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# +12 MAGNUM

## Basic Getting Started Manual

**MCS-MAGNUM SOFTWARE V17.0**  
**MCS-MAGNUM HARDWARE 9.1+**  
**TOUCHSCREEN FIRMWARE 3.0+**



MCS-MAGNUM-N-12



Keypad - Panel Mount



Keypad - Door Mount



MCS-MAGNUM - 15.4-12  
Control Cabinet

**MCS Total  
Solution  
for all your  
Control  
Needs**



**Energy Efficient and RoHS Compliant**

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LICENSED WITH MICRO CONTROL SYSTEMS  
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## Chapter - 1. Introduction to Magnum

Magnum V17.0 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.

### 1.1. Magnum V17 Software Control Point Capacity

Circuits (compressors): Up to 20

Steps per circuit: Up to 4

Relay Outputs: Up to 80

Analog Outputs: Up to 28

Sensor Inputs: Up to 112

Setpoints: 255

Alarm Memory: 100

Magnum Hardware Supported by Magnum V17.0 Software

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

MCS-Magnum-N-12 (10 ROs, 12 SIs, 4 Digital SIs, and 4 AOs)

MCS-IO Base and Ext. (16 SIs, 4 AOs, 10 ROs)

MCS-RO Base and Ext. (10 ROs)

MCS-SI Base and Ext. (16 SIs and 4 AOs)

The versatility of the Magnum-N-12 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.

### 1.2. About the Magnum

The Magnum-N-12 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.



**Additional information on the MCS-MAGNUM and related products can be found in a presentation available on our web site at:**

<http://www.mcscontrols.com/presentations.html>

## Chapter - 2. Table of Contents

Chapter - 1.	Introduction to Magnum .....	3
1.1.	Magnum V17 Software Control Point Capacity .....	3
1.2.	About the Magnum .....	3
Chapter - 2.	Table of Contents .....	4
Chapter - 3.	PC Support Software for Magnum.....	6
3.1.	Requirements for PC Software.....	6
Chapter - 4.	Network - RS-485 Connection .....	7
4.1.	MCS 485 Network .....	7
Chapter - 5.	Network Connection–Ethernet .....	8
5.1.	RJ45 using a Crossover Ethernet Cable .....	8
Chapter - 6.	Network Connection–Remote.....	9
6.1.	Remote using Ethernet.....	9
Chapter - 7.	MCS-MAGNUM .....	10
7.1.	MCS-Magnum Revision 11 .....	10
Chapter - 8.	Preparing to Upgrade an Existing Chiller .....	11
8.1.	Step 1- Open MCS Supplied Upgrade Kit .....	11
8.2.	Step 2- Plan to Mount New Microprocessor with Keypad .....	11
8.3.	Step 3- Prepare to Start the Unit .....	11
Chapter - 9.	MCS-CONNECT .....	13
9.1.	Scan for Controller.....	14
Chapter - 10.	Getting to know your Touchscreen .....	15
Chapter - 11.	Touchscreen’s Interface .....	16
Chapter - 12.	Site Documents .....	17
12.1.	Documents, Spec Sheets, Drawings, etc. ....	17
Chapter - 13.	Main Screen .....	18
13.1.	COMPANY GRAPHICS.....	18
Chapter - 14.	Touchscreen Keypad .....	19
14.1.	KEYPAD - .....	19
14.2.	'ON SCREEN KEYPAD' .....	19
Chapter - 15.	Touchscreen Utilities .....	20
15.1.	Utilities folder and its sub folders.....	20
15.1.1	Calibrate Touchscreen .....	20
15.1.2	Leafpad.....	20
15.1.3	LX Terminal.....	20
15.1.4	MCS Website .....	20
15.1.5	Network Connections.....	20
15.1.6	Reboot .....	21
15.1.7	Setting Time and Date - MCS-TOUCHSCREEN .....	21
Chapter - 16.	Network .....	23
16.1.	Setting Up Network For Communication With Your Controller .....	23
16.2.	Utilities Folder.....	23
16.2.1	Network Connections Screen .....	24
16.2.2	Adding IP Address .....	25
Chapter - 17.	MCS-CONNECT .....	26
17.1.	MCS-CONNECT Shortcut on Desktop .....	26
Chapter - 18.	MCS-Connect Communication .....	27
Chapter - 19.	UnLocking / Locking Touchscreen.....	28
19.1.	Unlocking the Touchscreen. ....	28

Chapter - 20. Calibrating Touchscreen.....30  
    20.1. USING CALIBRATING SOFTWARE .....30  
        20.1.1 CALIBRATING WITH NEW 9 POINT SOFTWARE .....31  
Chapter - 21. Using the Keypad and its Display Screens .....32  
Chapter - 22. Main Menu Function Keys .....44  
Chapter - 23. Authorization Function .....45  
Chapter - 24. Sensors Quick Reference Sheet .....46  
Chapter - 25. Troubleshooting Quick Reference Sheet .....47

## Chapter - 3. 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.

### 3.1. Requirements for PC Software

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

#### Minimum System Required to Run Program

- PC with a Pentium-class processor
- Windows 7 or later operating system or
- Linux operating system
- Minimum 1GB of RAM
- Minimum 4GB Drive
- 14.4k baud modem or higher for remote
- Communications
- 1280 x 800 pixel or higher display



**Additional information on the setup and using MCS-CONNECT can be found on our web site.  
Both an Instruction Manual and Powerpoint presentation are available at:  
<http://www.mcscontrols.com/#null>**

## Chapter - 4. Network - RS-485 Connection

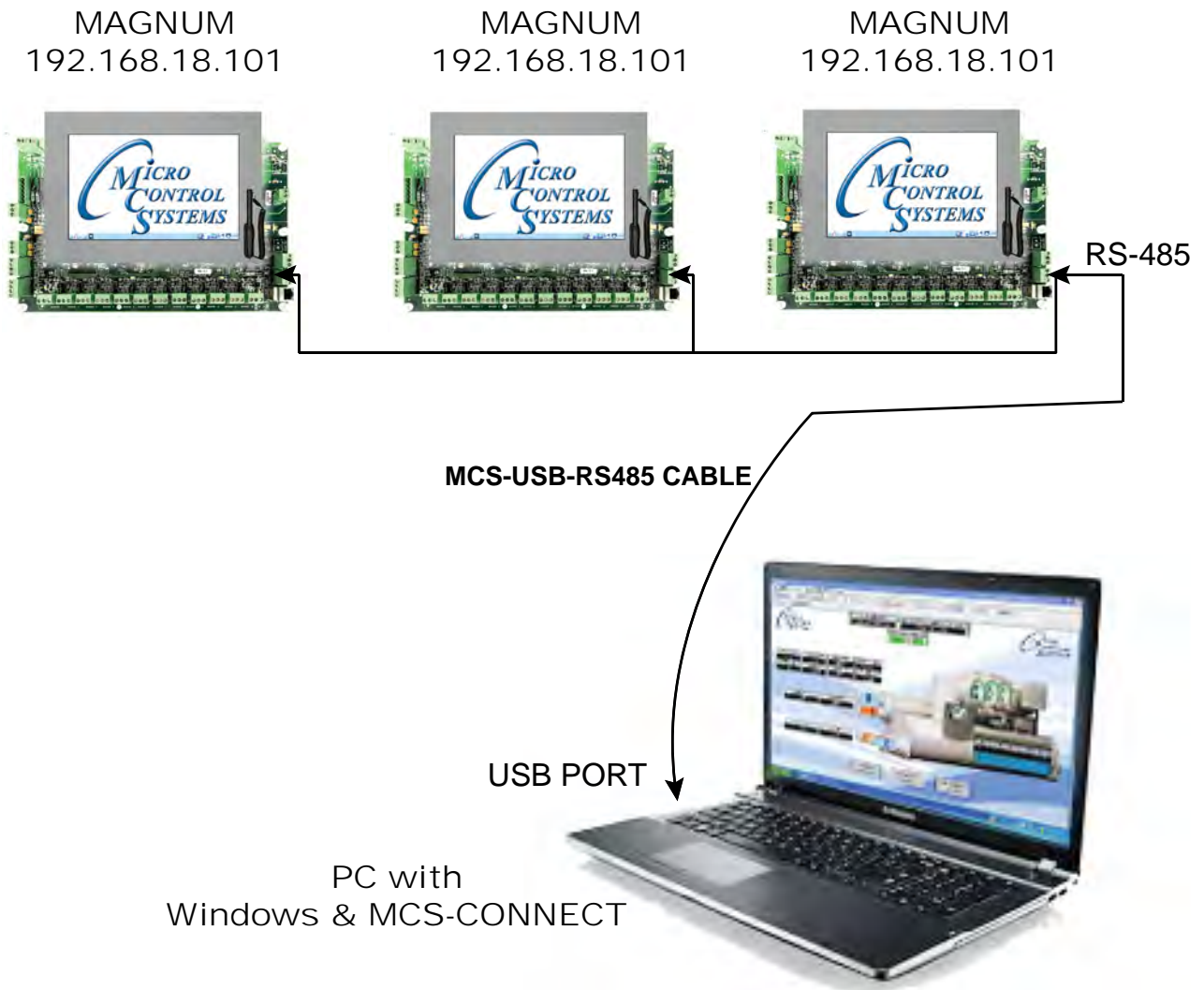
The next few pages show recommended network setups for communication to your controller, using products from MCS.

### 4.1. MCS 485 Network

The MCS 485 Network can support up to 20 Magnums and their associated I/O boards. Access to this network can be remotely, through a 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.

RS485 transmission should not exceed 4000 feet without a repeater.

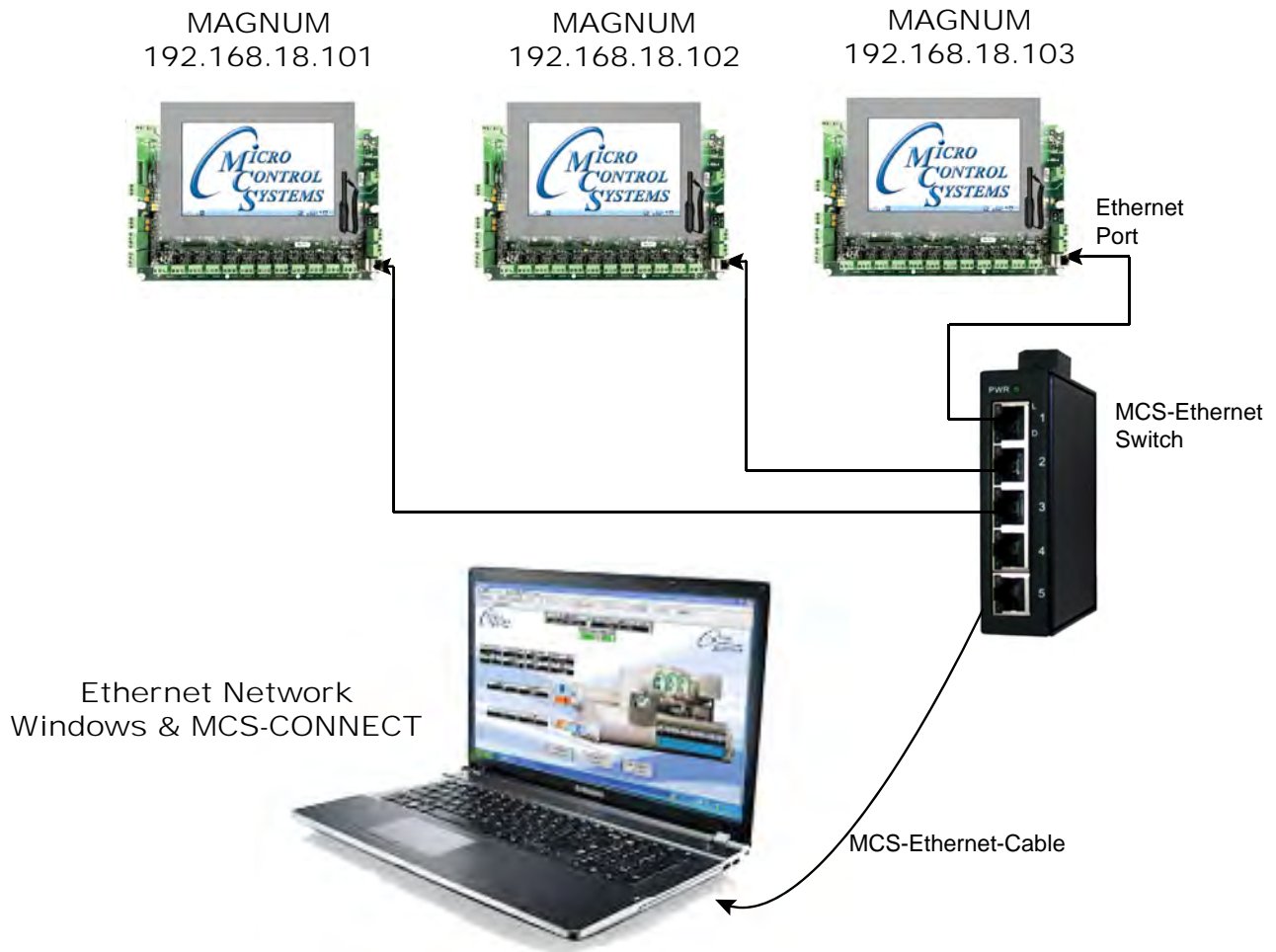




## Chapter - 5. Network Connection-Ethernet

### 5.1. RJ45 using a Crossover Ethernet Cable

When connecting directly through the 10/100 MBPS Ethernet port on the Magnum from a PC it is necessary to use a crossover Ethernet cable.





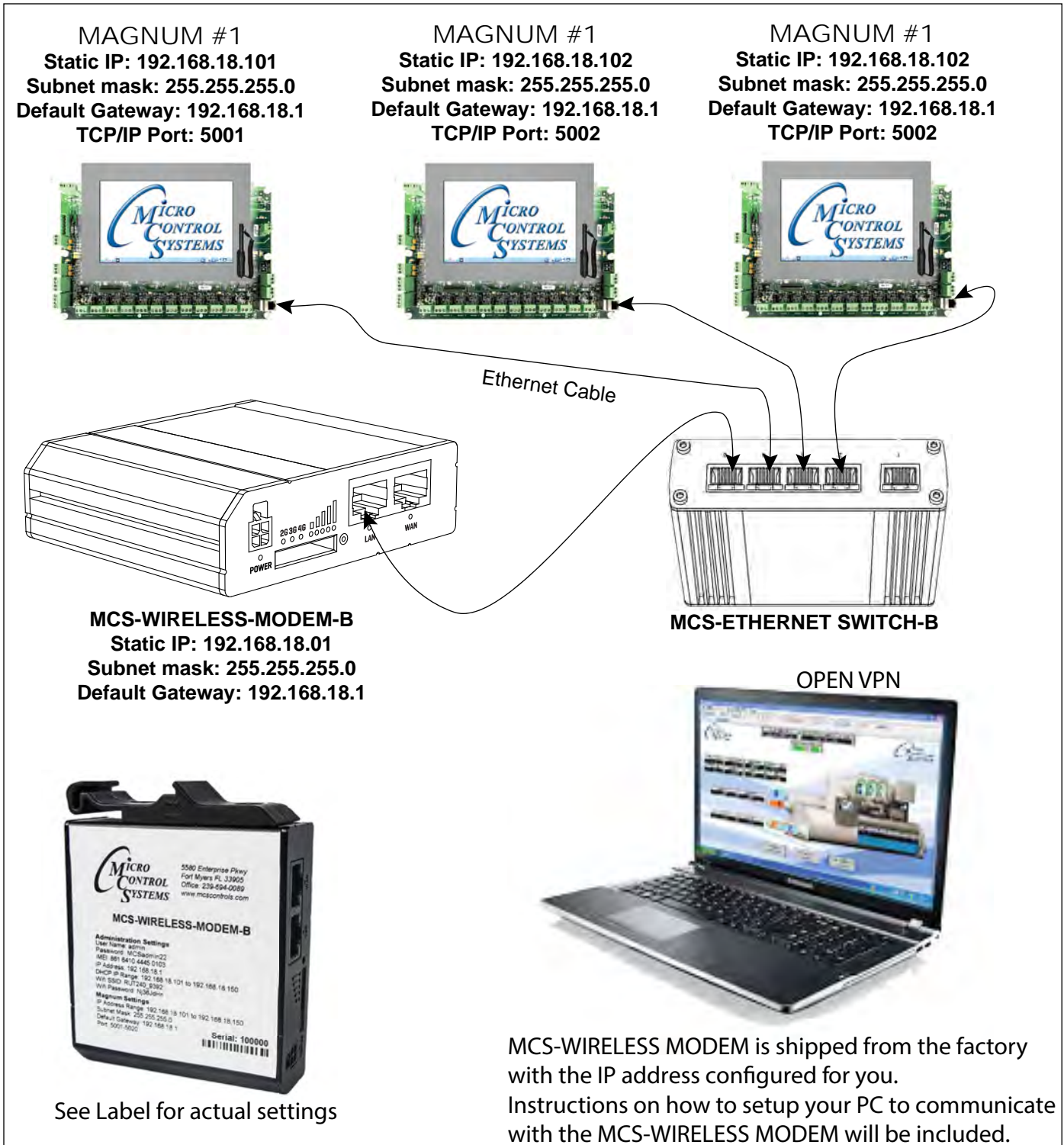
## Chapter - 6. Network Connection-Remote

### 6.1. Remote using Ethernet

When connecting directly through the 10/100 MBPS Ethernet port on the Magnum from a PC.



