



45530110
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Electric Screwdrivers

EL, EP and ET 115V AC Series

Maintenance Information



Save These Instructions

IR **Ingersoll Rand**

WARNING

Always wear eye protection when operating or performing maintenance on this tool.

Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool or before performing any maintenance on this tool.

Note: When reading the instructions, refer to exploded diagrams in parts Information Manuals when applicable (see under Related Documentation for form numbers).

Disassembly

Disassembly of the Housing

1. Unplug the Power Cord (84) from the wall socket. Unscrew the connection ring and set the cord aside.
2. Unscrew the Retainer Coupling (1) and remove the Flange (2).

NOTICE

This is a left-hand thread.

3. Lay the tool on the workbench with the Brush Light Plate (80) side down and remove the Housing Screw (83) using a #1 phillips screwdriver.
4. Insert a thin blade screwdriver into the two notches and carefully pry the two halves of the Housing Package (79) apart.
For Throttle Lever Start Models, remove the Throttle Lever (76), Throttle Spring (77) and Throttle Lever Pin (78).

Disassembly of the Clutch Housing and Gear Case

1. Tilt the Clutch Housing (12), Gear Case (36) and Motor Assembly upward slightly and turn the Gear Case until the Ground Screw (74) shows.

NOTICE

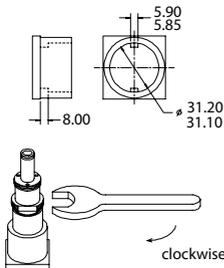
Be sure to hold the Motor Assembly and Gear Case together. Rough handling may damage the Fan Pilot Rod (40) in the Fan (41).

2. Using a phillips screwdriver, remove the Ground Screw and the Ground Screw Washer (75).
3. Remove the Clutch Housing and Gear Case from the Housing. When removing the Gear Case from the Housing, hold the Gear Case Shield (37) so that the Gears do not fall out.
4. Remove the Fan (41) and the Fan Pinion Gear (39). Remove the Fan Pilot Rod (40).

NOTICE

The Fan Pilot Rod is ceramic. Do not mishandle or drop.

5. Remove the Gear Case Shield and drop the two Spindle/Gear Heads (31) from the Gear Case.
6. Separate the Spindle/Gear Heads and remove the Gear head Pinion Gear (35) and Planet Gears (34).
7. Fit the two notches at the rear of the Gear Case into the Gear Case Jig part no. EP1510N-J37. (Refer to Dwg. TPD1820)



(Dwg. TPD1820)

8. Using a thin blade screwdriver, remove the Front Bit Retainer Retaining Ring (6) from the Bit Retainer Sleeve (9). Remove the Bit Retainer Collar (7), the Bit Retainer Spring (8) and the Bit Retainer Sleeve.
9. Remove the two Bit Retaining Balls (19) from the Bit Holder Assembly (21) by tapping the Housing on the work surface.
10. Unscrew the Clutch Adjusting Ring (4) and remove the three Clutch Adjusting Pins (11).
11. Using external snap ring pliers, remove the Bit Retainer Retaining Ring (10).
12. Using a 29 mm wrench on the flats of the Clutch Housing, unscrew and remove the Clutch Housing from the Gear Case.

NOTICE

This is a left-hand thread.

13. Remove the Clutch Spring Plate (15) and the Clutch Spring (16).
14. Remove the Taper Ring Retaining Ring (17).
15. Remove the Bit Holder Assembly and separate it from the Taper Ring Assembly (18).
16. Remove the two Pilot Cam Balls (20), the Pilot Push Spring (23), the Pilot Push Spring Washer (22) and the Pilot (22) from the Bit Holder Assembly.
17. **For Throttle Lever Start Models**, remove the Front Shim (13) and the Rear Shim (14) first. Then remove the Taper Ring Retaining Ring. Separate the Taper Ring Assembly from the Bit Holder. Remove the two Pilot Cam Balls and the Pilot (22) from the Bit Holder Assembly.
18. Remove the Clutch Pilot Rod (38) and the Cam Guide (24). Remove the two Cam Guide Balls (25) from the Guide.
19. Lift the Gear Case from the Gear Case Jig and push the Spindle Bearing (30) and Cam (27) from the Case.
20. Lift the Cam from the Spindle Bearing and remove the Cam Rollers (28).
21. Slide the Spindle Washer (29) from the Spindle Bearing.

