back and forth; or the outer edge of the foot is rocking up and down; or like both at once. The identical symptoms are caused by bent crank arms, which can easily be damaged by the same forces that damage the pedal. The first step is to remove the pedal and look at the end of the shaft as it rotates. If the end does not oscillate, then it is the crank arm that is bent. If the pedal shaft oscillates, install new pedals. If the symptom is still felt when riding with new pedals, then the arm is also bent.

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### *Symptoms indicating damaged pedal-mounting threads*

Pedal-mounting threads can be damaged by improper pedal installation. The only symptom that will be encountered is difficulty threading in the pedal. It may be repairable, or it may be necessary to replace the crank arm.

### TOOL CHOICES

In the accompanying table of tool choices, the tools shown in **bold** are the preferred choices. A tool is preferred because of a balance among: ease of use, quality, versatility, and economy. When multiple tools of the same size are shown in **bold**, it means that each is the best under different circumstances.

### TIME AND DIFFICULTY

Pedal removal and re-installation is a 1–2 minute-per-pedal job of little difficulty. In some cases, the pedal may be over-tightened and require patience and fortitude to break it loose.

If the pedal threads are damaged, it could take an additional 1–2 minutes to chase the threads.

If threads are stripped, it may take 10–30 minutes to install a thread bushing.

### COMPLICATIONS

#### *Difficult to break pedal loose*

Pedals can be difficult to break loose because of over-tightening, corrosion, or from turning them the wrong direction. Penetrating oil, a good wrench, and good technique are the only solutions when the problem is over-tightness or corrosion.

*The left-side pedal removes with a clockwise rotation!*

#### *Difficult to unthread pedal after breaking loose*

When a pedal is difficult to unthread after it has been broken loose, it often indicates that the threads are stripped or cross-threaded. Use penetrating oil and frequent breaks to allow cooling. Inspect for damaged threads after removal.

**PEDAL-REMOVAL/INSTALLATION TOOLS** (table 24-1)

<b>Tool</b>	<b>Fits and considerations</b>
<b>PEDAL WRENCHES</b>	
Campagnolo 1101	Fits 15, 16, and 17mm, durable, poor hand protection and poor mechanical advantage
Cyclo 1329	Fits 15mm only, poor hand protection, poor durability
Eldi 61	Fits 15mm and 9/16", poor durability and hand protection
<b>Hozan C200</b>	Fits 15mm only, durable, good hand protection and good mechanical advantage
Park HCW-6	Fits 15mm only, poor hand protection, poor durability
<b>Park PW-3</b>	Fits 15mm and 9/16", acceptable durability and excellent hand protection
Zog's Pedal Wrench	Fits 15mm only, poor hand protection, good durability
<b>THREAD-REPAIR TOOLS</b>	
<b>Eldi 2299</b>	Oversize tap and thread-bushing set for repairing stripped mounting threads in crank
<b>Park TAP-3</b>	1/2"x20tpi left and right tap set
<b>Park TAP-6</b>	9/16"x20tpi left and right tap set
VAR 41A	1/2"x20tpi left and right tap set
VAR 41E	9/16"x20tpi left and right tap set
VAR 41F	14x1.25mm left and right tap set (virtually extinct French thread)

***Difficult to start pedal threading in***

When a pedal is difficult to start in, do not force it! Check whether the pedal is on the correct side, whether it is cross-threading, or whether the crank-arm threads should be cleaned with a tap.

***Pedals previously cross-threaded***

After removing pedals that were cross-threaded, run a tap in from the back side of the crank arm for a fully-effective repair.

***Pedals previously installed on wrong side***

After removing pedals that were installed on the wrong side, run a tap in from the back side of the crank arm for a fully-effective repair.

