QD SERIES TORQUE INSTRUMENT

REPAIR

MAINTENANCE

&

TROUBLESHOOTING

INSTRUCTIONS

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Q D SERIES TORQUE INSTRUMENT REPAIR, MAINTENANCE AND TROUBLESHOOTING INSTRUCTIONS

SAFETY INSTRUCTIONS

Failure to follow **WARNING** instructions can cause personal injury to the operator.

Failure to follow **CAUTION** instructions can cause the equipment to fail or break in use.

! WARNING

Always wear Safety Glasses or goggles when using or repairing hand tools.

Read this manual completely before repairing torque instruments.

DO NOT use or test a instrument that shows signs of damage (bent tubes, cracked or broken parts) caused by misuse. Recommend replacement.

DO NOT use cheater extensions on the handles or tube to apply torque.

DO NOT exceed rated maximum torque.

Check all sockets or other test accessories for wear, damage or crack prior to their use with torque instruments. Do not exceed their rated maximum torque.

Always pull (DO NOT push) to apply torque. Adjust your stance to prevent a fall if something should give suddenly.

Ratchet head torque instruments must be checked for full (positive) engagement of the ratchet in the direction of use prior to applying a load on the instrument. Broken or slipping ratchets can cause injury.

CAUTION

Periodic recalibration is necessary to maintain accuracy.

Periodic examination and cleaning is necessary to maintain the instrument.

INTRODUCTION

This section covers the repair, maintenance and troubleshooting instructions to identify and remedy problems that could occur with the QD Series Torque Instruments. Each instrument model has an Exploded Illustration that lists the component parts and shows assembly particulars. The exploded illustration must be used as a guide for assembling QD Series Torque Instruments.

CLEANING

Wipe all exterior parts with a dry, clean and lint free cloth. **DO NOT USE** any abrasive or corrosive materials to clean any components of the QD Series Torque Instruments.

After assembly, a non-abrasive polishing agent applied with a dry, clean and lint free cloth may be used to polish the chrome exterior parts.

LUBRICATION

Snap-On Part # **ME18A63 -** Super Lube MULTI-Purpose Synthetic Lubrication with Teflon,. **NO SUBSTITUTES ALLOWED**.

REPAIR TOOLS REQUIRED

Figure 1 - Required Tools List

1	**Flat blade mini screwdriver** (max. blade size .063 or 1.6mm) Snap-On Mini Screwdriver Set **CM6551**
1	**End Cutter** (modified jaws ground flat on top to allow rivet removal) Snap-On Model **17CP**
2	Calibration Crank Handle Snap-On Part #'s: **QCS60082** (7/16") **QCS60088** (9/16")
1	**0 to 1" micrometer** with tenth (.0000) increments Snap-On Model **GA 1000**
1	**16 oz. Bronze tip hammer** Snap-On Model **HBT160**
1	**40 to 200 In. Lb. Torque Instrument** Snap-On Model **QD2R200**
1	**7/16" 6 Point Deep Socket** Snap-On Model **SFS-141**
1	**9/16" 6 Point Deep Socket** Snap-On Model **SFS-181**

OTHER REQUIRED MATERIALS

Snap-On Part # **CDI101100 -** Torque Seal

INSPECTION

Inspect all instruments repaired to determine that they are in an operational condition by visually inspecting for worn, broken, cracked or damaged parts. Replace parts not found to be in satisfactory condition.

CAUTION

Some customer's abuse torque instruments and damage them beyond repair. The most common abuse is using the instrument as a breaker bar. This type of misuse is evident if the tube or the drive is bent in the clockwise direction in relation to the tube or marks from a cheater bar are on the tube or handle. **DO NOT REPAIR** the instrument if it shows signs of this type of misuse. The component parts may be permanently damaged. The **SAFETY** and **INTEGRITY** of the instrument could be impaired. Recommend that the instrument be replaced.

ACCURACY VERIFICATION AND MINOR CALIBRATION PROCEDURE

This procedure is to be used to check the accuracy and, if necessary, perform a minor adjustment on calibration. It must also be used after a major calibration.

1. Preload the instrument by setting the instrument at 50% of full scale and operating three times in the direction of the test.

2. Reset handle to 20% of full scale. Place square drive in tester. Adjust the loading point of the tester until the load is being applied in the center of the handle.

