

Figure 4-2
Fault Message Appearing on Protocol Memory Menu

Fault # 001
Brake did not turn off

Occurs when: The Brake Status signal, located on the Mother board, is checked during Power-up testing. Pin 1 of U6 is toggled low by the CPU causing a low output by U6 pin 3. This signal is inverted by U15 to cause the Brake Status signal U7 pin 8 to toggle high. If a problem exists to cause the output to toggle low, the CPU will display the Fault message at the end of Power-up testing.

Corrective action: Check the Brake Status circuitry of U5, U6, U7 and U15 on the Mother board.

Fault # 002
Brake did not turn on

Occurs when: The Brake Status signal, located on the Mother board, is checked during Power-up testing. Pin 1 and pin 2 of U6 are toggled high by the CPU causing a high output by U6 pin 3. This signal is inverted by U15 to cause the Brake Status signal U7 pin 8 to toggle low. If a problem exists to cause the output to toggle high, the CPU will display the Fault message at the end of Power-up testing.

Corrective action: Check the Brake Status circuitry of U5, U6, U7 and U15 on the Mother board.

Fault # 003**Reverse relay would not turn off**

Occurs when: The Reverse Relay control signals, located on the Mother board, is checked during Power-up testing. Pin 13 and pin 12 of U6 are toggled low by the CPU, causing the output of U6 pin 11 to go low. This low signal then causes the output of U7 pin 6 to go high. If a problem exists to cause the output to stay low, the CPU will display the Fault Message at the end of Power-up testing.

Corrective action: Check chips U6, U15 and U7 on the Mother board.

Fault # 004**Reverse relay would not turn on**

Occurs when: The Reverse Relay control signals, located on the Mother board, are checked during Power-up testing. Pin 13 and pin 12 of U6 are toggled high by the CPU, causing the output of U6 pin 11 to go high. This high signal then causes the output of U7 pin 6 to go low. If a problem exists to cause the output to stay high, the CPU will display the Fault Message at the end of Power-up testing.

Corrective action: Check chips U6, U15 and U7 on the Motherboard.

Fault # 005**Safe relay would not turn off**

Occurs when: During Power-up testing, relay K2 on the Mother board is monitored by the CPU to ensure that it turn off. U6 pin 9 is set low by the CPU and U6 pin 10 is kept low due to the CPU not toggling U14 pin 12. If a problem exists to cause the output to toggle incorrectly, the CPU will display the Fault message at the end of Power-up testing.

Corrective action: Check chips U14, U6, U15 and Relay K2 on the Mother board.

Fault # 006**Safe relay would not turn on**

Occurs when: During Power-up testing, relay K2 on the Mother board is monitored by the CPU to ensure that it toggles accurately according to the inputs of U6 pin 9 and pin 10. If a problem exists to cause the output to toggle incorrectly, the CPU will display the Fault message at the end of Power-up testing.

Corrective action: Check chips U14, U6, U15 and Relay K2 on the Mother board.

Fault # 009

Safe relay turned on with no failsafe

Occurs when: During Power-up testing, the safe relay failsafe is tested to ensure that it is not stuck in an unsafe state. U6 pin 9 is set high by the CPU but the failsafe (U14 pin 12) is not toggled. If the safe relay turns off the CPU, the CPU will display the Fault message at the end of Power-up testing.

Corrective action: Check chips U14, U6, U15 and Relay K2 on the Mother board.

Fault # 010

PWM stop turned off with no failsafe

Occurs when: During Power-up testing, the PWM STP STATUS line (U5 pin 3) is checked to ensure that the PWM controller, U16, is not active unless the failsafe is toggled. U6 pin 1 is toggled low, causing U5 pin 2 to be low. The failsafe is not toggled, so U5 pin 1 should also be low. If the output of U5 pin 3 is not high, the CPU will display the Fault message at the end of the Power-up testing.

Corrective action: Check chips U5, U6 and U14 on the Mother board.

Fault # 011

PWM D/A conflicts with A/D (5V)

Occurs when: During Power-up testing, the CPU outputs +5V on the D/A, U18 pin 3 located on the CPU board. The output value is read by the A/D, U16 pin 1 on the CPU board. Any discrepancy between the two values will cause the CPU to display the Fault message at the end of Power-up testing.

