

# Comprehensive Technical Troubleshooting Guide

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## 1. VIBRO System Troubleshooting

### 1.1 NOT WORKING (No LED Indication)

**Symptom:** Device completely unresponsive, no LED lights

#### Step-by-Step Diagnosis:

##### Step 1: Check Fuse

- **Action Required:** Inspect the main fuse
- **Tools Needed:** Multimeter, spare fuses
- **Procedure:**
  - i. Turn off device and disconnect power
  - ii. Locate fuse holder (usually near power input)
  - iii. Remove fuse and test continuity with multimeter
  - iv. If fuse is blown (no continuity), replace with same rating
- **Resolution:** Replace fuse if defective

##### Step 2: Power Supply Verification

- **Action Required:** Test power supply output

- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Measure voltage at power supply output
  - ii. Check for stable DC voltage according to specifications
  - iii. Verify no fluctuations or noise in output
- **Resolution:** Replace power supply if output is incorrect

#### **Step 3: Supply Voltage Check (11V to 14V)**

- **Action Required:** Verify voltage reaches the main board
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Measure voltage at main board input terminals
  - ii. Ensure voltage is within 11V-14V range
  - iii. Check for voltage drops in connecting cables
- **Resolution:** Replace power supply if voltage out of range

#### **Step 4: Gun Element Short Circuit Test**

- **Action Required:** Check gun element for short circuit
- **Tools Needed:** Multimeter, insulation tester
- **Procedure:**
  - i. Disconnect gun element from circuit
  - ii. Measure resistance across gun element terminals
  - iii. Check for short circuit to ground
  - iv. Verify element resistance matches specifications
- **Resolution:** Replace gun element if short circuit detected

#### **Step 5: DC Connector Inspection**

- **Action Required:** Examine DC connector integrity
- **Tools Needed:** Visual inspection, multimeter
- **Procedure:**
  - i. Check connector for physical damage
  - ii. Verify pin continuity
  - iii. Ensure proper connection and no oxidation
- **Resolution:** Replace DC connector if damaged

## **Step 6: Stirrer Board Diagnosis**

- **Action Required:** Test stirrer board functionality
- **Tools Needed:** Multimeter, oscilloscope (if available)
- **Procedure:**
  - i. Check power input to stirrer board
  - ii. Verify control signal integrity
  - iii. Test output signals from board
- **Resolution:** Replace stirrer board if defective

## **1.2 NOT WORKING (LED Just Turns On and Off)**

**Symptom:** LED indicators flash or cycle but no operation

### **Step 1: Gun Element Short Circuit Check**

- **Action Required:** Test gun element for internal faults
- **Procedure:**
  - i. Disconnect gun element completely
  - ii. Test resistance between terminals
  - iii. Check insulation resistance to ground
  - iv. Verify element specifications match requirements
- **Resolution:** Replace gun if short circuit found

### **Step 2: DC Connector Verification**

- **Action Required:** Check DC connector and connections
- **Procedure:**
  - i. Inspect connector pins for damage
  - ii. Check for loose connections
  - iii. Verify proper voltage at connector
- **Resolution:** Replace DC connector if faulty

### **Step 3: Stirrer Board Assessment**

- **Action Required:** Diagnose stirrer board operation
- **Procedure:**
  - i. Check board for visible damage
  - ii. Test input/output voltages
  - iii. Verify control signals

- **Resolution:** Replace stirrer board if malfunctioning

### 1.3 MACHINE ON BUT NO VIBRATION

**Symptom:** System powers up normally but vibration mechanism doesn't operate

#### Step 1: Supply Voltage Verification (11V-14V)

- **Action Required:** Confirm adequate power supply
- **Procedure:**
  - i. Measure voltage at vibration motor terminals
  - ii. Check voltage under load conditions
  - iii. Verify stable power during operation
- **Resolution:** Replace power supply if voltage inadequate

#### Step 2: Gun Element Testing

- **Action Required:** Check gun element functionality
- **Procedure:**
  - i. Test element resistance
  - ii. Check for proper current draw
  - iii. Verify heating operation if applicable
- **Resolution:** Replace gun if element defective

#### Step 3: Frequency Potentiometer Check

- **Action Required:** Test frequency control circuit
- **Tools Needed:** Multimeter, oscilloscope
- **Procedure:**
  - i. Check potentiometer resistance variation
  - ii. Verify control signal output
  - iii. Test frequency adjustment range
- **Resolution:** Replace frequency potentiometer if faulty

#### Step 4: Stirrer Board Diagnosis

- **Action Required:** Comprehensive stirrer board test
- **Procedure:**
  - i. Check all input voltages
  - ii. Verify control signal processing
  - iii. Test output drive signals

- **Resolution:** Replace stirrer board if defective

## 1.4 CONTINUOUS VIBRATION

**Symptom:** Vibration mechanism runs continuously without control

### Step 1: Timer Potentiometer Check

- **Action Required:** Test timer control circuit
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Check timer potentiometer resistance
  - ii. Verify timing signal generation
  - iii. Test cable continuity to control board
- **Resolution:** Replace timer potentiometer if faulty

### Step 2: Stirrer Board Assessment

- **Action Required:** Check control logic on stirrer board
- **Procedure:**
  - i. Verify timer input processing
  - ii. Check control logic operation
  - iii. Test output switching function
- **Resolution:** Replace stirrer board if control logic fails

## 1.5 LOW VIBRATION INTENSITY

**Symptom:** Vibration operates but at reduced intensity

### Step 1: Supply Voltage Check (11V-14V)

- **Action Required:** Verify adequate power supply
- **Procedure:**
  - i. Measure voltage under full load
  - ii. Check for voltage drops during operation
  - iii. Verify power supply current capacity
- **Resolution:** Replace power supply if insufficient

### Step 2: Frequency Potentiometer Test

- **Action Required:** Check frequency control adjustment
- **Procedure:**
  - i. Test potentiometer full range operation

- ii. Verify frequency response curve
- iii. Check cable connections
- **Resolution:** Replace frequency potentiometer if range limited

### **Step 3: Stirrer Board Frequency Adjustment**

- **Action Required:** Adjust frequency trim potentiometer
- **Procedure:**
  - i. Locate frequency trim pot on stirrer board
  - ii. Adjust while monitoring vibration intensity
  - iii. Set to optimal frequency for maximum output
- **Resolution:** Adjust frequency trim potentiometer

### **Step 4: Stirrer Board Replacement**

- **Action Required:** Replace if adjustment doesn't resolve issue
- **Procedure:**
  - i. Document current settings before removal
  - ii. Install new board with proper connections
  - iii. Recalibrate frequency and timing settings
- **Resolution:** Replace stirrer board if defective

## **1.6 VIBRATION INDICATION LED NOT WORKING**

**Symptom:** Vibration operates normally but LED indicator doesn't function

### **Step 1: LED and Cable Inspection**

- **Action Required:** Test LED functionality and connections
- **Tools Needed:** Multimeter, spare LED
- **Procedure:**
  - i. Check LED with direct voltage application
  - ii. Test cable continuity end-to-end
  - iii. Verify proper polarity connections
- **Resolution:** Replace LED and cable assembly if defective

### **Step 2: Indication Line Voltage Check**

- **Action Required:** Verify control signal voltage
- **Procedure:**
  - i. Measure voltage at LED driver output

- ii. Check signal timing matches vibration operation
- iii. Verify voltage levels meet LED requirements
- **Resolution:** Replace stirrer board if driver circuit fails

## 1.7 POWER LED NOT WORKING

**Symptom:** Main power LED doesn't illuminate when system is on

### Step 1: LED and Cable Test

- **Action Required:** Check LED and connection integrity
- **Procedure:**
  - i. Test LED with known good voltage source
  - ii. Check cable for breaks or shorts
  - iii. Verify connector integrity
- **Resolution:** Replace LED and cable assembly if needed

### Step 2: Power Indication Circuit Check

- **Action Required:** Test power LED driver circuit
- **Procedure:**
  - i. Measure voltage at LED driver output
  - ii. Check for proper power indication signal
  - iii. Verify circuit operation matches power state
- **Resolution:** Replace stirrer board if driver defective

## 1.8 STIRRER WORKS ONLY WHEN ADAPTER PLUGGED

**Symptom:** System only operates when external power adapter is connected

### Step 1: Push Switch Functionality Check

- **Action Required:** Test switch operation and connections
- **Tools Needed:** Multimeter, oscilloscope
- **Procedure:**
  - i. Check switch contact resistance in both positions
  - ii. Verify switch signal reaches control board
  - iii. Test cable continuity from switch to board
- **Resolution:** Replace switch if contacts faulty

### Step 2: Stirrer Board Diagnosis

- **Action Required:** Check switch input processing on board

- **Procedure:**
    - i. Verify switch input voltage levels
    - ii. Check input signal conditioning circuits
    - iii. Test logic processing of switch commands
  - **Resolution:** Replace stirrer board if input circuit fails
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## 2. Solar Charger Board Issues

### 2.1 NO BATTERY CHARGING VOLTAGE (0V Output)

**Symptom:** Solar charger board produces no output voltage

#### Step 1: Charger Adapter Voltage Verification

- **Action Required:** Test input power supply voltages
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Measure 12.5V output from charger adapter
  - ii. Verify 24V output from charger adapter
  - iii. Check voltage stability under load
  - iv. Ensure adapter meets current requirements
- **Resolution:** Replace charger adapter if voltages incorrect

#### Step 2: Charger Fuse Inspection

- **Action Required:** Check and test charging circuit fuse
- **Procedure:**
  - i. Locate charger fuse on solar charger board
  - ii. Test fuse continuity with multimeter
  - iii. Check fuse rating matches requirements
  - iv. Inspect fuse holder for corrosion
- **Resolution:** Replace fuse if blown

#### Step 3: Wiring Verification

- **Action Required:** Check adapter to solar charger board connections
- **Procedure:**
  - i. Verify all connections are tight and secure
  - ii. Check wire continuity end-to-end

- iii. Inspect for damaged or corroded connections
  - iv. Ensure proper polarity throughout circuit
  - **Resolution:** Repair or replace damaged wiring
- Step 4: Solar Charger Board Component Check**
- **Action Required:** Inspect board for component damage
  - **Tools Needed:** Visual inspection, multimeter
  - **Procedure:**
    - i. Look for burned, cracked, or swollen components
    - ii. Check capacitors for bulging or leakage
    - iii. Test critical semiconductor components
    - iv. Verify proper component values
  - **Resolution:** Replace solar charger board if components damaged

## 2.2 LOW BATTERY CHARGING VOLTAGE

**Symptom:** Charging voltage present but below required levels

**Step 1: Charger Adapter Output Verification**

- **Action Required:** Confirm adapter outputs correct voltages
- **Procedure:**
  - i. Measure 12.5V and 24V outputs under load
  - ii. Check voltage regulation under varying load
  - iii. Verify adapter current capacity sufficient
- **Resolution:** Replace charger adapter if outputs low

**Step 2: Voltage Adjustment Trimmer Check**

- **Action Required:** Adjust charging voltage trimmer potentiometer
- **Tools Needed:** Small screwdriver, multimeter
- **Procedure:**
  - i. Disconnect battery from charger board
  - ii. Locate voltage adjustment trim potentiometer
  - iii. Measure output voltage while adjusting trimmer
  - iv. Set voltage to proper charging level (typically 14.4V for 12V battery)
- **Resolution:** Replace charger board if trimmer cannot adjust voltage properly

## 2.3 BATTERY CHARGING VOLTAGE TOO HIGH

**Symptom:** Charging voltage exceeds safe battery charging limits

### **Step 1: Voltage Adjustment Trimmer Correction**

- **Action Required:** Adjust charging voltage down to safe level
- **Procedure:**
  - i. Remove battery connection immediately to prevent damage
  - ii. Locate voltage adjustment trim potentiometer
  - iii. Carefully adjust trimmer to reduce output voltage
  - iv. Set to proper charging voltage (14.4V for 12V system)
  - v. Reconnect battery and monitor voltage
- **Resolution:** Replace charger board if trimmer cannot control voltage

