

## **Chapter 9: Troubleshooting**

---

## 9.1 Abnormal Conditions.

When an abnormal condition is detected by the system, the affected spindle stops, and lights “Abn” in the [DATA] display. For ease of troubleshooting the nature of the abnormal, the system provides an abnormal code in the [PARM] display and an abnormal sub-code in the [COUNT/D-NO] display.

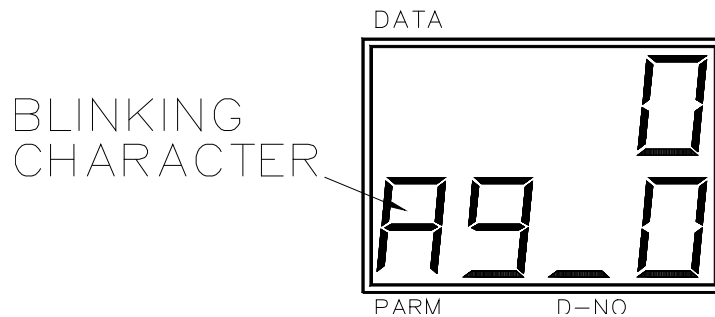
Note: ABNORMALS are not to be confused with fastening REJECTS. Abnormal’s signify a failure of a system process or self check during the fastening cycle.

- **Abnormal code display.**

When an Abnormal condition occurs, the display mode will automatically change to the STATUS mode. (If the display is not in the STATUS mode, depress the MODE button until a blinking “A” appears in the [WORK] display area) A code number appears at the right side of the blinking character. This code refers to some specific type of failure detailed in the tables shown in the following sections.

- **Abnormal Sub-code display.**

The number shown at the most right position in the [COUNT/D-NO] display area is a sub-code that can be used in conjunction with the Abnormal failure code to further narrow down the cause of the fault. See the following sections.



Example of Abnormal Code 9 Sub-Code 0

Abnormal Code Table

ABNORMAL CODE	DESCRIPTION
1	Torque Transducer Error.
2	Over Torque Error.
3	Tool EEPROM error.
4	System Memory Error.
5	Servo Amplifier Reply Error.
6	Servo Type Mismatch Error.
7	NOT USED
8	Servo Amplifier Error.
9	Parameter Error.

Abnormal sub-codes and specific actions for troubleshooting are detailed in the following section.



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

---

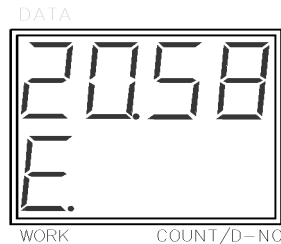
## 9.2 Torque Transducer Abnormals

---

### Calibration Error

---

When the CAL switch is pressed on the Fusion front panel, "E" is shown if the FULL-SCALE preset value is missing or a wrong tool is connected.



#### RECOVERY:

1. Program correct Full Scale Preset value for the tool connected
2. Exchange tool cable, tool and/or controller with known working units. Reinitialize the system after each exchange, and make note of any change in the location of the abnormal.
3. Replace the defective component.

---

### 9.2.1 Code 1-0 TORQUE TRANSDUCER / ZERO VOLTAGE ERROR

---

Zero level does not match master level read from tool EEPROM during power on initialization.

This abnormal is caused from;

1. When the tool transducer is sensing excessive torque due to pressure on the tool body.
2. If the controller or the transducer cable is located in an electric or magnetic noise field.
3. When the torque transducer, Tool cable or the controller malfunctions.

#### RECOVERY:

1. Check that the tool has no signs of an external force being applied to it. (No heavy impact has occurred with the tool assembly)
2. Verify that the cable or controller is not located near any high voltage transient power sources. Relocate as required and reinitialize.
3. Exchange tool cable, tool and/or controller with known working units. Reinitialize the system after each exchange, and make note of any change in the location of the abnormal.
4. Replace the defective component.

---

### 9.2.2 Code 1-1 TORQUE TRANSDUCER / CAL VOLTAGE ERROR

---

Calibration voltage error during power on initialization.

