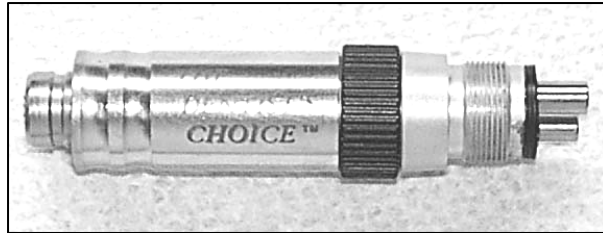


# STAR 20K MOTOR REPAIR PROCEDURE

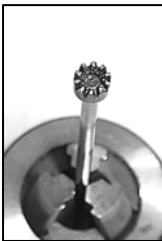


The Star 20K Motor is used with a plethora of Star attachments. Two of the attachments, the Star Motor to Angle Adapter and the Star Nosecone are also covered in this manual. It has gone through very little change since its inception so the following procedure will be relevant for any Star non-swivel 20K motor you encounter. Most replacement parts are available for this motor. Do not confuse this handpiece with the Star 5K Motor. The Star 5K Motor is much longer. As always, try to determine the problem before disassembling the motor.

Some of the most common problems with this handpiece are:

- The motor is locked up.
- The motor has low torque.
- The threads are worn.
- There is a loud grinding noise inside the motor.
- The main drive gear is worn.

The repair procedures for each of these problems is addressed below



## STEP 1

The first step is to make sure you have a tool that will allow you to put downward pressure on the drive gear of the motor while you unscrew the housing. This will prevent you from bending the alignment pin and ruining the head while you disassemble the unit. Your tool will consist of a long shaft that has a star gear attached to one end. The opposite end of the shaft should be held by your wooden handled hand collet or other similar device (see picture).



## STEP 2

Now place the threaded portion of the motor into a 9/16" collet. Once the collet is secure, wrap the main housing of the motor with a rubber strip and apply downward pressure to the drive gear using the above mentioned tool from **STEP 1**. While applying this pressure, you may unscrew the motor housing from the head. All thread patterns on this handpiece are regular so turn the housing counterclockwise to unscrew.



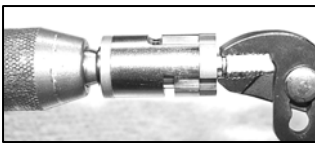
### STEP 3

Once the housing has been unthreaded from the head, tap the internal motor parts out onto your work surface and remove the head from the collet. If the problem with the handpiece was only worn threads, replace the head (60203) and reassemble by following **STEP 4** and **STEP 16**. Otherwise, proceed to the next step.



### STEP 4

In a complete overhaul you will want to replace the three o-rings on the head and also the forward/reverse valve o-ring. First, remove the screw from the forward/reverse ring. Once the screw is removed you can pull the ring off of the head and remove the o-rings with a needle. Then you will need to tap the forward/reverse valve out of the head and remove the o-ring found under the valve.



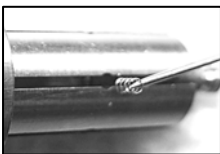
### STEP 5

Now that the head is disassembled, we will disassemble the internal motor. You will need to pull the alignment pin and distributor plate off of the motor. Then put the drive gear in your wooden handled collet holder. Once the gear is held securely, unscrew the locknut from the rear of the motor.

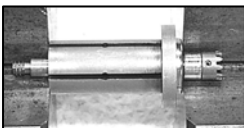


### STEP 6

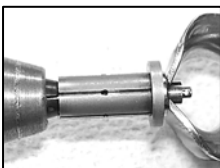
At this point, you can pull the end plate and rotor housing off of the rotor. Carefully remove the blades and springs. Be aware that some models do not have springs. Generally, a locked up motor or low torque motor can be repaired by ultrasonically cleaning the internal motor parts and replacing the blades and springs. Sometimes a new rotor housing is needed as well.