NOTE

The handle support **MUST** be at the center of the handle when the handle is adjusted to 60% of scale and again at 100% of scale. Torque instrument readings, per industrial (ASME B107.14M-1994) standards, have to be obtained by applying the load to the center of the handle.

3. Test the instrument three (3) times at 20% noting the accuracy error for each reading. Set and test the instrument three (3) times at 60% and 100% of full scale noting the accuracy error for each reading. If the readings are within the accuracy requirements for the direction no calibration adjustment is required.

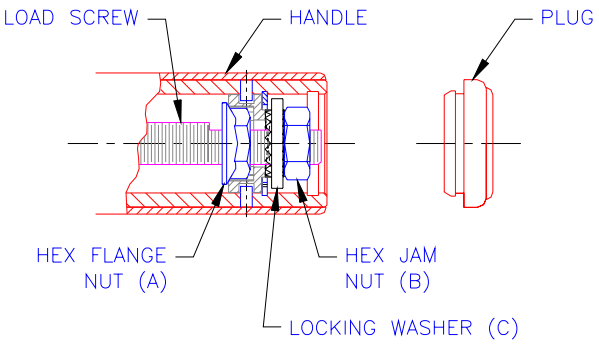
4. Test the torque instrument in the opposite direction by following steps 1 through 4 in that direction.

NOTE

A minor (handle) adjustment is used to adjust 20% of the scale reading. If the reading at 20% and 100% of scale are both either high or low to the required accuracy, a minor adjustment may be used to bring the accuracy within torque specification.

If the torque instrument requires minor adjustment follow steps 5 through 8.

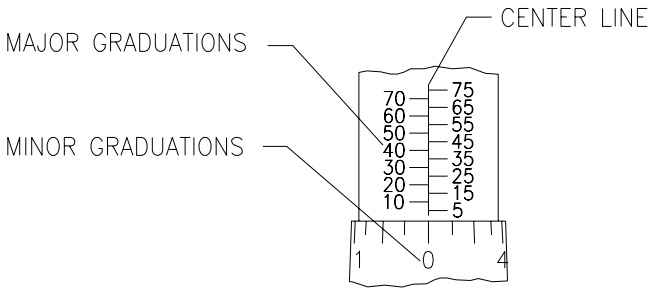
Figure 2 - Handle View



5. Set the handle at [1]20% of full scale. Remove the plug from the end of the handle.

6. Check the torque seal on the load screw. If removed or cracked, the instrument calibration has been tampered with or the handle has been forced below its preset stop point.

Figure 3 - Handle / Tube View



7. Push the lock ring forward and turn the handle until you reach the desired reading on the tester as follows:

A. If the reading on the tester was **below** the **accuracy limit** for the value tested turn the handle **clockwise** to **increase** the value. Repeat the test and adjustment procedure until the torque reading is within the accuracy limits.

[1] All torque instruments with ¼" head drives must be calibrated at 100% of scale, not minimum (20%)

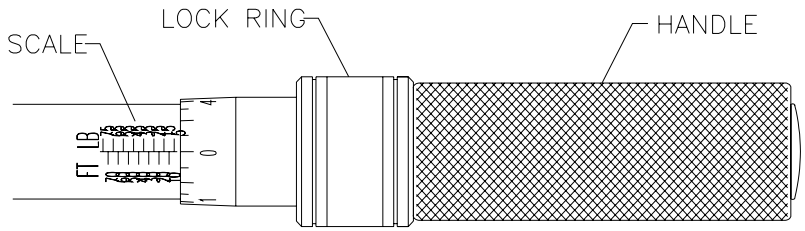
B. If the reading on the tester was **above** the **accuracy limit** for the value tested turn the handle **counterclockwise** to **decrease** the value. Repeat the test and adjustment procedure until the torque reading is within the accuracy limits.

Release the lock ring and check the value on the tester.

8. With the lock ring in the locked position and holding the instrument handle firmly to prevent rotation of the handle, loosen the hex jam nut (B) with the calibration crank handle about two full terns or until the handle can be moved back and forth approx. 1/8". The Torque seal will show a crack between the nut and screw. Remove the torque seal.

9. Push the lock ring forward, while applying a light force towards the instrument (to prevent handle disengagement) and turn handle until handle "0" mark is aligned to the centerline of the scale.