## **2.4 CORRECT CHARGING VOLTAGE BUT BATTERY NOT CHARGING**

**Symptom:** Voltage levels correct but battery doesn't accept charge

### **Step 1: Battery Condition Assessment**

- **Action Required:** Test battery health and capacity
- **Tools Needed:** Battery tester, multimeter, load tester
- **Procedure:**
  - i. Measure battery open-circuit voltage
  - ii. Test battery under load conditions
  - iii. Check battery specific gravity (if serviceable type)
  - iv. Verify battery age and service history
- **Resolution:** Replace battery if degraded or faulty

### **Step 2: Solar Charger Board Component Check**

- **Action Required:** Test charging circuit components
- **Procedure:**
  - i. Check charging current flow to battery
  - ii. Verify charging circuit components operational
  - iii. Test current limiting and regulation circuits
  - iv. Check for component failures preventing current flow
- **Resolution:** Replace solar charger board if charging circuit defective

## **2.5 BATTERY CHARGING INDICATION LED NOT WORKING**

**Symptom:** Battery charges properly but LED indicator doesn't show status

### **Step 1: Battery Condition Verification**

- **Action Required:** Ensure battery is in chargeable condition
- **Procedure:**
  - i. Check battery voltage and condition
  - ii. Verify battery is accepting charge current
  - iii. Confirm charging process is active
- **Resolution:** Replace battery if not accepting charge

### **Step 2: LED and Cable Assembly Check**

- **Action Required:** Test LED indicator and connections
- **Procedure:**
  - i. Check LED with direct voltage application
  - ii. Test cable continuity from board to LED
  - iii. Verify proper polarity and connections
  - iv. Check for damaged or corroded connections
- **Resolution:** Replace LED and cable assembly if defective

### **Step 3: Current Indication Line Voltage Test**

- **Action Required:** Verify LED driver circuit operation
- **Procedure:**
  - i. Measure voltage at LED driver output on board
  - ii. Check signal corresponds to charging current
  - iii. Verify voltage levels adequate for LED operation
- **Resolution:** Replace solar charger board if driver circuit fails

## **2.6 LOW VOLTAGE CUTOFF NOT WORKING**

**Symptom:** System doesn't shut down when battery voltage drops too low

### **Step 1: Low Voltage Cutoff Relay Test**

- **Action Required:** Test K2 relay operation
- **Tools Needed:** Multimeter, oscilloscope
- **Procedure:**
  - i. Power system on and rapidly cycle power switch
  - ii. Listen for relay clicking during on/off/on sequence
  - iii. Measure relay coil voltage during operation

- iv. Check relay contact resistance and operation
- **Resolution:** Replace solar charger board if relay defective

## 2.7 LOW VOLTAGE CUTOFF LED NOT WORKING

**Symptom:** Low voltage cutoff functions but LED doesn't indicate status

### Step 1: LED and Cable Verification

- **Action Required:** Test cutoff indication LED
- **Procedure:**
  - i. Check LED operation with direct voltage
  - ii. Test cable continuity end-to-end
  - iii. Verify connections are secure and clean
- **Resolution:** Replace LED and cable assembly if needed

### Step 2: Cutoff Indication Line Check

- **Action Required:** Test LED driver circuit
- **Procedure:**
  - i. Measure voltage at cutoff indication output
  - ii. Verify signal matches cutoff relay operation
  - iii. Check voltage levels meet LED requirements
- **Resolution:** Replace solar charger board if indication circuit fails

## 2.8 MACHINE RUNS CONTINUOUSLY ON BATTERY

**Symptom:** System doesn't switch to adapter power when available

### Step 1: Charger Adapter Voltage Check

- **Action Required:** Verify adapter provides correct voltages
- **Procedure:**
  - i. Measure 12.5V and 24V outputs from adapter
  - ii. Check voltage stability under load
  - iii. Verify adapter connection to solar charger board
- **Resolution:** Replace charger adapter if outputs incorrect

### Step 2: Low Voltage Setting Adjustment

- **Action Required:** Check and adjust low voltage cutoff setting
- **Procedure:**
  - i. Locate low voltage setting trim potentiometer

- ii. Check setting against battery voltage thresholds
- iii. Adjust if necessary to proper cutoff point
- **Resolution:** Replace solar charger board if adjustment ineffective

### **Step 3: Charger Adapter Detection Relay Test**

- **Action Required:** Test K1 relay for adapter detection
- **Procedure:**
  - i. Connect charger adapter and listen for relay operation
  - ii. Measure relay coil voltage when adapter connected
  - iii. Check relay contact operation and resistance
  - iv. Verify relay switches power source properly
- **Resolution:** Replace solar charger board if K1 relay defective

## **2.9 EXTERNAL BATTERY NOT WORKING**

**Symptom:** System doesn't operate from external battery connection

### **Step 1: External Battery Voltage Check**

- **Action Required:** Verify external battery condition
- **Procedure:**
  - i. Measure external battery voltage (must be above 11.5V)
  - ii. Test battery under load conditions
  - iii. Check battery connection integrity
  - iv. Verify battery capacity adequate for system
- **Resolution:** Charge external battery if voltage low

### **Step 2: K1 Relay Operation Test**

- **Action Required:** Test relay using charger adapter
- **Procedure:**
  - i. Connect charger adapter to activate relay
  - ii. Listen for relay clicking operation
  - iii. Measure relay contact resistance
  - iv. Verify relay switches between power sources
- **Resolution:** Replace solar charger board if relay fails

### **Step 3: Low Voltage Cutoff Adjustment**

- **Action Required:** Check cutoff setting for external battery

- **Procedure:**
    - i. Locate low voltage cutoff trim potentiometer
    - ii. Verify setting allows external battery operation
    - iii. Adjust if necessary to accommodate external battery
  - **Resolution:** Replace solar charger board if adjustment range insufficient
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### 3. Adapter Problems

#### 3.1 COMPACT ADAPTER - ZERO OUTPUT VOLTAGE (LSE V3/ECO V)

**Symptom:** Adapter produces no output voltage

##### Step 1: Status LED Check

- **Action Required:** Verify adapter power indication
- **Procedure:**
  - i. Check if status LED illuminates when adapter plugged in
  - ii. Observe LED color and behavior (solid, blinking, etc.)
  - iii. Compare with normal operation indicators
- **Next Action:** If LED not glowing, proceed to Step 2

##### Step 2: Internal PCB Inspection

- **Action Required:** Open adapter and inspect circuit board
- **Safety Warning:**  **DISCONNECT FROM MAINS POWER BEFORE OPENING**
- **Tools Needed:** Screwdriver set, flashlight, magnifying glass
- **Procedure:**
  - i. Unplug adapter from wall outlet
  - ii. Wait 5 minutes for capacitors to discharge
  - iii. Carefully open adapter housing
  - iv. Visually inspect PCB for:
    - Burned components (black or brown discoloration)
    - Swollen or leaked capacitors
    - Cracked components or PCB traces
    - Loose or corroded connections
- **Resolution:** Replace adapter PCB if damage found

##### Step 3: AC Cord Verification

- **Action Required:** Test input power cord
- **Tools Needed:** Multimeter, continuity tester
- **Procedure:**
  - i. Check AC cord for physical damage
  - ii. Test continuity through both power conductors
  - iii. Verify proper connection to adapter PCB
  - iv. Check for breaks or intermittent connections
- **Resolution:** Replace AC cord if defective

#### **Step 4: Adapter PCB Replacement**

- **Action Required:** Replace internal circuit board
- **Procedure:**
  - i. Source replacement PCB with same specifications
  - ii. Transfer connections from old to new PCB
  - iii. Ensure proper mounting and insulation
  - iv. Test output voltage before closing housing
- **Resolution:** Replace adapter PCB

### **3.2 COMPACT ADAPTER - ZERO OUTPUT WITH LED GLOWING**

**Symptom:** Status LED works but no DC output voltage

#### **Step 1: Output DC Connector Check**

- **Action Required:** Test output connector and cable
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Measure voltage at adapter PCB output terminals
  - ii. Check voltage at DC connector pins
  - iii. Test cable continuity from PCB to connector
  - iv. Verify connector pin integrity and connections
- **Resolution:** Replace output DC cable if defective

### **3.3 COMPACT ADAPTER - LOW OUTPUT VOLTAGE (8V-9V)**

**Symptom:** Adapter outputs voltage but below required level

#### **Step 1: PCB Component Inspection**

- **Action Required:** Check for component degradation

- **Procedure:**
  - i. Open adapter housing safely
  - ii. Inspect components for partial failure signs
  - iii. Look for components operating at high temperature
  - iv. Check electrolytic capacitors for bulging
- **Resolution:** Replace adapter PCB

#### **Step 2: Complete PCB Replacement**

- **Action Required:** Install new circuit board
- **Procedure:**
  - i. Remove old PCB completely
  - ii. Install new PCB with proper specifications
  - iii. Verify all connections secure
  - iv. Test output voltage before final assembly
- **Resolution:** Replace adapter PCB

### **3.4 CHARGER ADAPTER - ZERO OUTPUT (LSE-S V3/ECOD/ECOSV)**

**Symptom:** Dual output charger adapter produces no voltage

#### **Step 1: Status LED Verification**

- **Action Required:** Check adapter power indication
- **Procedure:**
  - i. Verify LED illuminates when plugged in
  - ii. Check LED indicates normal operation
  - iii. Compare with known good adapter operation
- **Next Action:** If no LED, proceed to component check

#### **Step 2: Internal Component Inspection**

- **Action Required:** Examine charger adapter PCB
- **Safety Procedure:**
  - i. Disconnect from mains power
  - ii. Wait for capacitor discharge (minimum 5 minutes)
  - iii. Open housing carefully
  - iv. Inspect for component damage or burning
- **Resolution:** Replace charger adapter PCB if damage found

### **Step 3: AC Cord Testing**

- **Action Required:** Verify input power cord integrity
- **Procedure:**
  - i. Test cord continuity
  - ii. Check for physical damage
  - iii. Verify proper connection to PCB
- **Resolution:** Replace AC cord if defective

### **Step 4: Charger Adapter PCB Replacement**

- **Action Required:** Install new circuit board
- **Procedure:**
  - i. Source correct replacement PCB
  - ii. Transfer all connections properly
  - iii. Test both 12V and 24V outputs
  - iv. Verify current capacity meets specifications
- **Resolution:** Replace charger adapter PCB

## **3.5 CHARGER ADAPTER - LED GLOWING BUT NO OUTPUT**

**Symptom:** Status indication normal but no DC output

### **Step 1: Output DC Connector Inspection**

- **Action Required:** Test output connections
- **Procedure:**
  - i. Check voltage at PCB output terminals
  - ii. Test continuity through output cable
  - iii. Verify connector pin integrity
  - iv. Check for loose or corroded connections
- **Resolution:** Replace output DC cable

## **3.6 CHARGER ADAPTER - 12V LOW (8V-9V), 24V NORMAL**

**Symptom:** One output voltage low while other is correct

### **Step 1: PCB Component Check**

- **Action Required:** Inspect components on 12V regulation circuit
- **Procedure:**
  - i. Open adapter housing safely

- ii. Identify 12V regulation components
  - iii. Check for overheating or damage signs
  - iv. Test critical components if possible
- **Resolution:** Replace charger adapter PCB

### **Step 2: Complete PCB Replacement**

- **Action Required:** Install new circuit board
- **Procedure:**
  - i. Remove defective PCB
  - ii. Install replacement with same specifications
  - iii. Test both voltage outputs under load
  - iv. Verify regulation within specifications
- **Resolution:** Replace charger adapter PCB

## **3.7 CHARGER ADAPTER - 12V NORMAL, 24V LOW/ZERO**

**Symptom:** 12V output correct but 24V output defective

### **Step 1: 24V Circuit Component Inspection**

- **Action Required:** Check 24V regulation circuit
- **Procedure:**
  - i. Safely open adapter housing
  - ii. Locate 24V output regulation components
  - iii. Look for damaged or overheated parts
  - iv. Check connections and PCB traces
- **Resolution:** Replace charger adapter PCB

### **Step 2: PCB Replacement**

- **Action Required:** Install new complete circuit board
- **Procedure:**
  - i. Remove old PCB assembly
  - ii. Install new PCB with proper connections
  - iii. Test both outputs thoroughly
  - iv. Verify load regulation and ripple specifications
- **Resolution:** Replace charger adapter PCB

