

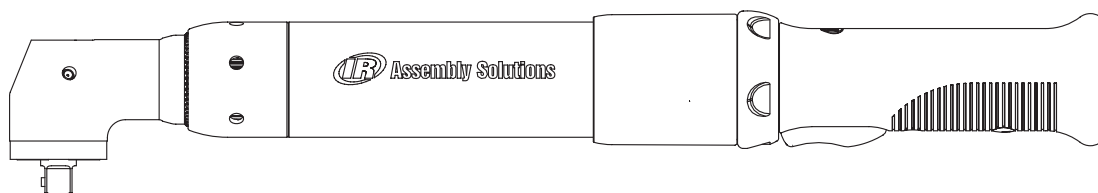


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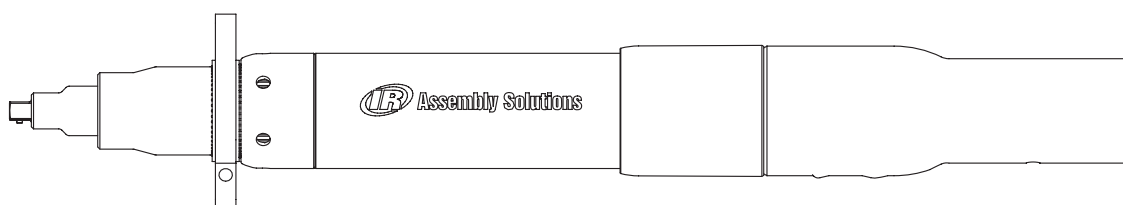
Service Manual for **QE4 Series** **Angle Wrench, In-Line and Push-to-Start** DC Electric Tools

NOTICE

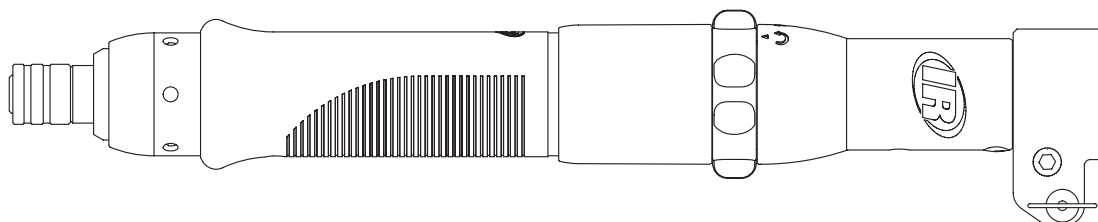
For routine Maintenance, Operation and Instruction information regarding this product, see Publication manual P7609, located at www.irttools.com/techdocuments, or contact the nearest Ingersoll-Rand Office or Distributor.



(Dwg. TP2174a)



(Dwg. TP2174b)



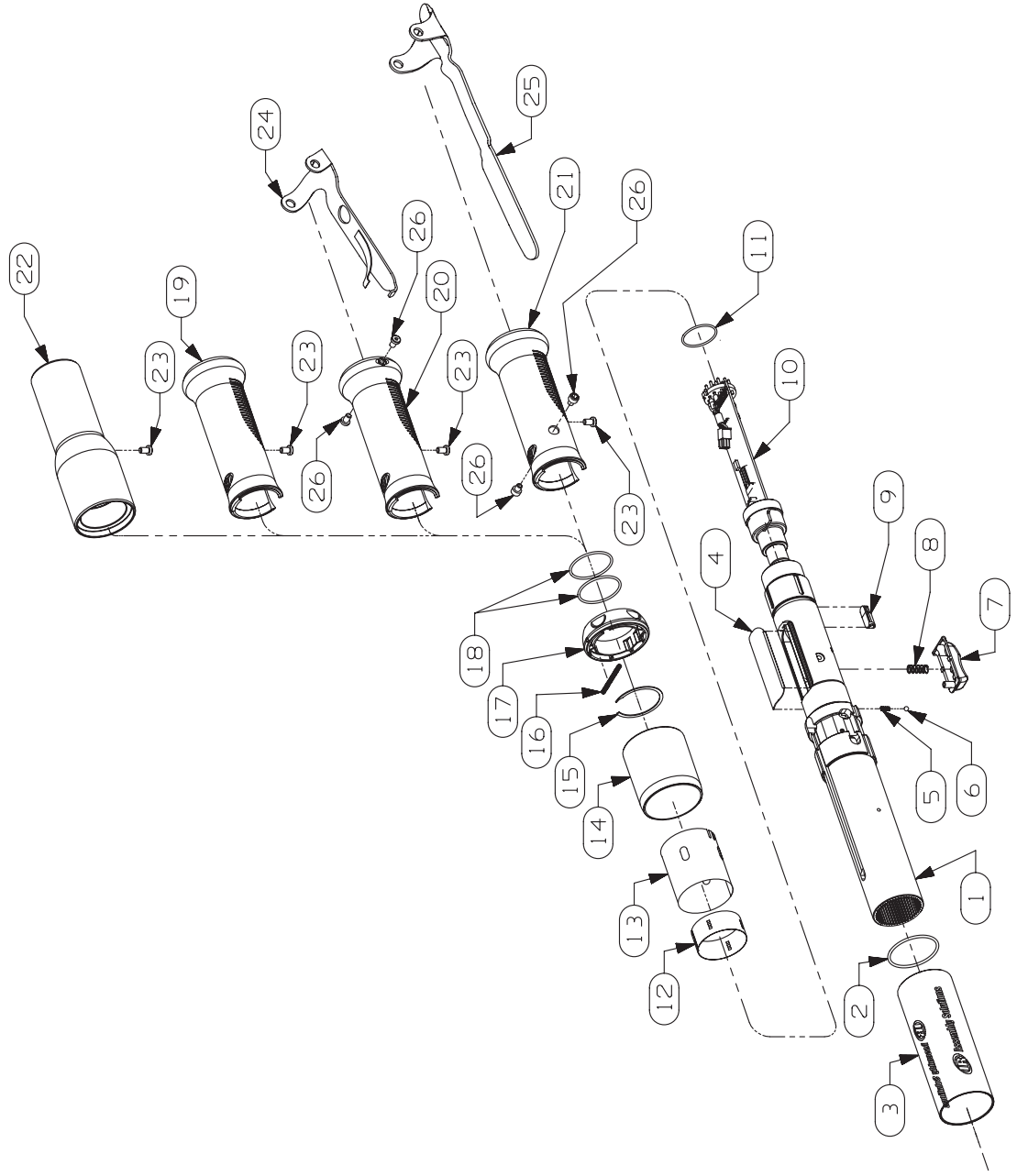
(Dwg. TP2104)

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QE4 MOTOR HOUSING ASSEMBLY, GRIPS AND LEVERS

For In-Line and Angle Tools



(Dwg. TP2166)

