



MOTOCRANE ULTRA

ULTRA Troubleshooting Guide v2.0

July 2020

**This guide helps users diagnose and repair issues in the field.
It should be used in conjunction with the ULTRA Operation Manual.**

If a quick fix is available, one is prescribed. If a quick fix is not possible, we give a service procedure for repair using the spare parts in the Deadlock Service Kit (available for purchase online). Without a Deadlock Service Kit, spare parts can be purchased individually or the affected modules can be returned to MotoCrane for repair.

Via MotoCrane Academy, Certified Technicians and Operators are trained on how to perform these more common service procedures. Find more information at www.motocrane.com/academy.

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Understanding System Feedback

ULTRA provides system feedback using two primary methods: LEDs and GUI Messages.

COM and Power LEDs

The Base Driver Unit, Base Pedestal, PSU, and Turret all contain LEDs to help quickly identify problems with electrical connections.

The COM LED will turn on when the electronics at that location are successfully communicating on the CAN-bus with the other parts of the system. If this LED turns off, this indicates that either the electronics at that location have stopped functioning properly, a wiring issue has developed that prevents normal communication to occur, or in an extremely rare case that the COM LED has burned out.

The COM LEDs can help to diagnose cabling vs. electronics issues. If all COM LEDs are off, this could be an issue with the Main Power Cable from the PSU to the Base. If only the Base Driver Unit COM LED is on, this could indicate internal wiring problems in the Base. If both the Base Driver Unit and Base Pedestal COM LEDs are on, but the Turret COM LED is off, this could indicate a bad cable between the Base Pedestal and Turret, or an LDU electronics failure.

Similarly, the Power LEDs indicate the presence of the 48V system power in their respective locations. Power LEDs are also present in the PSU, to provide a visual confirmation that the system power is connected and switched on.

*** Please note: Due to inherent properties of the power management system, the Power LEDs may remain dimly lit for a short while after the system power is turned off.*

GUI Warning and Error Messages

ULTRA has multiple internal sensors and an error reporting system built into the GUI.

If an active error or warning is present, the respective red or yellow icon will be displayed. A yellow icon indicates a warning, and the controller will beep once to alert the user. A red icon indicates an error, and the controller will beep repeatedly until the icon is touched or the DISARM physical switch is pressed by the user.

Touching the error or warning icon will bring you to the Status page, where you can see a list of active errors and warnings. If you are experiencing an intermittent issue, and the warning or error is not currently active, you can review events by navigating to the System Log, which is accessible through the Diagnostics page. The System Log will also provide a list of errors and warnings that have occurred, along with the time since the event occurred (in 2 minute increments). Note that the System Log will only hold the most recent 10 events, and is cleared upon power cycling the system.

From either the Status or System Log page, you can access the Code Lookup Table, which will provide you with a short description of the error or warning and a recommended first step for troubleshooting and clearing the issue. For reference, the 'Controller - GUI' section of the Operation Manual shows the location of the System Log and Code Lookup buttons within their respective pages.

More detail is given below about each error message along with a description of what to try if the first step does not work.

***When debugging any error or warning, first ensure that all cables are properly connected and check the status of the COM and Power LEDs on all modules.*

Diagnosing Common Issues

Please see the list of common symptoms below, and the procedure for fixing solving.

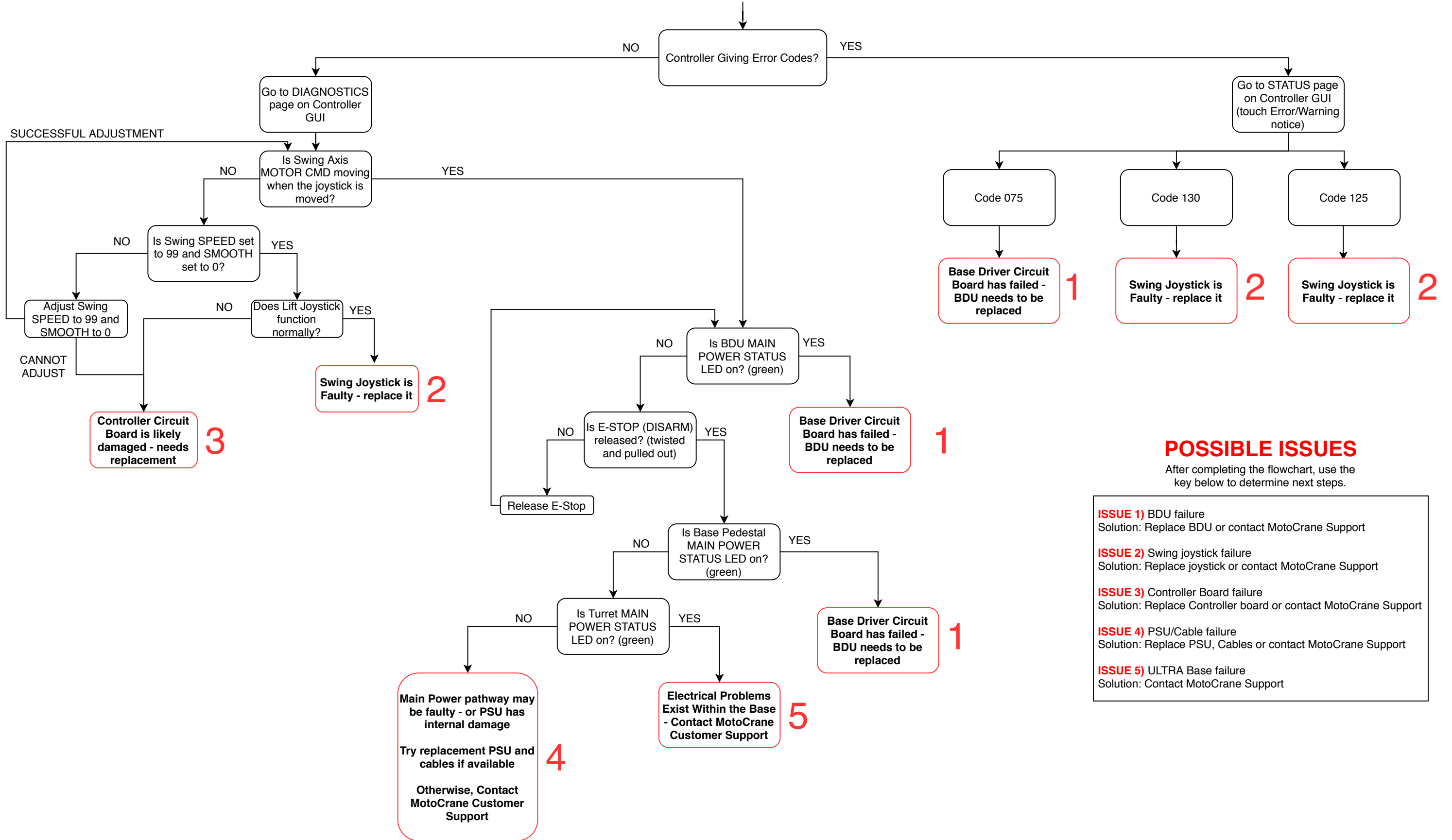
“I have anodizing/finish problems”