Figure 4 - Handle "0" Alignment To Tube Centerline View



10. Tighten the hex jam nut (B) with a 200 in. lb. torque instrument as follows :

Figure 5 - Handle Nut Size and Maximum Torque

Handle Locking		
Torque Instrument Ranges	**Hex Flange Nut Size**	**Maximum Torque**
50 in. lb. to 250 in. lb.	7/16"	65 in. lb.
75 ft. lb. to 1000 ft. lb.	9/16"	85 in. lb.

11. Retest the instrument for accuracy (steps 1 through 4). If the instrument is not within specified accuracy requirements repeat steps 5 through 10 or the instrument may require a major calibration.

MAJOR CALIBRATION AND REPAIR

These instructions are to be used for the major calibration and repair, replacement or maintenance of the tube internal parts. Major calibration requires the instrument to be partially disassembled from the front, to inspect the internal component parts for contaminates, damage and/or wear. Refer to the trouble shooting matrix to determine when this procedure is required.

To disassemble the tube

1. Push up the lock ring and unwind the handle of the instrument below 20% of scale until it stops.

2. Remove the pivot pin rivet from the tube by using the modified end cutters. Push the pivot pin out of the tube to release the head drive.

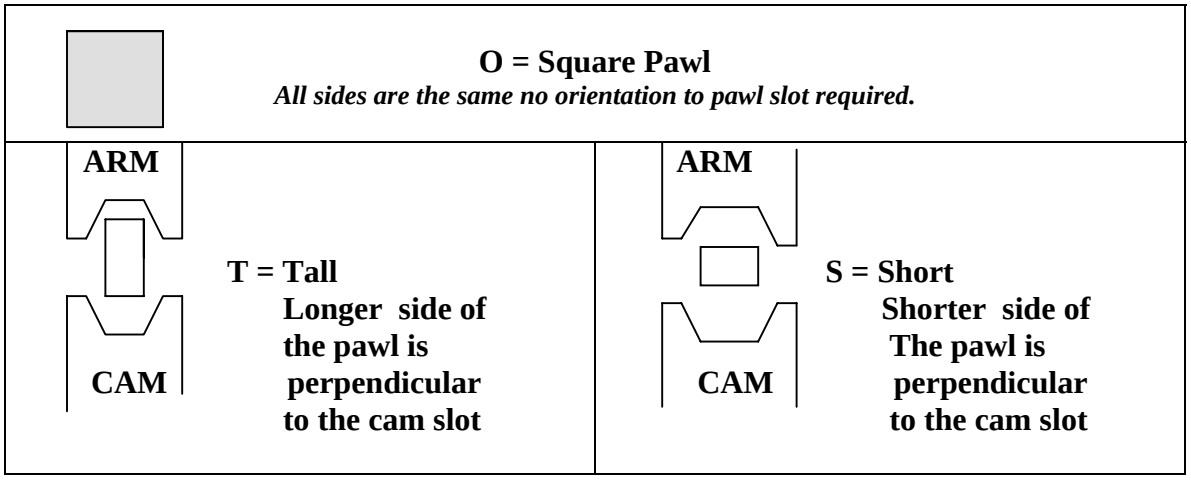
To recalibrate the instrument

1. Pull the head drive, secondary arm (if required), pawl and cam slowly out of the instrument to prevent the pawl from [2]loosing its orientation in the cam.

2. The orientation, size and style of the pawl in the instrument must be determined, measured and noted so it can be found on the pawl selection chart. Use a micrometer to measure the pawl and determine its size and style.

3 A major recalibration requires the selection of a new pawl. To find the correct pawl, locate the pawl removed from the instrument on the pawl selection chart. This is the starting point for selecting a new pawl.

Figure 6 - Pawl Orientation Chart



[2] If the pawl orientation in the slot of the cam is unknown rebuild the instrument without inserting the rivet into the pivot pin and retest.

Figure 7 – Pawl Style / Size Table

There are six different pawl sizes available for calibration starting with pawl number "0" with square cross sections.

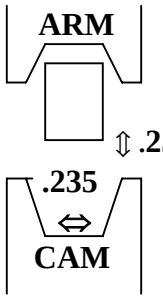
STYLE / SIZE	A	B	C
0	**-**	**.250 x .250**	**.187 x .187**
1	**-**	**.250 x .244**	**.187 x .183**
2	**.260 x .250**	**.250 x 240**	**.187 x .180**
3	**.260 x .245**	**.250 x .235**	**.187 x .176**
4	**.260 x .240**	**.250 x .230**	**.187 x .173**
5	**.260 x .235**	**-**	**.187 x .168**

Figure 8 – Pawl Style Chart

A = Pawl with longer side .260
B = Pawl with longer side .250 or both sides .250
C = Pawl with longer side .187 or both sides .187

NOTE: Style **"C"** is used on instruments up to a maximum scale of .250 in. lb.