Corrective action: Check chips U16 and U18 on the CPU board and U8 on the Mother board.

Fault # 012

PWM D/A conflicts with A/D (2.5V)

Occurs when: During Power-up testing, the CPU outputs +2.5V on the D/A, U18 pin 3 located on the CPU board. The output value is read by the A/D, U16 pin 1 on the CPU board. Any discrepancy between the two values will cause the CPU to display the Fault message at the end of Power-up testing.

Corrective action: Check chips U16 and U18 on the CPU board and U8 on the Mother board.

Fault # 013**PWM D/A conflicts with A/D (0V)**

Occurs when: During Power-up testing, the CPU outputs 0V on the D/A, U18 pin 3 located on the CPU board. The output value is read by the A/D, U16 pin 1 on the CPU board. Any discrepancy between the two values will cause the CPU to display the Fault message at the end of Power-up testing.

Corrective action: Check chips U16 and U18 on the CPU board and U8 on the Mother board.

Fault # 014**PWM stop would not turn off**

Occurs when: During Power-up testing, the PWM STP STATUS line, U5 pin 3, is checked to ensure that the DEAD STOP line, U6 pin 1, can enable the PWM controller. U6 pin 1 is toggled high, causing U5 pin 2 to be high. The failsafe is toggled, causing U5 pin 2 to be high. If the output of U5 pin 3 is high, the CPU will display the Fault message at the end of Power-up testing.

Corrective action: Check U5, U6, U14, and U16 on the Mother board.

Fault # 015**PWM stop would not turn on**

Occurs when: During Power-up testing, the PWM STP STATUS line, U5 pin 3, is checked to ensure that the DEAD STOP line, U6 pin 1, can turn the PWM stop on by itself. The failsafe is toggled which causes U5 pin 1 to be high. U6 pin 1 is toggled low, causing U5 pin 2 to be low. If the output of U5 pin 3 is low, the CPU will display the Fault message at the end of Power-up testing.

Corrective action: Check U5, U6 U14, and U16 on the Mother board.

Fault # 016**Position is not calibrated**

Occurs when: Calibration position parameters are stored in two addresses within chip U17 on the CPU board. During power-up testing and before an Injection is enabled, these two parameters are compared. If the parameters do not match, the Fault message will be displayed.

Corrective action: Re-calibrate the Powerhead position. If the error persists, replace chip U17 on the CPU board.

Fault # 017

Lost power head communications

Occurs when: During operation of the CT 9000, the CPU continually checks for signals from the powerhead. If a 3 second lapse occurs between receiving signals from the powerhead, the Fault message will be displayed.

Corrective action: Check the powerhead cable to ensure it is securely connected to the connectors in the rear of the powerhead and the rear of the electronics cabinet. If the Fault message continues, replace chips U13 and U14 on the Mother board and U1 on the Powerhead board.

Fault # 018

Lost console communications

Occurs when: This Fault message is only visible when two consoles are active. If this problem occurs while using a one-console system, the Fault Indicator light (the Injecting light) on the Powerhead will flash and the console keyboard will be locked-up.

Corrective action: Check the console cable to ensure it is securely connected to the connectors in the rear of the console and the rear of the electronics cabinet. If the console does not respond to these actions, replace the Console board.

Fault # 019

Flow rate error

Occurs when: The actual flow rate delivered by the syringe plunger is monitored by the CPU by using feedback from the motor encoder. When this flow rate is approximately 20% higher than the programmed flow rate, this Fault message will occur.

Corrective action: Replace chip U13 on the Mother board. If the problem persists, replace the Motor encoder.

Fault # 020

Motor moving wrong direction

Occurs when: Motor direction output from U14 pin 6 on the Mother board is incorrect. Fill syringe movement = high signal; Expel syringe movement = low signal.

Corrective action: Check to ensure J5 pins 1 and 2 on the Powerhead board are connected properly. Replace chips U14 and U13 on the Mother board.

Fault # 021**Syringe size sensing error**

Occurs when: Face plate magnates are not sensed for a valid syringe size.

Corrective action: Check magnets. Replace sensor board in Powerhead.

Fault # 022**Heater thermistor tracking error**

Occurs when: Heater Blanket thermistors are not at the approximate same level.

Corrective action: Replace the Heater Blanket. If the problem persists, replace U1 on the Powerhead board.

