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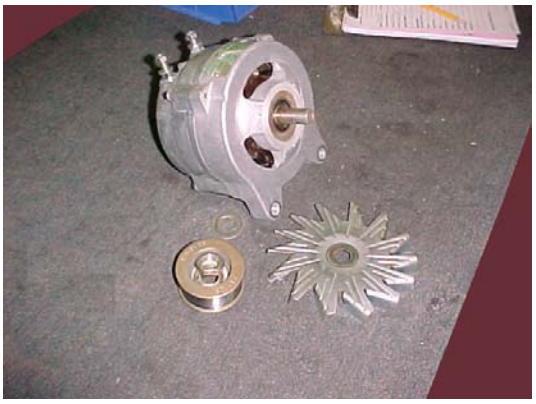
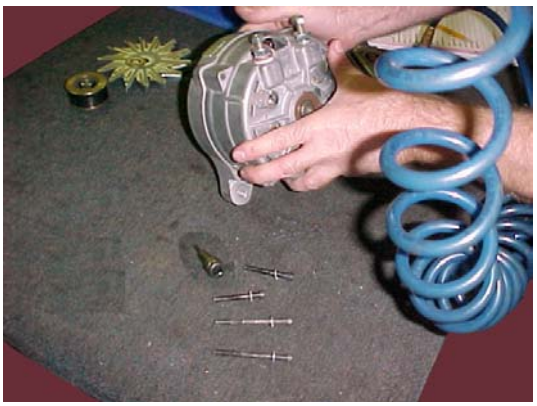
HOW TO DISASSEMBLE A PENNTEX PX-2, PX-4G, PX-5, OR PX-7 ALTERNATOR

Follow along as Roy Hamlin from PennTex Industries, Inc. disassembles a model PX-2R alternator. The other alternators in the PX-4G, 5 and 7 Series come apart the same way. Before disassembly, spin the fan and pulley while checking for bent fan fins or pulley damage. Inspect the pulley for belt residue or discoloration that might indicate belt slippage. Listen while it spins for any noises that might indicate something loose or rubbing inside. The first step is to remove the drive pulley attaching nut, lock washer, fan, and fan spacers (if used) with a half-inch impact and a 15/16 6-point (or 24mm) socket.

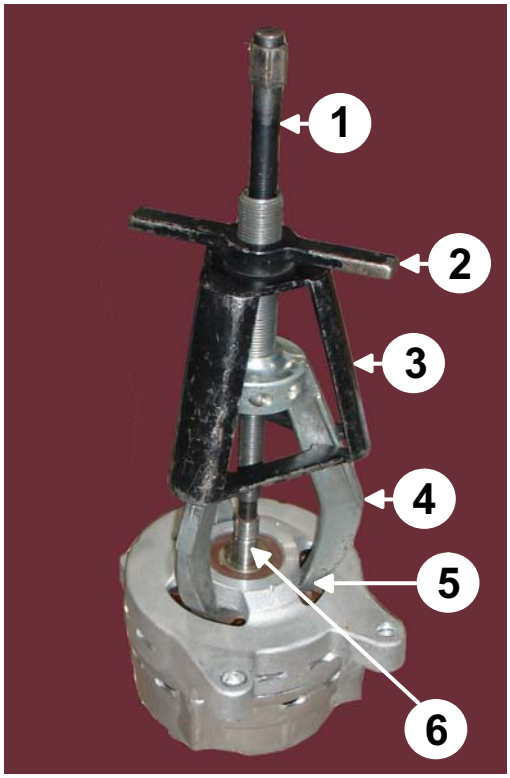


With these parts removed, inspect both sides of the fan for any damage. Check the alternator inside the front cooling holes for foreign objects. Check the alternator front bearing for any sign of seal damage or grease leakage. To help in disassembly, put some good penetrating oil on the front and rear bearings at the rotor shaft. Check the pulley attaching nut and the threads on the rotor for damage.

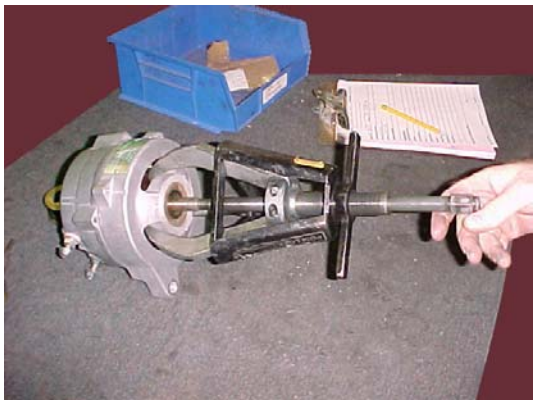
Remove the four case attaching bolts using a 3/16 Hex Socket bit.