PAWL IDENTIFICATION CODE EXAMPLE



= 3 T B = size 3 = .250 x .235

size ↓ style

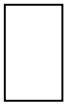
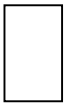
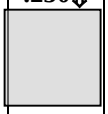
↓

orientation

= T = tall (longer side of pawl is perpendicular to the pawl slot)

B = pawl with longer side .250

Figure 9 - Pawl Selection Chart

STYLE	SIZE & ORIENTATION										
♦	5T	4T	3T	2T	1T	0	1S	2S	3S	4S	5S
A (.260) or	.260⇕  .235 ⇔	.260⇕  .240 ⇔	.260⇕  .245 ⇔	.260⇕  .250 ⇔							
B (.250)		.250⇕  .230 ⇔	.250⇕  .235 ⇔	.250⇕  .240 ⇔	.250⇕  .244 ⇔	.250⇕  .250 ⇔	.244⇕  .250 ⇔	.240⇕  .250 ⇔	.235⇕  .250 ⇔	.230⇕  .250 ⇔	
TO DECREASE THE READING⇐----------⇒TO INCREASE THE READING											
Style C *for instruments with a maximum scale up to 250 in. lb. <u>ONLY.</u>*											
♦	.187⇕  .168 ⇔	.187⇕  .173 ⇔	.187⇕  .176 ⇔	.187⇕  .180 ⇔	.187⇕  .183 ⇔	.187⇕  .187 ⇔	.183⇕  .187 ⇔	.180⇕  .187 ⇔	.176⇕  .187 ⇔	.173⇕  .187 ⇔	.168⇕  .187 ⇔

NOTES

To increase or decrease the torque reading approximately 2% requires changing the actual pawl size one location.

Always select a pawl to the left ⇐ of the actual pawl to decrease the instrument reading.

Always select a pawl to the right ⇒ of the actual pawl to increase the instrument reading.

There is an overlapping of pawl sizes. Style "A'" and "B" overlap from size 2T to 4T. Use style "A", if available.

EXAMPLE #1

The instrument reads approximately 5% low from nominal. You disassemble the instrument and measure the pawl. It was .260⇳ X .245⇔, orientated with the longer side of the pawl perpendicular to the cam slot. To find the correct pawl, locate the pawl removed from the instrument on the pawl selection chart. This pawl is number 3TA on the chart. This is the starting point for selecting a new pawl.

To increase the reading of the instrument 4% you would choose the pawl two places to the right of 3TA (.260⇳ X .245⇔) which is 1TB (.250⇳ X .244⇔). This pawl change should increase the instrument reading to within approximately 1% of nominal.

Figure 10 - Pawl Selection Chart (Example #1)

STYLE	SIZE & ORIENTATION										
♦	5T	4T	3T	2T	1T	0	1S	2S	3S	4S	5S
A or	.260⇳ .235 ⇔	.260⇳ .240 ⇔	.260⇳ .245 ⇔	.260⇳ .250 ⇔							
B		.250⇳ .230 ⇔	.250⇳ .235 ⇔	.250⇳ .240 ⇔	.250⇳ .244 ⇔	.250⇳ .250 ⇔	.244⇳ .250 ⇔	.240⇳ .250 ⇔	.235⇳ .250 ⇔	.230⇳ .250 ⇔	

EXAMPLE #2

The instrument reads approximately 5% high from nominal. You disassemble the instrument and measure the pawl. It was .250⇳ X .244⇔, orientated with the longer side of the pawl perpendicular to the cam slot. To find the correct pawl, locate the pawl removed from the instrument on the pawl selection chart. This pawl number is 1TA on the chart. This is the starting point for selecting a new pawl.

To decrease the reading of the instrument 4% you would choose the pawl two places to the left of 1TB (.250⇳ X .244⇔) which is 3TA (.260⇳ X .245⇔) or 3TB (.250⇳ X .235⇔).

The recommended change would be to a Style "A", if available. This pawl change should decrease the instrument reading to within approximately 1% of nominal.