## **4. ECOD-DPST Board Diagnostics**

### **4.1 CONTINUOUS "PLEASE WAIT..." MESSAGE**

**Symptom:** System startup hangs with continuous waiting message

#### **Step 1: SD Card Verification**

- **Action Required:** Check SD card functionality and integrity
- **Tools Needed:** Computer with SD card reader, spare SD card
- **Procedure:**
  - i. Remove SD card from ECOD-DPST board
  - ii. Insert SD card into computer card reader
  - iii. Check if card is recognized and accessible
  - iv. Verify file system integrity (should be FAT format)
  - v. Check for corrupted files or bad sectors
  - vi. Format card if necessary (FAT file system)
  - vii. Reinstall required system files
- **Resolution:** Replace SD card if defective

### **4.2 DISPLAY BLANK/BLACK SCREEN**

**Symptom:** LCD display shows no image or content

#### **Step 1: DPST Board Breathing LED Check**

- **Action Required:** Verify board is functioning
- **Tools Needed:** Visual observation
- **Procedure:**
  - i. Locate breathing LED on DPST board
  - ii. Observe LED for regular blinking pattern
  - iii. Compare with normal operation pattern
  - iv. Check LED color and intensity
- **Resolution:** Replace DPST board if LED not blinking properly

#### **Step 2: Display FRC Cable Direction Check**

- **Action Required:** Verify flat ribbon cable orientation
- **Tools Needed:** Visual inspection
- **Procedure:**
  - i. Locate FRC cable connecting DPST board to LCD

- ii. Check cable insertion direction and orientation
- iii. Note connector keying and alignment marks
- iv. Remove and reconnect cable in opposite direction
- v. Power on system and check for display operation
- **Resolution:** Connect FRC connector in opposite direction

### **Step 3: Display Cable and LCD Quality Check**

- **Action Required:** Test display components
- **Tools Needed:** Spare display cable, spare LCD module
- **Procedure:**
  - i. Inspect FRC cable for physical damage
  - ii. Check for bent or broken conductors
  - iii. Test with known good cable if available
  - iv. Check LCD module for cracks or damage
  - v. Test LCD with known good signal source
- **Resolution:** Replace display assembly

## **4.3 DISPLAY SHOWS ONLY HALF PORTION**

**Symptom:** LCD displays partial image or half screen

### **Step 1: FRC Cable and Connector Check**

- **Action Required:** Inspect display connection integrity
- **Tools Needed:** Magnifying glass, spare cable
- **Procedure:**
  - i. Examine FRC cable for physical damage
  - ii. Check connector insertion depth and alignment
  - iii. Look for bent or missing connector pins
  - iv. Verify cable is fully seated in both connectors
  - v. Test with replacement cable if available
- **Resolution:** Replace DPST to LCD cable

### **Step 2: LCD Module Functionality Test**

- **Action Required:** Check display module health
- **Procedure:**
  - i. Power on display and observe partial image quality

- ii. Check for lines, distortion, or color issues
- iii. Test with known good signal source
- iv. Verify LCD backlight operation
- **Resolution:** Replace LCD module

### **Step 3: DPST Board Assessment**

- **Action Required:** Test board display output
- **Procedure:**
  - i. Check DPST board display driver circuits
  - ii. Verify power supply to display circuits
  - iii. Test with known good LCD module
  - iv. Check for component damage on board
- **Resolution:** Replace DPST board

## **4.4 RTC TIME NOT SAVED (Resets on Restart)**

**Symptom:** Real-time clock loses time when system powered off

### **Step 1: CMOS Battery Voltage Check**

- **Action Required:** Test backup battery condition
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Locate CMOS battery on DPST board (usually CR2032)
  - ii. Measure battery voltage (should be above 2V)
  - iii. Test battery under light load condition
  - iv. Check battery holder contacts for corrosion
  - v. Verify battery is making good electrical contact
- **Resolution:** Replace CMOS battery if voltage below 2V

### **Step 2: RTC Circuit Connection Check**

- **Action Required:** Inspect RTC chip connections
- **Tools Needed:** Multimeter, soldering iron (if needed)
- **Procedure:**
  - i. Locate U5 RTC chip on board
  - ii. Check solder connections to processor
  - iii. Verify continuity of critical signal lines

- iv. Look for cold solder joints or cracks
- v. Re-solder connections if necessary
- **Resolution:** Re-solder connection points

#### **4.5 RTC TIME NOT RUNNING**

**Symptom:** Real-time clock doesn't advance time

##### **Step 1: Crystal Oscillator Check**

- **Action Required:** Test RTC crystal and associated components
- **Tools Needed:** Oscilloscope, spare components
- **Procedure:**
  - i. Locate Y3 crystal (32.768 kHz) near U5 RTC chip
  - ii. Check crystal for physical damage or cracks
  - iii. Test crystal oscillation with oscilloscope
  - iv. Check capacitors C37 and C38 for proper values
  - v. Verify capacitor connections and condition
- **Resolution:** Replace Y3 crystal and C37 & C38 capacitors

#### **4.6 KEYPAD NOT WORKING**

**Symptom:** Touch buttons or keypad unresponsive

##### **Step 1: Keypad FRC Cable Direction Check**

- **Action Required:** Verify keypad connection orientation
- **Tools Needed:** Visual inspection
- **Procedure:**
  - i. Locate FRC-10 cable connecting keypad to DPST board
  - ii. Check cable insertion direction at both ends
  - iii. Remove and reconnect in opposite direction
  - iv. Ensure cable is fully seated in connectors
  - v. Test keypad functionality after reconnection
- **Resolution:** Connect FRC-10 connector in opposite direction

##### **Step 2: Keypad Quality Assessment**

- **Action Required:** Test keypad module
- **Procedure:**
  - i. Inspect keypad for physical damage

- ii. Check for moisture or contamination
- iii. Test individual keys for response
- iv. Verify tactile feedback and operation
- **Resolution:** Replace DPST keypad

### **Step 3: DPST Board Keypad Interface Test**

- **Action Required:** Check board keypad input circuits
- **Procedure:**
  - i. Verify power supply to keypad interface
  - ii. Check keypad scanning circuits on board
  - iii. Test with known good keypad module
  - iv. Verify processor keypad input pins
- **Resolution:** Replace DPST board

## **4.7 USB INITIALIZATION ERROR**

**Symptom:** System shows USB-related error messages

### **Step 1: DPST to Backpanel Cable Check**

- **Action Required:** Verify USB interface cable
- **Tools Needed:** Spare FRC cable
- **Procedure:**
  - i. Locate FRC cable between DPST and backpanel boards
  - ii. Check cable for physical damage
  - iii. Verify connector orientation at both ends
  - iv. Remove and reconnect in opposite direction if needed
  - v. Ensure all pins make good contact
- **Resolution:** Replace FRC cable or correct connector direction

### **Step 2: Backpanel Board Test**

- **Action Required:** Check backpanel board USB circuits
- **Procedure:**
  - i. Connect new backpanel board temporarily
  - ii. Test USB initialization with replacement board
  - iii. Check USB connector integrity
  - iv. Verify USB power supply circuits

- **Resolution:** Replace DPST board if problem persists

## 4.8 WEIGHING SCALE NOT WORKING

**Symptom:** Scale interface doesn't function properly

### Step 1: Settings Configuration Check

- **Action Required:** Verify scale interface settings
- **Tools Needed:** System documentation, settings menu
- **Procedure:**
  - i. Access system settings menu
  - ii. Check scale interface configuration
  - iii. Verify baud rate, data format, and protocol settings
  - iv. Compare with scale manufacturer specifications
  - v. Adjust settings to match scale requirements
- **Resolution:** Set required settings values

### Step 2: Scale Interface Cable Test

- **Action Required:** Check scale connection cable
- **Tools Needed:** Multimeter, spare cable
- **Procedure:**
  - i. Inspect cable for physical damage
  - ii. Test continuity through all conductors
  - iii. Check connector pins for corrosion or damage
  - iv. Verify proper connection at both ends
- **Resolution:** Replace scale interface cable

### Step 3: Backpanel to DPST Scale Cable Check

- **Action Required:** Test internal scale interface connection
- **Procedure:**
  - i. Check cable between backpanel and DPST boards
  - ii. Verify cable seating and orientation
  - iii. Test signal continuity through cable
  - iv. Check for interference or noise issues
- **Resolution:** Replace backpanel to DPST scale cable

### Step 4: Backpanel PCB Functionality Test

- **Action Required:** Check backpanel board scale circuits
- **Procedure:**
  - i. Test scale interface circuits on backpanel
  - ii. Verify power supply to scale interface
  - iii. Check signal conditioning circuits
  - iv. Test with known good scale
- **Resolution:** Replace backpanel PCB

#### **Step 5: DPST Board Scale Interface Test**

- **Action Required:** Check DPST board scale processing
- **Procedure:**
  - i. Verify scale data reception on DPST board
  - ii. Check scale protocol processing software
  - iii. Test scale data interpretation and display
  - iv. Verify scale calibration factors
- **Resolution:** Replace DPST board

#### **4.9 COMPUTER OUTPUT NOT PRESENT**

**Symptom:** No data output to connected computer

##### **Step 1: Data Output Format Settings Check**

- **Action Required:** Verify output configuration
- **Procedure:**
  - i. Access analyzer output settings menu
  - ii. Check data format configuration (CSV, text, etc.)
  - iii. Verify baud rate and communication parameters
  - iv. Ensure output is enabled in settings
  - v. Check data timing and trigger settings
- **Resolution:** Set required settings values

##### **Step 2: Computer Cable Connectivity Test**

- **Action Required:** Check computer interface cable
- **Tools Needed:** Multimeter, spare cable
- **Procedure:**
  - i. Inspect cable for physical damage

- ii. Test continuity through all signal lines
    - iii. Verify proper connector types and pinouts
    - iv. Check cable shielding integrity
    - v. Test with known good cable
  - **Resolution:** Replace computer interface cable
- Step 3: Analyzer to Backpanel Interface Cable Check**
- **Action Required:** Test internal connection
  - **Procedure:**
    - i. Check cable between analyzer mainboard and backpanel
    - ii. Verify secure connections at both ends
    - iii. Test signal continuity and integrity
    - iv. Check for noise or interference issues
  - **Resolution:** Replace analyzer mainboard to backpanel interface cable

#### **Step 4: Backpanel PCB Computer Interface Test**

- **Action Required:** Check backpanel board output circuits
- **Procedure:**
  - i. Test computer interface circuits on backpanel
  - ii. Verify signal levels and timing
  - iii. Check output driver circuits
  - iv. Test with known good computer connection
- **Resolution:** Replace backpanel PCB

#### **Step 5: Analyzer Mainboard Output Test**

- **Action Required:** Check mainboard computer output function
- **Procedure:**
  - i. Verify data generation on mainboard
  - ii. Check output formatting and protocol
  - iii. Test data transmission circuits
  - iv. Verify processor output pin operation
- **Resolution:** Replace analyzer mainboard

#### **4.10 EXTERNAL DISPLAY DATA NOT PRESENT**

**Symptom:** External display shows no data from analyzer

### **Step 1: External Display Cable Check**

- **Action Required:** Test display connection cable
- **Tools Needed:** Multimeter, spare cable
- **Procedure:**
  - i. Inspect cable for physical damage
  - ii. Test continuity through all conductors
  - iii. Verify proper connector types and pinouts
  - iv. Check cable shielding and grounding
- **Resolution:** Replace external display cable

### **Step 2: DPST to Backpanel Display Cable Test**

- **Action Required:** Check internal display interface
- **Procedure:**
  - i. Verify cable connection between boards
  - ii. Check cable seating and orientation
  - iii. Test signal continuity through cable
  - iv. Verify display data format and timing
- **Resolution:** Replace DPST board to backpanel external display cable

### **Step 3: Backpanel PCB Display Interface Test**

- **Action Required:** Check backpanel display circuits
- **Procedure:**
  - i. Test display output circuits on backpanel
  - ii. Verify signal levels and timing
  - iii. Check display driver circuits
  - iv. Test with known good display
- **Resolution:** Replace backpanel PCB

### **Step 4: DPST Board Display Output Test**

- **Action Required:** Check DPST board display function
- **Procedure:**
  - i. Verify display data generation on DPST
  - ii. Check display formatting and protocol
  - iii. Test display update timing and triggers

