MICRO CONTROL SYSTEMS

MCS Total Solutions for all your HVAC/R Control Needs

MCS-NitroMag-DOOR

NEW

MCS-Nitromag Upgrade Brochure

Carrier 30HXC Watercooled Chiller

Click for Brochure Upgrades▶

This brochure describes a standard upgrade package for the 30HXC Chiller.

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

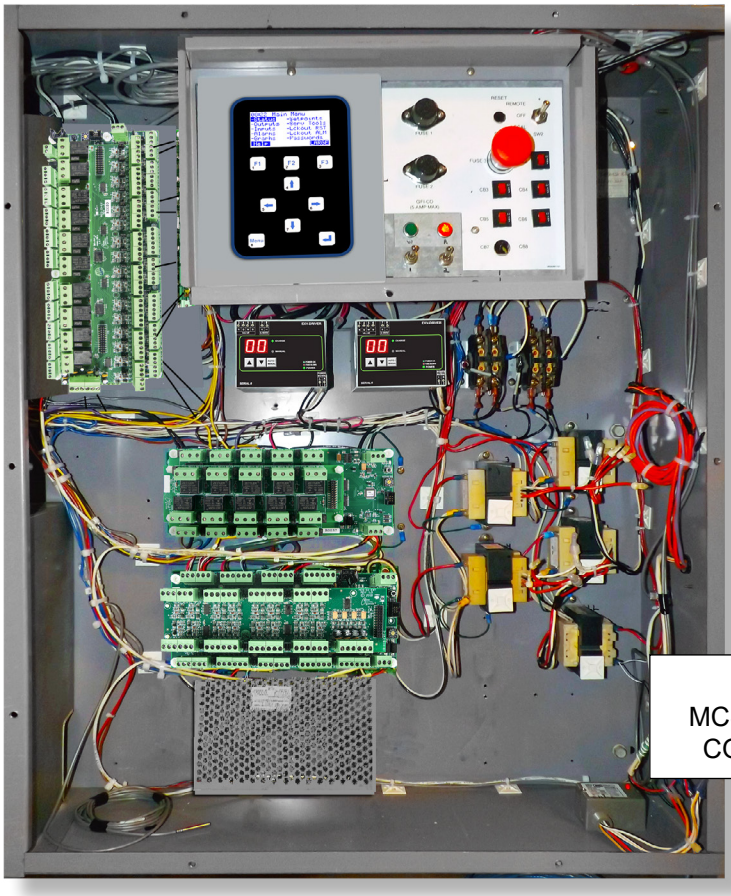
Fill out the brief questionnaire in the back of this brochure and forward to your sales representative for an estimate.

Revision - 2025-08-22

Example MCS-NitroMag Upgrade Photos

Reason for Upgrades:

- Failing linear floats in the economizer
- Continuous shut down trips
- Existing controls were obsolete
- Excessive man hours spent on site visits



NEW
MCS-NitroMag
CONTROLS

Steps Taken:

- Removed existing obsolete controls
- Installed MCS-NitroMag Controls
- Replaced old canister style economizer with a new plate-frame style economizer.
- Replace proprietary EXVs with standard Sporlan EXVs
- Connected compressor motor temperature sensors to MCS-NitroMag Expansion Boards.
- Customer added additional fan contractors to improve Discharge PSI control.

NEW
MCS Retrofit
Economizer
Piping Re-sized

Results:

Obsolete controls were replaced with the MCS-NitroMag Controller. This provided the customer with a control platform that is not built with a pre-planned obsolescence.

The MCS Controls will allow for future upgrades and operational changes that can be made through updated software. Previously released MCS hardware remains supported with current and future products.

MCS-NitroMag-DOOR
Description & Specifications

File No: E169780

RoHS Compliant

Part # MCS-NitroMag-DOOR

Description

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

The **MCS-NitroMag-DOOR** features an easy-to-use keypad with three function keys, four directions keys and two selection keys (Menu & Enter).

The display LCD is 128 x 64 dot pixel graphics, 2.8" diagonal viewing area with White characters on a dark background (reversible). Includes a NEMA Type 1 faceplate for easy mounting to an enclosure door.

The MCS-NitroMag-DOOR controller allows for 144 SI inputs, 90 RO outputs, and 36 AO outputs. (Expansion Boards required).

It comes with a built-in WiFi interface for Ethernet connectivity, and an onboard WiFi antenna mounted on the front.

Includes a **Modbus interface** which enables it to act as a Modbus Master using the Modbus RTU protocol, which allows communication with Modbus slave devices for parameter access.