Figure 11 - Pawl Selection Chart (Example #2)

STYLE	SIZE & ORIENTATION										
♦	5T	4T	3T	2T	1T	0	1S	2S	3S	4S	5S
A	.260⇳ .235 ⇔	.260⇳ .240 ⇔	.260⇳ .245 ⇔	.260⇳ .250 ⇔							
or											
B		.250⇳ .230 ⇔	.250⇳ .235 ⇔	.250⇳ .240 ⇔	.250⇳ .244 ⇔	.250⇳ .250 ⇔	.244⇳ .250 ⇔	.240⇳ .250 ⇔	.235⇳ .250 ⇔	.230⇳ .250 ⇔	

1. Check the pawl and pawl slot for worn or damaged edges. Choose the appropriate pawl to increase⇒ or decrease⇐ the reading.

2. Remove all parts from tube. Examine them for wear and/or damage. Replace parts as required. Clean and lubricate internal parts with Super Lube.

3. Assemble the parts according to the assembly blueprint requirements (spacers, Thrust washers, flat washers & spring). Slide into the tube.

4. Place the cam on top of the spring, properly orientated to the pivot hole.

5. Lightly grease the pawl to hold it into position in the cam. Place the pawl in the cam slot.

6. Place the end of the drive head or arm carefully against the top of the pawl and slide assembly back into the tube. Place pivot pin through the tube and head.

CAUTION

The instrument must always be assembled with some positive pressure on the spring. To assure positive pressure, the pivot hole of the head must be pushed into alignment with the pivot hole on the tube. Failure to assemble the instrument with positive pressure will result in the instrument not being able to hold calibration.

To check for positive pressure on the spring

a) Place the pivot pin into the assembled instrument.

b) With the handle unwound to its lowest point (the handle stop), the instrument should be at 5% to 10% of full scale (example a 250 ft/ lb. instrument should read 12.5 to 25 ft. lb.) on a torque tester.

c) If the instrument does not click or reads below at 5% of full scale on a torque tester when the handle is at its lowest position, disassemble and add more washers to increase the pressure.

7. Push the lock ring up and adjust the instrument up to the maximum scale value. Cycle the instrument a minimum of 25 times in both directions (clockwise & counterclockwise).

8. Push the lock ring up and adjust the instrument down to minimum scale value. Let the instrument rest a minimum of 2 hours (to allow spring to relax back to its natural "set").

9. Perform an accuracy verification and if required, a minor calibration adjustment.

10. After calibration, insert a new rivet into the pivot pin. Use a bronze head hammer to lock rivet into pivot pin.

HANDLE/LOCK RING REPAIR

These instructions are to be used for the repair of the handles or lock rings. Calibration does not require the handle to be disassembled. Replacing the tube insert requires the handle to be disassembled.

To Disassemble the Handle/Lock Ring

1. Remove the button FOD plug (8) with a flat blade mini screwdriver.

2. Remove the Torque Seal from the screw and nut.

3. To disassemble the handle (5) from the tube, remove the nut (7) from the end of the instrument using the calibration crank handle. Next, remove the lock washer (6).

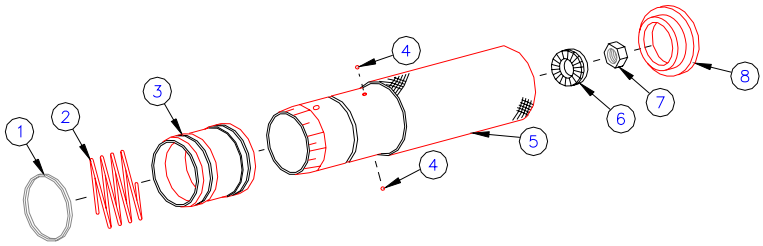
4. Push the lock ring (3) up to the unlock position (this releases the two balls (4) from the splines on the tube) and pull the handle off the tube.

5. Remove the lock ring (3) from the handle by fitting the mini flat blade screwdriver under the retaining ring (1) and lifting the ring while rotating the handle. When the retaining ring (1) is completely disengaged, remove it from the handle (5).

