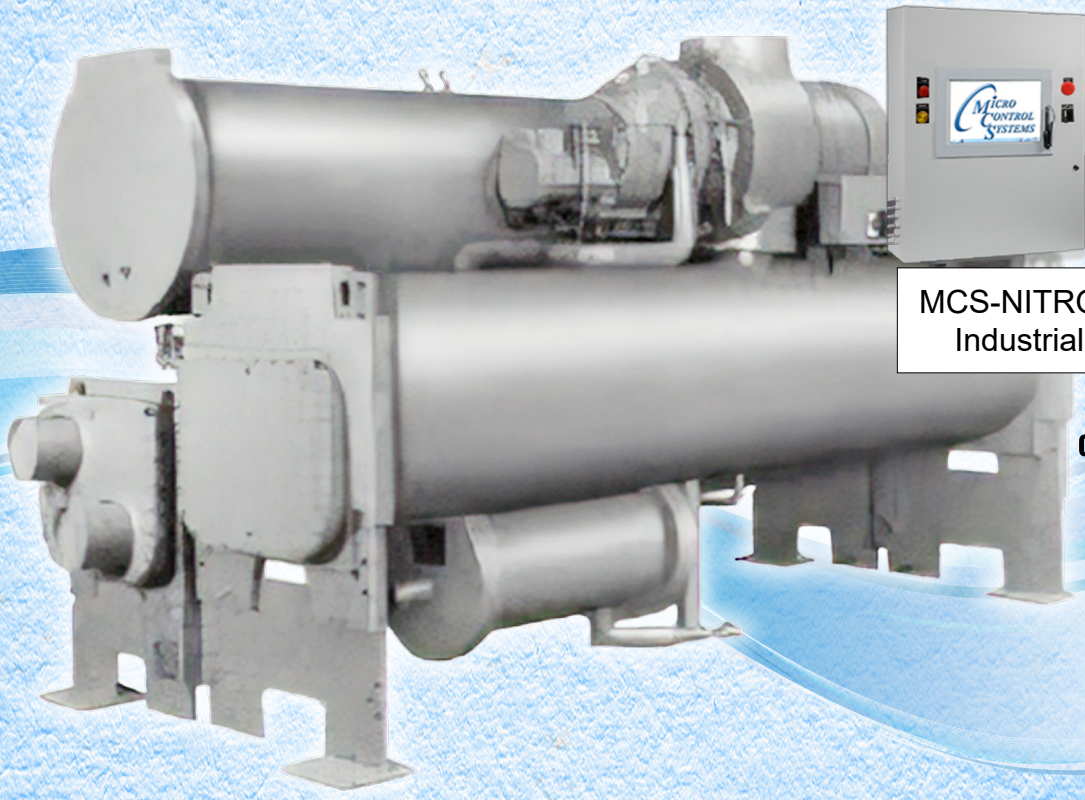




***MCS Total
Solutions for all your
HVAC/R Control Needs***



**MCS-NITROMAG-MLB-15.4
Industrial Control Panel**



MCS-Nitromag Upgrade Brochure

Carrier 23XL



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.



Example MCS-NitroMag 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





MCS-NitroMag-MLB-15.4 INDUSTRIAL CONTROL PANEL



Part #
MCS-NITROMAG-MLB-15.4*

Description

The **MCS-NitroMag-MLB-15.4 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-NitroMag-MLB-15.4** is a control system containing a Capacitive Touchscreen, MCS-NITROMAG Controller, MCS-IO-BASE, MCS-IO-EXT. It includes a processor, memory, eMMC Flash, and supporting power circuitry.

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 HAND/OFF/AUTO selector Switch.

The MCS-NITROMAG controller comes with a built-in WiFi interface for Ethernet connectivity, and an onboard WiFi antenna connection mounted on the front of the touchscreen.

It features various connections ports for:

- 2 HDMI ports (1 Standard and 1 Micro port)
- 12vdc & 24vdc power input connections
- Ethernet port (10Mbps/100Mbps/1 GHz)
- MCS-IO port for communicating with expansion boards

Includes a MODBUS interface which enables it to act as a Modbus Master using the Modbus RTU protocol, allowing communication with Modbus slave devices for parameter access. Power is supplied using a MCS-12V-90W power supply.