Cleaning and Inspection of the Tool

1. Clean all of the mechanical parts in an approved safety solution in a well-ventilated area. Inspect for damage or wear.
2. Inspect the Fan. If the four corners of the hole are worn, replace the Fan.
3. Inspect the Fan Pinion Gear and Fan Pilot Rod. If they are damaged or cracked, replace them.
4. If the taper on the Pilot is worn, replace the Pilot and the two Pilot Cam Balls.
5. Inspect the Cam Guide Balls. If they are worn, replace them.
6. Inspect the Cam Guide. If its holes are worn, replace it.
7. Inspect the Taper Ring Assembly. If the internal taper is worn, replace it.
8. Inspect the Cam Rollers. If they are worn, replace them.
9. Inspect the Spindle Washer. If its surface is worn, replace it.
10. Inspect the Spindle Bearing. If it does not rotate smoothly, replace it.
11. Inspect the Gears and the Gear Case. If the teeth are worn, replace them.

Disassembly of the Electrical Components

1. Remove the Reverse Switch Circuit Board (69) from the Housing.

NOTICE

Do not touch any circuit paths if using pliers.

2. Loosen the Receptacle Assembly (73).
3. Using a #0 phillips screwdriver, remove the two Switch Base Screws (63) mounted on the Microswitch Circuit Board (58).

NOTICE

The Switch Base Screws are coated with thread adhesive. Unscrew gradually to prevent damage to the threads.

4. Remove the Motor Assembly and the Controller Assembly (68) from the Housing Package while holding both of them together.

NOTICE

Be careful not to damage the Motor Pilot Rod (42).

5. To remove the Controller Assembly, pull the three pin connector from the Reverse Switch Circuit Board.
6. Remove the two-pin connector from the Microswitch Circuit Board.
7. Using needle nose pliers, remove the three wires from the Shut-off Switch (60).

NOTICE

Be careful not to damage the Shut-off Switch Terminals.

8. Set the Controller Assembly aside.
9. Grasp the Microswitch Circuit Board using needle nose pliers and squeeze the ends of the two white Switch Base Spacers (65).
10. Using needle nose pliers, squeeze the Switch Base Spacers and remove the Insulating Film (66).
11. Using the pliers, remove the Switch Base Spacers from the Brush Light Circuit Board.
12. Remove the two Shut-off Switch Screws (62).
13. Remove the two Start Switch Screws (62).
14. Remove the Switch Plate (59) and the Switch Pilot Rod (56) from the Switch Plate.
15. Inspect the tip of the Switch Pilot Rod. If it is bent or worn, replace it.
16. Check the Shut-off Switch for continuity. Replace it if defective.
17. Check the Start Switch (61) for continuity. If it is defective, desolder and remove it from the Microswitch Circuit Board.
18. If the Brush Light Circuit Board is defective, desolder and remove the red and blue wires.
19. If the components on the Reverse Switch Circuit Board are damaged or defective, desolder and remove the red and blue wires.

Assembly

Assembly of the Motor Housing

1. Install the Front Armature Bearing (47) and the Rear Armature Bearing (49) to the Armature shaft ends.
2. Apply grease to both ends of the Motor Pilot Rod (42) and insert it into the center hole of the Motor Assembly.
3. Insert the Armature through the notched end of the Field (46).

NOTICE

Be careful not to damage the commutator or the windings. Hold the rotor, not the commutator when assembling.

