



# MCS – Magnum Error / Alarm Manual

[www.drakechillers.com](http://www.drakechillers.com)

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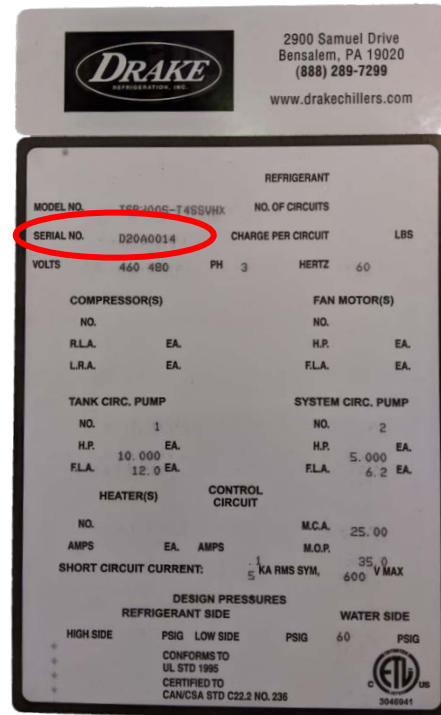
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# General Troubleshooting

1. Before calling Drake, make sure you:
  - a. Have ready:
    - i. Chiller’s serial number (located on the exterior of the chiller, inside the electrical panel door, and, on the sticker shown to the right)
    - ii. Multimeter
    - iii. Ambient readings, temperature probes, and pressure transducers
    - iv. Small flathead screwdriver
    - v. Laptop, for in-depth diagnostics using MCS-Connect
    - vi. An RS-485 to USB cable (shipped in the manilla folder with the chiller)
  - b. Check all fuses
  - c. Check fluids
    - i. Verify freeze point
    - ii. Check tank level
  - d. Make sure unit is correctly wired (no loose wires) and receiving power matching that found on the data tag
2. For component locations, refer to the included wiring and piping diagrams



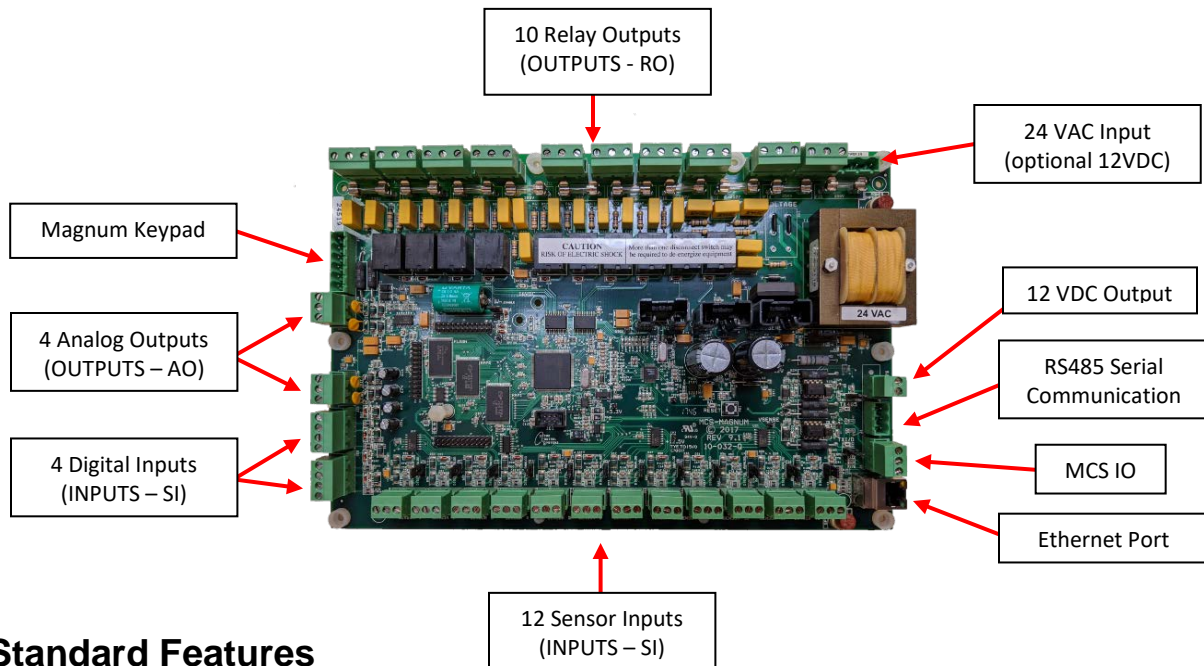
**WARNING!**



Make sure to shut down AND disconnect chiller, waiting for ALL displays or indicator lights to turn off, BEFORE making wiring changes or replacing fuses

Failure to follow could result in serious injury or death

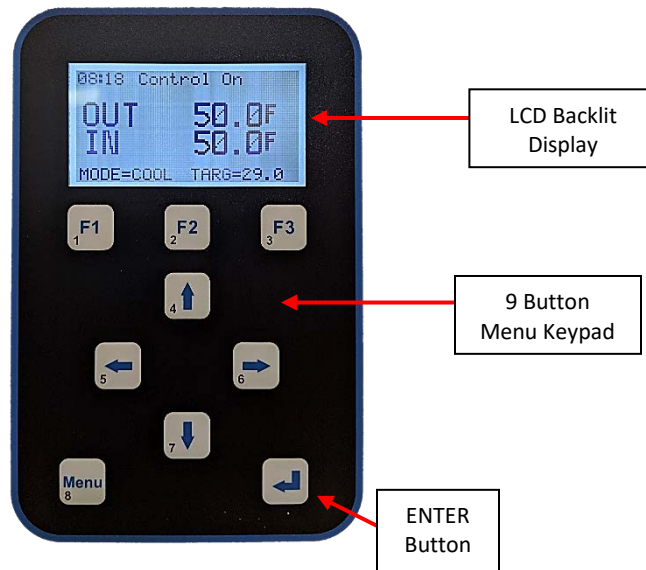
# Microprocessor Features



## Standard Features

- Operates within +/- 0.1°F accuracy
- Powered from chiller 24 VAC (or 12 VDC) control circuit, eliminating high voltage interference
- Can support up to 20 compressors
- Can be set up to use either °F or °C and PSI or Bar
- Can control chiller using inlet or outlet temperature
- Compressor short-cycling reduction to increase compressor lifespan
- Compressor pump-down capability
- Alarm lockouts for chiller protection
- Automatic compressor lead-lag on dual circuit chillers
- Basic chiller functionality for easy setup and operation
- Custom factory configurations
  - Programmable for VFDs
  - Programmable for EC fans
- Two RS-485 serial communication ports and one ethernet port
- Can communicate with Modbus RTU or BACnet/IP
- Wet contact supply for field-installed Run / Stop switch
- Dry contact for alarm output
- Scheduled shutdown capabilities
- Integrates with MCS-Connect, a simple, free to use chiller monitoring computer software
- Custom programmable control logic (call Drake for more information)
- Remote control capabilities
- Expansion boards for additional inputs and outputs
- Can add Gateway Card for BACnet MSTP, LonTalk, and Johnson N2

# Display Features



## Standard Features

- LED-backlit display with a 9-button navigation menu
  - Displays current unit status and lockout alarms
  - Displays full range of sensor inputs, relay outputs, and setpoints
  - Suction / discharge pressure and superheat monitoring
  - Monitors compressor runtime and cycles per day
- Data logging capabilities, setpoint changes, and sensor calibration
- Alarm history of previous 99 alarms and events
- Capable of extracting data from the last 90 minutes of runtime
- Password authorization for setpoint changes
- NEMA4 gasket seal for extreme weather protection
- Saves operational data of last five alarms

## Note

All changes, modifications, and alarm resets require a supervisor password (2112) to be entered first

# Magnum Unit States

## 1. Unit in Power Up

A 60-second delay (configurable) during chiller startup in which all Relay Outputs are shut off and ensures the board is receiving stable power.



