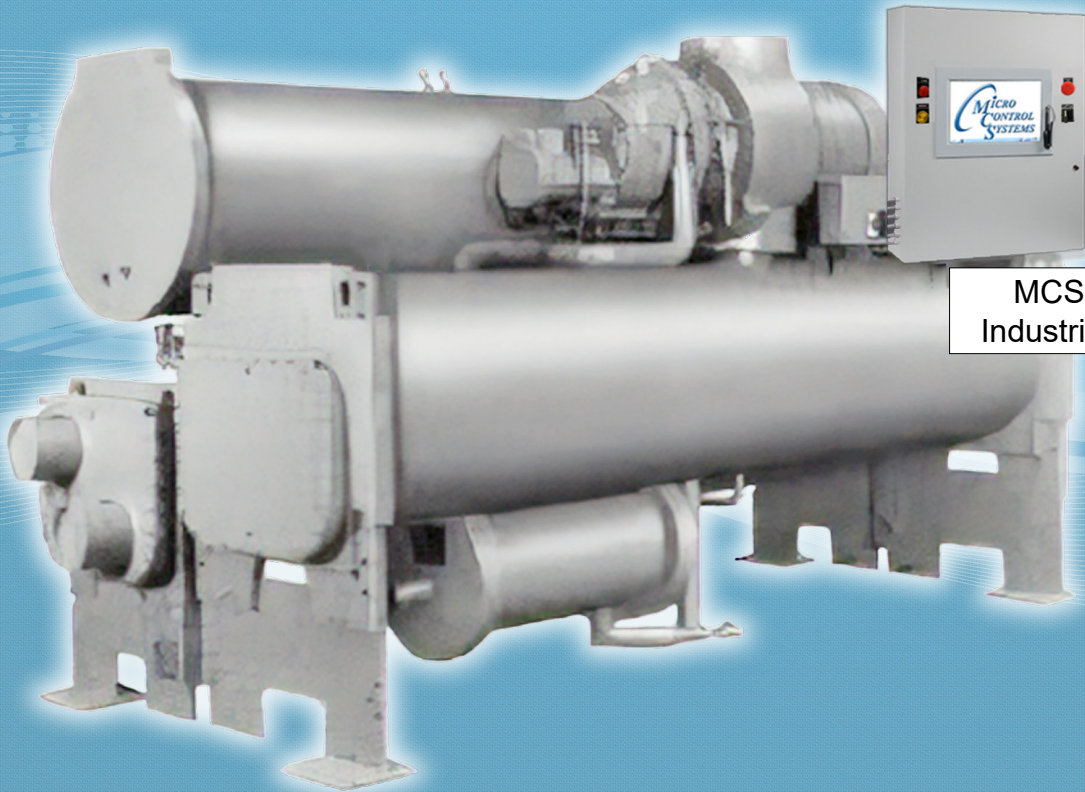




*MCS Total  
Solutions for all your  
HVAC/R Control Needs*



MCS-MLB-15.4-12  
Industrial Control Panel



# 23XL CONTROLS-12 UPGRADE

This brochure describes a standard upgrade package for the 23XL CHILLER.

Each control upgrade installation is unique. It may be necessary to add additional options to the standard upgrade as described in this brochure.

Fill out the brief questionnaire in the back of this brochure and forward to your sales representative for an estimate.



# UPGRADE PHOTOS

## 23XL Chiller Modernization

### Upgrade Requirements:

Chiller Controls Risk Reduction  
Modernization of two 15 year old chillers

### Modernization Scope:

Extend the overall life expectancy and provide customer cost savings thru efficiency on two Chillers by rebuilding one compressor slide valve and replacing two obsolete control panels with MCS Control Panels

### Process Results

Scope included replacing all existing wiring, starter panel included. Install all new external sensors to replace existing obsolete sensors. Full touch screen display for the MCS controls which exceeds the prior OEM control panel in capability, saves the customer on utility costs thru efficiency, and will extend the useful life of the chillers by many more years.