This abnormal is caused from;

1. When the tool transducer is sensing excessive torque due to pressure on the tool body.
2. If the controller or the transducer cable is located in an electric or magnetic noise field.
3. When the torque transducer, Tool cable or the controller malfunctions.

#### RECOVERY:

1. Check that the tool has no signs of an external force being applied to it. (No heavy impact has occurred with the tool assembly)
2. Verify that the cable or controller is not located near any high voltage transient power sources. Relocate as required and reinitialize.
3. Exchange tool cable, tool and/or controller with known working units. Reinitialize the system after each exchange, and make note of any change in the location of the abnormal.
4. Replace the defective component.

### **9.2.3 Code 1-2 TORQUE TRANSDUCER / ZERO CHECK ERROR**

---

Zero level voltage loaded to memory from tool EEPROM during initialization does not match the actual zero level during a self check with the self check function DISABLED.

This abnormal is caused from;

1. When the tool transducer is sensing excessive torque due to pressure or vibration during the fastening cycle start.
2. If the controller or the transducer cable is located in an electric or magnetic noise field.
3. When the torque transducer, Tool cable or the controller malfunctions.

RECOVERY:

1. Check that the tool has no external force applied to it.
2. Verify the tool mounting bolts are tight and nothing is cause excessive vibration to the tool.
3. Verify that the cable or controller is not located near any high voltage transient power sources. Relocate as required and attempt again the fastening start input.
4. Exchange tool cable, tool and/or controller with known working units. Input the start signal after each exchange, and make note of any change in the location of the abnormal.
5. Replace the defective component.

### **9.2.4 Code 1-3 TORQUE TRANSDUCER / CAL SELF CHECK ERROR**

---

Calibration level voltage error after a fastening start was attempted.

This abnormal is caused from;

1. When the tool transducer is sensing excessive torque due to pressure or vibration during the fastening cycle start.
2. If the controller or the transducer cable is located in an electric or magnetic noise field.
3. When the torque transducer, Tool cable or the controller malfunctions.

RECOVERY:

1. Check that the tool has no external force applied to it.
2. Verify the tool mounting bolts are tight and nothing is cause excessive vibration to the tool.
3. Verify that the cable or controller is not located near any high voltage transient power sources. Relocate as required and attempt again a fastening start input.
4. Exchange tool cable, tool and/or controller with known working units. Input the start input after each exchange, and make note of any change in the location of the abnormal.
5. Replace the defective component.

### **9.2.5 Code 1-4 TORQUE TRANSDUCER /STARTED ON ZERO ERROR CONDITION**

---

The start signal was input while a Zero voltage abnormal condition existed.

RECOVERY:

1. Interlock the PLC circuit to disable the start signal during an existing abnormal condition.
2. Follow the ZERO VOLTAGE ERROR abnormal help procedure.

### **9.2.6 Code 1-5 TORQUE TRANSDUCER / STARTED ON CAL ERROR CONDITION**

---

The start signal was input while a Cal voltage abnormal condition existed.

RECOVERY:

1. Interlock the PLC circuit to disable the start signal during an existing abnormal condition.
2. Follow the CAL VOLTAGE ERROR abnormal help procedure.

---

**9.2.7 Code 1-6 TORQUE TRANSDUCER / ZERO LEVEL SELF CHECK ERROR**

---

Zero level voltage loaded to memory from tool EEPROM during initialization does not match the actual zero level during a self check with the self check function enabled.

This abnormal is caused from;

1. When the tool transducer is sensing excessive torque due to pressure on the tool body.
2. If the controller or the transducer cable is located in an electric or magnetic noise field.
3. When the torque transducer, Tool cable or the controller malfunctions.

RECOVERY:

1. Check that the tool has no external force applied to it.
2. Verify that the cable or controller is not located near any high voltage transient power sources. Relocate as required and reinitialize.
3. Exchange tool cable, tool and/or controller with known working units. Reinitialize the system after each exchange, and make note of any change in the location of the abnormal.
4. Replace the defective component.

---

## 9.3 Torque Over Abnormals

---

### 9.3.1 Code 2-0 TORQUE OVER ABNORMAL / TORQUE INHIBIT HIGH LIMIT.

---

High torque was detected during the Torque Inhibit Function which was greater than the Torque Inhibit high limit parameter.