- iv. Verify display data accuracy
- **Resolution:** Replace DPST board

#### 4.11 RATE CHART DATA NOT ACCESSIBLE

**Symptom:** Rate information not loading or displaying from chart

##### Step 1: SD Card Functionality Check

- **Action Required:** Test SD card condition
- **Tools Needed:** Computer with SD card reader
- **Procedure:**
  - i. Remove SD card from system
  - ii. Test card in computer card reader
  - iii. Check for read/write capability
  - iv. Verify file system integrity
  - v. Test card speed and reliability
- **Resolution:** Replace SD card if defective

##### Step 2: Rate Chart File Verification

- **Action Required:** Check chart file integrity and format
- **Procedure:**
  - i. Locate rate chart file on SD card
  - ii. Verify file is present and readable
  - iii. Check file size and modification date
  - iv. Open file in spreadsheet application
  - v. Verify data format and structure
  - vi. Check for CSV format compliance
- **Resolution:** Save file in correct CSV format

##### Step 3: File Format and Data Validation

- **Action Required:** Ensure proper file type and data structure
- **Procedure:**
  - i. Verify file has .CSV extension
  - ii. Check data format matches system requirements
  - iii. Verify column headers and data structure
  - iv. Check for special characters or formatting issues

- v. Validate data ranges and values
- **Resolution:** Save to correct format and type (CSV)

#### **Step 4: DPST Board File Processing Test**

- **Action Required:** Check board's file reading capability
- **Procedure:**
  - i. Test with known good CSV file
  - ii. Check file processing software on DPST
  - iii. Verify SD card interface on board
  - iv. Test file parsing and data extraction
- **Resolution:** Replace DPST board

#### **4.12 FARMER DETAILS NOT SHOWN**

**Symptom:** Farmer information not displaying in system

##### **Step 1: SD Card Integrity Check**

- **Action Required:** Verify SD card functionality
- **Procedure:**
  - i. Test SD card in computer
  - ii. Check for proper read/write operation
  - iii. Verify file system integrity
  - iv. Check available storage space
- **Resolution:** Replace SD card if problems found

##### **Step 2: Farmer Data File Verification**

- **Action Required:** Check farmer database file
- **Procedure:**
  - i. Locate farmer details file on SD card
  - ii. Verify file is present and accessible
  - iii. Check file format and structure
  - iv. Verify data integrity and completeness
- **Resolution:** Check saved file type and data format

##### **Step 3: File Format Validation**

- **Action Required:** Ensure correct file format
- **Procedure:**

- i. Verify file is in CSV format
- ii. Check data structure matches requirements
- iii. Validate field names and data types
- iv. Check for proper encoding and formatting
- **Resolution:** Save to correct format and type (CSV)

#### **Step 4: DPST Board Database Processing Test**

- **Action Required:** Check board's database functionality
- **Procedure:**
  - i. Test database reading and processing
  - ii. Verify data parsing and display functions
  - iii. Check database search and retrieval
  - iv. Test with known good database file
- **Resolution:** Replace DPST board

### **4.13 ANALYZER CONNECTIVITY ERROR**

**Symptom:** Communication error between analyzer and DPST board

#### **Step 1: Interface Cable and Connector Check**

- **Action Required:** Test analyzer to DPST connection
- **Tools Needed:** Multimeter, spare cable
- **Procedure:**
  - i. Inspect interface cable for damage
  - ii. Check connector pins and seating
  - iii. Test cable continuity end-to-end
  - iv. Verify proper connector orientation
  - v. Check for corrosion or contamination
- **Resolution:** Replace analyzer to DPST board interface cable

#### **Step 2: Analyzer Mainboard Communication Test**

- **Action Required:** Check analyzer board communication circuits
- **Procedure:**
  - i. Test analyzer communication circuits
  - ii. Verify signal levels and timing
  - iii. Check communication protocol compliance

- iv. Test with known good DPST board
- **Resolution:** Replace analyzer mainboard

### **Step 3: DPST Board Communication Interface Test**

- **Action Required:** Check DPST communication circuits
- **Procedure:**
  - i. Test DPST communication interface
  - ii. Verify signal reception and processing
  - iii. Check communication protocol handling
  - iv. Test with known good analyzer board
- **Resolution:** Replace DPST board

## **4.14 WIFI/GSM MODULE ERROR**

**Symptom:** Wireless communication module not functioning

### **Step 1: WiFi/GSM Settings Verification**

- **Action Required:** Check wireless module configuration
- **Procedure:**
  - i. Access wireless settings menu
  - ii. Verify network credentials and parameters
  - iii. Check APN settings for GSM (if applicable)
  - iv. Verify frequency and region settings
  - v. Check authentication and security settings
- **Resolution:** Enter required settings

### **Step 2: FRC Cable and Connection Check**

- **Action Required:** Test module interface cable
- **Procedure:**
  - i. Check FRC cable between DPST and backpanel
  - ii. Verify connector orientation and seating
  - iii. Test cable continuity and integrity
  - iv. Re-connect cable in correct direction if needed
- **Resolution:** Replace FRC cable or correct connection direction

### **Step 3: WiFi/GSM Module Status Check**

- **Action Required:** Test module functionality

- **Tools Needed:** Visual observation
- **Procedure:**
  - i. Locate WiFi/GSM module breathing LED
  - ii. Observe LED pattern and behavior
  - iii. Compare with normal operation indicators
  - iv. Check module for physical damage
  - v. Verify module seating and connections
- **Resolution:** Replace WiFi/GSM module

#### **Step 4: Antenna and SMA Cable Check**

- **Action Required:** Test antenna system
- **Tools Needed:** SWR meter (if available), spare antenna
- **Procedure:**
  - i. Inspect antenna for physical damage
  - ii. Check SMA cable connections at both ends
  - iii. Test cable continuity and impedance
  - iv. Verify antenna is appropriate for frequency
  - v. Check for loose or corroded connections
- **Resolution:** Replace antenna and SMA cable

### **4.15 SMS NOT SENDING TO FARMER**

**Symptom:** Text messages not being delivered to farmer's phone

#### **Step 1: GSM/SIM Module Connectivity Check**

- **Action Required:** Verify SIM card and module setup
- **Procedure:**
  - i. Check SIM card insertion direction and seating
  - ii. Verify SIM card is valid and not expired
  - iii. Check SIM card account status and balance
  - iv. Test SIM card in known good phone
  - v. Verify network coverage in area
- **Resolution:** Correct module/SIM connectivity and extend SIM validity

#### **Step 2: Farmer Details Verification**

- **Action Required:** Check stored farmer information

- **Procedure:**
  - i. Access farmer database/contact list
  - ii. Verify phone numbers are correct and complete
  - iii. Check number format (include country code if needed)
  - iv. Verify contact information is properly stored
  - v. Test with known good phone number
- **Resolution:** Properly enter farmer details

### **Step 3: SMS Settings Configuration Check**

- **Action Required:** Verify SMS system settings
- **Procedure:**
  - i. Access SMS configuration menu
  - ii. Check if SMS sending is enabled
  - iii. Verify message format and content settings
  - iv. Check SMS center number configuration
  - v. Verify timing and trigger settings for SMS
- **Resolution:** Enter correct SMS settings

## **4.16 CLOUD UPDATE ERROR**

**Symptom:** Test results not uploading to cloud service

### **Step 1: WiFi/GSM Connectivity Verification**

- **Action Required:** Check internet connection
- **Procedure:**
  - i. Verify WiFi/GSM module is connected to network
  - ii. Check internet connectivity with ping test
  - iii. Verify network settings and credentials
  - iv. Check data plan status (for GSM)
  - v. Test connection with simple web request
- **Resolution:** Enter proper settings and establish connectivity

### **Step 2: Cloud Service Details Check**

- **Action Required:** Verify cloud configuration
- **Procedure:**
  - i. Check cloud service URL and endpoints

- ii. Verify authentication credentials
- iii. Check API keys and access tokens
- iv. Verify data format requirements
- v. Test cloud service availability
- **Resolution:** Enter proper cloud address and details

### **Step 3: Machine Registration Verification**

- **Action Required:** Check device registration in cloud
- **Procedure:**
  - i. Verify machine ID matches cloud registration
  - ii. Check model designation in cloud system
  - iii. Verify device is authorized for data upload
  - iv. Check registration status and validity
  - v. Verify all required fields are completed
- **Resolution:** Enter machine ID and model in web application

## **4.17 FILE SYSTEM ISSUES**

**Symptom:** Files not saving or SD card not readable

### **Step 1: SD Card File System Check**

- **Action Required:** Verify and correct file system format
- **Tools Needed:** Computer with SD card reader
- **Procedure:**
  - i. Insert SD card into computer
  - ii. Check current file system format
  - iii. Verify it's formatted as FAT (not NTFS or exFAT)
  - iv. Backup any important data
  - v. Format card as FAT32 file system
- **Resolution:** Format SD card with FAT file system

### **Step 2: SD Card Read/Write Test**

- **Action Required:** Test SD card functionality in system
- **Procedure:**
  - i. Insert formatted SD card into system
  - ii. Test file creation and writing

- iii. Verify file reading capability
- iv. Check file deletion and modification
- v. Test with various file sizes
- **Resolution:** Format SD card using system format function

#### **4.18 SAMPLE TESTING TIMEOUT**

**Symptom:** Sample test count exceeds normal time (above 50 seconds)

##### **Step 1: Interface Cable Check**

- **Action Required:** Test DPST to analyzer connection
- **Procedure:**
  - i. Check interface cable integrity
  - ii. Verify secure connections at both ends
  - iii. Test signal continuity and quality
  - iv. Check for electromagnetic interference
  - v. Test with replacement cable if available
- **Resolution:** Replace DPST board to analyzer mainboard cable

##### **Step 2: DPST Board Functionality Test**

- **Action Required:** Check DPST board operation
- **Procedure:**
  - i. Test DPST board processing speed
  - ii. Check for software/firmware issues
  - iii. Verify timing circuits operation
  - iv. Test communication protocol handling
- **Resolution:** Replace DPST board

##### **Step 3: Analyzer Mainboard Performance Test**

- **Action Required:** Check analyzer processing capability
- **Procedure:**
  - i. Test analyzer response time
  - ii. Check sensor reading speed
  - iii. Verify calculation processing time
  - iv. Test communication response
- **Resolution:** Replace analyzer mainboard

## **4.19 COMMUNICATION PROTOCOL ERROR**

**Symptom:** DPST board and analyzer mainboard communication issues

### **Step 1: Machine Model Selection Verification**

- **Action Required:** Check analyzer mainboard configuration
- **Procedure:**
  - i. Access analyzer mainboard settings
  - ii. Verify machine model is set to "ECOD"
  - iii. Check communication protocol settings
  - iv. Verify baud rate and data format
  - v. Ensure settings match DPST expectations
- **Resolution:** Set analyzer mainboard machine model selection to "ECOD"

## **4.20 PENDRIVE DETECTION FAILURE**

**Symptom:** USB flash drive not recognized by system

### **Step 1: Pendrive Functionality and Format Check**

- **Action Required:** Test USB drive and format
- **Tools Needed:** Computer, spare USB drive
- **Procedure:**
  - i. Test pendrive in computer
  - ii. Check current file system format
  - iii. Verify drive capacity and speed
  - iv. Format drive as FAT32 if needed
  - v. Test with different USB drives
- **Resolution:** Change pendrive file format to FAT file system

### **Step 2: Backpanel Board USB Interface Test**

- **Action Required:** Check USB port functionality
- **Procedure:**
  - i. Test USB port with known good device
  - ii. Check USB power supply (5V)
  - iii. Verify USB data line integrity
  - iv. Test USB connector for damage
- **Resolution:** Replace backpanel board

## **4.21 EXTERNAL KEYBOARD NOT DETECTED**

**Symptom:** USB keyboard not recognized by system

### **Step 1: FRC Cable Quality and Direction Check**

- **Action Required:** Test DPST to backpanel connection
- **Procedure:**
  - i. Check FRC cable for damage
  - ii. Verify cable orientation at both ends
  - iii. Re-seat cable connections
  - iv. Connect cable in opposite direction if needed
- **Resolution:** Replace FRC cable and correct connection direction

### **Step 2: Backpanel Board USB Functionality Test**

- **Action Required:** Check USB interface circuits
- **Procedure:**
  - i. Test backpanel USB circuits
  - ii. Verify USB power and data signals
  - iii. Check USB controller operation
  - iv. Test with known good keyboard
- **Resolution:** Replace backpanel board