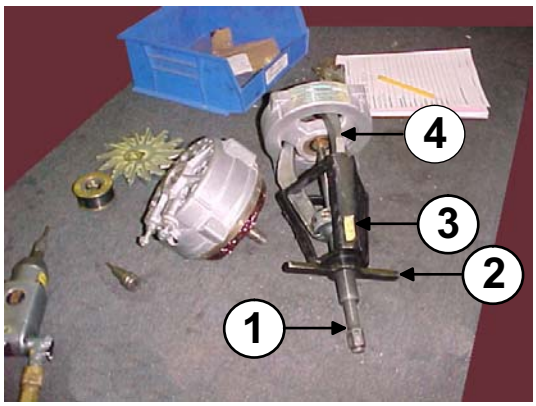
Check to see if the front housing will slide off of the rotor front shaft. Remove the front housing if it will come off. In most cases, it won't.



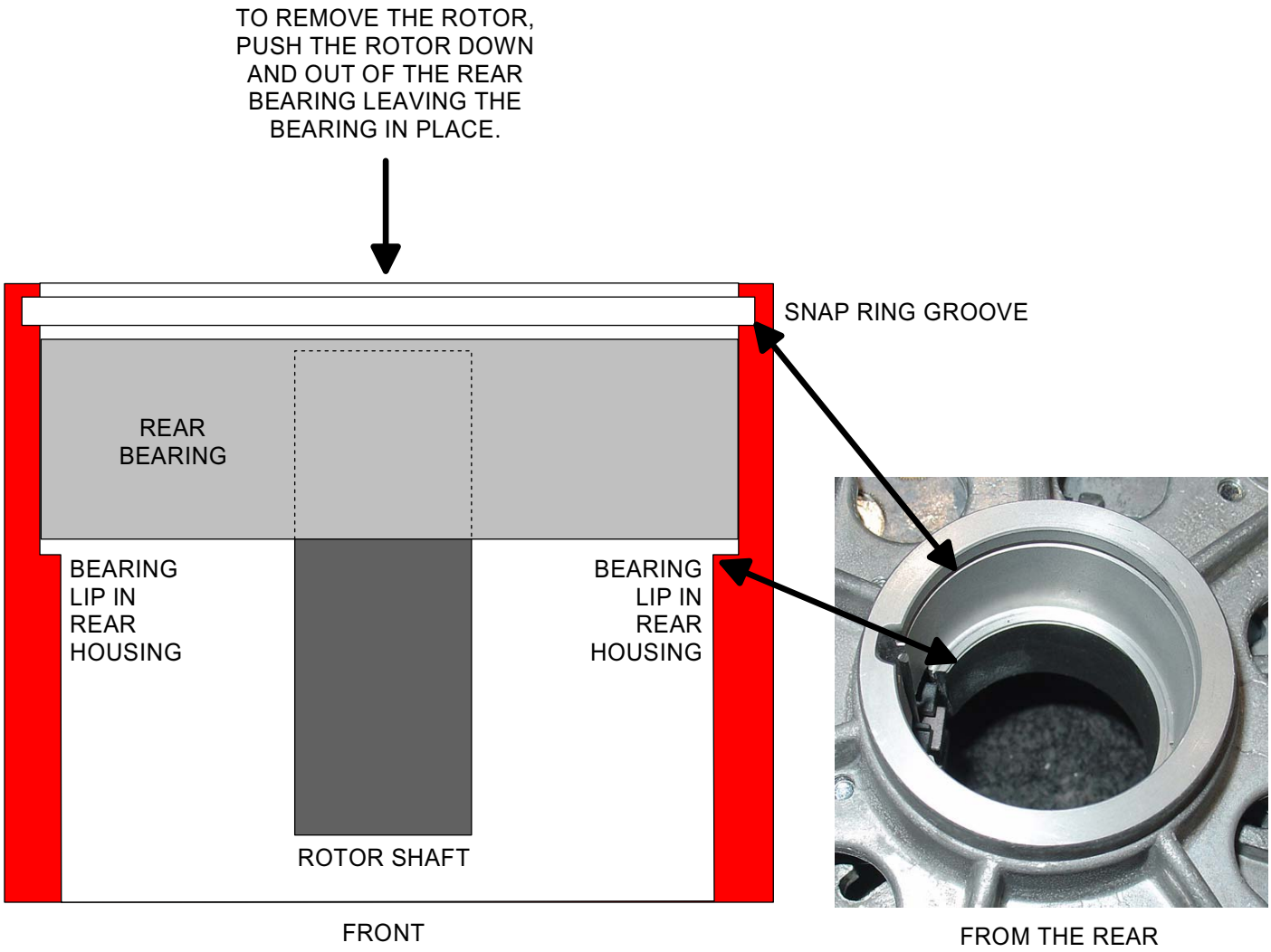
To remove the front housing we use a model # 106 heavy-duty three-jaw puller made by Posi Lock Puller, Inc. To get it in position to pull off the front housing, turn the center shaft (1) counter-clockwise to loosen it up. Loosen the jaw clamp tightening handle (2) counterclockwise. This loosens up the triangle-shaped portion of the puller (3) that controls the three jaws (4). The jaws (4) will go in behind the front bearing support (5). It may take some maneuvering to get the puller jaws inside the holes. Once they are inside the holes, tighten the jaw clamp (2) so that the jaws (4) are against the housing support. Tighten the center shaft (1) so it presses against the rotor front shaft (6). Check 1, 2, 3, and 4 to be sure the puller is centered properly on the rotor (6) and tight enough so the jaws (4) won't pull out from behind the housing (5).



