



The **CROSSFIRE** Controller Troubleshooting Guide

Introduction

Welcome to the **Crossfire Unit Troubleshooting Guide**. This guide is designed to help you quickly identify and resolve common issues with your Crossfire unit, whether it functions as a pump, air compressor, or vapor recovery unit (VRU).

The Crossfire controller is built with robust recovery features, ensuring reliable operation even in the event of a critical error or firmware issue. The controller operates with **two firmware slots**, allowing it to maintain both an active and fallback firmware version. If the system detects a catastrophic error or erratic behavior, it can switch to the fallback firmware automatically or manually to restore functionality.

This guide will assist you in understanding how the controller operates, interacting with the bootloader system, troubleshooting common issues, and restoring the unit from a "failed" state to ensure optimal performance and minimal downtime in the field.



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Controller Design and Default Operation



The Crossfire controller is engineered with a design philosophy that prioritizes **field recoverability, fault tolerance, and resilience**. Understanding the controller's core design features and default operation is essential for effective troubleshooting and maintenance.

Dual Firmware Locations

- The controller includes **two firmware slots**, ensuring it can maintain both an active and a fallback firmware version.
- If the active firmware encounters an error, such as corruption or erratic behavior, the system can automatically or manually switch to the fallback firmware to restore operation.

Firmware Switching Restrictions

- It is **not possible** to load two identical firmware versions into the controller.
- This design ensures the system cannot accidentally retain two versions of the same release, reducing the risk of bugs or unanticipated issues.

Bootloader System

The controller's **bootloader** enables users to:

1. Upload new firmware versions.
2. Switch between the active and fallback firmware slots.
3. Recover the unit from a "failed" state caused by corrupted firmware or other errors.

Normal Operation

1. **Active Firmware:** Under normal conditions, the controller runs on the active firmware slot.
2. **Automatic Fallback:** In the event of critical errors, the controller automatically switches to the fallback firmware to maintain functionality.
3. **Manual Interaction:** Users can interact with the bootloader to:
 - Manually switch between firmware versions.
 - Upload new firmware.
 - Recover from firmware corruption or failed states.

By leveraging these features, the Crossfire controller can remain operational in the field, even under challenging conditions.



How the Firmware Works

Key Principles of Firmware Operation

- 1. Dual Memory Locations:**
 - When new firmware is installed, the current active firmware is automatically moved to the **backup memory** location.
 - The newly installed firmware becomes the **active firmware**.
- 2. Verification Process:**
 - After updating the firmware, users must verify that both memory locations are populated and functional.
 - This ensures the unit can fail over to a valid firmware version in the unlikely event of a failure.
- 3. Best Practice: Install the Latest Two Versions:**
 - LCO recommends that the **two latest firmware versions** are installed in the controller.
 - This practice minimizes compatibility issues and ensures functionality remains consistent, even if the unit reverts to the backup firmware.
 - Example:
 - If **V38R08** is installed as the active firmware and the backup firmware is **V38R01**, reverting to V38R01 could cause functionality differences, as features and troubleshooting capabilities available in V38R08 may not exist in older firmware.
- 4. Firmware Packages:**
 - All firmware downloads from LCO Technologies include the **latest two versions** to facilitate this best practice.

Standard Procedure: Verify Both Memory Locations

- 1. After Firmware Update:**
 - Follow the verification steps outlined in **Step 5 of the Firmware Upgrade Instructions** to confirm that the active firmware has been updated successfully.
 - Use the **Check Version and Release** feature in the firmware tool software to verify the firmware version in both memory locations.
- 2. Regular Maintenance:**
 - As part of routine system checks, ensure that both memory locations remain populated with valid firmware versions.
- 3. Avoid Single Firmware Installation:**
 - Installing only the latest version of the firmware and neglecting to update the backup memory could cause **troubleshooting challenges** or result in **unexpected behavior** if the unit reverts to an outdated version.