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

Packaging

Weight 60 lbs(approx)
Box 24" x 10" x 30"

Specifications

NEMA Rating – Type 2 Control Panel

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 32.65" h 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

LCD Screen..... 15.4" (16:10 Diagonal)
16.2 Million Colors
1280x800 Resolution
View Angle 70°U, 70°D, 70°L, 70°R
Capacitive Stylus pen
White LED Backlight (Min Life 50,000 Hrs)
Luminance Min. 350 Min. 450 Typical
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)

Controller

Microprocessor..... Broadcom BCM2711 Quad core
Cortex (ARMv8) 64-bit SoC @ 1.5Ghz

INPUT	MINIMUM	NOMINAL	MAXIMUM
VOLTAGE	10	12	12.5
AMPS			2

Flash Memory 16 GB EMMC
RAM 2 GB DDR3
MCS-I/O Comm Port. 1 @ 38,400 baud
RS-485 Ports..... 2 @ go up to 115200 baud rate
Ethernet..... 10 Mbps/100Mbps/1Gbps
HDMI 2 HDMI 2.0 ports-Standard and Micro
WiFi 2.4 GHz, 5.0GHz 8.02 b/g/n/ac wireless
USB 2 USB type B 2.0 ports 480Mbps signalling
Protocols..... BACnet IP, BACnet MSTP, Modbus IP,
Modbus RTU Slave, Modbus RTU Master (BTL certification cpendig)
Real Time Clock Battery backup(Type BR2032)
Power Detection Automatic power fail reset

Power Supply - Specification

12vdc power supply..... 85vac ~ 264vac
AC frequency range..... 47 ~ 63Hz / 7.5A / 90W
24vdc power supply..... 85vac ~ 264vac
AC frequency range..... 47 ~ 63Hz / 4A / 96W

5580 Enterprise Pkwy., Fort Myers, FL 33905
Office: 239-694-0089 • Fax: 239-694-0031 www.mcscontrols.com

* Photo shown is an example of an Industrial Control Panel; some optional equipment may be shown.

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

23XL Industrial Control Panel

WiFi Antenna

Built in WiFi - 2.4 GHz, 5.0 GHz.



Graphics preloaded

Modbus RTU Master programmed in Firmware

Supports up to 10 Modbus devices e.g., VFD's KW Meter, Compressors.

2 HDMI ports

(1 Standard & 1 Micro)

MCS-NitroMag-15.4

MCS-IO-BASE & MCS-IO-EXT Expansion Boards

Terminal Blocks
to land lines and
neutrals
for devices

Electrical outlet for
Laptop plug-in
power at the panel

12 Volt Power Supply

SHIELDWIRE-GROUNDING
multi-terminal connectors

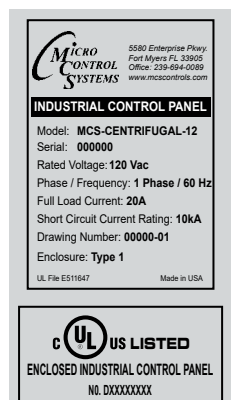
Five (5) port Ethernet Switch



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.