Some pullers are light-duty and a wrench must be used to tighten them down. The puller here is heavy-duty so a half-inch impact can be used. The puller is shown being tightened down against the rotor shaft. The front housing and bearing are coming off. In some cases the front bearing may stay on the rotor when the front housing is pulled off. This will bend the three front bearing retainer clips inside the front housing, and the bearing will have to be pulled off the rotor with a bearing puller. If you prelube the rotor shaft at the bearings, this usually won't happen.



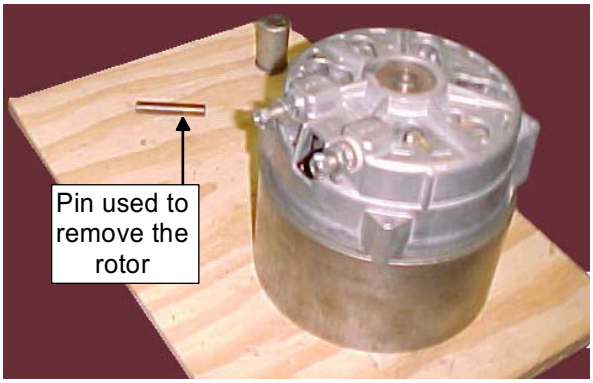
The front housing and bearing have been removed and the puller is about to removed from the front housing. Note how much shorter the center shaft (1) is now after pulling off the housing. Loosen the center shaft (1) and the jaw clamp handle (2) by turning them counterclockwise. This will loosen the clamp (3) and allow the jaws (4) to be pulled out of the front housing holes.



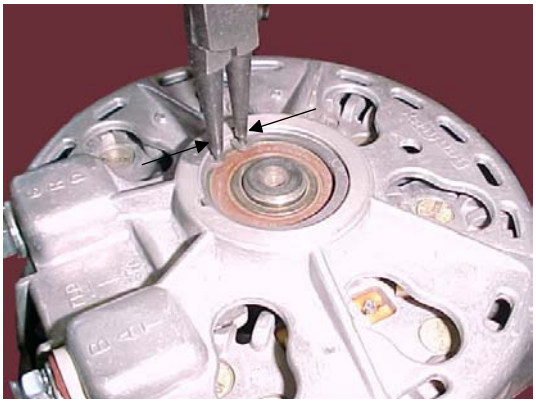
This is an enlargement of the rear bearing area in these alternators. It shows the rear bearing, the rotor shaft, the groove in the rear housing for the rear bearing retainer snap ring, and the lip in the bearing area of the rear housing that goes all the way around in the rear housing. The lip in the rear housing is there to locate and retain the rear bearing in the housing. The photo on the right helps illustrate the locations of these items.

When removing the rotor, the procedure is to push it down and out of the rear bearing, leaving the rear bearing in place. The rear bearing is removed later by turning the rear housing over and pressing the bearing out towards the rear of the housing. If the rear bearing is pushed down with the rotor, the bearing is being compressed against the lip in the rear housing and the housing will break.

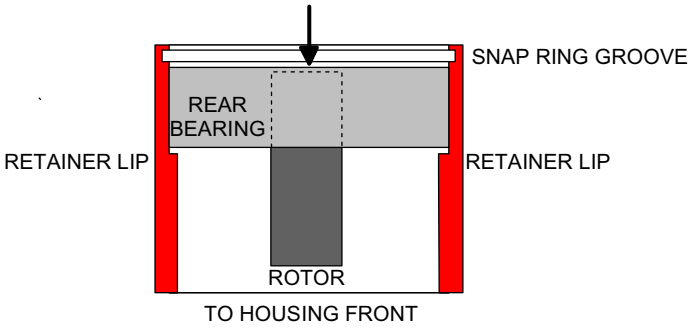
The next step is to push the rotor out of the rear bearing. The mild steel ring at the left is used to support the rear housing while the rotor is being removed. See the attached drawing for more information. Most machine shops can make one of these very quickly. It has a 7" outside diameter, is 3-1/2" tall, and is .400" thick. There is a .080 wide and .125" deep groove on the inside top edge for the stator to fit in. A quarter is in front of it for size reference. If you don't have a steel ring, an old PennTex housing with the center cut out of it will serve the same purpose.