Important Notes

- It is strongly recommended to have the **two latest firmware versions installed** in the controller.
- Always verify both memory locations after performing an update to ensure proper failover capability.
- Neglecting this step could introduce **inconsistencies, errors, or unexpected behavior**, particularly if the unit switches to backup firmware during operation.

Software and Firmware

The Crossfire unit requires specific software for configuration and a separate tool for firmware updates. Both are essential for maintaining the unit and ensuring compatibility with the latest features.

Configuration Software

The **Crossfire Configuration Software** is used to interact with and configure the Crossfire board during operation. It allows you to adjust settings, monitor system performance, and access diagnostic tools.

- Download the configuration software from the following locations:
 - [Crossfire Configuration Software Tool](#).

Firmware Upgrade Software

The **Firmware Upgrade Software** is a separate tool specifically for uploading new firmware to the Crossfire unit. This tool is used only when performing firmware updates or recovering the system.

- Download the firmware upgrade software from the following locations:
 - [Crossfire Firmware Updater Software](#)
 - [Crossfire Firmware File](#).

Important Notes:

1. **Firmware Password:** The password required to access the firmware file is: **Crossfire2023**
2. **Configuration Software Password:** **Crossfire2017**
3. **Always Differentiate Tools:** The configuration software and firmware upgrade software serve different purposes. Ensure you are using the correct tool for your task.
4. **Keep Up-to-Date:** Always use the latest versions of the software and firmware to ensure compatibility, improved performance, and bug fixes.



Controller Compatibility and Firmware Requirements

Not all Crossfire boards are compatible with firmware updates. To ensure your board can accept new firmware, it must meet the following compatibility requirements:

- Firmware Compatibility:**
 - Only controllers with firmware **V38 or later** can accept firmware updates.
 - Boards with versions prior to V38 must be upgraded at LCO Technologies for compatibility.
- Hardware Version:**
 - The latest hardware version at the time of this writing is **HW 2.3**.
 - If you are using an older board (V37 or earlier), LCO Technologies offers a **trade-in program** for a **nominal fee** to upgrade to the latest hardware and firmware.

How to Identify Your Controller Version

You can identify your controller version in the following ways:

- White Sticker on the Controller:**
 - Check the **bottom right corner** of the controller for a white sticker.
 - The sticker will display the version in the format: **231115V38R08** (where **V38** is the version and **R08** is the revision).
 - Note:** Once a firmware upgrade is performed, the sticker may become outdated. To maintain accuracy, write the updated version on the sticker after completing an upgrade.
- Configuration Software:**
 - Connect to the controller using the **Crossfire Configuration Software**.
 - Navigate to the **System Status** tab to view the firmware version, displayed as:
 - Version = 38, Release = 8** (for example).
- Silver Sticker on the Controller:**
 - Look for a silver sticker in the **top right corner** of the controller.
 - If the sticker says "**accepts firmware update**", it means the controller is **V38R01** or later and is compatible with firmware updates.





Trade-In and Upgrade Program

For customers with controllers **V37 or earlier**, LCO Technologies offers a **convenient trade-in program**. This program allows you to upgrade your controller to the latest hardware (**HW 2.3**) and firmware (**V38**) for a **nominal fee**. Upgrading ensures compatibility with the latest firmware releases and full access to all features and performance improvements.

- Contact **LCO Technologies Support** for more information on trade-in options and pricing.
- Alternatively, contact your local distribution office for local options.

Important Notes

- If your controller is **V37 or earlier**, it must be upgraded at LCO Technologies to accept new firmware.
- Always ensure both firmware memory locations are populated with the latest compatible versions for optimal performance and reliability.



Firmware Upgrade Instructions

The Crossfire unit's firmware can be updated using the **Crossfire Firmware Tool Software**. Follow these steps carefully to ensure a successful upgrade.

