MICRO CONTROL SYSTEMS

Getting Started Manual Rev. 2.0

MCS-MAGNUM HARDWARE VERSION 7.1+

The MCS Commitment: Our commitment is to provide practical solutions for the industry's needs and to be both a leader and partner in the effective use of microprocessor controls.

Micro Control Systems, Inc.
5877 Enterprise Parkway
Fort Myers, Florida 33905
Phone: (239) 694-0089
Fax: (239) 694-0031
www.MCScontrols.com

(Website contains product descriptions, manuals, software releases, troubleshooting aids, etc.)

Revision Page

Date	Author	Description of Changes
07/08/08	J. Walterick	**Created manual**
07/13/11	W. Klebs	**Updated Manual to Rev 2.0** • Updated Hardware to 7.1+

Table of Contents

Introduction to Magnum V8 Software

Magnum V8 software has been designed to control many different types of compressors of both fixed and variable capacity, as well as many additional features. Supported control options include multiple liquid line solenoids, electronic expansion valves (EXVs), liquid injection, economizers, hot gas bypass, variable frequency drives (VFDs), digital scrolls, and many more.

Applications vary from control of a single compressor to complex multiple compressor systems. In all applications, however, safety and operating efficiency is of primary importance. The controller interface is made to be informative and meaningful, with built-in logic to prevent unsafe operating conditions from occurring. This helps reduce or even completely eliminate nuisance alarms.

Magnum V8 Software Control Point Capacity

- Circuits (compressors): Up to 20
- Steps per circuit:: Up to 4
- Relay Outputs: Up to 80
- Analog Outputs: Up to 20
- Sensor Inputs: Up to 80
- Setpoints: 230
- Alarm Memory: 100

Magnum Hardware Supported by Magnum V8 Software

The following MCS boards can be connected together through the MCS-I/O communications terminal block:

- MCS-Magnum (10 RO's, 12 SI's, 4 Digital SI's, and 4 AO's)
- MCS-I/O (8 RO - 8 SI - 1 AO with I/O 7.00-C with a GAL 5.0 chip)
- MCS-RO8 (8 RO)
- MCS-SI16 (16 SI)
- MCS-RO10 (10 RO)
- MCS-SI16-AO4 (16 SI and 4 AO)

The versatility of the Magnum offers the user much flexibility in configuring the controls in an economical way. The limitation is not the number of boards but the total number of points.

About the Magnum

The Magnum is a rugged microprocessor controller designed for the harsh environment of the HVAC/R industry. It is designed to provide primary control without needing mechanical controls. It will interface locally with a null modem serial cable, remotely through an Ethernet connection, and also through building management systems. The Magnum offers a great deal of flexibility with adjustable setpoints and control options that can be set prior to activating a system or even when the unit is operational. The Magnum is designed to safeguard the system being controlled, minimize the need for manual intervention, and to provide a simple but meaningful user interface.

MCS 485 Network

The MCS 485 Network can support up to 20 Magnum's and their associated I/O boards. Access to this network can be local through a RS232 or Ethernet connection, or remotely through a 14.4K Baud modem. When using the dialup connection through a modem there is no degradation in the performance of the network.

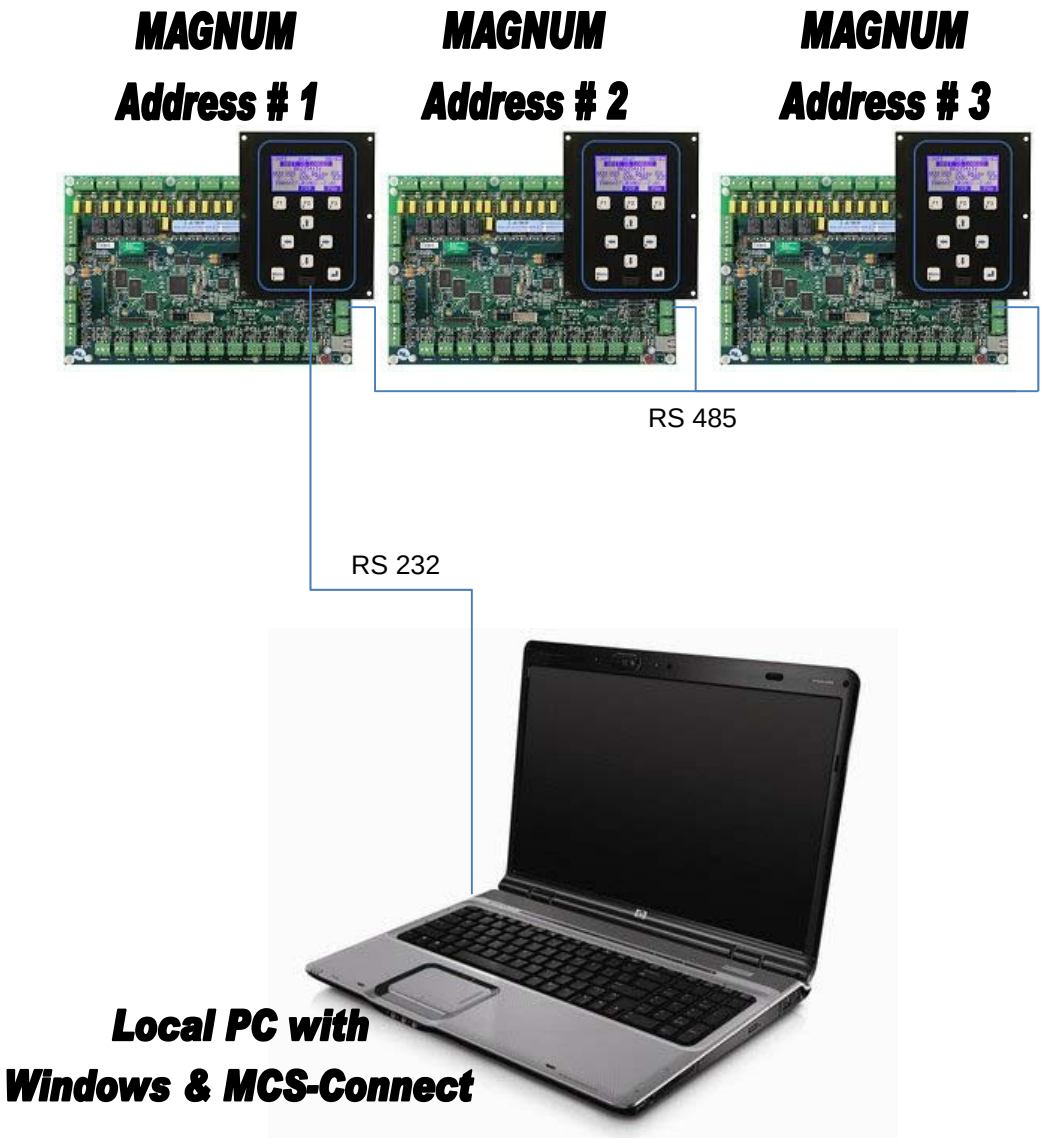
Each Magnum in the network must be assigned a unique address in the configuration file. This address will be the key in establishing communications with the appropriate Magnum system. It can be viewed or changed from the LCD / keypad of the unit with Factory authorization.

- RS 232 transmissions should not exceed 50' in length.
- RS 485 transmissions should not exceed 1 mile without a repeater.