## 2. Scheduled Off

When the unit is shut off due to a user set schedule, the unit displays this status. In this state, all relays are disabled, and their statuses will read "OFF." The schedule can be viewed or modified in the Service Tools menu.





## Magnum Unit States

### 3. Run/Stop Switch Off

This status is displayed when the Run/Stop Switch has been turned off. In this state, all relays are disabled, and their statuses will read “OFF.”

To enable the Run/Stop, refer to Appendix E.



### 4. Off – No Flow

This status is displayed when the Flow Switch does not detect any flow through the evaporator. In this state, all relays are disabled until flow is reestablished, and their statuses will read “OFF.”



## Magnum Unit States

### 5. No Run – I/O Lost

This state is displayed when the connection with an expansion board (whether a relay or sensor expansion board) has been lost. The board will keep trying to reconnect and will display a LOST I/O RESTART if it reconnects to board. In this state, all relay outputs except the alarm relay will be turned off.



### 6. Unit is Holding

This state is displayed when:

- The unit is at the target temperature, and is maintaining the temperature
- The unit temperature is above the target, but no additional cooling levels are needed because Setpoint #27 is satisfied
- The unit temperature is below the target, but the current level of cooling is adequate because Setpoint #28 is satisfied



**Magnum Unit States**

## 7. Unit Unloading

This state is displayed when the unit needs fewer cooling levels. The system will then start to decrease in capacity by turning off compressors or, if applicable, turning on compressor unloader valves.



## 8. Unit is Loading

This state is displayed when the unit needs more cooling levels. The unit will then start to increase in capacity by turning on compressors or, if applicable, turning off compressor unloader valves.



## Magnum Unit States

### 9. Unit is Unloaded

This state is displayed when all possible levels of cooling have been disabled, and thus the unit is no longer running. All compressors will be shut off in this state. No cooling is currently required but the unit is ready to react to any cooling requirements



### 10. Unit is Loaded

This state is displayed when all possible levels of cooling are active, and thus the unit is running at full capacity. All compressors will be running in this state.



# Magnum Unit States

## 11. Unit in Lockout

This state is entered whenever a critical situation is encountered that could cause harm to the chiller. In this state, all Relay Outputs except the alarm and pumps are turned off and will read "LOCKOUT."

Lockouts can be reset from the keypad or with the MCS-Connect program; however, if the lockout condition has not been corrected, the system will again be forced into this state.

Note - If the Lockout Reset is used more than 6 times in one day, the unit cannot be reset except with Factory authorization. Call Drake for support.



Note: Supervisor password (2112) is required to reset lockouts


# Magnum Alarms

## 1. Freeze

This alarm will trip if the fluid out temperature drops below the value of Setpoint #111. The chiller will lockout and all Relay Outputs will be disabled to avoid damage to the chiller.



Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
Sensor Fault / Calibration on fluid out	See Appendix B to troubleshoot
Setpoint #111 is incorrect for operating conditions	Change setpoint to a lower value <b>IMPORTANT!</b> If supply fluid is water, do NOT change setpoint to a value lower than 40°F (4.5°C) as the liquid may freeze and cause severe damage to the chiller!
Ambient temperature is cold enough to affect fluid temperatures	Verify insulation thickness is suitable for the lowest ambient operating temperature Add more glycol to lower freezing point, and then adjust Setpoint #111 accordingly
Lack of flow through the evaporator	Check that all valves are opened and that there are no blockages or restrictions in the y-strainer (shown to the right) or process plumbing 



**Magnum Alarms**

## 2. Low Suction Superheat

This alarm will trip if the suction superheat falls below the value of Setpoint #17 for a configurable time. When suction superheat drops too low, liquid refrigerant could enter the compressor, causing damage. If the compressor has low suction superheat, a LO SUPERHEAT alarm will display. The unit will attempt to run again after a few minutes, but another trip within the next hour will result in a lockout.



Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
Sensor Fault / Calibration on suction pressure or temperature	See Appendix B to troubleshoot
Lack of a load	Verify the chiller has a heat load
Lack of fluid flow	<p>Confirm active flow to the chiller</p> <p>Ensure y-strainer (shown to the right) and process plumbing are free of blockages or restrictions, and that all ball valves are opened</p> 
TXV	<p>Verify superheat reading with physical gauges</p> <p>Adjust the TXV (shown to the right)</p> <p>Replace if not responding to adjustments</p> 
Refrigerant Overcharge	Contact Drake

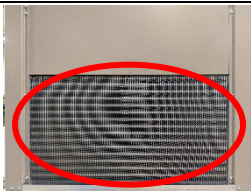
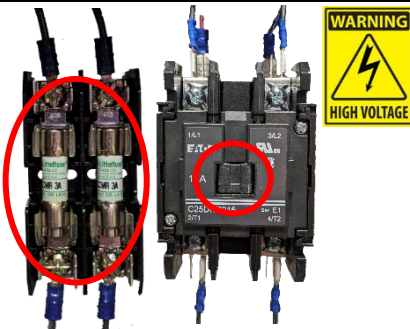
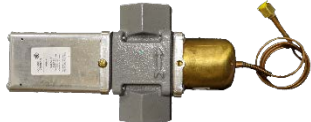
# Magnum Alarms

## 3. High Discharge Pressure



This alarm will trip if the discharge pressure rises above the value of Setpoint #81. If the compressor has high discharge pressure, it locks out the compressor and the HI DISC PSI alarm will display.

Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions	
Sensor Fault / Calibration on discharge pressure	See Appendix B to troubleshoot	
Condenser panels removed	Replace the panels on the chiller	
Condenser dirty or damaged (Air-cooled)	Clean or replace condenser coils (shown to the right)	
Condenser blocked (Air-cooled)	Poor installation location (overhang, other equipment installed too close, wall, fence or other object is within 3' of the chiller blocking airflow)	
Fans not running (Air-cooled)	Verify fuses are not blown (left picture) Carefully, with ONLY an insulated screwdriver, bump the condenser contactor at the circled spot to see if fans turn on (right picture)	
Restriction in cooling water (Water-cooled)	Confirm that all valves are opened Adjust regulator (shown to the right)	
Refrigerant Overcharge	Contact Drake	



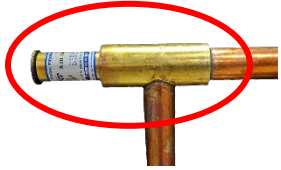
**Magnum Alarms**

# 4. Low Discharge Pressure



This alarm will trip if the discharge pressure drops below the value of Setpoint #85. If the compressor has low discharge pressure, it will lockout and display the LO DISC PSI alarm.

Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
Sensor Fault / Calibration on discharge pressure	See Appendix B to troubleshoot
Condenser fans not cycling properly	Check Setpoint #85 to ensure enough head pressure is being built
Flooded head pressure controls (Receivers only)	Adjust the ORI valve (shown to the right) for a higher receiver pressure setting 
Refrigerant charge is low	Check for refrigerant leak Contact Drake to determine the charge

# Magnum Alarms




## 5. Low / Unsafe Suction Pressure



Note: Supervisor password (2112) is required to reset lockouts

The low suction pressure alarm will trip if the suction pressure drops below the value of Setpoint #77 for a configurable time. If the compressor has low suction pressure, it will lockout and display the LOW SUCTION alarm.

The unsafe suction pressure alarm will trip if the suction pressure drops below the value of Setpoint #80. This alarm warns of critically low suction pressure and will lockout the compressor on that circuit.