Step 1: Download the Required Files

1. Visit the LCO Technologies website: [LCO Technologies](#).
2. Navigate to the **Resources** page and download the following files:
 - **CROSSFIRE Latest Firmware File:** [Direct Link](#).
 - **Firmware Tool Software:** [Direct Link](#).
3. The password to access the firmware file is: **Crossfire2023**.
4. Save both files to a location on your computer where they are easily accessible.

Step 2: Connect the Controller

1. **Open the Firmware Tool Software:** Launch the application on your computer.
2. **Establish a Connection:**
 - Use an **RS232 to USB cable** to connect your computer to the Crossfire unit.
 - Ensure the controller is powered on.
 - Note: The firmware upgrade cannot be performed over Bluetooth; a hardwired connection is required.
3. **Select the Correct COM Port:**
 - Click **Refresh COM** in the tool to populate available COM ports.
 - Select the port corresponding to your connected Crossfire unit.
4. **Open the Port:**
 - Click the **Open** button. If the connection is successful, a confirmation message will appear in the terminal window of the tool.

Step 3: Enter Bootloader Mode

1. Enter the password: **Automatio** in the **Check Version and Release** section.
2. Click **Login to Controller**.
3. Click **Jump to Bootloader:**
 - The controller will enter bootloader mode, and the LEDs on the unit will begin flashing.

Step 4: Upload the New Firmware

1. **Select the Firmware File:**



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- Click **Browse** in the software tool and navigate to the firmware file downloaded earlier.
 - 2. **Start the Upload:**
 - Click **Start Upload** to begin the firmware update.
 - A progress bar will display the upload status.

Step 5: Confirm the Firmware Update

1. **Successful Upload:**
 - Once the upload is complete, the progress bar will turn green and display **100%**.
 - The new firmware is now active.
2. **Verify the Version:**
 - Go to the **Check Version and Release** section.
 - Click the button to verify that the new firmware version is displayed in the **Version** and **Release** fields.

Troubleshooting Firmware Updates

1. **Upload Failure:**
 - If the upload fails (e.g., due to a corrupted file or disconnected cable), the progress bar will turn red and flash.
 - The controller will automatically revert to the fallback firmware to remain operational.
 - Reconnect the cable and follow the upload steps again.
2. **Corrupted Firmware Recovery:**
 - If the unit appears unresponsive with no LED activity, follow the steps under **Recovery from Corrupted Firmware Image** in the troubleshooting section.
 - If recovery fails, contact LCO Technologies Support for assistance.

Important Notes

- Always ensure the controller is powered during the firmware update process.
- Do not disconnect the cable or power off the unit while the firmware is uploading.
- Verify the new firmware version after the update to ensure the process was successful.



Crossfire Controller Firmware Upgrader Version 1.2

Terminal **Crossfire Controller Firmware Upgrader**

Firmware Upload Procedure:

Step 1 - Connect Serial Port
Refresh COM Baud

Step 2 - Select File for Upload
*.ben File

Step 3 - Get into the Bootloader Mode

Password:

In Firmware App

c) Click the "Start Upload" button below to upload image
click to exit bootloader

Recovery from corrupted image
Main Menu can be seen on the terminal above
1. Click on this Text Box -->
2. Press and hold on key 'c' on the keyboard
3. Turn Controller power OFF and then ON
Or press Reset button on the controller
4. Release the Key 'c' then press the buttons below to switch to a good image while all the LEDs are still blinking

5. Follow steps a, b, c to upload a new image

Step 4 - Upload Image

Check Version and Release
Password:

Swap to Previous Version / Release
In Controller Application go from step a to d
In bootloader mode go from step c to d

In bootloader mode, you may click to return to Controller App

Instructions:
If new image upload failed the controller will jump back to the existing image. Please try again by repeating the same steps
If the controller has booted into a corrupted image, it will look dead. Please go to Recovery to force into Bootloader, then click "Start Upload" the image, or click the "Swap to Previous Version / Release" button to swap image
If you see the "Comm Timeout" popup window then you must restart this Firmware Upgrader



Troubleshooting Scenarios

This section provides scenario-based troubleshooting steps to help you identify and resolve common issues with your Crossfire unit. Each scenario includes symptoms, possible causes, and step-by-step instructions for resolution.