Before



Before



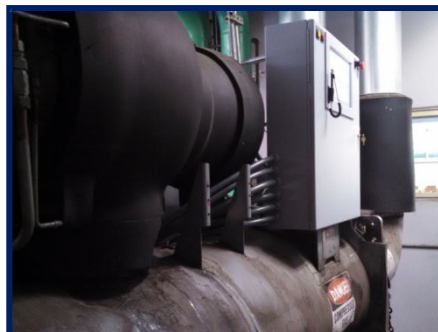
During



After



After



Complete



# 23XL Industrial Control Panel



Part #  
**MCS-MAGNUM-MLB-15.4-12**

## Description

The **MCS-MAGNUM-MLB-15.4-12 Industrial Control Panel** is made of powder coated aluminum for durability and longevity. A left hand swing door is mounted with three eight-inch hinges for strength. A key lock is provided for security on the door while still giving easy access of the display. This panel is intended for use in an environment protected from the weather.

The **MCS-MAGNUM-15.4-12** consists of a MCS-MAGNUM controller along with a Touchscreen 15.4 in display.

The **MCS-TOUCH-15.4** capacitive touchscreen interface designed to simplify user access with the MCS-Magnum and MicroMag utilizing MCS-Connect to provide both graphics and service mode access to technicians. Input method: Finger, Stylus and \*Glove.

Highly accurate and does not require calibration - easy to clean glass surface. Works outdoors, bright screen, water resistant, Exceptional Optics - 1280x800 resolution, sharp and vibrant images.

MCS-TOUCH-15.4 comes preloaded with the MCS-CONNECT program that allows you to view the 'unit's status', 'extended history', 'alerts', 'alarms', setpoints, and more, all in a user-friendly graphic format. The **MCS-TOUCH-15.4-12** can connect up to 60 MCS controllers and supports RS485 or Ethernet networking.

Power is supplied using a MCS-12V power supply.

Panel includes the following; 20A, and a 5A Single-Pole Circuit Breaker, a 5 port 10/100/1000 Ethernet Workgroup Switch Industrial rated, Red Alarm Indicator, Yellow Warning Indicator, Emergency Stop Switch and 3 Position Run/Stop Selector Switch.

There is also an electrical outlet for laptop plug-in power at the panel.

SHIELDWIRE-GROUNDING multi-terminal connectors are included to eliminate stray electrical current, thereby helping to reduce line noise form the sensors to the controller.

This panel is intended for use in an environment protected from the weather.

## Specifications

Certification.....UL508A

### **NEMA Rating – Type 1 Control Panel- IP20 Rating**

Enclosure is intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment and is not protected from liquids.

### **Industrial Control Panel**

Dimensions..... 23.5" w x 32.65h x 8" d  
 Mounting Holes..... Mounts with four pre drilled 15/32" holes  
 Rated Voltage (Standard) ..... 120VAC or 230VAC  
 'Phase / Frequency..... 1 Phase / 60Hz  
 Full Load Current(approx) .... 40A at 120VAC or 20A at 240VAC  
 Short Circuit Current Rating . 10kA

### **Temp. Range for Control Panel & Touch Screen**

Operating Temperature..... -4°F to 158°F (-20°C to 70°C)  
 Operating Humidity..... 0-95% Non-Condensing  
 Storage Temperature ..... -4°F to 158°F (-20°C to 70°C)

### **MCS-MAGNUM Controller**

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) ..... 12 vdc Regulated Power Supply  
 Minimum (Brown in) ..... 9.44 vdc  
 Amp Draw (Loaded) ..... 857.0 mA  
 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

### **MCS-SI-BASE Expansion Board**

Sensor Inputs (SI)..... 16 inputs 0-5vdc (10-bit A/D)  
 Analog Outputs (AO) ..... 4 outputs 0-10vdc  
 MCS-I/O Comm Port ..... 1 @ 38,400 baud

### **MCS-TOUCH-15.4 - Capacitive Touchscreen**

LCD Screen..... 15.4" Diagonal (Aspect Ratio 16:10)  
 Dimensions..... 17"L x 12.11"W x 3.228"H  
 1280 x 800 Resolution  
 NEMA 4 IP66 rated