Possible Causes	Solutions
Sensor Fault / Calibration on suction pressure	See Appendix B to troubleshoot
Liquid line blocked/restricted	<p>Check that all valves are open between the condenser and TXV, and that filter dryer (shown to the right) is not blocked</p>  <p>Ensure TXV is opening and is set properly</p>
Lack of load/flow	<p>Ensure y-strainer (shown to the right) and process plumbing are free of blockages or restrictions, and that all ball valves are opened</p>  <p>Ensure heat load is present</p>
Setpoint #77 is incorrect for operating conditions	Check with Drake, then change setpoint to a lower value
Defective TXV valve	<p>Shut down system, fully backseat TXV (shown to the right), then front-seat TXV. Set TXV back to the operating position. If operating problems persist, call Drake</p> 
Refrigerant charge is low	<p>Check for refrigerant leak</p> <p>Contact Drake to determine the charge</p>

**Magnum Alarms**

**6. No Flow**

This alarm will trip if the Flow Switch on the evaporator detects no flow. With this alarm tripped, the compressors will shut down and stay off until flow is reestablished. All outputs are disabled except for the pumps.



Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
<p>Flow switch is not reading</p>	<p>The flow switch (top photo) is out of adjustment. Isolate, then remove from the pipe and clean sensor</p> <p>Air is present in the chilled fluid lines. Purge air from the system</p> <p>No fluid in the tank or low fluid levels</p> <p>Ensure y-strainer (bottom photo) and process plumbing are free of blockages or restrictions, and that all ball valves are opened</p> <p>Check for a loose wire on flow sensor terminal block, and check that Magnum is outputting 5VDC</p> <div data-bbox="1149 877 1382 1062" style="float: right;"> </div> <div data-bbox="1154 1125 1354 1297" style="float: right;"> </div>
<p>Pump not operating correctly</p>	<p>Verify pump is running</p> <p>Check for any blown fuses (left photo)</p> <p>Verify that the overload relay has not been tripped (right photo, reset button circled)</p> <p>Check pump phasing to ensure it is rotating in the proper direction</p> <div data-bbox="1081 1507 1227 1793" style="float: right;"> </div> <div data-bbox="1256 1423 1419 1793" style="float: right;"> </div>

# Magnum Alarms

## 7. Phase Loss

This alarm will trip if the chiller has lost phase, forcing the chiller to temporarily shut down until any faults are cleared on the phase monitor. All relay outputs will shut off except the alarm.



Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions	
<p>Problem with 24VAC</p>	<p>Check transformer output to make sure it is outputting 24VAC to the phase monitor. If not, make sure the transformer inputs are set up for the correct line voltage</p> <p>Verify that all wires are connected securely to the transformer and the phase monitor</p> <p>Check for any blown fuses (left photo)</p>	
<p>Problem with 5VDC Magnum output</p>	<p>Ensure Magnum is outputting 5VDC from the sensor terminal</p> <p>If Magnum is not outputting 5VDC, call Drake for assistance</p>	
<p>Fault on Phase Monitor</p>	<p>See Appendix C to troubleshoot (Phase monitor is shown to the right)</p>	



**Magnum Alarms**

# 8. Emergency Stop

This alarm will display when the Emergency Stop Switch has been turned on. All relays, other than the alarm, will be shut off and the unit will be locked out



Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
Remote or digital emergency stop switch turned ON	Verify unit is safe to operate  Turn either the remote switch (if installed) OFF or set the value of the digital switch to MANOFF (see Appendix E)  Reset lockouts on the unit

# Magnum Alarms

## 9. Low Discharge Superheat



This alarm will display when the discharge superheat drops below the value of Setpoint #84 for an adjustable time (found in the Setpoint). If the circuit has low discharge superheat, the compressor for that circuit will be locked out.

Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions	
Sensor Fault / Calibration	See Appendix B to troubleshoot	
Compressor not running when there is a call for cooling	Verify fuses are not blown (left picture)  Verify contactors are working properly (right picture)  Ensure Magnum relay output is working correctly (see Appendix A: Relay Output Errors)  Verify all wiring is correct	
Setpoint #84 is not properly adjusted	Change the time in the Setpoint to allow the compressor more time to raise the discharge superheat	
Liquid refrigerant entering compressor	Take a manual superheat reading and verify sensor accuracy	
Liquid injection not functioning properly	Call Drake	

**Magnum Alarms**

# 10. High Discharge Temperature



This alarm will display when the discharge temperature is above the value of Setpoint #87 for an adjustable time (found in the Setpoint). If the circuit has a high discharge temperature, the compressor for that circuit will be locked out.

Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
Sensor Fault / Calibration	See Appendix B to troubleshoot
Lack of load	Unit running unloaded for an extended period
High Ambient (for most chillers, above 95°F)	
Moisture present in system	Check sight glass for moisture. If present, call Drake
Lack of oil / bad oil quality	Fill oil to compressor manufacturer's specifications Replace oil in compressor
Higher than normal fluid temperatures	Call Drake
Liquid injection not functioning properly	Call Drake

## Magnum Alarms

# 11. Compressor Fault / Compressor Proof

HI MOTOR TEMP will display when the motor temperature rises above the value of Setpoint #95 for an adjustable time (found in the Setpoint). If a circuit has a high motor fault, that circuit will be locked out.

NO COMP PROOF will display when a compressor is called to be on, but the compressor proof digital input is OFF for a configurable amount of time (Setpoint #96). If this alarm occurs, the circuit with that compressor will be locked out.



Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
Sensor Fault / Calibration	See Appendix B to troubleshoot
Unit running unloaded for an extended period due to lack of load	Adjust Setpoints #1 - #3 to cycle the compressor off
Moisture present in system	Check sight glass for moisture. If present, call Drake
Fault from compressor motor module	Check fault code
Higher than normal fluid temperatures	Call Drake
Liquid injection not functioning properly	Call Drake



**Magnum Alarms**

# 12. High Motor Amperage

This alarm will display when the compressor amperage rises above the value of Setpoint #75 for an adjustable time (found in the Setpoint). If this alarm occurs, the circuit that the compressor is on will lockout.



Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
Sensor Fault / Calibration	See Appendix B to troubleshoot
Moisture in system	Check sight glass for moisture. If present, call Drake
Liquid refrigerant in compressor during startup	The crankcase has failed. Replace the compressor crankcase
System overcharged	Call Drake

# Magnum Alarms

## 13. Low Motor Amperage

This alarm will display when the compressor amperage drops below the value of Setpoint #76 for an adjustable time (found in the Setpoint). If this alarm occurs, the circuit that the compressor is on will lockout.

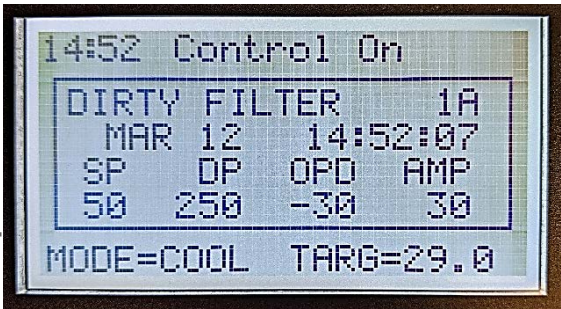


Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions	
Sensor Fault / Calibration	See Appendix B to troubleshoot	
Compressor not running when called	<ul style="list-style-type: none"> <li>Verify fuses are not blown (left picture)</li> <li>Verify contactors are working properly (right picture)</li> <li>Ensure Magnum relay output is working correctly (see Appendix A: Relay Output Errors)</li> <li>Verify all wiring is correct</li> </ul>	
Low refrigerant charge	Call Drake	

**Magnum Alarms**

# 14. Dirty Oil Filter and Low / Unsafe Oil Differential



DIRTY FILTER will display when the difference between the discharge pressure and the oil pressure is above the value of Setpoint #97 for an adjustable time (found in the Setpoint).

Note: Supervisor password (2112) is required to reset lockouts

LOW DIF PSI is displayed when the difference between the oil pressure and the suction pressure of the compressor drops below Setpoint #91 for an adjustable time (found in the Setpoint).

