
Chapter 9: Troubleshooting

9.1 Abnormal Conditions.

When an abnormal condition is detected by the system, the affected spindle stops and lights the ABNORMAL LED. 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 [DATA-NO] display. When connected to the AFC Userconsole software, the cause of the abnormal is also reported via the Fastening Data Monitor screen.

- **Abnormal code display.**

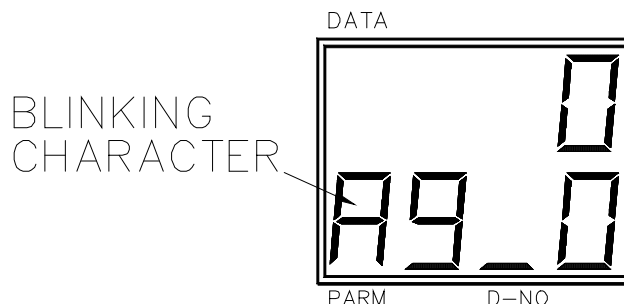
When an Abnormal condition occurs (ABNORMAL LED is lit), the display mode will automatically change to the STATUS mode. (If the display is not in the STATUS mode, depress the MODE button until a blinking "A" appears in the [PARM] display area) A code number appears at the right side of the blinking character. 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 [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.

The main Abnormal codes are:

Abnormal Code 9 Sub-Code 0



ABNORMAL CODE	DESCRIPTION
1	Torque Transducer Origin Error, Cal Check Error.
2	Torque Value Error.
3	Preamplifier error.
4	System Memory Error.
5	Servo Amplifier Response Error.
6	Servo Type Error.
7	Control Error with Multi.
8	Servo Amplifier Error.
9	Setting Data Error.

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

9.2 Torque Transducer Origin Error, Cal Check Error.

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, transducer (T/D) cable or the controller malfunctions.

RECOVERY:

1. Check that the tool has no external force applied to it. (Nothing touching the tool assembly)
2. Verify that the cables or controllers are not located near any high voltage transient power sources. Relocate as required and reinitialize.
3. Exchange transducer (T/D) 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, transducer (T/D) cable or the controller malfunctions.

RECOVERY:

1. Check that the tool has no external force applied to it. (Nothing touching 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 transducer (T/D) 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, transducer (T/D) 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 cables or controllers are not located near any high voltage transient power sources. Relocate as required and attempt again the fastening start input.
4. Exchange transducer (T/D) cable, tool and/or controller with known working units. Apply start signal after 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, transducer (T/D) 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 cables or controllers are not located near any high voltage transient power sources. Relocate as required and attempt again a fastening start input.
4. Exchange transducer (T/D) 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, transducer (T/D) cable or the controller malfunctions.

RECOVERY:

1. Check that the tool has no external force applied to it.
2. Verify that the cables or controllers are not located near any high voltage transient power sources. Relocate as required and reinitialize.
3. Exchange transducer (T/D) 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 / OFFSET TORQUE.

High torque was detected during an Offset Check Function which was greater than the programmed Offset Torque Limit.

The cause of this abnormal is;

1. Excessive binding in the spindle assembly or drive external to the square drive of the tool assembly.
2. The tool transducer is sensing excessive torque due to pressure or vibration during the offset check cycle.
3. The controller or the transducer cable is located in an electric or magnetic noise field.

RECOVERY:

1. Repair or replace mechanism which is binding external to the square drive output of the tool.
2. Check that the tool has no external force applied to it.
3. Verify that the cable or controller is not located near any high voltage transient power sources. Relocate as required and reinitialize.

9.3.2 Code 2-1 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 the 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 SAN 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, transducer (T/D) cable or the controller malfunctions.

RECOVERY:

1. Verify that the cable or controller are not located near any high voltage transient power sources. Relocate as required and reinitialize the system.
2. Exchange transducer (T/D) 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 SAN 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, transducer (T/D) cable or the controller malfunctions.

RECOVERY:

1. Verify that the transducer cable is connected
2. Verify that the cable or controller are not located near any high voltage transient power sources. Relocate as required and reinitialize the system.
3. Exchange transducer (T/D) 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 SAN Flash ROM during WRITE attempt.

This abnormal is caused from;

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

RECOVERY:

1. Remove SAN 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 SAN Flash ROM during READ attempt.

This abnormal is caused from;

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

RECOVERY:

1. Remove SAN 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 SAN Servo Amp flash ROM.

This abnormal is caused from;

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

RECOVERY:

1. Remove SAN 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 SAN Unit model does not match the connected motor type.

1. Verify the servo type tag with the motor type tag.
2. There are Multiple types of SAN Units (controllers) available & they must be connected to the correct motor size as shown in the table below.