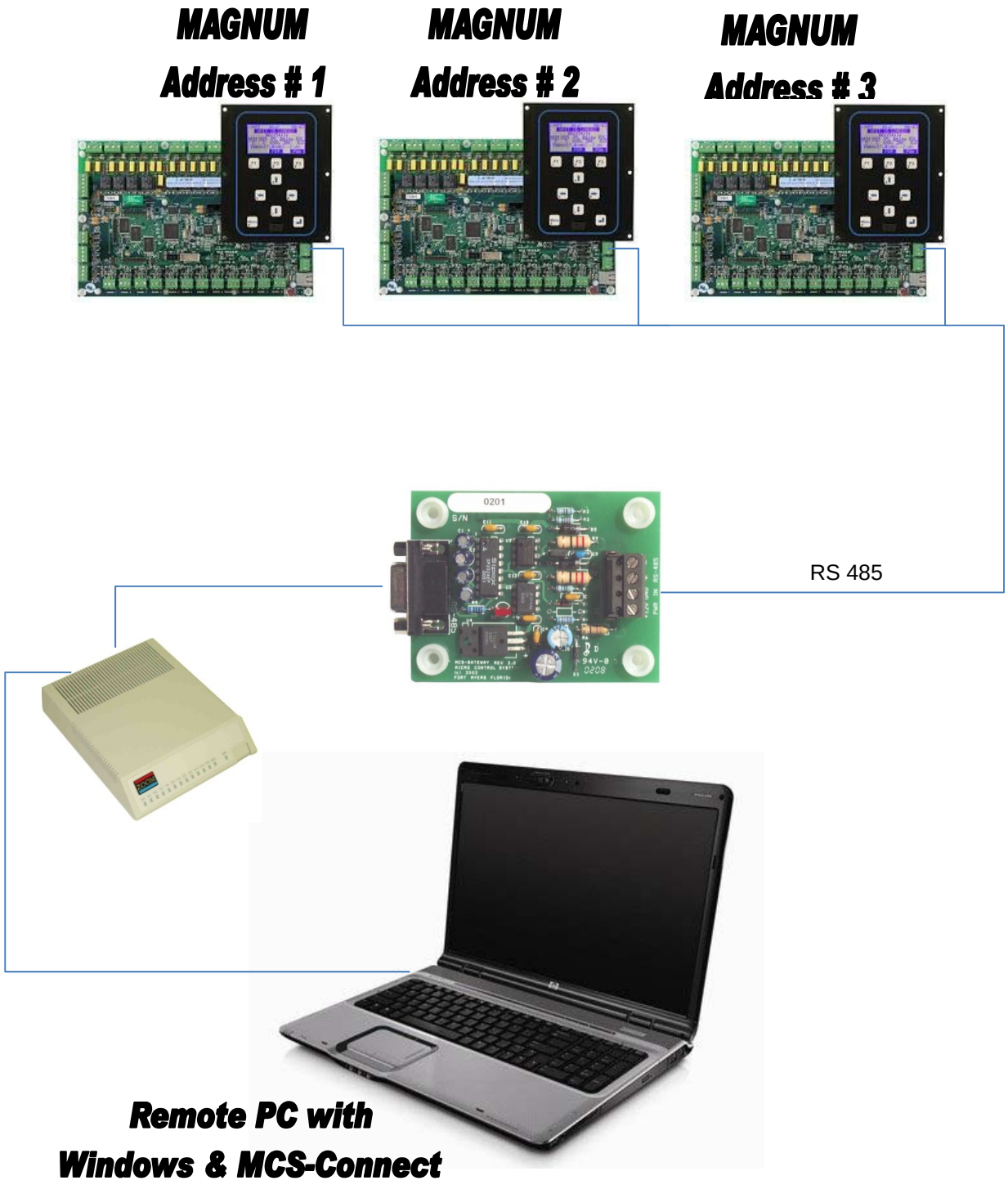
MCS Ethernet Port

When connecting directly through the 100 MBPS Ethernet port on the Magnum from a PC it is necessary to use a crossover Ethernet cable.

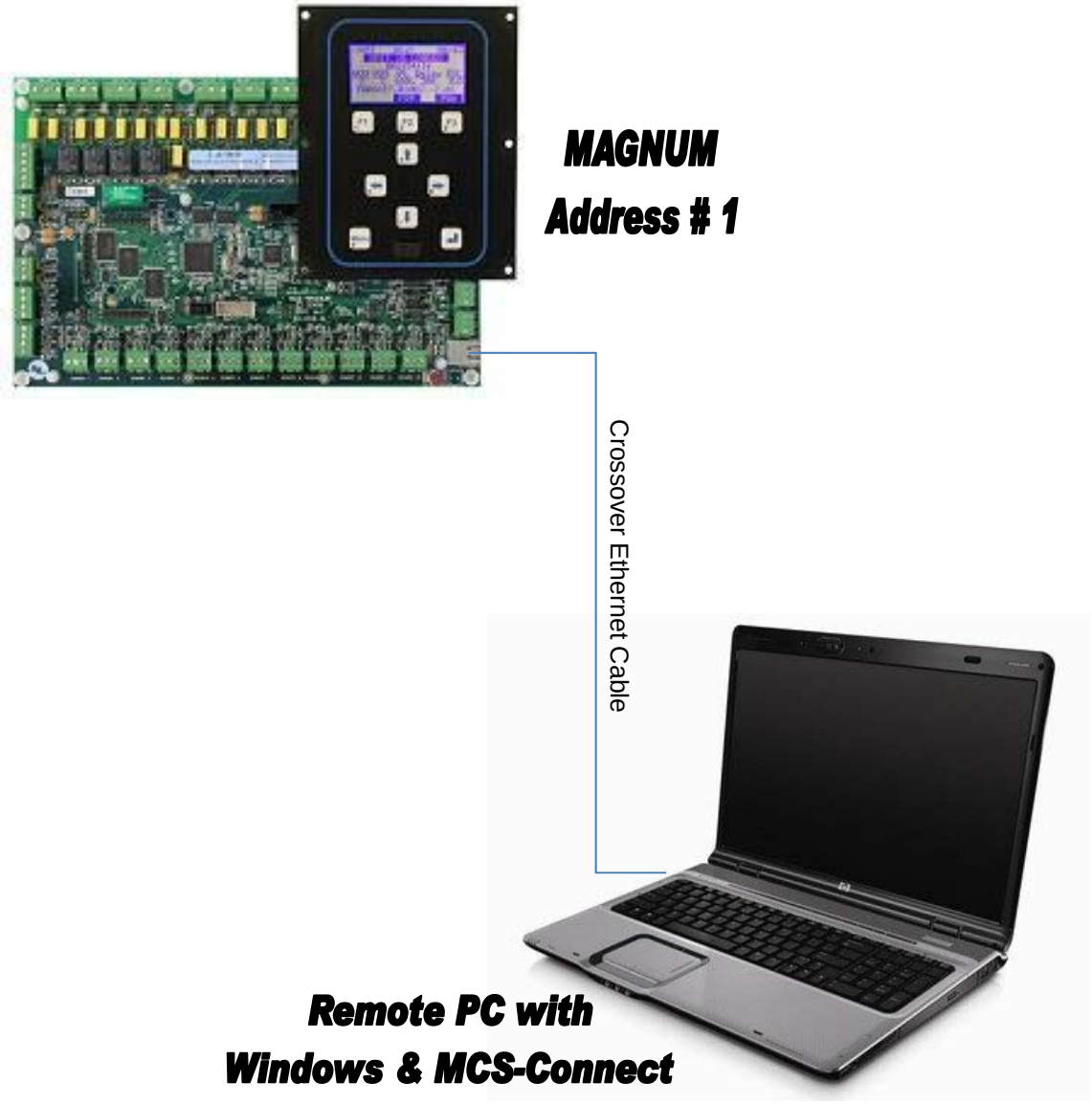
RS485 Network with Local RS232 Communications



RS485 Network with Remote Modem Communications



Crossover Ethernet Cable Connection



PC Support Software for Magnum

MCS-Connect provides both local and remote communications to the Magnum independent of software type. Local communications can be either through an RS485 or Ethernet connection. This program displays the status of the controller, and changes can be made to the system with proper authorization. Configuration files can be transmitted to or received from a Magnum unit. The Magnum automatically performs history logging and this program allows the data to be presented in a useful graph form. A manual created in a PDF format is available on our web site: www.MCScontrols.com, or available in other formats upon request.

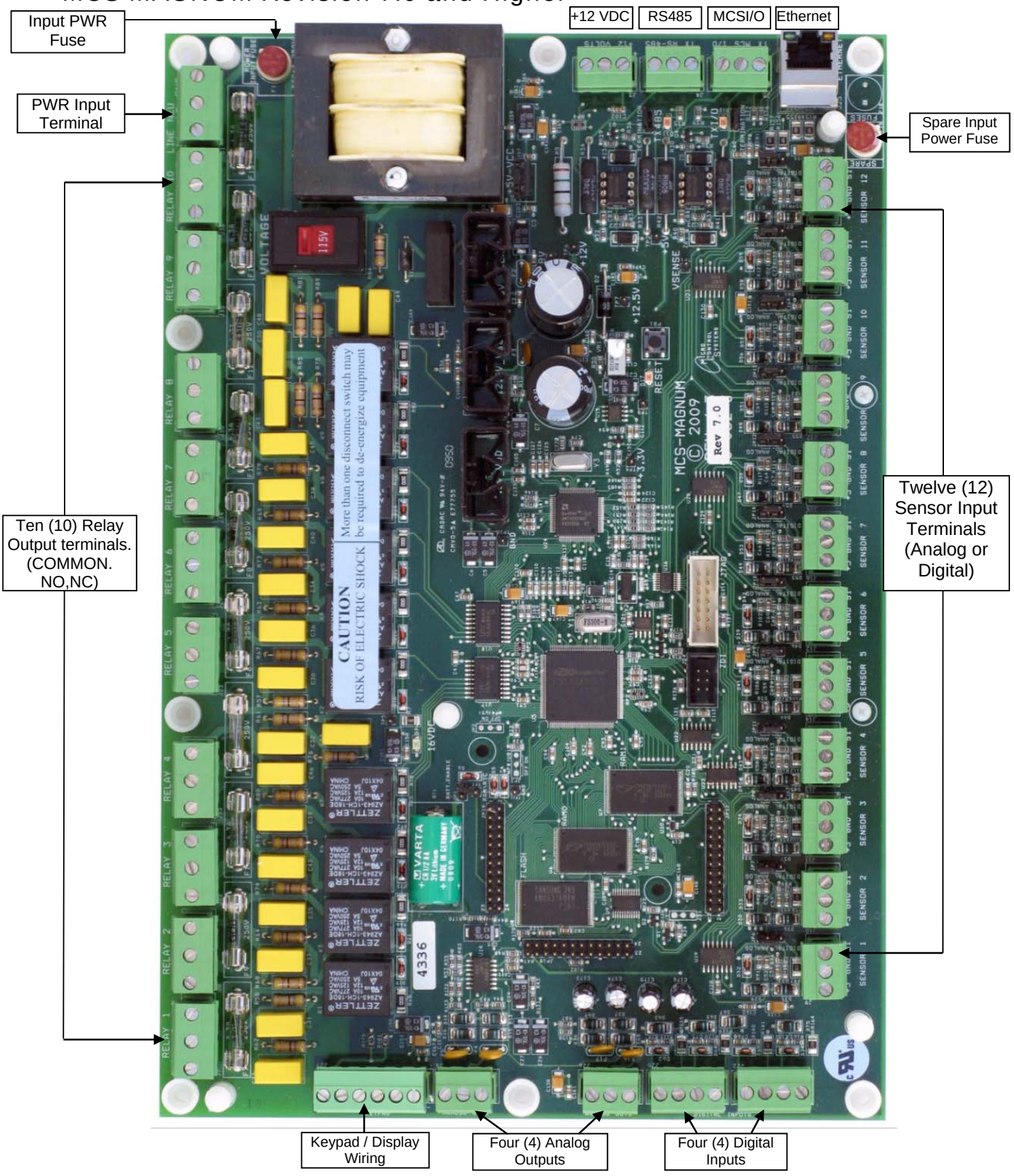
Requirements for PC Software

To install and run the program we suggest the following system requirements:

Minimum System Required to Run Program

- Windows 2000 or higher
- Pentium processor
- 20 Gigabyte Available Hard Disk space
- Super VGA Display capable of displaying 256 colors
- 512 Megabytes RAM

MCS-MAGNUM Revision 7.0 and Higher



Preparing to Upgrade an Existing Chiller

Step 1- Open MCS Supplied Upgrade Kit

(Usually fits in a 16” x 16” x 16” box)

- Verify Packing list of all MCS parts
- Obtain Spiral Binder (Divided in up to 4 sections):
  - Getting Started Manual
  - MCS-Config printout (Inputs, outputs, setpoints, etc.)
  - Drawings of each MCS printed circuit board with wiring connections
  - Specification sheet for each MCS part

Step 2- Plan to Mount New Microprocessor

- Keypad / Display
  - Chiller Installed Outside- You should use a Panel mount which you install inside the existing rain proof enclosure.
  - Chiller Installed Inside- You should use a Door mount with a Template for mounting
- Mount electronics in dry location.
- Do not mount in enclosure with Frequency Drive or High Voltage.
- Avoid mounting in front of or close to High Voltage Contactors.
- **High Voltage wiring should be run separate from Low Voltage wiring.**
- All wiring to Analog Sensors must be with shielded cable.
- When running shielded cable in areas with high voltage avoid running parallel. (Run perpendicular)
- Allow adequate space on all sides of MCS boards to run cables and plug in communication cables.
- If at all possible, avoid splicing shielded cable. If a splice is required please do the following:
  - Splice in an area where no high voltage is within three (3) feet.
  - Splice in a dry area.
  - Splice all wires including Drain wire with butt connectors or solder. (Foil shield need not be connected. Tape connections.) Stagger where butt connectors are made to avoid bulky connections.

GROUND CONNECTIONS

- **It is important to provide a good earth ground to the 120 VAC power input to the printed circuit boards.**
- **Do not jumper the ground connections to MCS boards. Each printed MCS board should have its ground wired <u>directly</u> to ground with a wire made as short as possible (12AWG).**

Step 3- Prepare to Start the Unit

- Relay Output Check - Once the microprocessor has been completely wired a dry test of the wiring should be done. To accomplish this use the following procedure:
  - Keep main power to compressors off. Keep high voltage breakers off or pull fuses to compressors.
  - Turn on 120 VAC control power.
  - Get authorized on the MCS-Magnum controller. (via the keypad or MCS-Connect.)
  - Put each Relay Output in ‘MANUAL ON’ and verify the appropriate contactor or solenoid turns on. When testing the wiring to a Liquid Line Solenoid be careful not to leave it on too long if the system uses an expansion valve.)
  - Place each digital Sensor Input in ‘MANUAL ON’ to verify the correct value.
  - Verify all Analog Sensors are within reasonable tolerances.
  - Remove the Packard connector from each pressure transducer. Verify the computer reads -99.9P on the correct sensor.
  - Calibrate pressure transducer offsets.
  - If you have any Analog Outputs verify they are correct. Manually set analog values to 0%, 50%, and 100%.
- After testing all Outputs and Inputs, make sure all RO’s, SI’s and AO’s are in ‘AUTO’ mode.
- Through the keypad, clear alarms and point information under ‘Service Diagnostics’ with factory authorization.
- If any compressor is in Lockout, perform a Lockout Reset to clear.

- All setpoints should be displayed on the MCS-Magnum and reviewed for correctness. Specific attention should be paid to the following Setpoints:
  - Verify / set ‘Full Load Amps’
  - Verify / set ‘Target’ (supply air / leaving liquid)
  - ‘Low Suction, Freeze’.
  - ‘High Disc’ based on water or air-cooled
  - ‘Condenser‘ setpoints
- You are now ready to turn on main power.
- Once main power is ON verify the following:
  - All Relay Outputs are in ‘AUTO’. (Not ’Lockout’)
  - Flow switch is ‘ON’ or ‘YES’.
  - RUN/STOP is in ‘RUN’.
  - Assuming additional capacity is required the control state should go to ‘LOADING’. Once the delay has reached zero the lead compressor will turn on. (If a screw with oil, then the oil pump will come on first)
  - When the compressor comes on the LLS should open. (There may be a pre-pump out to eliminate liquid from reaching the compressor for direct expansion systems.)
  - Watch suction, discharge, amps etc. to verify the unit is running normally.
  - For screw compressors: Verify if the load and unload pulse timing setpoints need adjusting. The pulse should allow the slide to move so the amps are moving but not overshooting the target. You may need to also adjust the amp deadband setpoints if the system seems to hunt. (Amp deadband should be about 3-4% of FLA)
- Fine-tuning should now be done. (ROC, step delay, control zone, etc.)

Keypad Display Screens

To reach the Main Menu press the Menu button after powering up. Based on the highlighted menu option when the enter key (↵) is pressed will bring up one of the following screens.

Menu Key

Pressing the 'Menu' key shows the following:

ACTUAL DISPLAY

```
09:56 Main Menu
-Status       -Setpoints
-Outputs      -Serv Tools
-Inputs       -Lckout RST
-Alarms       -Lckout ALM
-Graphs       -Passwords
Help
```

DESCRIPTION

```
HH:MM      Screen Title
-Control Status Display     -Active Setpoints Display
-Relay/Analog Display       -Service Tools Display
-Sensor Input Display       -Lockout Reset Display
-Alarm Display              -Lockout Alarm Display
-Graphing Display           -Password Display
Help
```

Status

Selecting the 'Status' menu option shows the following Chiller Status screen:

ACTUAL DISPLAY

```
09:56        Unit          23/35
       UNIT IS LOADED
          002:26:18
WTD   ACT  WTD%   DLY   ROC
 1     1   100%   300   0.0
          TARG=27.0
                PG↑        PG↓
```

DESCRIPTION

```
HH:MM             CHILLER UNIT                LEV/ENT
                CURRENT CONTROL STATE
                TIME IN CURRENT STATE
WANTED      ACTUAL      WANTED%     DELAY       SLOPE
#STEPS      #STEPS      ACTUAL%   NEXT CHG    DIRECTION
           TARGET SET POINT + TARGET RESET
                          Page Up              Page Down
```

Pressing the Page Down button shows the following Circuit Status screen:

ACTUAL DISPLAY

```
09:56     CMP #1        23/35
       CMP IS HOLDING
          002:26:18
SUCT   DISC   OPD   MOTOR
 44P   222P   156P  101%
 33F   177F    OK    OK
              PG↑       PG↓
```

DESCRIPTION

```
HH:MM                CIRCUIT                  LEV/ENT
                CURRENT CONTROL STATE
                TIME IN CURRENT STATE
  SUCTION     DISCHARGE    OIL DIFFERENTIAL    MOTOR
 PRESSURE      PRESSURE       PRESSURE         AMP %
TEMPERATURE  TEMPERATURE      STATUS           STATUS
                          Page Up              Page Down
```

Pressing the Page Down button shows the next Circuit Status screen:

ACTUAL DISPLAY

```
09:55     CMP #1        45/54
       CMP OFF/READY
          000:00:42
SST    SSH     SCT     DSH
 38   16.9      97     79.2

              PG↑       PG↓
```

DESCRIPTION

```
HH:MM                CIRCUIT                  LEV/ENT
                CURRENT CONTROL STATE
                TIME IN CURRENT STATE
SAT.SUCT.     SUCT SHEAT      SAT.COND.     DISC SHEAT
  TEMP          TEMP            TEMP          TEMP

                          Page Up              Page Down
```

Pressing the Page Down button shows the following Liquid Line Solenoid Status screen:

ACTUAL DISPLAY

```
09:55      LLS #1      45/54
          IS HOLDING
           002:43:42
         Suction Info
PRES      SST    TEMP    SSH
14.0P     60F     12F   47.0
              PG↑         PG↓
```

DESCRIPTION

```
HH:MM          LIQUID LINE SOLENOID              LEV/ENT
                CURRENT CONTROL STATE
                TIME IN CURRENT STATE

SUCTION       SAT.SUCT.      SUCTION      SUCT.SHEAT.
PRESSURE        TEMP           TEMP          TEMP
                                Page Up              Page Down
```

Outputs

Selecting the 'Outputs' menu option shows the first 4 Relay Outputs:

ACTUAL DISPLAY

```
09:56    Outputs        ◄ ►
 Relays              Status
M-1 COMP           Lck Off
M-2 LOAD           Lck Off
M-3 UNLOAD         Lck Off
M-4 LLS 1          Lck Off
Anlog         PG↑          PG↓
```

DESCRIPTION

```
HH:MM              Screen Title      Left/Right Arrow
 RO position & names        Current status of RO

 Using the Left and Right arrow buttons allows user to view all
  data for RO's displayed (Status, Last On, Last Off, Run Time
   Today, Cycles Today, Run Time Yesterday, Cycles Yesterday,
              Total Run Hours, and Total Cycles)
Switch to AO's          Page up                Page down
```

Pressing the Page Down button shows the next 4 Relay Outputs:

ACTUAL DISPLAY

```
09:56    Outputs        ◄ ►
 Relays              Status
M-5 LIQ INJ           On
M-6 HOT GAS           On
M-7 LLS 2             On
M-8 SUBCOOLER         On
Anlog         PG↑          PG↓
```

DESCRIPTION

```
HH:MM              Screen Title      Left/Right Arrow
 RO position & names        Current status of RO

 Using the Left and Right arrow buttons allows user to view all
  data for RO's displayed (Status, Last On, Last Off, Run Time
   Today, Cycles Today, Run Time Yesterday, Cycles Yesterday,
              Total Run Hours, and Total Cycles)
Switch to AO's         Page up               Page down
```

Continue pressing the Page Down or Page Up buttons to scroll through all the Output screens.