4. Install the Rear End Plate (50) to the notched end and the Front End Plate (43) to the Field.
5. Snap the two Motor Assembly Spring (44) over the notches of the Rear End Plate and the Front End Plate.
6. Insert the Brush Assemblies (51) into the brush holders of the Rear End Plate. Be sure the tab on the Brush Assembly slides into the notch in the holder.

20. If the Reverse Switch (70) is damaged, desolder and replace.
21. Using an Ohm meter, check the Resistor (72) on the Reverse Switch Circuit Board. Reading should be 20 Ohm for 115 V Tools and 80 Ohm for 230 V Tools. Desolder and replace Resistor if necessary.
22. If the Capacitor (71) is damaged, desolder and replace it.
23. If the Motor Coil (53) is damaged, desolder the red and blue motor leads and replace the coil.

NOTICE

115 V Tools have one coil and 230 V Tools have two coils.

Disassembly of the Motor

1. Remove the Brush Caps (52) from the Rear End Plate (50). Using a pick, catch the terminal of the Brush Assembly (51) and pull it out of the Rear End Plate.

NOTICE

Do not damage the copper wires of the Brush Assembly. Reinstall the Brushes as they were removed unless they are replaced.

2. Remove the insulation tape around the Motor.
3. Using a thin blade screwdriver, remove the Motor Assembly Springs (44) by inserting the screwdriver between the Springs and the Rear End Plate and prying upward.

NOTICE

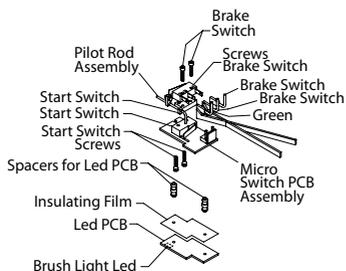
230 V models have the two capacitors on the Motor Assembly Spring. Be careful not to damage the capacitors when removing the Spring.

4. Remove the Rear End Plate and the Front End Plate (43) from the Field (46).
5. Pushing the Armature (48) toward the Fan side, remove the Armature from the Field.
6. Do not damage the commutator or the winding of the Armature. Hold the rotor, not the commutator.
7. Remove the Motor Pilot Rod from the Armature and inspect it. If it is worn, replace it.
8. Remove the Front Armature Bearing (47) and the Rear Armature Bearing (49) from the Armature and inspect them. If they do not rotate smoothly, replace them.
9. Inspect the Armature, Field and End Plates. Use a piece of fine cloth to wipe away contamination. For excess build up, spray with contact cleaner and brush if necessary.
10. To clean the commutator on the Armature, spray with contact cleaner and brush if necessary.
11. Using a tester, inspect the commutator. Replace the Armature if necessary.

7. Screw on the Brush Caps (52).
8. Wrap one layer of 3M #56 insulation tape around the Motor Assembly.
9. **For Throttle Lever Start Models**, put two additional strips of insulation tape, one upon the other, onto the Brush Light Circuit Board (67) side of the Motor Assembly. This insulates the area between the ground wire and the Field.

Assembly of the Electrical Components

1. Solder the red and blue wires to the Brush Light Circuit Board.
2. Solder the Reverse Switch (70) and the Resistor (72). Using shrink tubing 5 mm long as spacers, solder the Capacitor (71) into place. Solder the red and blue wires to the Reverse Switch Circuit Board (69).
3. Solder the Start Switch (61) onto the Microswitch Circuit Board (58).
4. Insert the Switch Pilot Rod (56) into the hole in the Switch Plate (59). (Refer to Dwg. TPD1819).