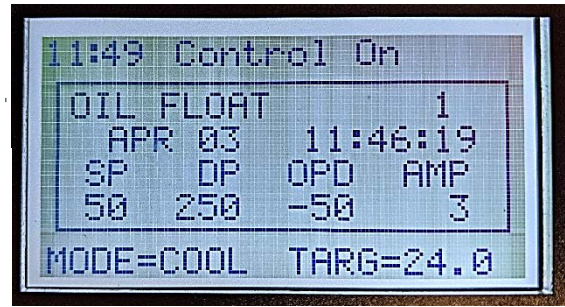
UNSAFE DIF displays when the difference between the oil pressure and the suction pressure of the compressor drops below the value of Setpoint #92 for an adjustable time (found in the Setpoint). If this alarm occurs, the circuit the compressor is on will lockout.

Possible Causes	Solutions
Sensor Fault / Calibration	See Appendix B to troubleshoot
Low oil pressure differential	Check oil filter Check oil level Increase time delay of corresponding Setpoint Make sure oil line ball valves are open and that oil line solenoids are functioning properly
Poor oil quality	Replace oil to compressor manufacturer's specifications

## Magnum Alarms

# 15. Oil Float

This alarm displays when the digital input for oil float is ON for an adjustable time (found in Setpoint #139).



Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
Sensor Fault / Calibration	See Appendix B to troubleshoot
Low oil level	Check compressor oil level Adjust Setpoint #139 for longer time before trip

**Magnum Alarms**

# 16. Sensor Fault

This alarm will occur whenever a sensor input is not receiving any feedback from its sensor. If a sensor or wire is disconnected from the Magnum, the input will read -99.9 and if a sensor is shorted, it will read 999.9.

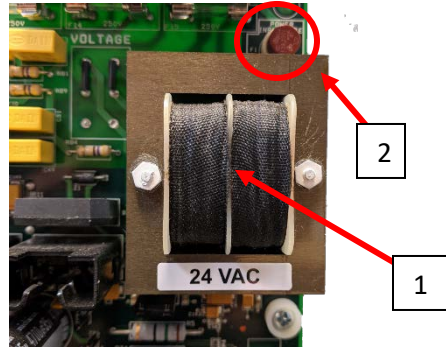

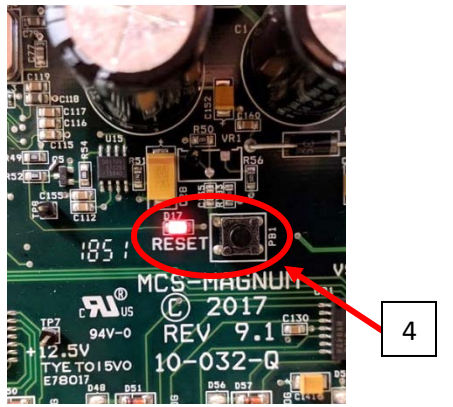


Note: Supervisor password (2112) is required to reset lockouts

Possible Causes	Solutions
Sensor Fault / Calibration	See Appendix B to troubleshoot

# Appendix A

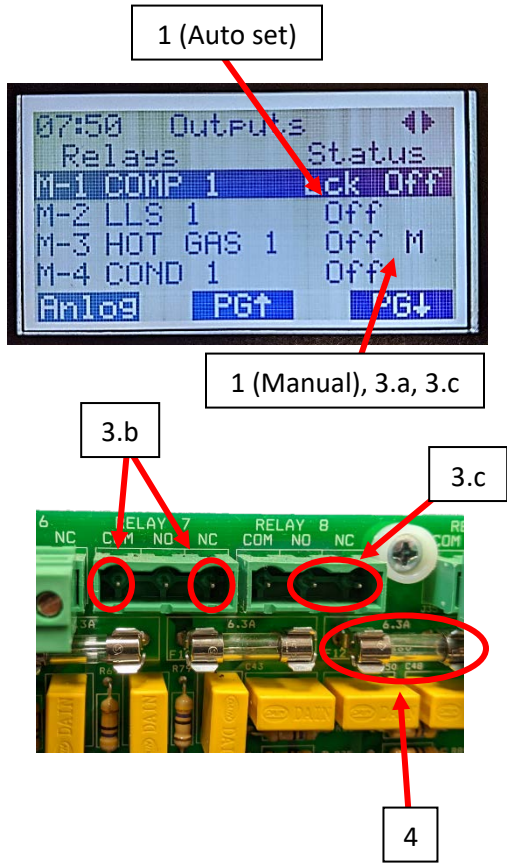
## Magnum Board Troubleshooting

Dead board	
<ol style="list-style-type: none"> <li>1. Verify board is receiving power and that it is at the right voltage (either 24 VAC or 12 VDC). The board is 24 VAC if transformer shown to the right is on board, otherwise, the board is 12 VDC</li>   <li>2. If the board is 24 VAC, check to make sure Power Input Fuse is not blown</li>   <li>3. Make sure green 16 VDC light is on. If not, call Drake</li>   <li>4. Check to see if red Reset Light is always on                         <ol style="list-style-type: none"> <li>a. If it is, press the Reset Button</li> <li>b. If problem not resolved, unplug the board's power for 10 seconds and then plug it back in</li> <li>c. If still unresolved, call Drake</li> </ol> </li>   <li>5. Make sure LCD backlight on the keypad is lit up. If not, call Drake</li>   <li>6. Call Drake for assistance</li> </ol>	  

**Appendix A**

**Relay Output Errors**

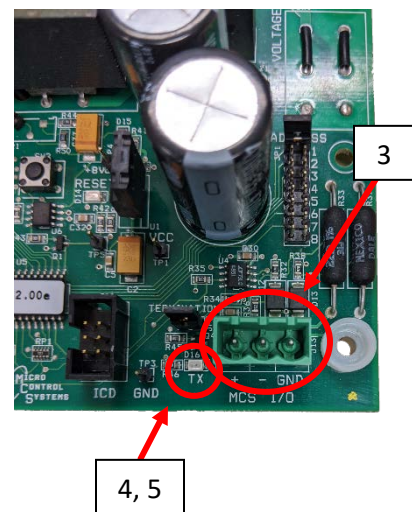
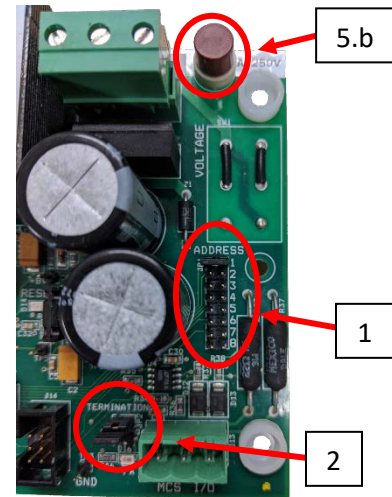
1. Make sure all relays are set to auto and not set to a manual output
2. If no relays are working:
  - a. Disconnect board power for 10 seconds and plug it back in
3. If only one bad relay:
  - a. Remove wires from relays connector and set relay output to MANOFF\*\*
  - b. Measure the resistance between COM and NC. Ensure resistance is below 1 ohm
  - c. Set relay output to MANON\*\*. Ensure the resistance between COM and NO is below 1 ohm
4. Make sure the relay output fuse is not blown
5. Call Drake for assistance



# Appendix A

## Lost I/O Communications

1. Verify all address jumpers are in the correct place
2. Ensure termination jumper is on first and last boards only
3. Verify MCS I/O wiring is correct between boards
4. Make sure TX I/O light is blinking on the Magnum board. If not:
  - a. Turn magnum power off for 10 seconds and power back on
  - b. If still unresolved, call Drake
5. Verify TX light is on for at least one expansion board. If not, go to board without TX light and:
  - a. Check board power at input block
  - b. Check AC input fuse
  - c. Replace expansion board
6. Call Drake for assistance