Inputs

Selecting the 'Inputs' menu option shows the first 4 Sensor Inputs:

ACTUAL DISPLAY

```
09:56    Inputs         ◄ ►
 Sensor              Value
M-1 SUCT PSI        66.0P
M-2 DISC PSI       121.3P
M-3 SPAREM-3         ----
M-4 AMPS            52.3A
              PG↑          PG↓
```

DESCRIPTION

```
HH:MM              Screen Title       Left/Right Arrow
  SI position & names          Current status of SI
Using Left/Right arrow allows user to view all data for SI's displayed
(Value, Type, Last On, Last Off, Max Value Today, Min Value Today, Run
Time Today, Average Value Today, Cycles Today, Run Time Yesterday, Max
   Value Yesterday, Cycles Yesterday, Min Value Yesterday, Total Run
         Hours, Average Value Yesterday, and Total Cycles)
                        Page up               Page down
```

Pressing the Page Down button shows the next 4 Sensor Inputs:

ACTUAL DISPLAY

```
09:56    Inputs        ◀ ▶
 Sensor              Value
M-5 DISC TMP      150.0F
M-6 GlycTmp In     20.0F
M-7 GlycTmpOut     19.0F
M-8 Evp1SucTmp     15.0F
               PG↑        PG↓
```

DESCRIPTION

```
HH:MM              Screen Title       Left/Right Arrow
  SI position & names          Current status of SI
Using Left/Right arrow allows user to view all data for SI's displayed
(Value, Type, Last On, Last Off, Max Value Today, Min Value Today, Run
Time Today, Average Value Today, Cycles Today, Run Time Yesterday, Max
  Value Yesterday, Cycles Yesterday, Min Value Yesterday, Total Run
        Hours, Average Value Yesterday, and Total Cycles)
                      Page up              Page down
```

Continue pressing the Page Down or Page Up buttons to scroll through all the Input screens.

Alarms

Selecting the 'Alarms' menu option shows the first 2 alarms:

ACTUAL DISPLAY

```
09:56    Alarms
 1 LOST RO COMM       #2
      JUL 04   12:09:16
 2 LOST RO COMM       #1
      JUL 04   12:09:16
             PG↑         PG↓
```

DESCRIPTION

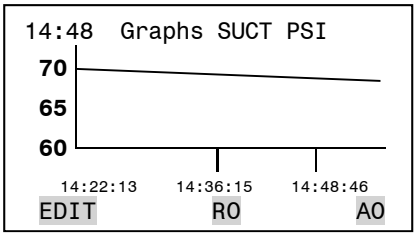
```
HH:MM              Screen Title
1st Alarm #        Alarm Title        Unit Number
             Alarm Date & Time of 1st alarm
2nd Alarm #        Alarm Title        Unit Number
             Alarm Date & Time of 2nd alarm

                      Page up              Page down
```

Continue pressing the Page Down or Page Up buttons to scroll through all the Alarm screens.

Graphs

Selecting the 'Graphs' menu option shows the following:

ACTUAL DISPLAY



DESCRIPTION

```
HH:MM          Screen Title     Sensor Name

  The graph has the last 25 samples with an appropriate
   scale to allow it to fit on the display. Using the
 up/down arrows will scroll through the different Sensor
        Inputs, Relay outputs, or Analog Outputs.
Edit Sample Rate   Switched to RO's    Switches to AO's
```

Setpoints

Selecting the 'Setpoints' menu option shows the first 4 setpoints:

ACTUAL DISPLAY

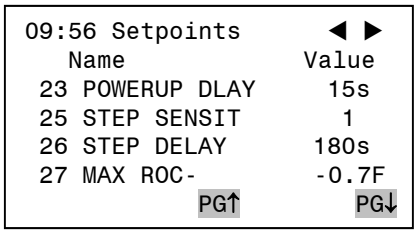
```
09:56 Setpoints       ◀ ▶
   Name              Value
 1 GLYCOL TRGT        -5.2F
 2 CTRL ZONE+          0.5F
 3 CTRL ZONE-          0.5F
17 LO SUPERHEAT        2.0F
              PG↑         PG↓
```

DESCRIPTION

```
HH:MM              Screen Title       Left/Right Arrow

Using Left/Right arrow allows user to view all data for
the setpoints displayed (Value, Time(sec), and Type)


                          Page up              Page down
```

Pressing the Page Down button shows the next 4 setpoints:

ACTUAL DISPLAY



DESCRIPTION

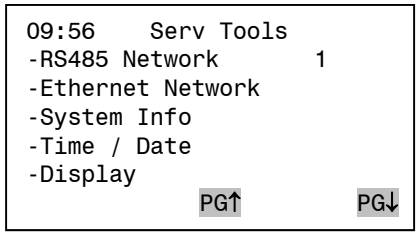
```
HH:MM            Screen Title       Left/Right Arrow

Using Left/Right arrow allows user to view all data for
the setpoints displayed (Value, Time(sec), and Type)


                                Page up          Page down
```

Continue pressing the Page Down or Page Up buttons to scroll through all the setpoint screens.

Service Tools

Selecting the 'Service Tools' menu option shows the following submenu:

ACTUAL DISPLAY

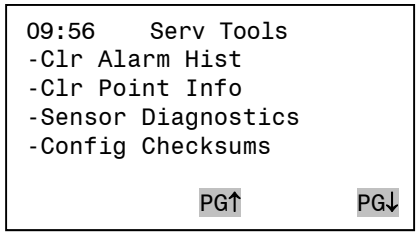


DESCRIPTION

```
HH:MM        Screen Title
Highlight choice and press enter to access Sub Menu.
1.RS485 Network- View network protocol, address, and baud rate.
2.Ethernet Network- View dynaimic IP, IP address, Subnet mask,
default gateway, and MCS port. 3.System Info- View Firmware
version, config name, company name, model name, unit serial
number, install date, config version, config date, bootloader
version, hardware serial number, physical mac address, and type
of I/O boards. 4.Time / Date- View and change the time or date.
5. Display View contrast, background color, and backlight.
                              Page up          Page down
```

Pressing the down arrow shows the rest of the submenu options:

ACTUAL DISPLAY



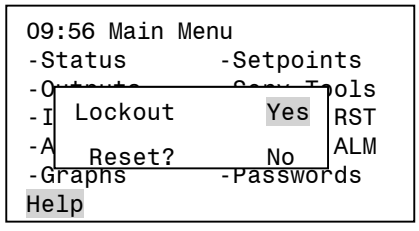
DESCRIPTION

```
HH:MM        Screen Title
Highlight choice and press enter to access Sub Menu.
6.Clr Alarm Hist- Clear the alarm history. 7.Clr Point Info-
Clear the point information. 8.Sensor Diagnostics- View
sensor values and voltages. Page Up/Down for more sensors.
9.Config Checksums- view if a section of the configuration
has been corrupted when an invalid config alarm occurs. Both
the calculated checksums and storage checksums are displayed
allowing the user to compare the checksums. If all checksums
match, then the file is not corrupted. If a section has been
corrupted the checksums will not match.
                          Page up          Page down
```

Lockout Reset

Selecting the 'Lckout RST' menu option shows the following:

ACTUAL DISPLAY



DESCRIPTION

```
HH:MM        Screen Title

Pop-up will prompt user to perform lockout reset.
```

Lockout Alarms

Selecting the 'Lckout ALM' menu option shows the first 2 Lockout alarms (Lockout alarms are a subset of alarms):

ACTUAL DISPLAY

```
09:56 Lckout ALM
11 ALARM      CIR BREAKER
       MAR 29 08:56:34

No Additional Info
         Prev        Next
```

DESCRIPTION

```
HH:MM        Screen Title

Screen will show any Lockout Alarms, including the
alarm number, name, date, and time.

                    Previous alarm          Next
```

Passwords

Selecting the 'Passwords' option shows the following:

ACTUAL DISPLAY

```
09:56 Password

        Enter Pin

          ----

    Then Press '↵' Key
```

DESCRIPTION

```
HH:MM        Screen Title

Enter 4 digit Password and press the enter key to gain
authorization.
```

Authorization Function

The authorization code is a special four-character code that enables access in to the Magnum system. The code must be numeric with values between 1 and 8 if it is entered from the Keypad/Display. If the Magnum is being accessed through MCS-Connect, the code may consist of any valid alpha/numeric characters. Each system can have up to 15 different authorization codes. There are four levels of authorization, which provide different capabilities within the system. The authorization codes cannot be viewed in a Magnum system. These are established when building the configuration file in MCS-Config.