Touchscreen Surface..... UV Degradation Protection  
 Operating Temperature -22°F to 176°F (-30°C to +80°C)  
 Operating Humidity..... 90 %RH (Non Condensing)  
 Storage Temperature ..... -22°F to 176°F (-30°C to +80°C)  
 Motherboard-Rev 4.0 ..... Freescale i.MX6 Dual Core 800mhz  
 2Gb of 512mhz DDR3 RAM memory  
 16Gb of eMMC Flash memory  
 10m/100m/1G Ethernet  
 1 Micro-SD Slots  
 2 USB Host 2.0  
 Real Time Clock (RTC) w/ Battery  
 3 RS485 communication ports

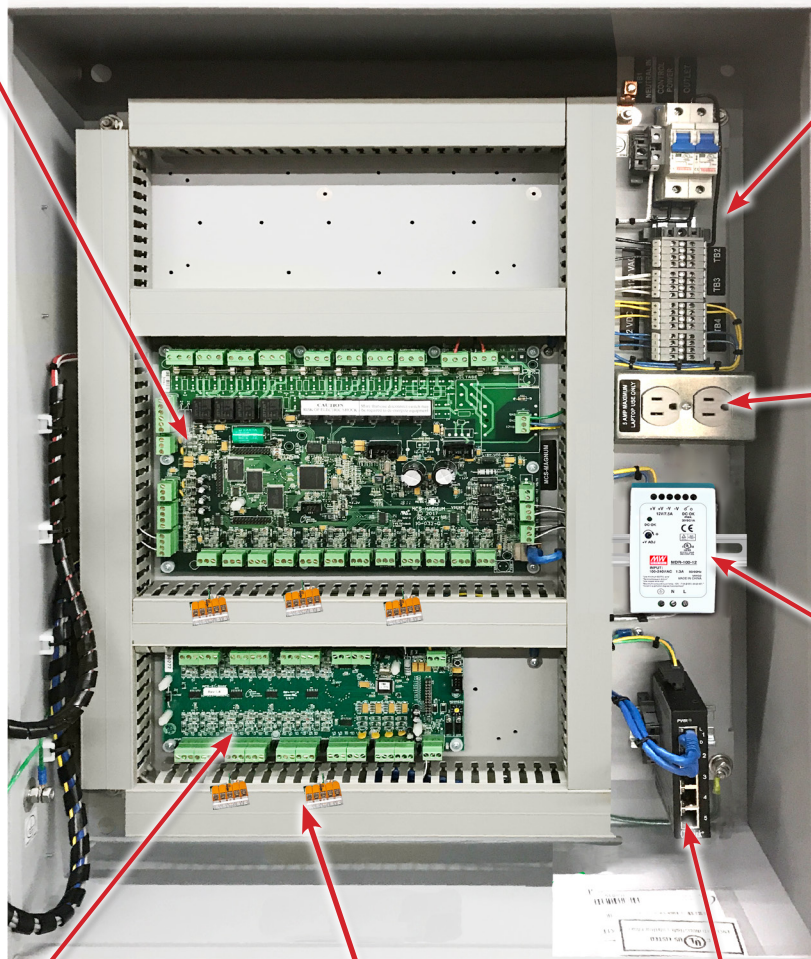
Touchscreen Surface..... UV Degradation Protection

Crossover Cable (orange) .. can be used for connecting MCS Touchscreen direct to MCS-MAGNUM or to a Laptop

\*The glove needs to have a conductive fabric or material to work with cap touchscreens.

# 23XL Industrial Control Panel

**MCS-MAGNUM-N-12**



**Terminal Blocks to land lines and neutrals for devices**

**Electrical outlet for Laptop plug-in power at the panel**

**12 Volt Power Supply**

**MCS-SI-BASE Expansion Board**

**SHIELDWIRE-GROUNDING multi-terminal connectors**

**Five (5) port Ethernet Switch**



5590 Enterprise Pkwy.  
Fort Myers FL 33905  
Office: 239-694-0089  
www.mcscontrols.com

## INDUSTRIAL CONTROL PANEL

Model: MCS-CENTRIFUGAL-12  
Serial: 000000  
Rated Voltage: 120 Vac  
Phase / Frequency: 1 Phase / 60 Hz  
Full Load Current: 20A  
Short Circuit Current Rating: 10kA  
Drawing Number: 00000-01  
Enclosure: Type 1