(Dwg. TPD1819)

- Mount the Switch Plate with the Pilot Rod onto the Start Switch by depressing the Start Switch lever with the Pilot Rod. Insert the Pilot Rod into the slot in the Microswitch Circuit Board and align the Switch Plate on top of the Start Switch. Insert the two Switch Base Screws (63) from the bottom of the Microswitch Circuit Board into the Switch Plate. Tighten the Screws to 1.6 KG-cm.
- Mount the Shut-off Switch (60) onto the Switch Plate with the two Switch Screws (62). Tighten the screws to 1.6 KG-cm.
- Position the Insulating Film (66) onto the back of the Brush Light Circuit Board. Insert the two Switch base Spacers (65) through the Insulating Film and into the holes of the Circuit Board.
- Install the Brush Light Circuit Board onto the back of the Microswitch Circuit Board by inserting the two Switch base Spacers into the holes in the Circuit Board.

NOTICE

Be sure that the Brush Light LED is toward the motor side of the circuit board.

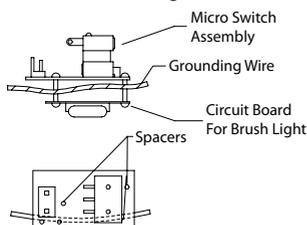
- Using needle nose pliers, install the three connectors from the Controller Assembly (68) onto the Shut-off Switch.

NOTICE

Make sure to connect the correct color wire to the proper terminal. Refer to the wiring diagram to insure that all wires are installed properly.

- Install the two-pin connector from the Controller Assembly onto the Microswitch Circuit Board.
- Install the three-pin connector from the Controller Assembly onto the Reverse Switch Circuit Board.
- Run the ground wire around the Switch Base Spacers and between the Microswitch Circuit Board and the Brush Light Circuit Board. (Refer to Dwg. TPD1818).

Route of Grounding Wire



(Dwg. TPD1818)

- Bring the Motor Assembly and Microswitch Circuit Board together by inserting the Motor Pilot Rod into the hole in the Motor shaft and then setting both into the Housing Package (79).
For Throttle Lever Start Models, lay the ground wire between the Motor and the Housing Package.

- Install the two Switch Base Screws and tighten to 1.6 KG-cm.
- Install the Controller Assembly into its groove in the Housing. Place the ground wire into the notch in the Controller Assembly and align this notch with the tab in the Housing.
- Install the Reverse Switch Circuit Board into the two grooves in the Housing.
- Install the Receptacle Assembly (73) into the Housing, making sure the ground wire is underneath the HIC. The Receptacle can be installed in either position.
- Place the black and white Receptacle wires into the notch Controller Assembly.
- Place the ceramic Fan Pilot Rod (40) into the Fan Pinion Gear (39) and then fit the Gear into the Fan (41). Now slide the Fan (41) onto the Motor Shaft.

Assembly of the Gear Case and Clutch Housing

- Apply grease to the Planet Gears (34), the surfaces of the Gear Heads (32) and the teeth of the Gear Head Pinion Gear (35).
- Assemble the Spindle Gear Heads, the Gear Head Pinion Gear and the Gear Head.
- Apply grease to all the Gears.
- Place the Gear Head onto the Spindle/Gear Heads.
- Apply grease to the Spindle Washer (29).
- Place the Spindle Washer, then the Spindle Bearing (30), onto the Cam (27).
- Apply grease to the inner teeth of the Gear Case (36).
- Insert the Cam into the Spindle Bearing.
- Hold the Cam with needle nose pliers and insert the entire unit into the Gear Case while rotating the Cam and the Gear Case.
- Apply grease to the gear end of the Gear Case and install the Gear Case Shield (37).
- Apply grease to the notches of the Cam.
- Place the Cam Rollers (28) into the notches on the Cam.
- Apply grease to the inner surface, the holes and the grooves of the Cam Guide (24).
- Insert the Cam Guide Balls (25) into the holes in the Cam Guide.
- Install the Cam Guide over the Cam. Keep the Cam Balls at a 90 degree angle to the Cam Rollers to prevent the Balls from being pushed out.
- Apply grease to the inner surface of the Bit Holder Assembly (21). Using a rod, push the Pilot (22) into the Bit Holder.
- For Push to Start Models**, insert the Pilot Push Spring Washer (22) and the Pilot Push Spring (23) into the Bit Holder.
Throttle Lever Start Models do not use a Push Spring and Washer.
- Apply grease to the holes of the Bit Holder and insert the two Pilot Cam Balls (20).
- Apply grease to the inner diameter and the tapered end of the Taper Ring Assembly (18). Insert grease between the ball bearing thrust washer and the Taper Ring Assembly, which are attached. Install the Taper Ring Assembly onto the Bit Holder.
- Install the Bit Holder Assembly onto the Cam Guide in the Gear Case.
- The Taper Ring Retaining Ring (17) has a round edge side and a sharp edge side. Install the Taper Ring Retaining Ring, sharp edge side first, into the groove on the Bit Holder.