From the Keypad/Display the following changes can be made based upon the authorization level:

FUNCTION	VIEW	USER	SERVICE	SUPERVISOR	FACTORY
Sensor offsets	NO	NO	YES	YES	YES
Sensor diagnostics	NO	NO	YES	YES	YES
Clear alarm history	NO	NO	NO	NO	YES
Clear point information	NO	NO	NO	NO	YES
Date and time set	YES	YES	YES	YES	YES
Day of week set	YES	YES	YES	YES	YES
Change No Flow Lockout or shut down	NO	NO	NO	NO	YES
Change rotate Yes or No	NO	NO	NO	NO	YES
Change Manual/Auto settings	NO	NO	NO	YES	YES
Change setpoint values	*	*	*	*	YES
Change operating schedules	NO	YES	YES	YES	YES
Change holiday dates	NO	YES	YES	YES	YES
Lockout Reset	**	**	**	**	YES
Change RS485 network settings	NO	YES	YES	YES	YES
Change Ethernet network settings	NO	YES	YES	YES	YES
Adjust Keypad/Display contrast	YES	YES	YES	YES	YES

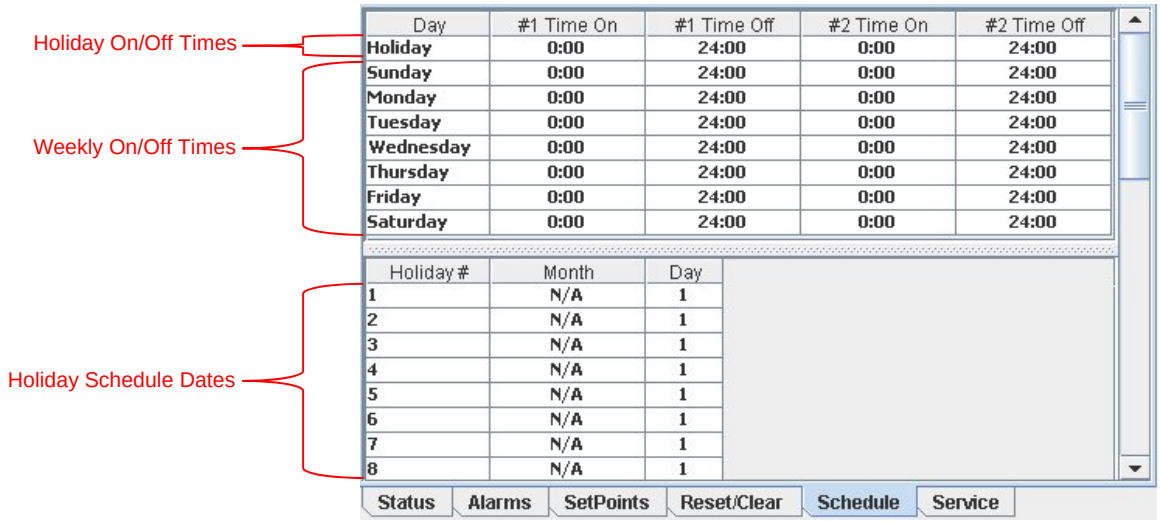
* Setpoints may have individual authorization levels; you must have the proper authorization to view or edit them.
**See the Setup screen of the configuration for authorization level(s) that are allowed unlimited resets per day. Authorization levels below 'Auth Level Bypass' are allowed only a limited number of resets. Authorization levels at and above 'Auth Level Bypass' are allowed unlimited lockout resets.

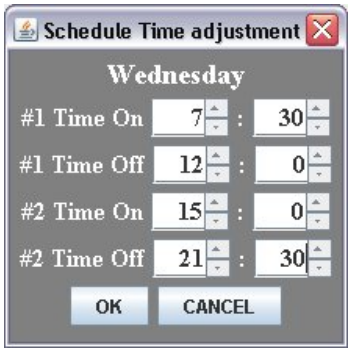
To get authorized on Magnum do the following:

1. Press 'Menu'
2. Using ↑, ↓, →, or ← to position the cursor on 'Passwords'
3. Press ↵ key.
4. Enter 4 digit password and press↵.
5. Press 'Menu' to make next selection.

Schedule Function

In MCS-Connect, there is the capability to set up specific schedules for which the unit will be allowed to run (up to 2 distinct on/off times. When the 'Schedule' tab is selected, the following screen will show:





To make changes to the schedule, you must be authorized at USER level or above. Once authorized, double click on a day to change its scheduled on/off times, and the following pop-up will appear:

Within this dialog box, you are able to select up to 2 different start/stop times per day. Make sure the times do not conflict with each other (Note: the Magnum software uses 24 hour time, not 12 hour am/pm). If you only need one on and off time, then leave the second on/off times at zero.

In addition to the standard 7 day weekly schedule, up to 8 individual dates throughout the year may be specified to run a special holiday schedule. The holiday on/off times are set up in the same way as above for the days of the week. To select the dates on which to run the holiday schedule, double click on one of the 8 holiday slots to bring up the following pop-up box in which to input the holiday's month and day:

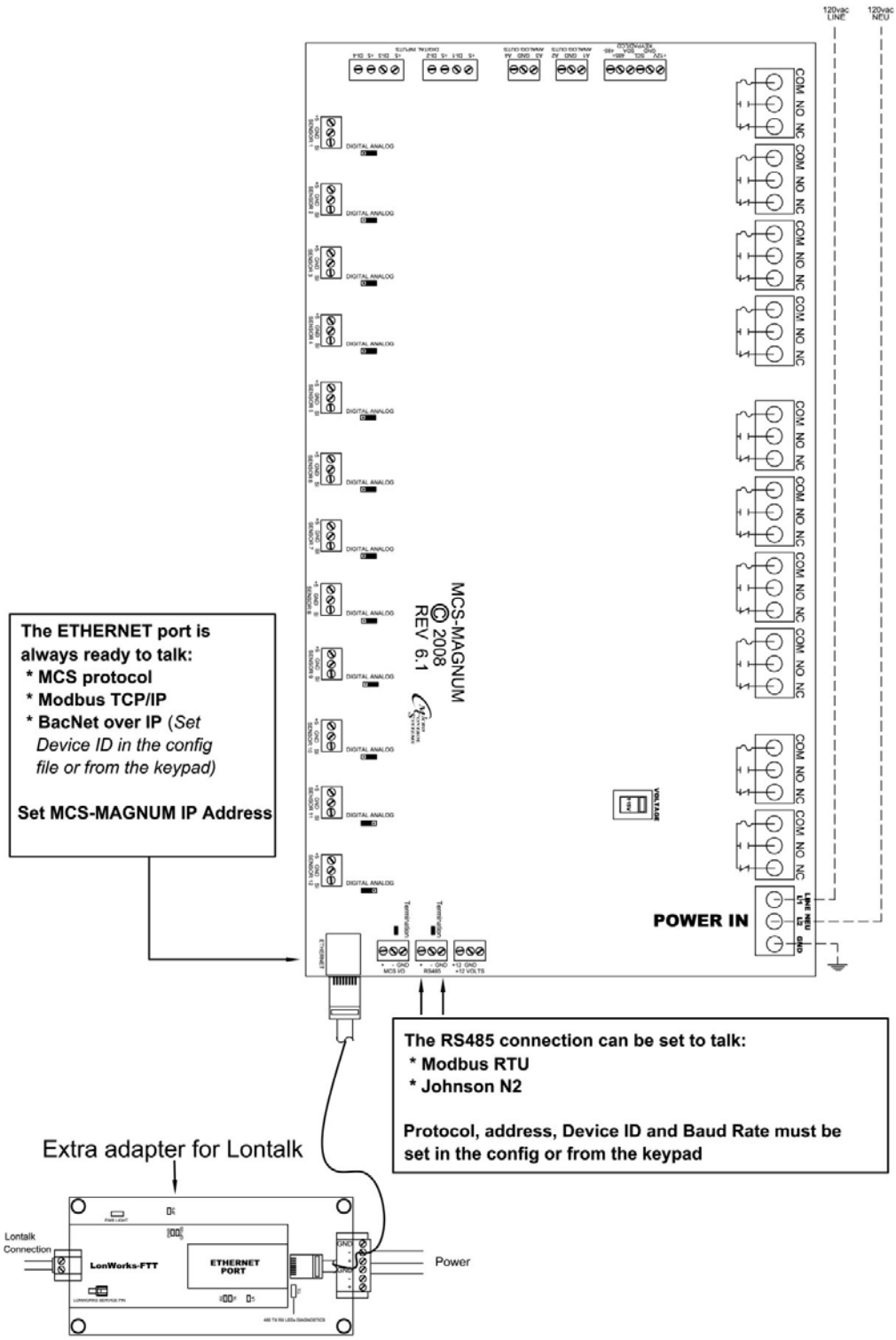
During the times when the unit is scheduled to be off, the Unit Status will change to "SCHEDULED OFF", and the compressor(s) state will change to "CMP IS OFF". No compressors will be allowed to run until the next time the unit is scheduled to be on.

If no schedule is specified by the user and the default settings are kept, then the unit will run based solely off the control sensor regardless of time or date.

BMS Communication Protocols

The MCS-Magnum supports BACnet IP, Modbus RTU, Modbus TCP/IP, and Johnson N2. Supported baud rates for Modbus RTU and Johnson N2 are 4800bps, 9600bps, 19200bps, 38400bps, and 57600bps.

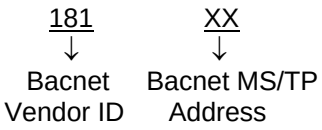
MCS-Magnum to BMS Connections



MCS-Magnum BMS protocols settings

Bacnet Over IP

The BACNET DEVICE ID is a five-digit number. The first three digits are based on our Bacnet vendor ID 181, and the last two are set by the Bacnet/MSTP address.



The Bacnet address can be verified and changed (with the proper authorization code) from the Keypad/LCD. The following steps will display the Bacnet MSTP Network address, and the Baud Rate:

- Press the Menu key, select Serv Tools, and then press the Enter key.
- Select RS485 Network then press Enter.
- Select Protocol then press Enter. Change the protocol to BACnet MSTP
- Select address then press Enter. Change the address so it matches the last two digits of the device ID then press Enter.
- Select Protocol then press Enter. Set the protocol back to MCS.