QE4 MOTOR HOUSING ASSEMBLY, GRIPS AND LEVERS

For In-Line and Angle Tools

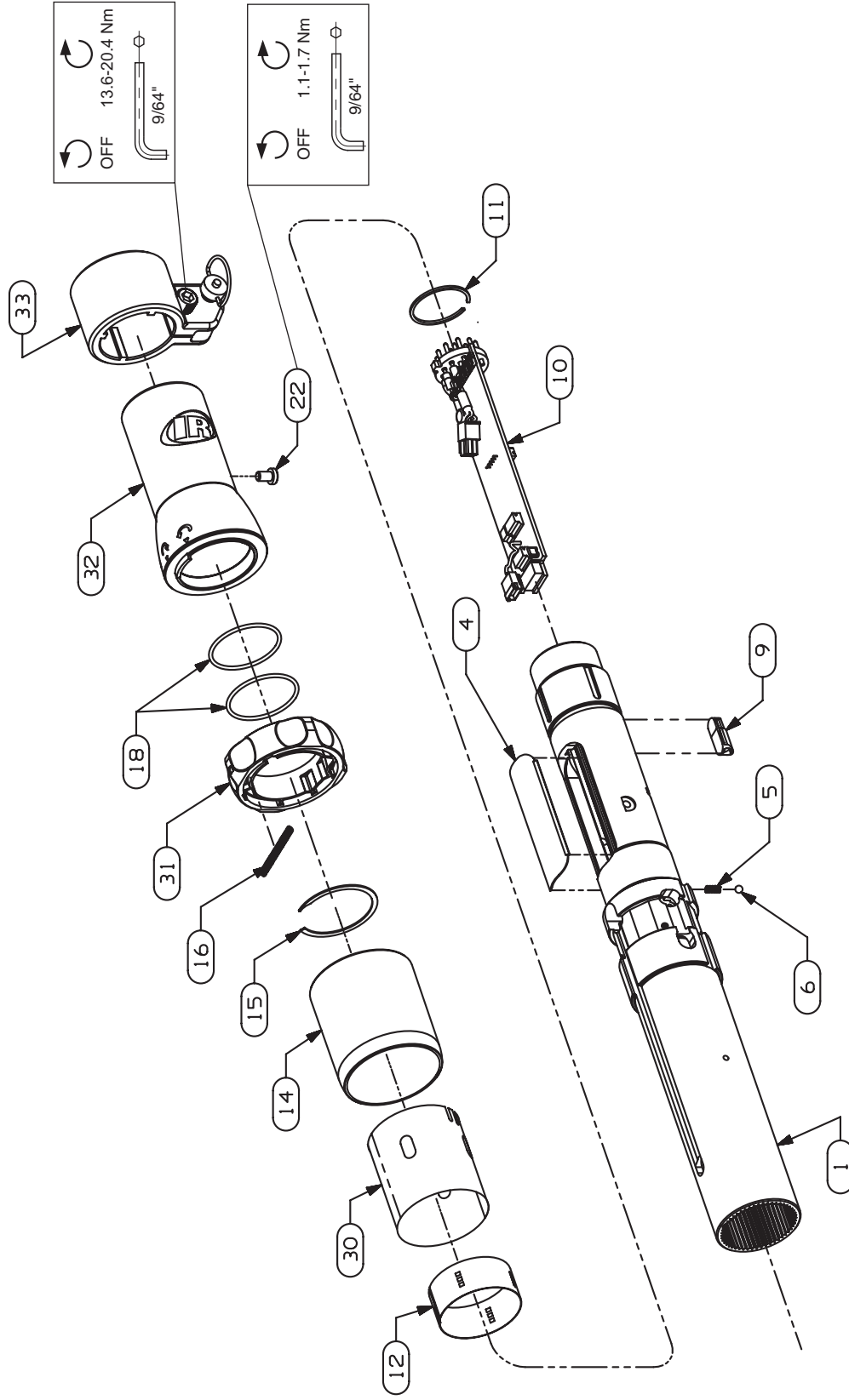


When Ordering, use applicable Part Number

Parts List					
Item	Part Description	Part Number	Item	Part Description	Part Number
1	Motor Housing Assembly	GEA15-D53	14	Label-Cover Lens	GEA15-600
2	O-ring	GEA40-136-211	15	Retaining Ring	GEA40-208
3	Housing Cover	GEA15-136	16	Spring	GEA40-329-52
4	Cover	GEA15-144	17	Reverse Ring	GEA40-329
5	Spring	GEA40-329-51	18	O-ring	GEA40-801
6	Ball	AV1-255	19	Handle Grip	GEA40-135
7	Trigger	GEA40-273	20	Handle Grip	GEA40-135SL
8	Spring	GEA40-273-51	21	Handle Grip	GEA40-135EL
9	Memory Chip	TRP-A528	22	Fixture Tool Sleeve	GEF40-137
10	Communication Board	GEA15-A2309	23	Socket Cap Screw (Low Head)	GEA40-135-68
11	Retainer	GEA40-2309-104	24	Lever, Short	GEA40-273SL
12	LED Flex Board	GEA15-98	25	Lever, Extended	GEA40-273EL
13	Warning Label	GEA15-99	26	Socket Head Cap Screw	GEA40-273EL-68

QE4 MOTOR HOUSING ASSEMBLY AND COMPONENTS

For Push-to-Start Tools



(Dwg. TP2170_B)

QE4 MOTOR HOUSING ASSEMBLY AND COMPONENTS

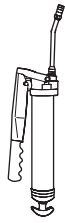
For Push-to-Start Tools



When Ordering, use applicable Part Number

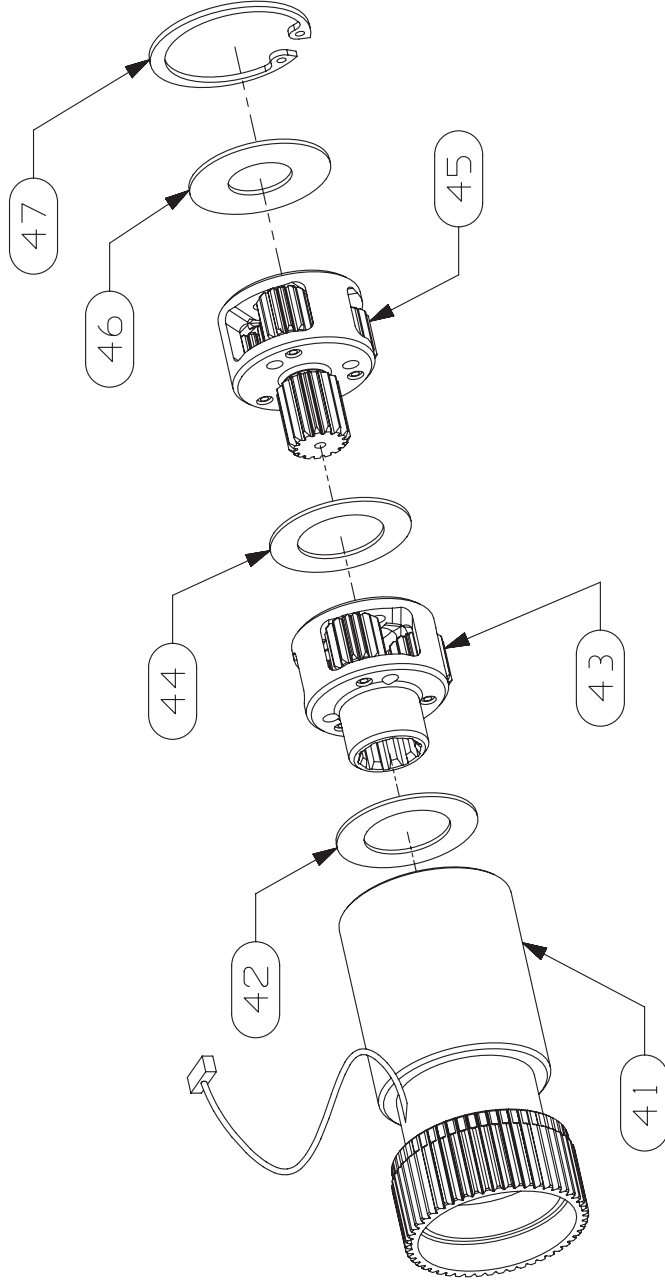
Parts List

Item	Part Description	Part Number	Item	Part Description	Part Number
1	Motor Housing Assembly	GEA15-D53	15	Retaining Ring	GEA40-208
4	Cover	GEA15-144	16	Spring	GEA40-329-52
5	Spring	GEA40-329-51	18	O-ring	GEA40-801
6	Ball	AV1-255	22	Socket Cap Screw (Low Head)	GEA40-135-68
9	Memory Chip	TRP-A528	30	Warning Label	GEPTS15-99
10	Communication Board	GEPTS15-A2309	31	Reverse Ring	GEPTS15-329
11	Retainer	GEA40-2309-104	32	Sleeve, Push to Start	GEPTS15-137
12	LED Flex Board	GEA15-98	33	Bracket	GEPTS15-A25
14	Label-Cover Lens	GEA15-600			



Ingersoll-Rand #67

For In-Line, Angle and Push-to-Start Tools



(Dwg. TP2167)