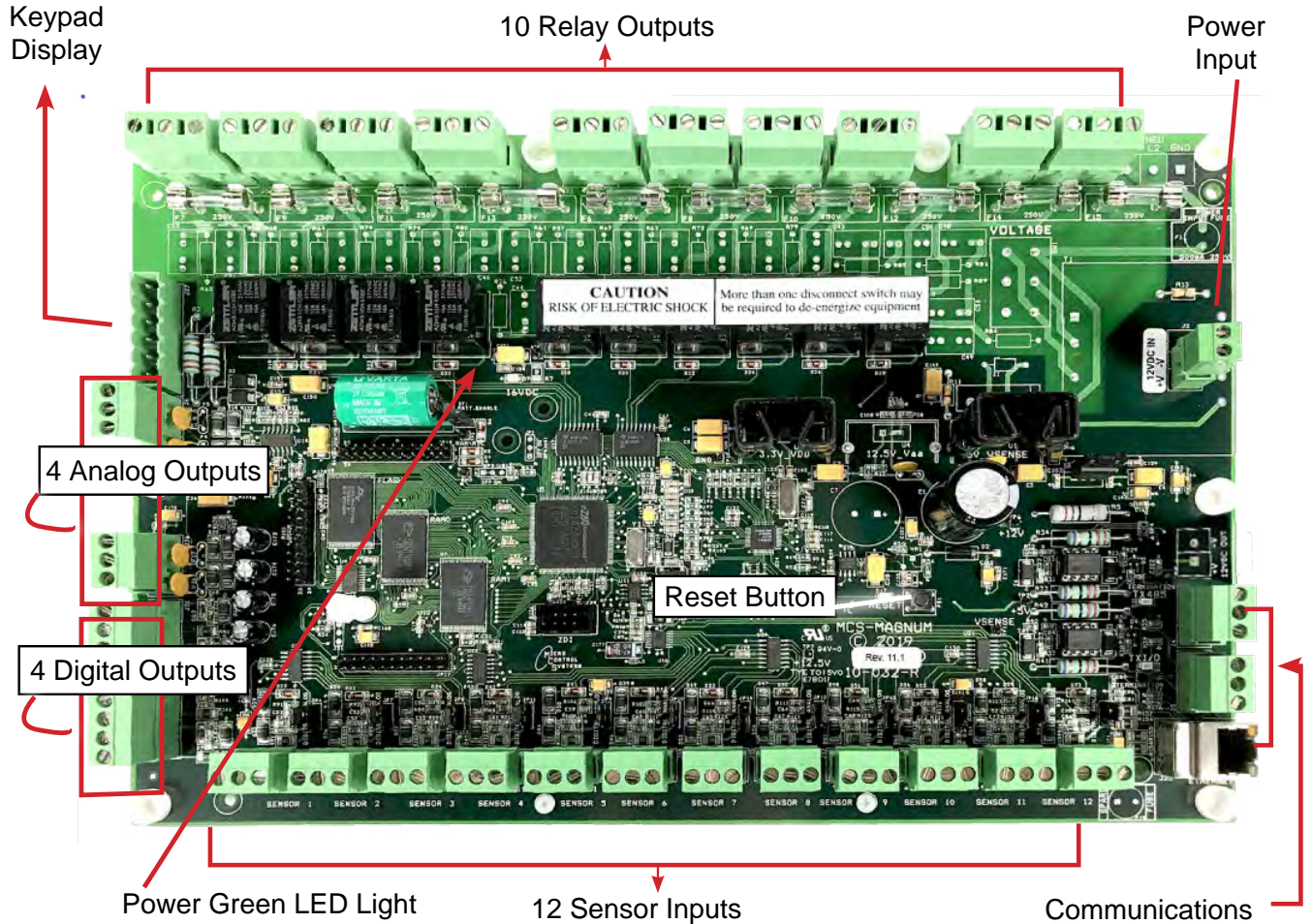
It is necessary to use a crossover Ethernet cable to the MCS-WIRELESS MODEM.



# Chapter - 7. MCS-MAGNUM

## 7.1. MCS-Magnum Revision 11

# MCS-MAGNUM-N-12



## Specifications

### Controller

Dimensions.....12.0”w, 8.0”h, 2.0”d  
 Mounting Holes.....Mounts on a backplane using eight #6 sheet metal screws  
 Operating Temperature.....-40°F to +158°F (-40°C to +70°C)  
 Operating Humidity.....0-95% Non-Condensing  
 Storage Temperature ..... -40°F to +158°F (-40°C to +70°C)  
 Microprocessor ..... Zilog eZ80 Acclaim! @ 50mhz  
 Sensor Inputs (SI)..... 12 inputs 0-5vdc (10-bit A/D)  
 Digital Inputs..... 4 inputs 0 or 5vdc only  
 Relay Outputs (RO).....10 outputs 6.3amps @ 230vac  
 Analog Outputs (AO) .....4 outputs 0-10vdc  
 Printed Circuit Board .....Six layer with separate power and ground planes

Input Power (Standard) ..... 12vdc  
 MCS-I/O Comm Port ..... 1 @ 38,400 baud  
 RS-485 Comm Port ..... 1 @ 19,200 baud  
 Ethernet .....10/100 Mbps Ethernet  
 Real Time Clock ..... Battery backup  
 Power Detection .....Automatic power fail reset

## Chapter - 8. Preparing to Upgrade an Existing Chiller

### 8.1. 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




MCS-MAGNUM

### 8.2. Step 2- Plan to Mount New Microprocessor with Keypad



Keypad-Panel Mount

- 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.



Keypad-Door Mount

#### GROUND CONNECTIONS



- It is important to provide a good earth ground to the 12 VDC/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 directly to ground with a wire made as short as possible (12AWG).

### 8.3. 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 contractor 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 ROs, SIs and AOs 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 - 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.)

## Chapter - 9. MCS-CONNECT

MCS-CONNECT software is part of the MCS Support System. Its purpose is to provide both local and remote communication for MCS micro controllers either by themselves, or as part of a network.

MCS-CONNECT supports the following controllers:

- MCS-MAGNUM controller
- MicroMag controller

MCS-CONNECT permits the user to monitor the status of the micro controller in real time and, with proper authorization, changes can be made to the system. In as fast as 10 seconds, configuration files can be transmitted to, or received from an MCS micro controller.

Another powerful feature of MCS-CONNECT is its ability to graph event history. Since MCS controllers automatically perform history logging, the user can select which inputs or outputs to graph and view the results either in real time, or over a user selectable period of time.

MCS-CONNECT supports the SAVE of history data in the GRAPH function as a \*.txt file. This allows the user to bring the data up in MCS-CONNECT off line, or in a spreadsheet program such as Microsoft Excel.

Updates for MCS-CONNECT can be downloaded directly from the MCS website under "Support", PC Software.

The program is available as Microsoft Windows based software or as Linux based software.

You can find complete installation and setup for MCS-CONNECT in the manual located on the MCS website.

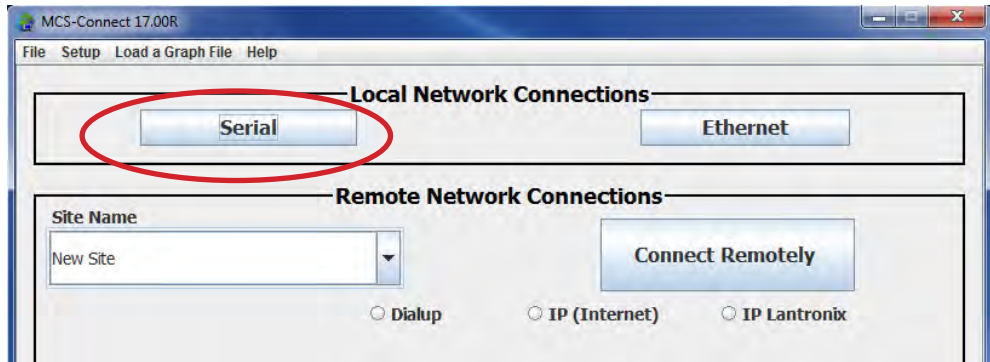


**MCS has over a hundred APP Notes on 'HOW TO' for our products. They can be found at:**

<http://www.mcscontrols.com/appNotes.html>

### 9.1. Scan for Controller

Once connected, click on the MCS-CONNECT program to open. If you are connected using the MCS-485-USB cable use the serial button to scan for the controller.



Next screen shows MCS-CONNECT scan for controller. Click anywhere in the row to open your controller.

Address	HW Serial #	Cfg Name	Company Name	Unit Model #	Unit Serial #	Installed Date	Cfg Vers.	Firmware Vers.	Cfg Date
192.168.10.4 (2)	001088	OFFICE AHU	MicroCtrlSystem	Cool/Heat/OA		11/13/2012	11	HVAC 09.14-M	12/16/2014
192.168.10.4 (6)	011492	PLANT AHU3	MCS	AAON	JB-HVAC 14.02F	01/07/2014	14	HVAC 14.00-V	06/17/2014
192.168.10.4 (5)	010462	TR ROOM	MicroCtrlSystem	Cool/Heat/OA		11/13/2012	11	HVAC 09.14-M	07/29/2014
192.168.10.4 (7)	012938	PLANT AHU1	MCS	AAON	JB-HVAC 14.05U	01/07/2014	14	HVAC 14.00-F	09/22/2014
192.168.10.4 (3)	002210	DOWN VAVS	MicroCtrlSystem	8,10,11,13A,13B	JAT HVAC 09.10L	06/01/2012	11	HVAC 09.14-M	11/10/2014
192.168.10.4 (4)	001624	UP VAVS	MicroCtrlSystem	8,10,11,13A,13B	JAT HVAC 09.10Q	08/03/2012	11	HVAC 09.14-M	06/17/2014
192.168.10.4 (11)	013036	STJ	MicroCtrlSystem	Cool/Heat/OA		06/04/2014	14	HVAC 14.00-V	12/10/2014

Next screen shows 'Status screen' for the controller.



A Powerpoint presentation on MCS-CONNECT can be found on our web site at:

<http://www.mcscontrols.com/presentations.html>

## Chapter - 10. Getting to know your Touchscreen

On the following pages we will acquaint you with the function and use of the MCS-TOUCHSCREEN, plus introduce you to the graphics that we have incorporated into the design.

OEMs with additional training and the Graphic Builder, will be able to make changes to the graphics and help manage with all the information the MCS controller has available to provide.

### TOUCHSCREENS

The MCS-TOUCHSCREEN has a new Weather Proof Touchscreen interface designed to simplify user access with the MCS-Magnum and MCS-MicroMag. MCS-Connect can be utilized to provide both graphics and service mode access for technicians.

Information and graphics on the MCS-TOUCHSCREEN are shown on high resolution (1280x800) LCD display with LED back lighting, which guarantees long-life operation.

The high resolution screen makes it easy for the user to manage complex installations quite easily. It also ensures that the pages can be navigated in a fast and straightforward manner. Up to 60 MCS controllers can be connected to a MCS-TOUCH via RS485 or Ethernet.

Utilizing a gasket for an environment seal provides the MCS-TOUCHSCREEN with a NEMA4 rating.

Depending on the Box Enclosure you choose, an installation can be either indoor or outdoor.

A NEMA4 Box Enclosure must be used for outdoor installation or for areas that are subject to water wash-down or extreme harsh environments. The MCS-TOUCH temperature range is -20oC to 70oC / -4oF to 158oF.

The Magnum can be installed without the Keypad Display using the new Touchscreens.

### GRAPHICS FOR TOUCHSCREENS

With the new Graphical Interface and MCS-Connect, you now have a better view of your controller's many functions as shown on the screen to the right.

The graphics package is pre-installed and can be customized by OEMs with the MCS Graphic Builder or custom build by MCS for your clients.



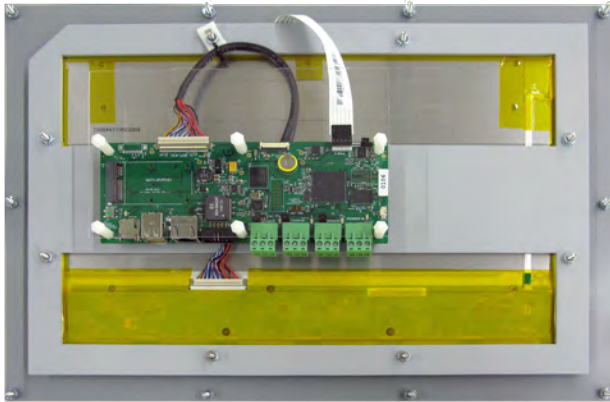
**Additional information on the setup and using your Touchscreen and Graphics can be found on our web site, along with additional App. notes concerning the Touchscreens.**

**<http://www.mcscontrols.com/manuals.html>**



## Chapter - 11. Touchscreen's Interface

Your touchscreen is shipped installed with the latest Linux operating system, MCS-Connect and additional files for displaying your graphics.



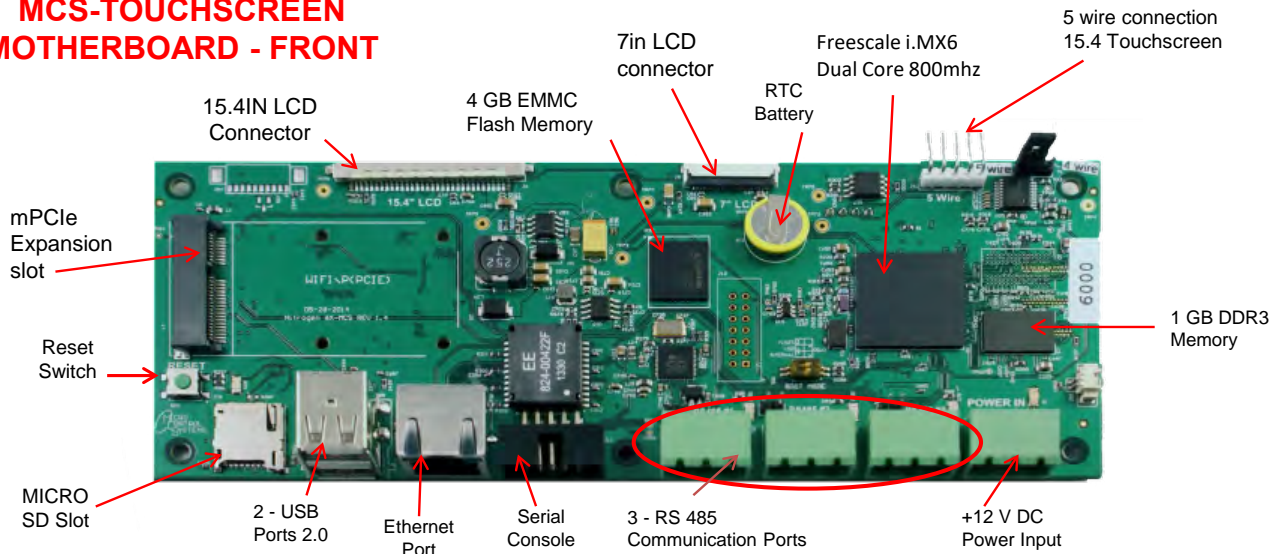
Back of Display - 15.4"



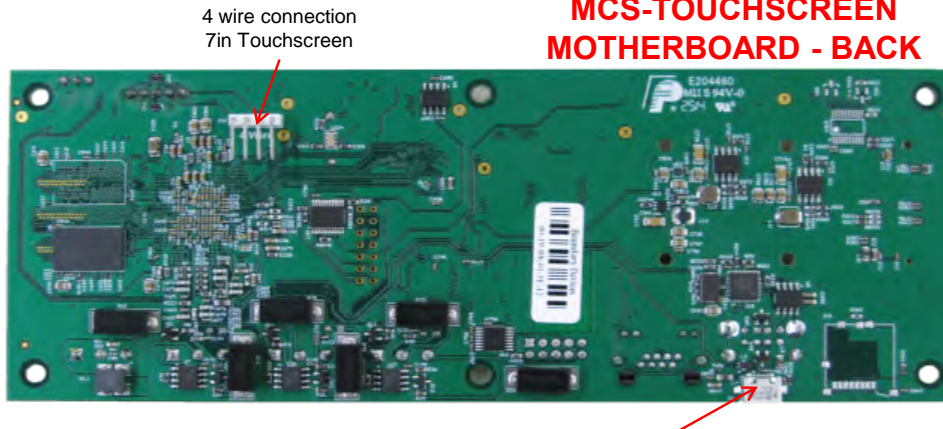
### INCLUDED COMPONENTS

**90W Single Output Power Supply for Touchscreen**  
Resistant to short circuiting, overloading, and over voltage.  
Operating temperature up to 158F (70 °C)

### **MCS-TOUCHSCREEN MOTHERBOARD - FRONT**



### **MCS-TOUCHSCREEN MOTHERBOARD - BACK**



## Chapter - 12. Site Documents

### 12.1. Documents, Spec Sheets, Drawings, etc.

Stored in the Touchscreen's flash memory you will find pdf's and documents pertaining to the building of your unit. Each unit's configuration is different, so the 'SITE DOCUMENTS' file will pertain to that unit only.

