BRX Do-more! Maintenance and Troubleshooting

In This Appendix...

Hardware Maintenance

Standard Maintenance

The BRX Platform is a low maintenance system requiring only a few periodic checks to help reduce the risks of problems. Routine maintenance checks should be made regarding two key items.

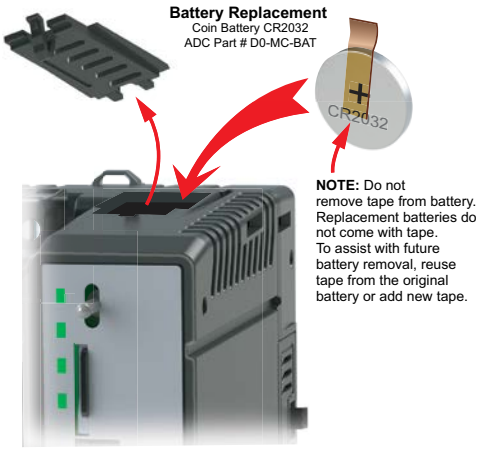
- Air quality (cabinet temperature, airflow, etc.)
- CPU battery

Air Quality Maintenance

The quality of the air your system is exposed to can affect system performance. If you have placed your system in an enclosure, check to see that the ambient temperature is not exceeding the operating specifications. If there are filters in the enclosure, clean or replace them as necessary to ensure adequate airflow. A good rule of thumb is to check your system environment every one to two months. Make sure the BRX Platform is operating within the system operating specifications.

CPU Battery Replacement

A battery is included with the CPU. When installed, the time and date along with retentive memory values will be retained. The battery is not needed for program backup. It is recommended that the battery be replaced annually.



Battery (Optional)	
D0-MC-BAT	Coin type, 3.0 V Lithium battery, 190mAh, battery number CR2032

NOTE: *Proper orientation of battery is with the "+" symbol facing left when viewed from front of MPU.*

Diagnostics

Diagnostics

Your BRX MPU performs many predefined diagnostic routines with every CPU scan. The diagnostics have been designed to detect various types of failures for the CPU and I/O modules. There are two primary error classes, critical and non-critical.

Critical Errors

Critical errors are errors the CPU has detected that present a risk of the system not functioning safely or properly. If the CPU is in Run Mode when the critical error occurs, the CPU will switch to Stop Mode (Remember, in Stop Mode all outputs are turned off). If the critical error is detected while the CPU is in Stop Mode, the CPU will not enter Run Mode until the error has been corrected. Here are some examples of critical errors:

- Power supply failure
- Parity error or CPU malfunction
- I/O configuration errors
- Certain programming errors.

Non-Critical Errors

Non-critical errors are flagged by the CPU as requiring attention. They can neither cause the CPU to change from Run Mode to Stop Mode, nor do they prevent the CPU from entering Run Mode. There are system memory addresses that the application program references to detect if a non-critical error has occurred. The application program can be used to take the system to an orderly shutdown or to switch the CPU to Stop Mode if necessary.

Some examples of non-fatal errors are:

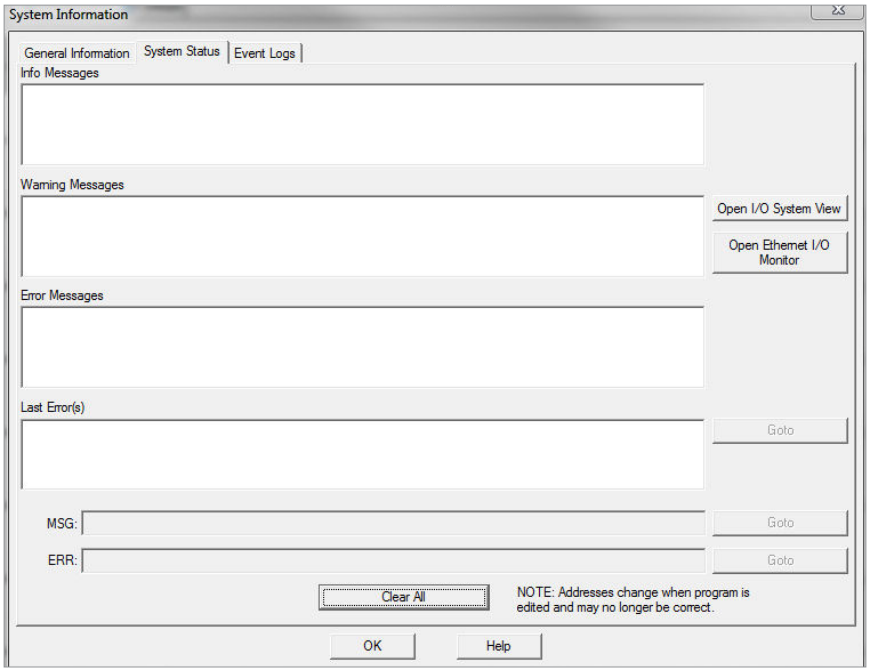
- Backup battery voltage low
- Certain programming errors

NOTE: *Please refer to Appendix D for the error code list.*

Finding Diagnostic Information

The CPU automatically logs critical and non-critical error codes. Logged errors can be found in the following places marked with a time and date stamp:

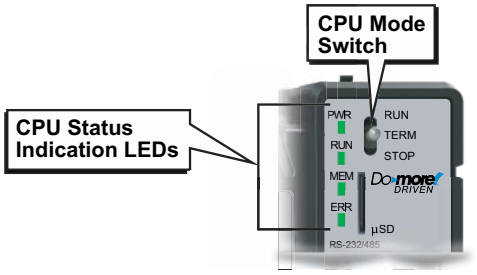
- Under the PLC menu item, select System Information and then pick the System Status tab. All errors and messages are shown here.
- Also check the Event Log tab for further system status.