### STEP 7



To replace the drive gear and or top bearing, follow the next few steps. Most repairs on this motor do not require **STEP 7** through **STEP 12**. First, place the rotor and gear assembly over two v-blocks (as shown). Once the gear pin is visible, tap it out of the drive gear using a small thin punch.



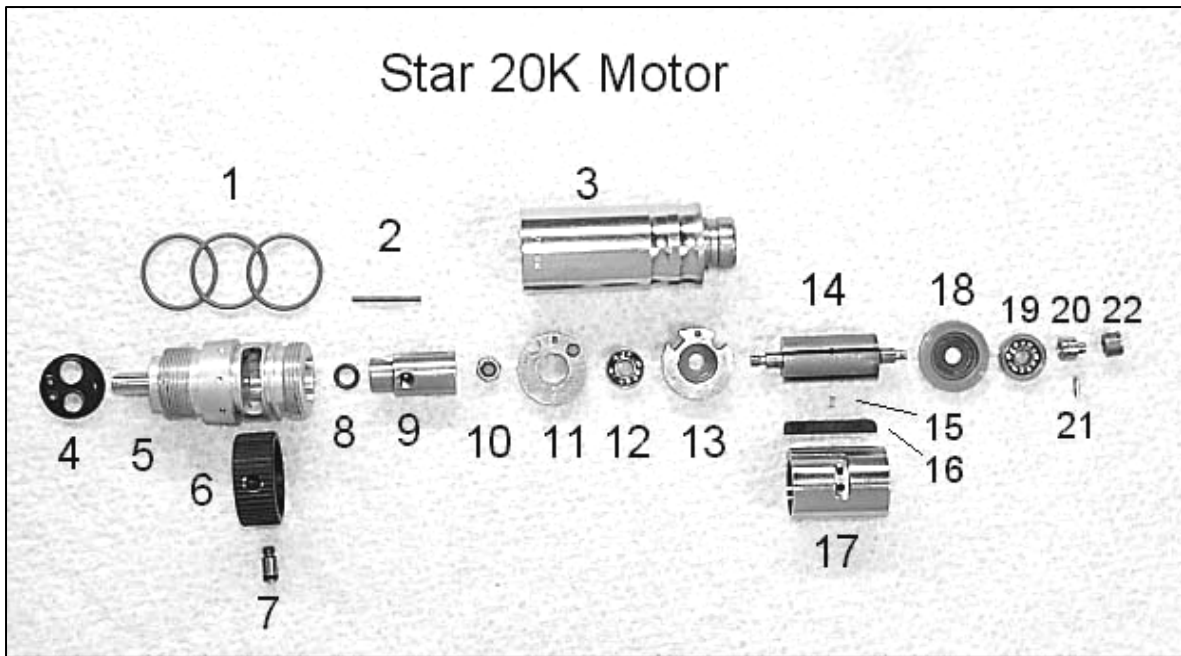
### STEP 8

After removing the pin, secure the opposite end of the rotor assembly in your collet. At this point, remove the gear and gear post off of the rotor with your fish skippers.



### STEP 9

To remove the bearing, put the main body of the rotor assembly in your elevated work block (as shown). Then gently press the visible post out of the bearing and lower end plate. Remove the bearing from the plate.



Picture Number	Part Number	Description
1	60226	O-Rings
2	60222	Alignment Pin
3	60201	Main Housing
4	40422A	Gasket
5	60203A	Head
6	60213	Forward/Reverse Ring
7	60214	Collar Screw
8	60227	Forward/Reverse Valve O-Ring
9	60211	Forward/Reverse Valve
10	60221	Lock Nut
11	60210	Distributor
12	60225	Rear Bearing
13	60208	Upper End Plate
14	60207	Rotor
15	60220A	Springs
16	60220	Rotor Blades
17	60206	Rotor Housing
18	60209A	Lower End Plate
19	60224	Front Bearing
20	60212A	Gear Post
21	60219A	Pin
22	60219	Drive Gear

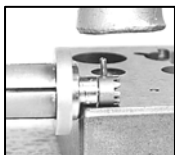
We will address some of the troubleshooting tips now that we are about to reassemble our adapter.