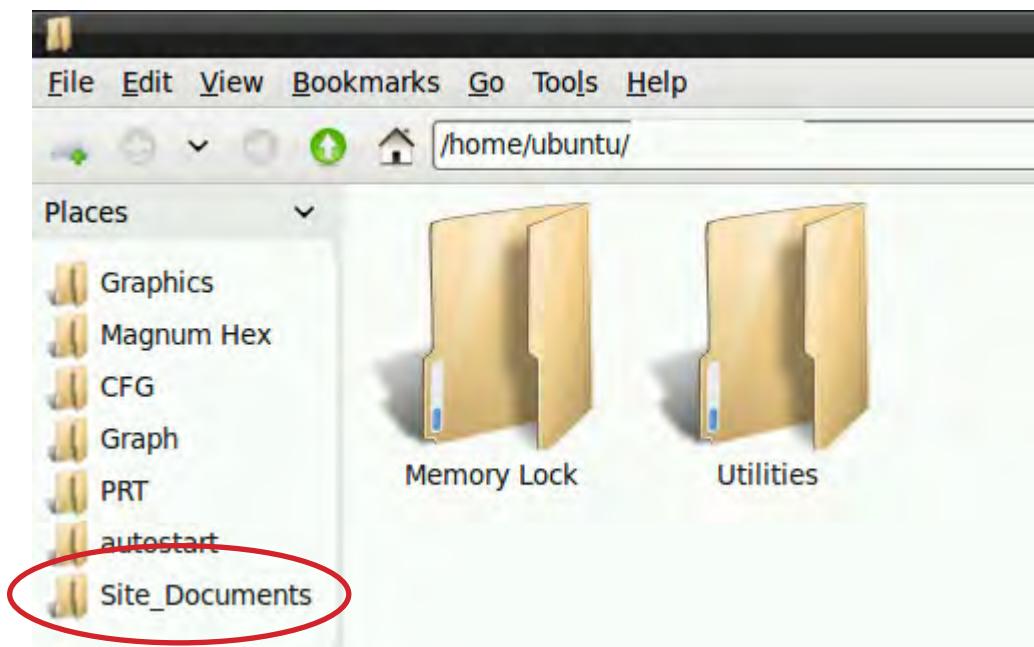
An example of the contains of the 'SITE DOCUMENTS' folder may contain:

1. **DRAWINGS** (PDF'S) of the components used in this unit
2. **EXAMPLE OF MANUALS** (if installed in your unit)
  - a. Getting Started Manual
  - b. Keypad Manual
  - c. Touchscreen Manual
  - d. EXV Manual
  - e. BMS-GATEWAY Startup Guide
  - f. Additional manual may be stored here depending on the configuration of the unit
3. **SPECIFICATION SHEETS**

Each part installed should have a spec (data) sheet included in the 'SITE DOCUMENTS' folder
4. **CONFIGURATION FILE** - This is the key file in building your unit. If your config file is somehow corrupted, this is the original file used and may need to be re-installed. Call MCS-SUPPORT for help in re-installing this file to your controller.

To locate the 'SITE DOCUMENTS' folder:

1. Navigate to the '**MCS TOOLS folder**' on your desktop
2. Double click on folder to open



## Chapter - 13. Main Screen

The Main Screen on the Touchscreen is displayed below showing the MCS logo, plus:

1. MCS-Connect icon
2. On Screen Keypad icon
3. MCS Tools, icon
4. Touchscreen Software Version
5. Touchscreen - LOCKED OR UNLOCKED
6. Time of Day



### 13.1. COMPANY GRAPHICS

If your touchscreen came pre-installed with the 'Graphic Package', OEM's and trained Installers will be able to modify some of the displays after the initial installation using the Graphic Builder if they are authorized.

With its 1280x800 Resolution, the display is sharp and easy to read. Making use of the 'Stylus pen', and the on screen keypad adjustments are easy and lets the technician check readouts as to the status of the controller.



The Touchscreen now comes with a Linux operating system.

The latest 15.4 touchscreens, firmware version 3.0 +, comes with a 9 point calibrating software program for pin point accuracy.



## Chapter - 14. Touchscreen Keypad

### 14.1. KEYPAD -

On the main screen, click on Keypad Icon as shown in screen 1.



### 14.2. 'ON SCREEN KEYPAD'

Screen 2 shows keypad display. Use the stylus and keypad to enter or make adjustments.



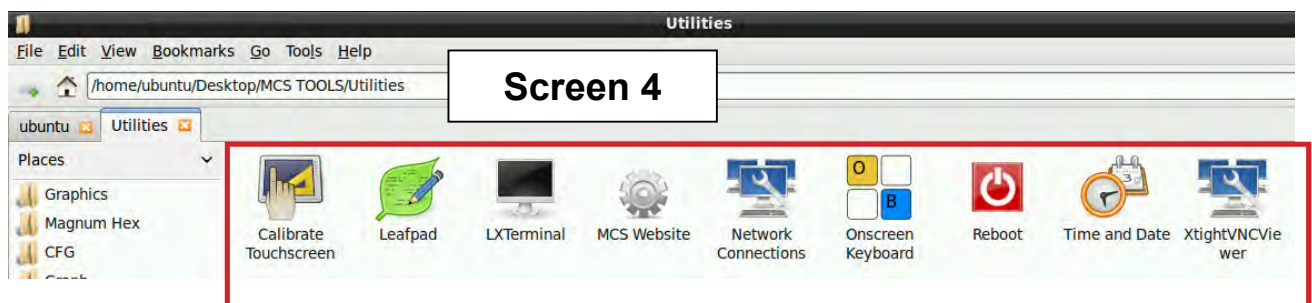
## Chapter - 15. Touchscreen Utilities

### 15.1. Utilities folder and its sub folders

1. **Navigate to the 'MCS TOOLS folder' on your desktop.**
2. **Double click on folder to open.**
3. **Double click on the 'Utilities' sub folder to view contents.**



4. **Screen 3 below displays the difference utilities build into the system.**



**Brief descriptions of these files will be shown on the following pages in this manual.**

#### 15.1.1 Calibrate Touchscreen

Your touchscreen comes with a software program which will allow you to calibrate your touchscreen stylus pen to pin point the accuracy. When you touch an area on the screen the stylus point aligns with the screen area. We will describe how to do this later in this manual.

#### 15.1.2 Leafpad

Leafpad is a text editing program enabling you to make changes to text files.

#### 15.1.3 LX Terminal

LXTerminal is the LXDE version of a terminal emulator. It is used by programmers who are familiar with the Linux operating system.

#### 15.1.4 MCS Website

If you are connected to the internet where this touchscreen is installed, you will be directed to the MCS web site by clicking on this icon.

#### 15.1.5 Network Connections

Clicking on this icon will direct you to a program which will allow you to setup your communications to the company's network and controllers.

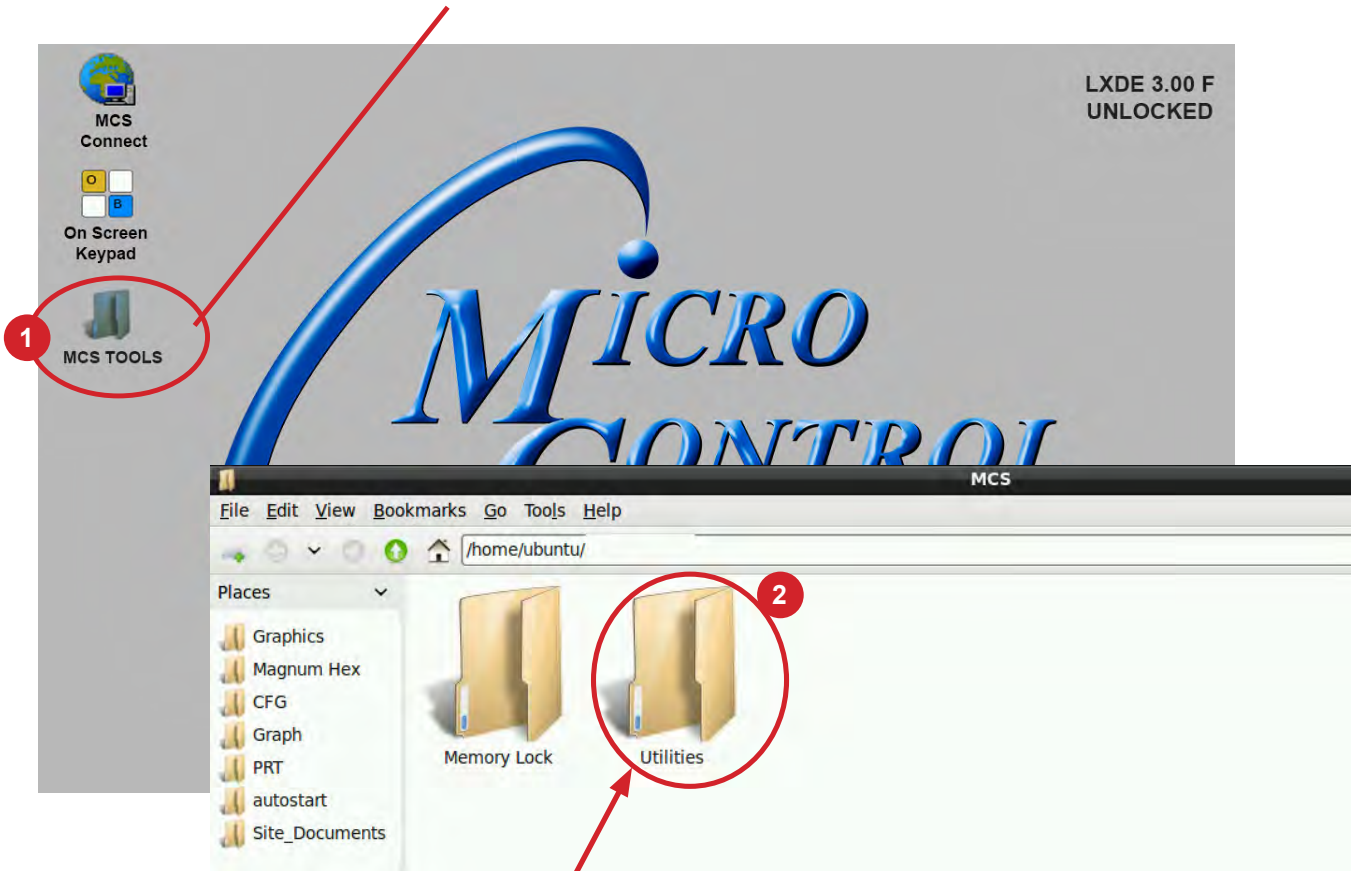
### 15.1.6 Reboot

Clicking on this icon will reboot your touchscreen.

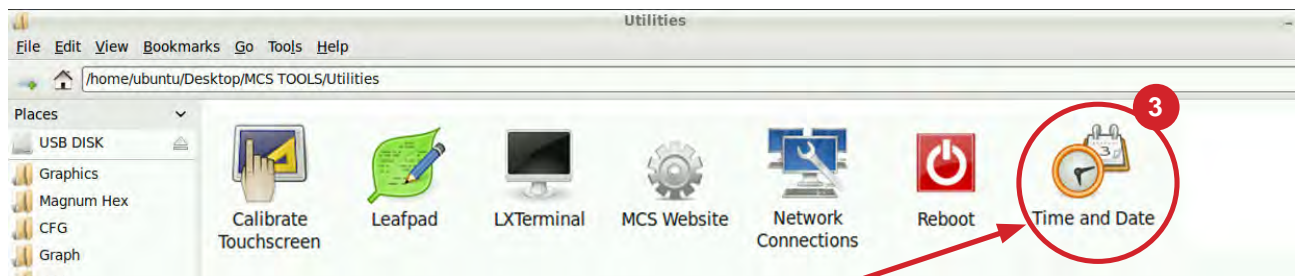
### 15.1.7 Setting Time and Date - MCS-TOUCHSCREEN

1. **Navigate to the 'MCS TOOLS' folder on your desktop.**

**Double click on folder to open.**



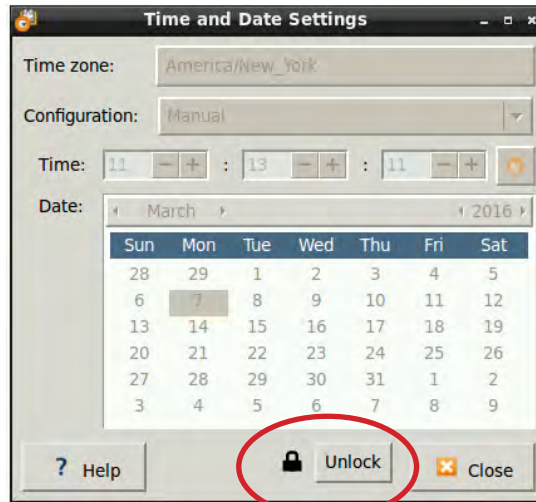
2. **Double click on the 'Utilities' sub folder to view contents.**



3. Double Click 'Time And Date' to make changes

4. Screen opens- click on 'Unlock'

You must be authorized to make these changes.