Scenario 1: No Power or No Response from Unit

Symptoms

- The unit does not power on.
- No LEDs or activity are observed, even when power is applied.

Possible Causes

1. **Blown Fuse:** The internal or external fuse may be damaged.
2. **Inadequate Power Supply:** Voltage at the power input terminals is below specification.
3. **Faulty Connections:** Loose or damaged wiring may prevent power from reaching the unit.

Troubleshooting Steps

1. **Check Power Supply at Input Terminals:**
 - Use a multimeter to measure the voltage at the power input terminals.
 - Ensure the voltage meets the unit's specifications. If voltage is low or unstable:
 - Inspect the power source (battery, solar panel, or power supply).
 - Confirm there are no inline resistances (e.g., frayed cables or loose connectors).
2. **Inspect External Fusing:**
 - If no power is present at the input terminals, inspect the external fuse.
 - **If the fuse is blown**, replace it with a new **quick-blow fuse** (not a slow-blow fuse).
 - Ensure the external fuse is rated between **6 Amps and 9.9 Amps** to blow before the internal fuse.
3. **Check the Internal Fuse:**
 - If you have valid power at the input terminals, the next step is to check if the internal fuse is blown.
 - **Measure Voltage Across Phase Terminals:**
 - Use your multimeter to measure from the input terminal voltage to each of the three phase motor terminals: **PH(a)**, **PH(b)**, and **PH(c)**.
 - With a valid power supply and an intact internal fuse, you should measure approximately **1.2 VDC** at each phase terminal.
 - **What to Do if Measurements Are Incorrect:**



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- If you measure **0 VDC** or close to 0, it is likely that the internal fuse is blown, or the board is damaged.
 - If this occurs, the unit will require professional repair or replacement.
4. **Check Wiring Connections:**
- Verify that all connections to the power input terminals are secure and free from corrosion or damage.
 - Inspect the wiring across phase terminals for continuity and proper gauge adherence.
-

Important Notes

- Always measure from the power input terminals to the phase terminals to confirm both power delivery and internal fuse integrity.
 - If the internal fuse is blown, it is not field-replaceable. Contact LCO Technologies for repair or replacement services.
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Scenario 2: Firmware Upload Failure or Corrupted Firmware

Symptoms

- The firmware update fails midway, displaying a red and flashing progress bar in the firmware tool.
- The unit appears unresponsive after the update, with no LED activity.

Possible Causes

1. **Connection Interruption:** The serial cable may have been disconnected during the upload.
 2. **Corrupted Firmware File:** The downloaded firmware file may be incomplete or damaged.
 3. **Empty Backup Memory Location:** The second firmware memory location may be empty. If the unit reverted to this empty location during a failover, it would result in a non-functional state.
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Troubleshooting Steps

1. **Reconnect and Retry:**
 - Ensure the serial cable is securely connected to both the computer and the Crossfire unit.
 - Retry the upload process following the steps in **Firmware Upgrade Instructions**.
2. **Verify Firmware File Integrity:**



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- Re-download the firmware file from the LCO website and ensure it is not corrupted.
 - Confirm the password (**Crossfire2023**) is entered correctly during extraction.
 - 3. **Check the Second Memory Location:**
 - Use the firmware tool to verify whether the second memory location contains valid firmware.
 - If the second memory location is empty:
 - Download and install the two latest firmware versions from the LCO website.
 - Follow the steps in **Firmware Upgrade Instructions** to populate both memory locations.
 - Verify that both locations are populated using the **Check Version and Release** feature.
 - 4. **Recovery from Corrupted Firmware:**
 - If the unit remains unresponsive with no LED activity, enter bootloader recovery mode using the firmware tool.
 - Follow the recovery steps to re-upload firmware and restore functionality.
 - 5. **Verify Backup Firmware:**
 - After restoring the unit, verify that both memory locations are populated with valid firmware versions.
 - Ensure that the second memory location is not empty to avoid issues during failover.