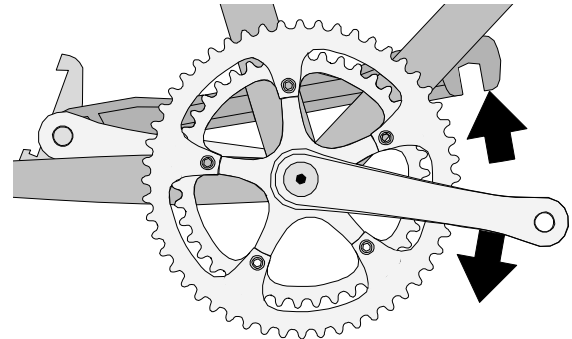
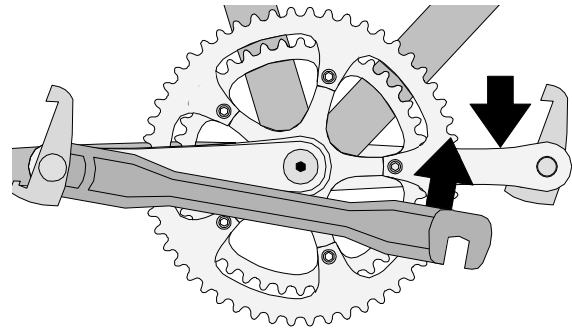
**ABOUT THE REST OF THIS CHAPTER**

The rest of this chapter is divided into three parts: ***PEDAL REMOVAL, REPLACEMENT, AND INSTALLATION***, ***REPAIRING PEDAL-MOUNTING THREADS***, and ***PEDAL-MOUNTING TROUBLESHOOTING***.

***PEDAL REMOVAL, REPLACEMENT, AND INSTALLATION*****PEDAL REMOVAL**

Right-side pedals remove with a counterclockwise rotation. Left-side pedals remove with a clockwise rotation. This can get confusing, particularly if standing on the opposite side of the bike from the pedal being removed. To reduce this confusion, the following procedure specifies where to stand, the position of the crank arms, and which direction to move the wrench.

Another problem with pedal removal is that a great deal of force may be required to break a pedal loose. If the leverage of the opposite crank arm and other principles of mechanical advantage are not used, then it will be unnecessarily difficult. The following steps, if followed faithfully, provide the greatest mechanical advantage, so that it is as easy as possible to break loose a pedal. This is not to say that it is always easy. Pedals can be very difficult to break loose. Other than using the following technique and using penetrating oil, nothing helps more with difficult pedal removal.



**24.1** *This is the correct orientation of crank arm and wrench, and the correct directions to apply force, to make a pedal as easy as possible to break loose.*

1. [ ] With bike elevated in bike stand and horizontal, stand on side of bike where pedal is to be removed, facing rear of bike.
  2. [ ] Position crank arm with pedal being removed pointing to rear axle.
  3. [ ] Reaching through or over frame with hand closest to bike, grasp end of crank arm on side that pedal is *not* being removed.
  4. [ ] Put wrench on pedal flats so that that it is as close as possible to horizontal and pointing straight forward.
  5. [ ] Push down on crank arm not having pedal removed and pull up simultaneously on end of pedal wrench until pedal breaks free.
- Once the pedal is broken loose, it will be awkward to unthread it the rest of the way by rotating the wrench around the pedal. It is easier just to use the wrench and pedal together to turn the cranks in the direction they turn when riding. The pedal will unthread automatically. Grasp the pedal wrench close to the pedal to make it easier to keep the wrench on the pedal while turning the crank.
6. [ ] Stand facing pedal being removed. Grasp pedal in one hand and grasp wrench with other hand and use both hands to turn crank in same direction that crank rotates when pedaling bike.
  7. [ ] Repeat steps 1–6 on other side of bike to remove second pedal.

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### PEDAL REPLACEMENT

#### *Determining thread compatibility of new pedals*

There are three thread types (see table 24-2). Of these three, the BSC thread is almost universal. The American thread is found exclusively on inexpensive bikes with one-piece cranks and BMX bikes with one-piece cranks. Both have such a different diameter that there is no possibility of mismatching BSC and American threads. The French thread is close enough to BSC to confuse them without measurement, but it is so rare these days that it should not be a concern unless replacing pedals on a bicycle made in France before the late 1970s.

8. [ ] Measure thread pitch of old pedals with thread-pitch gauge. Record pitch here: \_\_\_\_\_ tpi/mm.
9. [ ] Measure O.D. of old pedal-mounting threads with caliper and record here: \_\_\_\_\_ mm.
10. [ ] Measure pitch of new pedal threads and compare to step 8. Pitch must be identical.
11. [ ] Measure O.D. of new pedal thread and compare to step 9. Difference must be <.3mm.