QE4 TRANSDUCER GEAR PACK ASSEMBLY AND COMPONENTS

For In-Line, Angle and Push-to-Start Tools

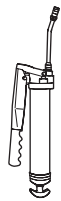


When Ordering, use applicable Part Number

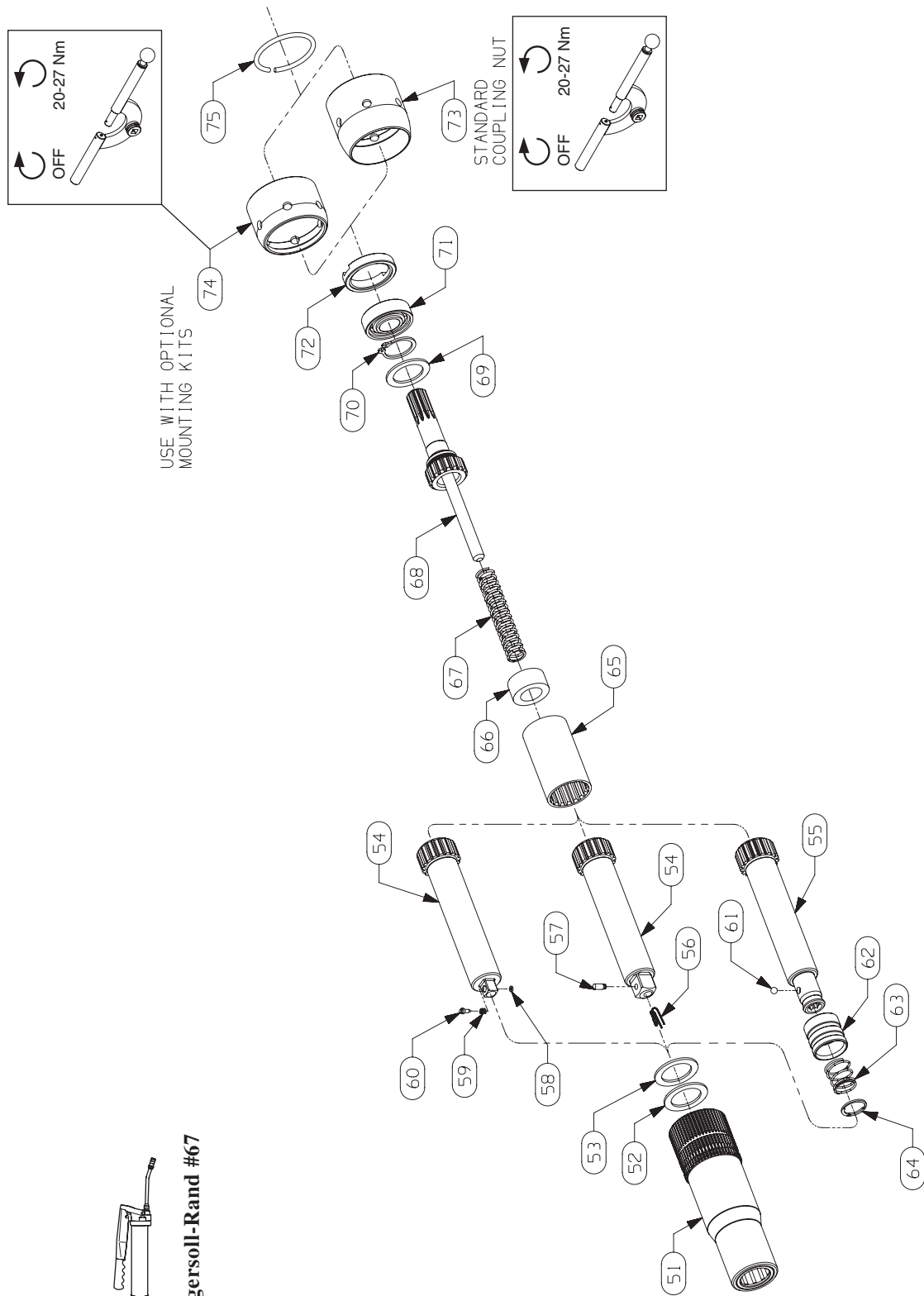
Model Identification				
Item	Part Description	Part Number	Part Number	Part Number
■	Transducer Gear Pack Assembly	GEA15-13-M37	QE4A{ }020{ }{ }	QE4A{ }034{ }{ }
41	Transducer Assembly	GEA15-A756-15	QE4S{ }015{ }{ }	QE4S{ }025{ }{ }
42	Spacer	DEP30-80	QE4T{ }015{ }{ }	QE4T{ }025{ }{ }
43	Spindle Assembly (2nd Stage)	DEP20-A8		
44	Spacer	DEP30-80		
45	Spindle Assembly (1st Stage)	GEA15-A216		
46	Spacer	DEP30-81		
47	Retaining Ring	W22-118		

QE4 ATTACHMENT COMPONENTS

For In-Line Tools



Ingersoll-Rand #67



QE4 ATTACHMENT COMPONENTS

For In-Line Tools

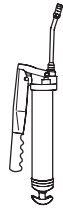


When Ordering, use applicable Part Number

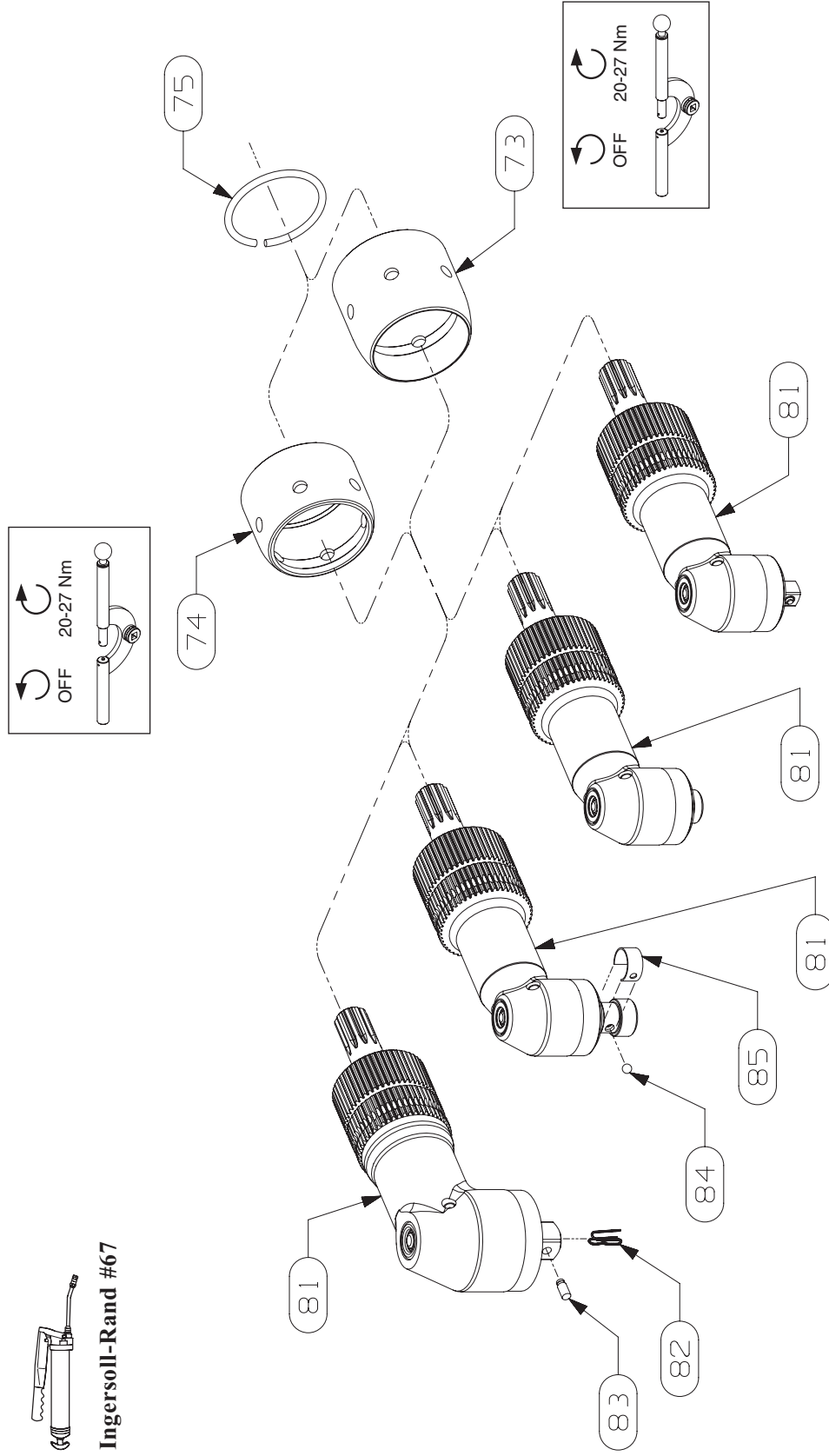
QE6 In-Line Attachment Components Parts List					
Item	Part Description	Part Number	Item	Part Description	Part Number
----	QE4...21S04 (1/4" Sq. Drive & 2" Long Shank)	15E2S4	58	Washer for 21S04 and 41S04	2U-817
----	QE4...21S06 (3/8" Sq. Drive & 2" Long Shank)	15E2S6	59	Spring for 21S04 and 41S04	500B-818
----	QE4...21S08 (1/2" Sq. Drive & 2" Long Shank)	15E2S8		Socket Retaining Pin for 21S04 and 41S04	500B-816AX
----	QE4...21Q04 (1/4" Hex, Quick Change & 2" Long Shank)	15E2Q4		Ball for 21Q04 and 41Q04	RX1-629
----	QE4...41S04 (1/4" Sq. Drive & 4" Long Shank)	15E4S4		Sleeve for 21Q04 and 41Q04	5C1-930-4
----	QE4...41S06 (3/8" Sq. Drive & 4" Long Shank)	15E4S6		Spring for 21Q04 and 41Q04	5C1-931-4
----	QE4...41S08 (1/2" Sq. Drive & 4" Long Shank)	15E4S8	60	Retaining Ring for 21Q04 and 41Q04	5C1-853
----	QE4...41Q04 (1/4" Hex, Quick Change & 4" Long Shank)	15E4Q4		Coupler for 21S04, 21S06, 21S08 and 21Q04	15E2-581
----	QE4...20Q04 (2" Long, no float, 1/4" Quick Change)	15E1Q4		Spacer for 41S04, 41S06, 41S08 and 41Q04	120E4-581
----	QE4...20S04 (2" Long, no float, 1/4" Square)	15E1S4		Disengaging Spring for 20Q04, 20S04 and 20S06	GEA15-591
----	QE4...20S06 (2" Long, no float, 3/8" Square)	15E1S6		for 21S04, 21S06, 21S08 and 21Q04	15E2-626
51	Housing Assembly for 21S04, 21S06, 21S08 and 21Q04	15E2-A580	61	for 41S04, 41S06, 41S08 and 41Q04	120E4-626
	for 41S04, 41S06, 41S08 and 41Q04	15E4-A580		Drive Spindle Assembly	15E2-A584
52	Washer	120E4-105		Washer	120E4-105
53	Washer	120E4-106		Retaining Ring	FEA100-20
54	Square Drive Spindle for 21S04	15E2S4-586		Rear Spindle Bearing	8SA32-593
	for 21S06	15E2S6-586	62	Bearing Cap	8SA32-531
	for 21S08	15E2S8-586		Coupling Nut, Long	GEA2-27
	for 41S04	120E4S4-86		Coupling Nut, Short	15E2-27
	for 41S06	120E4S6-586		Retainer	GEA2-29
	for 41S08	120E4S8-586			
55	1/4" Hex, Quick Change Spindle for 21Q04	15E2Q4-586	63		
	for 41Q04	120E4Q4-586			
	Socket Retainer Spring for 21S06 and 41S06	401-718			
56	for 21S08 and 41S08	5UHD-718			
	Socket Retaining Pin for 21S06 and 41S06	5020-716			
57	for 21S08 and 41S08	804-716	64		