Fault # 023**Overheating error**

Occurs when: If the Heater Blanket temperature is greater than 42 °C, this Fault message will be displayed.

Corrective action: Replace the Heater Blanket. If the problem persists, replace U1 on the Powerhead board.

Fault # 024**Power head communication error**

Occurs when: The power pack indicates to the powerhead that the power pack communications packets are not valid.

Corrective action: Check U1 on the Powerhead board and U3 on the Mother board

Fault # 025**Power head flow rate error**

Occurs when: The actual flow rate delivered by the syringe plunger is measured by the microcontroller in the powerhead. When this flow rate is approximately 25 % higher than the programmed flow rate, this Fault message will occur. This precaution acts as a backup to Fault # 19—Flow Rate Error.

Corrective action: Replace U1 on the Powerhead board.

Fault # 026

Ram past extend limit error

Occurs when: During plunger movement, the linear pot has moved past the calibrated 0 ml point.

Corrective action: Re-calibrate the position. Check the linear pot on the powerhead. Replace U1 on the Powerhead board.

Fault # 027

Ram past retract limit error

Occurs when: During plunger movement, the linear pot has moved past the calibrated 125/200 ml point.

Corrective action: Re-calibrate the position. Check the linear pot on the powerhead. Replace U1 on the Powerhead board.

Fault # 028

Unknown power head fault

Occurs when: The powerhead transmits garbled information to the power pack.

Corrective action: Replace the receiver U13 on the Mother board or the transmitter U3 on the Powerhead board.

Fault # 029

Pressure is not calibrated

Occurs when: Calibration pressure parameters are stored in two addresses within chip U17 on the CPU board. During power-up testing and before an Injection is enabled, these two parameters are compared. If the parameters do not match, the Fault message will be displayed.

Corrective action: Re-calibrate the Powerhead pressure. If the error persists, replace chip U17 on the CPU board.

Fault # 030

Illegal state transition

Occurs when: The software has inadvertently moved into an erroneous state.

Corrective action: Cycle power to correct problem. If this problem persists, replace chips U10, U12, and U15 (RAM and ROM) on the CPU board.

Fault # 031**Bad power head communications**

Occurs when: The power pack detects a number of invalid communications packets from the powerhead.

Corrective action: Replace U13 on the Mother board and/or U3 on the Powerhead board.

Fault # 032**No power head detected**

Occurs when: During Power-up tests, the CPU checks for signals from the powerhead. If signals are not found, the Fault message will be displayed.

Corrective action: Check the powerhead cable to ensure it is securely connected to the connectors in the rear of the powerhead and the rear of the electronics cabinet. If the Fault message continues, replace chips U13 and U14 of the Mother board and U1 of the Powerhead board.

Fault # 033**Bad EEPROM detected on CPU Board**

Occurs when: During Power-up testing, the CPU performs a Write function to the EEPROM, chip U17. If this cannot be completed, the CPU displays the Fault message at the end of Power-up testing.

Corrective action: Replace the EEPROM U17 on the CPU board.

Fault # 035**Software error**

Occurs when: A Power-up Fault message is called to be displayed when no Power-up Faults have been detected by the CPU.

Corrective action: Cycle power to correct problem. If this problem persists, replace chips U10 and U12 on the CPU board.

Fault # 036**RAM test failed**

Occurs when: This Fault message will be displayed when the RAM R/W test performed by the CPU during Power-up testing has failed.

Corrective action: Replace the RAM chip U15.

Fault # 037
ROM test failed

Occurs when: This Fault message will be displayed when the EPROM (U10) Cyclic Redundancy Check (CRC) has failed.

Corrective action: Replace U10.

Fault # 038
No encoder counts detected

Occurs when: This Fault message will be display when the encoder counts are not being detected by the CPU even though a voltage is being delivered to the motor.

Corrective action: Check the motor, connector J5 on the powerhead and Fuse 2 on the Mother board.

Fault # 039
Linear pot. tracking error

Occurs when: This Fault message will be displayed when the linear pot position on the RAM does not match the motor encoder position.

Corrective action: Ensure the linear pot is connected securely to J7 and that the wiper on the linear pot is attached to the ball screw.

Fault # 041
Overvolume error detected

Occurs when: This Fault message will by displayed when the volume delivered exceeds programmed volume by 2 ml.