The following steps will display the Ethernet Network settings:

If you are going to manually assign the IP Address, Subnet Mask, and Default Gateway.

- Press the Menu key, select Serv Tools, and then press the Enter key.
- Select Ethernet Network then press Enter.
- Set “DHCP Enabled” to NO.
- Set the “IP Address”.
- Set the “Subnet Mask”.
- Set “Default Gateway”.

If you are going to let your network assign the IP Address, Subnet Mask, and Default Gateway:

- Press the Menu key, select Serv Tools, and then press the Enter key.
- Select Ethernet Network then press Enter.
- Set “DHCP Enabled” to YES.
- Connect the MCS-Magnum to the network and power up the board.

Modbus RTU

The Modbus RTU address can be verified and changed (with the proper authorization code) from the keypad/LCD. The following steps will display the Modbus RTU Network address, and the Baud Rate:

- Press the Menu key, select Serv Tools, and then press the Enter key.
- Select RS485 Network then press Enter.
- Select Protocol then press Enter. Change the protocol to Modbus.
- Select address then press Enter. Change the address then press Enter.
- Select Baud then press Enter. Set the baud rate then press Enter.
- Connect the communication wires to the TX RS485 three-position terminal located above the Ethernet connector.

Modbus TCP/IP

This protocol is always active. Make sure the MCS-Magnum network settings are set correctly.

If you are going to manually assign the IP Address, Subnet Mask, and Default Gateway.

Press the Menu key, select Serv Tools, and then press the Enter key.

- Select Ethernet Network then press Enter.
- Set “DHCP Enabled” to NO**.**
- Set the “IP Address”.
- Set the “Subnet Mask”.
- Set “Default Gateway”.

If you are going to let your network assign the IP Address, Subnet Mask, and Default Gateway:

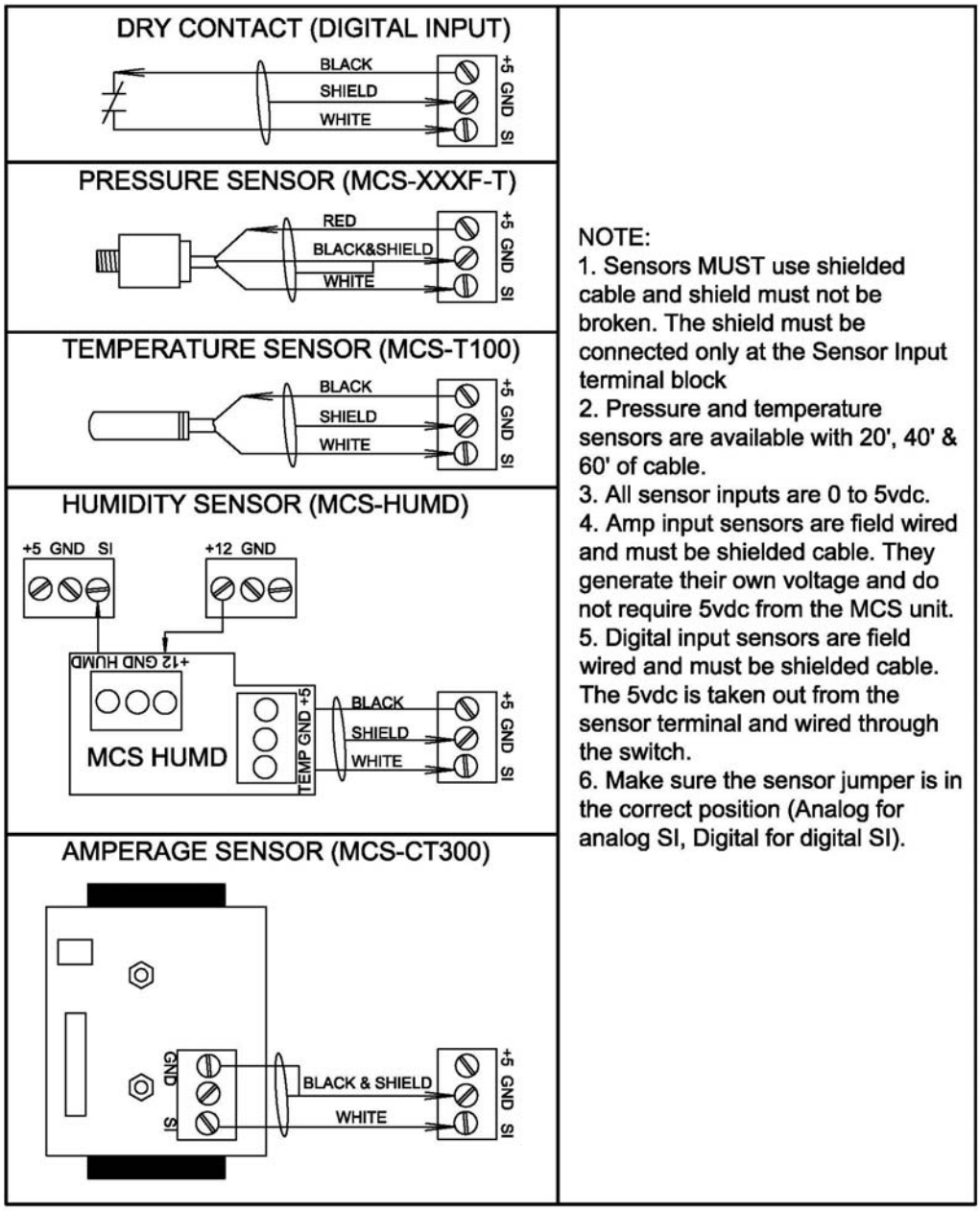
- Press the Menu key, select Serv Tools, and then press the Enter key.
- Select Ethernet Network then press Enter.
- Set “DHCP Enabled” to YES.
- Connect the MCS-Magnum to the network and power up the board.

Johnson N2

The N2 address can be verified and changed (with the proper authorization code) from the keypad/LCD.

- Press the Menu key, select Serv Tools, and then press the Enter key.
- Select RS485 Network then press Enter.
- Select Protocol then press Enter. Change the protocol to N2.
- Select address then press Enter. Change the address then press Enter.
- Select Baud then press Enter. Set the baud rate then press Enter.
- Connect the communication wires to the TX RS485 three-position terminal located above the Ethernet connector.