Important Notes

- Always install the **two latest firmware versions** to prevent compatibility issues or loss of functionality during failover.
- If the second memory location is empty or contains outdated firmware, the controller may behave unpredictably or fail to recover during a failover.



Scenario 3: Stuttering, Wobble, or Strange Behavior

Symptoms

- The unit starts and stops intermittently, failing to run continuously.
- The motor exhibits stuttering or erratic movement.
- The system does not perform as expected under normal operating conditions.

Possible Causes

1. **Voltage Instability or Variability:**
 - Fluctuations in the power supply can disrupt operation.
 - Examples include:
 - **Voltage drops under load:** Large voltage drops when the unit starts or restarts can prevent stable operation.
 - **External equipment interference:** Starting or stopping of external equipment with large current draws can cause voltage spikes or fluctuations.
2. **Mechanical Resistance:**
 - Internal mechanical issues may cause resistance, including:
 - Physical obstructions, wear and tear, or damaged components.
 - Manifestation of these mechanical issues can appear electrically, affecting the motor's performance.
 - In severe cases, the unit may require mechanical repair.
3. **Faulty Connections:**
 - Loose, corroded, or damaged wiring may disrupt stable operation.
4. **Firmware or Configuration Issue:**
 - Outdated or mismatched firmware can cause inconsistent performance.
 - Reverting to older firmware during failover could **potentially reintroduce previously resolved control issues**, depending on the version installed.
5. **Voltage Spikes and Power Protection:**
 - The Crossfire unit, as a **Variable Frequency Drive (VFD)**, is designed to protect itself during large power spikes or voltage drops, which can result in temporary operational inconsistencies.
6. **Error Codes:**
 - Error codes stored in the system's memory can provide critical insights into past or present failures, even if the operator was not present during the event.
7. **Motor Calibration Parameters:**
 - The motor calibration parameters may have become corrupted, requiring manual intervention and LCO assistance to restore correct operation.

Troubleshooting Steps



1. **Check Power Supply with Multimeter:**
 - Use a multimeter to measure the voltage at the power input terminals.
 - Most multimeters have a **MIN/MAX mode**, which can be enabled to monitor real-time voltage averages, as well as maximum and minimum spikes.
 - **Steps for MIN/MAX Diagnosis:**
 - Enable the MIN/MAX mode on your multimeter.
 - While the unit is starting or restarting, observe any large voltage drops or spikes.
 - Spikes may indicate inrush current events from external equipment, while sustained low readings may suggest a weak power source (e.g., battery banks with low capacity under load).
2. **Check Voltage Stability:**
 - Inspect the power source for any conditions causing voltage fluctuations, such as:
 - Weak battery banks.
 - Inconsistent solar panel output.
 - External equipment with large current draws.
3. **Inspect Mechanical Components:**
 - Shut down the unit and inspect for physical issues, such as:
 - Obstructions or buildup in valves or pistons.
 - Wear and tear on seals or other moving parts.
 - Signs of mechanical damage requiring repair or replacement.
4. **Verify Wiring and Connections:**
 - Inspect all wiring for:
 - Loose or damaged connections.
 - Corrosion or wear at terminals.
 - Cables that do not meet installation specifications (e.g., incorrect gauge or length).
 - Repair or replace faulty connections.
5. **Verify Firmware Versions:**
 - Check that the latest two firmware versions are installed to avoid issues during failover.
 - Use the **Check Version and Release** feature in the firmware tool to verify both memory locations.
 - **If the firmware is outdated or mismatched:**
 - Follow the steps in **Firmware Upgrade Instructions** to update both locations.
6. **Check Error Codes:**
 - Use the **Crossfire Configuration Software** to review the unit's error codes.
 - Check both the **current error codes** and the **last known error codes** stored in the system's memory.
 - These codes can provide insight into what has happened, even if the operator was not present during the failure or strange behavior.
 - Refer to the system's error code documentation or contact LCO Technologies for assistance interpreting the codes.
7. **Check Motor Calibration Parameters:**



- If all other steps fail to resolve the issue, motor calibration parameters may be corrupted.
- This requires manual intervention:
 - Contact LCO Technologies for assistance in resetting and recalibrating the parameters.