NOTICE

There are four grooves on the Bit Holder. The fourth groove from the bit end is for Push to Start Models. The third is for Throttle Lever Start Models.

- For Throttle Lever Start Models**, place the Spindle Washers onto the Bit Holder.
- Place the Clutch Spring (16) and the Clutch Spring Plate (15) over the Bit Holder.
- Fit the two notches at the rear end of the Gear Case Assembly into the Gear Case Jig part no. EP1510N-J37. Screw the Clutch Housing (12) partially into the Gear Case.

NOTICE

This is a left-hand thread.

At the middle of the Clutch Housing threads, apply Loctite Threadlocker 3 Bond 1406[®] to about three threads. Push down and rotate the Bit Holder until it engages the Cam Guide. Hold in place. Screw the Clutch Housing in completely.

- Using an open end torque wrench on the flats of the Clutch Housing, tighten the Clutch Housing to 28.5 Nm.
- Apply grease to both ends of the Clutch Pilot Rod (38) and insert it into the Gear Case.
- For Throttle Lever Start Models**, inspect the clearance of the Bit Holder Assembly. Touch the end of the Clutch Pilot Rod and push on the Bit Holder Assembly. If the Clutch Pilot Rod is moved by the Bit Holder at this time, add additional spacers.
- Install the Bit Retainer Retaining Ring (10), sharp edge side first, into the second groove from the bit end of the Bit Holder.
- Apply grease to the holes of the Bit Holder and insert the two Bit Retaining Balls (19) into the holes.
- Apply grease to one end of each Clutch Adjusting Pin (11) and insert the three Pins into the Clutch Housing.
- Apply grease to the other end of each Clutch Adjusting Pin and the threads of the Clutch Housing. Screw the Clutch Adjusting Ring (4) onto the Housing.
- Install the Bit Retainer Sleeve (9), the Bit Retainer Spring (8) and the Bit Retainer Collar (7) onto the Bit Holder.
- Using a thin blade screwdriver, install the Front Bit Retainer Retaining Ring (6).
- Unclamp the Gear Case Jig from the vise and turn it over to remove the Clutch and Gear Case Assembly.
- Lift the Motor slightly and slide the Gear Case onto Motor with the Ground Screw hole adjacent to the ground wire.
- Attach the ground wire to the Gear Case with the Ground Screw (74) and Washer (75). Tighten to 4 KG-cm.
- Turn the Gear Case until the notch in the Gear Case matches the tab in the Housing.
- Completely insert the ground wire into the groove in the Housing.

Adjusting the Brake Timing

- Insert a .65 mm thick gauge or pin gauge between the Pilot Rod Adjusting Screw (55) head and the Shut-off Switch. Push the Bit Holder. **The Shut-off Switch should not click.**

- Insert a .80 mm gauge and push the Bit Holder. **The Shut-off Switch should click.**
- Adjust the Pilot Rod Adjusting Screw if necessary using the two adjusting spanner wrenches.
- For Throttle Lever Start Models**, there is no need to push the Bit Holder. Slide the gauges between the Pilot Rod Adjusting Screw and the Throttle Lever (76).

