

Chapter 8: Maintenance and Inspection

8.1 Inspection Items

A scheduled inspection is recommended to keep the FUSION System in the best condition. A preventive maintenance routine should be set-up. Recommended inspection schedules are given for each item.



WARNING: Follow Lockout/Tagout and other safety precautions when connecting or disconnecting cabling, wiring, and equipment. Always verify the System is disabled prior to touching any moveable components

8.1.1 Nutrunner (Tool)

Recommended Schedule: Quarterly

It is important to keep the nutrunner tools clean and properly adjusted to ensure correct fastening and accurate system outputs. Inspect each tool, and ensure the following conditions exist:

- All environmental conditions are within the specified ranges.
- The duty cycle is within specifications, and the motor is producing normal heat levels.
- The tool is producing normal levels of noise and vibration (no irregular noise)
- The tool is free from excessive contamination and foreign matter.
- The tool is securely mounted, with mounting bolts properly tightened.
- The Tool cable is securely connected to the tool.

8.1.2 Tool Cable

Recommended Schedule: Quarterly

This cable connects the tool to the Controller unit. Ensure the following conditions are met:

- The cables are free from unnecessary binding, force and tension and are free to move.
- The cables are in good condition, sufficiently insulated (no cuts) with no indication of broken wires.
- The cables are free from excessive contamination and foreign matter.
- The cables are securely connected to the Controller unit and to the nutrunner (connectors are tight).
- The cables are free from heat distortion, and are not warm or hot to the touch.
- The cables and cable connectors are securely and correctly fastened.

(See 4.11.1 for Cable Installation Guidelines)

8.1.3 Controller Unit

Recommended Schedule: Quarterly

The Controller Unit requires careful use and handling. Inspect each Controller unit and ensure the following requirements are met:

- The environmental conditions are within specifications.
- There is no moisture, oil, or foreign matter on the unit.
- The unit is securely mounted, with appropriate clearance on all sides.
- All screws (for the cover of the unit and for mounting) are correctly tightened.
- The input power remains within specifications at all times.
- The unit is not producing any abnormal (excessive) heat.
- Unit cables (on the back and the underside) are securely fastened and without damage.

8.1.4 Auxiliary Tool Heads (Crowsfoot, Tubenut, Hold & Drives, etc.)

Recommended Schedule: Monthly

External auxiliary heads require special attention due to the nature of their small design withstanding high forces. These heads are typically designed for a maximum of 250,000 cycles or less and should be inspected more frequently than a standard tool. (life cycle is dependant upon the torque it is used at).

Typically, these heads should be inspected and greased every 10,000 cycles. During this inspection, the inspection time may be lengthened or shortened depending on the conditions seen during the first few inspections. (this will vary by application)

Inspect each tool, and ensure the following conditions exist:

- The head is producing normal levels of noise and vibration (no irregular noise)
- The head is free from excessive contamination and foreign matter.
- The head turns freely with no binding
- The head is securely mounted to the tool, with mounting bolts properly tightened
- All covers, screws and bolts are in place and securely tightened on head
- The head is sufficiently lubricated (approx. 1/5 oz. of grease each application) Do NOT over grease!

Auxiliary Head Lubrication Information

Description	Part Number
Grease Gun	GG-K97
Lubriplate Grease (14oz)	GR-132-A
Lubriplate Grease (6 lb can)	GR-132-B

8.2 Basic Operational Tests



WARNING: Follow Lockout/Tagout and other safety precautions when connecting or disconnecting cabling, wiring, and equipment. When performing the following inspections, verify that the system is disabled prior to touching any moveable components.

8.2.1 Torque Transducer.

The system can perform a transducer check before each fastening cycle, comparing the values from the torque transducer (zero and calibration) to the data stored in the system memory. The system is maintenance free, however it can be manually checked as follows:

- 1. Be sure that the nutrunner is in the READY mode.(powered up) and not running.
- 2. Check that the torque display shows 0 when the keyboard-display unit RESET key is being pressed.
- 3. At the same time as 2 (above), check that “ABN” is not displayed on the Data display.
- 4. Check that the display is showing the full scale torque value when the Controller unit CAL key is being pressed.
- 5. At the same time as 4 (above), check that “ABN” is not displayed on the Data display.
- If any of these checks fail internal limits, an ABNORMAL will be generated and “ABN” will display. See Chapter 9 for troubleshooting.