- *The Motor is Locked Up.* This is usually caused by the existence of rust and debris in the internal motor. Disassemble and clean all the motor parts to cure the problem. Occasionally, a broken rotor blade will seize the motor up. Replacing the blades will remedy that problem. If the lock nut is loose or too tight, you may also have a locked up motor. Be sure to adjust the nut as described in **STEP 14**.
- *The Motor Has Low Torque.* In addition to the repair steps mentioned above, you need to do the following. Lap all the motor plates on fine grit sandpaper, (2000 grit). Replace the Forward/Reverse Valve O-Ring like in **STEP 16**. And make sure the spacing between the rotor and lower end plate is correct, see **STEP 10**. You may also need to replace the rotor housing (60206), if it is damaged.
- *The Threads are Worn Out.* Simply replace the head as described in **STEP 16**.
- *There is a Loud Grinding Noise in the Motor.* Generally, replacing the bearings will quiet down the motor. The bearings numbers are 60224 and 60225. Look at **STEP 10** and **STEP 14** for the proper repair procedure.
- *The Main Drive Gear is Worn Out or Cracked.* To replace this gear, follow **STEP 7**, **STEP 8**, and **STEP 12**.



#### **STEP 10**

Reassemble the rotor assembly by placing a new bearing into the lower end plate. Turn the unit upside down and place the bearing over hole # 4 in your work block. Place a small piece of paper between the lower end plate and the rotor assembly. This will properly space the assembly when you tap it together. To protect the threads, you can screw the lock nut partially onto the threads. Now carefully press the rotor into the bearing and plate. Now remove the paper from the assembly.



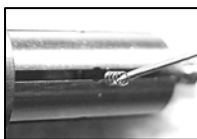
#### **STEP 11**

To replace the gear, slide it onto the gear post. Make sure the pin hole in the gear lines up with the pin hole in the post. Place the pin into the hole in the gear and tap it through the holes until it is fully inserted.



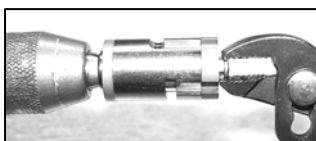
#### **STEP 12**

Replace the gear post by putting the opposite end of the rotor assembly into hole # 4. Then tap the post onto the rotor assembly with a brass hammer until it is fully seated.



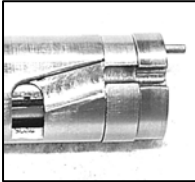
#### **STEP 13**

Reassemble the rotor by putting all of the springs into the spring retaining groove (as shown). Follow that by replacing the blades into their grooves and sliding the rotor housing back over the assembly.



#### **STEP 14**

Once again secure the drive gear in your wooden handled collet. Next, slide the upper end plate into its position, bearing away from the rotor, and tighten the assembly by screwing the locknut onto the appropriate threads. If the nut does not have good resistance while being screwed into position, it is faulty and must be replaced. To properly adjust this internal motor, screw the lock nut all the way down, and then back it off approximately ¼ turn. When adjusted properly, you should be able to turn the upper end plate with your fingers.



#### **STEP 15**

Line up the alignment pin holes in the rotor housing and upper end plate. Insert the alignment pin and then push the distributor plate onto the pin.



#### **STEP 16**

To reassemble the head, place the forward/reverse valve upside down on your work surface. Install the bottom two green o-rings and collar onto the head and place the forward/reverse valve o-ring into the groove on the valve. Lower the head over the valve so that the hole in the forward/reverse collar will line up with the hole in the valve. Then install the collar screw and third green o-ring.



#### **STEP 17**

Place the threads of the head back into the 9/16" collet and secure. Place the inner motor assembly properly onto the head. Do this by placing the alignment pin in the appropriate hole in the head. You should now lower the outer housing over the inner motor and begin to thread it onto the head. Again apply downward pressure on the drive gear with your gear shaft tool described in **STEP 1**. While applying the downward pressure screw the outer housing completely onto the head.