Example Graphics MCS-NitroMag-15.4

Touchscreen

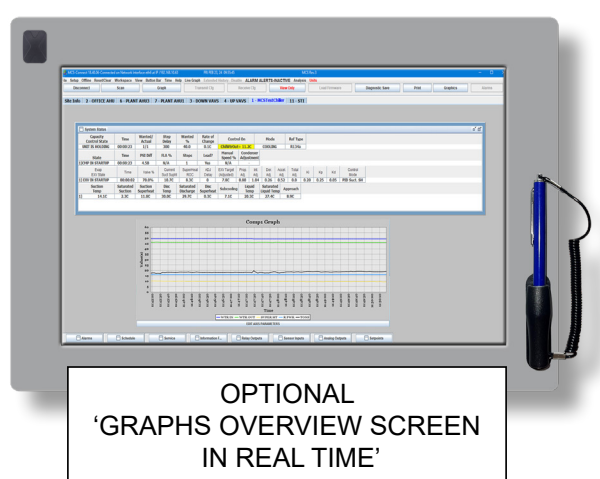
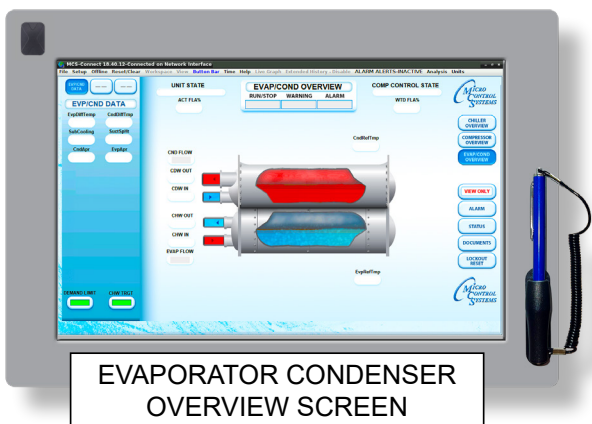
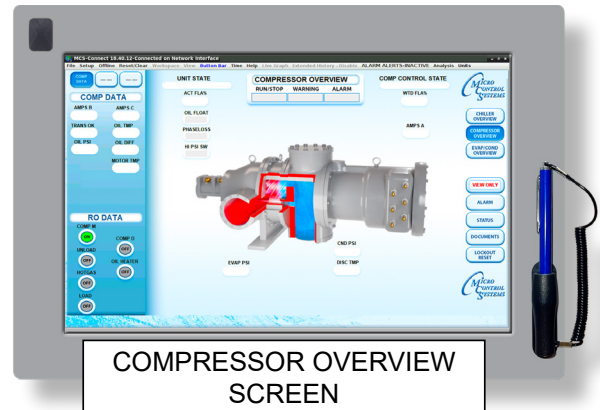
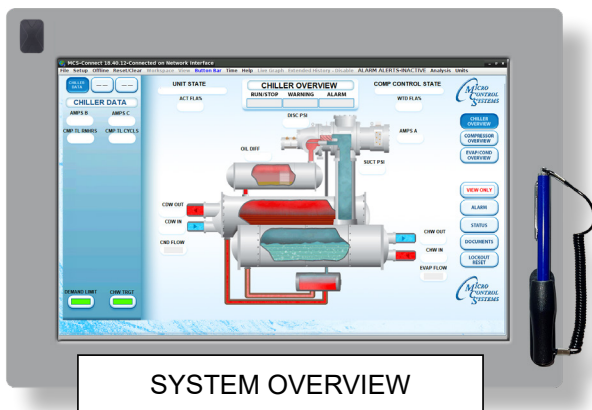
The MCS-NitroMag-15.4 capacitive touchscreen interface designed to simplify user access with MCS Expansion boards utilizing MCSConnect to provide both graphics and service mode access to technicians. Input method: Finger, glove, stylus.

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.

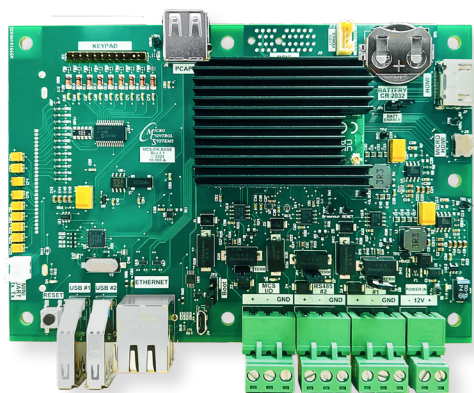
MCS-MCS-NitroMag-15.4 comes preloaded with the MCS-CONNECT program that allows you to view the 'unit's status', 'extended history', 'alerts', 'alarms', setpoints, and more, all in a user-friendly graphic format.

Standard screens include:

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



Example Typical Upgrade with Optional Boards



MCS-NitroMag-N

The **MCS-NitroMag-N** is a control system containing a processor, memory, eMMC Flash, and supporting power circuitry. The Broadcom quad-core processor delivers a blazing speed of 1.5GHz.

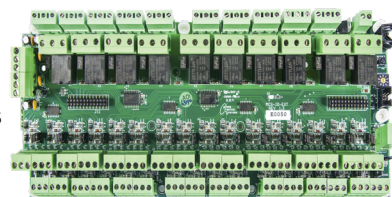
The MCS-NitroMag-N controller connects with MCS Expansion boards and Extension boards, allowing for a maximum of 144 SI inputs, 90 RO outputs, and 36 AO outputs.