8.2.2 Resolver.

Take the following steps to manually inspect the resolver:

- 1. Make sure that the system will not be started by an operator.
- 2. Place the Controller keyboard-display unit into the real-time display mode (Chapter 7 - Display has only one digit active in the D-NO display. This is the default mode when power is applied). The [D-NO] display must be set to [3] using the Up/Down arrow keys in order to see the angle of rotation on the DATA display.
- 3. If the socket of the tool is turned in the clockwise direction, the angle indication should increase.
- 4. Verify that the angle rotated matches the indicated angle in the data display.

8.2.3 Motor.

If doubts about the condition of the motor exist, the windings can be manually checked with a Ohm meter. To check the motor, measure the winding's resistance and the isolation resistance.

- 1. **Power down the system.**
- 2. Disconnect the motor connector from the tool assembly.
- 3. Measure the resistance between windings. (Refer to Fig 8-2-3)

- 4. Measure the isolation resistance between each pair and the frame.
Insulation resistance: Using a megohmmeter, 500 VDC, 50 Mohms or more, test the insulation resistance between the motor windings and the motor case. The values should register in excess of 50 Mohms for each winding.

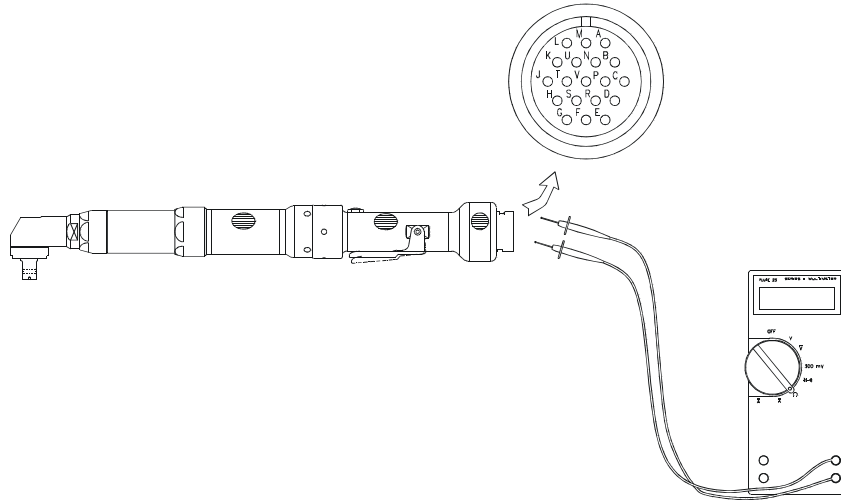


FIG. 8-2-3 Motor Inspection

Motor Winding Resistance*			
MOTOR SIZE	Pins A - M	Pins M - L	Pins L - A
(M80)	5.0Ω	5.0Ω	5.0Ω
(M50)	7.8Ω	7.8Ω	7.8Ω

Tolerance + / - 10%

Resolver Winding Resistance			
MOTOR SIZE	Pins C - D	Pins P - R	Pins V - S
(M80)	20 – 30 Ω	65 – 75 Ω	65 – 75 Ω
(M50)	20 – 30 Ω	65 – 75 Ω	65 – 75 Ω

Resolver windings should not be “Open” or zero ohms.

Insulation Resistance			
MOTOR SIZE	Pins J - K	Pins K - L	Pins L - J
(M80)	More than 50 mega ohms at 500 VDC		
(M50)			

8.2.4 Transmission Disassembly and Inspection

- The planetary gear transmissions used in the FUSION System's tool assemblies are designed to withstand the forces exerted upon them by high production requirements of modern assembly plants.
- The total cycle count of the tool assembly is stored on the Tool Preamplifier and can be retrieved using the FUSION User Console Software. This count can be used for diagnostic and maintenance purposes. (Only FEC can reset this counter)
- To prolong the life of the transmission assembly, the components must be inspected and greased at regular intervals.
- FEC INC. recommends performing this procedure initially after equipment has been in use for one year or 500,000 cycles, whichever is reached first.
- When the initial maintenance is performed, the condition of the transmission assembly should be analyzed to determine future maintenance requirements. Systems operating under more severe conditions (Full scale torque in high temperatures) may require maintenance every 250,000 cycles, while other systems may only require maintenance every one million cycles.

1. REMOVE TRANSMISSION FROM TOOL ASSEMBLY. Separate the transmission from the motor by disassembling tool assembly drive end. (See Tool Assembly Manual)

Note: Care must be taken when disassembling the tool assembly. Small parts and wiring can easily be lost or damaged.