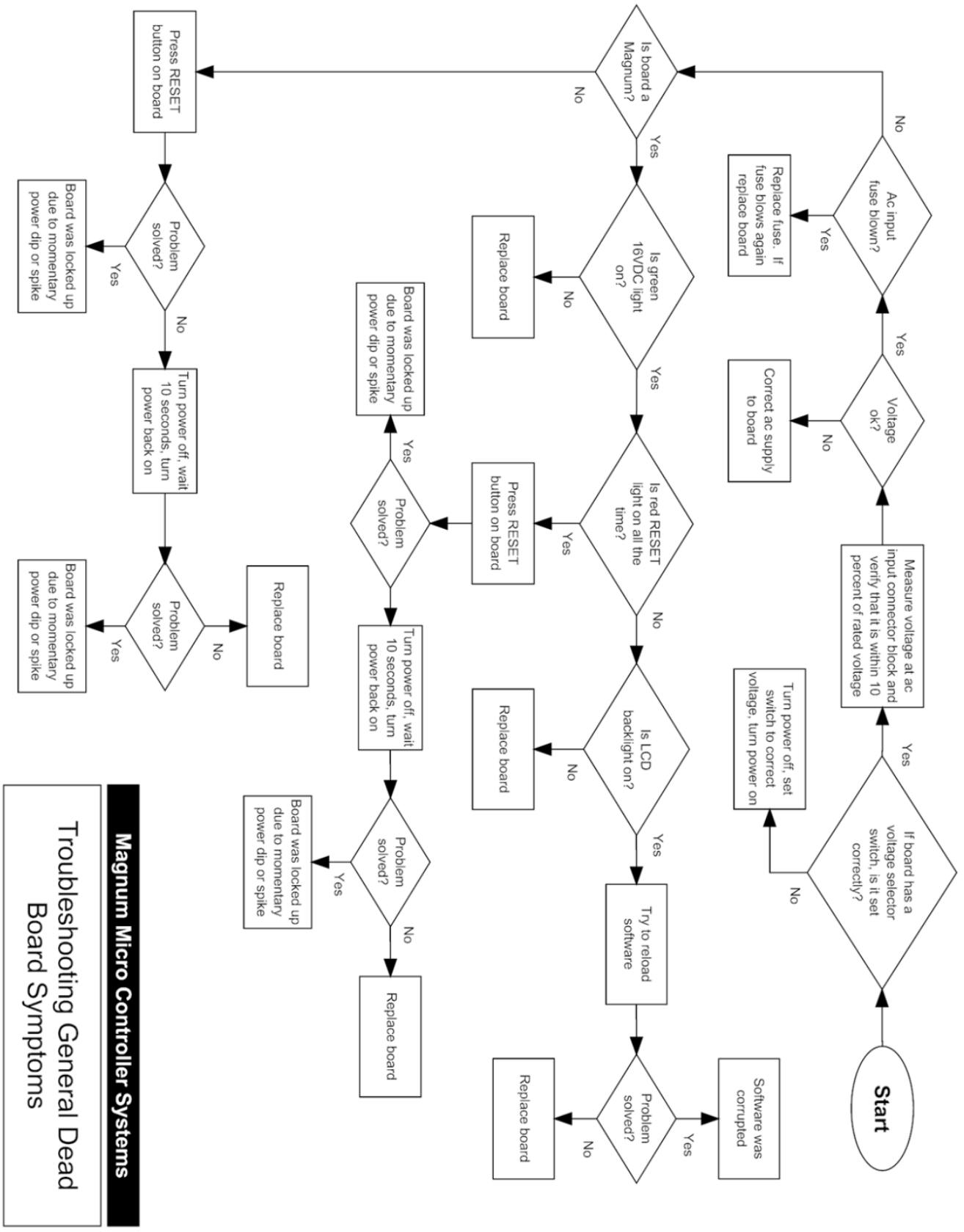
The MCS Sensors Quick Reference Sheet

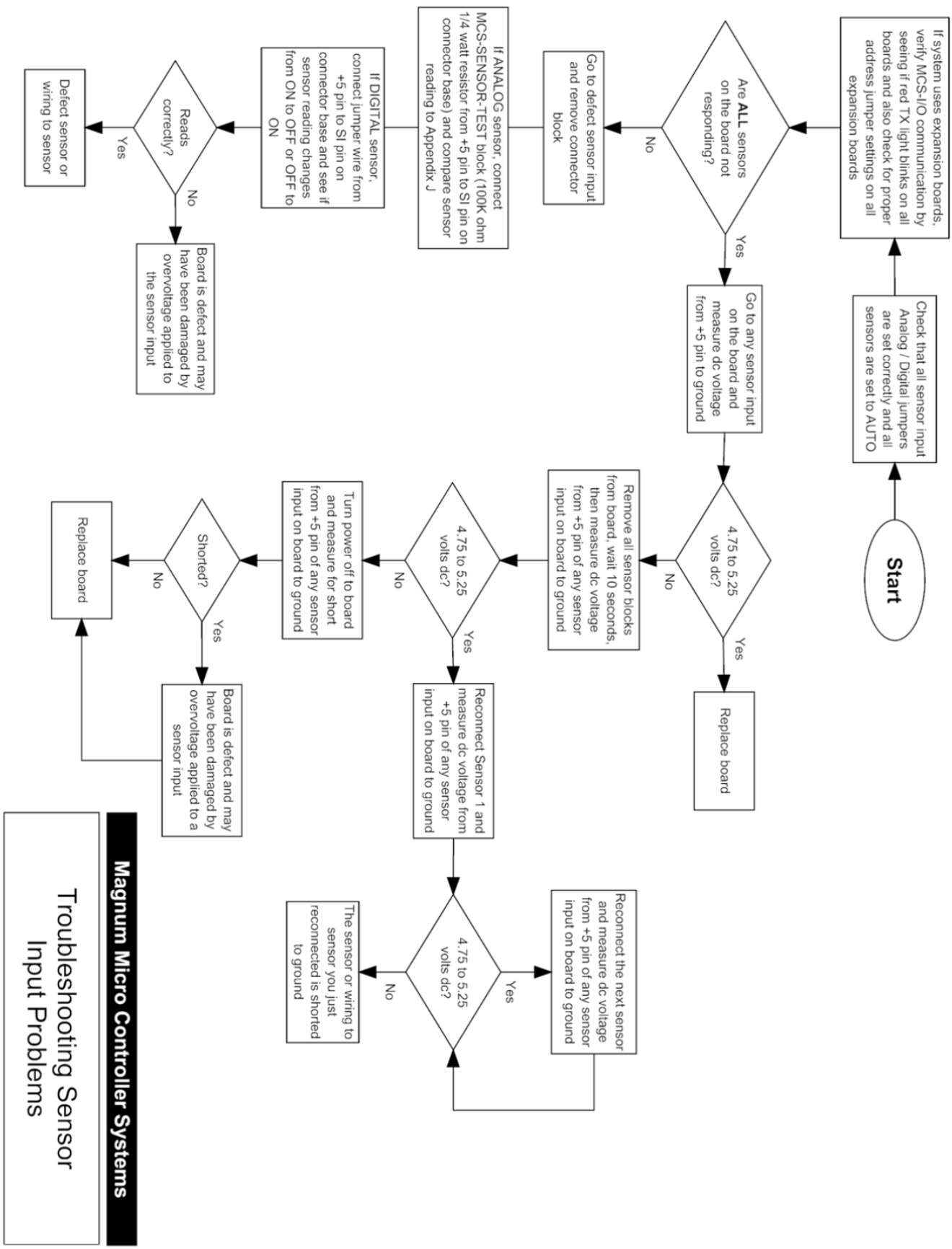


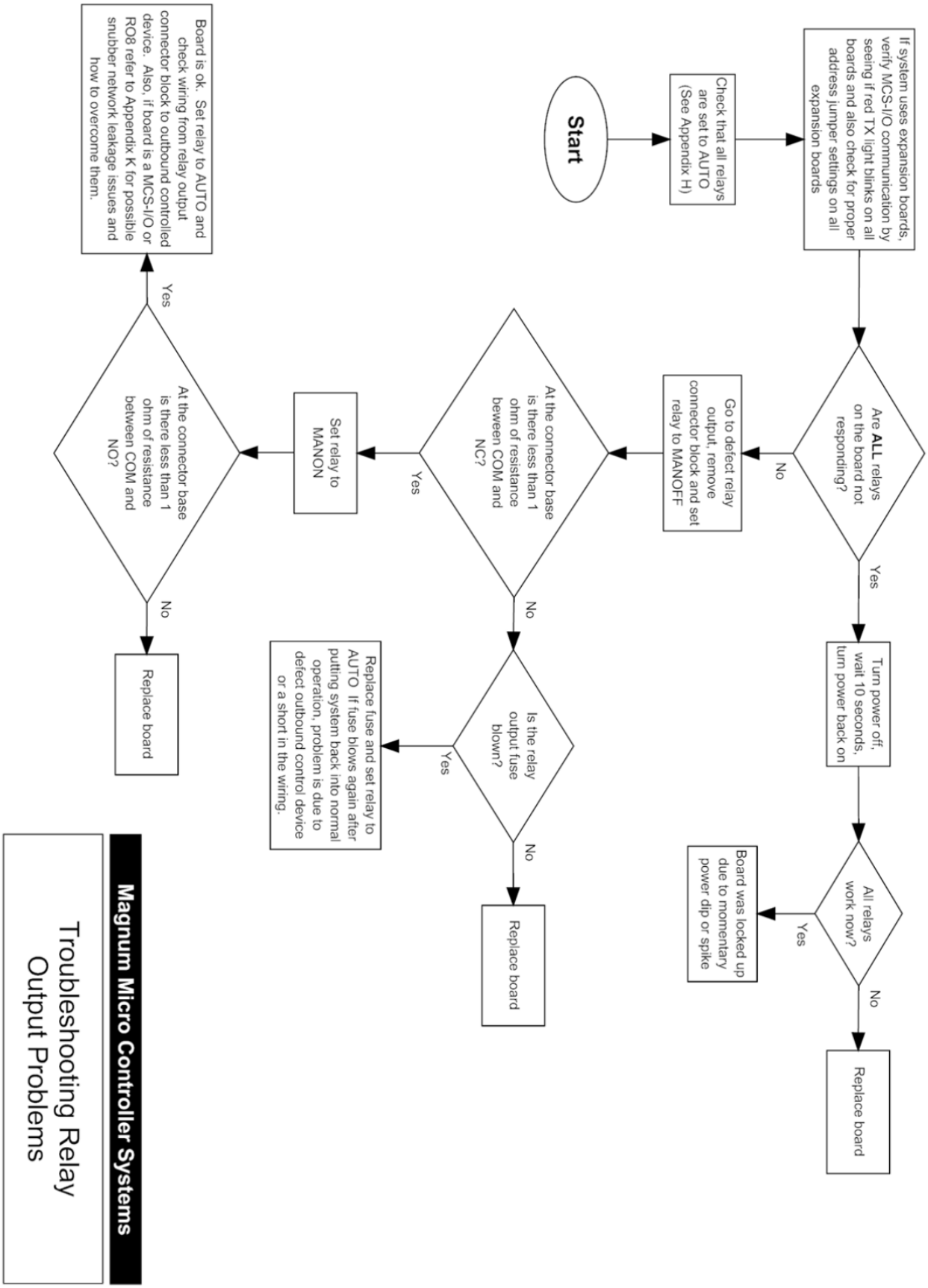
Trouble Shooting Quick Reference Sheet

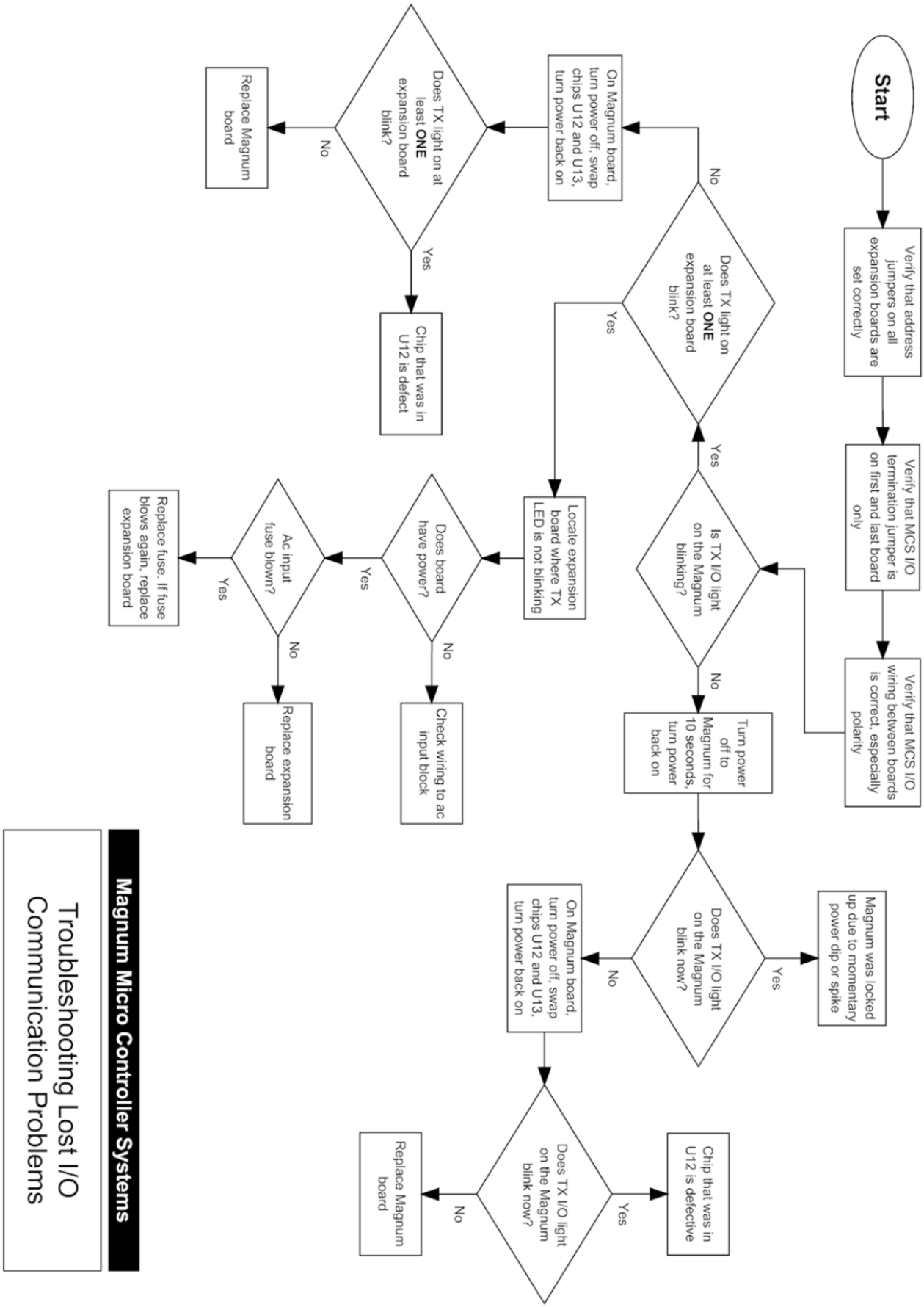
(A complete trouble shooting guide is available from our web site)

PROBLEM	POTENTIAL SOLUTION
A sensor input reads -99.9	This indicates an open sensor input signal or 5 VDC problem. ■ Check sensor wiring for missing wire or poor connection. ■ Check sensor for bad sensor. If less than 5 VDC is on the sensor 5 VDC terminal block, the problem is with probably a shorted sensor. (A poly fuse protects the board) ■ Remove all sensor input terminals. ■ Wait about 1 min. or until 5 VDC restored at sensor input. ■ Connect terminals 1 at time until short reappears.
A sensor input reads +999.9	This indicates a shorted sensor input signal. ■ Check sensor wiring for +5VDC shorted to signal etc. ■ Check sensor for bad sensor.
A sensor is reading less then or greater than 3% off	This indicates the sensor needs to be calibrated. (You need to have a valid Authorization code to change sensor offsets) ■ Press Service Diagnostics, press until LCD display s sensor offset option ■ Press enter, 1st SI# and offset appears (i.e. Suction 1 = 0.0) ■ Scroll using “increase (+)/decrease (-)” keys to find sensor to be calibrated Press enter, use the “increase (+)/decrease (-)” keys to change the calibration value. When value is correct, press enter.
LCD blank or flashing.	Indicates bad connection. ■ Check wiring to keypad ■ Could indicate bad software transfer, retransmitting may be necessary.
Lost I/O	Indicates communications problem. ■ Verify RS485 LED blinking. ■ Verify termination jumper only on JP4 on the MCS-Magnum and the last I/O board. ■ Verify MCS-Magnum and each I/O’s address is set correctly. ■ Verify wiring from the MCS-Magnum to each I/O is correct. ■ Check fuses/120 VAC on I/O units
Invalid reading on one sensor input.	This indicates an input problem with 1 sensor. ■ Verify jumper settings correct for that SI.
Invalid authorization	This indicates an invalid authorization number. Follow steps below for proper authorization ■ Press SERVICE DIAGNOSTICS until the auth. option appears ■ Press the ENTER key ■ From the “Display Status” press keys corresponding to your authorization # ■ Press ENTER


Start
If board has a voltage selector switch, is it set correctly?
No
Turn power off, set switch to correct voltage, turn power on
Yes
Measure voltage at ac input connector block and verify that it is within 10 percent of rated voltage
Voltage ok?
No
Correct ac supply to board
Yes
Ac input fuse blown?
No
Replace fuse. If fuse blows again replace board
Yes
Is board a Magnum?
No
Press RESET button on board
Problem solved?
Yes
Board was locked up due to momentary power dip or spike
No
Turn power off, wait 10 seconds, turn power back on
Problem solved?
Yes
Board was locked up due to momentary power dip or spike
No
Replace board
Yes
Is green 16VDC light on?
No
Replace board
Yes
Is red RESET light on all the time?
No
Press RESET button on board
Problem solved?
Yes
Board was locked up due to momentary power dip or spike
No
Turn power off, wait 10 seconds, turn power back on
Problem solved?
Yes
Board was locked up due to momentary power dip or spike
No
Replace board
Yes
Is LCD backlight on?
No
Replace board
Yes
Try to reload software
Problem solved?
Yes
Software was corrupted
No
Replace board
Magnum Micro Controller Systems
Troubleshooting General Dead Board Symptoms


Start
Check that all sensor input Analog / Digital jumpers are set correctly and all sensors are set to AUTO
If system uses expansion boards, verify MCS-I/O communication by seeing if red TX light blinks on all boards and also check for proper address jumper settings on all expansion boards