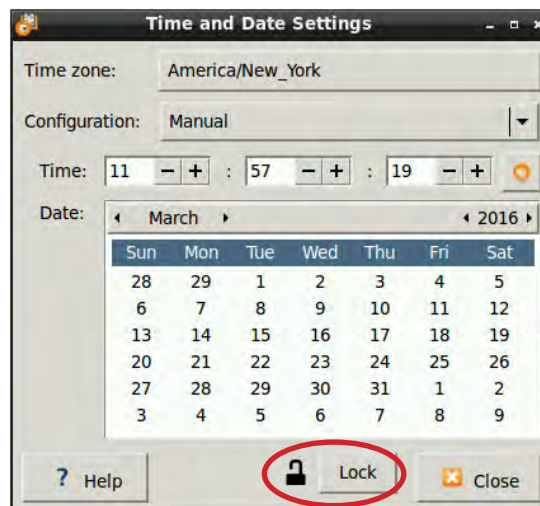


5. Using the keypad, enter password "mcs" (lower case)

6. Click 'Authenticate' to unlock



7. Make changes to date or time and click to 'Lock'.

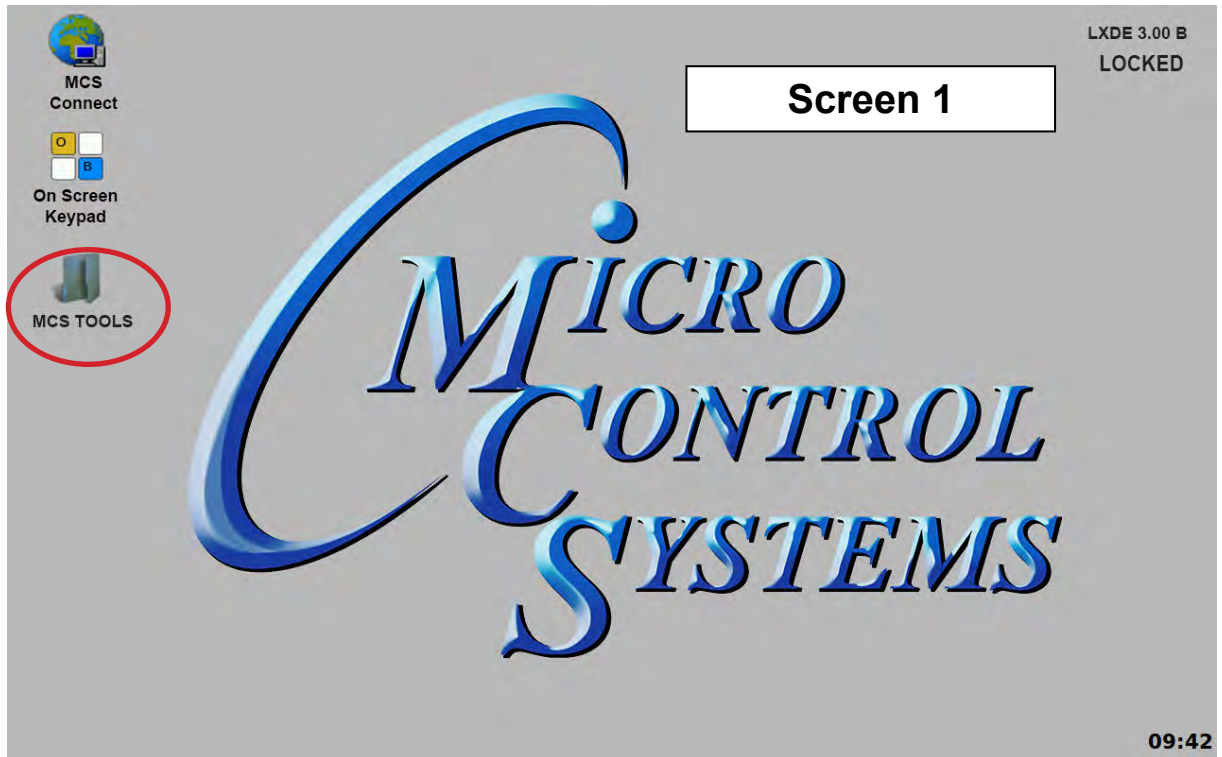




## Chapter - 16. Network

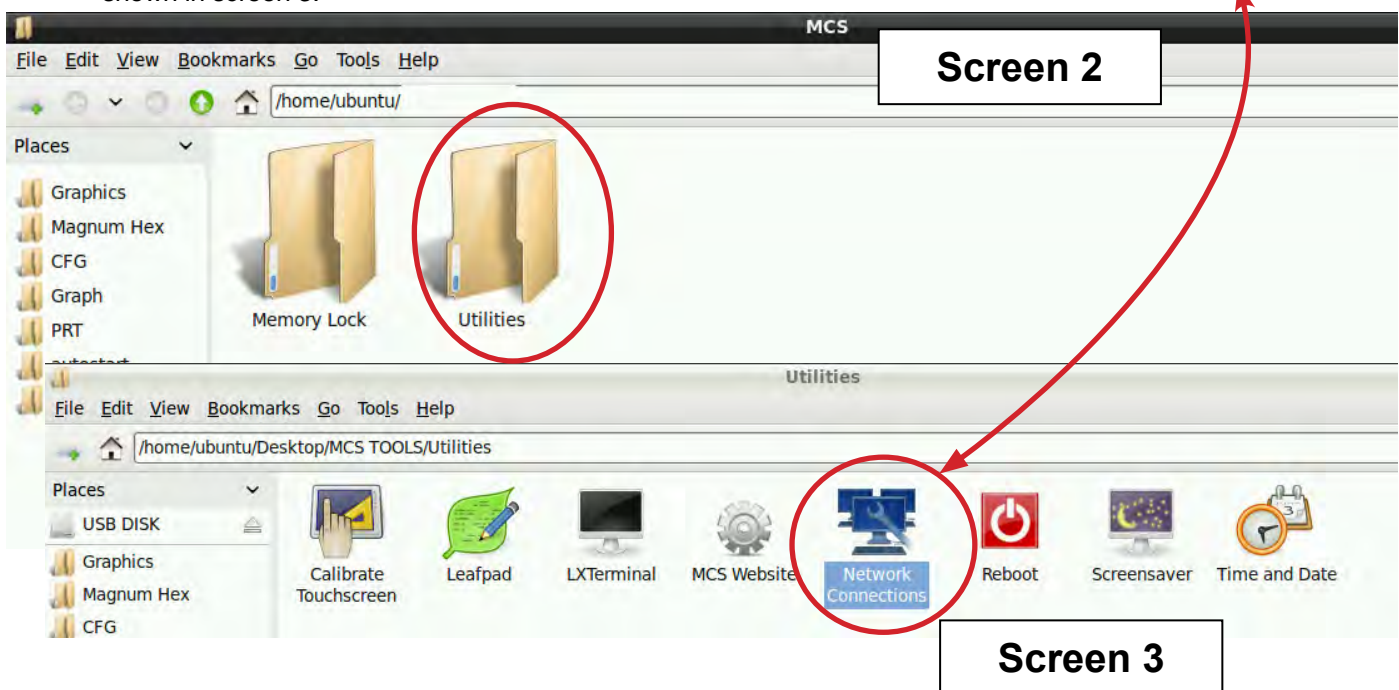
### 16.1. Setting Up Network For Communication With Your Controller

At the touchscreen main screen, click on 'MCS TOOLS' folder' as seen screen 1.



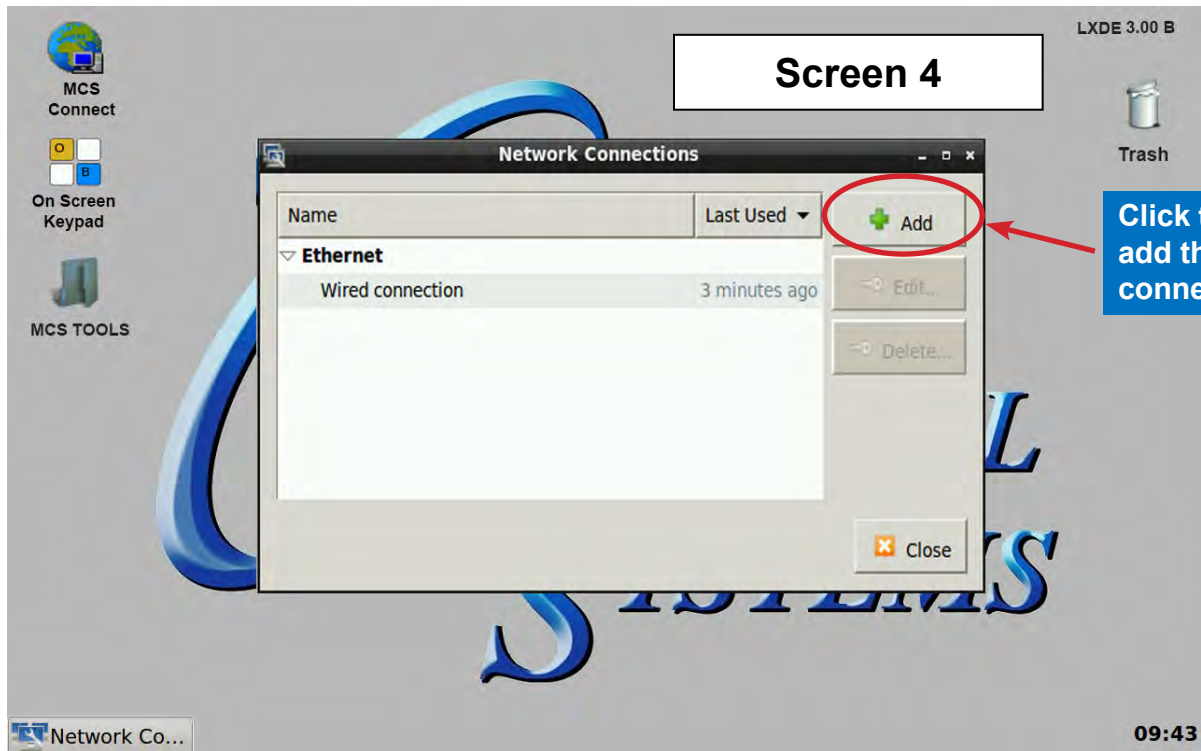
### 16.2. Utilities Folder

Screen 2 appears, click on 'Utilities' to view contents of folder. Click on 'Network Connections' as shown in screen 3.

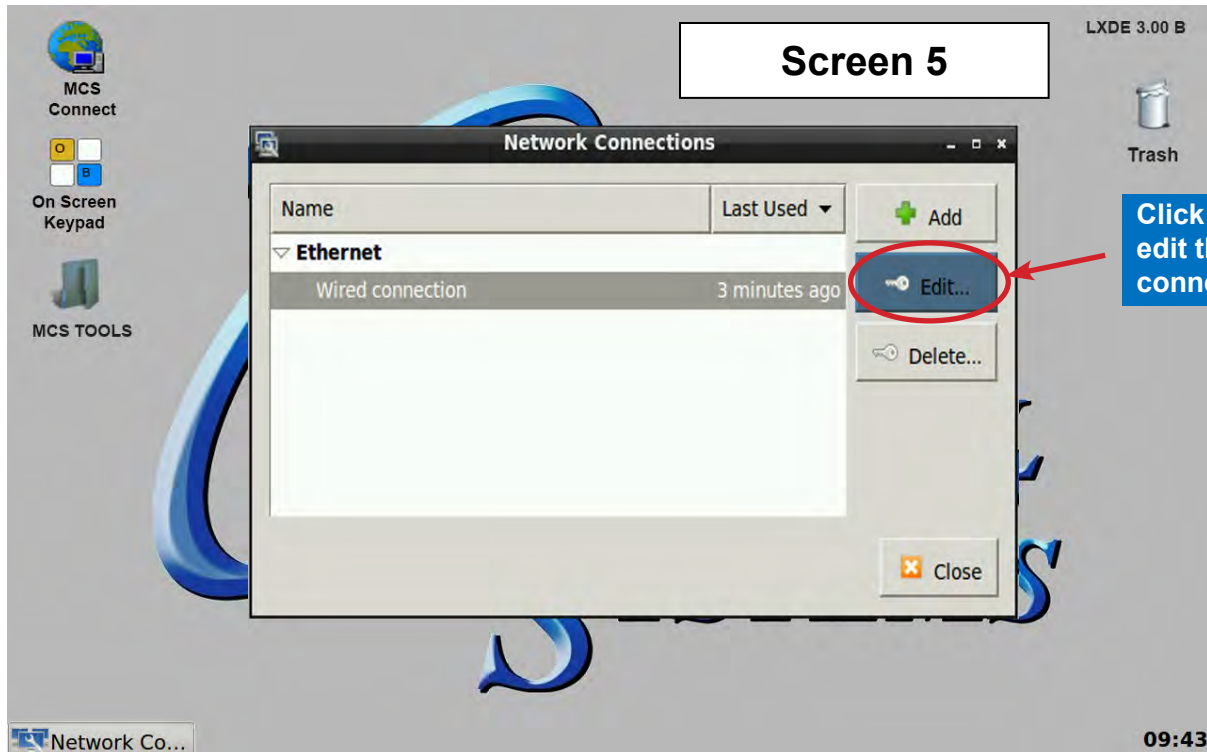


### 16.2.1 Network Connections Screen

Next display, screen 9-4 shows network communication screen. Your touchscreen will show 'Wired connection', click to add.

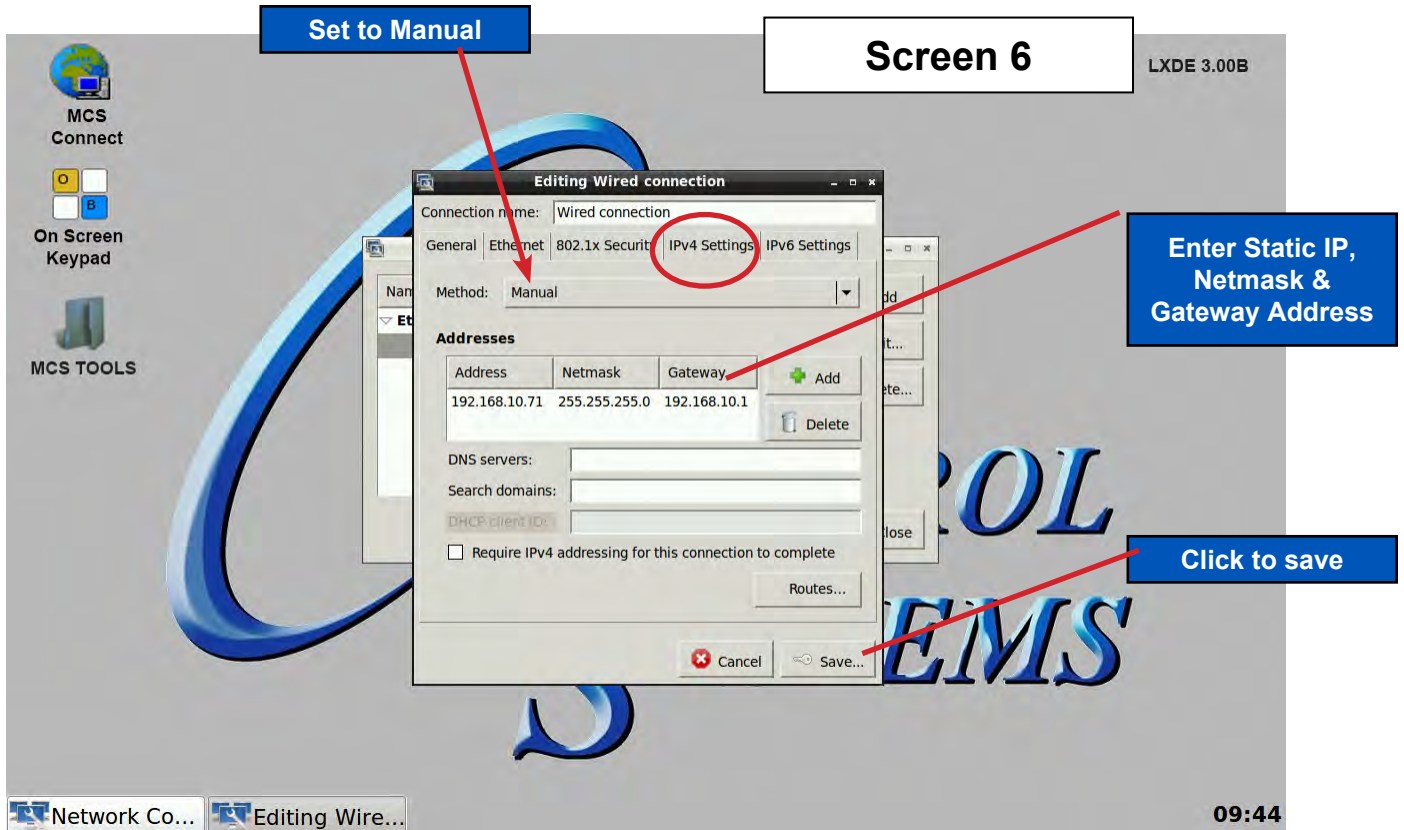


Screen 5, click to 'Edit' this connection.



### 16.2.2 Adding IP Address

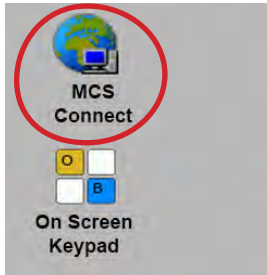
On screen 6, set **'Method'** to **'Manual'** click on 'IPV4' than click on 'Address', enter the IP address, the netmask and gateway addresses. Click to save to touchscreen memory.



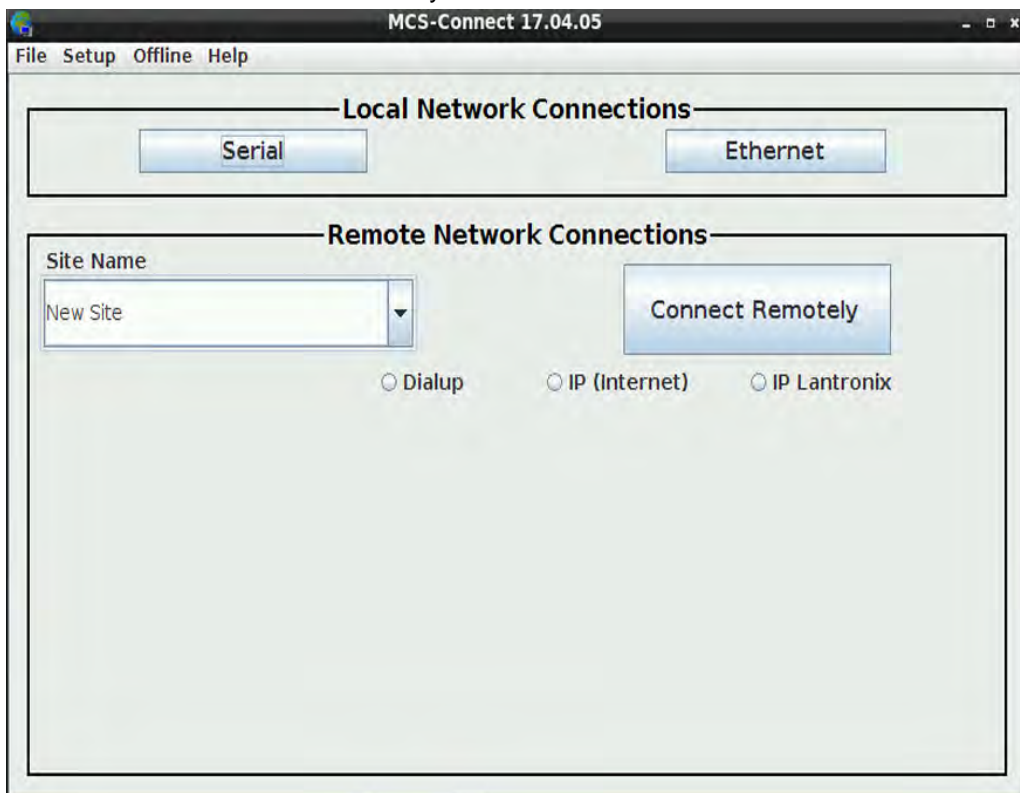
## Chapter - 17. MCS-CONNECT

### 17.1. MCS-CONNECT Shortcut on Desktop

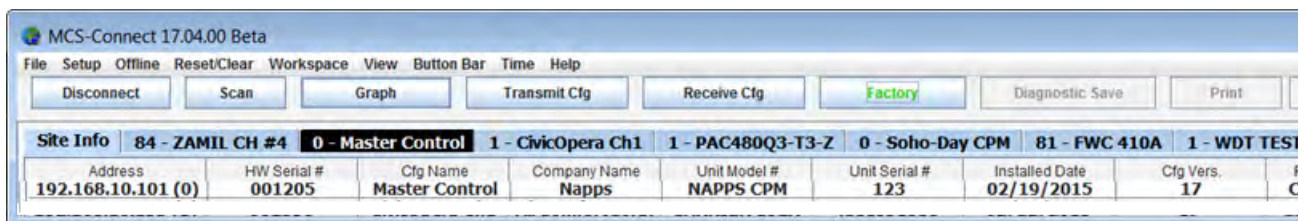
1. Click on the MCS-Connect.