It features various connection ports for:

- 2 HDMI ports (1 Standard & 1 Micro)
- WiFi antenna connection
- 12vdc power input connection
- Ethernet port (10 Mbps/100 Mbps/1Gbps)
- Two RS-485 Ports up to 115200 baud rate
- MCS-IO port for communicating with expansion boards

Specifications

Keypad Door

Dimensions.....7.25"w x 8.50"h 1.42"d
(184.15 mm x 215.9 mm x 36.17 mm)
Mounts using supplied #6-32 Kep nut

Display.....128 x 64 dot pixel STN monochrome graphics LCD with 2.8" diagonal viewing area

Color.....White characters on a blue background (Reversible)

Keypad Size.....5.26"w x 8.50"h (8 mounting studs)

Keypad Layout.....9 keys (3 function keys)

Operating Temperature....-4°F to +185°F (-20°C to +85°C)

Operating Humidity.....0-95% Non-Condensing

Controller

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

INPUT	MINIMUM	NOMINAL	MAXIMUM
VOLTAGE	10	12	12.5
AMPS			0.5

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 pending)

Real Time Clock .....Battery backup(Type BR2032)

Power Detection .....Automatic power fail reset

POWER SUPPLY NOT INCLUDED

Ship Weight ..... 2.00 lbs (approx)

Box Dimensions..... 9" x 6-1/2" x 2-3/4" (approx)

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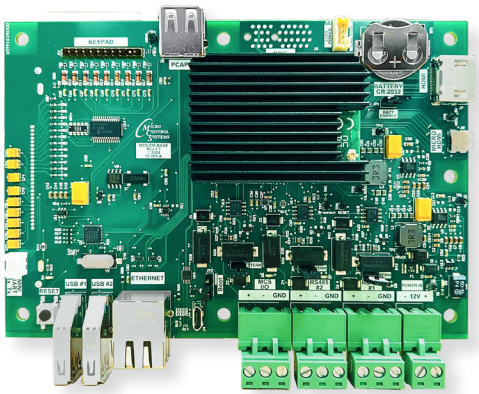
Office: 239-694-0089 • Fax: 239-694-0031 www.mcscontrols.com

Revision - 2025-07-01

Example Typical Upgrade with Optional Boards



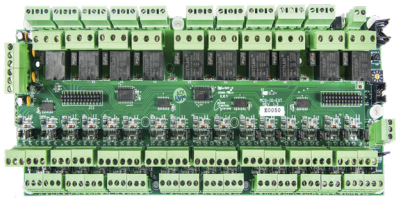
MCS-NitroMag-N

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.

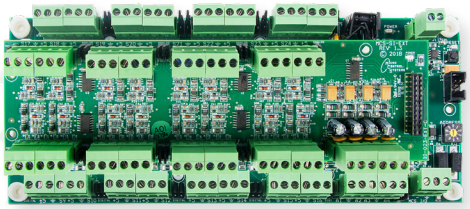
MCS-IO-Base & MCS-IO-EXT



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.

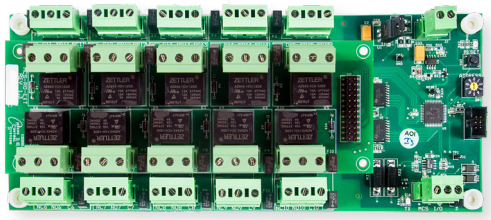
MCS-SI-Base & MCS-SI-EXT



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 ouputs. All data is check summed with auto error correction. MCS-SI-BASE 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.

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 ¼" 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-T100

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 32ºF to 212ºF 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.

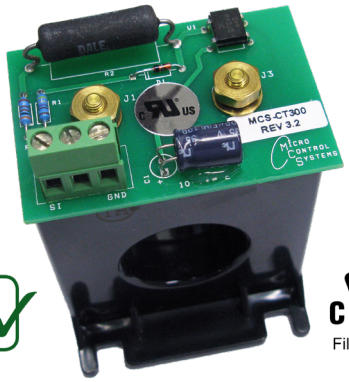
The MCS-USB-RS485 cable contains a small internal electronic circuit board, which converts USB to RS485 with LED indicators for transmit (TX=Red) and receive (RX=Green).

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



RoHS Compliant

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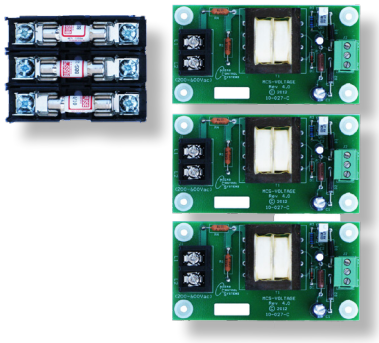
File No: E169780

MCS-CT300

The **MCS-CT300** current sensor monitors current flowing to electrical equipment. The magnitude of the current is converted to a linear 0 to 5vdc output signal 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.