UL File E511647 Made in USA



ENCLOSED INDUSTRIAL CONTROL PANEL  
NO. DXXXXXXX

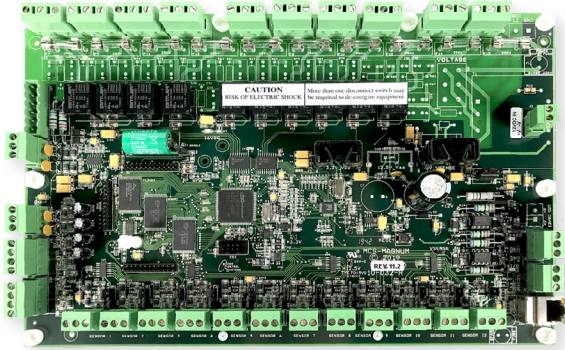
## UL 508A Certified Industrial Control Panel

Benefits of selecting an Industrial Control Panel that carries the UL 508A certification include:

- UL 508A certification provides the inspection authority and your customer evidence that the control panel complies with nationally recognized safety standards. These standards ensure public safety and provide assurances that the Industrial Control Panel is compliant with national and local electrical codes.
- For a control panel to carry the UL 508A Listing Mark, the panel must contain only UL recognized and listed components. The UL Mark on a component means that UL has evaluated and tested samples of this component and has concluded that they meet the UL requirements. This protects the quality and integrity of the enclosure and provides guarantee of safe performance.

# 23XL Industrial Control Panel

## MCS-MAGNUM-N-12



The **MCS-MAGNUM-N-12** is a durable microprocessor based controller designed for the hostile environments in the HVAC/R industry. It is designed to be the primary manager of the package it is controlling.

The Magnum provides flexibility with set points and control options that can be selected prior to commissioning a system or when the unit is live and functioning. The TouchScreen and MCS-CONNECT provide a clear and simple language that informs the user as to the status of the controller.

## Touchscreen

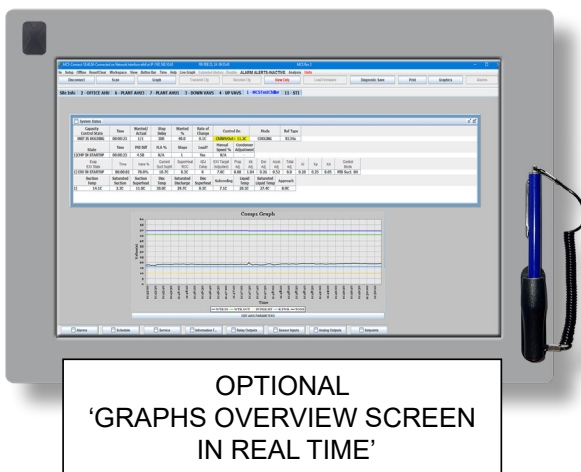
The **MCS-TOUCH-15.4** capacitive touchscreen interface designed to simplify user access with the MCS-Magnum, MCS- NitroMag and MicroMag utilizing MCS-Connect to provide both graphics and service mode access to technicians. Input method: Finger, glove, stylus.

Highly accurate and does not require calibration - easy to clean glass surface. Works outdoors, bright screen, water resistant, Exceptional Optics - 1280x800 resolution, sharp and vibrant images.

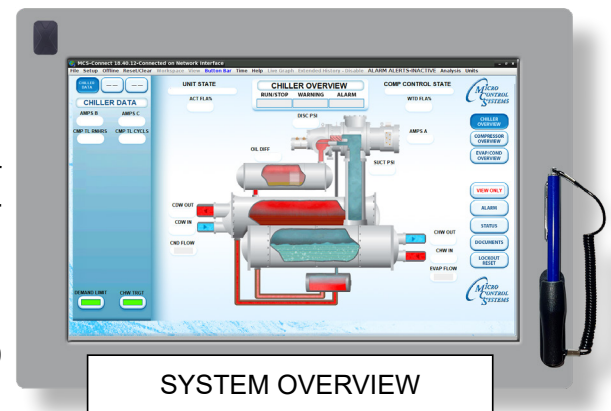
MCS-TOUCH-15.4 comes preloaded with the MCS-CONNECT program that allows you to view the 'unit's status', 'extended history', 'alerts', 'alarms', setpoints, and more, all in a user-friendly graphic format.