2. This will launch the MCS-Connect main screen.
3. Click on Serial or Ethernet to scan for your controller.



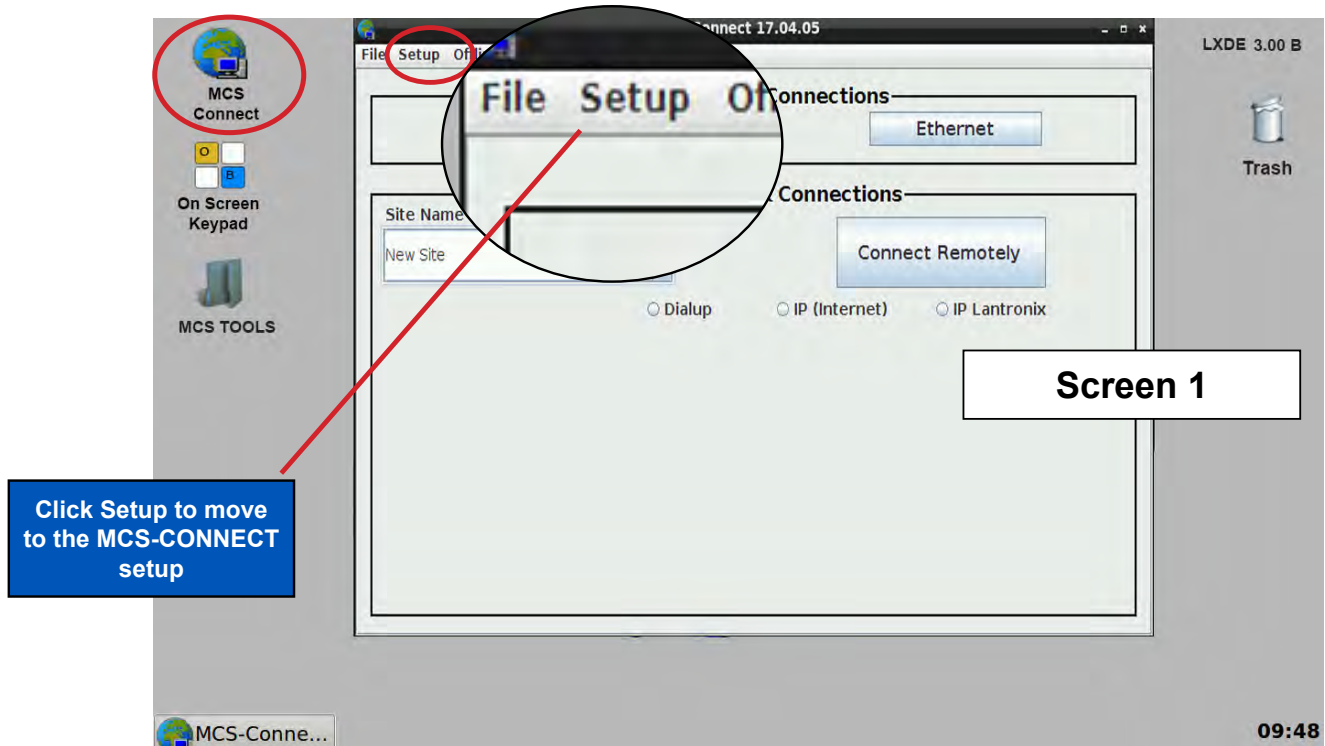
4. Screen below shows available controllers on your network.



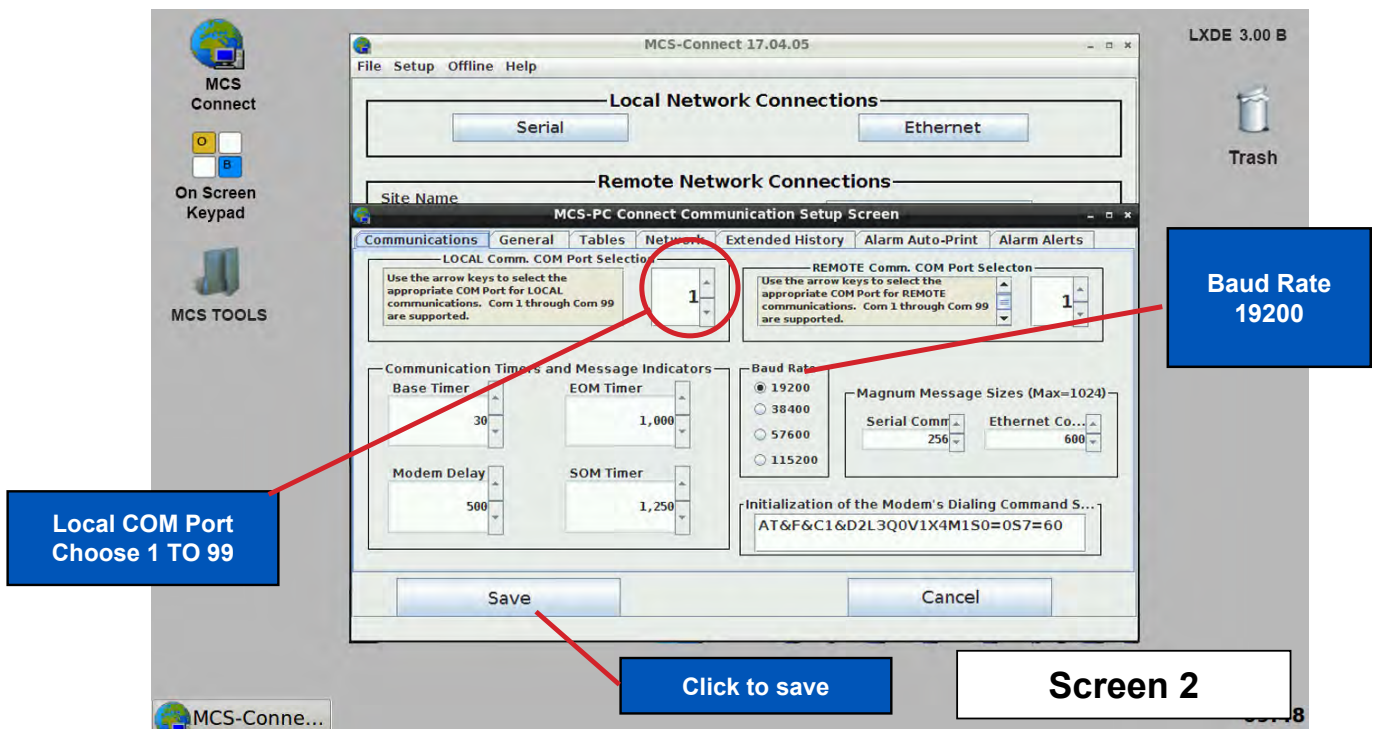


## Chapter - 18. MCS-Connect Communication

1. At the 'Desktop screen' click on the 'MCS-CONNECT shortcut'.
2. Click on 'Setup' at the MCS-CONNECT' screen.



3. Next screen is the setup screen for communicating with your controller or PC.
4. You can change the "Com port" and "Baud Rate" depending on how you are communicating with your controller or computer.



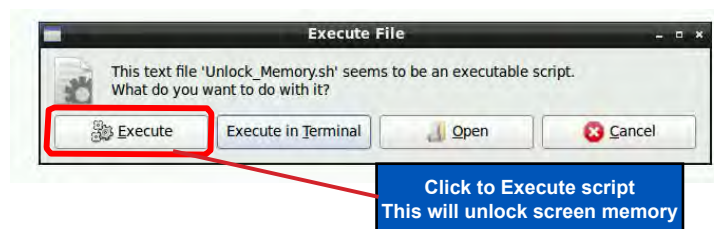
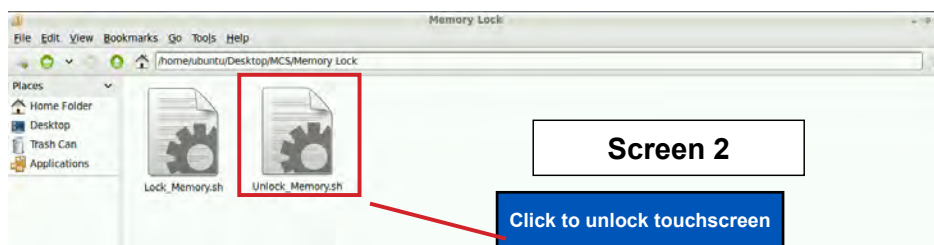
## Chapter - 19. UnLocking / Locking Touchscreen

### 19.1. Unlocking the Touchscreen.

1. Click on the 'MCS TOOLS' folder on the desktop, 'Memory Lock' sub folder will appear when this file is opened..



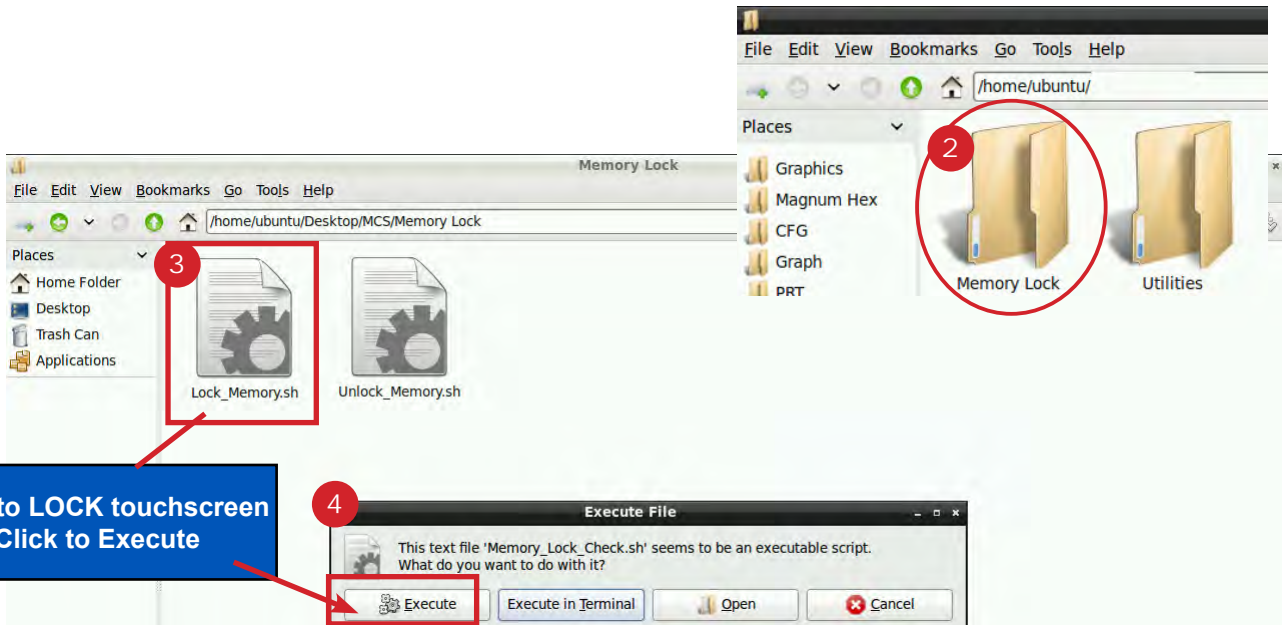
2. Double click on the 'Memory lock' folder
3. Double click on the 'Unlock\_Memory.sh' icon
4. Next screen, click on 'Execute'
5. Touchscreen will perform a restart



## Re-Locking Touchscreen



1. Double click the 'MCS TOOLS' Icon on the Desktop.
2. Double click 'Memory Lock' sub directory.
3. Double click 'Lock Memory'.
4. Click 'EXECUTE'. The touchscreen will reboot.



**When the Lock Memory file is pressed it does an automatic** reboot and autostarts MCS-Connect.  
Check the top right corner of the desktop to make sure the touchscreen is locked.

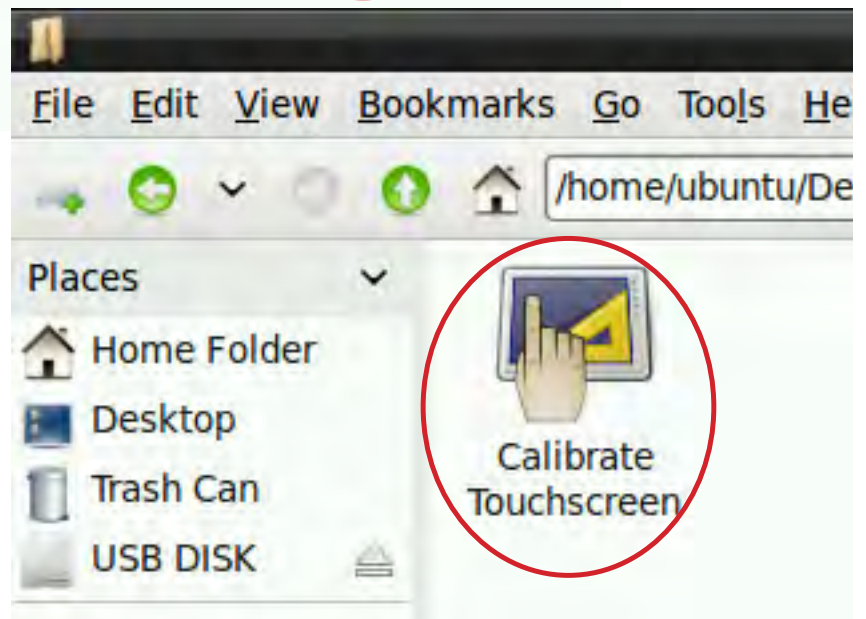
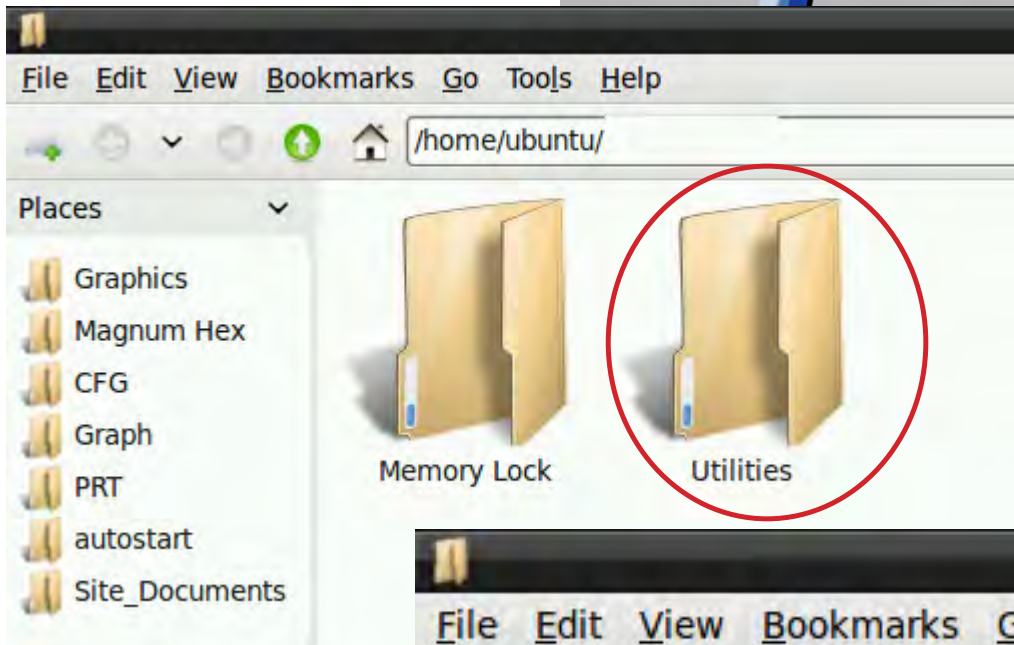
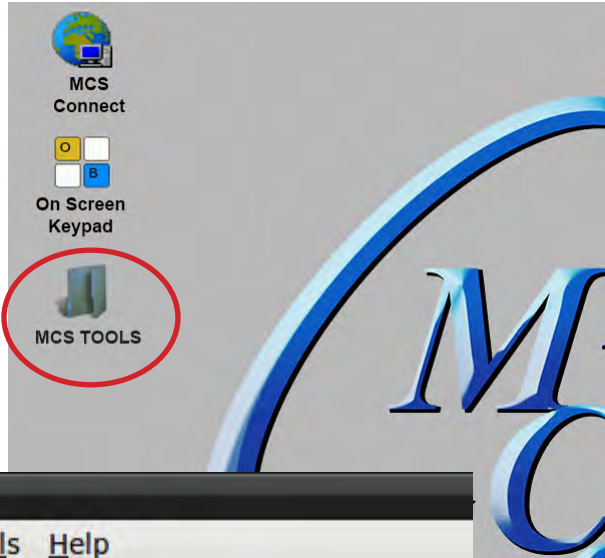


## Chapter - 20. Calibrating Touchscreen

### 20.1. USING CALIBRATING SOFTWARE

**At the main menu:**

1. Click on the 'MCS TOOLS folder'
2. Click on the 'Utilities' folder'
3. Click on 'Calibrate Touchscreen'
4. **Calibration software will open.**



### 20.1.1 CALIBRATING WITH NEW 9 POINT SOFTWARE

The screen below shows calibration for the touchscreens.