### **Step 3: DPST Board USB Interface Test**

- **Action Required:** Check DPST USB processing
- **Procedure:**
  - i. Test DPST USB interface circuits
  - ii. Verify USB protocol handling
  - iii. Check keyboard driver functionality
  - iv. Test USB communication
- **Resolution:** Replace DPST board

## **4.22 EXTERNAL DISPLAY NOT WORKING**

**Symptom:** External monitor/display shows no output

### **Step 1: FRC Cable Connection Check**

- **Action Required:** Test DPST to backpanel display connection
- **Procedure:**

- i. Check FRC cable quality and connections
- ii. Verify proper connector orientation
- iii. Re-seat connections at both ends
- iv. Test cable continuity if possible
- **Resolution:** Replace FRC cable or correct connector direction

#### **Step 2: Backpanel Board Display Interface Test**

- **Action Required:** Check display output circuits
- **Procedure:**
  - i. Test backpanel display output circuits
  - ii. Verify display signal levels and timing
  - iii. Check display connector and pinout
  - iv. Test with known good display
- **Resolution:** Replace backpanel board

#### **Step 3: DPST Board Display Output Test**

- **Action Required:** Check DPST display generation
- **Procedure:**
  - i. Test DPST display output function
  - ii. Verify display data generation
  - iii. Check display protocol and format
  - iv. Test display timing and synchronization
- **Resolution:** Replace DPST board

#### **Step 4: External Display Cable Test**

- **Action Required:** Check display interface cable
- **Tools Needed:** Spare display cable
- **Procedure:**
  - i. Inspect display cable for damage
  - ii. Test cable continuity through all conductors
  - iii. Check connector integrity and pinout
  - iv. Test with replacement cable
- **Resolution:** Replace external display interface cable

#### **4.23 PRINTER NOT WORKING**

**Symptom:** Connected printer not functioning properly

### **Step 1: Printer Power Supply Check**

- **Action Required:** Verify printer power requirements
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Check printer power supply voltage (should be 8-9V)
  - ii. Measure current capacity under load
  - iii. Verify power supply regulation and ripple
  - iv. Check power cable integrity and connections
- **Resolution:** Change power cable or printer supply board

### **Step 2: Printer Functionality Test**

- **Action Required:** Test printer mechanical operation
- **Procedure:**
  - i. Power on printer independently
  - ii. Run printer self-test if available
  - iii. Check paper feed mechanism
  - iv. Verify print head operation
  - v. Check for mechanical obstructions
- **Resolution:** Change printer if mechanical problems found

### **Step 3: Printer Settings Verification**

- **Action Required:** Check communication settings
- **Procedure:**
  - i. Verify baud rate settings match printer
  - ii. Check data format and protocol settings
  - iii. Verify flow control settings
  - iv. Check print job format requirements
- **Resolution:** Change settings to match printer requirements

### **Step 4: Communication Cable Test**

- **Action Required:** Test printer interface cable
- **Tools Needed:** Spare cable, multimeter
- **Procedure:**

- i. Check cable for physical damage
  - ii. Test continuity through all conductors
  - iii. Verify proper connector pinout
  - iv. Check for electromagnetic interference
- **Resolution:** Change communication cable
- 

## 5. Pump System Troubleshooting

### 5.1 PUMP NOT WORKING

**Symptom:** Pump motor doesn't operate at all

#### Step 1: Analyzer Mainboard Status Check

- **Action Required:** Verify mainboard is operational
- **Tools Needed:** Visual observation
- **Procedure:**
  - i. Locate breathing light on analyzer mainboard
  - ii. Observe LED for regular blinking pattern
  - iii. Check LED color and intensity
  - iv. Compare with normal operation indicators
  - v. Verify board power supply status
- **Resolution:** Replace analyzer board if breathing light not working

#### Step 2: Motor Cable and Connector Inspection

- **Action Required:** Test motor connection integrity
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Inspect motor cable for physical damage
  - ii. Check connector seating and pin integrity
  - iii. Test cable continuity end-to-end
  - iv. Verify proper connector orientation
  - v. Check for corrosion or contamination
- **Resolution:** Replace motor if cable/connector issues found

#### Step 3: Motor Motion Sensor Board Cable Check

- **Action Required:** Test sensor connection

- **Procedure:**
  - i. Inspect sensor board cable for damage
  - ii. Check connector seating at both ends
  - iii. Test cable continuity through all conductors
  - iv. Verify proper connector alignment
- **Resolution:** Replace cable if defective

#### **Step 4: Motor Motion Sensor Board Functionality Test**

- **Action Required:** Check sensor board operation
- **Tools Needed:** Multimeter, oscilloscope (if available)
- **Procedure:**
  - i. Test sensor board power supply
  - ii. Check sensor signal output
  - iii. Verify position feedback signals
  - iv. Test sensor calibration and accuracy
- **Resolution:** Replace motor motion sensor board

#### **Step 5: Motor Driver Module Check**

- **Action Required:** Test motor driver circuits
- **Procedure:**
  - i. Check motor driver module for physical damage
  - ii. Test driver input signals from mainboard
  - iii. Verify driver output to motor
  - iv. Check driver module power supply
  - v. Test driver protection circuits
- **Resolution:** Replace motor driver module

#### **Step 6: Analyzer Mainboard Motor Control Test**

- **Action Required:** Check mainboard motor control circuits
- **Procedure:**
  - i. Test motor control signal generation
  - ii. Verify motor control software operation
  - iii. Check motor control output pins
  - iv. Test motor control timing and sequencing

- **Resolution:** Replace analyzer mainboard

## 5.2 PUMP MOVES TO ONE SIDE ONLY

**Symptom:** Pump mechanism moves only in one direction and hits clamp

### Step 1: Motor Motion Sensor Board Cable Check

- **Action Required:** Test sensor feedback connection
- **Procedure:**
  - i. Inspect sensor board cable thoroughly
  - ii. Check for intermittent connections
  - iii. Verify secure connector seating
  - iv. Test cable under movement conditions
- **Resolution:** Replace motor motion sensor board cable

### Step 2: Motion Sensor Board Functionality Test

- **Action Required:** Check position feedback system
- **Tools Needed:** Oscilloscope, multimeter
- **Procedure:**
  - i. Test sensor board position feedback signals
  - ii. Check sensor calibration and accuracy
  - iii. Verify sensor range and resolution
  - iv. Test sensor response to motor movement
- **Resolution:** Replace motor motion sensor board

### Step 3: Analyzer Mainboard Motion Control Test

- **Action Required:** Check mainboard position control logic
- **Procedure:**
  - i. Test position control software operation
  - ii. Verify position feedback processing
  - iii. Check motion control algorithms
  - iv. Test safety limit detection
- **Resolution:** Replace analyzer mainboard

## 5.3 PUMP SENSE ERROR

**Symptom:** System reports pump sensor error

### Step 1: Motion Sensor Board Cable Verification

- **Action Required:** Check sensor communication
- **Procedure:**
  - i. Test sensor cable for signal integrity
  - ii. Check for electromagnetic interference
  - iii. Verify cable shielding integrity
  - iv. Test under various operating conditions
- **Resolution:** Replace motor motion sensor board cable

### **Step 2: Motion Sensor Board Diagnosis**

- **Action Required:** Test sensor electronics
- **Procedure:**
  - i. Check sensor board power supply circuits
  - ii. Test sensor signal conditioning circuits
  - iii. Verify sensor calibration data
  - iv. Check sensor error detection circuits
- **Resolution:** Replace motor motion sensor board

### **Step 3: Analyzer Mainboard Sensor Processing Test**

- **Action Required:** Check mainboard sensor interface
  - **Procedure:**
    - i. Test sensor signal processing on mainboard
    - ii. Verify sensor error detection algorithms
    - iii. Check sensor communication protocol
    - iv. Test sensor data validation routines
  - **Resolution:** Replace analyzer mainboard
- 

## **6. Battery and Power Issues**

### **6.1 LOW BATTERY ERROR SHOWN (ECOD/ECOSV/LSE-S V3)**

**Symptom:** System displays low battery warning

#### **Step 1: Battery Voltage Measurement**

- **Action Required:** Check actual battery condition
- **Tools Needed:** Multimeter, battery load tester
- **Procedure:**

- i. Measure battery voltage under no-load conditions
- ii. Test battery voltage under load (should be above 11.5V)
- iii. Check battery specific gravity if serviceable type
- iv. Test battery capacity with load tester
- v. Verify battery age and service history

- **Resolution:** Replace battery if voltage below 11.5V or capacity degraded

### **Step 2: Solar Charger to Analyzer Interface Cable Check**

- **Action Required:** Test battery monitoring connection
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Check cable connecting solar charger to analyzer
  - ii. Test voltage signal continuity
  - iii. Verify connector integrity and seating
  - iv. Check for voltage drops in cable
- **Resolution:** Replace solar charger board to analyzer interface cable

### **Step 3: Analyzer Mainboard Battery Monitoring Test**

- **Action Required:** Check mainboard battery sensing circuits
- **Procedure:**
  - i. Test battery voltage sensing accuracy
  - ii. Verify battery monitoring calibration
  - iii. Check low battery threshold settings
  - iv. Test battery monitoring software
- **Resolution:** Replace analyzer mainboard

### **Step 4: Solar Charger Board Battery Management Test**

- **Action Required:** Check charger board battery monitoring
- **Procedure:**
  - i. Test battery voltage measurement accuracy
  - ii. Check battery management circuits
  - iii. Verify charging control logic
  - iv. Test battery protection features
- **Resolution:** Replace solar charger board

## **6.2 BATTERY FULL LED NOT WORKING**

**Symptom:** Battery full indicator LED doesn't illuminate when battery charged

### **Step 1: Analyzer Mainboard Warming Process Check**

- **Action Required:** Verify system initialization complete
- **Procedure:**
  - i. Allow system to complete full startup sequence
  - ii. Check if warming process is still active
  - iii. Cancel warming process if stuck
  - iv. Verify system reaches normal operating state
- **Resolution:** Cancel warming process to allow normal operation

### **Step 2: Battery Voltage Verification**

- **Action Required:** Confirm battery is fully charged
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Measure battery voltage (should be above 14.3V when fully charged)
  - ii. Check battery voltage under light load
  - iii. Verify battery accepts and holds charge
  - iv. Check charging current drops to maintenance level
- **Resolution:** Charge battery to full capacity

### **Step 3: Interface Cable Check**

- **Action Required:** Test charger to analyzer connection
- **Procedure:**
  - i. Check cable between charger board and analyzer
  - ii. Test signal continuity for battery status
  - iii. Verify connector integrity and seating
  - iv. Check for signal interference or noise
- **Resolution:** Replace charger board to analyzer mainboard interface cable

### **Step 4: Solar Charger Board Voltage Calibration**

- **Action Required:** Check and adjust charging voltage
- **Tools Needed:** Multimeter, small screwdriver
- **Procedure:**

- i. Disconnect battery from charger board
  - ii. Measure charging voltage output (should be 14.45V)
  - iii. Locate voltage adjustment trimmer potentiometer
  - iv. Adjust trimmer to set charging voltage to 14.45V
  - v. Reconnect battery and verify operation
- **Resolution:** Adjust trimpot of solar charger board to set charging voltage

#### **Step 5: Battery Full Indication LED Test**

- **Action Required:** Check LED functionality
  - **Tools Needed:** Multimeter, spare LED
  - **Procedure:**
    - i. Test LED with direct voltage application
    - ii. Check LED forward voltage and current requirements
    - iii. Verify LED is not burned out or damaged
    - iv. Test LED connections and polarity
- **Resolution:** Replace battery full indication LED

#### **Step 6: LED Connection Cable Check**

- **Action Required:** Test LED connection integrity
  - **Procedure:**
    - i. Check cable from analyzer mainboard to LED
    - ii. Test continuity through all conductors
    - iii. Verify proper connector seating
    - iv. Check for cable damage or corrosion
- **Resolution:** Replace LED connection cable

#### **Step 7: Analyzer Mainboard LED Driver Test**

- **Action Required:** Check LED driver circuits on mainboard
  - **Procedure:**
    - i. Test LED driver circuit operation
    - ii. Verify driver input signals
    - iii. Check driver output voltage and current
    - iv. Test LED control logic software
- **Resolution:** Replace analyzer mainboard

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## 7. Analyzer Mainboard Problems (LSE V3, ECOV, ECOSV)