# Appendix A

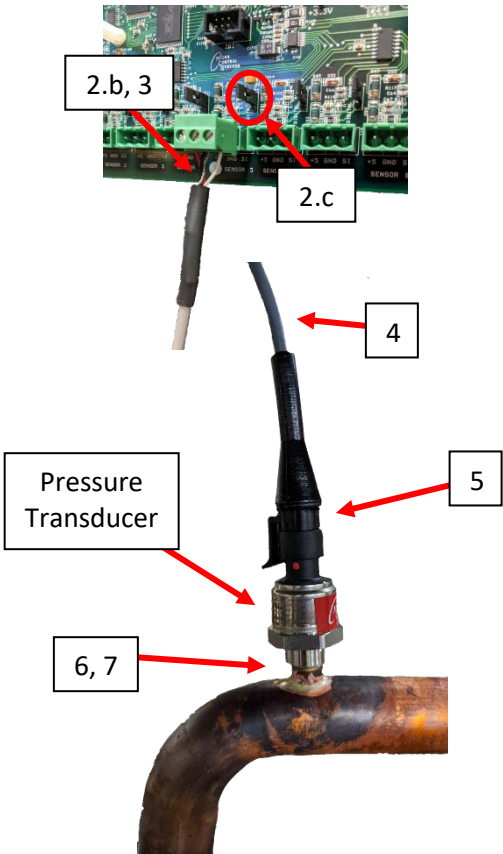
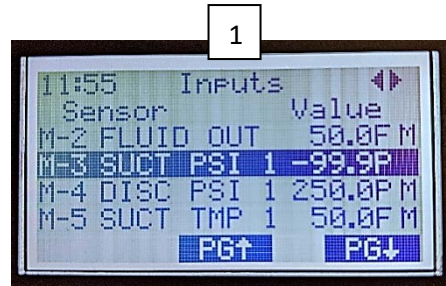
Dead Keypad	
<ol style="list-style-type: none"><li>1. Remove keypad wire for 30 seconds, then plug it back in</li><li>2. Check keypad wire for any damage and continuity</li><li>3. Check keypad for moisture<ol style="list-style-type: none"><li>a. If moisture is present, replace keypad and seal electrical box</li></ol></li><li>4. Ensure Magnum is outputting +12VDC</li><li>5. If unit is still running with keypad off:<ol style="list-style-type: none"><li>a. Connect Magnum to MCS-Connect using an RS-485 cable</li><li>b. Verify unit is running properly without keypad being on<ol style="list-style-type: none"><li>i. If not, go to Appendix A: Dead Board to troubleshoot</li><li>ii. If it is, replace the keypad</li></ol></li></ol></li><li>6. Call Drake</li></ol>	

# Appendix B

## Diagnosing Sensor Errors

### Pressure Sensor

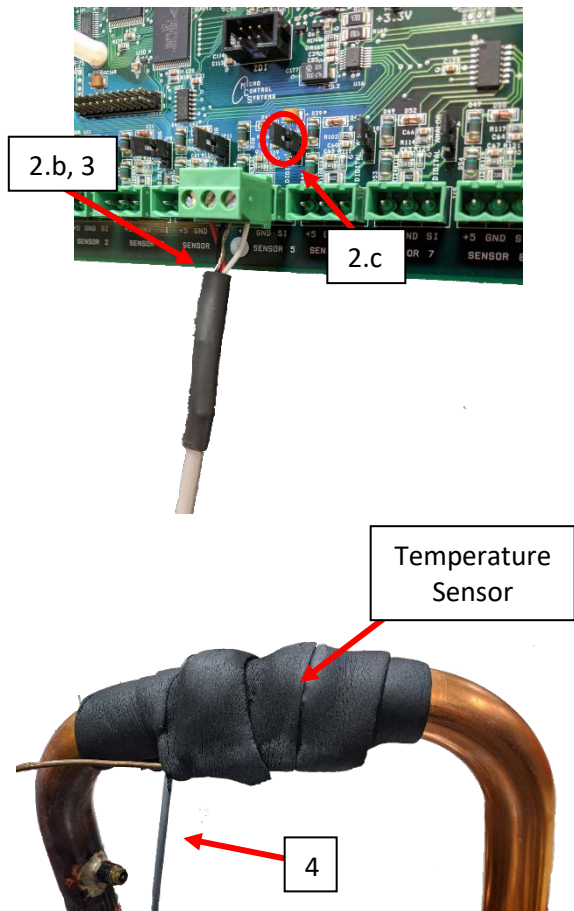
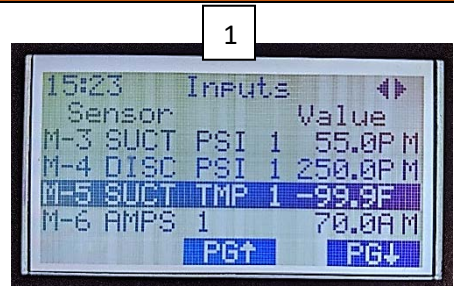
1. Check sensor inputs. If the sensor is reading a value of -99.9 (sensor or wire disconnected, the value is shown to the right) or 999.9 (shorted wire), jump to step 2b
2. Verify sensor accuracy
  - a. Verify sensor with refrigerant pressure gauges
  - b. Ensure the Magnum is outputting +5VDC at the "+5" sensor input port (measured between "+5" and "GND")
  - c. Make sure sensor is set to analog "A"
3. Check for loose wire on sensor terminal block of Magnum and verify wiring is in the correct sequence (see Sensor Wiring section on page 35)
4. Check the sensor cable for any signs of damage
5. Ensure sensor harness is securely connected to the pressure transducer
6. Verify that pressure sensor is completely screwed into Schrader valve on the pipe
7. Check to make sure Schrader valve is depressing
8. Call Drake for assistance



Appendix B

Temperature Sensor

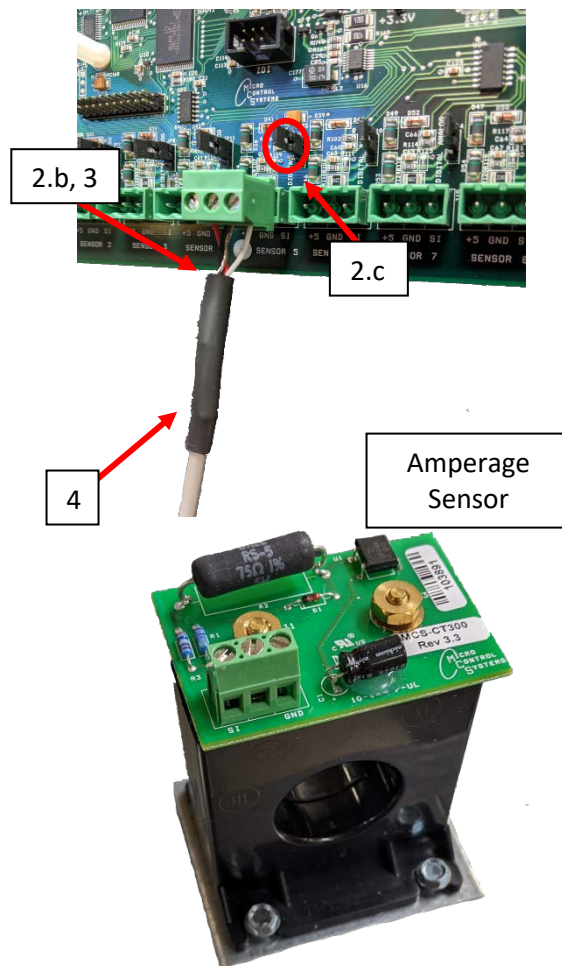
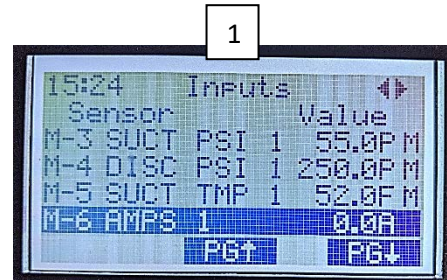
1. Check sensor inputs. If the sensor is reading a value of -99.9 (sensor or wire disconnected, the value is shown to the right) or 999.9 (shorted wire), jump to step 2b
2. Verify sensor accuracy
  - a. Verify sensor with temperature probe
  - b. Ensure the Magnum is outputting +5VDC at the “+5” sensor input port (measured between “+5” and “ $\perp$ ”)
  - c. Make sure the sensor is set to analog “A”
3. Check for loose wire on sensor terminal block of Magnum and verify wiring is in the correct sequence (see Sensor Wiring section on page 35)
4. Check the sensor cable for any signs of damage
5. Call Drake for assistance