The cause of this abnormal is;

1. Torque Inhibit High Limit parameter set too low for application.
2. Initial starting torque is too high for size of tool. (If limit is set at full scale torque)
3. Excessive binding of output shaft or driver during Torque Inhibit.

RECOVERY:

1. Raise Torque Inhibit Limit.
2. Check that the tool has no external force applied to it.
3. Verify that torque required is not more than tool capability.
4. Verify that nothing is binding on the output shaft of the tool while it begins its cycle.

---

## 9.4 Tool EEPROM Errors

---

### 9.4.1 Code 3-0 PREAMPLIFIER / TOOL ID CHECKSUM ERROR

---

Communication data Checksum error between the Preamplifier and the CONTROLLER Unit. Data is not reliable due to data error.

This abnormal is caused from;

1. If the controller or the transducer cable is located in an electric or magnetic noise field.
2. When the torque transducer, Tool cable or the controller malfunctions.

RECOVERY:

1. Verify that the cable or controller is not located near any high voltage transient power sources. Relocate as required and reinitialize the system.
2. Exchange Tool cable, tool and/or controller with known working units. Reinitialize the system after each exchange, and make note of any change in the location of the abnormal.
3. Replace the defective component.

### 9.4.2 Code 3-1 PREAMPLIFIER / TOOL TYPE ERROR

---

The connected tool type does not match the tool type programmed into the controller. This error may occur in the multi- tool type application or when controllers are replaced and not reprogrammed with the correct configuration.

RECOVERY:

1. Verify the tool type name from the tool identification tag
2. Compare the tool tag name with the setup value located on Data Display (see 7.2.5)
3. Program proper tool number into CONTROLLER Unit or change tool to proper tool.

### 9.4.3 Code 3-2 STARTED WITHOUT TOOL CONNECTED

---

The start signal was applied while a TOOL IS NOT CONNECTED abnormal condition existed.

RECOVERY:

1. Interlock the PLC circuit to disable the start signal during an existing abnormal condition.
2. Follow the TOOL IS NOT CONNECTED (Code 3-3) abnormal help procedure.

### 9.4.4 Code 3-3 PREAMPLIFIER / TOOL IS NOT CONNECTED

---

Communications error between the tool preamplifier and the controller.

This abnormal is caused from;

1. The transducer cable is not connected
2. If the controller or the transducer cable is located in an electric or magnetic noise field.
3. When the torque transducer, Tool cable or the controller malfunctions.

RECOVERY:

1. Verify that the transducer cable is connected
2. Verify that the cable or controller is not located near any high voltage transient power sources. Relocate as required and reinitialize the system.
3. Exchange Tool cable, tool and/or controller with known working units. Reinitialize the system after each exchange, and make note of any change in the location of the abnormal.
4. Replace the defective component.

---

## **9.5 System Memory Errors**

---

### **9.5.1 Code 4-0 SYSTEM MEMORY ERROR / FLASH ROM WRITE ERROR**

---

Communications error to internal CONTROLLER Flash ROM during WRITE attempt.

This abnormal is caused from;

1. Metal chips and/or debris has migrated inside CONTROLLER Unit through vent holes.
2. Flash ROM IC chip has malfunctioned

RECOVERY:

1. Remove CONTROLLER Unit and blow or shake out debris.
2. Replace and return unit to FEC for repair.

### **9.5.2 Code 4-1 SYSTEM MEMORY ERROR / FLASH ROM READ ERROR**

---

Communications error to internal CONTROLLER Flash ROM during READ attempt.

This abnormal is caused from;

1. Metal chips and/or debris has migrated inside CONTROLLER Unit through vent holes.
2. Flash ROM IC chip has malfunctioned

RECOVERY:

1. Remove CONTROLLER Unit and blow or shake out debris.
2. Replace and return unit to FEC for repair.

### **9.5.3 Code 4-2 SYSTEM MEMORY ERROR / SERVO AMP FLASH ROM ERROR**

---

Communications error to internal CONTROLLER Servo Amp flash ROM.