(only one target point will display at a time)



The first target point will display on the left top side of your screen.

1. Position your stylus pen point as close to the center of the target as you can.  
BE CAREFUL NOT TO PRESS ON THE SCREEN IN OTHER AREAS.
2. After touching the left top target, the next target will appear in the top center and continue to display as per the screen below until all '9 target points' have been calibrated.

If satisfied with the calibration, go to the next step. If needed, rerun the calibration tool.

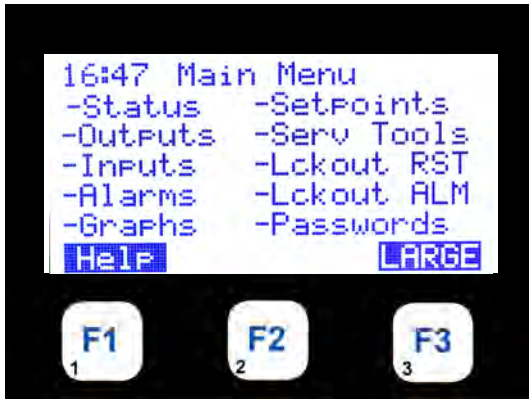
3. After you calibrated all 9 points on the screen you will be returned to the desktop.

## Chapter - 21. Using the Keypad and its Display Screens

The display screens shown on the following pages show a configuration setup for an HVAC system using two screw compressors. For purpose of display, the sensors and relays are set to manual mode.

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.

21.1. Menu Key - Pressing the 'Menu' key shows the following:

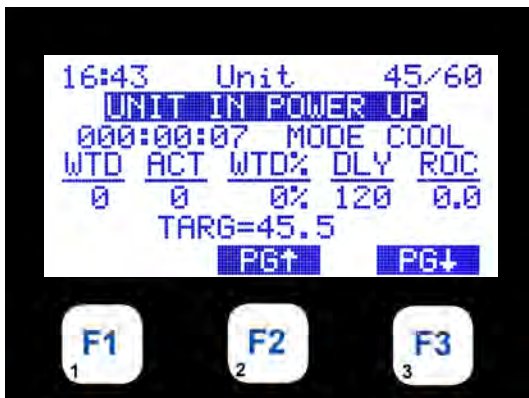


### DESCRIPTION

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	-LARGE

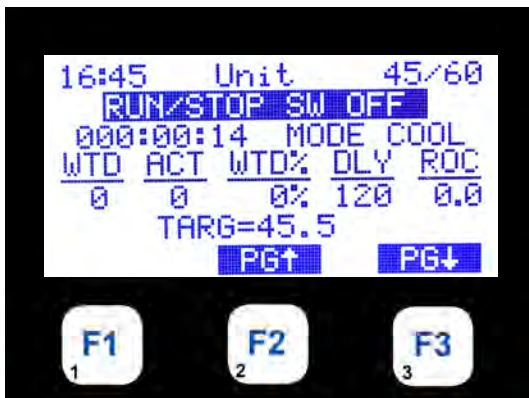
NOTE: Your Keypad LCD can be setup in your configuration file so that the LCD will continuously scroll the status of the controller you are monitoring. When a button is pressed, the LCD will stop scrolling and move to view that item. There will be a 15 minute pause before the Keypad LCD will start scrolling.

21.2. Status: Unit in Power up mode



HH:MM	CHILLER UNIT	LEV/ENT
	UNIT IN POWER UP	
	TIME IN CURRENT STATE	
<u>WANTED</u>	<u>ACTUAL</u>	<u>WANTED%</u>
#STEPS	#STEPS	ACTUAL%
		<u>DELAY</u>
		NEXT CHG
		TARGET SET POINT + TARGET RESET
		PAGE UP↑
		<u>SLOPE</u>
		DIRECTION
		PAGE DOWN↓

Unit is powered up Run/Stop SW is off. Press F3 to see next screen:

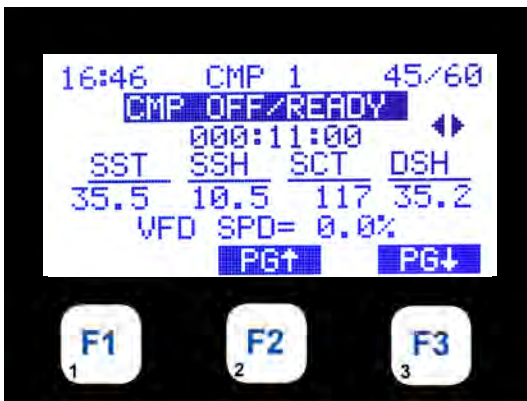


HH:MM	CHILLER UNIT	LEV/ENT
	RUN/STOP SW OFF	
	TIME IN CURRENT STATE	
<u>WANTED</u>	<u>ACTUAL</u>	<u>WANTED%</u>
#STEPS	#STEPS	ACTUAL%
		<u>DELAY</u>
		NEXT CHG
		TARGET SET POINT + TARGET RESET
		PAGE UP↑
		<u>SLOPE</u>
		DIRECTION
		PAGE DOWN↓



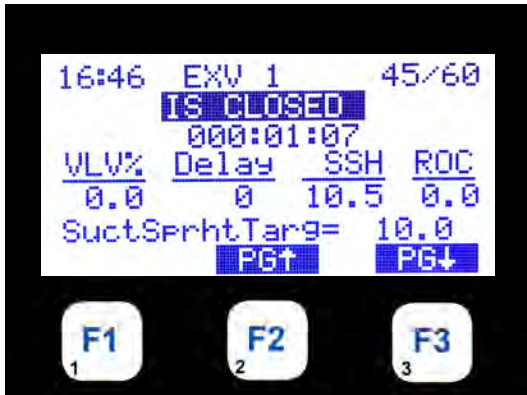
**DESCRIPTION**

HH:MM	CMP 1		LEV/ENT
	CMP OFF/READY		
	TIME IN CURRENT STATE		
<u>SUCTION</u>	<u>DISCHARGE</u>	<u>OIL DIFFERENTIAL</u>	<u>MOTOR</u>
PRESSURE	PRESSURE	PRESSURE	AMP %
TEMP	TEMP	STATUS	STATUS
	PAGE UP↑		PAGE DOWN↓



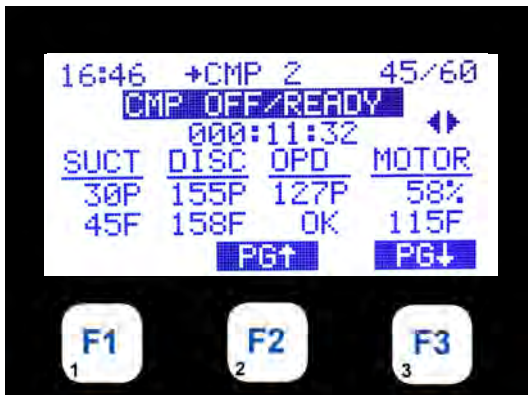
HH:MM	CMP 1		LEV/ENT
	CURRENT CONTROL STATE		
	TIME IN CURRENT STATE		
<u>SAT.SUCT</u>	<u>SUCTS HEAT</u>	<u>SAT.COND.</u>	<u>DISC SHEAT</u>
TEMP	TEMP	TEMP	TEMP
	PAGE UP↑		PAGE DOWN↓

Pressing the Page Down F3 button shows the next Circuit Status screen:



HH:MM	EXV 1 STATUS		LEV/ENT
	VALVE IS CLOSED		
	TIME IN THIS MODE		
PROVIDES VALVE %, TIME TO NEXT CHANGE, SUPERHEAT & RATE OF CHANGE, PROVIDES CONTROL & TARGET			
	PAGE UP↑		PAGE DOWN↓

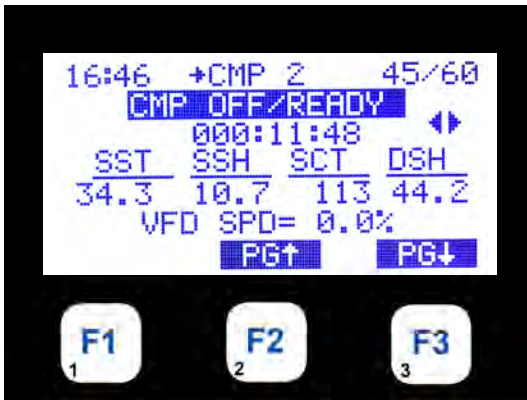
Pressing the Page Down F3 button shows the next Circuit Status screen:



HH:MM	CMP 2		LEV/ENT
	CMP OFF/READY		
	TIME IN CURRENT STATE		
<u>SUCTION</u>	<u>DISCHARGE</u>	<u>OIL DIFFERENTIAL</u>	<u>MOTOR</u>
PRESSURE	PRESSURE	PRESSURE	AMP %
TEMP	TEMP	STATUS	STATUS
	PAGE UP↑		PAGE DOWN↓

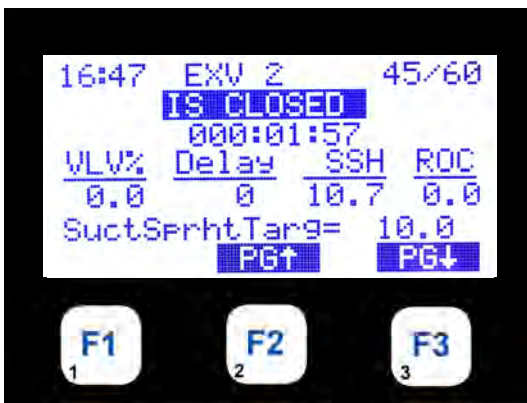


Pressing the Page Down F3 button shows the next Circuit Status screen:



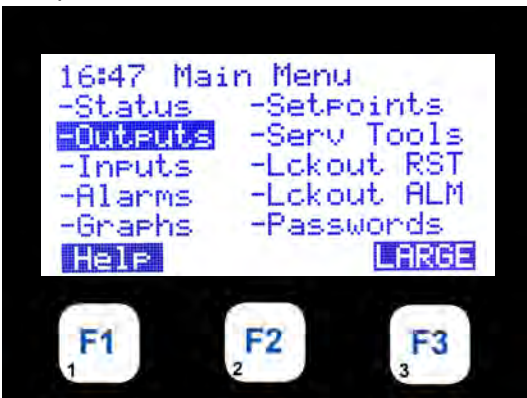
DESCRIPTION			
HH:MM	CIRCUIT	LEV/ENT	
	CURRENT CONTROL STATE		
	TIME IN CURRENT STATE		
<u>SAT.SUCT.</u>	<u>SUCT SHEAT</u>	<u>SAT.COND.</u>	<u>DISC SHEAT</u>
TEMP	TEMP	TEMP	TEMP
PAGE UP↑		PAGE DOWN↓	

Pressing the Page Down F3 button shows the next Circuit Status screen:



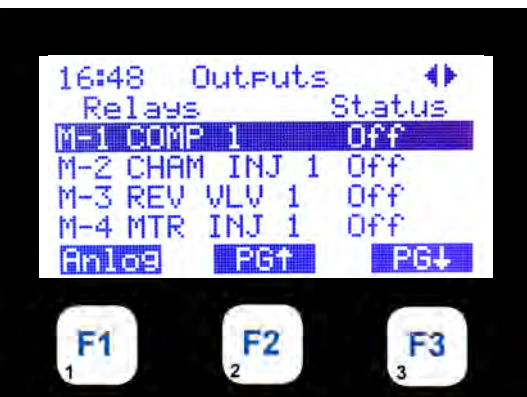
HH:MM	EXV 2 STATUS	LEV/ENT
	OPENING EXV 2	
	TIME IN THIS MODE	
PROVIDES VALVE %, TIME TO NEXT CHANGE, SUPERHEAT & RATE OF CHANGE, PROVIDES CONTROL & TARGET		
PAGE UP↑		PAGE DOWN↓

### 21.3. Outputs



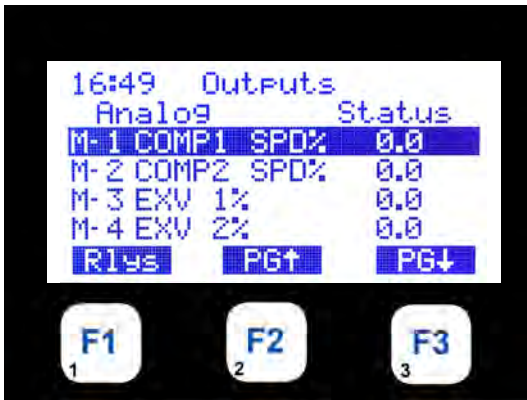
HH:MM	MAIN MENU
PRESS MENU KEY TO VIEW OUTPUTS	
PRESS ←ENTER	

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



HH:MM	SCREEN TITLE	LEFT/RIGHT ARROW
THE 1ST FOUR RELAY OUTPUTS ARE PRESENTED		
← → ↓ ↑ KEYS ALLOW THE USER TO SCROLL THROUGH THE DATA FUNCTION		
KEY F1 ALLOWS THE USER TO DISPLAY ANALOG OUTPUTS		
PAGE UP / DOWN DISPLAYS NEXT 4 OUTPUTS		

Pressing ←ENTER shows the value of output:



**DESCRIPTION**

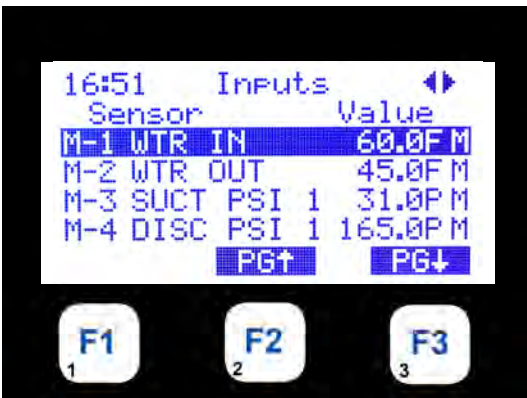
HH:MM SCREEN TITLE LEFT/RIGHT ARROW  
 THE 1ST FOUR ANALOG OUTPUTS ARE PRESENTED  
 ← → ↓ ↑ KEYS ALLOW THE USER TO SCROLL THROUGH THE DATA FUNCTION  
 KEY F1 ALLOWS THE USER TO RETURN TO RELAY OUTPUTS  
 PRESS ← MENU TO RETURN TO MAIN MENU

21.4. Inputs



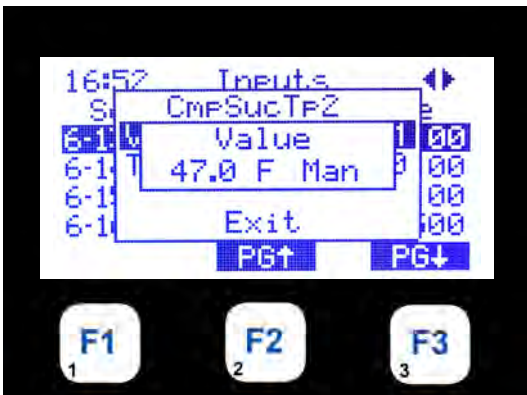
HH:MM MAIN MENU  
 PRESS MENU KEY TO VIEW INPUTS  
 PRESS ←ENTER

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



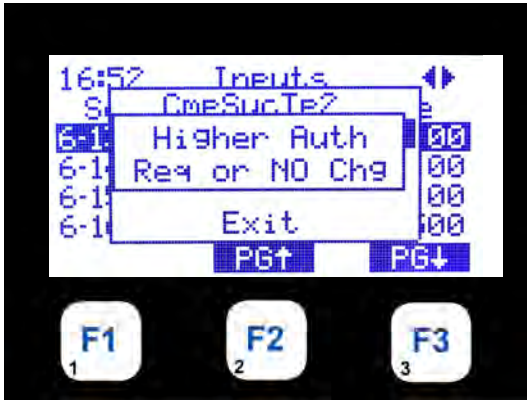
HH:MM SCREEN TITLE LEFT/RIGHT ARROW  
 THE 1ST FOUR INPUT SENSORS ARE PRESENTED  
 ← → ↓ ↑ KEYS ALLOW THE USER TO SCROLL THROUGH THE DATA FUNCTION  
 KEY F1 ALLOWS THE USER TO RETURN TO RELAY OUTPUTS  
 PRESS ← MENU TO RETURN TO MAIN MENU

Pressing ← Enter brings up value of highlighted Sensor input:



HH:MM  
 INPUT SHOW CURRENT VALUE  
 PRESS ←ENTER TO CHANGE VALUE

Changing a Value of a Sensor Input- press ← Enter:



**DESCRIPTION**

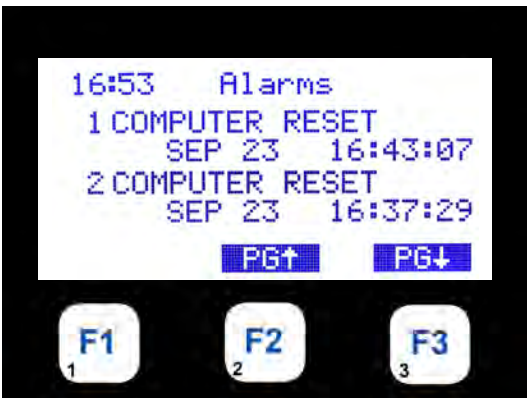
HH:MM  
 NEXT SCREEN SHOWS HIGHER AUTH NEEDED TO CHANGE VALUE  
 PRESS ← ENTER TO RETURN TO INPUTS OR PRESS MENU TO ENTER PASSWORDS TO CHANGE TO HIGHER AUTHORIZATION

21.5. Alarms



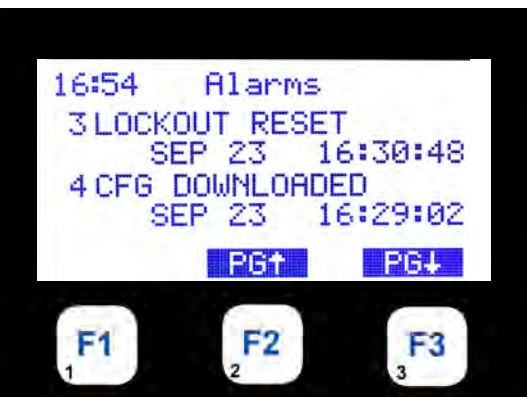
HH:MM  
 MENU KEY, SELECT ALARMS  
 ← ENTER  
 THIS WILL ALLOW USER TO DISPLAY DETAILS OF THE ALARMS  
 THERE ARE A MAXIMUM OF 100 ALARMS PRESENTED TWO TO A SCREEN WITH MOST CURRENT FIRST

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



HH:MM  
 ALARMS  
 THE FIRST TWO ALARMS ARE PRESENTED  
 ↓↑ ALLOWS THE USER TO SCROLL THROUGH THE ALARMS  
 PAGE UP / DOWN DISPLAYS NEXT ALARMS

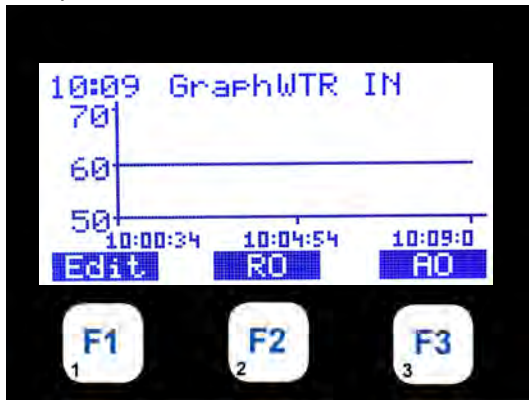
Continue pressing the Page Down or Page Up buttons to scroll through all the Alarm screens:



HH:MM  
 ALARMS  
 THE NEXT TWO ALARMS ARE PRESENTED  
 ↓↑ ALLOWS THE USER TO SCROLL THROUGH THE ALARMS  
 PAGE UP / DOWN DISPLAYS NEXT ALARMS



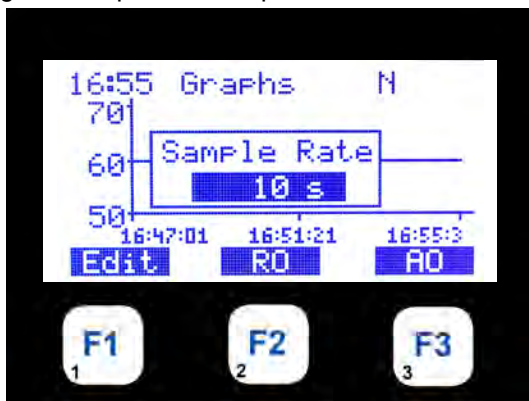
## 21.6. Graphs



HH:MM

MENU KEY, SELECT GRAPHS, PRESS (←) ENTER  
THIS WILL ALLOW USER TO DISPLAY DETAILS OF A GRAPH  
ONE ITEM IS GRAPHED AT A TIME  
IT WILL BE PLOTTED IN REAL TIME

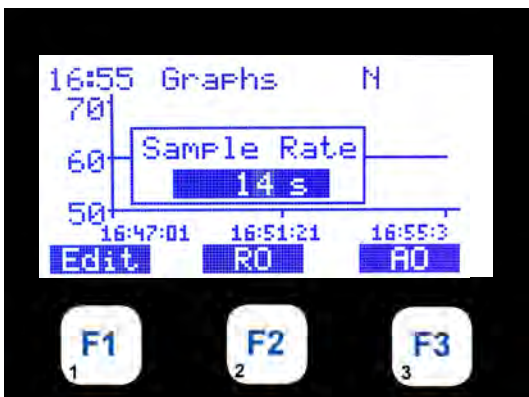
Selecting the 'Graphs' menu option shows the following:



HH:MM

GRAPHS  
PRESSING F1 "EDIT" BRINGS UP THIS DISPLAY  
WITH CURRENT VALUE HIGHLIGHTED  
PRESS THE (←) ENTER KEY  
USING ↓↑ ADJUST THE SAMPLE RATE

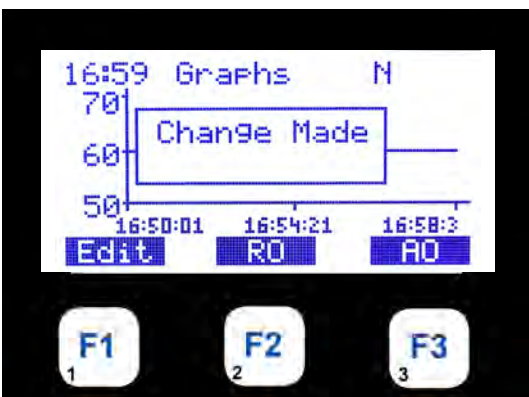
Press (←) Enter key to change Sample Rate - you must be authorized to make this change:



HH:MM

GRAPHS  
ONCE THE SAMPLE RATE IS CORRECT  
PRESS THE (←) ENTER KEY  
NOTE YOU MUST BE AUTHORIZED TO MAKE THE CHANGE

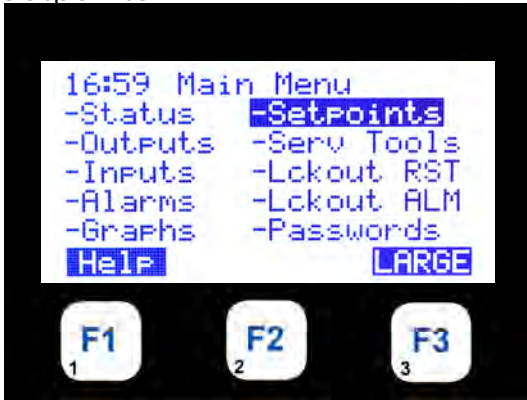
Next Screen shows change made with proper authorization:



HH:MM

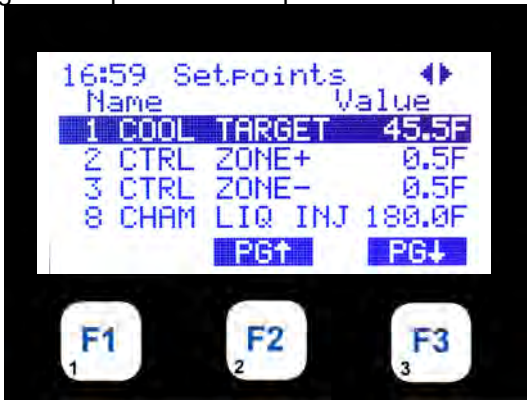
GRAPHS  
NEW SAMPLE RATE HAS BEEN MADE  
PRESS THE (←) ENTER KEY  
PRESS (←) MENU TO RETURN TO MAIN MENU

21.7. Setpoints



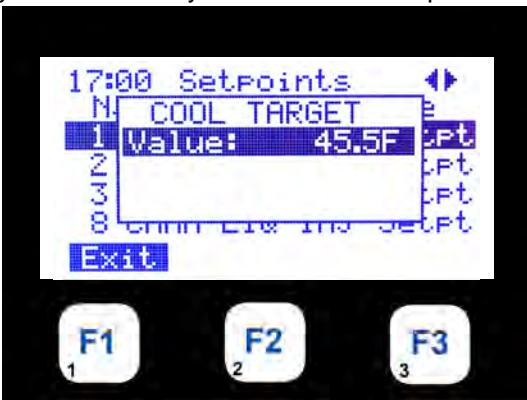
HH:MM  
 MENU KEY, SELECT SETPOINTS  
 PRESS ←ENTER KEY  
 THIS WILL ALLOW THE USER TO DISPLAY DETAILS OF SETPOINTS  
 SETPOINTS CAN BE DISPLAYED  
 BASED ON AUTHORIZATION LEVEL

Selecting the 'Setpoints' menu option shows the first 4 setpoints- continue to page ↓to see all setpoints:



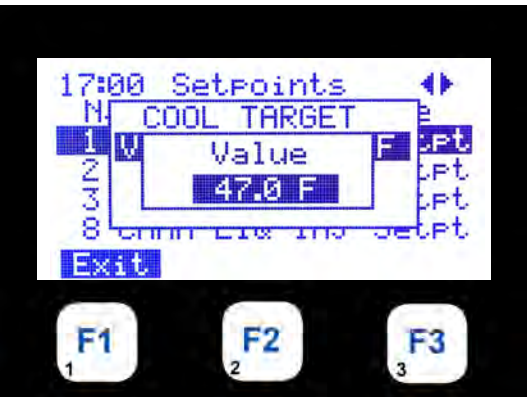
HH:MM  
 THE 1ST FOUR SETPOINTS ARE DISPLAYED  
 ← → ↓ ↑ KEYS ALLOW THE USER TO SCROLL THROUGH THE  
 DATA FUNCTION  
 KEY F1 ALLOWS THE USER TO DISPLAY SETPOINT DATA PRESS ←  
 ENTER KEY TO SEE VALUE OF SETPOINT 1

Pressing the ← Enter key shows value of setpoint 1:



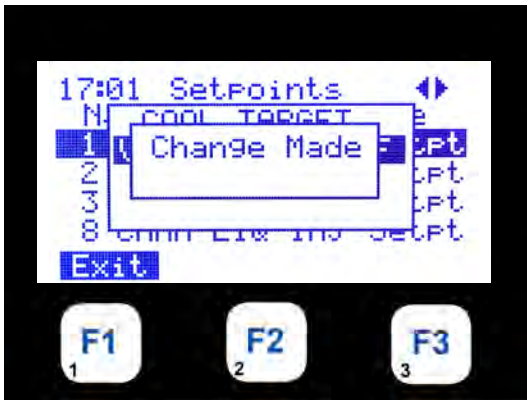
HH:MM  
 SETPOINT 1 VALUE SHOWN  
 SETPOINTS VALUES CAN BE CHANGED  
 BASED ON AUTHORIZATION LEVEL  
 PRESS ←ENTER KEY TO CHANGE VALUE

Press ← Enter key to change value of setpoint 1:



HH:MM  
 VALUE SHOWS NEW CHANGE  
 PRESS ←ENTER KEY TO ACCEPT VALUE

Change made with proper authorization:



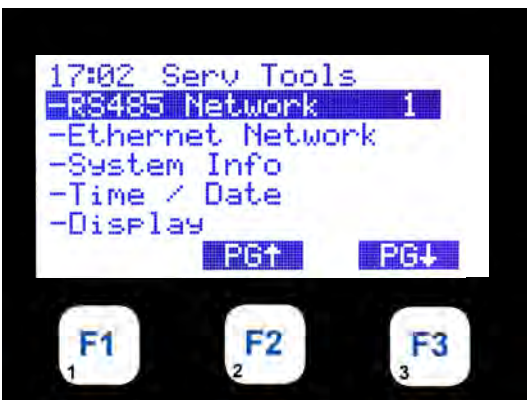
HH:MM  
 CHANGE MADE  
 NEW VALUE HAS BEEN SENT TO THE CONTROLLER  
 PRESS ← MENU TO RETURN TO MAIN MENU

21.8. Service Tools



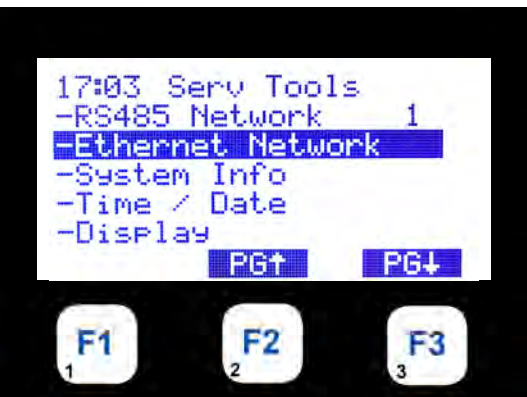
HH:MM  
 MENU KEY, SELECT SERV TOOLS, PRESS (←) ENTER  
 THIS WILL ALLOW USER TO DISPLAY  
 DETAILS OF SERV TOOLS

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



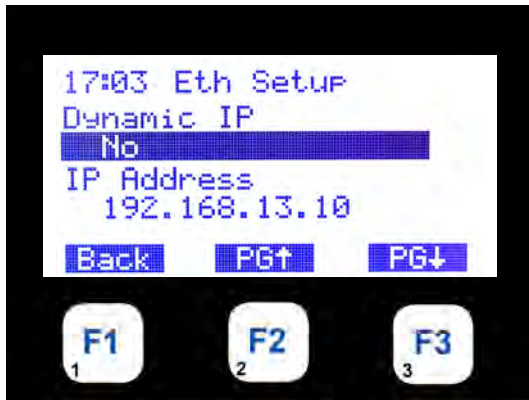
HH:MM  
 SERV TOOLS  
 THE SERV TOOL OPTIONS ARE DISPLAYED  
 ↑ ↓ KEYS ALLOW THE USER TO SCROLL  
 THROUGH THE OPTIONS  
 FUNCTION KEYS ALLOW PAGE UP/DOWN  
 PRESS ↓ PG DOWN SELECT SYSTEM INFO

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



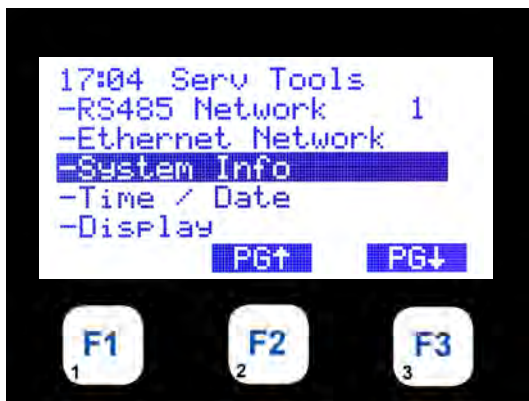
HH:MM  
 SELECT SYSTEM INFO - ETHERNET NETWORK  
 PRESS (←) ENTER TO SELECT  
 FUNCTION KEYS ALLOW PAGE UP/DOWN

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



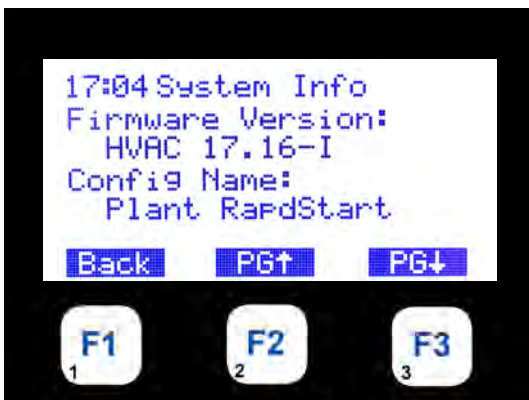
HH:MM  
 SYSTEM INFO  
 SCREEN SHOWS ETHERNET SETUP  
 DYNAMIC IP  
 & IP ADDRESS SETTING  
 PRESS ↓ PG DOWN CONTINUES NEXT SERV TOOLS

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



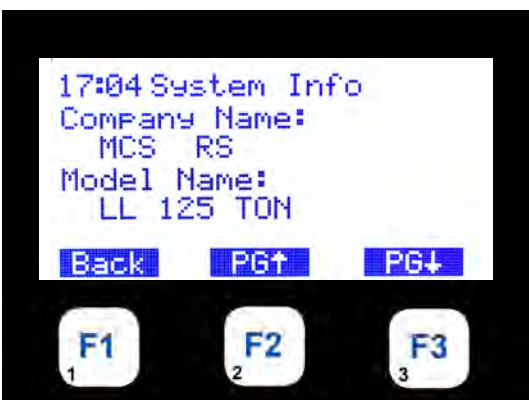
HH:MM  
 SERV TOOLS  
 SYSTEM INFO  
 PRESS↵ENTER KEY TO SELECT