## Appendix B

### Amperage Sensor

1. Check sensor inputs. If the sensor is reading a value of 0.0 while the compressor is running (sensor or wire disconnected, the value is shown to the right) or 999.9 (shorted wire), jump to step 2b
  
2. Verify sensor accuracy
  - a. Verify sensor with ammeter  
**WARNING! HIGH VOLTAGE**
  
  - b. Ensure the Magnum is outputting +5VDC at the “+5” sensor input port (measured between “+V” and “ $\perp$ ”)
  
  - c. Make sure the sensor is set to analog “A”
  
3. Check for loose wire on sensor terminal block of Magnum and verify wiring is in the correct sequence (see Sensor wiring on page 35)
  
4. Check the sensor cable for signs of damage
  
5. Call Drake for assistance

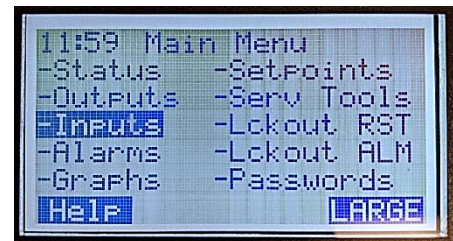


**Appendix B**

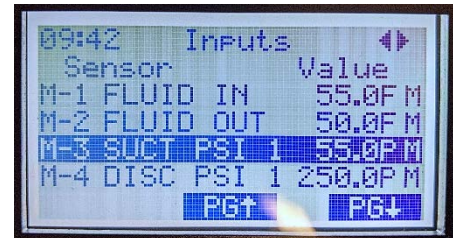
# Calibrating Sensors

1. Connect **Physical Gauges** and compare the values to the ones connected to the Magnum. If the values are **within ±5**, continue to **Step #2**. Otherwise, replace the sensor

2. After entering the **Supervisor Password** (Appendix D), press the **Menu** button on the keypad. Navigate to the **“Inputs”** menu and press



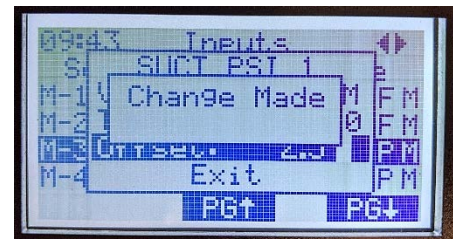
3. Using the **▲/▼** buttons, highlight the sensor that needs to be calibrated and press



4. The following screen will appear. Press **▲/▼** on the keypad to get to **“Offset”**, then press **PG↑**. Use the **PG↑/PG↓** buttons to change to **MANOFF**. Press **PG↓** when finished

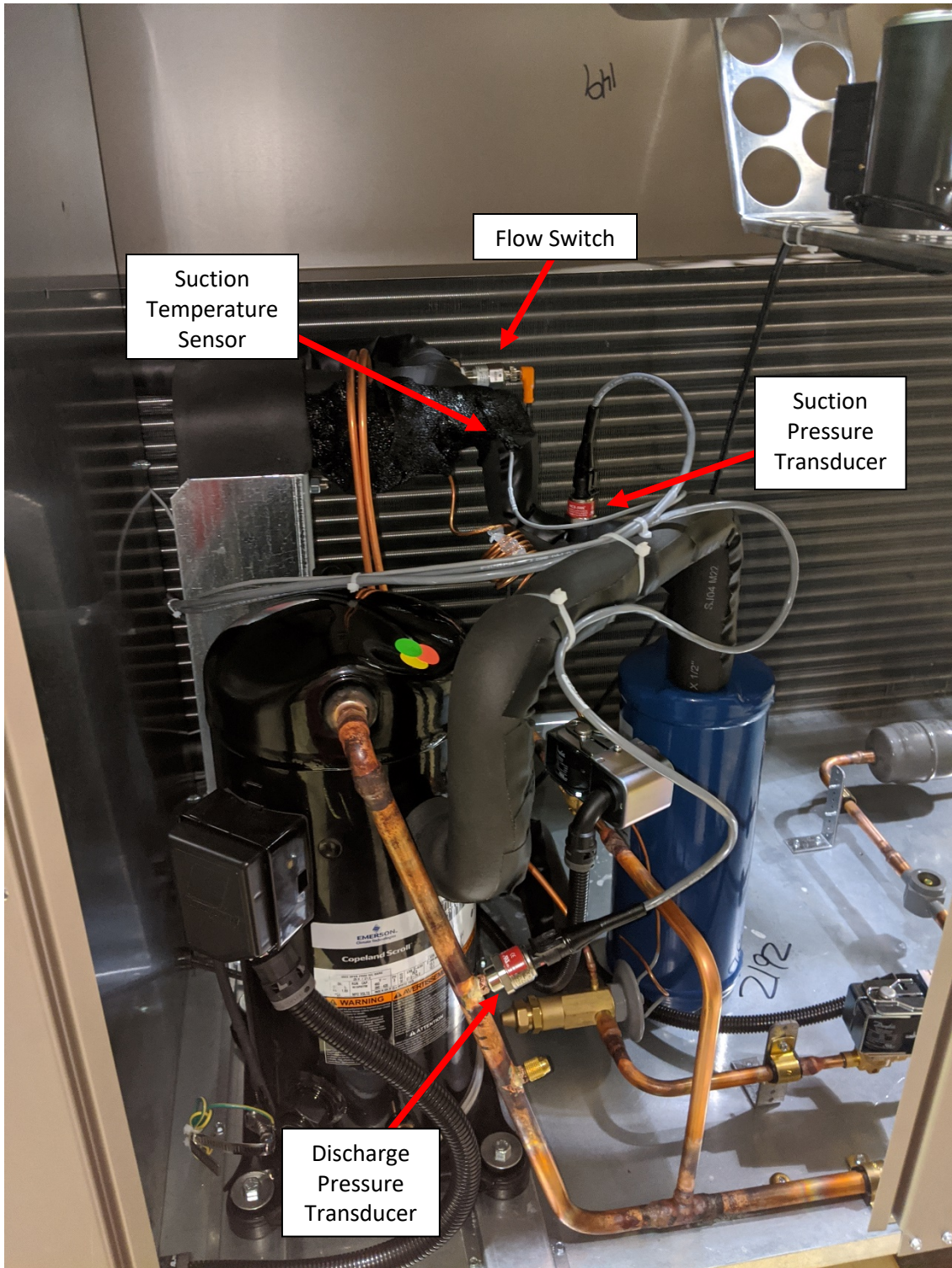


5. Press the **Menu** button to return to the **“Main Menu”**. The unit should now start powering back up if there are no current alarms