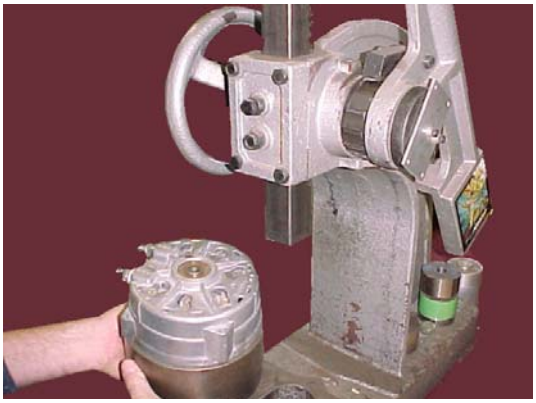


The rear housing with stator is sitting on the support ring with the rotor front shaft pointing down. The small steel pin to the left of this assembly will be used to push the rotor down and out of the rear bearing, once the assembly is placed on the arbor press.



With the housing located in the support ring, remove the rear bearing retainer snap ring with snap ring pliers. Note that the rear bearing is pressed into the rear housing from the back, and is removed after the rotor is pressed out of it. The rear bearing won't come out unless the rotor is removed first.





Place the assembly on an arbor press to push the rotor down and out of the rear bearing. A hand-operated press like this works better here because you have more control.

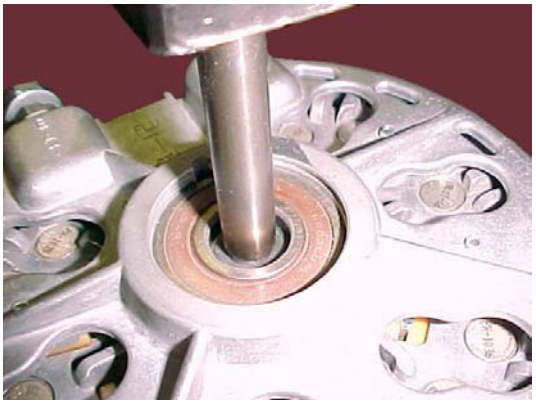
Place a drive pin smaller than the outside diameter of the rotor between the press and rotor. A 2 inch-long 3/8" bolt also works very well, with the head of the bolt up towards the press. Use a good penetrating oil between the bearing and rotor shaft, and let it soak it in.

NOTE: if removing the rotor from a PX-2RL-5 Series alternator, support will need to added to the area circled in red. The rear housing has been modified to clear obstructions on the engine.

Adding support to hold up this area before using a press to remove the bearing will help insure that the rear housing does not break.

A piece of steel used a bridge with a washered bolt to catch the underside of the housing or the heat sink would be sufficient extra support while pressing the bearing out.

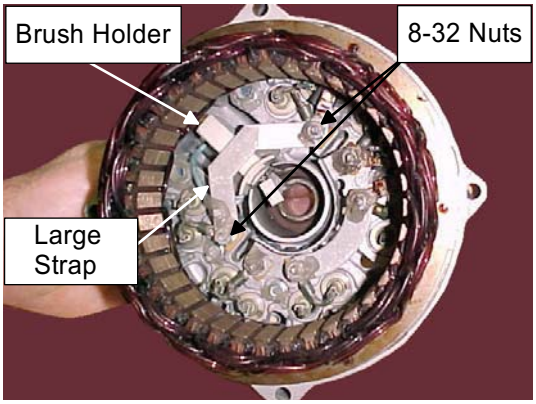
This next operation is the one that will determine if the rotor will easily press out the rear bearing. Don't just make one hard pull downward with the press handle. With the alternator in position as shown, pull down with very slight pressure on the handle. Once you have pressure on the rotor shaft, lightly bounce the press handle several times to break the bond between the rotor and the bearing inner race. The press handle will probably not move as much as in the exaggerated illustration to the left.



The rotor may move down slightly in the rear bearing race as shown. If it doesn't, try lightly bouncing the handle several more times. When you are pulling on the handle you might see the rear housing flexing slightly, and that is OK. The idea is to put pressure on the rotor shaft but not so much that you crack the rear housing. Add another shot of penetrating oil and let it sit for a while if the rotor is not coming out.

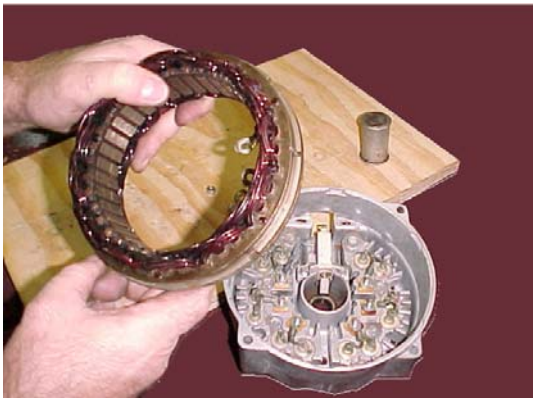
Once the rotor has moved in the rear bearing inner race, continue to pull down on the handle until the rotor pushes completely down and out of the bearing. Don't attempt to remove the rear bearing at this time. It comes out later when the case is turned over.