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



HH:MM  
 SYSTEM INFO  
 SHOWS FIRMWARE VERSION  
 & CONFIG NAME  
 PG ↓ CONTINUES TO NEXT SYSTEM INFO

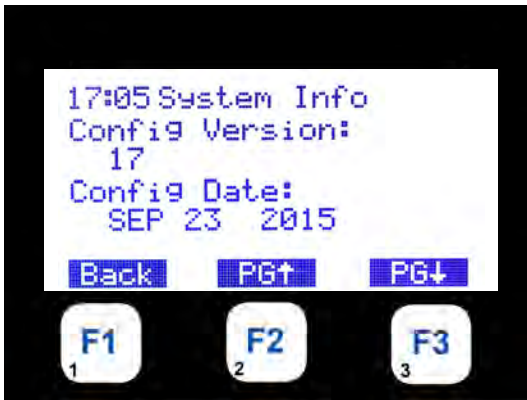
Pressing the down arrow shows the rest of the submenu options:



HH:MM  
 SYSTEM INFO  
 SHOWS COMPANY NAME  
 & TYPE OF UNIT BEING CONTROLLED  
 PG ↓ CONTINUES TO NEXT SYSTEM INFO



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



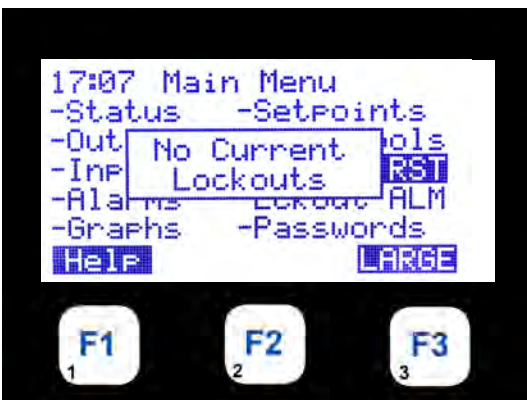
HH:MM SYSTEM INFO  
 SHOWS CONFIG VERSION NUMBER  
 & CONFIG DATE  
 PG ↓ CONTINUES TO NEXT SYSTEM INFO OR  
 PRESS ← MENU TO RETURN TO MAIN MENU

21.9. Lockout Reset



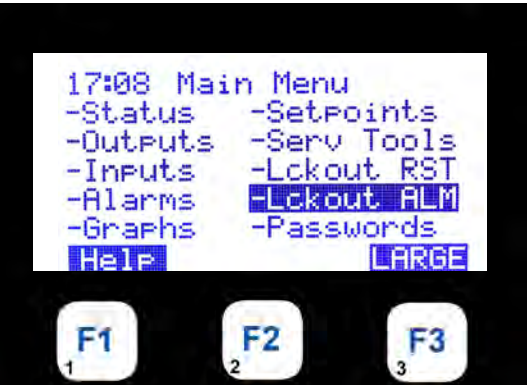
HH:MM MENU KEY, SELECT LCKOUT RST  
 ← ENTER KEY  
 THIS WILL ALLOW USED TO  
 DISPLAY ANY LOCKOUTS

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



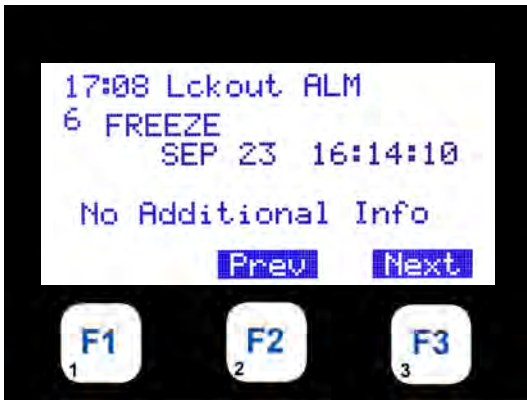
HH:MM IF NO LOCKOUTS EXIST YOU WILL BE NOTIFIED  
 IF THE UNIT IS IN LOCKOUT YOU WILL BE ALLOWED TO RESET.  
 YOU ARE LIMITED TO 10 RESETS A DAY  
 MAKE SURE THE CAUSE OF THE RESET IS FIXED  
 BEFORE TRYING AGAIN

21.10. Lockout Alarms



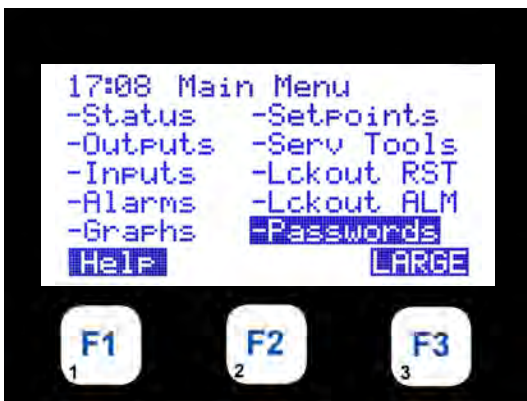
HH:MM MENU KEY, SELECT LCKOUT ALARMS, PRESS (←) ENTER  
 THIS WILL ALLOW USER TO  
 DISPLAY ANY LOCKOUTS ALARMS

Selecting the 'Lckout ALM' menu option shows the first 2 Lockout alarms:



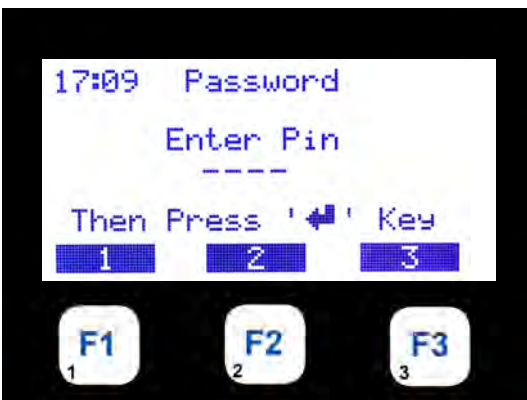
HH:MM  
SYSTEM INFO LOCKOUT ALARM  
NO LOCKOUT ALARMS

21.11. Passwords



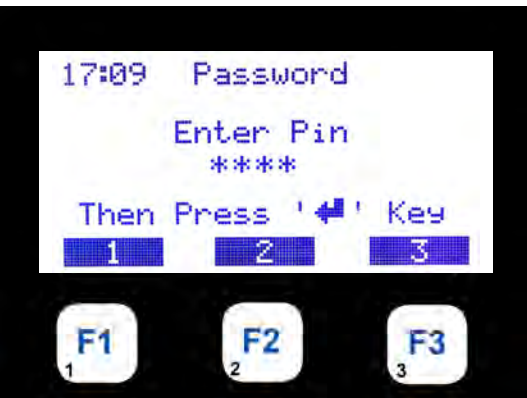
HH:MM  
MENU KEY, SELECT PASSWORD, PRESS (↵) ENTER  
THIS WILL ALLOW USER TO GET AUTHORIZED

Selecting the 'Passwords' option shows the following:



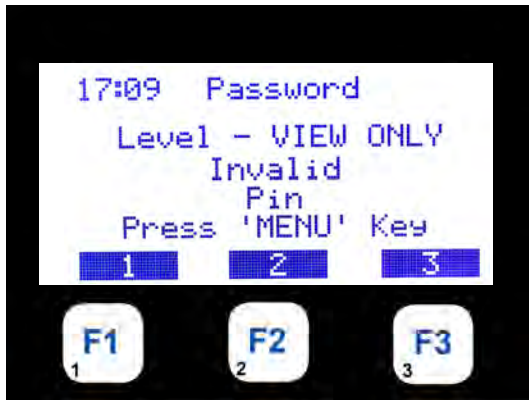
HH:MM  
ENTER YOUR 4 DIGIT PASSWORD  
MUST BE NUMBERS BETWEEN 1 & 8 TO ENTER  
FROM KEYPAD  
CAN BE ANY COMBINATION FROM LAPTOP

Enter your Password by using the number keys, F1, F2, etc. An astrick will appear - passwords are 4 numbers:



HH:MM  
AS EACH DIGIT IS ENTERED AN (\*) ASTERICK SHOWS  
UP ON DISPLAY  
WHEN COMPLETED PRESS ENTER (↵)

Entering the incorrect password will keep the system in the 'View mode' until the correct password is entered:



HH:MM

IF AN INCORRECT PASSWORD IS ENTERED  
YOU WILL BE NOTIFIED AT WHAT  
LEVEL YOU ARE AUTHORIZED  
PRESS ENTER (↵)

Screen shows correct password entered for 'Factory Authorization':

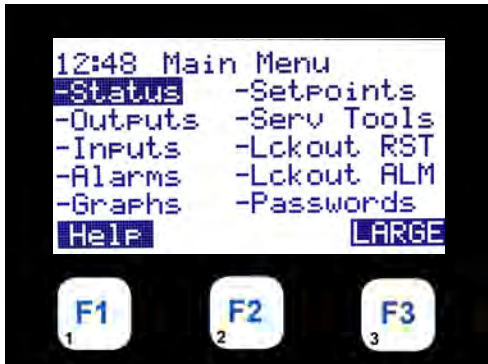


HH:MM

IF A CORRECT PASSWORD IS ENTERED  
YOU WILL BE NOTIFIED AT WHAT  
LEVEL YOU ARE AUTHORIZED

## Chapter - 22. Main Menu Function Keys

### 22.1. MAIN MENU



HH:MM

PRESS MENU KEY  
F1 KEY FOR HELP  
PRESS ← ENTER

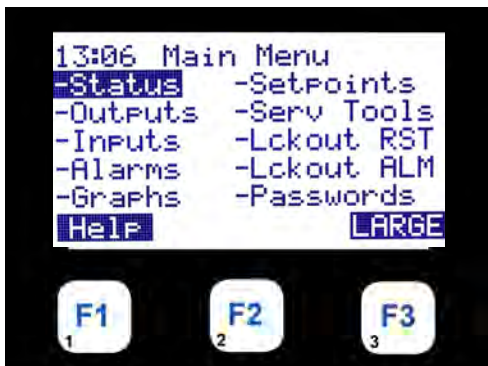
### 22.2. HELP DISPLAY



HH:MM

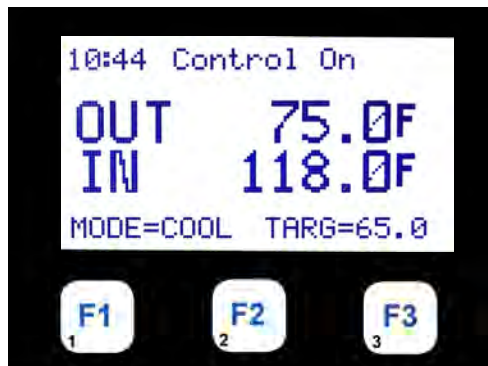
DESCRIPTION OF THE SYMBOLS USED  
TO MOVE CURSOR  
& KEYS USED TO ENTER PASSWORD

### 22.3. LARGE TYPE DISPLAY



HH:MM

PRESS F3 KEY AT MAIN MENU



HH:MM

DISPLAY SHOWS LARGE TYPE  
OF STATUS WINDOW



## Chapter - 23. Authorization Function

The authorization code is a special four-character code that enables access in to the NUC-MAGNUM-V17 system. The code must be numeric with values between 1 and 8 if it is entered from the Keypad/Display.

If the NUC-MAGNUM-V17 is being accessed through NUC-V17-Connect, the code may consist of any valid alpha/numeric characters. Each NUC-MAGNUM-V17 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 NUC-MAGNUM-V17 system. These are established when building the configuration file in NUC-V17-Config.

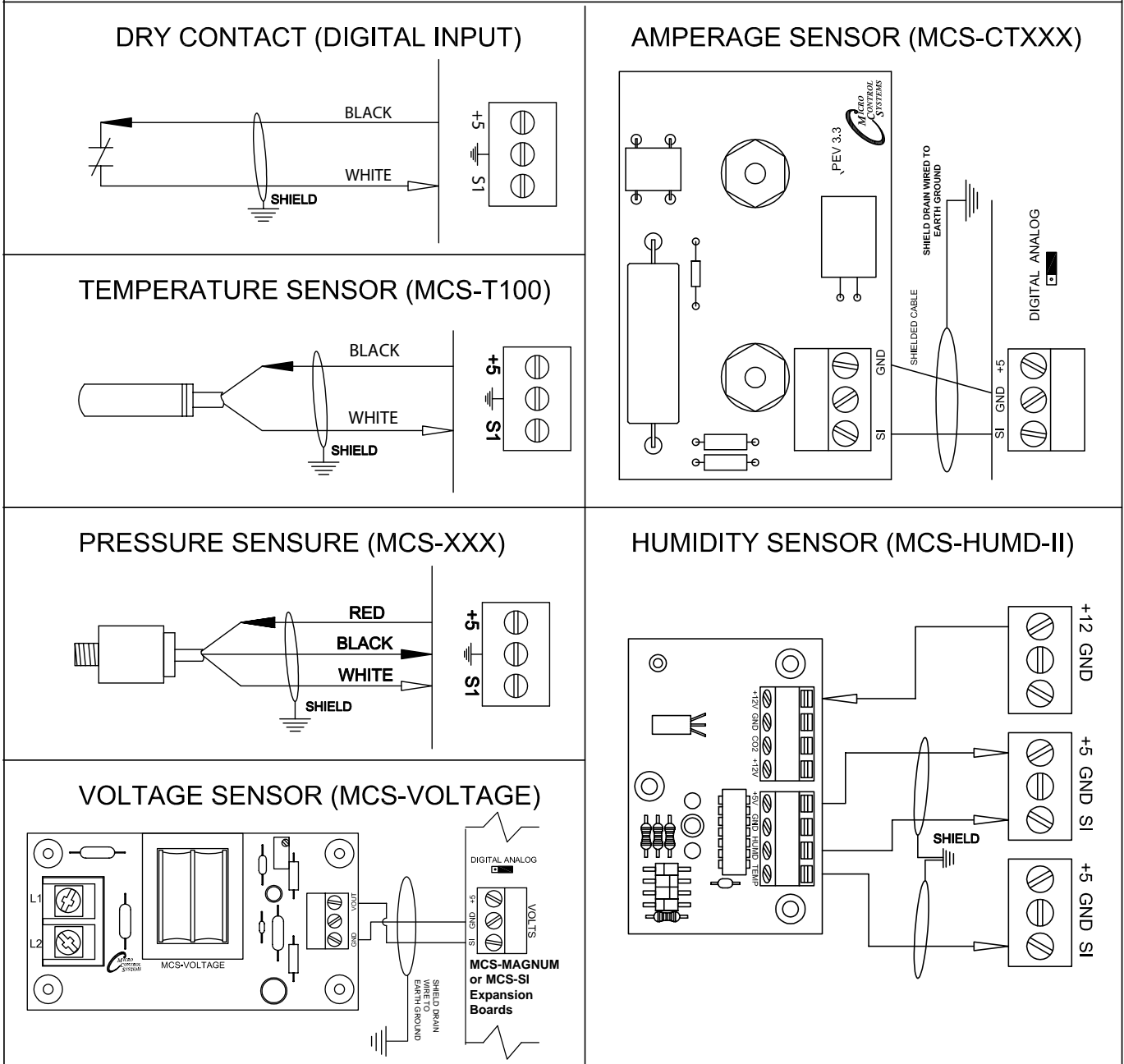
From the Keypad/Display the following changes can be made based upon the authorization level:

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

\* Setpoints may have individual authorization levels; you must have the proper authorization to view or edit them.

The number of lockout reset per day is limited. NUC-MAGNUM-V17 configuration defines the number of reset per day and what level of authorization is allow to bypass the limit of reset per day.

# Chapter - 24. Sensors Quick Reference Sheet



**NOTES:**

1. Sensors **MUST** use shielded cable and shield must not be broken.  
Shield Drain wired to earth ground

2. All sensor inputs are 0 to 5vdc.

3. Amp input sensors are field wired and must be shielded cable. They generate their own voltage and do not require 5vdc from the MCS unit.

4. Digital input sensors are field wired and must be shielded cable. The 5vdc is taken out from the sensor terminal and wired through the switch. The jumper must then be set to digital.

5. Pressure and Temperature sensors are available with 20', 40', & 60' of cable.

6. Make sure the sensor jumper is in the correct position (Analog for analog SI, Digital for digital SI.)

## Chapter - 25. Troubleshooting Quick Reference Sheet

PROBLEM	POTENTIAL SOLUTION
A sensor input reads -99.9	<p>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.</p>
A sensor input reads +999.9	<p>This indicates a shorted sensor input signal.                      Check sensor wiring for +5VDC shorted to signal etc.                      Check sensor for bad sensor.</p>
A sensor is reading less then or greater than 3% off	<p>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.</p>
LCD blank or flashing.	<p>Indicates bad connection.                      Check wiring to keypad                      Could indicate bad software transfer, retransmitting may be necessary.</p>
Lost I/O	<p>Indicates communications problem.                      Verify RS485 LED blinking.                      Verify termination jumper only on JP4 on the NUC-Magnum and the last I/O board.                      Verify NUC-Magnum and each I/O's address is set correctly.                      Verify wiring from the NUC-Magnum to each I/O is correct.                      Check fuses/120 VAC on I/O units</p>
Invalid reading on one sensor input.	<p>This indicates an input problem with 1 sensor.                      Verify jumper settings correct for that SI.</p>
Invalid authorization	<p>This indicates an invalid authorization number.                      Follow steps below for proper authorization                      Press 'PASSWORDS' at the main menu screen                      Press the ENTER key                      From the corresponding to your authorization # (4 digits)                      Press ENTER</p>







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