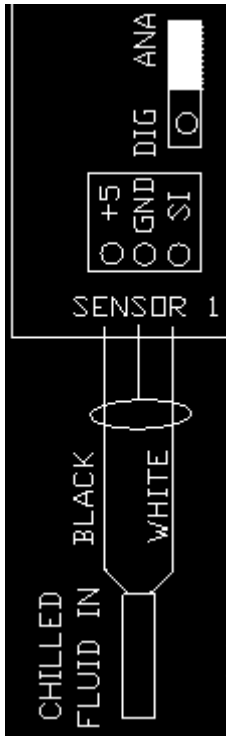
# Appendix B

## Sensor Locations

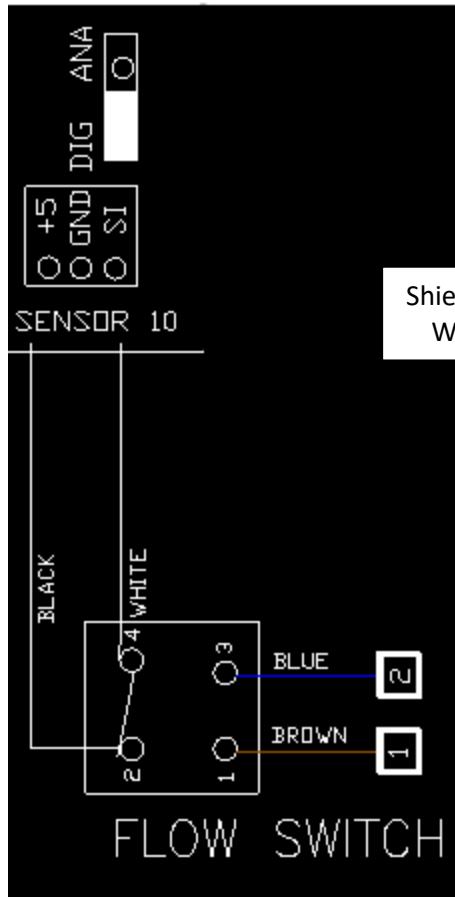


**Appendix B**

### Sensor Wiring

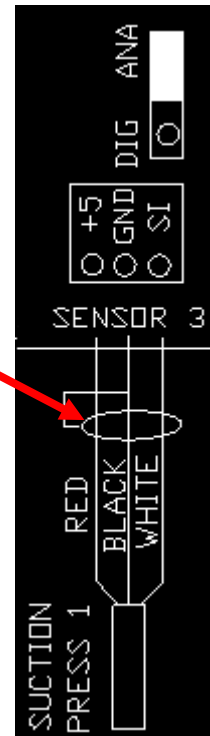


Temperature Sensor Wiring Diagram

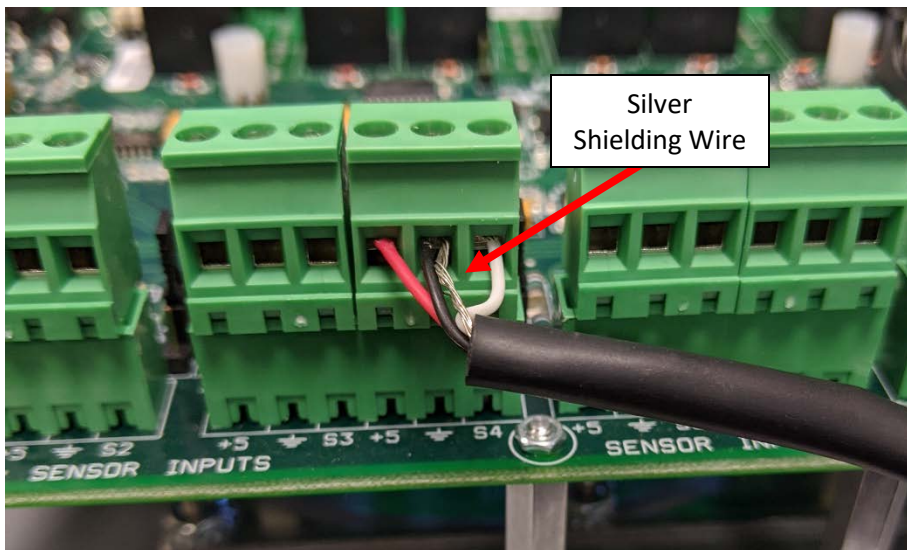


Flow Switch Wiring Diagram

Shielding Wire



Pressure Transducer Wiring Diagram



Example Sensor Wiring (Pressure Transducer)

# Appendix C

## Phase Monitor Faults

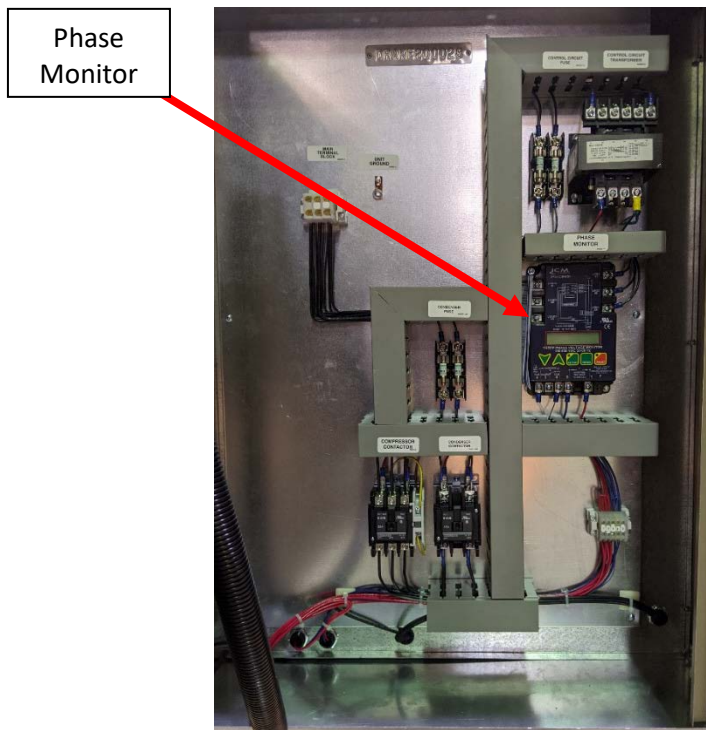
Fault	Solutions
<p><b>Back Phase Loss</b> Missing phase on the load side</p>	<ol style="list-style-type: none"> <li>1. Re-energize the contactor</li> <li>2. If the fault reappears after the load energizes:               <ol style="list-style-type: none"> <li>a. Turn all power OFF</li> <li>b. Check all load side connections</li> <li>c. Check the contacts of the contactor for debris or excess carbon</li> </ol> </li> </ol>
<p><b>Back Phase Rev</b> Load phases not shifted by 120°</p>	<ol style="list-style-type: none"> <li>1. Turn OFF all power</li> <li>2. Swap any 2 phases on the load side of the phase monitor</li> <li>3. Re-apply power</li> </ol>
<p><b>Back Phase Unbalance</b> Voltage unbalance between load phases</p>	<ol style="list-style-type: none"> <li>1. Press the READ button to observe the present load voltages. Check system for unbalance cause</li> <li>2. Increase the fault interrogation time if necessary</li> <li>3. Increase the percent unbalance setting if necessary</li> </ol>
<p><b>Front Over Voltage</b> Average phase voltage above maximum</p>	<ol style="list-style-type: none"> <li>1. Check system for over-voltage cause</li> <li>2. Increase the percent over-voltage setting if necessary</li> <li>3. Increase the fault interrogation time if necessary</li> </ol>
<p><b>Front Phase Loss</b> Missing phase on the line side</p>	<ol style="list-style-type: none"> <li>1. Press and hold the READ button on the phase monitor or use an AC voltmeter to carefully measure all three phase-phase line voltages (example: Line 1 Line 2, Line 2 Line 3, Line 3 Line 1)</li> <li>2. Repair the missing phase</li> </ol>



**Appendix C**

<p><b>Front Phase Reversal</b> Line phases not shifted by 120°</p>	<ol style="list-style-type: none"> <li>1. Turn OFF all power</li> <li>2. Swap any 2 phases on the line side of the phase monitor</li> <li>3. Re-apply power</li> </ol>
<p><b>Front Phase Unbalance</b> Voltage unbalance between phases</p>	<ol style="list-style-type: none"> <li>1. Press the READ button to observe the present load voltages. Check system for unbalance cause</li> <li>2. Increase the fault interrogation time if necessary</li> <li>3. Increase the percent unbalance setting if necessary</li> </ol>
<p><b>Front Under Voltage</b> Average phase voltage below minimum</p>	<ol style="list-style-type: none"> <li>1. Check system for under-voltage cause</li> <li>2. Increase the percent under-voltage setting if necessary</li> <li>3. Increase the fault interrogation time if necessary</li> </ol>