- **Anodizing/finish problems in non-wear areas.**
 - Cause: Some anodizing batches are more susceptible to fade/ color change under UV exposure.
 - Operation Manual reference: N/A
 - Repair Procedure: Replace or re-finish problematic parts.
 - Warranty: Covered, manufacturing defect in fit/finish. The customer pays all shipping costs, as outlined in Terms of Sale.
- **Cracking Anodizing around boom fasteners.**
 - Cause: Washers are needed to minimize surface abrasion.
 - Operation Manual: See ULTRA Boom + Isolator Setup on p. 21 to ensure customers are using washers appropriately.
 - Repair Procedure: N/A
 - Warranty: Not covered. Normal wear and tear.

“Grease is Leaking from the Base”

- **Some grease has become liquid and escaped through the grease ports.**
 - Cause: As the swing axis moves, the grease is continually circulated within the chamber and undergoes a transition from thick to thin, depending on its location and temperature. Some thin grease may escape at times, but this is not a cause for concern. Simply wipe it away and it should diminish over time.
 - Operation Manual: N/A
 - Repair Procedure: N/A
 - Warranty: N/A

"SWING IS NOT WORKING"

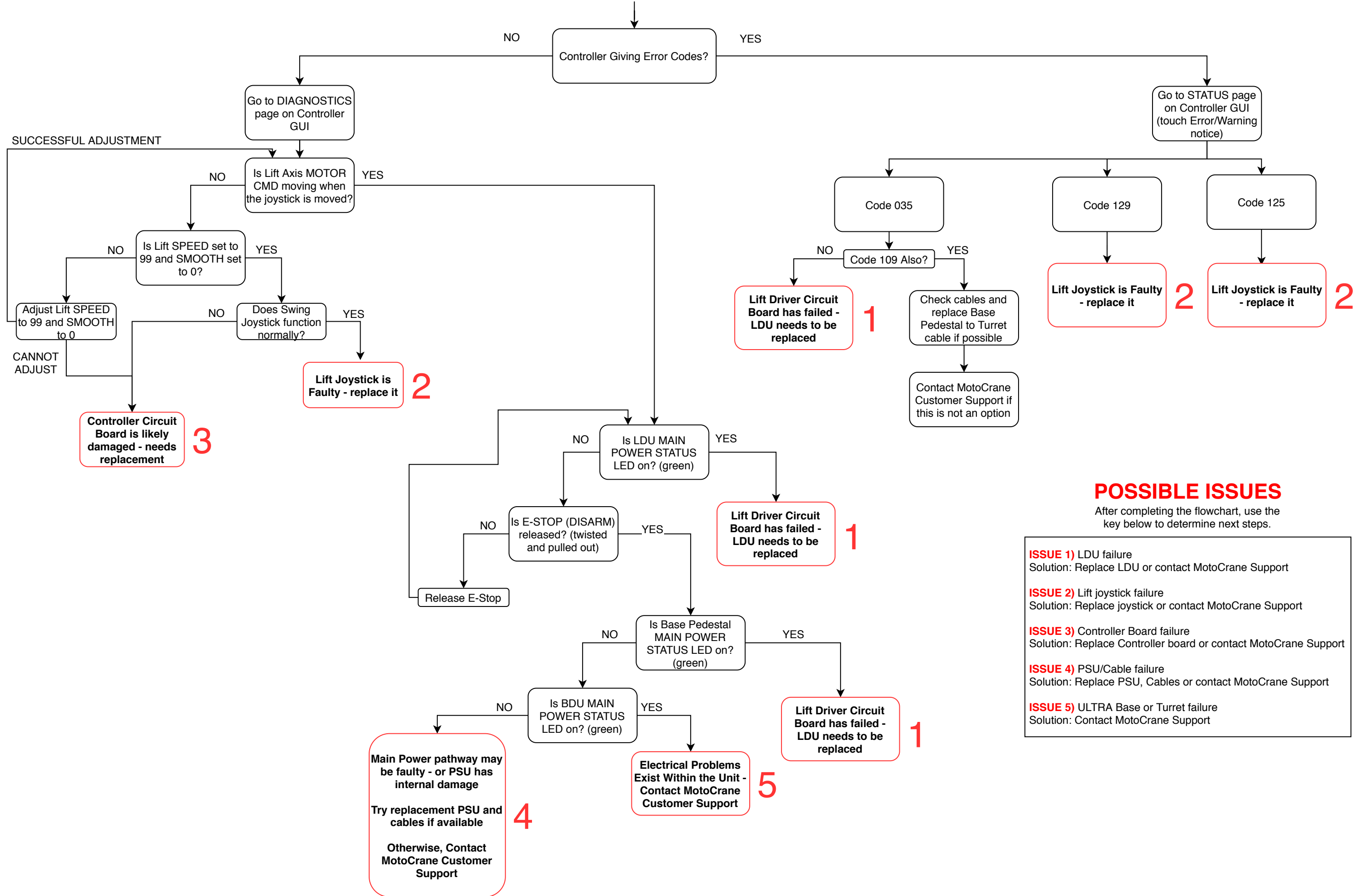


POSSIBLE ISSUES

After completing the flowchart, use the key below to determine next steps.