2. DISASSEMBLE TRANSMISSION. Refer to the appropriate transmission assembly drawing while disassembling the transmission for cleaning.

3. CLEAN TRANSMISSION PARTS. Clean all parts with an appropriate solvent, such as mineral spirits, to remove all excess grease and contamination. Parts should be carefully wiped dry with a lint-free cloth to remove any residue. Allow the parts to dry thoroughly in an area free from contamination.

4. INSPECT TRANSMISSION PARTS. Examine all gears, pins, bearings, etc. for signs of excessive wear. Replace any part that failed or appears it may fail.

5. LUBRICATE TRANSMISSION PARTS. Reassemble the transmission in a contaminant-free area. Re-pack all bearings and grease all gears. Do not pack the transmission housing with excessive grease; over-greasing could damage the tool and cause it to stall. Recommended grease: *Sunoco Sunaplex 992 EP* or equivalent.

6. REASSEMBLE TRANSMISSION. Refer to the appropriate transmission assembly drawing while reassembling the transmission. If needed, rotate the gears to aid in the assembly process. If the transmission does not rotate freely after re-assembly, then disassemble the transmission again to isolate and correct the cause.

7. RE-ASSEMBLE TOOL. If needed, rotate the output shaft to align the transmission planetary gears with the motor output shaft. If the transmission does not rotate freely after reassembling the tool, then disassemble the tool again to isolate and correct the cause.

8.3 Replacements



WARNING: DO NOT CONNECT OR DISCONNECT CABLES OR OTHER SYSTEM COMPONENTS WITH POWER APPLIED. FOLLOW LOCKOUT/TAGOUT AND OTHER APPLICABLE SAFETY PRECAUTIONS WHEN CONNECTING OR DISCONNECTING CABLING, WIRING, AND EQUIPMENT.



NOTE:When replacing the FUSION System Controller unit, ensure that the new unit is configured with the same Hardware and the same Firmware version as the unit being replaced. (Controller Unit displays the Firmware Version number when “WORK” 00 D-NO 01 is selected. Version will show in the Data Display. ie. 1.02)

8.3.1 Controller Unit Replacement (No Partial Replacement)

All tools operate from one model of Controller (HFC-EC-16). When one Controller unit is being replaced with another, it is important to verify that the new unit is set-up identical to the unit being removed.

1. Verify the controller power is off. Ensure all cables connected to the controller are clearly marked (for ease of reconnection).
2. Disconnect all cables from the rear (& front if applicable) of the unit. If wires are connected to the I/O terminal on the controller and to avoid removing all the I/O wires, you may simply disassemble the terminal block from the controller using the top and bottom screws holding the terminal block to the controller, and reassemble the terminal block to the new controller.
3. Turn the controller on the cover hinges 90 degrees and Lift up on the controller unit to remove.
4. Verify the new controller unit dip switches are set the same as the unit being replaced. Refer to Section 4.10.
5. Verify the SAN Units have the same configuration (hardware and software).
6. Install the new controller in reverse order of removal.
7. Apply power and confirm operation. (After approximately 5 seconds, the controller will finalize the Power On Self Test (POST)).

The new Controller will require reentry of the preset data. Refer to Chapters 6 and 7.

8.3.2 Replace Nutrunner (tool).

Do not attempt to replace a component of the tool - the tool must be replaced as a complete assembly. The tool type identification can be found on the identification tag affixed to the tool and on the System [TOOL TYPE] preset value.



WARNING: DO NOT CONNECT OR DISCONNECT CABLES OR OTHER SYSTEM COMPONENTS WITH POWER APPLIED.

1. Verify all System power is off.
2. Twist connector on the tool in the (CCW) direction and pull connector from tool.
3. Replace tool and plug in connector aligning the key in the connector to the keyway in the tool.
4. Twist connector in the (CW) direction to the fully locked position.
5. Power – up controller and confirm no ABN (abnormal) is displayed in the LED display. (Controller automatically checks that replacement tool is the same type)

8.3.3 Replace homerun cable

1. Verify all System power is off.
2. Disconnect the damaged cable(s) from the nutrunner tool and the Controller unit, and replace with the spare cable(s). (Align keyways on both ends and fully twist connectors into the locked position)

Note: Wave Washer (Part# WAV-25036) can be used to tighten the tool side twist lock connector if desired. The washer must be split and inserted by threading the washer underneath the twist lock rollers.