#### *Checking cage-retention bolts or cleat-mechanism bolts*

A common source of mysterious noises coming from the crank/pedal region is loose hardware on the pedal. Factories are notorious for not getting bolts tight. Once they are properly tightened, they should stay tight. If allowed to loosen up and fall out, they could cause damaged threads in the pedal body and damaged pedal cages (holes will not line up). It would be good insurance to remove the bolts and treat them with Loctite #222 or #242.

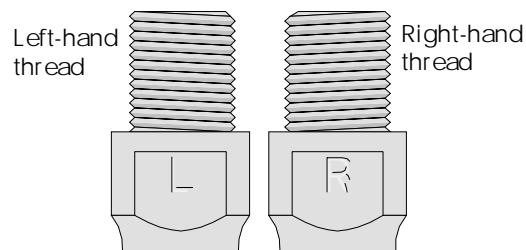
12. [ ] Check and secure all bolts holding pedal cage to pedal body or cleat-retention mechanism to pedal body. Torque to 50in-lbs (12lbs@3").

**NOTE:** Go to step 14 if not transferring toe clips and straps to new pedals.

13. [ ] Remove straps and toe clips (if any) from old pedals.

### PEDAL INSTALLATION

Pedals that go in the right crank arm have a right-hand thread. Pedals that go in the left crank arm have a left-hand thread. There is usually, but not always, an “R” or “L” notation on the pedal. If other letters are there, or it is difficult to read the letters, the thread direction is easy to determine by observation, as indicated in step #14.



**24.2** The threads sloping up to the left on the left example indicate that it is a left-hand thread. The threads sloping up to the right on the right example indicate that it is a right-hand thread.

14. [ ] Hold each pedal so that threaded shaft points up and examine which direction threads slope. (Threads sloping up to right, pedal installs on right. Threads sloping up to left, pedal installs on left.)

15. [ ] Grease pedal threads thoroughly.

It is best to start pedals threading in with fingers. This way no damage can be caused if they get installed on the wrong side of the bike, or cross-threaded. Once engaged at least one full turn, then use a tool to install them the rest of the way.

16. [ ] Using fingers, start each pedal in on its appropriate side (step 14) and thread in as far as possible without using pedal wrench.

PEDAL-MOUNTING THREADS (table 24-2)

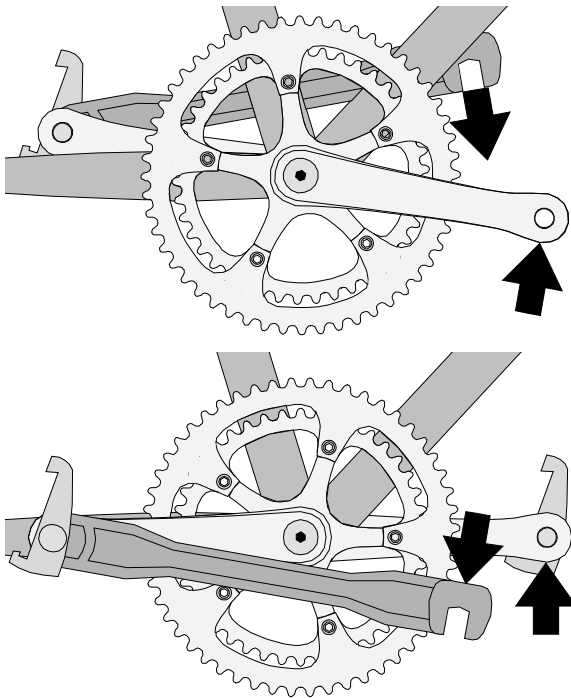
Nominal measurement (thread type)	Approximate axle-thread O.D.	Approximate mounting-hole I.D.	Typical occurrences
9/16" × 20tpi (BSC)	14.0–14.2mm	12.9–13.1mm	Most quality bicycles with conventional three-piece crank sets.
14mm × 1.25mm (French)	13.7–13.9mm	12.6–12.8mm	Older French-made bicycles from the late 1970s or earlier.
1/2" × 20tpi (American)	12.4–12.6mm	11.3–11.5mm	Bikes with one-piece crank arms including American-made department-store derailleur bikes, BMX bikes, and juvenile non-derailleur bikes. Also old Schwinn's.