- ISSUE 1)** BDU failure
Solution: Replace BDU or contact MotoCrane Support
- ISSUE 2)** Swing joystick failure
Solution: Replace joystick or contact MotoCrane Support
- ISSUE 3)** Controller Board failure
Solution: Replace Controller board or contact MotoCrane Support
- ISSUE 4)** PSU/Cable failure
Solution: Replace PSU, Cables or contact MotoCrane Support
- ISSUE 5)** ULTRA Base failure
Solution: Contact MotoCrane Support

"LIFT IS NOT WORKING"



POSSIBLE ISSUES

After completing the flowchart, use the key below to determine next steps.

- ISSUE 1) LDU failure**
Solution: Replace LDU or contact MotoCrane Support
- ISSUE 2) Lift joystick failure**
Solution: Replace joystick or contact MotoCrane Support
- ISSUE 3) Controller Board failure**
Solution: Replace Controller board or contact MotoCrane Support
- ISSUE 4) PSU/Cable failure**
Solution: Replace PSU, Cables or contact MotoCrane Support
- ISSUE 5) ULTRA Base or Turret failure**
Solution: Contact MotoCrane Support

Appendix 1: Diagnosis Procedures

External Deactivation of Lift Drive Brake

In a rare situation, it is possible that the lift motor driver electronics could fail due to extreme overuse, disregard for system warnings, faulty cables, improper system power supply, among others. Because the nature of the lift drive brake is 'fail-safe', this means that when the system is unpowered (more specifically, the lift motor driver electronics are not receiving power), the brake is activated and the lift axis will not move, except in the case of extreme imbalance between payload and counterweight. In the event that the lift motor driver electronics stop working, and the lift axis is stuck in an undesirable position, the following steps can be taken to manually unlock the lift axis:

1. Turn off power from the system and remove the short cable connecting the Base Pedestal to the Turret
2. Plug the main power input cable directly into the socket on the Turret (this cable normally connects directly to the Base Driver Unit)
3. Ensure the other side of the main power input cable is connected to the PSU
4. Remove the small rectangular cover on the Turret, immediately adjacent to the main power input socket (there are two small flat-head cap screws to remove)
5. Turn on the main power switch on the PSU
6. Depress and latch the button that was exposed by removing the rectangular cover on the Turret
7. An audible click should be heard when this button is pressed, and the brake should be deactivated
8. Manually position the boom to the desired location
9. Press the button again to un-latch it
10. Turn off the main power switch on the PSU
11. Replace the rectangular cover back on the Turret

Note that this feature is an immediate solution for re-positioning the fulcrum and boom, in the event that the system cannot otherwise be transported or disassembled normally. Service will still be required to repair the electronics and return the system to normal operating conditions.

“Remove PSU Top”



“Remove 24V Power Fuse”



“Check Power Fuse for Continuity”

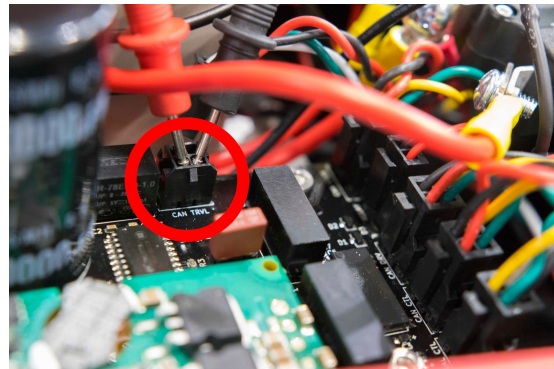
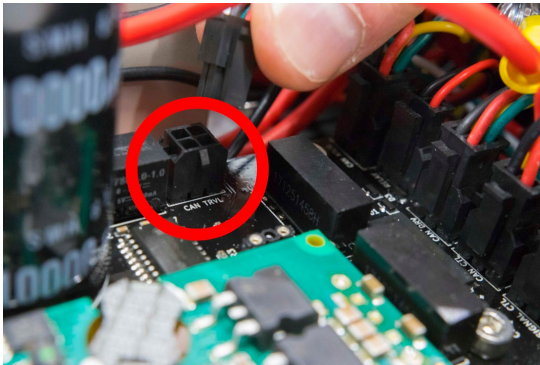


NO Continuity



YES Continuity

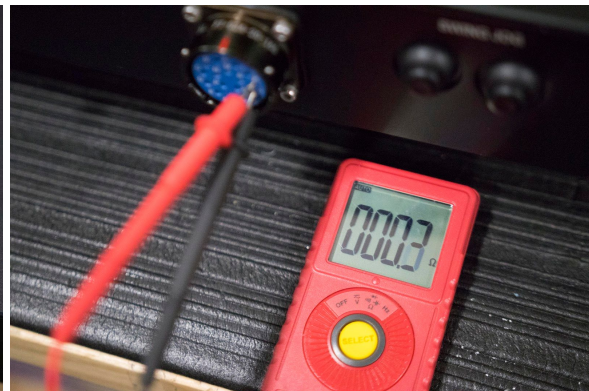
“Unplug CAN-TRVL, Check Pins 3 and 4 for Continuity”



“Check continuity across Pins H and J on the BDU Main Power Input Socket”

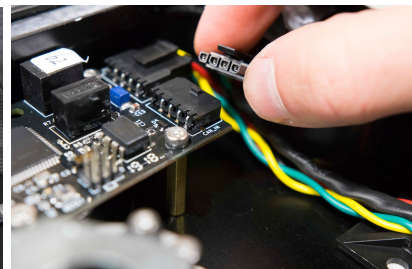
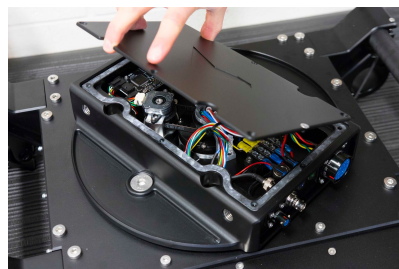
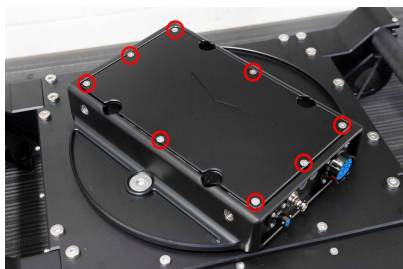