This abnormal is caused from;

1. Metal chips and/or debris has migrated inside CONTROLLER Unit through vent holes.
2. Flash ROM IC chip has malfunctioned

RECOVERY:

1. Remove CONTROLLER Unit and blow or shake out debris.
2. Replace and return unit to FEC for repair.

---

## **9.6 Servo Amplifier Response / Resolver**

---

### **9.6.1 Code 5-0 SERVO AMPLIFIER REPLY ERROR / NO REPLY FROM RESOLVER**

---

The controller is attempting to turn the motor, but is not receiving any signals back from the resolver to indicate that the tool is actually turning.

This abnormal is caused from;

1. The motor/resolver cable is damaged or not connected
2. When the resolver, motor, or the controller malfunctions.
3. If there is excessive binding in the fastener, transmission, or the spindle assembly keeping the motor from turning.

RECOVERY:

1. Verify that the motor cable is connected and not damaged.
2. Connect all spare tool cables to the existing tool.
3. Exchange tool and/or controller with known working units. Reinitialize the system after exchanges.
4. Inspect and correct any binding in the spindle assembly, transmission or fasteners.

---

## **9.7 Servo Type Error**

---

### **9.7.1 Code 6-0 SERVO TYPE ERROR / SERVO TYPE MISMATCH**

---

The CONTROLLER Unit model does not match the connected motor type.

1. Verify the servo type tag with the motor type tag.

---

## Servo Amplifier Error

---

### 9.9.1 Code 8-1 SERVO AMPLIFIER ERROR / SERVO IS OVER HEATED

---

The CONTROLLER servo circuit has overheated.

This abnormal is caused from;

1. The controller servo drive circuit has failed.
2. If the environment temperature is more than 122 degrees Fahrenheit (50 degree centigrade) without any air flow.
3. Source voltage is very close to the limit and the environment temperature is also close to the limit.

RECOVERY:

1. Replace the controller
2. Provide additional cooling to the enclosure.
3. Verify and correct the source voltage as required.

### 9.9.2 Code 8-4 SERVO AMPLIFIER ERROR / OVER CURRENT

---

The CONTROLLER servo circuit experienced a current overload.

This abnormal is caused from;

1. The controller servo drive circuit has failed.
2. If the environment temperature is more than 122 degrees Fahrenheit (50 degree centigrade) without any air flow.
3. Source voltage is very close to the limit and the environment temperature is also close to the limit.
4. Maximum torque is being run or exceeded by the tool every cycle.
5. Speed may be too low or too high during torque speed.

RECOVERY:

1. Replace the controller
2. Verify proper cooling for the enclosure.
3. Verify and correct the source voltage as required.
4. Verify proper torque or work piece.
5. Adjust torque speed setting.

### 9.9.3 Code 8-5 SERVO AMPLIFIER ERROR / INTERNAL POWER SUPPLY.

---

The CONTROLLER servo power supply circuit is not working properly or the input voltage is above the maximum limit.

This abnormal is caused from;

1. The controller internal power supply has failed
2. Source voltage is very close to the limit and the environment temperature is also close to the limit.
3. If the environment temperature is more than 122 degrees Fahrenheit (50 degree centigrade) without any air flow.

RECOVERY:

1. Replace the controller
2. Provide additional cooling to the enclosure.
3. Verify and correct the source voltage as required.

### **9.9.4 Code 8-6 SERVO AMPLIFIER ERROR / INPUT VOLTAGE ABNORMAL**

---

The CONTROLLER servo power supply circuit has detected improper input voltage either above or below the specified limits

This abnormal is caused from;

1. The controller internal power supply has failed
2. Source voltage is out of the limit and/or the environment temperature is also close to the limit.
3. One or more phases of input power is missing

RECOVERY:

1. Replace the controller
2. Provide additional cooling to the enclosure.
3. Verify and correct the source voltage as required.

### **9.9.5 Code 8-9 SERVO AMPLIFIER ERROR/ OVER SPEED.**

---

The resolver signal received at the CONTROLLER indicates an over speed condition.