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It is awkward to rotate the wrench around the pedal to thread the pedal the rest of the way in. Instead put the wrench on the pedal and rotate the crank (one hand on wrench and one hand on pedal) backwards to thread the pedal the rest of the way in.

**17. [ ] Stand facing pedal being installed. Place wrench on pedal flats. Grasp pedal in one hand and wrench with other hand and use both hands to turn crank in opposite direction than when riding. Stop when pedal begins to feel snug.**

If not set up and positioned correctly, it will be unnecessarily difficult to adequately secure the pedals. Steps #18–#22 are the easiest way to secure the pedals.



**24.3** *With the crank arms and wrench in this position, apply force in the directions indicated to easily secure the pedal.*

**18. [ ] With bike elevated in bike stand and horizontal, stand on side of bike where pedal is to be installed, facing rear of bike.**

**19. [ ] Position crank arm with pedal being secured pointing to rear axle.**

**20. [ ] Reaching through or over frame with hand closest to bike, grasp end of crank arm on side pedal is not being secured.**

**21. [ ] Put wrench on pedal flats in way that it is as close as possible to horizontal and pointing straight forward.**

Many pedals have thin wrench flats that require the use of a special pedal wrench. Many others have wider wrench flats that fit any open-end wrench. The ones that require a special wrench must be torqued by

feel. A 15mm crow's-foot adapter for a socket wrench can be used on a torque wrench when the pedal wrench flats are wide. Using this technique reduces liability, and also improves development of the proper feel for tightening pedals that cannot fit a crow's-foot.

**22. [ ] Pull up on crank arm not having pedal secured and push down simultaneously on end of pedal wrench with force of 300–360in-lbs (33–40lbs@9"). Reposition wrench if it rotates past 90° from crank arm before achieving torque.**

Tightening the pedal against the crank-arm face often creates a small sharp aluminum burr. If excess grease has oozed out, then this burr can be hidden in the grease. Avoid the painful experience of getting this burr in a fingertip later, by using a rag to wipe around the end of the pedal to remove any grease and any hidden burrs, as indicated in step #23.

**23. [ ] Use rag to wipe excess grease away at point pedal enters crank arm.**

**24. [ ] Repeat steps 17–23 for other pedal if necessary.**

## TOE-CLIP AND STRAP INSTALLATION

**NOTE:** *Skip remaining steps if not installing toe clips and straps.*

**25. [ ] Treat toe-clip-bolt threads with Loctite 222 or 242.**

**26. [ ] Place toe clip on outside face of front side of pedal cage and install bolts and nuts (if any).**

**27. [ ] Align toe clip laterally.**

**28. [ ] Secure toe clip bolts to 24–36in-lbs (8–12lbs@3").**

**29. [ ] Feed end of toe strap into hole on outer end of pedal cage/body.**

**30. [ ] Twist toe strap one full twist, then thread end of strap through hole in inner end of pedal cage/body.**

**31. [ ] Feed end of top strap through loop at top of toe clip and once through buckle.**

**32. [ ] Repeat steps 25–31 for other side if necessary.**

## REPAIRING

### PEDAL-MOUNTING THREADS

Pedal threads can be damaged in a number of ways, and the way that they are damaged determines whether or not the threads are repairable. If the pedal is poorly aligned and threaded in with a wrench, it will cross-thread the crank arm, which is repairable. If a wrench is used to start a pedal installation and it is the wrong pedal for that side of the bike, the damage will be repairable. If a pedal is improperly secured and unthreads, at some point it will rip out of the crank arm. How far it has threaded out and how much pressure there is on the pedal at the moment it rips out, determines how many threads in the crank arm are damaged. Depending upon the extent of the damage, this may or may not be repairable. Step #7 is an integrity test that determines, after attempting repair, whether the repair will hold, or not.