Are ALL sensors on the board not responding?
Yes
No
Go to any sensor input on the board and measure dc voltage from +5 pin to ground
Go to defect sensor input and remove connector block
If ANALOG sensor, connect MCS-SENSOR-TEST block (100K ohm 1/4 watt resistor from +5 pin to SI pin on connector base) and compare sensor reading to Appendix J
If DIGITAL sensor, connect jumper wire from +5 pin to SI pin on connector base and see if sensor reading changes from ON to OFF or OFF to ON
Reads correctly?
Yes
No
Defect sensor or wiring to sensor
Board is defect and may have been damaged by overvoltage applied to the sensor input
4.75 to 5.25 volts dc?
Yes
No
Replace board
Remove all sensor blocks from board, wait 10 seconds, then measure dc voltage from +5 pin of any sensor input on board to ground
4.75 to 5.25 volts dc?
Yes
No
Reconnect Sensor 1 and measure dc voltage from +5 pin of any sensor input on board to ground
Turn power off to board and measure for short from +5 pin of any sensor input on board to ground
Shorted?
Yes
No
Board is defect and may have been damaged by overvoltage applied to a sensor input
Replace board
4.75 to 5.25 volts dc?
Yes
No
Reconnect the next sensor and measure dc voltage from +5 pin of any sensor input on board to ground
The sensor or wiring to sensor you just reconnected is shorted to ground
Magnum Micro Controller Systems
Troubleshooting Sensor Input Problems


Start
Check that all relays are set to AUTO (See Appendix H)
If system uses expansion boards, verify MCS-I/O communication by seeing if red TX light blinks on all boards and also check for proper address jumper settings on all expansion boards
Are ALL relays on the board not responding?
No
Go to defect relay output, remove connector block and set relay to MANOFF
Yes
Turn power off, wait 10 seconds, turn power back on
All relays work now?
Yes
Board was locked up due to momentary power dip or spike
No
Replace board
At the connector base is there less than 1 ohm of resistance beween COM and NC?
Yes
Set relay to MANON
At the connector base is there less than 1 ohm of resistance between COM and NO?
Yes
Board is ok. Set relay to AUTO and check wiring from relay output connector block to outbound controlled device. Also, if board is a MCS-I/O or RO8 refer to Appendix K for possible snubber network leakage issues and how to overcome them.
No
Replace board
No
Is the relay output fuse blown?
Yes
Replace fuse and set relay to AUTO If fuse blows again after putting system back into normal operation, problem is due to defect outbound control device or a short in the wiring.
No
Replace board
Magnum Micro Controller Systems
Troubleshooting Relay Output Problems


Start
Verify that address jumpers on all expansion boards are set correctly
Verify that MCS I/O termination jumper is on first and last board only
Verify that MCS I/O wiring between boards is correct, especially polarity
Is TX I/O light on the Magnum blinking?
Yes
No
Does TX light on at least ONE expansion board blink?
Yes
No
Chip that was in U12 is defect
On Magnum board, turn power off, swap chips U12 and U13, turn power back on
Does TX light on at least ONE expansion board blink?
Yes
No
Replace Magnum board
Locate expansion board where TX LED is not blinking
Does board have power?
Yes
No
Ac input fuse blown?
Yes
No
Replace fuse. If fuse blows again, replace expansion board
Replace expansion board
Check wiring to ac input block
Turn power off to Magnum for 10 seconds, turn power back on
Does TX I/O light on the Magnum blink now?
Yes
No
Magnum was locked up due to momentary power dip or spike
On Magnum board, turn power off, swap chips U12 and U13, turn power back on
Does TX I/O light on the Magnum blink now?
Yes
No
Chip that was in U12 is defective
Replace Magnum board
Magnum Micro Controller Systems
Troubleshooting Lost I/O Communication Problems