This abnormal is caused from;

1. The resolver cable or resolver has failed.

RECOVERY:

1. Check resolver using method in 8.2.2
2. Replace resolver cable to spare cable
3. Replace tool assembly.

### **9.9.6 Code 8-10 SERVO AMPLIFIER ERROR / OVER LOAD ( I SQUARE T)**

---

The duty cycle of the fastening application is too severe for this size of tool, or for the parameters currently setup.

RECOVERY:

1. Reduce duty cycle - Increase tool "downtime or off time" and/or increase torque speed to reduce the amount of time running at high torque/slow speed.
2. If the problem remains, a larger tool assembly may be required for this application. Please contact FEC.

### **9.9.7 Code 8-11 SERVO AMPLIFIER ERROR / RESOLVER SIGNAL ERROR.**

---

The resolver signal received is not correct.

RECOVERY:

1. Check the cable; look for loose connectors for visible damages to the cable.
2. Replace with known good tool.

---

## **9.10 Parameter Error**

---

### **9.10.1 Code 9-0 PARAMETER ERROR / MISSING SPEED PRESET.**

---

Some speed preset is not setup in the parameter number selected or the wrong parameter number has been selected by the PLC.

RECOVERY:

1. Verify that the parameter number that is being selected by the PLC is configured in the controller.
2. Check that the reverse speed preset is not <0> or out of the specified speed range of the tool.

### **9.10.2 Code 9-1 PARAMETER ERROR / MISSING TIME or SPEED PRESET**

---

Some Time or Speed preset is not setup in the parameter number selected or the wrong parameter number has been selected by the PLC.

RECOVERY:

1. Verify that the parameter number that is being selected by the PLC is configured in the controller.
2. Check that the reverse speed preset is not <0> or out of the specified speed range of the tool.

### **9.10.3 Code 9-2 PARAMETER ERROR / PARAMETER SELECT ERROR**

---

The parameter selected was empty.

RECOVERY:

1. Verify that the parameter number that is being selected by the PLC is configured in the controller.
2. Check that the fastening presets are not <0> or out of the specified range for the tool.

### **9.10.4 Code 9-3 PARAMETER ERROR / MISSING REVERSE SPEED**

---

The Reverse speed preset is missing.

RECOVERY:

1. Verify that the parameter number that is being selected by the PLC is configured in the controller.
2. Check that the reverse presets are not <0> or out of the specified range for the tool.

### **9.10.5 Code 9-4 PARAMETER ERROR / TORQUE SPEED NOT SET**

---

The Torque speed preset is missing.

RECOVERY:

1. Verify that the parameter number that is being selected by the PLC is configured in the controller.
2. Check that the Torque speed is not set as <0> or out of the specified range for the tool.

### **9.10.6 Code 9-5 PARAMETER ERROR / TORQUE SETUP ERROR**

---

One of the Torque presets is out of range

RECOVERY:

1. Verify that the Torque presets are in range for the tool size.
2. Check that the torque presets are not <0> or setup as specified in 6.1.1.

### **9.10.7 Code 9-6 PARAMETER ERROR / ANGLE SETUP ERROR**

---

One of the Angle presets is out of range

RECOVERY:

1. Verify that the Angle presets are in range for the tool size.
2. Check that the Angle presets are not <0> or setup as specified in 6.1.2.

### **9.10.8 Code 9-7 PARAMETER ERROR / REVERSE TORQUE OVER.**

---

The Reverse torque is more than 1.5 times the Full Scale Torque.

RECOVERY:

1. Verify that the preset value is correct.
2. If the value is correct, check the application. The size of the tool is not adequate for this application or the fastener being reversed may be over-torqued.

---

## **9.11 FUSION CONTROLLER Unit Fastening Faults and Causes**

---

### **9.11.1 Torque Accept Conditions**

---

The Accept LED will light for the following reasons:

1. The previous fastening was completed within all preset limits (TORQUE, ANGLE, 1st RATE, 2nd RATE, and TIME).

### **9.11.2 Torque Reject Conditions**

---

The Reject LED will light for the following reasons:

1. The final fastening torque is not between the low and high Torque limits, low and high angle limits, low and high rate 1, 2 and 3 or the time 1 or final time limits set in the parameter presets.