Return the arbor press ram to its upper position and remove the rear housing from the press. Remove the rotor from inside the support ring. Good test results for the rotor are as follows: PX-2 & PX-4G: 1.9 ohms & 6.3 to 7.5 amps. PX-5 & PX-7: 1.7 ohms & 7.0 to 8.4 amps. Inspect the slip rings for wear or damage. Look for a consistent brush wear pattern with no signs of bouncing or skipping.

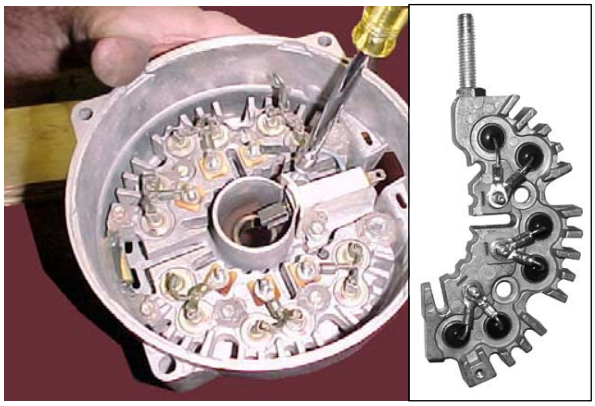


Inspect the inside of the rear housing for any loose or melted components. To get to the brush holder, remove the 8-32 Keps nuts attaching the large strap. The retainer silicone covering the nuts makes it hard for a socket or nutdriver to push onto them, and it also makes it difficult to get the nuts out of the socket once they're removed. Once you get the socket or nutdriver on the nut, loosen it up but don't take it all the way off. Leave a few threads, pull the socket off the nut, and remove the nut the rest of the way with your fingers.

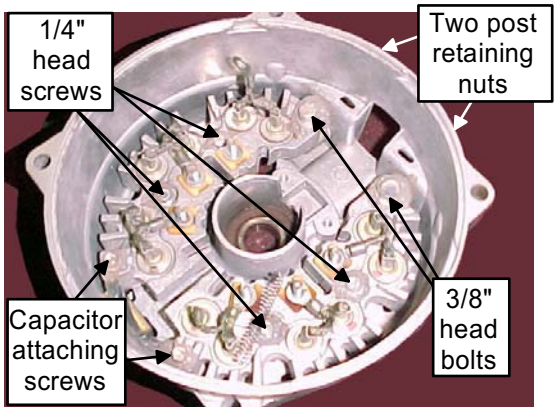
With a nutdriver or socket, remove the five 8-32 Keps nuts that retain the two remaining connecting straps and the three stator connections. The same trick of removing the nuts the last few threads with your fingers works here also.



Remove the connecting straps and remove the stator. Inspect the stator for any discoloration or an uneven color in the groups of wire indicating a burned stator phase. Check the inner diameter of the stator for any indication that the rotor was hitting it. Check to be sure that the three stator terminals are tight. Use of a Stator Tester is recommended to check the stator condition. We use a Rotek II and a Fluke 1520 MegOhm Meter for that testing. Check on the heat sinks where the straps and stator connections were for loose or discolored studs or insulators.

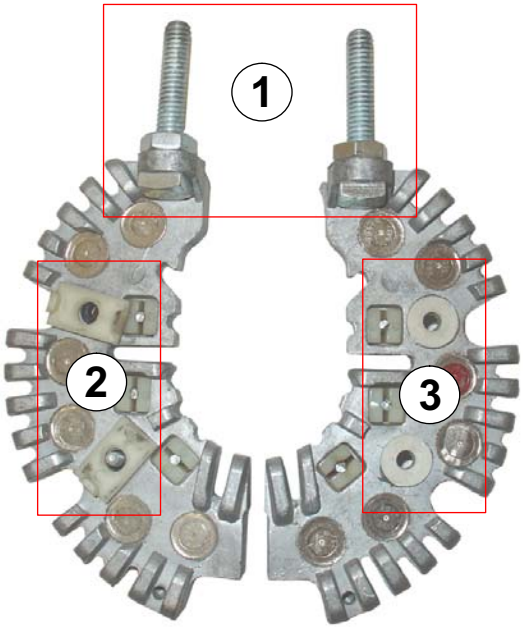


Use a 1/4" nutdriver to remove the two brush holder retaining screws. Inspect the brush holder and brushes for wear or damage. Check the diodes with a diode tester or multimeter. We use a Fluke Model 1507 to check diodes. The capacitor can be checked with a multimeter. Check the diode leads and cans for heat or physical damage. The housing assembly has old style diode leads. The inset photo shows the current style with one crimped and soldered terminal on the lead.