**Standard screens include:**

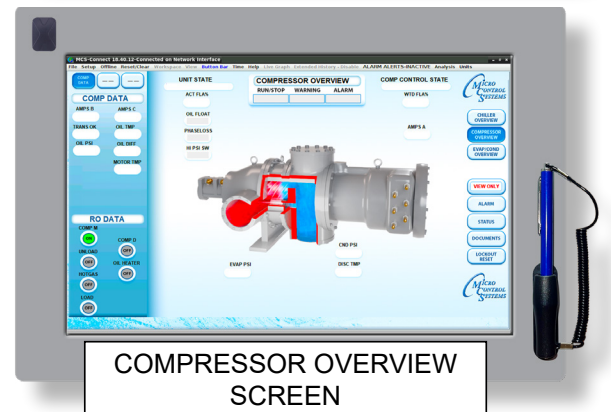
- **SYSTEM OVERVIEW, COMPRESSOR OVERVIEW and EVAPORATOR/CONDENSER OVERVIEW**



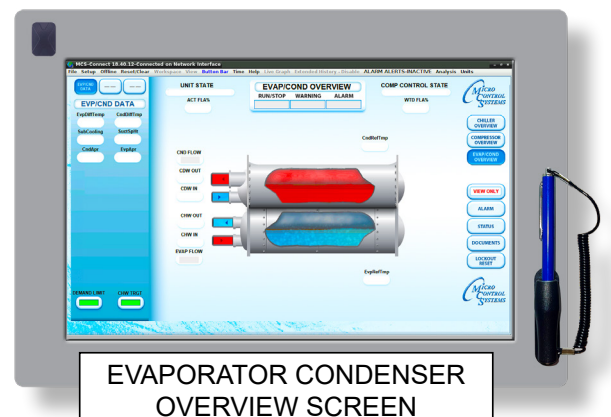
OPTIONAL  
'GRAPHS OVERVIEW SCREEN  
IN REAL TIME'



SYSTEM OVERVIEW



COMPRESSOR OVERVIEW  
SCREEN



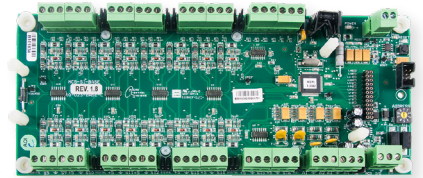
EVAPORATOR CONDENSER  
OVERVIEW SCREEN

# 23XL Industrial Control Panel

## MCS-SI-Base

The **MCS-SI-BASE** provides a flexible and cost effective way to allow sensor input and analog output expansion for the **MCS MAGNUM**. Each MCS-SI-BASE has a stand-alone micro-processor which communicates with the MCS MAGNUM over the MCS-I/O port at 38,400 baud. All data is check summed with auto error correction. Because communication is over a RS-485 long distance two-wire differential network transmission system, the MCS-SI-BASE may be located up to 5,000 feet away.

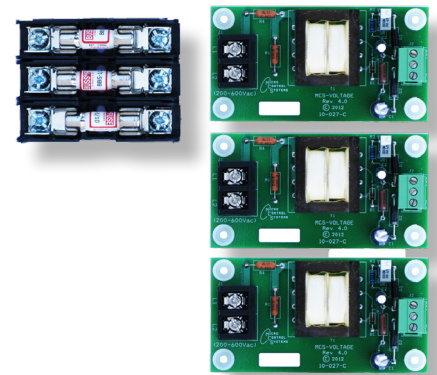
Each MCS-SI-BASE board can be powered by a 12VDC regulated power supply and has a automatic power fail reset system.