Example Typical Control Upgrade Options

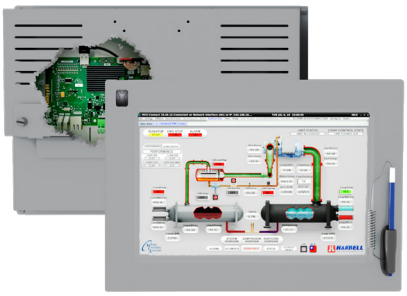
MCS-EXV-DRIVER

The **MCS-EXV-DRIVER** is used for the positioning and control of Sporlan, Alco, Carel, and Danfoss bipolar expansion valves using an analog input of 0-10 VDC (0 VDC = 0% valve opening, 10 VDC = 100% valve opening). The MCS-EXV-DRIVER also supports overdriving on full opened and full closed voltage signals. The display decimal notifies when overdriving by blinking.

MCS-SEHI/SERI

The **MCS-SEHI/SERI** are Electronically Operated Step motor flow control valves, intended for the precise control of liquid refrigerant flow. Synchronized signals to the motor provide discrete angular movement, which translates into precise linear positioning of the valve piston. Valve pistons and ports are uniquely characterized, providing improved flow resolution and performance. The MCS-SEHI/SERI valves are easily interfaced with MCS microprocessor based controllers.

MCS-NitroMag-15.4



The **MCS-NitroMag-15.4** is a control system containing a Capacitive Touchscreen, and a MCS-NitroMag-N controller. It includes a processor, memory, eMMC Flash, and supporting power circuitry. The Broadcom quad-core processor on the MCS-NitroMag-N 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 Capacitive touchscreen interface designed to simplify user access with the MCS Expansion Boards and utilizing MCS-Connect to provide both graphics and service mode access to technicians.

Example Typical Points List with Optional Boards

Relay Outputs (MCS-IO-BASE)

#	Output Name	Type	Description
1-1	Comp 1AM	Step w/ EXV	Compressor 1 main relay for star-delta
1-2	Comp 1AD	Standard	Compressor 1 transition relay for star-delta
1-3	Load 1A-1	Step w/ EXV	Compressor 1 loaded to 50%
1-4	Load 1A-2	Step w/ EXV	Compressor 1 loaded to 100%
1-5	Oil Pump 1A	Standard	Oil pump: Turn ON or OFF circuit A
1-6	HotGas 1A	Standard	Hot gas bypass: Turn ON or OFF circuit A
1-7	LiqInj 1A	Standard	Liquid injection motor cooling compressor 1
1-8	Oil Sol 1A	User Logic	Opens oil line to the compressor circuit A
1-9	Econ 1A	User Logic	Opens solenoid for economizer circuit A
1-10	Warning	Standard	Warning Light: unit is in a safety condition prior to a safety shutdown.

Relay Outputs (MCS-IO-EXT)

2-1	Comp 2BM	Step w/ EXV	Compressor 2 main relay for star-delta
2-2	Comp 2BD	Standard	Compressor 2 transition relay for star-delta
2-3	Load 2B-1	Step w/ EXV	Compressor 2 loaded to 50%
2-4	Load 2B-2	Step w/ EXV	Compressor 2 loaded to 100%
2-5	Oil Pump 2B	Standard	Oil pump: Turn ON or OFF circuit B
2-6	HotGas 2B	Standard	Hot gas bypass: Turn ON or OFF circuit B
2-7	LiqInj 2B	Standard	Liquid injection motor cooling compressor 2
2-8	Oil Sol 2B	User Logic	Opens oil line to the compressor circuit B
2-9	Econ 2B	User Logic	Opens solenoid for economizer circuit 2
2-10	Alarm	Standard	Alarm Light: unit is in a safety shutdown

Relay Outputs (MCS-SI-BASE)

3-1	Evap Pump	Standard	Evaporator loop pump: Turn ON or OFF
3-2	Cnd Pump	User Logic	Condenser pump: Turn ON or OFF
3-3	Tower Fan	Standard	Tower fan enable
3-4	Spare 3-4	Spare	Relay output not used
3-5	Spare 3-5	Spare	Relay output not used
3-6	Spare 3-6	Spare	Relay output not used
3-7	Spare 3-7	Spare	Relay output not used
3-8	Spare 3-8	Spare	Relay output not used
3-9	Spare 3-9	Spare	Relay output not used
3-10	Spare 3-10	Spare	Relay output not used

Analog Outputs (MCS-IO-BASE)

1-1	Exv 1%	Standard	% of EXV valve opening for circuit A
1-2	Exv 2%	Standard	% of EXV valve opening for circuit B
1-3	CndSpd%	Standard	% of condensor fan/pump speed