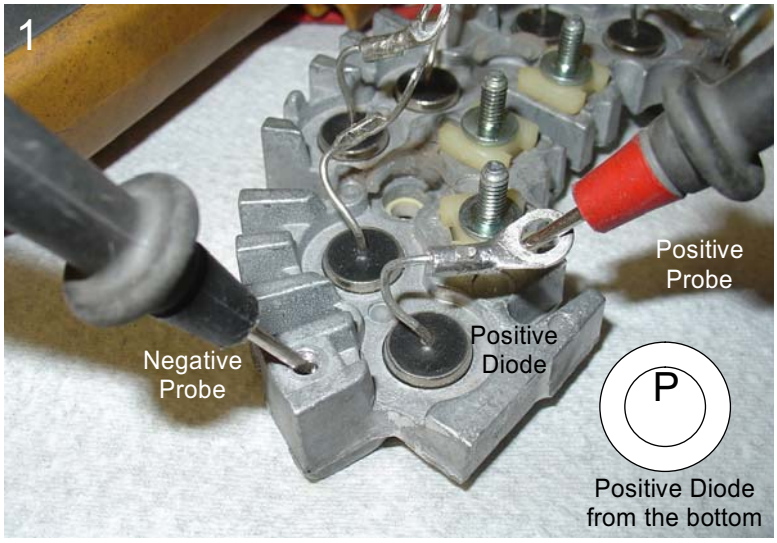


Newer model PennTex alternators use a different system to attach the output/ground post to the heat sinks, but the main components still disassemble in the same way. If your PX-5 alternator has a connecting strap on the outside between the output posts, and it has six negative diodes in the rear housing, that means that both heat sinks inside the alternator have positive diodes in them. A PX-2, PX-4G, or early PX-5, such as this one here, will have one negative heat sink and one positive heat sink. Be sure of what you have. Disassemble the rear housing and heat sinks in this order: Remove the large post retaining nuts, washers and insulators from the outside. On the earlier alternators like this one, remove the 3/8" head bolts that attach the output posts to the heat sinks. On later units, just leave the posts attached to the heat sinks. Remove the 1/4" head screws that attach the capacitor to the heat sinks. The capacitor will have silicone attaching it to the rear housing and that may need to be cut out with a box knife. Remove the four 1/4" screws that retain the heat sinks. Remove the heat sinks and posts from the case.

This is the bare housing with almost all components removed. Note the two rectangular insulators on the right side. These insulators are used in all PX-2, PX-4G-5, PX-5, and PX-7 Series alternators because that heat sink is the one that is always Positive. The heat sink on the left (from the front) is negative in PX-2, and PX-4G-5 Series alternators. The heat sink on the left (from the front) is Positive in PX-5 Series alternators made after October of 2005 and in all PX-7 alternators. Six negative diodes go in the round holes seen in the rear housing. The PX-5 & 7 housings are designed for the diodes and replacement housings are machined to accept them. PX-2 and PX-4G-5 rear housings have the holes, but the holes are not machined to have diodes installed in them.



These are two positive heat sinks from a PX-5 Series alternator with dual positive posts as seen from the back. #1 shows how the output posts are attached to the body of the heat sink. All PX-2, PX-4G-5, PX-5, and PX-7 Series alternators manufactured after approximately August of 2003 have this style of heat sink, whether they are negative or positive. #2 shows the location and style of insulator used on the Positive heat sink in the PX-2, PX-4G-5, PX-5, and PX-7 Series alternators. #3 shows the insulators that actually attach to the Positive heat sink in PX-5 and PX-7 alternators with dual positive posts. PX-2 and PX-4G-5 alternators use no insulator at this location since this is a Negative heat sink in these models. Each of these diodes will have a "P" for Positive or "N" for Negative visible on the bottom to indicate their polarity. Be sure of what you have.



A good diode, whether Negative or Positive, should allow current flow in only one direction. When checking Negative or Positive diodes, the direction is always Red probe to Black probe.