Assembly of the Tool

- For Push to Start Models**, make sure the ground wire is inserted in the groove in the Housing.
- For Throttle Lever Start Models**, make sure the Ground Wire is between the Motor Assembly and the Housing.
- Snap the Housing halves together.
- For Throttle Lever Start Models**, insert the Throttle Lever Pin (78) into the Housing. Insert the Throttle Spring (77) into the Throttle Lever. While compressing the Throttle Spring, install the Throttle Lever onto the Throttle Lever Pin. Snap the Housing halves together.
- Install the Housing Screws (83) into the Housing and tighten to 4 KG-cm.
- Slide the Flange (2) onto the Housing. Screw the Retainer Coupling (1) onto the Housing until it clicks into place.

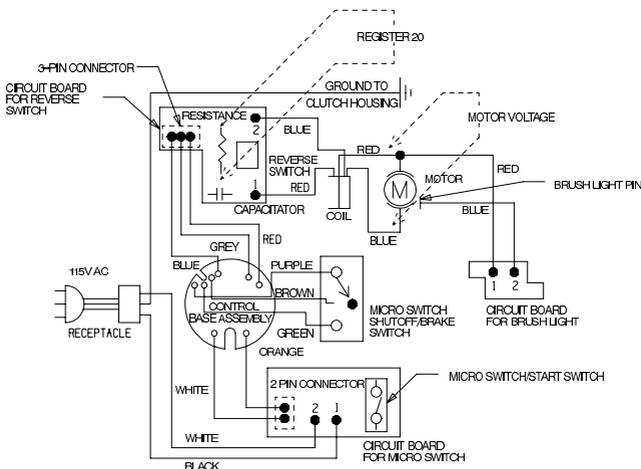
NOTICE

These are left-hand threads.

- Attach the Power Cord (81 or 84).

Testing the Tool

- Test forward and reverse operation by pressing the Bit Holder against the work surface with the Reverse Switch in each position.
- Tighten the Clutch Adjusting Ring all the way, reverse it one turn and test for proper shut off operation and maximum torque.
- Reset the Clutch Adjusting Ring to mid scale and check for torque repeatability by cycling the tool between five to ten times.
- For repair and troubleshooting of the high torque low voltage Controller, refer to the operation and maintenance manual.