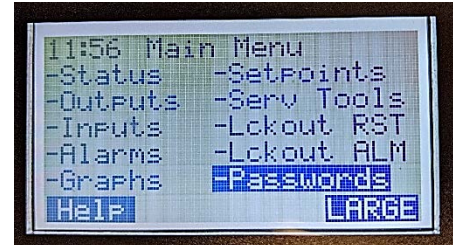
**Location**



# Appendix D

## Enter Password

1. Press the **Menu** button on the keypad. The “**Main Menu**” will appear. Using the buttons, navigate to the “**Passwords**” option and press ↵



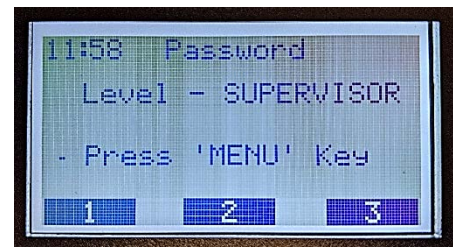
2. The following screen will appear. Enter the **Supervisor Password** (2112) using the keypad (numbering found on bottom left of each button) and press ↵



3. If the following screen appears, the password was entered incorrectly. Follow the onscreen prompts and restart from Step #1



4. If the password was entered correctly, the following screen will appear. Press **Menu** to return to the device menu



# Appendix E

## Enable Run/Stop

1. After entering the **Supervisor Password** (Appendix D), press the **Menu** button on the keypad. Navigate to the **“Inputs”** menu and press **↵**



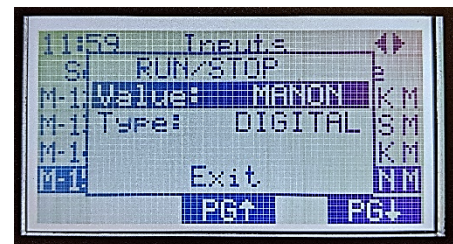
2. Using the UP and DOWN buttons, highlight the **“RUN/STOP”** menu item and press **↵**



3. The following screen will appear. Press **↵** on the **“Value”** selection and use the **▲/▼** buttons to change to **MANON (MANOFF to disable)**. Press when finished **↵**



4. Press the **Menu** button to return to the **“Main Menu”**. The unit should now start powering back up if there are no current alarms



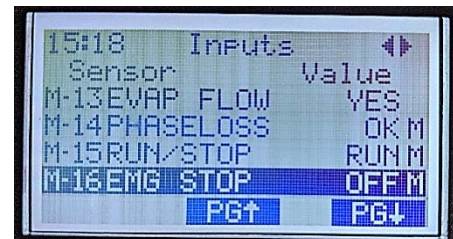
## Appendix E

### Reset Emergency Switch

- After entering the **Supervisor Password** (Appendix D), press the **Menu** button on the keypad. Navigate to the **“Inputs”** menu and press ↵



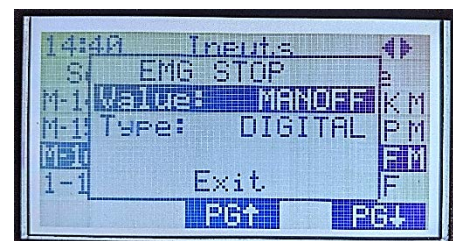
- Using the ▲/▼ buttons, highlight the **“EMG STOP”** menu item and press ↵



- The following screen will appear. Press ↵ on the **“Value”** selection and use the ▲/▼ buttons to change to **MANOFF**. Press ↵ when finished



- Press the **Menu** button to return to the **“Main Menu”**. The unit should now start powering back up if there are no current alarms



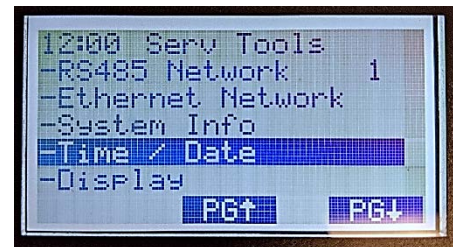
# Appendix F

## Change Date / Time

1. After entering the **Supervisor Password** (Appendix D), press the **Menu** button on the keypad. Navigate to the “**Serv Tools**” menu and press ↵



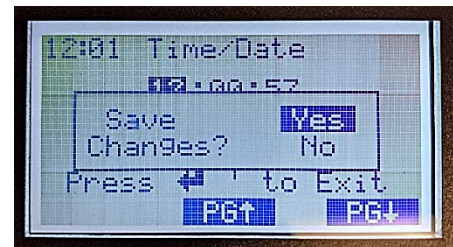
2. Highlight the “**Time / Date**” selection and press ↵



3. The “**Change Date / Time**” menu will appear. Press the ▲/▼ buttons to change the highlighted value and use the ◀/▶ arrows to change the selection. Press ↵ when finished



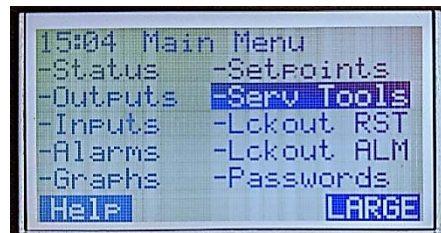
4. The following screen will pop up. Press ↵ to save your changes



# Appendix G

## Setting Operating Schedules

1. After entering the **Supervisor Password** (Appendix D), press the **Menu** button on the keypad. Navigate to the “**Serv Tools**” menu and press ↵



2. Navigate to the “**Operating Schedule**” selection and press ↵ on the keypad



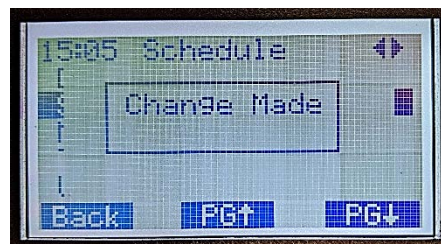
3. The “**Schedule**” menu will appear. Press the ▲/▼ buttons to select the day of the week the schedule will be active and then press ↵



4. The following screen will appear. Use ▲/▼ buttons to change the value of the highlighted selection and the ◀/▶ buttons to change the selection. Press ↵ when finished



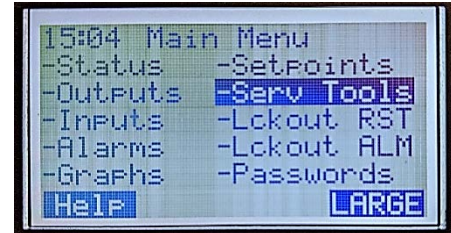
5. The following screen will appear when the changes to the schedule have been successfully completed



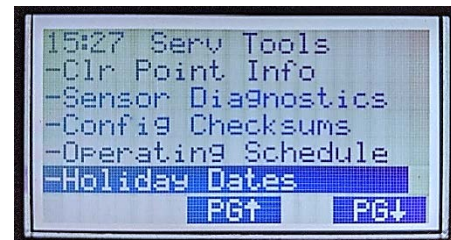
**Appendix G**

## Setting Holiday Schedules

1. After entering the **Supervisor Password** (Appendix D), press the **Menu** button on the keypad. Navigate to the **“Serv Tools”** menu and press **↵**



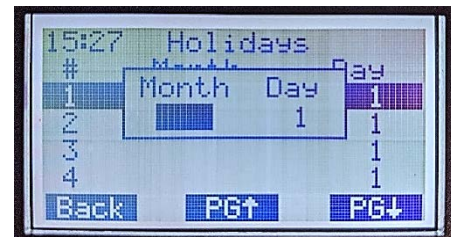
2. Navigate to the **“Holiday Dates”** selection and press **↵** on the keypad



3. The **“Holidays”** menu will appear. Up to 8 different holidays can be set. Select a number you would like to either change or set and then press the **↵** button



4. The following screen will appear. Use the **▲/▼** buttons to change the value of the highlighted selection and the **◀/▶** buttons to change the selection. Press **↵** when finished



5. The following screen will appear when the changes to the schedule have been successfully completed





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