QE4 ATTACHMENT COMPONENTS

For Angle Assembly Attachment



Ingersoll-Rand #67



(Dwg. TP2169)

QE4 ATTACHMENT COMPONENTS

For Angle Assembly Attachment

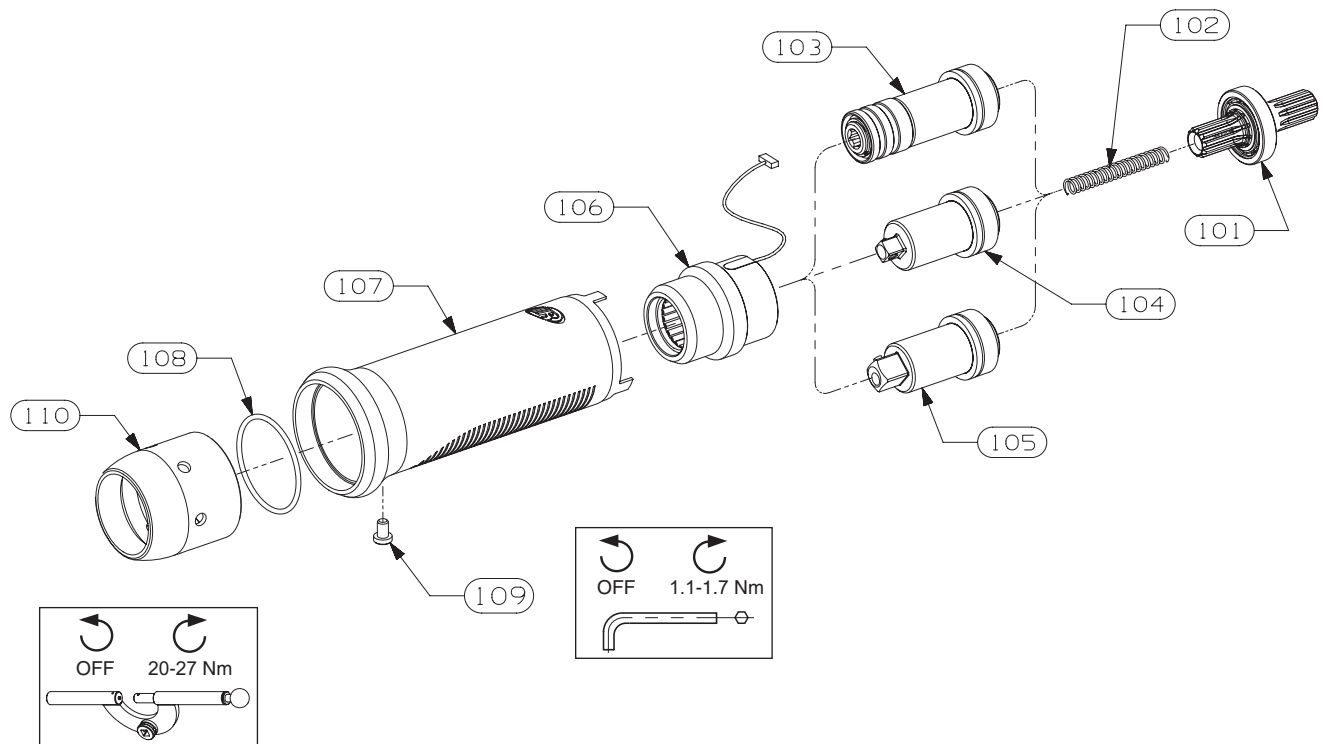


When Ordering, use applicable Part Number

		Model Identification							
		QE4.....A2H04	QE4.....A2Q04	QE4.....A2S04	QE4.....A2S06	QE4.....A4S06	QE4.....A4S08		
Item	Part Description	Part Number	Part Number	Part Number	Part Number	Part Number	Part Number	Part Number	Part Number
73	Coupling Nut, Long	GEA2-27	GEA2-27	GEA2-27	GEA2-27	GEA2-27	GEA2-27	GEA2-27	GEA2-27
74	Coupling Nut, Short	15E2-27	15E2-27	15E2-27	15E2-27	15E2-27	15E2-27	15E2-27	15E2-27
75	Retainer	GEA2-29	GEA2-29	GEA2-29	GEA2-29	GEA2-29	GEA2-29	GEA2-29	GEA2-29
81	Angle Assembly Attachment	GEA2H4	GEA2Q4	GEA2S4	GEA2S6	GEA4S6	GEA4S8	GEA4S8	GEA4S8
82	Socket Retaining Spring	----	----	----	401-718	401-718	4UHD-718	4UHD-718	4UHD-718
83	Socket Retaining Pin	----	----	----	5020-716	5020-716	804-716	804-716	804-716
84	Bit Retaining Ball.	----	AV1-255	----	----	----	----	----	----
85	Bit Retaining Spring	----	102A60-241	----	----	----	----	----	----

QE4 GRIP AND SPINDLES

For Push-to-Start Tools



(Dwg. TP2171_B)