### 7.1 T2/TEMPERATURE SET ERROR

**Symptom:** System reports temperature setting or sensor error

#### Step 1: Sample Path Leakage/Blockage Check

- **Action Required:** Inspect entire sample flow path
- **Tools Needed:** Visual inspection, cleaning materials
- **Procedure:**
  - i. Check all sample handling components for blockages
  - ii. Look for sample liquid leaks throughout path
  - iii. Verify proper sample flow during operation
  - iv. Check for air bubbles or contamination

#### Step 2: Inlet Pipe Inspection

- **Action Required:** Check sample inlet pipe condition
- **Tools Needed:** Visual inspection, spare inlet pipe
- **Procedure:**
  - i. Inspect inlet pipe for cracks or breaks
  - ii. Check for blockages inside pipe
  - iii. Verify pipe connections are secure
  - iv. Test pipe flexibility and integrity
  - v. Check for contamination or residue buildup
- **Resolution:** Replace inlet pipe if broken or blocked

#### Step 3: Inlet Tube to Preheater Silicon Tube Check

- **Action Required:** Inspect connection tubing
- **Tools Needed:** Replacement silicon tubing, cable ties
- **Procedure:**
  - i. Check silicon tube for cracks or breaks
  - ii. Verify tube connections are tight and secure
  - iii. Look for loose or disconnected tubes
  - iv. Check tube routing and support
  - v. Test tube flexibility and condition

- **Resolution:** Replace silicon tube or secure connections with ties

#### **Step 4: Preheater to Sensor Silicon Tube Inspection**

- **Action Required:** Check sensor connection tubing
- **Procedure:**
  - i. Inspect silicon tube between preheater and sensor
  - ii. Check for breaks, cracks, or loose connections
  - iii. Verify proper tube routing and support
  - iv. Test tube integrity under pressure
  - v. Check for contamination or blockages
- **Resolution:** Replace silicon tube or secure connections

#### **Step 5: Sensor to Syringe Silicon Tube Check**

- **Action Required:** Inspect syringe connection tubing
- **Procedure:**
  - i. Check silicon tube from sensor to syringe
  - ii. Look for breaks, loose connections, or damage
  - iii. Verify proper tube routing and clamp positions
  - iv. Test tube flexibility and integrity
  - v. Check for air leaks or contamination
- **Resolution:** Replace silicon tube or secure connections

#### **Step 6: Syringe Condition Assessment**

- **Action Required:** Test syringe functionality
- **Tools Needed:** Spare syringe, cleaning materials
- **Procedure:**
  - i. Check syringe for cracks or damage
  - ii. Test syringe plunger operation
  - iii. Verify syringe seals and O-rings
  - iv. Check syringe mounting and alignment
  - v. Test syringe volume accuracy
- **Resolution:** Replace syringe if damaged

#### **Step 7: Bellow to L-Plug Silicon Tube Inspection**

- **Action Required:** Check final connection tubing

- **Tools Needed:** Magnifying glass, cleaning tools
- **Procedure:**
  - i. Inspect silicon tube from bellow to L-plug
  - ii. Check for breaks, loose connections, or contamination
  - iii. Look inside tube for particles or debris (burrs)
  - iv. Check bellow inlet side for obstructions
  - v. Verify proper tube routing and support
- **Resolution:** Replace silicon tube or remove burrs/particles

#### **Step 8: L-Plug and O-Ring Check**

- **Action Required:** Inspect L-plug assembly
- **Tools Needed:** Spare L-plug, O-rings, lubricant
- **Procedure:**
  - i. Check L-plug for cracks or damage
  - ii. Inspect O-ring condition and sealing
  - iii. Verify proper L-plug installation and alignment
  - iv. Test O-ring compression and sealing
  - v. Check for wear or deterioration
- **Resolution:** Replace L-plug or O-ring

#### **Step 9: Bellow Quality Assessment**

- **Action Required:** Test bellow functionality
- **Tools Needed:** Spare bellow
- **Procedure:**
  - i. Check bellow for tears or holes
  - ii. Test bellow flexibility and range of motion
  - iii. Verify bellow mounting and alignment
  - iv. Check bellow sealing integrity
  - v. Test bellow response to pressure changes
- **Resolution:** Replace bellow if defective

#### **Step 10: Sensor Inner Box Leakage Check**

- **Action Required:** Inspect sensor housing integrity
- **Tools Needed:** Pressure tester, leak detection fluid

- **Procedure:**
  - i. Check sensor housing for cracks or damage
  - ii. Test sensor sealing integrity
  - iii. Look for sample leakage inside sensor box
  - iv. Verify sensor mounting and gasket condition
  - v. Check for blockages in sensor flow paths
- **Resolution:** Replace mainboard and sensor board pair

### **Step 11: Mainboard Functionality Test**

- **Action Required:** Check analyzer mainboard operation
- **Procedure:**
  - i. Test mainboard temperature control circuits
  - ii. Verify sensor interface operation
  - iii. Check temperature monitoring accuracy
  - iv. Test control algorithm operation
- **Resolution:** Replace mainboard and sensor board pair

## **7.2 BOX TEMPERATURE ERROR**

**Symptom:** System reports sensor box temperature error

### **Step 1: Power Supply Jumper Check**

- **Action Required:** Inspect mainboard to sensor board power connection
- **Tools Needed:** Multimeter, soldering iron
- **Procedure:**
  - i. Locate power supply jumper between boards
  - ii. Check jumper for physical damage or corrosion
  - iii. Test continuity through jumper connection
  - iv. Verify secure electrical connection
  - v. Check for loose or broken solder joints
- **Resolution:** Replace power supply jumper

### **Step 2: Sensor Board Functionality Test**

- **Action Required:** Check sensor board operation
- **Tools Needed:** Multimeter, temperature reference
- **Procedure:**

- i. Test sensor board power supply voltages
- ii. Check temperature sensor operation
- iii. Verify sensor calibration accuracy
- iv. Test sensor response time and stability
- **Resolution:** Replace sensor board

### **Step 3: Mainboard Temperature Control Test**

- **Action Required:** Check mainboard temperature circuits
- **Procedure:**
  - i. Test mainboard temperature control circuits
  - ii. Verify temperature monitoring accuracy
  - iii. Check temperature setpoint control
  - iv. Test temperature control algorithms
- **Resolution:** Replace mainboard and sensor board pair

## **7.3 SAMPLE NOT FOUND/AIR IN MILK**

**Symptom:** System cannot detect sample or reports air contamination

### **Step 1: Sample Path Leakage/Blockage Check**

- **Action Required:** Comprehensive sample path inspection
- **Tools Needed:** Cleaning materials, replacement parts
- **Procedure:**
  - i. Check entire sample flow path for leaks
  - ii. Look for blockages in tubes or connectors
  - iii. Verify all connections are tight and secure
  - iv. Check for air ingress points
  - v. Test sample flow continuity
- **Resolution:** Replace damaged components in sample path

### **Step 2: Mainboard Sample Detection Test**

- **Action Required:** Check sample detection circuits
- **Procedure:**
  - i. Test sample detection sensor operation
  - ii. Verify sample detection algorithm
  - iii. Check sample detection sensitivity settings

- iv. Test detection circuit calibration
- **Resolution:** Replace mainboard and sensor board pair

## 7.4 PLUNGE IN WATER/WATER IN SENSOR

**Symptom:** System detects water contamination in sensor

### Step 1: Sample Liquid Removal

- **Action Required:** Remove liquid from sensor tube
- **Tools Needed:** Cleaning materials, compressed air
- **Procedure:**
  - i. Disconnect sample tubes from sensor
  - ii. Drain any liquid from sensor tube
  - iii. Use compressed air to clear remaining liquid
  - iv. Clean sensor tube thoroughly
  - v. Verify sensor is completely dry before reconnection
- **Resolution:** Remove sample liquid from sensor

### Step 2: Mainboard Water Detection Test

- **Action Required:** Check water detection system
- **Procedure:**
  - i. Test water detection sensor operation
  - ii. Verify water detection algorithms
  - iii. Check detection sensitivity settings
  - iv. Test system recovery after water removal
- **Resolution:** Replace mainboard and sensor board pair

## 7.5 HOT SAMPLE ERROR

**Symptom:** System reports sample temperature too high

### Step 1: Sample Temperature Verification

- **Action Required:** Check actual sample temperature
- **Tools Needed:** Thermometer, temperature reference
- **Procedure:**
  - i. Measure sample temperature with external thermometer
  - ii. Verify sample is below 40°C (104°F)
  - iii. Allow sample to cool if necessary

- iv. Check sample preparation procedures
- v. Verify environmental temperature conditions
- **Resolution:** Use sample at proper temperature (below 40°C)

### **Step 2: Sensor Board Temperature Measurement Test**

- **Action Required:** Check temperature sensing accuracy
- **Tools Needed:** Temperature calibrator
- **Procedure:**
  - i. Test sensor board temperature measurement
  - ii. Verify temperature sensor calibration
  - iii. Check temperature measurement accuracy
  - iv. Test sensor response time and stability
- **Resolution:** Replace mainboard and sensor board pair

### **Step 3: Mainboard Temperature Processing Test**

- **Action Required:** Check mainboard temperature circuits
- **Procedure:**
  - i. Test mainboard temperature processing
  - ii. Verify temperature limit settings
  - iii. Check temperature validation algorithms
  - iv. Test temperature error detection
- **Resolution:** Replace mainboard and sensor board pair

## **7.6 COUNT ZERO/RESULT ZERO**

**Symptom:** System shows zero count or zero results

### **Step 1: Sensor Cleaning and Test Count Check**

- **Action Required:** Clean sensor and verify operation
- **Tools Needed:** Cleaning solution, test samples
- **Procedure:**
  - i. Clean sensor thoroughly with appropriate solution
  - ii. Remove any blockages or contamination
  - iii. Test with known sample to verify count
  - iv. Check sensor optical surfaces for clarity
  - v. Verify proper sample flow through sensor

- **Resolution:** Clean sensor thoroughly

### **Step 2: Sensor Gain Settings Check**

- **Action Required:** Verify and adjust sensor gain
- **Tools Needed:** Test samples, gain adjustment tools
- **Procedure:**
  - i. Access sensor gain settings
  - ii. Check current gain value against specifications
  - iii. Adjust gain to normal/optimal setting
  - iv. Test with known samples to verify proper operation
  - v. Document gain settings for future reference
- **Resolution:** Set normal gain settings

### **Step 3: Sensor Board Electronics Test**

- **Action Required:** Check sensor board circuits
- **Procedure:**
  - i. Test sensor board power supplies
  - ii. Check sensor signal conditioning circuits
  - iii. Verify sensor amplification stages
  - iv. Test sensor output signal quality
- **Resolution:** Replace sensor board

### **Step 4: Mainboard Signal Processing Test**

- **Action Required:** Check mainboard sensor interface
- **Procedure:**
  - i. Test mainboard sensor input circuits
  - ii. Verify signal processing algorithms
  - iii. Check count calculation routines
  - iv. Test result generation and display
- **Resolution:** Replace mainboard and sensor pair

## **7.7 READING VARIATION/INCONSISTENT RESULTS**

**Symptom:** Test results vary significantly between measurements

### **Step 1: Sensor and Tube Cleaning**

- **Action Required:** Thoroughly clean sample path

- **Tools Needed:** Appropriate cleaning solutions
- **Procedure:**
  - i. Clean sensor optical surfaces completely
  - ii. Clean all silicon tubes in sample path
  - iii. Remove any residue or contamination
  - iv. Flush system with cleaning solution
  - v. Rinse thoroughly with clean water
- **Resolution:** Clean sensor and silicon tubes

### **Step 2: Sensor Gain Optimization**

- **Action Required:** Set optimal gain settings
- **Procedure:**
  - i. Access sensor gain adjustment
  - ii. Set gain to manufacturer recommended value
  - iii. Test with reference samples
  - iv. Fine-tune gain for optimal performance
  - v. Document final gain settings
- **Resolution:** Set normal gain settings

### **Step 3: Offset Calibration and Testing**

- **Action Required:** Perform system calibration
- **Tools Needed:** Reference standards, calibration materials
- **Procedure:**
  - i. Perform system offset calibration
  - ii. Use certified reference standards
  - iii. Test reading accuracy with known samples
  - iv. Verify repeatability of measurements
  - v. Document calibration results
- **Resolution:** Replace mainboard and sensor board pair if calibration fails