## MCS-VOLTAGE-3PH

The **MCS-VOLTAGE-3PH** measures AC voltage between 200-600 AC. It is designed to monitor the voltage of each phase of the main input power to the unit.

The MCS-VOLTAGE-3PH sensor provides three separate DC voltage outputs that correspond to the AC voltage it is measuring.



## MCS-PHASE-B

The **MCS-PHASE-B** is a programmable 3-phase line voltage monitor, high temperature LCD display, easy setup and clear diagnostic readout of system faults. The MCS-PHASE-B was specifically designed to protect motors and other 3-phase loads from premature failure and damage due to common voltage faults such as unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling.



## MCS-PRESSURE TRANSDUCERS



The **MCS Pressure Transducers** are one of the most economical and durable options on the market for dealing with high-pressure industrial applications.

In addition to being CE and UL approved, MCS transducers are capable of surviving high vibration. They include a cavity built out of solid 17-4 PH stainless steel 1/4" SAE Female Flare fitting & Schrader valve; 7/16-20 UNF pipe thread which creates a leak-proof, all metal sealed system that makes the transducers ideal for use with rugged HVAC environments.

# 23XL Industrial Control Panel

## MCS-T-100 Temp Sensor



An extremely fast acting temperature sensor built for demanding environments. It is ideal for high moisture locations with continuous freeze and thaw cycles. The sensor is potted with a thermally conductive RTV Cure Silicon Adhesive to guarantee durability and response. Its high accuracy allows for interchangeability in the field. The large resistance range allows the use of over 1000' of cable with no noticeable effect. The MCS-T100 sensor has the ability to move from 32°F to 212°F in approximately 10 to 15 seconds.

## MCS-Wells/Tubes

The MCS-WELL was designed to be used with the MCS-T100 temperature sensor, although it has other applications. It is used in the 23XL series chillers in the chilled water and condenser water lines. It comes pre-filled with heat conductive compound to aid in temperature to the sensor.



The **MCS-TUBE** can be epoxied to a discharge or suction line on the 23XL series chillers in order to obtain temperature readings without the use of a well. It was designed to be used with the MCS-T100 temperature sensor and comes pre-filled with heat conductive compound to aid in transferring temperature to the sensor.

## MCS-USB-RS485



The **MCS-USB-RS485** is a USB to RS485 cable that provides a fast simple way to connect a **MCS-MAGNUM** to a Laptop or PC.

The MCS-USB-RS485 cable contains a small internal electronic circuit board, which converts USB to RS485 with LED indicators for transmit (TX=Red) and receive (RX=Green).

## MCS-EPOXY

- Pre-measured resins and hardeners in one tube
- Easy to use - bonds, seals, plugs, molds and rebuilds
- No special tools needed
- Can even harden under water



- Pressure tested to ..... 1300 psi
- Temperatures up to ..... 500 degree F
- Color..... Gray
- Density ..... 15.9 lb/gal (1.9 g/cc)
- Hardness (Shore D) ..... 85
- Tensile Strength ..... 6000 psi
- Compressive Strength ..... 18.000 psi
- Modulus of Elasticity ..... 6 x 105 psi
- Shear Strength ..... 700 psi

# 23XL Industrial Control Panel

## MCS-CT500



**MCS-CT500** current sensor monitors current flowing to electrical equipment. The magnitude of the current is converted to a linear output voltage between 0.06 to 4.52vdc which can be read as a standard analog input signal. The signal is used by MCS micro controllers for the following:

1. For slide valve control on screw machines
2. For high amp motor overload protection
3. For verification of device on / off

## MCS-CARRIER 5K-ADAPTER

The 23XL series chiller comes equipped with embedded 5K thermistors in the motor. There are two (2) thermistors factory installed in each compressor. There are three (3) terminals for the thermistors. (S1, S2 & C) Motor temperature is measured by leads connected to one of the S terminals and the C terminal.

The thermistors are not field serviceable. If both motor thermistors fail the compressor needs to be replaced.