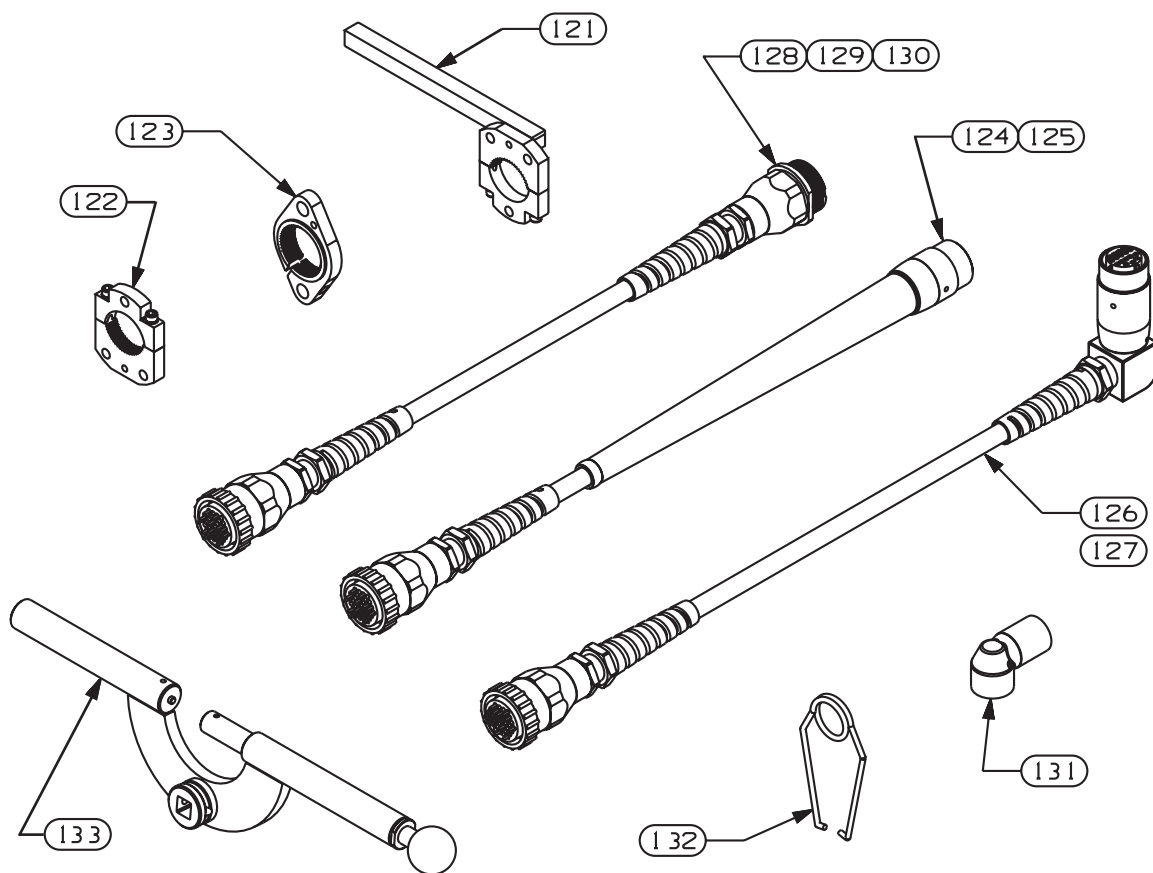


When Ordering, use applicable Part Number

Parts List for QE4 Push-To-Start Grip and Spindles

Item	Part Description	Part Number
101	Drive Spindle Assembly.....	GEPTS15-A586
102	Spring.....	DEPTS30-626
103	1/4" Hex, Quick Change Spindle Assembly.....	GEPTS15-A586-Q4
104	1/4" Sq. Drive Spindle Assembly.....	GEPTS15-A586-S4
105	3/8" Sq. Drive Spindle Assembly.....	GEPTS15-A586-S6
106	Spindle Housing Assembly.....	GEPTS15-A531
107	Grip Handle.....	GEPTS15-145
108	O-ring.....	GEA15-136-211
109	Cap Screw.....	GEA40-135-68
110	Coupling Nut.....	GEPTS15-27

QE4 ACCESSORIES (OPTIONAL PARTS)



(Dwg. TP2172_B)



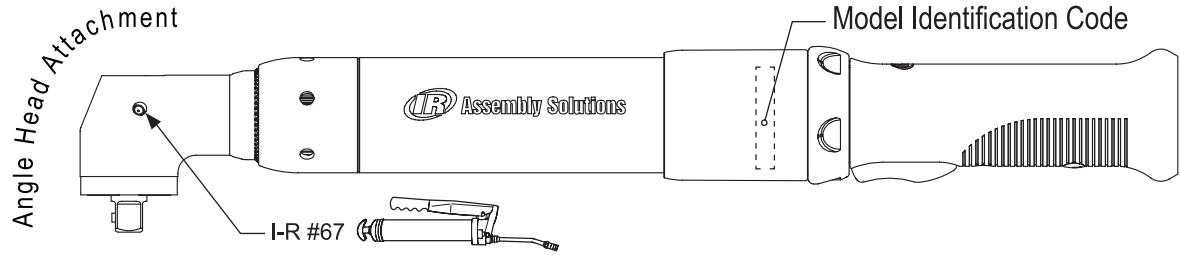
When Ordering, use applicable Part Number

QE4 Accessories Parts List		
Item	Part Description	Part Number
121	† Reaction Bar Assembly	GEA15-K48
122	† Mounting Plate Assembly	GEA4-K48
123	† Mounting Plate Assembly	15E4-K48
124	Power Cord Assembly (3 Meter)	GEA40-C0RD-3M
125	Power Cord Assembly (10 Meter)	GEA40-C0RD-10M
126	Power Cord Assembly, 90 Deg. (3 Meter)	GEA40-C0RD-3M-90
127	Power Cord Assembly, 90 Deg. (10 Meter)	GEA40-C0RD-10M-90
128	Power Cord Extension Assembly (10 Meter)	GEA40-EXT-10M
129	Power Cord Extension Assembly (20 Meter)	GEA40-EXT-20M
130	Power Cord Extension Assembly (40 Meter)	GEA40-EXT-40M
131	Angle Head Sleeve for Models { } A2H04, { } A2Q04, { } A2S04, { } A2S06	GEA40-170
	for Models { } A4S06, { } A4S08	GEA40-171
132	Suspension Bail	7L-365
133	Spanner Wrench	GEA40-478

† Must be used with QE4 'In-Line' tools; Optional for 'Angle Wrench' tools.

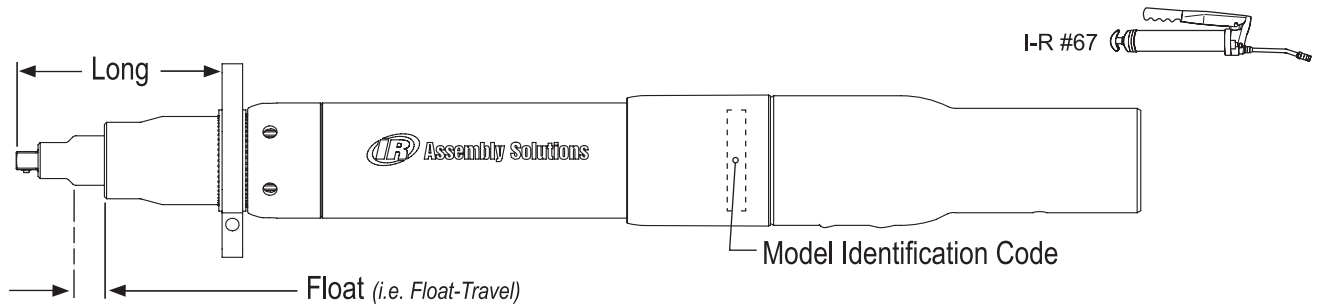
QE4 TOOL ASSEMBLIES

Angles



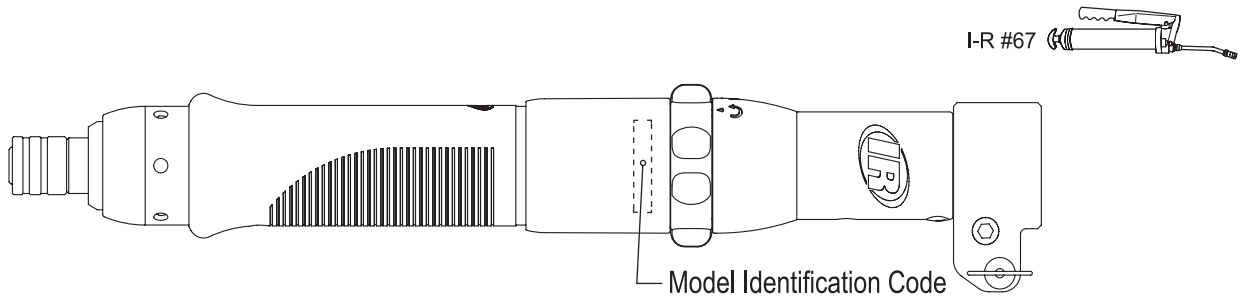
(Dwg. TP2174a)

In-Lines



(Dwg. TP2174b)

Push-to-Start



(Dwg. TP2104)

Table 1

Suggested Tools Parts List			
Item	Tool Used	Description	Where Used?
1	Spanner Wrench	I-R Part #GEA40-478	Coupling Nut
2	Pin Spanner Wrench	3 mm or 1/8" pin	Cable
3	Hook Spanner Wrench	-----	Motor Housing Assembly
4	Torque Wrench	1/2" Sq. Drive, 50 ft-lb capacity	General use
5	Adjustable Pin Wrench	-----	In-Line Spindle Bearing Caps
6	5/64" Hex Key	-----	Cap Screws (Low Socket Head)
7	9/64" Hex Key	-----	Cap Screws
8	Internal Snap Ring Pliers	-----	General use
9	Pick	-----	O-Rings, Smalley Ring, etc.
10	Needle Nose Pliers	-----	Accessing Connectors

MAINTENANCE

General Instructions :

- Refer to Table 2 “*Suggested Tools Parts List*” for quick reference to the tools recommended for the following disassembly/assembly instructions.

WARNING

- Repairs should be made only by authorized trained personnel. Consult your nearest Ingersoll-Rand Authorized Service Center.
- Disconnect the power cord from the receptacle before performing any maintenance on this or any other tool.
- Always use protective eyewear when performing maintenance on a tool or while operating a tool.
- Use of non-Ingersoll-Rand parts or failure to follow Maintenance Instructions may create a risk of electric shock or injury.

LUBRICATION

Whenever this product is disassembled, clean the parts and re-lubricate them as follows:

1. Clean and degrease all parts except for the 1st and 2nd Stage Spindle Assemblies (45, 43).
2. Wipe clean the 1st and 2nd Stage Spindle Assemblies with a clean, dry and lint-free rag
3. Once cleaned, apply prescribed amounts of Ingersoll-Rand #67 Grease as follows:
 - 2 to 3 cc to central area between gears of Spindle Assemblies
 - 1 to 2 cc to faces of Spindle Assemblies
 - Thin layer on Ring Gear teeth
4. **For Models with an Angle Assembly Attachment:** Use Ingersoll-Rand #67 Grease to lubricate Angle Head through Grease Fitting.
5. **For Models with an In-Line Attachment:** Use Ingersoll-Rand #67 Grease to lubricate the Drive Spindle Bearings, the Drive Spindle (54) and the Disengaging Spring (67).
6. **For Push-To-Start Models:** Use Ingersoll-Rand #67 Grease to lubricate bearing located inside Spindle Housing Assembly (107).