### **Step 4: Mainboard Processing Test**

- **Action Required:** Check signal processing consistency
- **Procedure:**
  - i. Test mainboard signal processing stability

- ii. Check for electronic noise or interference
- iii. Verify calculation algorithm consistency
- iv. Test result processing and formatting
- **Resolution:** Replace mainboard and sensor pair

## 7.8 FAT READING IN WATER

**Symptom:** System shows fat content when testing pure water

### Step 1: Milk Sample Test Verification

- **Action Required:** Verify system calibration with milk samples
- **Tools Needed:** Known milk samples, reference standards
- **Procedure:**
  - i. Test system with various milk samples
  - ii. Compare results with known values
  - iii. Check calibration accuracy
  - iv. Verify system is properly calibrated
- **Resolution:** Check calibration details if results not OK

### Step 2: Sensor and Tube Deep Cleaning

- **Action Required:** Perform thorough cleaning procedure
- **Tools Needed:** Cleaning solutions, rinse water
- **Procedure:**
  - i. Perform complete sensor cleaning cycle
  - ii. Clean all tubes in sample path
  - iii. Remove any milk residue or contamination
  - iv. Flush system multiple times
  - v. Verify complete removal of previous samples
- **Resolution:** Clean sensor and tube thoroughly

### Step 3: Water Zero Operation

- **Action Required:** Perform water zero calibration
- **Tools Needed:** Distilled water
- **Procedure:**
  - i. Use certified distilled water
  - ii. Perform water zero operation procedure

- iii. Verify zero reading with water
- iv. Test again with water sample
- v. Document zero calibration results
- **Resolution:** Apply water zero operation and retest

#### **Step 4: Mainboard Pair Functionality Verification**

- **Action Required:** Verify mainboard and sensor pair operation
- **Procedure:**
  - i. Test with known good mainboard/sensor pair
  - ii. Verify proper pairing and calibration
  - iii. Check for hardware faults
  - iv. Test system functionality completely
- **Resolution:** Ensure paired mainboard is functionally OK, otherwise replace

### **7.9 LCD CONTINUOUSLY SHOWING COMPUTER MODE**

**Symptom:** Display stuck in computer mode screen

#### **Step 1: Front Panel Keypad Test**

- **Action Required:** Check keypad key functionality
- **Tools Needed:** Keypad tester (if available)
- **Procedure:**
  - i. Test individual keys for proper operation
  - ii. Check for stuck or damaged keys
  - iii. Verify keypad connections
  - iv. Test key response and feedback
  - v. Clean keypad contacts if necessary
- **Resolution:** Replace keypad if keys defective

#### **Step 2: Mainboard Keypad Interface Test**

- **Action Required:** Check mainboard keypad processing
- **Procedure:**
  - i. Test mainboard keypad input circuits
  - ii. Verify keypad signal processing
  - iii. Check keypad scanning routines
  - iv. Test mode switching logic

- **Resolution:** Replace mainboard and sensor board pair

## 7.10 LCD CONTINUOUSLY SHOWING VERSION

**Symptom:** Display stuck showing version information

### Step 1: Front Panel Keypad Inspection

- **Action Required:** Test keypad operation
- **Procedure:**
  - i. Check all keypad keys for proper function
  - ii. Look for mechanically stuck keys
  - iii. Test key electrical contacts
  - iv. Verify keypad cable connections
- **Resolution:** Replace keypad if defective

### Step 2: Mainboard Display Control Test

- **Action Required:** Check mainboard display control
- **Procedure:**
  - i. Test mainboard display control circuits
  - ii. Verify display mode switching logic
  - iii. Check display control software
  - iv. Test display update routines
- **Resolution:** Replace mainboard and sensor board pair

## 7.11 SYSTEM SHUTDOWN DURING WARMING/FUSE BURNING

**Symptom:** System shuts down or blows fuse during startup warming cycle

### Step 1: Mainboard MOSFET Failure Check

- **Action Required:** Check mainboard power control circuits
- **Tools Needed:** Multimeter, component tester
- **Procedure:**
  - i. Test mainboard power control MOSFETs
  - ii. Check for short circuits in power stages
  - iii. Verify MOSFET gate drive circuits
  - iv. Test power control logic circuits
- **Resolution:** Replace mainboard and sensor board pair

### Step 2: Sensor Board Coil Inspection

- **Action Required:** Check sensor heating coil
- **Tools Needed:** Multimeter, insulation tester
- **Procedure:**
  - i. Test sensor board heating coil resistance
  - ii. Check for coil short circuits to ground
  - iii. Verify coil insulation integrity
  - iv. Test coil current draw under normal operation
- **Resolution:** Replace mainboard and sensor board pair

### **Step 3: Power Switch and Fuse Check**

- **Action Required:** Inspect power input components
- **Tools Needed:** Multimeter, spare fuse and carrier
- **Procedure:**
  - i. Test on/off switch operation and contacts
  - ii. Check fuse and fuse carrier for proper seating
  - iii. Verify fuse rating matches requirements
  - iv. Test switch contact resistance
  - v. Check for loose connections
- **Resolution:** Replace switch or reset fuse and carrier

### **Step 4: Power Cable and Connector Inspection**

- **Action Required:** Check power input integrity
- **Procedure:**
  - i. Inspect power cable for damage
  - ii. Check connector seating and pin integrity
  - iii. Test cable continuity under stress
  - iv. Verify proper connection torque
- **Resolution:** Replace faulty power components

## **7.12 USB DEVICE DETECTION FAILURE**

**Symptom:** System doesn't recognize USB devices (pendrive/keyboard)

### **Step 1: USB Settings Verification**

- **Action Required:** Check system USB configuration
- **Procedure:**

- i. Access USB settings in system menu
  - ii. Verify USB is enabled
  - iii. Check USB mode settings
  - iv. Verify USB protocol configuration
  - v. Reset USB settings to defaults if needed
- **Resolution:** Correct USB settings

### **Step 2: USB Connector and Cable Test**

- **Action Required:** Check USB hardware
- **Tools Needed:** Multimeter, spare USB cable
- **Procedure:**
  - i. Inspect USB connector for damage
  - ii. Test USB cable continuity
  - iii. Check USB power supply (5V)
  - iv. Verify USB data line integrity

  - **Resolution:** Replace connector or cable

### **Step 3: Mainboard USB Interface Test**

- **Action Required:** Check mainboard USB circuits
- **Procedure:**
  - i. Test mainboard USB controller
  - ii. Verify USB power supply circuits
  - iii. Check USB signal processing
  - iv. Test USB protocol handling

  - **Resolution:** Replace mainboard and sensor board pair

## **7.13 WIFI/GSM MODULE ERROR (Mainboard Version)**

**Symptom:** Wireless communication module not functioning with mainboard

### **Step 1: WiFi/GSM Settings Check**

- **Action Required:** Verify wireless configuration
- **Procedure:**
  - i. Check network credentials and parameters
  - ii. Verify APN settings for GSM
  - iii. Check frequency and region settings

- iv. Verify authentication settings
- **Resolution:** Enter required wireless settings

### **Step 2: Module Cable and Connection Test**

- **Action Required:** Check module interface
- **Procedure:**
  - Check cable between mainboard and module/backpanel
  - Verify FRC cable direction and seating
  - Test cable continuity and signal integrity
  - Check connector orientation
- **Resolution:** Replace cable or correct connection direction

### **Step 3: WiFi/GSM Module Status Verification**

- **Action Required:** Test module operation
- **Procedure:**
  - Check module breathing LED operation
  - Verify module power supply
  - Test module initialization sequence
  - Check module response to commands
- **Resolution:** Replace WiFi/GSM module

### **Step 4: Antenna System Check**

- **Action Required:** Test antenna and connections
- **Tools Needed:** SWR meter (if available)
- **Procedure:**
  - Check antenna for physical damage
  - Test SMA cable connections
  - Verify antenna impedance matching
  - Check for loose or corroded connections
- **Resolution:** Replace antenna and SMA cable

## **7.14 FRONT PANEL KEYPAD NOT WORKING**

**Symptom:** Front panel buttons unresponsive

### **Step 1: Keypad and Interface Components Check**

- **Action Required:** Test keypad hardware

- **Tools Needed:** Multimeter, spare components
- **Procedure:**
  - i. Test keypad key operation individually
  - ii. Check keypad interface cable continuity
  - iii. Verify connector seating and integrity
  - iv. Test keypad power supply
- **Resolution:** Replace keypad, interface cable, and connector

### **Step 2: Mainboard Keypad Interface Test**

- **Action Required:** Check mainboard keypad circuits
- **Procedure:**
  - i. Test mainboard keypad input circuits
  - ii. Verify keypad scanning logic
  - iii. Check keypad signal processing
  - iv. Test keypad interrupt handling
- **Resolution:** Replace mainboard and sensor pair

## **7.15 LCD NOT WORKING - BLANK DISPLAY**

**Symptom:** LCD display shows no image

### **Step 1: LCD and Interface Components Check**

- **Action Required:** Test display hardware
- **Tools Needed:** Spare LCD, cables, connectors
- **Procedure:**
  - i. Test LCD with known good signal source
  - ii. Check LCD interface cable continuity
  - iii. Verify connector seating and pin integrity
  - iv. Test LCD power supply
  - v. Check LCD backlight operation
- **Resolution:** Replace LCD, interface cable, and connector

### **Step 2: Mainboard Display Interface Test**

- **Action Required:** Check mainboard display circuits
- **Procedure:**
  - i. Test mainboard display output circuits

- ii. Verify display signal generation
- iii. Check display timing and synchronization
- iv. Test display driver circuits
- **Resolution:** Replace mainboard and sensor pair

## 7.16 RTC TIME NOT RUNNING (Mainboard Version)

**Symptom:** Real-time clock not advancing time

### Step 1: RTC Components Check

- **Action Required:** Test RTC circuit components
- **Tools Needed:** Oscilloscope, spare components
- **Procedure:**
  - i. Test RTC crystal oscillation (32.768 kHz)
  - ii. Check crystal for physical damage
  - iii. Test filter capacitors (typically 12-22pF)
  - iv. Verify capacitor values and condition
  - v. Check crystal load capacitance matching
- **Resolution:** Replace crystal and capacitors

### Step 2: Mainboard RTC Circuit Test

- **Action Required:** Check mainboard RTC functionality
- **Procedure:**
  - i. Test RTC chip operation
  - ii. Verify RTC power supply
  - iii. Check RTC register access
  - iv. Test RTC interrupt generation
- **Resolution:** Replace mainboard and sensor pair

## 7.17 COMPUTER OUTPUT NOT PRESENT (Mainboard Version)

**Symptom:** No data output to computer interface

### Step 1: Data Output Format Settings Check

- **Action Required:** Verify output configuration
- **Procedure:**
  - i. Check data output format settings
  - ii. Verify communication parameters

- iii. Check output enable settings
- iv. Verify data content and timing settings
- **Resolution:** Set required settings values

### **Step 2: Computer Interface Cable Test**

- **Action Required:** Check computer connection
- **Tools Needed:** Spare cable, multimeter
- **Procedure:**
  - i. Test computer interface cable continuity
  - ii. Check connector integrity and pinout
  - iii. Verify proper cable type for interface
  - iv. Test cable shielding and grounding
- **Resolution:** Replace computer interface cable

### **Step 3: Mainboard Computer Interface Test**

- **Action Required:** Check mainboard output circuits
- **Procedure:**
  - i. Test mainboard computer output circuits
  - ii. Verify output signal levels and timing
  - iii. Check output driver circuits
  - iv. Test computer interface protocol
- **Resolution:** Replace mainboard and sensor pair

## **7.18 RTC TIME NOT SAVED (Mainboard Version)**

**Symptom:** RTC time resets when power cycled

### **Step 1: CMOS Battery Check**

- **Action Required:** Test backup battery
- **Tools Needed:** Multimeter, spare battery
- **Procedure:**
  - i. Measure CMOS battery voltage (should be above 2V)
  - ii. Test battery under light load
  - iii. Check battery holder contacts
  - iv. Verify battery type and specification
- **Resolution:** Replace CMOS battery