Troubleshooting Guide

Trouble	Probable Cause	Solution
Screwdriver fails to rotate (forward or reverse).	Does the microswitch "click" when the bit is pushed rearward on push to start models or when the trigger is depressed on trigger models?	Starting microswitch is defective; replace the microswitch. Pilot Rod "H" is binding; clear obstruction or replace Rod. Pilot Rod "G" or Pilot Rod "H" is defective; repair or replace Rod. Bit Holder is binding; clear the obstruction. Incorrect Pilot Rod; check each rod length and place each length in its proper position. Incorrect assembly of Clutch; check clutch parts and balls for proper assembly. Stop Ring out of position; install the Stop Ring correctly.
	Is the brush light turned on?	Brushes are worn; replace the brush assemblies.
	With tool unplugged, can bit be rotated manually?	Defective planetary gearing; replace the defective parts. Defective clutch; replace the defective parts. Defective motor, replace the motor.
	Are the brush assemblies in good condition?	Brushes are cracked; replaced the Brush Assemblies. Commutator worn; replace the motor.
	Remove the Coupling, separate the Housing halves and plug the tool into an electrical receptacle. Using a voltmeter, make the following determinations:	NOTICE
	Is there voltage to the Motor?	Motor is defective: replace the Motor. Brushes are defective; replace the Brush Assemblies.
	Is there voltage to the Reverse Switch?	Coil is defective, replace the Coil. Wiring is defective; replace any broken wires and resolder any defective solder connections.
	Is there voltage out of the Reverse Switch?	Reverse Switch is defective; replace the Reverse Switch. Solder connections defective; resolder any defective connections. Power Cord is defective; replace the Power Cord.
	Is there voltage to the controller?	Solder connections defective; resolder any defective connections. Replace the ON/Off Switch.
Screwdriver operates in one direction but will not operate in the opposite direction.	Are the wire leads in good condition?	Solder connections are defective; resolder any defective solder connections.
	Does the "Forward-Reverse" Switch function properly?	Defective "Forward-Reverse" Switch; replace the Switch.
Bit does not rotate but motor hums.	When the gears are removed, will the motor rotate?	Armature is in contact with the magnets; replace the motor. Foreign material in the motor; clean the motor.
	Is the planetary gearing smooth when the bit is rotated by hand?	Gears are worn or damaged; replace any defective gearing. Clutch Assembly is worn; replace damaged or worn parts.
Motor runs but the Bit fails to rotate.		Armature Fan is defective; replace the Armature Fan. Gears are worn or damaged; replace any defective gearing.
Shut-off Brake malfunctions more than one index of the Clutch.	Does Bit speed exceed rated speed by more than 100 .pm?	Motor magnet is demagnetized; replace the motor.
	Is Shut-off Brake microswitch functioning? (Does it click when button is depressed does it test correctly with an ohmmeter?)	Defective microswitch; replace the microswitch.
	Is Shut-off Brake Switch in "ON" position when the Bit Holder is fully depressed?	Pilot Rods "H", "G" and "F" are worn; check Rod length. Replace if necessary. Pilot Rod "D" out of adjustment; readjust with Adjusting Screw. Loose Clutch Housing Assembly; tighten the Clutch Housing Assembly.
	When the start switch is in the "ON" position, does the motor stop when the shut-off Brake Switch turns on?	Controller package is defective; replace the controller. Resister is defective; replace the Resistor.

Trouble	Probable Cause	Solution
Bit Holder cannot be depressed		Bit Holder is defective; repair or replace the Bit Holder. Retaining Ring on Bit Holder has been lost or is out of position.
Tool makes abnormal sounds when the motor is running.	Is there looseness at the assembled points.	Screws are loose; tighten all Screws Clutch Housing is loose; tighten Clutch Housing to proper torque.
	After removing the gear train does the motor sound normal when running?	Armature is in contact with the magnet; replace the magnet. Foreign material has gotten into the Motor; clean or replace the Motor. Ball Bearings are defective; replace the Motor. Armature is defective; replace the motor.
	Is gear train properly lubricated?	No grease on the gear train; apply a thin film of the recommended grease. Gears are worn or dirty; clear or replace the gears.
Tool generates abnormal heat when operating.	After removing the gear train, does the tool cool down and motor run normally?	Motor is defective; replace the motor. Planetary gears and the Clutch require lubrication; lubricate the Clutch and gear train with the recommended grease. NOTICE Do not apply too much or too little grease.
Tool outputs high torque	Is the shut-off brake functioning properly?	Refer to problem "Shut-off Brake malfunctions more than one index of the Clutch" to check shut-off brake malfunctions.
	Is the Clutch properly lubricated?	No lubrication on the Clutch components; lubricate the clutch with recommended grease.
	Is there wear on the face of the spindle washer?	Spindle Washer is worn; replace the spindle washer. Clutch Spring is damaged; replace the Clutch Spring
Tool outputs low torque.	Is the Clutch Housing Assembly joint tight?	Loose joint between the Gear Case and Clutch Assembly; tighten the joint with a torque wrench to the specified torque. Cam is worn; replace the Cam. Clutch Spring is damaged; replace the Clutch Spring. Cam Guide is damaged; replace the Cam Guide.

Related Documentation

For additional information refer to:

Product Safety Information Manual 16602963.

Product Information Manual 45527579.

Parts Information Manual 45530102.

Manuals can be downloaded from www.irttools.com.

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