DISASSEMBLY

WARNING

- This procedure is to be performed by an authorized, trained repair person. To ensure proper functioning of the tool:
- When replacing the Motor Housing Assembly (1), always ensure that the Memory Chip (9), Communication Board (10), Transducer Gear Pack Assembly, and Attachment are all assembled as a set with the new Motor Housing Assembly.

CAUTION

- When replacing an Attachment, always use the Angle Assembly Attachment designed for that model. Never replace an Angle Assembly Attachment with an In-Line Attachment.
- When replacing a Transducer Gear Pack Assembly, always use the Assembly designed for that model.

General Instructions for Disassembly

1. Do not disassemble the tool any further than necessary to replace or repair damaged parts.
2. To protect part surfaces and to prevent distortion of Housings and threaded joints, use care when grasping the tool.
3. Avoid clamping non-metal surfaces, unless directed otherwise.
4. Do not remove any press fit part or any part of an assembly unless its removal is necessary for repair or replacement.

Grips

1. **For models with levers,** use the appropriate hex key to loosen Cap Screws (25) from lever (23 or 24) and remove lever from Handle Grip (20 or 21).
2. **For Push-To-Start models** loosen cap screw in Bracket Assembly (33) and remove Bracket Assembly from the Motor Housing Assembly.
3. **For all models,** with the lever or Bracket Assembly removed, use the appropriate hex key to loosen the Cap Screw (22) from the Handle Grip (19, 20, or 21), or from Sleeve (32).
4. Slide Handle Grip or Sleeve off of Motor Housing Assembly.

Attachments

WARNING

- NEVER grasp the tool in a vise, as this will likely result in damage to the tool causing wire leads to malfunction, which increases risk of electric shock.

CAUTION

- When installing or removing a Coupling Nut, use a Hook Spanner Wrench or similar wrench to hold the tool, and use a Spanner Wrench to tighten or loosen the Coupling Nut.

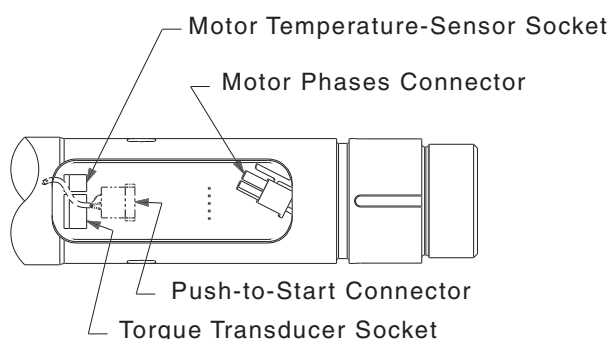
Disassembly of External Components

1. Dislodge O-rings (18) and remove Memory Chip (9) from assembly.
2. Remove Trigger Mechanism (7) from Motor Housing Assembly.

3. Remove Spring(s) (8) from Trigger mechanism. Note that there are two springs for models with an extended lever.
4. Slide Reverse Ring (17 or 21) away from Housing, being careful not to lose the Detent Ball (6) or Springs (5 and 16).
5. Remove Retaining Ring (15) from behind Label Cover Lens (14).
6. In a sliding motion, pull Warning Label (13 or 30) and Label Cover Lens (14) off end of Motor Housing Assembly.

Disassembly of Internal Components

1. Remove the Cover (4) for the Communication Board access hole in the Motor Housing Assembly.
2. Remove Retainer (11) used to retain Communication Board (10), located at rear end of Motor Housing Assembly in Connector cavity.
3. Through Communication Board access hole, disconnect the Motor Phase connector. (Refer to TP2173a)
4. Disconnect the Motor temperature-sensor connector from the Communication Board. (Refer to TP2173a)
5. Disconnect the Torque Transducer connector from the Communication Board. (Refer to TP2173a)



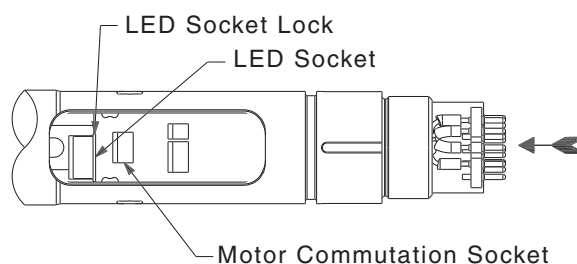
Torque and Motor Connector(s)

(Dwg. TP2173a)

6. Now slide the Communication Board (10) partially out of the Motor Housing Assembly (1) so that the Motor Commutation and LED Flex Board sockets are visible. (Refer to TP2173b)
7. Disconnect the Motor Commutation connector from the Communication Board. (Refer to TP2173b)
8. **For Push-To-Start models**, disconnect the Push-To-Start Connector from the Communication Board. (Refer to TP2173b)

Disassembly of Internal Components (Continued)

9. After sliding the lock on the LED Flex Board socket away from the socket, remove the LED Flex Board ribbon from the socket on the Communication Board. (Refer to TP2173b)
10. If necessary, remove the Communication Board from the Motor Housing Assembly.



LEDs and Temperature Connector(s)

(Dwg. TP2173b)

Angle Assembly Attachments

1. **For 3/8" and 1/2" Square Drive Spindles**,
 - a. Looking down hole of the Spindle's square socket, locate Retaining Pin (83) and Retaining Spring (82).
 - b. If necessary, use a pointed metal probe to pull retaining Spring out of Spindle cavity.
 - c. Also, if necessary, remove Pin from Spindle.
2. **For Quick Change Spindles**, remove Bit Retaining Spring (85) and Bit Retaining Ball (84).
3. Using a Hook Spanner Wrench or similar wrench to hold the tool, and using Spanner Wrench #GEA40-478 (or other appropriate wrench), unscrew Coupling Nut (73 or 74) and pull the Angle Assembly Attachment (81) out of Motor Housing Assembly (1).
4. If necessary, remove Coupling Nut Retainer (75) using an appropriate tool.

In-Line Attachments

1. For 3/8" Square Drive Spindles,
 - a. Locate Retaining Pin (57) and Retaining Spring (56) of Spindle's square socket.
 - b. If necessary, use a pointed metal probe to pull Retaining Spring out of Spindle cavity.
 - c. Also, if necessary, remove Pin from Square Drive Spindle (54).
2. For Quick Change Spindles,
 - a. Remove Retaining Ring (64), using Snap Ring Pliers.
 - b. Slide Spring (63), Sleeve (62), and Ball (61) off of the Spindle (55).
3. Using a Hook Spanner Wrench or similar wrench to hold the tool, and using Spanner Wrench #GEA40-478 (or other appropriate wrench), unscrew Coupling Nut (73 or 74) and pull the In-Line Attachment out of Motor Housing Assembly.
4. If desired, remove Coupling Nut Retainer (75) using the appropriate tool.

Note: *In the following step, the Bearing Cap (72) has a left-hand thread.*

5. Using an adjustable Pin Wrench, unscrew Bearing Cap (72).
6. Pull the Drive Spindle Assembly (68) out of Housing Assembly (51).
7. If necessary, using a bearing puller tool, press the Rear Spindle Bearing (71) off the Drive Spindle Assembly. Then remove the Retaining Ring (70) and Washer (69).
8. Now tilt Spindle Housing, causing the Disengaging Spring (67), Coupler (65), Square Drive or Quick Change Spindle (54 or 55), and Washers (52) and (53) to slide out.
9. Note that the No-Float Models have an extra Spacer (66) inside the Coupler.

Sleeve (For In-Line and Angle Wrench Models)

1. Slide Housing Cover (3) off of Motor Housing Assembly (1).
2. Remove O-ring (2) from the Motor Housing Assembly near the location of the Label Cover Lens (14).

Push-To-Start Output Spindle Assembly End - Disassembly

1. Using a Hook Spanner Wrench or similar Wrench to hold the tool, and using Spanner Wrench #GEA40-478 (or other appropriate wrench), unscrew Coupling Nut (110).
2. Use the appropriate hex key to loosen the Socket Cap Screw (109) from the Handle Grip (107) and remove from Motor Housing Assembly.

3. Remove O-ring (108) from underneath edge of Grip Handle (107).
4. Slide Handle Grip off of the Motor Housing Assembly.
5. Verify that the Push-To-Start and Transducer Assembly connectors have been disconnected from their perspective terminals. (See Disassembly of Internal Components section.)
6. Gently pull the connectors out of the Motor Housing Assembly from the hole underneath the Label and Label-Cover Lens area.
7. Carefully slide the Spindle Housing Assembly (106) out of Motor Housing Assembly, but do not pull the connector back into the slot in the Motor Housing Assembly side.
8. Remove Quick Change or Square Drive Spindle Assembly (103, 104, or 105) from the Spindle Housing Assembly.
9. Remove Spring (102).
10. Slide the Drive Spindle Assembly (101) out of the Transducer Gear Pack Assembly inside the Motor Housing Assembly.
11. Carefully slide the Transducer Gear Pack Assembly out of the Motor Housing Assembly while ensuring clearance for wire assemblies between the spline teeth of the Transducer and the relief notch in the Motor Housing Assembly.
12. Gently pull wires and connectors through slot in side of Motor Housing Assembly, and finally out of Motor Housing Assembly.