## **Step 2: RTC Module and Mainboard Test**

- **Action Required:** Check RTC circuit functionality
- **Procedure:**
  - i. Test RTC module operation
  - ii. Check RTC data retention circuits
  - iii. Verify mainboard RTC interface
  - iv. Test RTC backup power switching
- **Resolution:** Replace RTC module or mainboard pair

## **7.19 SMS NOT SENDING (Mainboard Version)**

**Symptom:** Text messages not being transmitted

### **Step 1: GSM/SIM Module Setup Check**

- **Action Required:** Verify SIM and module configuration
- **Procedure:**
  - i. Check SIM card insertion and orientation
  - ii. Verify SIM card validity and account status
  - iii. Test SIM card in known good device
  - iv. Check network coverage and signal strength
- **Resolution:** Correct module/SIM connectivity and extend validity

### **Step 2: Farmer Details Verification**

- **Action Required:** Check contact information accuracy
- **Procedure:**
  - i. Verify farmer phone numbers are correct
  - ii. Check number format and country codes
  - iii. Verify contact database integrity
  - iv. Test with known good phone numbers
- **Resolution:** Properly enter farmer details

### **Step 3: SMS Settings Configuration**

- **Action Required:** Check SMS system settings
- **Procedure:**
  - i. Verify SMS functionality is enabled
  - ii. Check SMS center number configuration

- iii. Check message format and content settings
  - iv. Verify SMS timing and trigger settings
- **Resolution:** Enter correct SMS settings

## 7.20 CLOUD UPDATE ERROR (Mainboard Version)

**Symptom:** Data not uploading to cloud service

### Step 1: Network Connectivity Check

- **Action Required:** Verify internet connection
- **Procedure:**
  - i. Test WiFi/GSM network connection
  - ii. Verify internet connectivity
  - iii. Check network settings and credentials
  - iv. Test with simple network requests
- **Resolution:** Enter proper settings and establish connectivity

### Step 2: Cloud Service Configuration Check

- **Action Required:** Verify cloud settings
- **Procedure:**
  - i. Check cloud service URL and endpoints
  - ii. Verify authentication credentials
  - iii. Check API keys and access permissions
  - iv. Test cloud service availability
- **Resolution:** Enter proper cloud address and details

### Step 3: Device Registration Verification

- **Action Required:** Check cloud registration
- **Procedure:**
  - i. Verify machine ID in cloud system
  - ii. Check model designation matches
  - iii. Verify device authorization status
  - iv. Check registration completeness
- **Resolution:** Enter machine ID and model in web application

## 7.21 RATE CHART NOT ACCESSIBLE (Mainboard Version)

**Symptom:** Rate information not loading from chart

### **Step 1: Rate Chart Settings Check**

- **Action Required:** Verify chart configuration
- **Procedure:**
  - i. Check rate chart settings in system
  - ii. Verify chart file path and location
  - iii. Check chart format and structure settings
  - iv. Verify chart enable/disable settings
- **Resolution:** Enter correct chart settings

### **7.22 FARMER DETAILS NOT SHOWN (Mainboard Version)**

**Symptom:** Farmer information not displaying

#### **Step 1: Farmer Details Entry Check**

- **Action Required:** Verify farmer information
- **Procedure:**
  - i. Check farmer details entry completeness
  - ii. Verify data format and structure
  - iii. Check required fields are populated
  - iv. Verify data integrity and accuracy
- **Resolution:** Enter correct farmer details

### **7.23 WEIGHING SCALE NOT WORKING (Mainboard Version)**

**Symptom:** Scale interface not functioning

#### **Step 1: Scale Settings Configuration**

- **Action Required:** Check scale interface settings
- **Procedure:**
  - i. Verify scale interface is enabled
  - ii. Check scale communication parameters
  - iii. Verify scale protocol settings
  - iv. Check scale calibration settings
- **Resolution:** Set required settings values

#### **Step 2: Mainboard to Backpanel Cable Check**

- **Action Required:** Test internal interface connection
- **Procedure:**

- i. Check FRC cable between mainboard and backpanel
- ii. Verify cable orientation and seating
- iii. Test cable continuity and signal integrity
- iv. Check connector condition
- **Resolution:** Replace mainboard to backpanel FRC cable and correct direction

#### **Step 3: Backpanel PCB Scale Interface Test**

- **Action Required:** Check backpanel scale circuits
- **Procedure:**
  - i. Test backpanel scale interface circuits
  - ii. Verify scale power supply
  - iii. Check scale signal conditioning
  - iv. Test scale communication protocols
- **Resolution:** Replace backpanel PCB

#### **Step 4: Mainboard Scale Processing Test**

- **Action Required:** Check mainboard scale interface
- **Procedure:**
  - i. Test mainboard scale input circuits
  - ii. Verify scale data processing
  - iii. Check scale protocol handling
  - iv. Test scale calibration routines
- **Resolution:** Replace mainboard and sensor pair

#### **Step 5: Scale Interface Cable Test**

- **Action Required:** Check external scale connection
- **Tools Needed:** Spare cable, multimeter
- **Procedure:**
  - i. Test scale interface cable continuity
  - ii. Check connector integrity and pinout
  - iii. Verify proper cable type for scale
  - iv. Test cable shielding and grounding
- **Resolution:** Replace weighing scale interface cable

#### **7.24 EXTERNAL DISPLAY NOT WORKING (Mainboard Version)**

**Symptom:** External display shows no output

#### **Step 1: Mainboard to Backpanel Cable Check**

- **Action Required:** Test display interface connection
- **Procedure:**
  - i. Check FRC cable between mainboard and backpanel
  - ii. Verify cable orientation and seating
  - iii. Test cable signal integrity
  - iv. Check connector condition and pins
- **Resolution:** Replace mainboard to backpanel FRC cable and correct direction

#### **Step 2: Backpanel Board Display Interface Test**

- **Action Required:** Check backpanel display circuits
- **Procedure:**
  - i. Test backpanel display output circuits
  - ii. Verify display signal levels and timing
  - iii. Check display driver circuits
  - iv. Test display connector functionality
- **Resolution:** Replace backpanel board

#### **Step 3: Mainboard Display Output Test**

- **Action Required:** Check mainboard display generation
- **Procedure:**
  - i. Test mainboard display output circuits
  - ii. Verify display data generation
  - iii. Check display protocol and format
  - iv. Test display timing and synchronization
- **Resolution:** Replace mainboard

#### **Step 4: External Display Cable Test**

- **Action Required:** Check display connection cable
- **Tools Needed:** Spare cable, multimeter
- **Procedure:**
  - i. Test display interface cable continuity
  - ii. Check connector integrity and pinout

- iii. Verify proper cable type for display
  - iv. Test cable shielding and signal quality
  - **Resolution:** Replace external display interface cable
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## 8. General System Issues

### 8.1 ANALYZER NOT WORKING

**Symptom:** Complete system failure - no response

#### Step 1: Fuse Inspection

- **Action Required:** Check main system fuse
- **Tools Needed:** Multimeter, spare fuses
- **Procedure:**
  - i. Locate main system fuse
  - ii. Test fuse continuity with multimeter
  - iii. Check fuse rating matches system requirements
  - iv. Inspect fuse holder for damage or corrosion
  - v. Check for signs of overcurrent damage
- **Resolution:** Replace fuse if blown

#### Step 2: Power Supply Voltage Check

- **Action Required:** Verify system power supply
- **Tools Needed:** Multimeter
- **Procedure:**
  - i. Test adapter output voltage (should be within specifications)
  - ii. Test battery voltage under load (should be above 11.5V)
  - iii. Check power supply regulation and stability
  - iv. Verify power supply current capacity
  - v. Test power supply under various load conditions
- **Resolution:** Replace adapter or battery if voltage inadequate

#### Step 3: Power Switch Functionality Test

- **Action Required:** Check main power switch operation
- **Tools Needed:** Multimeter
- **Procedure:**

- i. Test switch contact operation in both positions
- ii. Check switch contact resistance
- iii. Verify switch mechanical operation
- iv. Test switch electrical continuity
- v. Check switch mounting and connections
- **Resolution:** Replace on/off switch if defective

#### **Step 4: Internal Power Distribution Check**

- **Action Required:** Check for short circuits in system
- **Tools Needed:** Multimeter, insulation tester
- **Procedure:**
  - i. Disconnect all internal boards one by one
  - ii. Test each board for short circuits to ground
  - iii. Check power distribution wiring
  - iv. Verify proper isolation between circuits
  - v. Look for damaged components or wiring
- **Resolution:** Replace shorted board

#### **Step 5: Internal Wiring and Connection Check**

- **Action Required:** Inspect internal power connections
- **Tools Needed:** Multimeter, visual inspection
- **Procedure:**
  - i. Check all power connectors for seating and integrity
  - ii. Test continuity through power distribution cables
  - iii. Look for loose, corroded, or damaged connections
  - iv. Verify proper wire routing and strain relief
  - v. Check for connector pin damage or corrosion
- **Resolution:** Replace faulty connectors or cables

## **9. Safety Guidelines**

### **9.1 Electrical Safety**

**⚠️ WARNING: Always follow these safety procedures:**

1. **Power Disconnection:**

- Always disconnect from mains power before opening equipment
- Remove batteries when working on battery-powered sections
- Wait minimum 5 minutes for capacitor discharge

## 2. High Voltage Precautions:

- Adapters contain high voltage circuits
- Use insulated tools when working on power supplies
- Never work on live circuits

## 3. ESD Protection:

- Use anti-static wrist straps when handling circuit boards
- Work on anti-static mats
- Store sensitive components in anti-static bags

## 9.2 Chemical Safety

### 1. Sample Handling:

- Wear appropriate protective equipment
- Handle samples according to material safety data sheets
- Ensure adequate ventilation

### 2. Cleaning Solutions:

- Use only approved cleaning solutions
- Follow manufacturer's safety recommendations
- Dispose of waste properly

## 9.3 Mechanical Safety

### 1. Moving Parts:

- Ensure pump mechanisms are stopped before inspection
- Keep hands clear of moving components
- Use proper lockout/tagout procedures

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## 10. Tools Required

### 10.1 Basic Tools

#### Essential Tools:

- Multimeter (digital, auto-ranging)
- Screwdriver set (Phillips and flathead, various sizes)

- Hex key set (metric and imperial)
- Wire strippers and cutters
- Soldering iron and solder (60/40 rosin core)
- Desoldering wick or pump
- Anti-static wrist strap
- Flashlight or headlamp
- Magnifying glass

## **10.2 Specialized Tools**

### **Advanced Troubleshooting:**

- Oscilloscope (100 MHz minimum)
- Function generator
- Battery load tester
- Insulation tester (megohmmeter)
- SWR meter (for antenna testing)
- Temperature calibrator
- Pressure tester

## **10.3 Consumables**

### **Replacement Parts Inventory:**

- Fuses (various ratings)
- Batteries (CMOS, system)
- Silicon tubing (various sizes)
- O-rings and seals
- Cleaning solutions
- Anti-static bags
- Cable ties and strain reliefs

## **10.4 Reference Standards**

### **Calibration Materials:**

- Certified reference standards for analyzer
- Temperature references
- Voltage/current references
- Known good test samples

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## **11. Documentation and Record Keeping**

### **11.1 Service Records**

**Maintain detailed records of:**

- Service date and technician
- Symptoms reported
- Tests performed and results
- Parts replaced
- Calibration data
- System settings and configurations

### **11.2 Calibration Records**

**Document all calibrations:**

- Calibration date and technician
- Reference standards used
- Calibration procedure followed
- Before and after readings
- Adjustment values
- Next calibration due date

### **11.3 Parts Tracking**

**Track replacement parts:**

- Part numbers and specifications
- Supplier information
- Installation dates
- Warranty information
- Failure analysis data

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## **12. Preventive Maintenance**

### **12.1 Daily Checks**

**Operator Responsibilities:**

- Visual inspection for damage
- Check power indicators

- Verify basic functionality
- Clean external surfaces
- Check consumable levels

## **12.2 Weekly Maintenance**

### **Scheduled Tasks:**

- Clean sample path
- Check connections
- Verify calibration
- Test backup systems
- Update software if needed

## **12.3 Monthly Maintenance**

### **Comprehensive Checks:**

- Battery condition testing
- Connector cleaning
- Cable inspection
- Filter replacement
- Performance verification

## **12.4 Annual Maintenance**

### **Major Service:**

- Complete calibration
- Component replacement (scheduled)
- Software updates
- Warranty renewals
- Training updates