NO Continuity

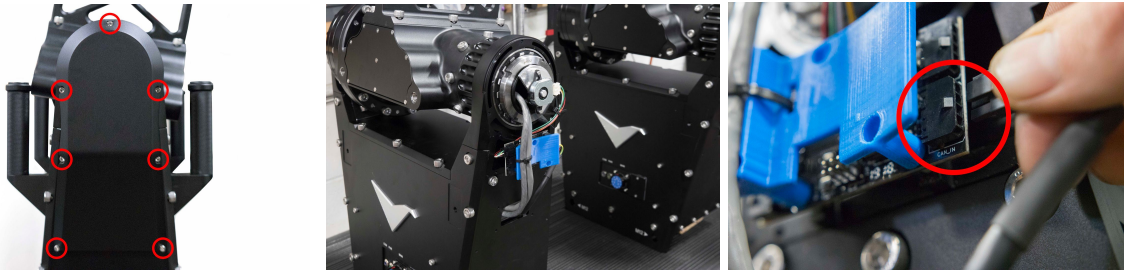


YES Continuity

“Open Base Pedestal Plate, Remove CAN IN Connector”



“Remove Lift Encoder Cover, Unplug CAN IN from Lift Encoder Board”



“Check continuity between pins H and J on the LDU Main Power Input Socket”



NO Continuity

YES Continuity

“Emergency Bypass Procedure” (for PSU Circuit Board failure)

NOTE: This procedure is only recommended for emergency and time-critical situations. For everything else, the best course of action is to wait for a replacement PSU or PSU Circuit Board in order to restore the system to its original state. Operating the PSU without the capacitors and without a proper fuse may present risks to the rest of the system, and lacks protection for potential (but unlikely) failures in other modules, such as the Base, Turret, or Controller.

Additional information about this procedure:

We have seen isolated failures of two capacitors in particular (C10 and C11 on the PSU Circuit Board), which results in a short circuit of the low power 24V communication power line in the system, blowing the fuse in the PSU and preventing the system from powering up. Although these capacitors are on the board for a reason, they are not absolutely essential to the short term operation of the circuit. Therefore, the emergency bypass procedure involves physically removing these capacitors from the board in order to remove the short circuit condition and allow for operation of the unit until a new PSU circuit board can be installed. In addition to

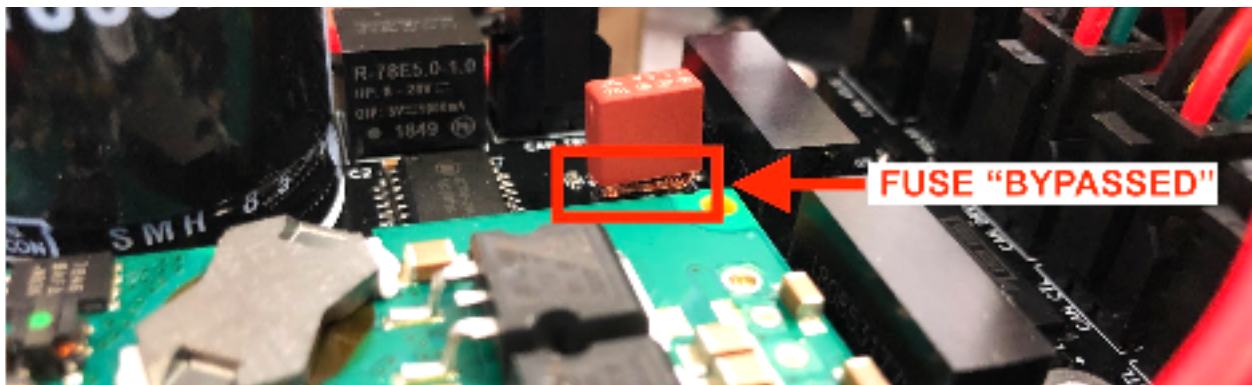
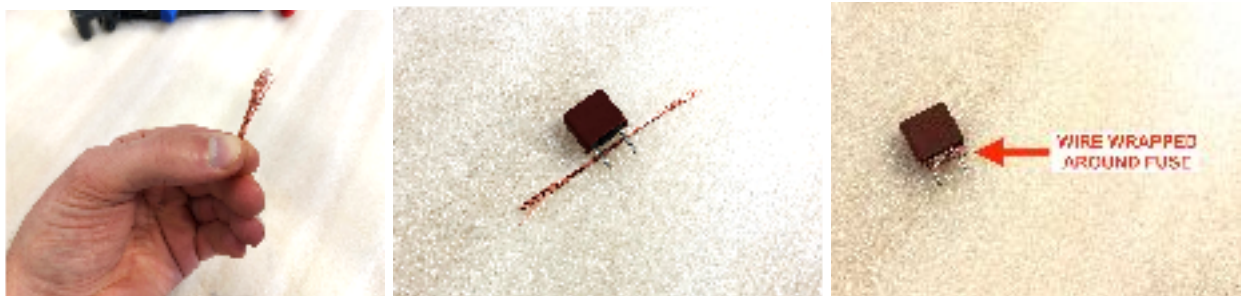
removing the capacitors, the fuse will need to be replaced or bypassed with a conductor, since the fuse fails in an open-circuit configuration. Please refer to the following images and descriptions for information about removing these capacitors and bridging the fuse connection.

FUSE BYPASS

A common multi-strand wire can be used to bypass (bridge) the fuse. Start by stripping the insulation, and separating out 4-6 individual copper wires.