TOOL TYPE	ORIGINAL SERVO TYPE	UPDATED SERVO TYPE
NFT-051RM1(A) -S1	SAN2-12	SAN3-24
NFT-051RM1(A) -S	SAN2-12	SAN3-24
NFT-101RM1(A) -S/O	SAN2-12	SAN3-24
NFT-201RM1(A) -S/O	SAN2-12	SAN3-24
NFT-211RH1(A/B) -SA	N/A	SAN3-24H
NFT-301RM2(A) -S/O	SAN2-24	SAN3-24
NFT-311RH1(A/B) -SA	N/A	SAN3-24H
NFT-401RM1(A) -S/O	SAN2-12	SAN3-24
NFT-411RH1(A/B) -SA	N/A	SAN3-24H
NFT-401RM3(A) -S/O	SAN2-40	SAN3-40
NFT-601RM3(A) -S/O	SAN2-40	SAN3-40
NFT-801RM3(A) -S/O	SAN2-40	SAN3-40
NFT-801RH3(A/B) -SS	N/A	SAN3-60H
NFT-132RM3(A) -S/O	SAN2-40	SAN3-40
NFT-132RH3(A/B) -SS	N/A	SAN3-60H
NFT-152RM3(A) -S/O	SAN2-40	SAN3-40
NFT-202RM3(A) -S/O	SAN2-40	SAN3-40
NFT-202RH3(A/B) -SS	N/A	SAN3-60H
NFT-302RM3(A) -S/O	SAN2-40	SAN3-40
NFT-502RM4(A) -S/O	SAN2-80	SAN3-120TM
NFT-802RM4(A) -S/O	SAN2-80	SAN3-120TM
NFT-103RM5 -S	SAN2-120	SAN3-120WM

Tool Type Part Number Breakdown

RM1 motor = SAN2-12, SAN3-24
 RH1 motor = SAN3-24H
 RM2 motor = SAN2-12, SAN3-24
 RM3 motor = SAN2-40, SAN3-40
 RH3 motor = SAN3-60H
 RM4 motor = SAN2-80, SAN3-120TM
 RM5 motor = SAN2-120, SAN3-120WM

Example: Tool Type NFT-601**RM3**A-S = RM3 motor size

9.8 Multi Unit Control Error

9.8.1 Code 7-0 START SIGNAL TIMING ERROR

The controller received a start signal from the MULTI Unit or PLC while the SAN Unit was busy.

This abnormal is caused from;

1. Not enough time delay between a reverse operation and a forward operation.
2. SAN controller failure.
3. Not enough time delay between fastening Steps.

RECOVERY:

1. Add a minimum of 0.2 sec delay from a reverse operation to a forward operation.
2. Replace the SAN controller.

9.8.2 Code 7-1 REVERSE SIGNAL TIMING ERROR

The controller received a reverse signal from the MULTI Unit or PLC while the SAN Unit was busy.

This abnormal is caused from;

1. Not enough time delay between a reverse operation and a forward operation.
2. SAN controller failure.
3. Not enough time delay between fastening Steps.

RECOVERY:

1. Add a minimum of 0.3 sec delay from a reverse operation to a forward operation.
2. Replace the SAN controller.

9.9 Servo Amplifier Error

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

The SAN 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 (242 volts ac) 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 SAN 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 (242 volts ac) 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. (Confirm that Crossover Torque is not set between 95% - 100% of Standard Torque – See note @ 6.3)

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 SAN 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 (242 volts ac) 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 SAN 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 (180-242 volts AC) 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. Between 180-242 VAC 3 phase.

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

The resolver signal received at the SAN controller indicates an overspeed 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.
3. Confirm that Crossover Torque is not set between 95% - 100% of Standard Torque – See note @ 6.3.

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

The resolver signal received is not correct.

RECOVERY:

1. Check the cables and look for loose connectors or 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.

9.10.5 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.

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

9.11 AFC1500 SAN Unit Fastening Faults and Causes

REFER TO SECTION “6.2 Monitoring Functions” for detailed descriptions of Fastening Faults and causes related to all monitoring functions.

9.11.1 Torque Accept Conditions

The Accept LED will light for the three following reasons:

1. The RESET input is active on either the display/programming unit or via a PLC input, and the re-set condition (ZERO LEVEL) of the TRANSDUCER is within acceptable limits.
2. The CAL input is active on either the display/programming unit or via a PLC input, and the calibration condition (CAL LEVEL) of the transducer is within acceptable limits.
3. The previous fastening was completed within all preset limits (TORQUE, ANGLE, 1st RATE, 2nd RATE, 3rd RATE and TIME).

9.11.2 Torque Reject Conditions

The Reject LED will light for the following reasons:

1. The ZERO Level is outside acceptable limits.
2. The CAL Level is outside acceptable limits.
3. 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 1st or final time limits set in the parameter presets.

The Reject LED will blink for the following reasons:

1. Flashes fast indicating an Angle reject. (on 100 msec – off 300 msec)
2. Flashes Slow indicating a Torque rate or time reject. (on 100 msec – off 700 msec)

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