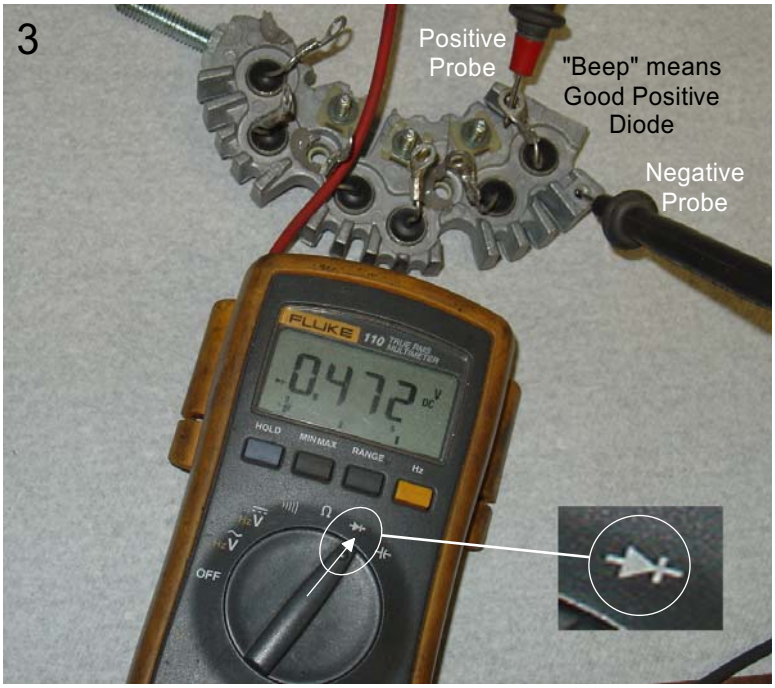
This is a PX-2544 left-side (from the rear) Positive heat sink from a later PX-5 Series alternator.

Positive diodes have a "P" on the bottom. Negative diodes have an "N" on the bottom.

To test the diodes, bend the leads up from the post so one diode is checked at a time. Look for melted insulators, loose connections & broken diode leads.

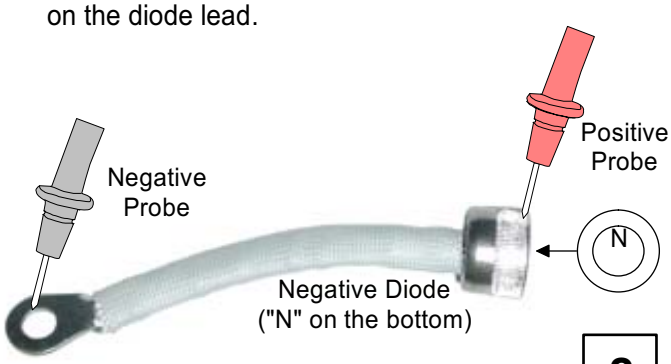
The meter at the left is set on "Ohms". The meter readings should be consistent with all of the diodes. When the Red & Black meter leads are switched side for-side to check the diode in the other direction, these meters will indicate "OL". This should be the reading for all of the positive diodes since current flow is blocked in this direction. If there is any reading other than "OL", the diode is defective.

Negative diodes work in the other direction, so current should still go only one way, but the in opposite direction of a Positive diode.

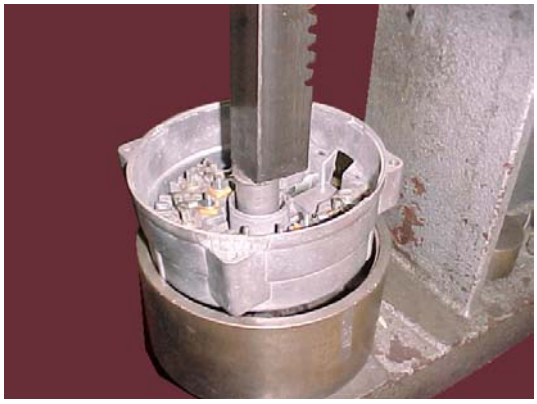


This meter has a "Diode Check" feature. When the leads are first connected to a good positive diode as shown in Photo 3, the meter will "beep". In the other direction, the meter indicates "OL" and there is no "beep".

When checking a negative diode in this "Diode Check" position, the diode is good if the "beep" comes when tested in the hookup below with the Negative probe on the diode lead.



Double-check that the rear bearing retainer snap ring has been removed and place the rear housing back on the arbor press support ring as shown. Use a driver larger than the ID of the rear bearing inner race to remove the bearing.