Corrective action: Re-calibrate position. If the problem persists, check the brake circuitry on the Mother board consisting of U15, Q2, and Q3.

Fault # 042
Console key closed on powerup

Occurs when: During Power-up testing, all console keys must be in the opened position. Otherwise, this Fault message will be displayed by the CPU at the end of Power-up testing.

Corrective action: Ensure all keys are released during Power-up testing. If the problem persists, replace the Console keyboard.

Fault # 043

Power head key closed on powerup

Occurs when: During Power-up testing, all powerhead keys must be in the opened position. Otherwise, this Fault message will be displayed by the CPU at the end of Power-up testing.

Corrective action: Ensure all keys are released during Power-up testing. If the problem persists, replace the Powerhead keyboard.

RE-ASSEMBLY OF THE POWERHEAD

Two critical dimensions and one screw torque necessary for the re-assembly process of the Powerhead are as follows:

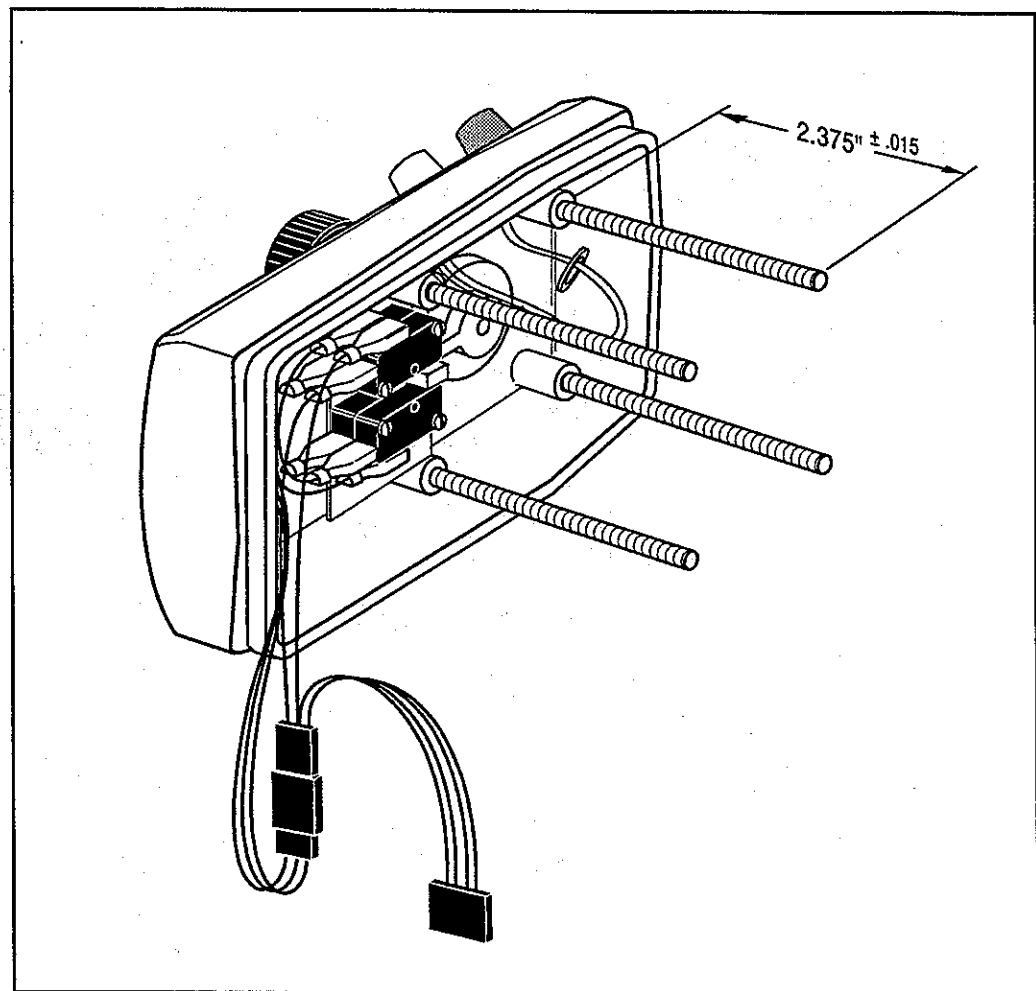


Figure 4-3
Critical Dimension of the End Bracket Assembly