6. Remove the lock ring spring (2). Then slide the lock ring (3) off of the handle.

7. Remove the two small round balls (4) (held with Super Lube to handle) from the inside of the handle.

Figure 12 - Handle/Lock Ring Assembly



To assemble the handle/lock ring

1. Place Super Lube on the ball holes on handle (5). Place two balls (4) in holes (Super Lube will hold them in place).

2. Place lock ring (3) on handle (5). Next, place lock ring spring (2) on handle (5). It will fit between the handle (5) and the lock ring (2)

3. Spread the retaining ring (1) apart to fit it on the handle (5). Next, place the end of the retaining ring (1) into the handle (5) groove by applying pressure with the mini flat blade screwdriver. Continue to apply pressure while rotating the handle until the retaining ring (1) is fully engaged.

4. Push the lock ring (3) up into the unlock position while sliding the handle (5) as far as it will go onto the tube. Turn the handle (5) until the flange nut on the tube screw is engaged into the handle's insert. Release the lock ring (3) to engage the balls into the splines on the tube.

5. Next, set the handle (5) on the lowest increment of the tube. Push the lock ring (3) up to the unlock position and turn the handle until the top of the handle scale is lined up with the lowest increment on the tube. Release the lock ring to engage balls into the splines on the tube.

NOTE

The top of the handle must touch the increment line on the tube scale. When "0" is set, the top of the handle can not cover up the increment line on the tube scale or be below it.

1. If the center line of the tube is not lined up with the "0" on the handle (5), push up on the lock ring (3) to unlock it, pull the handle (5) back off of the flange nut on the tube screw (approx. ¼"). Turn the handle to reset the flange nut into the handle insert so that the "0" is lined up with the center line of the tube scale. Release the lock ring and jiggle the handle lightly left and right until the lock ring is fully engaged.

2. Tighten the hex flange nut (B) with a 200 in. lb. torque instrument per Figure 5 on page 8.

3. An accuracy and minor adjustment must be performed after a handle is assembled.

TROUBLESHOOTING

The **Troubleshooting Matrix** is for the **QD Torque Micrometer Adjustable Instrument** models **only**. Refer to the **Troubleshooting Matrix** for problems that could occur to the **QD Series Micrometer Adjustable Torque Instruments** and their remedy.

Figure 13 - QD Series Micrometer Adjustable Torque Instrument Troubleshooting Matrix

PROBLEM	CAUSE(s)	REMEDY
Lock ring is jammed or doesn't fall into lock position when released.	Handle spring problem.	Disassemble the handle/lock ring and replace lock ring spring.
The instrument only clicks in one direction or can only be calibrated in one direction.	The head drive and/or secondary arm (if used) are not in centerline.	Replace the head drive and/or secondary arm (if used).
Lock Ring Doesn't Lock.	Customer forced handle to turn without releasing the lock ring. (the tube will show groove marks through the splines)	Replace the tube.
Handle and load screw disassembled.	Customer disassembled handle (no torque seal) **OR** Handle was not locked on properly at factory.	See handle/lock ring repair section to assemble.
The pawl double clicks.	Sharp or rough edges on the pawl. **OR** Rough surfaces on the pawl slot of the head and/or secondary arm (if used).	Check and replace as needed head and/or secondary arm (if used). **OR** Check and replace the pawl, as needed.

PROBLEM	CAUSE(s)	REMEDY
Calibration accuracy at 20% of scale is out of tolerance. **OR** Calibration accuracy at 20%, 60% and 100% of scale is out of tolerance. **OR** Calibration accuracy at 60% and 100% of scale is out of tolerance	Customer tampering (torque seal cracked or missing) **OR** Not set correctly at the factory. **OR** Customer unwound the handle below the stop point. (torque seal cracked or missing) **OR** Customer disassembled handle and reassembled wrong. (torque seal cracked or missing) **OR** Pawl and/or pawl slots worn or damaged.	**NOTE** Check handle prior to adjusting to assure it is engaged to the adjusting screw. Minor calibration Adjustment. **NOTE** If a minor calibration fails to bring the 20% of scale reading into tolerance or if adjustment causes the 60% or 100% of scale to fall out of the tolerance a major calibration is required. **OR** **NOTE** Check pawl and pawl slots prior to a major calibration. A major calibration.
The instrument does not click.	The pawl is not in the pawl slot. **OR** There is no pressure on the pawl.	Disassemble instrument and add washers to increase pressure on pawl. **NOTE** When placing the ratchet/head drive into the tube to insert the pivot pin, the drive pivot hole must be pushed into the tube to align the holes. If there is no pressures remove parts and add more washers to increase pressure on the pawl.