In order to monitor the motor on the 23XL series a cable is installed on the C and S1 terminals of the Carrier's thermistor and then wired along with the MCS-CARRIER 5K-ADAPTER to a sensor input on the MCS-MAGNUM or MCS-SI-BASE board. This allows the MAGNUM to monitor the temperature of the 23XL series motors for proper operation.

A wiring diagram and instructions are included with the MCS-CARRIER 5K-ADAPTER.



## 23XL Typical Options

### VFD OPTION

MCS-MODBUS I/O is added for communication to the Variable Frequency Drive.

A second MCS-MODBUS I/O can be added for communicating to another slave device including the MCS-POWERMETER.

### BMS GATEWAY

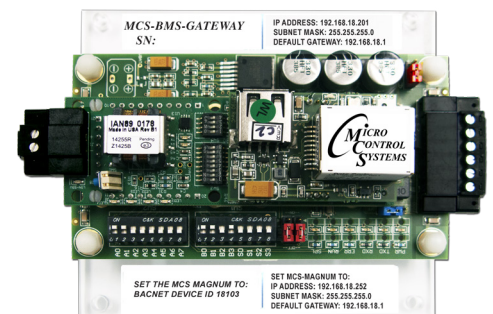
The **MCS-BMS-GATEWAY** is a microprocessor based communication device that provides translation from Bacnet IP, Bacnet MSTP, Modbus IP, Lontalk, or Johnson N2 communication interface. Information that can be transmitted includes the status of control points, alarm information, digital inputs, analog inputs or setpoints.

The MCS-BMS-GATEWAY protocol is field selectable by setting jumper on the device. Using **MCS-CONFIG** and the CONFIG files for the MCS-MAGNUM, you can automatically create the CSV files that is required by the MCS-BMS-GATEWAY.

### MCS-POWERMETER-B-KIT

Monitors the voltage, current, power, energy, and many other electrical parameters on single and three-phase electrical systems.

Kit Components Include:  
3 rope Current Transformers  
MCS-MODBUS-I/O





# 23XL Typical Point List

## Relay Outputs

#	Output Name	Type	Description
M-1	Comp M	Screw-No EXV	Compressor main relay for star-delta
M-2	Comp D	Standard	Compressor transition relay for star-delta
M-3	Load	Standard	Increase compressor capacity
M-4	Unload	Standard	Decrease compressor capacity
M-5	Oil Heater	Standard	Oil heater: Turn ON or OFF
M-6	HotGasBy	Standard	Hot gas bypass: Turn ON or OFF
M-7	Oil Solnd	User Logic	Opens oil line to the compressor
M-8	Shunt Trip	User Logic	Shut Trip: Turn ON or OFF
M-9	Warning	Standard	Warning Light: unit is in a safety condition prior to a safety shutdown.
M-10	AlarmLight	Standard	Alarm Light: unit is in a safety shutdown
1-1	LowOilTemp	User Logic	Turns on General Alarm Relay and stores alarm message
1-2	CmplsOff	User Logic	Compressor off

## Sensor Inputs

#	Output Name	Type	Description
M-1	ChilWtr In	MCS-T100	Chilled water in temperature
M-2	ChilWtrOut	MCS-T100	Chilled water out temperature
M-3	CndWtrIn	MCS-T100	Condenser water incoming temperature
M-4	CndWtrOut	MCS-T100	Condenser water leaving temperature
M-5	Suct Psi	MCS-200	Suction PSI
M-6	Disc Psi	MCS-500	Discharge PSI
M-7	Oil Psi	MCS-500	Oil PSI
M-8	Spare M-8	Spare	Not Used - Reserved for Expansion
M-9	CndRefTemp	MCS-T100	Condenser refrigerant temperature
M-10	Disc Tmp	MCS-T100	Discharge temperature
M-11	EvapRefTmp	MCS-T100	Evaporator refrigerant temperature
M-12	MotorTemp	Carr-5K	Reads the motor temperature
M-13	CndWtrFlow	Digital	Proof for condenser flow
M-14	Phaseloss	Digital	Phase loss: phase imbalance
M-15	Run/Stop	Digital	Run/Stop/Hand Switch
M-16	Emg/Stop	Digital	Emergency stop switch
1-1	Rotor Temp	Carr-5K	Suction temperature
1-2	Trans OK	Digital	Transition starter OK
1-3	Hi Psi SW	Digital	Mechanical high pressure safety