Transducer Gear Pack Assembly Removal (For In-Line and Angle Wrench Models):

1. Make sure the Transducer connector is disconnected from the Communication Board.
2. Gently pull Transducer Gear Pack Assembly out of the Motor Housing Assembly, feeding the Transducer wire through the holes in the Motor Housing Assembly.
3. Carefully push Transducer's connector through the hole and remove Transducer Gear Pack Assembly from Motor Housing Assembly.

Transducer Gear Pack Disassembly

1. Remove Retaining Ring (47) from Transducer Assembly (41).
2. Slide internal components out of Ring Gear.
3. Separate 1st and 2nd Stage Spindle Assemblies (45, 43) and Spacers (42, 44, and 46).

ASSEMBLY

Motor Housing Assembly

General Instructions

1. To protect the part's surfaces and to prevent distortion of Housings and threaded joints, use care when grasping the tool.
2. Always press on the inner ring of a ball-type bearing when installing the bearing onto a shaft.
3. Always press on the outer ring of a ball-type bearing when pressing the bearing into a bearing recess.
4. Refer to the "Lubrication" section of this manual for instructions on how to properly grease this tool.

WARNING

- This following procedures are to be performed by an authorized, trained repair person. To ensure proper functioning of the tool:
- When replacing the Motor Housing Assembly (1), always ensure that the Memory Chip (9), Communication Board (10), Transducer Gear Pack Assembly, and Attachment are all assembled as a set with the new Motor Housing Assembly.

CAUTION

- When replacing an Attachment, always use the Angle Assembly Attachment designed for that model. Never replace an Angle Assembly Attachment with an In-Line Attachment.
- When replacing a Transducer Gear Pack Assembly, always use the Assembly designed for that model.

Transducer Gear Pack - Assembly

1. Apply Grease (*Ingersoll-Rand #67*) to ring gear of Transducer Assembly (41).
2. Place one Spacer (42) into Transducer Assembly against bottom face.
3. Grease the planet gear teeth of the 2nd Stage Spindle Assembly (43), and slide into Transducer Assembly (41).
4. Place second Spacer (44) into Transducer Housing against face of 2nd Stage Spindle Assembly.
5. Grease the planet gear teeth of the 1st Stage Spindle Assembly (45), and slide into Transducer Assembly, taking care to align gear teeth of the 1st Stage Spindle Assembly with the planet gears of the 2nd Stage Spindle Assembly.
6. Place third Spacer (46) against 1st Stage Spindle Assembly.
7. Finally, install Retaining Ring (47) taking care to properly align into groove of Transducer Assembly.
8. To assure free rotation of assembly, hold Transducer Gear Pack Assembly steady, and manually rotate the 1st Stage Spindle Assembly.

Push-To-Start Output Spindle Assembly Installation

1. Orient the Spacer located in the Motor Housing Assembly groove at the bottom of the spline, so that the opening in the spacer lines up with the hole in the housing.
2. Insert applicable output Spindle Assembly; Square Drive Spindle Assembly (104 or 105) or Quick Change Spindle Assembly (103), into Spindle Housing Assembly (106).
3. Push Spring (102) into hole in end of output Spindle Assembly (103, 104, or 105).
4. Guide output end of Drive Spindle Assembly over Spring (102).
5. Collectively holding components 101 thru 106 (*as applicable*), position Spindle Housing Assembly with Transducer Assembly, so that:
 - a. Drive Spindle Assembly is properly inserted into Transducer Assembly,
 - b. and wiring of both assemblies (41 and 106) lie in a common plane and orientation relative to the slot in the side of the Motor Housing Assembly.
6. Insert both wire assemblies into Motor Housing Assembly (1) and out through slot in side of Motor Housing Assembly.
7. Locate relief notch found on output (splined) end of Motor Housing Assembly and lay the two wire assemblies between notch and teeth of Transducer Assembly.

8. Gently slide Transducer Assembly and output Spindle Assembly into Motor Housing Assembly, while ensuring clearance for wire assemblies.
9. Align gear teeth of Transducer Assembly with matching teeth of Motor Housing Assembly.
10. Gently rotate end of Spindle until both assemblies (41 and 106) are fully seated inside Motor Housing Assembly (1).
11. Slide Grip Handle (107) onto Motor Housing Assembly aligning the hole and the tabs of the Grip Handle with the corresponding threaded hold and tabs of the Motor Housing Assembly.
12. Install Socket Cap Screw (109) through hole in Grip Handle and into Motor Housing Assembly.
13. Torque Socket Cap Screw to 10 to 15 lb_f • in (1.1 to 1.7 Nm).
14. Place O-ring (108) onto Motor Housing Assembly and slide underneath the end of the Grip Handle.
15. Thread Coupling Nut (110) onto Motor Housing Assembly.
16. While holding the tool using a Hook Spanner or similar wrench, use a Spanner Wrench to torque Coupling Nut to 15 - 20 lb_f • ft (20 - 27 Nm).

Transducer Gear Pack Assembly Installation (For In-Line and Angle Wrench Models)

1. Orient the Spacer located in the Motor Housing Assembly groove at the bottom of the spline, so that the opening in the spacer lines up with the hole in the housing.
2. After guiding Transducer's connector into the hole found at end of Motor Housing Assembly's long outer groove, insert Transducer Gear Pack Assembly (ring gear end first) into Motor Housing Assembly.
3. Carefully pull Transducer's connector and wiring through hole of Motor Housing Assembly.
4. Engage external spline teeth of Transducer Gear Pack Assembly into the internal spline teeth of Motor Housing Assembly. Continue sliding Transducer Gear Pack Assembly into the Motor Housing while guiding the wire through the hole.
5. Align and engage the 1st Stage Spindle Assemblies planet gears with gear teeth on rotor of the Motor Housing Assembly. Be certain that the Transducer wire exits the Transducer directly over the access hole through which the wire was fed.
6. Continue inserting the Transducer Assembly until it is fully seated.

Sleeve (For In-Line and Angle Wrench Models)

1. Lay the Transducer wire into the groove running along the axis of the tool, and insert the connector through the hole at the end of the groove.
2. Slide O-ring (2) onto splined end of Motor Housing Assembly and over Transducer wire until it reaches the shoulder of Housing.
3. Slide on Housing Cover (3) until it is up against O-ring, and carefully ensure that Transducer and Motor wires are not disturbed.

In-Line and Angle Wrench Attachments - Assembly

1. Visually check Housing for loose material fragments.
2. **For 3/8" and 1/2" Square Drive Spindles**, install Socket Retaining Pin (83) into small hole on one of the flat sides of square Spindle.
 - a. With Socket Retaining Pin (83) in place, locate the Pin's groove inside large end-hole of square Spindle.
 - b. Position Socket Retaining Spring (82) inside large hole of square Spindle such that the free ends of the Socket Retaining Spring are faced away from the hole and the closed side of the spring will straddle the Socket Retaining Pin (83).
 - c. Holding the Socket Retaining Pin steady, push Spring down hole of square Spindle until the Socket Retaining Spring's wire engages Socket Retaining Pin.
 - d. Socket Retaining Pin is properly installed when Socket Retaining Spring snaps into place.
3. **For Quick Change Spindles**, install Socket Retaining Ball (84) into small hole, and then place Ball Retaining Spring (85) in groove of spindle such that the hole in the Ball Retaining Spring lines up with the Socket Retaining Ball.
4. Spin output Spindle by hand to check freedom of movement.
5. Slide Coupling Nut (73 or 74) over Angle Assembly Attachment.
6. Using an appropriate tool, install Retainer (75) on assembly. Take care to seat Retainer Ring in groove.
7. Slide Coupling Nut over Retainer (75), and spin by hand to check freedom of movement.
8. Position the Angle Assembly Attachment to desired orientation.
9. Engage Angle Assembly Attachment's Pinion into spline of Spindle Assembly (43), then engage the spline on the Angle Assembly Attachment with the internal spline of the Motor Housing Assembly.
10. Thread Coupling Nut (73 or 74) onto Motor Housing Assembly.
11. While holding the tool using a Hook Spanner or similar wrench, use a Spanner Wrench to torque Coupling Nut to 15 - 20 lb_f • ft (20 - 27 Nm).