#### *Thread chasing*

1. [ ] **Make sure that tap is correct for side of bike. (Right-hand thread for right side, left-hand thread for left side.)**
2. [ ] **Squirt cutting oil inside damaged threads and cover tap threads with cutting oil.**
3. [ ] **Thread tap into *back side* of crank arm that has damaged threads.**
4. [ ] **When encountering cutting resistance, advance tap no more than 1/4 turn before backing out 1/2 turn to clear cutting edge of fragment build-up. Add cutting oil repeatedly.**
5. [ ] **Continue advancing tap (adding cutting oil repeatedly) in this fashion until *tap comes fully out of front face of crank arm*.**
6. [ ] **Clean threads in crank arm with toothbrush and solvent.**

If threads were stripped because the pedal came out while the bike was being ridden, perform the integrity test in step #7 to determine if the remaining threads are adequate. If the threads strip further during the test, then the crank is no worse off than before (still unusable). In this case, a thread bushing can be installed. The labor to install a thread bushing may be up to half an hour, so it may be cheaper to replace the damaged arm in some cases.

7. [ ] **Install pedal normally but torque to 50ft.lbs. (67lbs@9") to test thread integrity.**
8. **Select one of two following choices:**
  - [ ] **Threads stripped in step 7, replace crank arm or install thread bushing.**
  - [ ] **Threads passed integrity test in step 7, loosen and torque normally.**

#### *Thread bushing installation*

Thread bushings can be installed in all aluminum crank arms that are threaded with a 9/16" × 20tpi thread. A special tool (Eldi 2299) is required. The tool reams the old threads out and then taps the arm to a new oversize-thread description. The thread bushing matches the new thread on the outside and the old thread on the inside.

The Eldi tool tends to ream slightly undersize. Using a 15mm or 19/32" drill bit should work better.

9. [ ] **Use correct Eldi 2299 reamer/tap for side of bike and clean out all existing threads.**
10. [ ] **Using cutting oil generously, tap through crank arm with oversize tap.**
11. [ ] **Grease pedal-shaft threads and thread bushing by hand onto pedal shaft.**
12. [ ] **Treat outside threads of bushing with Loctite 242, 272, or RC680.**
13. [ ] **Thread in pedal (with bushing attached) same as normal pedal installation, but do not torque.**
14. [ ] **After Loctite has cured overnight, torque pedal normally.**
15. [ ] **File excess bushing material (if any) off back face of crank arm.**

## ***PEDAL-MOUNTING TROUBLESHOOTING***

<i>Cause</i>	<i>Solution</i>
<b>SYMPTOM:</b> <i>When riding, one ankle feels as though the end of the pedal is rocking up and down, and/or it feels as though the surface of the pedal is rotating back and forth.</i>	
Pedal shaft is bent from a crash.	Remove pedal and inspect end of pedal shaft for oscillation when rotating. Replace if bad. If symptom persists when pedal shaft is good, crank arm is bent and should be replaced.
If pedal shaft is not bent, crank arm is bent.	Replace crank arm.
<b>SYMPTOM:</b> <i>A popping sound or sensation is experienced once per crank-revolution, often on the down-stroke of the right pedal.</i>	
Loose pedal-cage piece(s).	Check and secure pedal-cage piece(s).
Loose pedal mounting.	Check and secure pedal mounting.
Shoe cleat is moving on cage or in retention mechanism.	Check cleat wear and security.
Cleat-retention mechanism is loose.	Check and secure cleat-retention mechanism.
Loose crank arm.	Check and secure crank arm.
Loose chainring bolt(s).	Check and secure chainring-mounting bolt(s).
Loose bottom-bracket cups, lockrings, or retaining rings.	Check and secure bottom-bracket cups, lockrings, or retaining rings.
Bent chainring tooth.	Inspect and bend back.
<b>SYMPTOM:</b> <i>The pedal loosens up while riding</i>	
Pedal was improperly torqued.	Secure pedal to 300–360in-lbs.
<b>SYMPTOM:</b> <i>Looseness is felt in the pedal</i>	
Loose pedal mounting.	Check and secure pedal.
Loose cage-retention bolts or cleat-retention-mechanism bolts.	Check and secure cage-retention bolts or cleat-retention-mechanism bolts.
Loose bearing adjustment or loose bearing-unit retention.	See chapters 14 and 15.