Example Typical Points List with Optional Boards

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	Suct Psi 1A	MCS-200	Suction PSI circuit A
1-4	Disc Psi 1A	MCS-500	Discharge PSI circuit A
1-5	Oil Psi 1A	MCS-500	Oil PSI circuit A
1-6	Amps 1A	CT-300	Compressor amps compressor 1
1-7	Suct Tmp 1A	MCS-T100	Suction temperature circuit A
1-8	Disc Tmp 1A	MCS-T100	Discharge temperature circuit A
1-9	Mtr Tmp 1A	Carr-5K	Reads the motor temperature on circuit A
1-10	TransOK 1A	Digital	Transition starter OK circuit A
1-11	Oil Lvl 1A	Digital	Oil level float switch compressor 1
1-12	Mtr Ovld1A	Digital	Motor module reading compressor 1
1-13	ChilWtrFlow	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

Sensor Inputs (MCS-IO-EXT)

2-1	Suct Psi 2B	MCS-200	Suction PSI circuit B
2-2	Disc Psi 2B	MCS-500	Discharge PSI circuit 2B
2-3	Oil Psi 2B	MCS-500	Oil PSI circuit 2B
2-4	Amps 2B	CT-300	Compressor amps compressor 2
2-5	Suct Tmp 2B	MCS-T100	Suction temperature circuit B
2-6	Disc Tmp 2B	MCS-T100	Discharge temperature circuit B
2-7	Mtr Tmp 2B	Carr-5K	Reads the motor temperature on circuit B
2-8	TransOK 2B	Digital	Transition starter OK circuit B
2-9	Oil Lvl 2B	Digital	Oil level float switch compressor 2
2-10	Mtr Ovld2B	Digital	Motor module reading compressor 2
2-11	Suct Psi 3A	MCS-200	Suction PSI circuit A
2-12	Disc Psi 3A	MCS-500	Discharge PSI circuit A
2-13	Oil Psi 3A	MCS-500	Oil PSI circuit A
2-14	Amps 3A	CT-300	Compressor amps compressor 3
2-15	Suct Tmp 3A	MCS-T100	Suction temperature circuit A
2-16	Disc Tmp 3A	MCS-T100	Discharge temperature circuit A

Example Typical Points List with Optional Boards

Sensor Inputs (MCS-SI-BASE)			
#	**Input Name**	**Type**	**Description**
3-1	Mtr Tmp 3A	Carr-5K	Reads the motor temperature on circuit A
3-2	TransOK 3A	Digital	Transition starter OK circuit A
3-3	Oil Lvl 3A	Digital	Oil level float switch compressor 3
3-4	Mtr Ovld3A	Digital	Motor module reading compressor 3
3-5	LiqRefTmp1	MCS-T100	Evaporator barrel temperature circuit A
3-6	LiqRefTmp2	MCS-T100	Evaporator barrel temperature circuit B
3-7	EvpRefTmp1	MCS-T100	Evaporator refrigerant temperature circuit 1A
3-8	EvpRefTmp2	MCS-T100	Evaporator refrigerant temperature circuit 2B
3-9	Ref Lvl 1	VOLT5DC	Refrigerant level circuit A
3-10	Ref Lvl 2	VOLT5DC	Refrigerant level circuit B
3-11	CndWtrIn	MCS-T100	Condenser water incoming temperature
3-12	CndWtrOut	MCS-T100	Condenser water leaving temperature
3-13	CndWtrFlow	Digital	Verifies that the cooling loop pump is running
3-14	MechHiPsi1	Digital	Mechanical high pressure safety circuit 1A
3-15	MechHiPsi2	Digital	Mechanical high pressure safety circuit 2B
3-16	Disable1	Digital	Turns off compressor 1

Sensor Inputs (MCS-SI-EXT)

4-1	Disable2	Digital	Turns off compressor 2
4-2	Disable3	Digital	Turns off compressor 3
4-3	Ctrl Flow	User Logic	Monitors the chilled water and condenser flow
4-4	Spare 3-4	Spare	Sensor input not used
4-5	Spare 3-5	Spare	Sensor input not used
4-6	Spare 3-6	Spare	Sensor input not used
4-7	Spare 3-7	Spare	Sensor input not used
4-8	Spare 3-8	Spare	Sensor input not used
6-9	Spare 3-9	Spare	Sensor input not used
4-10	Spare 3-10	Spare	Sensor input not used
4-11	Spare 3-11	Spare	Sensor input not used
4-12	Spare 3-12	Spare	Sensor input not used
4-13	Spare 3-13	Spare	Sensor input not used
4-14	Spare 3-14	Spare	Sensor input not used
4-15	Spare 3-15	Spare	Sensor input not used
4-16	Spare 3-16	Spare	Sensor input not used

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 Starter 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, over 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 wires?_____
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 Infomation we need to know?):

Click for Brochure Upgrades▶

1. ***Viewing form printed Brochure***, Scan QR code from mobile device, email the form to your email address.
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 your need, click on fillable form, fill out and email to sales@mcscontrols.com

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