In-Line Attachment - Assembly

1. **For 3/8" Square Drive Spindles,**
 - a. Install Socket Retaining Pin (57) into small hole on one of the flat sides of the square Spindle.
 - b. With Pin in place, locate Pin's groove inside large end-hole of square Spindle.
 - c. Position Socket Retaining Spring (56) inside large hole of square Spindle such that the free ends of the Socket Retaining Spring (56) are faced away from the hole and the closed side of the spring straddles the Socket Retaining Pin.
 - d. Holding the Socket Retaining Pin steady, push Spring down hole of square Spindle until the Socket Retaining Spring's wire engages Socket Retaining Pin.
 - e. Socket Retaining Pin is properly installed when Socket Retaining Spring snaps into place.
2. **For Quick Change Spindles,**
 - a. Place Ball (61) into hole in Spindle.
 - b. Slide Sleeve (62) onto Spindle so that it retains the Ball, and slide Spring (63) onto Spindle underneath the Sleeve.
 - c. Place Retaining Ring (64) into groove of Spindle to retain Spring and Sleeve.
3. Spin Spindle by hand to check freedom of movement.
4. Lubricate the bearings of the Housing Assembly (51) with Ingersoll-Rand # 67 Grease.
5. Slide Washer (52) and Washer (53) onto applicable output Spindle; Square Drive Spindle (54) or Quick Change Spindle (55), and insert output Spindle into Housing Assembly (51).
6. Align the Coupler (65) to slide over splines of output Spindle.
7. Slide Coupler into position in Housing Assembly (51).
8. For No-Float Models, insert Spacer (66) into the Coupler.
9. Slide Washer (69) on the Drive Spindle Assembly (68).
10. Use snap-ring Pliers to install the Retaining Ring (70) on top of the Washer.
11. Press on Rear Spindle Bearing (71) to Drive Spindle Assembly (68).
12. Place Disengaging Spring (67) over Drive Spindle Assembly.
13. Align the Drive Spindle Assembly with spline of Coupler and insert Drive Spindle assembly into Housing assembly (51).
14. Apply one drop of Perma-Lok MM-115 to threads of Bearing Cap (72).
15. Carefully grasp the Housing Assembly.

Note: In the following step, the Bearing Cap (72) has a left-hand thread.

16. Using the appropriate tool, tighten Bearing Cap to 15 - 20 lb_f • ft (20 - 27 Nm) of torque.

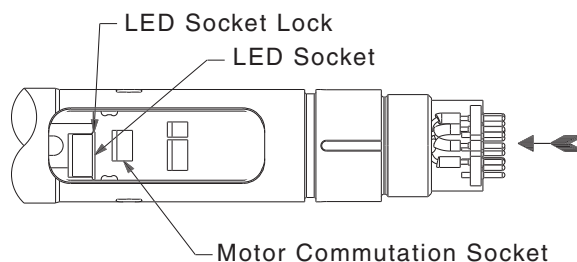
17. Slide Coupling Nut (73 or 74) over Housing Assembly (51).
18. Using an appropriate tool, install Retainer (75) onto spline of Housing Assembly until seated into groove.
19. Slide Coupling Nut over Retainer (75), and spin by hand to check freedom of movement.

In-Line Attachment - Installation

1. Position the In-Line Attachment appropriately.
2. Engage the spline on the input spindle of the In-Line Attachment with the matching internal spline of the Spindle Assembly (43), then engage the spline on the Housing Assembly with the internal spline of the Motor Housing Assembly and thread the Coupling Nut onto the Motor Housing.
3. While holding the tool using a Hook Spanner or similar wrench, use a Spanner wrench to torque Coupling Nut to 15 - 20 lb_f • ft (20 - 27 Nm).

Internal Components

1. Insert the narrow connector end of the LED Flex Board (12) through the same hole that the Transducer connector was placed into (Opening nearest the Communication Board access hole), and align edge of LED Flex Board with edge of groove in Motor Housing Assembly. Be sure that the Transducer wires lay above the LED Flex Board, and wrap the LED Flex Board around the Motor Housing Assembly.
2. Using two of the three internal axial grooves of Motor Housing Assembly, slide Communication Board (10) part way into Motor Housing Assembly, so that the LED Flex Board and Motor Commutation sockets are visible through the access hole. (Refer to TP2173b)
3. Through the Communication Board access hole, move socket lock forward; slide LED Flex Board ribbon into socket on Communication Board and then slide lock back into place to retain ribbon. (Refer to TP2173b)
4. Connect Motor Commutation connector into socket on Communication Board. (Refer to TP2173b)
5. Slide the Communication Board the remainder of the way into the housing.



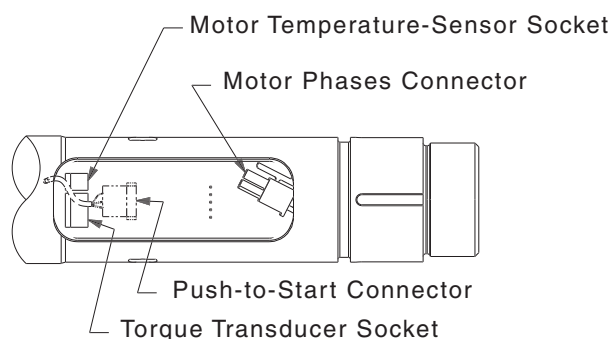
LEDs and Temperature Connector(s)

(Dwg. TP2173b)

ASSEMBLY (Continued)

Internal Components (Concluded)

6. Route Motor Temperature Sensor Connector cable in order to snap Motor Temperature-Sensor connector into the Motor Temperature-Sensor socket. (Refer to TP2173a)
7. Connect the Motor Phase Female Connector to Male Connector of Motor.
8. Snap Transducer's connector into Communication Board socket. (Refer to TP2173a)
9. **For Push-to-Start models:** connect mating 'push-to-start' connectors. (Refer to TP2173a)
10. Install Retainer (11) behind Communication Board in connector cavity in the end of the Motor Housing Assembly.
11. Place the Cover (4) for the Communication Board into the access hole of the Motor Housing Assembly.



Torque and Motor Connector(s)

(Dwg. TP2173a)

External Components

1. Slide Warning Label into Label Cover Lens. Note Warning Label (13 or 31) and Label Cover Lens (14) slot and tab alignment features.
2. Slide Label Cover Lens and Warning Label over Motor Housing Assembly grip area.
3. Install Retaining Ring (15) into groove behind Label Cover Lens.
4. Place Spring (16) into Reverse Ring (17).
5. Install and depress Spring (5) and Ball (6) and then slide Reverse Ring onto Motor Housing Assembly.

When replacing the Motor Housing Assembly, always ensure that the Memory Chip (9), Communication Board (10), Transducer Gear Pack Assembly, and Attachment are all assembled as a set with the new Motor Housing Assembly.

6. Install Memory Chip (9) into grip with terminal aligned with O-ring groove.
7. Slide two O-rings (18) into groove to retain Memory Chip.
8. Install Spring (8) on the post closest to the middle of Trigger (7) and install Trigger into Motor Housing Assembly.
9. Place Cover (4) into Main Board access hole.
10. For models with Extended Levers (24), install an additional spring on Triggers' auxiliary post.
11. Slide Handle Grip (19, 20, or 21) or Sleeve (32) onto Motor Housing Assembly.
12. Apply a medium strength thread locker to Socket Cap Screw (22).
13. Install Socket Cap Screw into Motor Housing Assembly.
14. Torque Socket Cap Screw to 10 to 15 lb_f • in (1.1 to 1.7 Nm).
15. **For Models with Levers:**
 - a. Place Lever (23 or 24) in position against Handle Grip and install lever Socket Cap Screws (25).
 - b. Torque Socket Cap Screw (25) to 5 to 10 lb_f • in (0.5 to 1.1 Nm).
16. **For Push-to-Start Models:**
 - a. Align tabs of Bracket Assembly (33) with slots of Motor Housing Assembly (1) and slide Bracket Assembly onto Motor Housing Assembly.
 - b. Torque Bracket Assembly cap screw to 10 - 15 lb_f • in (13.6 - 20.4 Nm).

MAINTENANCE *(Concluded)*

NOTICE

SAVE THESE INSTRUCTIONS. DO NOT DESTROY.

When the life of the tool has expired, it is recommended that the tool be disassembled, degreased and the parts be separated by material so that they can be recycled.

QE4 Series Wiring <i>(Cable)</i> Chart			
Connector Pin	Wire Color <i>(Cable)</i>	Logic	Connector Pin
A	Red	VCC	13
B	Black	COM	14
C	Gray	Spare 1	12
D	Pink	Spare 2	27
E	Brown	Spare 4	15
F	Yellow	Sine	21
G	Orange	Cosine	28
H	Violet	Spare 3	7
J	Green	Ground Sense	20
K	Blue	RX+	5
L	Blue/White	RX-	6
M	White	TX-	8
N	White/Blue	TX+	9
U	Red	Motor Phase B	23
V	Black	Motor Phase C	34
W	White	Motor Phase A	36
X	Green/Yellow	Ground	25
-----	-----	TX Shield	1
-----	-----	RX Shield	4
-----	-----	Hall Shield	22
-----	-----	Motor Shield	16

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