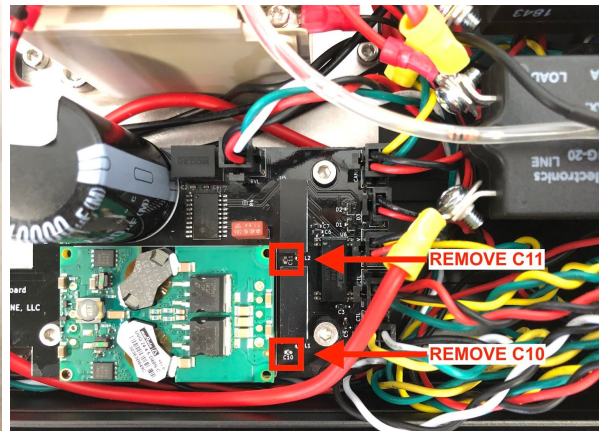
Wrap the copper strands around the fuse legs, and re-install into the Fuse Holder.



****NOTE:** For this procedure, it is also possible to remove the fuse completely and replace it with a paper clip or solid wire, provided that it fits snugly in the fuse-holder terminals. The objective is to create continuity between the two terminals of the fuse-holder.

REMOVE C10 and C11 CAPACITORS

While it is preferable to use a hot air/soldering station, a small jeweler's/precision screwdriver can be used to "pop" or "pry" the damaged C10 and C11 capacitors off of the PSU circuit, making the circuit functional again.



Appendix 2: Error Codes Lookup Table

Code	Description	Service	Details
002	Lift Motor Temp Warning	<ul style="list-style-type: none"> • Use caution and watch motor temp • Make sure payload and counterweight are properly balanced • Make sure there are no obstructions preventing the boom from raising or lowering • Keep system 'DISARMED' during periods of inactivity 	<p>The lift motor temperature has risen to a level that is higher than expected, under normal use. This can be caused by excessive load and higher than normal current passing through the motor.</p> <p>Under very high ambient temperatures and with the Turret Fulcrum in direct sunlight, this warning can appear from time to time and is not a concern. Keeping the system 'DISARMED' during periods of inactivity, and keeping the system covered or in shade will help prevent this warning from happening</p>
003	Lift Motor Temp Error	<ul style="list-style-type: none"> • Discontinue use until temp is reduced • Make sure payload and counterweight are properly balanced • Make sure there are no obstructions preventing the boom from raising or lowering 	<p>The lift motor temperature has risen to a level that is potentially dangerous to the system. This could be caused by extreme overuse, high ambient temperatures, imbalanced load, obstruction of lift movement, or some combination of these events. Allow the system to cool down below the error threshold before continuing major lift-axis movements.</p>
004	Lift Motor Temp Sensor Failure	<ul style="list-style-type: none"> • Use caution and contact MotoCrane Support • Avoid heavy use of lift moves in high ambient temperatures 	<p>The lift motor temperature sensor reading has been lost by the system. The most likely cause of this failure is damage to the Turret internal wiring or electronics. Service on the Turret by MotoCrane is required to resolve this issue. The unit can still be used with caution, but should be serviced at the earliest convenience.</p>
007	Lift Motor Driver Temp Warning	<ul style="list-style-type: none"> • Use caution and watch driver temp • Make sure payload and 	<p>The temperature of the lift motor driver electronics has risen to a level that is higher than expected, under normal use.</p>

		<p>counterweight are properly balanced</p> <ul style="list-style-type: none"> ● Make sure there are no obstructions preventing the boom from raising or lowering 	<p>This is generally caused by excessive load and higher than normal current being used by the motor. If the problem is persistent, contact MotoCrane Support.</p>
008	Lift Motor Driver Temp Error	<ul style="list-style-type: none"> ● Discontinue use until temp is reduced ● Make sure payload and counterweight are properly balanced ● Make sure there are no obstructions preventing the boom from raising or lowering 	<p>The temperature of the lift motor driver electronics has risen to a level that is potentially dangerous to the system. This could be caused by extreme overuse, high ambient temperatures, imbalanced load, obstruction of lift movement, or some combination of these events. If the problem is persistent, contact MotoCrane Support.</p>
009	Lift Motor Driver Temp Sensor Failure	<ul style="list-style-type: none"> ● Use caution and contact MotoCrane Support ● Avoid heavy use of lift moves in high ambient temperatures 	<p>The lift motor driver temperature sensor reading has been lost by the system. The most likely cause of this failure is damage to the Turret electronics. Service on the Turret by MotoCrane is required to resolve this issue. The unit can still be used with caution, but should be serviced at the earliest convenience.</p>
012	Lift Over-Current Warning	<ul style="list-style-type: none"> ● Use caution and observe current and temps ● Make sure payload and counterweight are properly balanced ● Make sure there are no obstructions preventing the boom from raising or lowering 	<p>The lift motor current has risen to a level that is higher than expected, under normal use. This is generally caused by excessive load and higher than normal current passing through the motor.</p>
013	Lift Over-Current Error	<ul style="list-style-type: none"> ● Discontinue use while error is active ● Make sure payload and counterweight are properly balanced ● Make sure there are no obstructions preventing the boom from raising 	<p>The lift motor current has risen to a level that is potentially dangerous to the system. This could be caused by extreme movements, imbalanced load, obstruction of lift movement, or some combination of these events.</p>