The MCS-NitroMag-N comes with a built-in WiFi interface for Ethernet connectivity, and an onboard WiFi antenna connection.

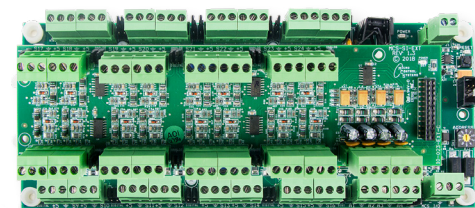
MCS-IO-Base & MCS-IO-EXT

MCS-IO-BASE has a stand-alone microprocessor which communicates with a MCS-NitroMag over the MCS-I/O port at 38,400 baud. The MCS-IO-BASE has 16 SI inputs, 10 RO outputs, and 4 AO outputs. All data is check summed with auto error correction. Each MCS-IO-BASE board can be powered by a 12VDC regulated power supply and has a automatic power fail reset system.

The **MCS-IO-EXT** provides a flexible and cost effective way to allow relay output, sensor input and analog output expansion for MCS-NitroMag. Each MCS-IO-EXT can be paired with a MCS-IO-BASE to double the number of inputs and outputs.



MCS-SI-Base & MCS-SI-EXT



board can be powered by a 12VDC regulated power supply and has a automatic power fail reset system.

The **MCS-SI-EXT** provides a flexible and cost effective way to allow sensor input and analog output expansion for the **MCS MAGNUM**. Each MCS-SI-EXT can be paired with a MCS-SI-BASE to double the number of inputs and outputs.

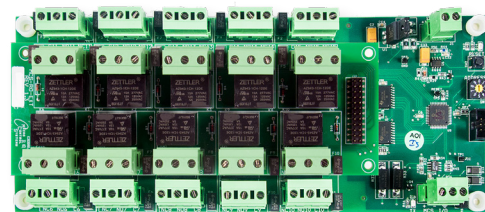
The **MCS-SI-BASE** provides a flexible and cost effective way to allow sensor input and analog output expansion for the **MCS-NitroMag**. Each MCS-SI-BASE has a stand-alone microprocessor which communicates with the MCS-Nitromag over the MCS-I/O port at 38,400 baud. The MCS-SI-BASE has 16 SI inputs and 4 AO outputs. All data is check summed with auto error correction. MCS-SI-BASE

MCS-RO-Base & MCS-RO-EXT

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

The MCS-RO-BASE board is powered by a 12VDC regulated power supply.

The **MCS-RO-EXT** provides a flexible and cost effective way to allow relay output expansion for the **MCS NitroMag**. Each MCS-RO-EXT can be paired with a MCS-RO-BASE to double the number of outputs.



Example Typical Control Upgrade

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.

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.



1/4- 2.5"

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).

Example Typical Control Upgrade

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

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:

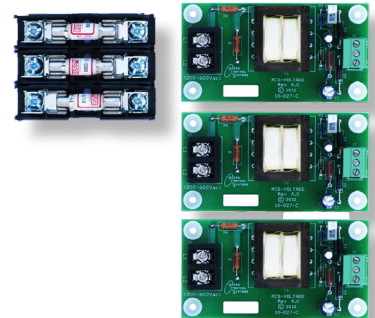
1. For slide valve control on screw machines
2. For high amp motor overload protection
3. For verification of device on / off



MCS-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-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-IO-BASE or MCS-SI-BASE board.



Example Typical Points List with Optional Boards

Relay Outputs (MCS-IO-BASE)

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

Relay Outputs (User Logic, virtual board)

2-1	LowOilTemp	User Logic	Turns on General Alarm Relay and stores alarm message
2-2	CmplsOff	User Logic	Compressor off

Sensor Inputs-(MCS-IO-BASE)

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

Example Typical Points List with Optional Boards

Sensor Inputs (MCS-IO-EXT)