Important Notes

- Using MIN/MAX mode on your multimeter while troubleshooting can reveal spikes and dips in voltage that may not appear during normal readings.
- The Crossfire unit's built-in power protection mechanisms may temporarily disrupt operation during large power spikes or drops.
- Error codes are invaluable for diagnosing issues and understanding system behavior during past events.

Scenario 4: System Fails to Start or Operates Below Expected Performance

Symptoms

- The unit fails to start, even though power is present at the input terminals.
- The unit starts but operates below expected performance levels (e.g., low flow, pressure, or motor output).

Possible Causes

- 1. Incorrect Configuration Settings:**
 - Pressure, flow, or control settings may be improperly configured in the software.
- 2. Mechanical Obstructions or Damage:**
 - Blockages or buildup in flow paths (e.g., valves, hoses, pistons).
 - Wear or damage to internal components that limits performance.
- 3. Faulty Sensors or Control Signals:**
 - Pressure, flow, or position sensors may be malfunctioning or disconnected, leading to incorrect feedback to the system.
- 4. Environmental Factors:**
 - Temperature extremes, high humidity, or debris can impact system operation.
- 5. Electrical Faults:**
 - Loose wiring, corroded terminals, or incorrect voltage/current delivery to the unit can reduce motor performance.
- 6. Incremental Wear or Resistance:**



- Over time, wear and tear on softgoods or internal components can increase resistance, leading to higher current draw and reduced efficiency.

Troubleshooting Steps

- 1. Verify Configuration Settings:**
 - Open the **Crossfire Configuration Software** and check all system parameters:
 - Pressure and flow setpoints.
 - Motor speed and load parameters.
 - Any custom control logic settings that may limit performance.
 - Adjust settings to match operational requirements.
- 2. Inspect for Mechanical Issues:**
 - Shut down the unit and inspect:
 - Valves, pistons, seals, or hoses for blockages, debris, or wear.
 - Any moving components for signs of friction or misalignment.
 - Clean or replace damaged parts as necessary.
- 3. Test Sensors and Control Signals:**
 - Use the configuration software to check the readings from all sensors (e.g., pressure, flow, position).
 - Compare readings to expected values to determine if any sensor is malfunctioning.
 - Replace or recalibrate faulty sensors.
- 4. Check Environmental Conditions:**
 - Verify that the unit is operating within its environmental tolerances:
 - Ensure the temperature and humidity levels are within the unit's specified range.
 - Inspect the unit for debris or external interference that could impede performance.
- 5. Inspect Wiring and Power Delivery:**
 - Check all power and control wiring for:
 - Loose connections or damaged insulation.
 - Corroded terminals that could impact current delivery.
 - Measure the voltage and current at the input terminals and ensure they meet system specifications.
- 6. Monitor Current Draw Using Modbus:**
 - The Crossfire unit provides **current draw** as a tag available via Modbus.
 - Set up a **trend** to monitor current draw over time:
 - Use this trend to identify incremental resistance, wear and tear, or maintenance needs due to prolonged use.
 - **Baseline Current:** Each unit will have a different baseline power consumption based on its application, but trends should remain relatively consistent.
 - **Look for Deviations:** Any significant deviation in current draw trends can indicate:
 - Increased resistance from worn seals, pistons, or other softgoods.