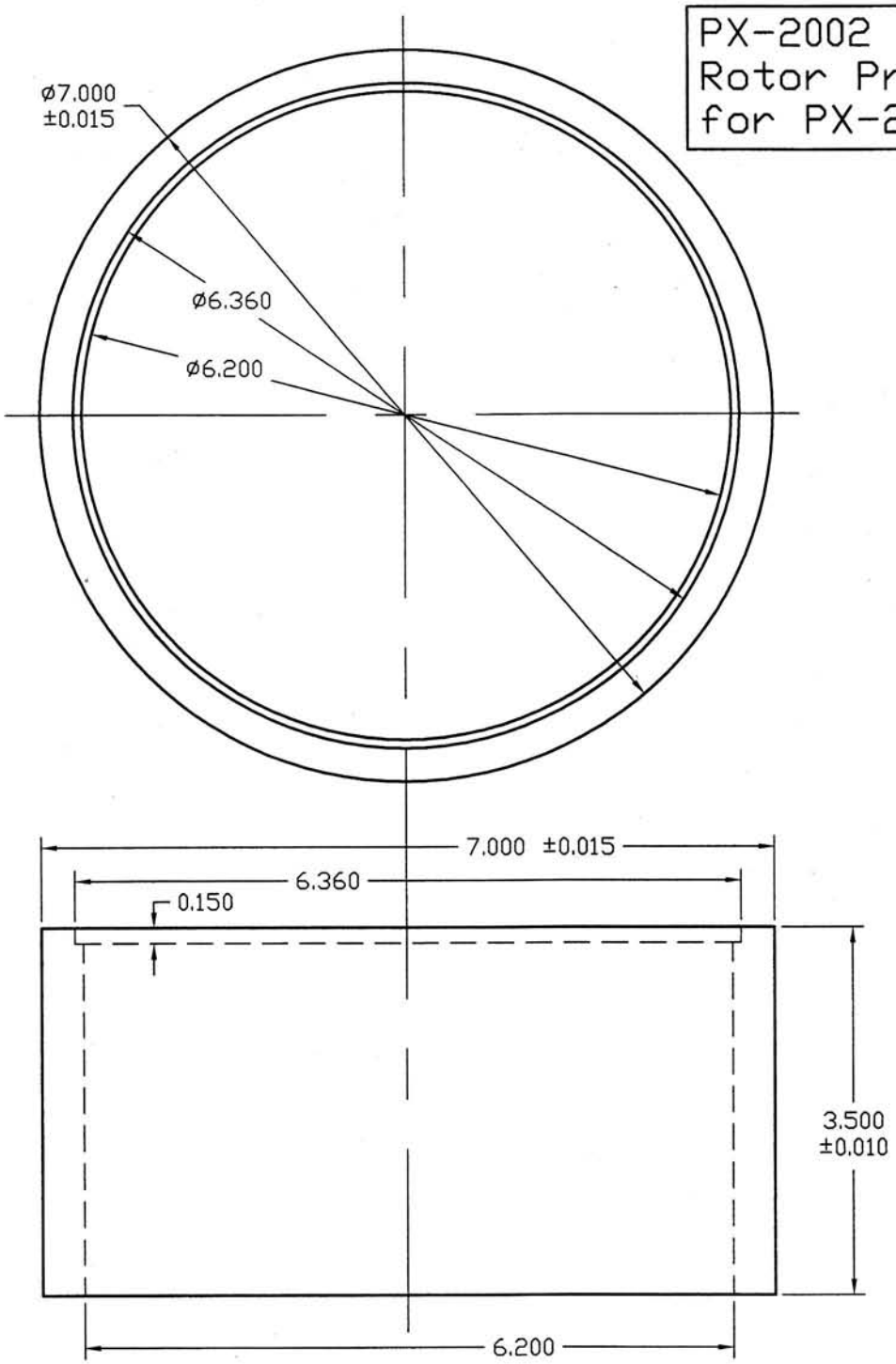
Put light pressure against the removal tool with the arbor press. Pull harder on the handle using a slight bouncing motion like you used when removing the rotor to start the rear bearing moving down. Once the bearing has moved, continue to push the bearing out of the housing.

Remove the three 1/8" socket-head screws that attach the front bearing retainer clips to the front housing. NOTE: sometimes the front bearing will remain on the rotor when the front housing is removed. A bearing removal tool can be used to get the bearing off of the rotor if that happens.

Place the front housing on the support ring as shown. Using the same tool used to push out the rear bearing, put light pressure against the bearing. Use a slight bouncing motion with the press handle to dislodge the bearing. Once it starts to move, push it down and out of the housing.

If parts are required, see the PennTex website at www.penntexusa.com for parts drawings and parts lists you can print out, and a list of Warehouse Distributors. If you need tech help, call us at 877-590-7366 Monday through Friday 8 AM to 5 PM Central time, or e-mail the Tech Department at tech@penntexusa.com. Thanks for choosing PennTex!

PX-2002
Rotor Press Tool for PX-2 & 5



Notes:
Inches
Tol.: ±0.005 (Unless Specified)
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Material: mild steel
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REV	DATE	DESCRIPTION	BY	DN #
A	2-19-2007	Modified per R.H. to work on PX-2 also	RW	PD-0169
None	5-21-2001	Original PX-5 Rotor Press for PX-5 Rebuilding	RW	PD-0169

PennTex INDUSTRIES, INC. Ft. Worth, TX Dover, PA

Title/Desc: Rotor Press Tool for PX-2 & 5 Rebuilding

Part #	Date	DN #
PX-2002	2-19-07	PD-0169

Rev #	DWN By:	CKD by:
A	RW	RW

Size	Scale	Page
A	None	1 of 1