NOTE: *Please refer to Appendix D for the error code list.*

CPU Indicators

The BRX MPU has indicators on the faceplate to help diagnose problems with the system. The table below gives a quick reference of potential problems associated with each status indicator. The pages following the table contain a detailed analysis of each of these problems.



CPU Status Indicators		
Indicator	**Status**	**Description**
PWR	OFF	Base power OFF
	Green	Base power ON
	Yellow	Low battery
RUN	OFF	CPU is in STOP (Program) mode
	Green	CPU is in RUN mode
	Yellow	Forces are active
MEM	OFF	No ROM activity, No SD card
	Green	SD Card installed and mounted*
	Yellow	ROM activity (Flash or SD card)
	Red	microSD Card installed and not mounted*
ERR	OFF	CPU is functioning normally
	Red	CPU fatal hardware error or software watchdog error

**** A microSD card will become "mounted" once the MPU recognizes the microSD card and renders it accessible for use.***

CPU Mode Switch	
Position	**Description**
RUN	Puts the CPU into RUN mode - assuming there are no issues that prevent it from happening, like errors in the project currently loaded in the CPU, or a problem with the hardware.
TERM	Allows the Do-more! Designer programming software to set the CPU's mode using the "Set PLC Mode" utility.
STOP	Puts the CPU into Stop (Program) mode which stops running the currently loaded project.

PWR Indicator

There are three general reasons for the CPU power status LED (PWR) to be OFF:

1. Power to the MPU is incorrect or is not applied.
2. MPU power supply is faulty.
3. Other component(s) have the power supply shut down.

Incorrect MPU Power

If the voltage to the power supply is not correct, the MPU may not operate properly or may not operate at all. Use the following guidelines to correct the problem.

WARNING: To minimize the risk of electrical shock, always disconnect the system power before inspecting the physical wiring.

1. First, disconnect the system power and check all incoming wiring for loose connections.
2. If you are using a separate termination panel, check those connections to make sure the wiring is connected to the proper location.
3. If the connections are acceptable, reconnect the system power and measure the voltage at the power supply connection terminal block to ensure it is within specification. If the voltage is not correct, shut down the system and correct the problem.
4. If all wiring is connected correctly and the incoming power is within the specifications required, the MPU should be replaced.

Faulty MPU

There is no simple test for a faulty MPU other than substituting a known good one to see if this corrects the problem. If you have experienced major power surges, it is possible the MPU has been damaged. If you suspect this is the cause, a line conditioner should be installed on the incoming line. This will keep damaging voltage spikes from reaching the MPU.

External Device or Module Causes the Power Supply to Shutdown

Module:

If the Power LED is not lit, remove all modules including a POM module (if present) from the BRX Platform and reapply power. If the Power LED is still unlit, then the BRX unit has sustained damage and will need to be replaced.

External Device:

External influence from a communications port.

Test as follows:

1. Turn off power to the BRX Platform.
2. Disconnect all external devices (i.e., communication cables) from the BRX Platform.
3. Reapply power.
4. If power supply operates normally then check for a shorted device or shorted cable.

RUN Indicator

If the CPU will not enter the Run mode (the RUN indicator is off), the problem is usually in the application program, unless the CPU has a critical error. If a critical error has occurred, the ERR LED should be on. You can use Do-more! Designer Software to determine the cause of the error.

When the RUN LED is yellow it indicates the CPU has one or more memory locations with Forced values.

ERR Indicator

If the ERR indicator is OFF, it means the CPU is functioning normally. If the ERR indicator is ON, the CPU has experienced one or more of the following conditions:

- A Fatal Hardware Error.
- A Software Watchdog Error has occurred.
- An I/O module has been removed while the CPU is in RUN mode.
- An I/O module in an Ethernet I/O Slave drop is not present.

If rebooting the BRX Platform clears the error, you should monitor the system and determine what caused the problem. You will find this problem is sometimes caused by high frequency electrical noise introduced into the MPU from an outside source. Check your system grounding and install electrical noise filters if the grounding is suspected. If power cycling the system does not reset the error, or if the problem returns, you should replace the MPU.

The ERR indicator can be made to BLINK from the Edit Link dialog in order to help identify the CPU. This is helpful where you may have multiple MPUs in a cabinet.