		or lowering	
014	Lift Current Sensor Failure	<ul style="list-style-type: none"> • Use caution and contact MotoCrane Support • Avoid extreme movements of lift axis and make sure payload and counterweight are balanced 	The lift motor current sensor reading has been lost by the system. The most likely cause of this failure is damage to the Turret electronics. Service on the Turret by MotoCrane is required to resolve this issue. The unit can still be used with caution, but should be serviced at the earliest convenience.
018	Lift Motor Stall	<ul style="list-style-type: none"> • Disarm, power cycle, and check functionality • Make sure there are no obstructions preventing the boom from raising or lowering 	Stall conditions are detected to prevent excessive current and temperature from damaging the motor. If the motor current is above a certain threshold for a period of time, without any movement of the motor, a stall is detected and the power to the motor is shut off. In order to attempt movement again, the joystick has to be returned to a neutral position first. If there are no obstructions preventing the boom from moving up and down, and this error continues to occur, this likely means there is an issue with the lift drive mechanism and the Turret needs to be serviced by MotoCrane. If the problem is persistent, contact MotoCrane Support.
020	Lift IMU Warning	<ul style="list-style-type: none"> • Do not subject the system to higher forces 	This warning indicates that the G-forces experienced by the unit are slightly higher than normal. Do not attempt to subject the system to more extreme conditions than those that triggered the warning.
021	Lift IMU Error	<ul style="list-style-type: none"> • Reduce intensity of use to acceptable level 	This error indicates that the G-forces experienced by the unit are much higher than normal. Do not continue operating the unit in these extreme conditions.
022	Lift IMU Sensor Failure	<ul style="list-style-type: none"> • Use caution and contact MotoCrane Support 	The lift IMU reading has been lost by the system. The most likely cause of this failure is damage to the Turret electronics. Service on the Turret by

			MotoCrane is required to resolve this issue. The unit can still be used with caution, but should be serviced at the earliest convenience.
029	Lift Motor Command Timeout	<ul style="list-style-type: none"> • Power cycle system to reset • Double check all cable connections • With system Disarmed, enter the Diagnostics page of the GUI and move the lift joystick to check for motor commands 	This error indicates that the lift driver board is not receiving commands from the Controller. The most likely cause of this error is an issue with the Controller, which may be solved with a simple power cycle. If this does not resolve the issue, the Controller may have sustained damage and has stopped generating the appropriate motor commands. If the problem is persistent, contact MotoCrane Support.
031	Boom Imbalance - Front Heavy	<ul style="list-style-type: none"> • Ensure Payload and CW are properly balanced, in accordance with the Operation Manual instructions 	While lift limits are turned on, an option is available (within the Settings+ page of the GUI) to enable ULTRA to auto-detect Payload/CW imbalances. The system can generally detect situations where the Payload is more than +/- 5 lbs heavy/light.
032	Lift Limits Disabled From Error	<ul style="list-style-type: none"> • Power cycle and calibrate lift angle 	This error occurs if limits are enabled, and an encoder error or failure is triggered. Because lack of reliable encoder data prevents limits from being trusted, limits are disabled and cannot be enabled again while the error persists. If power cycling the system does not eliminate the encoder error, limits will not be available until the encoder can be repaired.
033	Boom Imbalance - Back Heavy	<ul style="list-style-type: none"> • Ensure Payload and CW are properly balanced, in accordance with the Operation Manual instructions 	While lift limits are turned on, an option is available (within the Settings+ page of the GUI) to enable ULTRA to auto-detect Payload/CW imbalances. The system can generally detect situations where the Payload is more than +/- 5 lbs heavy/light.
035	Central	<ul style="list-style-type: none"> • Power cycle system to 	This error occurs if the lift motor driver

	Heartbeat Timeout	<p>reset</p> <ul style="list-style-type: none"> ● Double check all cable connections 	<p>electronics are not detected in the system. This error will be triggered if the Turret is not connected to the system, or if the cable between the Base Pedestal and the Turret has failed. COM LEDs on the Turret may also help to isolate the issue. If changing the cable does not solve the issue, the electronics may have been damaged and the Turret will need to be serviced. If the COM LED on the Turret is the only one that is not on, check the Diagnostics page in the GUI. If good values are present for the lift position, there is likely a problem with the Turret electronics, which will require service. If Code 109 is also seen, there is likely a cable problem, either between the Base Pedestal and the Turret, or internal to the turret. If this issue cannot be solved by power cycling or replacing cables, a field repair can be achieved by replacing the LDU.</p>
042	Swing Motor Temp Warning	<ul style="list-style-type: none"> ● Use caution and watch motor temp ● Make sure there are no obstructions preventing the boom from swinging 	<p>The swing motor temperature has risen to a level that is higher than expected, under normal use. This is generally caused by excessive load and higher than normal current passing through the motor. If the swing motor is experiencing low to moderate use, but high ambient temperatures and direct sunlight are a factor, there is no need for concern. Do not push the system past the swing motor temp error threshold.</p>
043	Swing Motor Temp Error	<ul style="list-style-type: none"> ● Discontinue use until temp is reduced ● Make sure there are no obstructions preventing the boom from swinging 	<p>The swing motor temperature has risen to a level that is potentially dangerous to the system. This could be caused by extreme overuse, high ambient temperatures, obstruction of swing movement, or some combination of these events. Wait until the temperature has dropped below the error threshold to attempt movement again.</p>

044	Swing Motor Temp Sensor Failure	<ul style="list-style-type: none"> ● Use caution and contact MotoCrane Support ● Avoid heavy use of swing moves in high ambient temperatures 	The swing motor temperature sensor reading has been lost by the system. The most likely cause of this failure is damage to the Base internal wiring or electronics. Service on the Base by MotoCrane is required to resolve this issue. The unit can still be used with caution, but should be serviced at the earliest convenience.
047	Swing Motor Driver Temp Warning	<ul style="list-style-type: none"> ● Use caution and watch driver temp ● Make sure there are no obstructions preventing the boom from swinging 	The temperature of the swing motor driver electronics has risen to a level that is higher than expected, under normal use. This is generally caused by excessive load and higher than normal current being used by the motor.
048	Swing Motor Driver Temp Error	<ul style="list-style-type: none"> ● Discontinue use until temp is reduced ● Make sure there are no obstructions preventing the boom from swinging 	The temperature of the swing motor driver electronics has risen to a level that is potentially dangerous to the system. This could be caused by extreme overuse, high ambient temperatures, obstruction of swing movement, or some combination of these events.
049	Swing Motor Driver Temp Sensor Failure	<ul style="list-style-type: none"> ● Use caution and contact MotoCrane Support ● Avoid heavy use of swing moves in high ambient temperatures 	The swing motor driver temperature sensor reading has been lost by the system. The most likely cause of this failure is damage to the Base electronics. Service on the Base by MotoCrane is required to resolve this issue. The unit can still be used with caution, but should be serviced at the earliest convenience.
052	Swing Over-Current Warning	<ul style="list-style-type: none"> ● Use caution and observe current and temps ● Make sure there are no obstructions preventing the boom from swinging 	The swing motor current has risen to a level that is higher than expected, under normal use. This is generally caused by excessive load and higher than normal current passing through the motor.
053	Swing Over-Current Error	<ul style="list-style-type: none"> ● Discontinue use while error is active ● Make sure there are no obstructions preventing 	The swing motor current has risen to a level that is potentially dangerous to the system. This could be caused by extreme movements, obstruction of swing