# 23XL Typical Point List

## Sensor Inputs

#	Output Name	Type	Description
1-4	Oil Temp	MCS-T100	Oil temperature
1-5	OilLvIFit	Digital	Level of oil in oil separator
1-6	EvpWtrFlow	Digital	Proof of evaporator flow
1-7	Amps A	MCS-CT500	Reads amp draw on leg 1
1-8	Amps B	MCS-CT500	Reads amp draw on leg 2
1-9	Amps C	MCS-CT500	Reads amp draw on leg 3
1-10	Volts A	User Defined	Volts phase A
1-11	Volts B	User Defined	Volts phase B
1-12	Volts C	User Defined	Volts phase C
1-13	Spare 1-13	Spare	Sensor input not used
1-14	Spare 1-14	Spare	Sensor input not used
1-15	Spare 1-15	Spare	Sensor input not used
1-16	Spare 1-16	Spare	Sensor input not used
2-1	Evap Appr	User Logic	Chilled water out temperature minus Evaporator refrigerant temperature
2-2	Cnd Appr	User Logic	Condenser water approach: difference between saturated discharge temperature minus the condenser leaving water
2-3	SuctSprHt	User Logic	Suction superheat
2-4	Sub Cool	User Logic	Subcooling: saturated liquid temperature minus actual liquid temperature
2-5	Lift	User Logic	Lift ratio: either difference between suction/discharge temperature or pressure
2-6	FLa%	User Logic	Full load amps
2-7	LowOilTemp	User Logic	Low oil temperature
2-8	CndEvpFlow	User Logic	Proof that the condenser and evaporator are on
2-9	CmplsOn	User Logic	Proof that the compressor is running; amps >=5

# 23XL Upgrade Information

**NOTE: This form has drop down fillable areas, fill in and email to: [sales@mcscontrols.com](mailto:sales@mcscontrols.com)**

Company: \_\_\_\_\_ Phone: \_\_\_\_\_

Name: \_\_\_\_\_ Title: \_\_\_\_\_ Email: \_\_\_\_\_

Mobile: \_\_\_\_\_ Site: \_\_\_\_\_

Model Number	Serial Number	Refrigerant Used	Full Load Amps of Compressor

1. **Model of existing Panel:**

2. **What is the Starter Type?** **Are we monitoring the Transition OK or Starter Fault?**

a. Does the Compressor have a remote starter?      Yes                      No

3. **Is there a Variable Frequency Drive?:** What is the VFD Make and Model?      Make: \_\_\_\_\_      Model: \_\_\_\_\_

a. Will the VFD be hardwired to MCS controls, over MODBUS or both?

b. If you are using a VFD other than a Yaskawa VFD, do you need MCS to control the VFD Enclosure Temperature and Fans?      Yes      No

3. **What protocol will be used for Building Management communication?**

4. **Will Phase loss need to be monitored?**      Yes      No      **How would you like the pressures to be displayed?**

5. **What kind of Hot Gas Bypass is present?**

6. **Is MCS controlling Pumps?**      Yes                      No

a. **How will the Chilled Water Pump(s) be wired?**

b. **How will the Condenser Water Pump be wired?**

7. **Is MCS controlling Condenser/Evaporator Isolation Valve?**      Yes      No      BMS

8. **What Main Voltage is being supplied to the unit?**      Voltage: \_\_\_\_\_      Is MCS monitoring Main Voltage?      Yes      No

9. **What is the Control Voltage being supplied?**      Voltage: \_\_\_\_\_

10. **What is the 'RUN LOAD AMPS' (FLA)**                      **COMP 1:**                      **COMP 2:**

11. **Will the Chilled/Condenser Water Flow be measured by Flow or Differential?**

12. **Will Ambient Temperature need to be monitored?**      Yes      No

**COMMENTS (is there any other information we should know?):**



5580 Enterprise Pkwy., Fort Myers, FL 33905

Office: 239-694-0089 • Fax: 239-694-0031

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