- The need for maintenance or replacement of internal components.
- 7. **Perform Regular Softgoods Maintenance:**
 - Over time, all softgoods will require replacement or servicing to maintain optimal performance.
 - LCO offers the following to assist customers:
 - **Repair Kits:** For minor repairs.
 - **Rebuild Kits:** For more extensive maintenance needs.
 - **Professional Services:** For complete servicing or rebuilds of the unit.
- 8. **Check Error Codes:**
 - Review the **current** and **last known error codes** using the Crossfire Configuration Software.
 - These codes can provide insight into the cause of the failure or reduced performance.
- 9. **Perform a Phase Voltage Check:**
 - Measure the voltage from the input terminals to each phase terminal (**PH(a)**, **PH(b)**, **PH(c)**).
 - If phase voltages are inconsistent or abnormally low, the internal components of the board may require diagnostics or repair.

Important Notes

- **Current Draw Trends:** Monitoring current draw over time can provide early warning signs of resistance or wear, helping to schedule maintenance before performance degrades significantly.
- **Softgoods Maintenance:** Regular servicing is critical to ensuring the longevity and reliability of the unit. Contact LCO for repair or rebuild kits or professional services.



Engage Bootloader Mode Manually

When the board has power, the internal fuse is intact, but the unit is unresponsive, you may need to force it into firmware bootloader mode. This process uses a **0.5-second window** during startup, allowing the board to recognize the command for bootloader entry. Follow these steps carefully:

Steps to Force Bootloader Mode

- 1. Prepare Your Setup:**
 - Connect the board to your computer using a **USB-to-Serial cable** and a **serial cable**.
 - Open the **Crossfire Firmware Tool Software**.
 - Select the correct **COM port** and click **Open** to establish a connection.
 - Enter the password: **Automatio** in the firmware tool. This will unlock the dialog box under **Recovery from Corrupted Image**.
- 2. Restart the Board:**
 - Restart the board by either:
 - **Resetting power:** Disconnect and reconnect the power supply.
 - **Pressing the Reset Button:** Briefly press the reset button on the board (do not hold it).
- 3. Flood the Serial Port with the 'c' Character:**
 - During the board's startup sequence, there is a **0.5-second window** where it listens for the character 'c' via the serial port.
 - Click into the terminal dialog box in the firmware tool and **hold down the 'c' key** on your keyboard.
 - The terminal will begin to fill with 'c's, flooding the serial port. This is normal and ensures the command is received during the startup sequence.
- 4. Execute the Sequence:**
 - While holding the 'c' key, restart the board:
 - Either power cycle the unit or press the reset button once.
 - If successful, the terminal will populate with bootloader-related information. Once this happens, release the 'c' key.
- 5. Perform a Firmware Update:**
 - Use the firmware tool to upload the appropriate firmware files:
 - Update the **active memory location** first.
 - Then update the **backup memory location** to ensure both slots are populated.
 - Verify the updates using the **Check Version and Release** feature.
- 6. Test Communication Setup:**
 - If the unit still does not respond, test your communication setup:



- Try connecting to another LCO unit or compatible device using the same COM port and cable to confirm they are functional.
 - Replace cables or troubleshoot the computer setup if the communication setup fails.
7. **Seek LCO Support if Necessary:**
- Contact LCO Technologies for assistance if recovery attempts fail. The unit may require professional diagnostics, refurbishment, or replacement.

Additional Tips and Best Practices

- **Timing is Key:** The 0.5-second window is short, so ensure you are ready to hold down 'c' immediately after resetting power or pressing the reset button.
- **Flooding the Serial Port:** Continuously holding down the 'c' key ensures the board receives the command during the critical window.
- **Populate Both Firmware Locations:** Always update both the active and backup firmware slots to maintain failover functionality.
- **Check Other Devices:** If you suspect communication issues, verify the COM port and cables by connecting to another LCO unit or device.

Support Options

If this procedure does not resolve the issue:

- **Reset and Retry:** Multiple attempts may be necessary to catch the timing.
- **Contact LCO Support:** LCO Technologies offers phone assistance to guide you through the recovery process.
- **Replacement or Refurbishment:** If all recovery attempts fail, the board may require professional refurbishment or replacement.



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