		the boom from swinging	movement, or some combination of these events.
054	Swing Current Sensor Failure	<ul style="list-style-type: none"> • Use caution and contact MotoCrane Support • Avoid extreme movements of swing axis under high load 	The swing motor current sensor reading has been lost by the system. The most likely cause of this failure is damage to the Base electronics. Service on the Base by MotoCrane is required to resolve this issue. The unit can still be used with caution, but should be serviced at the earliest convenience.
058	Swing Motor Stall	<ul style="list-style-type: none"> • Disarm, power cycle, and check functionality • Make sure there are no obstructions preventing the boom from swinging 	Stall conditions are detected to prevent excessive current and temperature from damaging the motor. If the motor current is above a certain threshold for a period of time, without any movement of the motor, a stall is detected and the power to the motor is shut off. In order to attempt movement again, the joystick has to be returned to a neutral position first. If there are no obstructions preventing the boom from swinging, and this error continues to occur, this likely means there is an issue with the swing drive mechanism and the Base needs to be serviced by MotoCrane.
060	Swing IMU Warning	<ul style="list-style-type: none"> • Do not subject the system to higher forces 	This warning indicates that the G-forces experienced by the unit are slightly higher than normal. Do not attempt to subject the system to more extreme conditions than those that triggered the warning.
061	Swing IMU Error	<ul style="list-style-type: none"> • Reduce intensity of use to acceptable level 	This error indicates that the G-forces experienced by the unit are much higher than normal. Do not continue operating the unit in these extreme conditions.
062	Swing IMU Sensor Failure	<ul style="list-style-type: none"> • Use caution and contact MotoCrane Support 	The swing IMU reading has been lost by the system. The most likely cause of this failure is damage to the Base electronics. Service on the Base by MotoCrane is required to resolve this issue. The unit

			can still be used with caution, but should be serviced at the earliest convenience.
069	Swing Motor Command Timeout	<ul style="list-style-type: none"> • Power cycle system to reset • Double check all cable connections • With system Disarmed, enter the Diagnostics page of the GUI and move the swing joystick to check for motor commands 	This error indicates that the swing driver board is not receiving commands from the Controller. The most likely cause of this error is an issue with the Controller, which may be solved with a simple power cycle. If this does not resolve the issue, the Controller may have sustained damage and has stopped generating the appropriate motor commands.
072	Swing Limits Disabled From Error	<ul style="list-style-type: none"> • Power cycle and calibrate swing orientation 	This error occurs if limits are enabled, and an encoder error or failure is triggered. Because lack of reliable encoder data prevents limits from being trusted, limits are disabled and cannot be enabled again while the error persists. If power cycling the system does not eliminate the encoder error, limits will not be available until the encoder can be repaired.
075	Swing Driver Heartbeat Timeout	<ul style="list-style-type: none"> • Power cycle system to reset • Double check all cable connections 	This error occurs if the swing motor driver electronics are not detected in the system. This error will be triggered if the Base is not connected to the system, or if the cable between the PSU and the Base is disconnected or faulty. COM LEDs on the unit may also help to isolate the issue. If changing the cable does not solve the issue, the electronics may have been damaged and the Base will need to be serviced. Check the COM LED on the Base Driver Unit, as well as the COM LEDs on the Base Pedestal and the Turret. If the COM LED on the Base Driver Unit is the only one that is not on, there is likely a problem with the Base Driver Unit which requires service. If all COM LEDs are off, there is likely a problem with the cable from the PSU to the Base. If the BDU is faulty, a field

			replacement is possible - contact Customer Support.
081	Swing Encoder Data Suspect	<ul style="list-style-type: none"> • Power cycle system to reset 	This warning indicates some inconsistency in the angular position readings from the swing encoder. If the condition gets worse, the encoder will go into an error state. Limits are not allowed while this condition is active, to ensure that bad encoder values do not cause limits to fail.
082	Swing Encoder Data Invalid	<ul style="list-style-type: none"> • Use caution and contact MotoCrane Support • Try power cycling the system to reset the board 	This warning indicates that valid data is not being received from the swing encoder. Limits are not allowed while this condition is active, to ensure that bad encoder values do not cause limits to fail. The swing position gauge on the Operate page of the GUI may also be non-functional. If this error persists after multiple attempts at power cycling, the encoder electronics in the Base need to be serviced.
089	Swing Encoder Heartbeat Timeout	<ul style="list-style-type: none"> • Power cycle system to reset • Double check all cable connections 	This error occurs if the swing encoder electronics are not detected in the system. This error will be triggered if the Base is not connected to the system, or if the cable between the PSU and the Base is disconnected or faulty. COM LEDs on the unit may also help to isolate the issue. If changing the cable does not solve the issue, the electronics may have been damaged and the Base will need to be serviced. Check the COM LED on the Base Pedestal, as well as the COM LEDs on the Base Driver Unit and the Turret. If the COM LED on the Base Pedestal is the only one that is not on, there is likely a problem with the swing encoder electronics, which requires service. If all COM LEDs are off, there is likely a problem with the cable from the PSU to the Base.