#	Output Name	Type	Description
2-1	Rotor Temp	Carr-5K	Suction temperature
2-2	Trans OK	Digital	Transition starter OK
2-3	Hi Psi SW	Digital	Mechanical high pressure safety
2-4	Oil Temp	MCS-T100	Oil temperature
2-5	OilLvIFlt	Digital	Level of oil in oil separator
2-6	EvpWtrFlow	Digital	Proof of evaporator flow
2-7	Amps A	MCS-CT500	Reads amp draw on leg 1
2-8	Amps B	MCS-CT500	Reads amp draw on leg 2
2-9	Amps C	MCS-CT500	Reads amp draw on leg 3
2-10	Volts A	User Defined	Volts phase A
2-11	Volts B	User Defined	Volts phase B
2-12	Volts C	User Defined	Volts phase C
2-13	Spare 1-13	Spare	Sensor input not used
2-14	Spare 1-14	Spare	Sensor input not used
2-15	Spare 1-15	Spare	Sensor input not used
2-16	Spare 1-16	Spare	Sensor input not used

Sensor Inputs (User Logic, virtual board)

#	Output Name	Type	Description
3-1	Evap Appr	User Logic	Chilled water out temperature minus Evaporator refrigerant temperature
3-2	Cnd Appr	User Logic	Condenser water approach: difference between saturated discharge temperature minus the condenser leaving water
3-3	SuctSprHt	User Logic	Suction superheat
3-4	Sub Cool	User Logic	Subcooling: saturated liquid temperature minus actual liquid temperature
3-5	Lift	User Logic	Lift ratio: either difference between suction/discharge temperature or pressure
3-6	FLa%	User Logic	Full load amps
3-7	LowOilTemp	User Logic	Low oil temperature
3-8	CndEvpFlow	User Logic	Proof that the condenser and evaporator are on
3-9	CmplsOn	User Logic	Proof that the compressor is running; amps >=5

Sample Questionnaire

Visit <https://www.mcscontrols.com/brochures.html> for a fillable form to email to sales@mcscontrols.com

General Information

Company: _____ Phone: _____
Name: _____ Title: _____ Email: _____
Mobile: _____ Site: _____

Unit Information

Installation Site Name _____
Model # _____ Unit Serial # _____ Site Unit # _____
What is the Voltage of the Unit? ☐ 208V, ☐ 230V, ☐ 460V, ☐ 4160V, Other Voltage _____
What is the Control voltage in the unit? ☐ 24V, ☐ 115V, ☐ 230V, What type of Refrigerant is being used? _____
Is MCS monitoring Main Voltage? ☐ Yes ☐ No. Will Phase loss need to be monitored? ☐ Yes ☐ No.

Network Information

1. Integrating to Building Management System (BMS) ☐ Yes ☐ No, If yes, complete the form provided on page 2.

Motor Information

2. What is the Starter Type? _____ Are we monitoring the transition OK or start Fault? _____
a. Does the Compressor have a remote starter? ☐ Yes ☐ No.
3. Is there a Variable Frequency Drive? ☐ Yes ☐ No
a. What is the VFD Make and Model? VFD Make _____ VFD Model _____
b. Will the VFD be hardwired to MCS controls, or MODBUS _____
c. Is MCS required to control VFD Cabinet Auxiliary Fan? ☐ Yes ☐ No.
4. What are the Motor "RUN LOAD AMPS"(FLA)? COMP 1: _____ COMP 2: _____
5. Is Hot Gas Bypass present? ☐ Yes ☐ No, How does it operate? _____

Purge Information

6. What is the Purge Type on the unit, how is it controlled? _____

Evap/Condenser/Pump Information

7. Is MCS controlling the chiller Water Pump(s)? ☐ Yes ☐ No, How will they be wired? _____
8. Is MCS controlling the Condenser water Pump(s)? ☐ Yes ☐ No, How will they be wired? _____
9. Is MCS controlling Condenser/Evaporator Isolation Valve? ☐ Yes ☐ No ☐ BMS.
10. Is MCS controlling tower fan(s)? ☐ Yes ☐ No, How many are there _____, how are they wired? _____
11. Will the Chilled/Condenser Water Flow be measured by? _____

Ambient Information

12. Will Ambient temperature need to be monitored? ☐ Yes ☐ No.

CVHA Information Only

13. Is there a Motor Cooler? ☐ Yes ☐ No, Will MCS be monitoring the Oil Feed? ☐ Yes ☐ No, Return Temp _____

COMMENTS (Is there any other information we need to know?):

Click for Brochure Upgrades▶

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2. Click on the emailed link. Fill out the digital fillable form on a computer and email to sales@mcscontrols.com
3. **Viewing brochure from Computer**, click on QR code, find the form you need, click on fillable form, fill out and email to sales@mcscontrols.com





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