Communications Problems

If you cannot establish communications with the MPU, check these items:

- The cable is disconnected.
- The cable has a broken wire or has been wired incorrectly.
- The cable is improperly terminated or grounded.
- The device connected is not operating at the correct baud rate.
- The device connected to the port is sending data incorrectly.
- A grounding difference exists between the two devices.
- Electrical noise is causing intermittent errors.
- If it is determined that a built-in CPU communications port is bad, the MPU should be replaced. If it is a POM communications port, just replace the POM port.

I/O Troubleshooting

Things to Check

If you suspect an I/O error, there are several things that could be causing the problem:

- A blown fuse
- A loose terminal block
- The 24VDC supply has failed or 24VDC has not been supplied to the I/O common.
- The I/O point has failed.

Error Codes

Also, in the Do-more! Designer software, you can go to the PLC menu item, select System Information and then pick the System Status tab.

All errors and messages are shown here. Also check the Event Log for further information on system status such as rebooting.

Some Quick Steps

When troubleshooting the BRX Platform I/O there are a few facts you should be aware of which may assist you in quickly correcting an I/O problem:

- The CPU cannot detect shorted or open output points. If you suspect one or more points on an output module to be faulty, you should measure the voltage drop from the common to the suspect point. Remember, when using a Digital Volt Meter, leakage current from an output device, such as a triac or a transistor, must be considered. A point which is off may appear to be ON if no load is connected to the point.
- The I/O point status indicators on the modules are logic side indicators. This means the LED which indicates the ON or OFF status reflects the status of the point in respect to the CPU. For an output module, the status indicators could be operating normally, while the actual output device (transistor, Triac etc.) could be damaged. With an input module, if the indicator LED is ON, the input circuitry should be operating properly. To verify proper functionality, check to see that the LED goes off when the input signal is removed.
- Leakage current can be a problem when connecting field devices to I/O points. False input signals can be generated when the leakage current of an output device is great enough to turn on the connected input device. To correct this, install a resistor in parallel with the input or output of the circuit. The value of this resistor will depend on the amount of leakage current and the voltage applied but usually a 10kΩ to 20kΩ resistor will work. Verify that the wattage rating of the resistor is correct for your application.
- The easiest method to determine if an I/O point has failed is to replace the MPU or the expansion module if you have a spare. However, if you suspect another device to have caused the failure in the MPU or the expansion module, that device may cause the same failure in the replacement as well. As a point of caution, you may want to check devices or power supplies connected to the failed MPU or expansion module before replacing it with a spare.

Testing Output Points

Output points can be set ON or OFF using the force function to override a point even while the program is running. However, this is not a recommended method to test the output points.

NOTE: *RUN LED will turn Yellow when one or more outputs are forced.*

WARNING: Depending on your application, forcing I/O points may cause unpredictable machine operation that can result in a risk of personal injury or equipment damage. Make sure you have taken all appropriate safety precautions prior to testing any I/O points.

If you want to do an I/O check independent of the application program, follow the procedure in the table below:

I/O Check Procedure

Step	Action
1.	Use Do-more! Designer software to communicate on-line to the CPU.
2.	Change to Program Mode.
3.	Go to the first rung of $Main. All System Tasks should be disabled by following Step 4 as well.
4.	Insert a rung with an “END” statement. (This will cause program execution to occur only at address 0 and prevent the application program from turning the I/O points on or off).
5.	Change to Run Mode.
6.	Use the programming device to set (turn) on or off the points you wish to test.
7.	When you finish testing I/O points delete the “END” statement at the first rung.

Noise Troubleshooting

Electrical Noise Problems

Noise is one of the most difficult problems to diagnose. Electrical noise, whether conducted or radiated, can enter a system in many different ways. It may be difficult to determine how the noise is entering the system but the corrective actions for either type of noise problem are similar.

Conducted noise is when the electrical interference is introduced into the system by way of an attached wire, panel connection, etc. It may enter through an I/O point, a power supply connection, the communication ground connection, or the chassis ground connection.

Radiated noise is when electrical interference is introduced into the system without a direct electrical connection such as radio waves.

Reducing Electrical Noise

While electrical noise cannot be eliminated completely, it can be reduced to a level that will not affect system function. Proper grounding of components and signal wiring along with proper isolation of voltages can minimize noise in the system.

1. Grounding:

   Most noise problems result from improper grounding of the system. A good earth ground can be the single most effective way to correct noise problems. If a ground is not available, install a ground rod as close to the system as possible.

   Ensure all ground wires are single point grounds and are not daisy chained from one device to another. Ground metal enclosures around the system. A loose wire is no more than a large antenna waiting to introduce noise into the system; therefore, you should tighten all connections in your system. Loose ground wires are more susceptible to noise than the other wires in your system. Review Chapter 1, "General Installation and Wiring Guidelines", if you have questions regarding how to ground your system.

2. Isolation:

   Electrical noise can enter the system through the power source for the MPU and I/O. Installing an isolation transformer for all AC sources can correct this problem.

   DC power sources should be properly grounded, except for Class II power supplies. Switching DC power supplies commonly generate more noise than linear supplies.

   Place input and output wiring in separate wireways or wiring bundles. Keep AC and DC wiring separated as well. Never run I/O wiring parallel or close proximity to high voltage wiring.