101	Lift Encoder Data Suspect	<ul style="list-style-type: none"> • Power cycle system to reset 	This warning indicates some inconsistency in the angular position readings from the lift encoder. If the condition gets worse, the encoder will go into an error state. Limits are not allowed while this condition is active, to ensure that bad encoder values do not cause limits to fail.
102	Lift Encoder Data Invalid	<ul style="list-style-type: none"> • Use caution and contact MotoCrane Support • Try power cycling the system to reset the board 	This warning indicates that valid data is not being received from the lift encoder. Limits are not allowed while this condition is active, to ensure that bad encoder values do not cause limits to fail. The lift position gauge on the Operate page of the GUI may also be non-functional. If this error persists after multiple attempts at power cycling, the encoder electronics in the Turret need to be serviced.
109	Lift Encoder Heartbeat Timeout	<ul style="list-style-type: none"> • Power cycle system to reset • Double check all cable connections 	This error occurs if the lift encoder electronics are not detected in the system. This error will be triggered if the Turret is not connected to the system, or if the cable between the Base and the Turret is disconnected or faulty. COM LEDs on the unit may also help to isolate the issue. If changing the cable does not solve the issue, the electronics may have been damaged and the Turret will need to be serviced. Check the COM LED on the Turret, as well as the COM LEDs on the Base Driver Unit and the Base Pedestal. If the COM LED on the Turret is the only one that is not on, and error 035 is also seen, there is likely a cable problem between the Base Pedestal and the Turret. Otherwise, if all COM LEDs are on, and error 035 is not seen, there is likely a problem with the Turret encoder electronics which will require service.
121	System Over-Voltage	<ul style="list-style-type: none"> • Ensure correct voltage of power source 	This warning will be triggered if the system voltage is above 59V. Applying

	Warning		voltage higher than this can potentially cause system damage.
122	System Under-Voltage Warning	<ul style="list-style-type: none"> • Ensure correct voltage of power source 	This warning will be triggered if the system voltage is below 46V. Applying voltage lower than this can potentially disable the system and prevent normal operation.
123	System Over-Voltage Error	<ul style="list-style-type: none"> • Disarm system and remove power source • Ensure the proper power source is being connected 	This error will be triggered if the system voltage is above 60V. Applying a voltage higher than this will likely cause system damage or failure.
124	System Under-Voltage Error	<ul style="list-style-type: none"> • MAKE SURE CONTROLLER CABLE IS PLUGGED IN TO THE PSU 'COM' PORT, NOT 'AUX' • Otherwise, move system to safe position and disarm 	This error will be triggered if the system voltage is below 45V. Applying voltage lower than this will likely cause the system to shut down and become inoperational.
125	Joystick Failure Error	<ul style="list-style-type: none"> • Disarm and power cycle • Ensure joysticks are not being touched during Controller power-up 	This error detects joystick failure by checking for a normal operational voltage range. If the joystick outputs a higher or lower voltage than normal, for an extended period of time, it has likely failed. If power cycling does not resolve the issue, the Controller will require service to replace the faulty joystick.
126	System Over-Current Warning	<ul style="list-style-type: none"> • Use caution and observe current draw • Ensure the boom is free and clear of obstructions • Ensure payload and counterweight are balanced 	If the system current remains higher than normal for an extended period of time, this warning will become active. This is generally caused by excessive load on the system and higher than normal current passing through the motors.
127	System Over-Current Error	<ul style="list-style-type: none"> • Discontinue use while error is active • Ensure the boom is free 	The system current has risen to a level that is potentially dangerous to the system. This could be caused by extreme

		<p>and clear of obstructions</p> <ul style="list-style-type: none"> • Ensure payload and counterweight are balanced 	<p>movements, imbalanced load, obstruction of swing or lift movement, or some combination of these events. If intense movement was not the trigger of this event, there may be a short circuit in the system and further diagnosis and service will be required.</p>
128	System Current Sensor Failure	<ul style="list-style-type: none"> • MAKE SURE CONTROLLER CABLE IS PLUGGED IN TO THE PSU 'COM' PORT, NOT 'AUX' • Otherwise, contact MotoCrane Support 	<p>The system current sensor reading has been lost. The most likely cause of this failure is damage to the PSU or Controller electronics. Service on both of these units by MotoCrane is required to resolve this issue. The unit can still be used with caution, but should be serviced at the earliest convenience.</p>
129	Lift Joystick Initialization Failure	<ul style="list-style-type: none"> • Power cycle system with joysticks neutral 	<p>If the joysticks are not in the neutral position when the system is initialized, the Controller will take action to prevent unintended movement of the system. A power cycle will be required after this error, to reset the system. If the error persists, the joystick or Controller internal wiring may be faulty and require service by MotoCrane.</p>
130	Swing Joystick Initialization Error	<ul style="list-style-type: none"> • Power cycle system with joysticks neutral 	<p>If the joysticks are not in the neutral position when the system is initialized, the Controller will take action to prevent unintended movement of the system. A power cycle will be required after this error, to reset the system. If the error persists, the joystick or Controller internal wiring may be faulty and require service by MotoCrane.</p>
131	Controller Heartbeat Timeout	<ul style="list-style-type: none"> • Power cycle system to reset • Double check all cable connections 	<p>This error occurs if the Controller is not detected in the system. This error will be triggered if the Controller is not connected to the system, or if the cable between the PSU and the Controller is disconnected or faulty. The GUI Diagnostics page may help in isolating the issue. If there are no values (zero) for</p>

			speed, smooth, and motor commands, on both swing and lift, the Controller electronics are not working properly. If a power cycle does not solve the issue, the Controller is likely faulty and will require service. The Controller Board can be replaced to solve this issue.
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If these steps don't fix your problem, please contact us at support@motocrane.com. We can help troubleshoot and diagnose the issue. If we determine that a manufacturing defect exists in a part and it is covered under the Limited Warranty, we will repair the unit at no cost to you. If your system is experiencing general wear and tear, we can advise what options exist to get your system back to 100%. This includes sub-assembly upgrades, component replacement, or sending your unit back to MotoCrane Headquarters for a tune up.

Revision History

Revision	Date	Description
1.0	01NOV19	Initial Release
2.0	01JUL20	Added info to Appendix 1 and additional diagnostic steps

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This content is subject to change.

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If you have any questions about this document, please contact MotoCrane, LLC by sending a message to contact@motocrane.com.

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