



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



**CALUS**  
File No: E169780

MCS-NitroMag-Panel

**NEW**

# **MCS-Nitromag Upgrade Brochure CGAC-D-E-F Self-Contained Package**

Click for Brochure Upgrades▶

This brochure describes a standard upgrade package for the CGA 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 - 2025-08-20  
Subject to change without prior notice



# Example MCS-NitroMag Upgrade Photos

## Steps Taken:

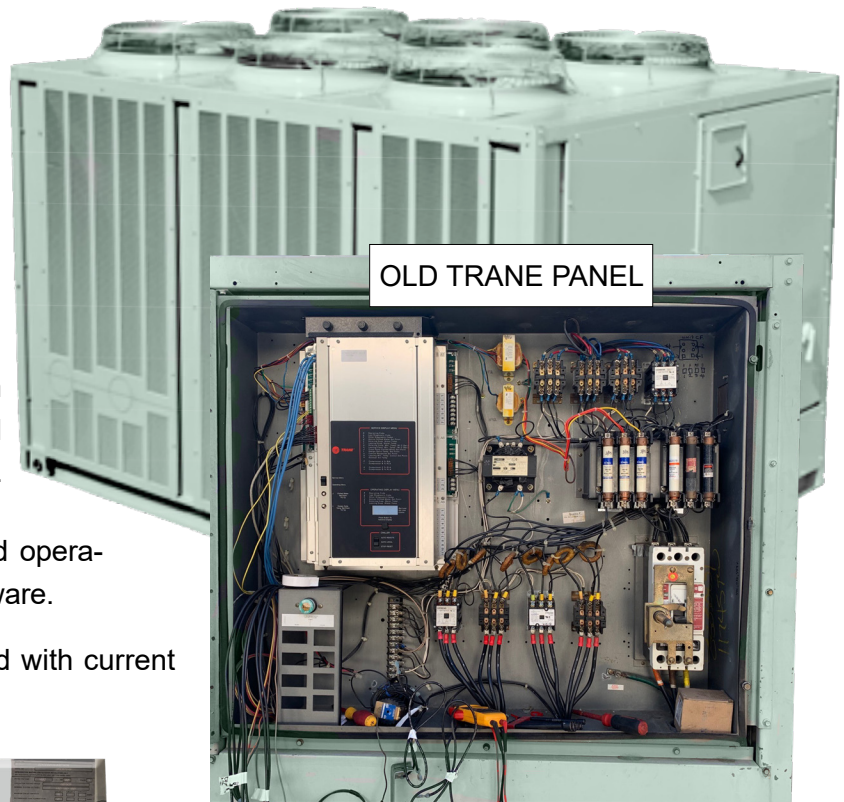
- Removed existing obsolete controls
- Installed MCS-Magnum Controls
- New Temperature, Pressure, Current and Voltage sensors installed
- Provide sub cooling and superheat calculations

## Results:

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

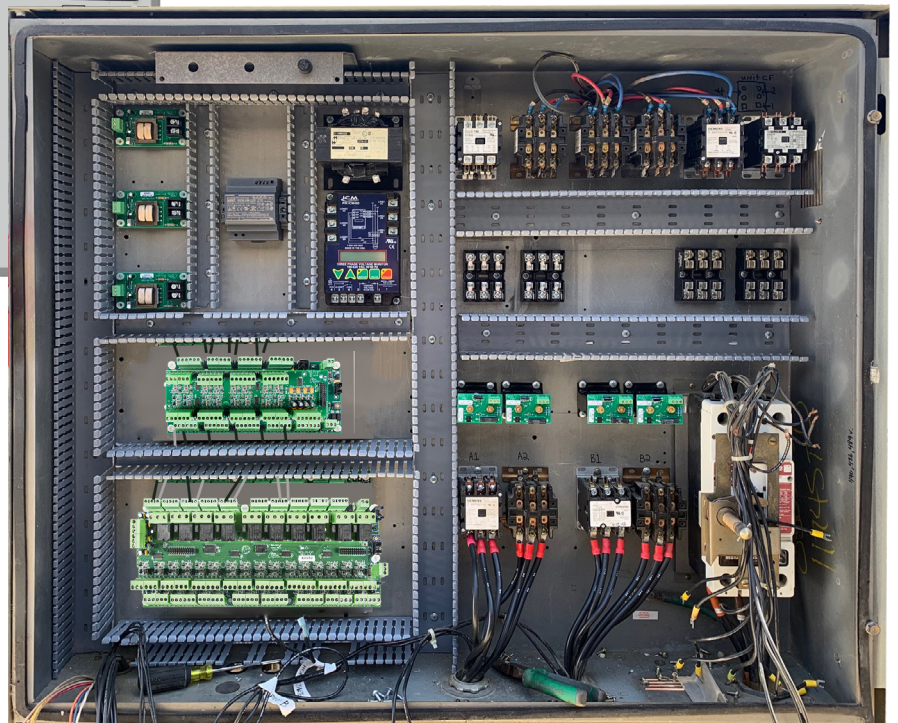
The MCS Controls will allow for future upgrades and operational changes that can be made through updated software.

Previously released MCS hardware remains supported with current and future products.



## New MCS Controls:

MCS-NitroMag-PANEL  
MCS-IO-BASE and MCS-IO-EXT  
MCS-SI-BASE and MCS-SI-EXT  
MCS-PHASE  
MCS-CURRENT SENSORS  
MCS-90W POWER SUPPLY





# MCS-NitroMag-PANEL

## Description & Specifications



Part # MCS-NitroMag-PANEL

### Description

The **MCS-NitroMag-PANEL** is a system module 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-PANEL 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 installed on backplane inside an enclosure.

The MCS-NitroMag-N 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 internet and device connectivity, and an onboard WiFi antenna connection.

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 supply connection
- Ethernet port (10Mbps/100Mbps/1Gbps)
- Two RS-485 Ports up to 115200 baud rate
- MCS-IO port for communicating with expansion boards

### Specifications

#### Keypad Panel

Panel overall Size..... 5.5"W x 8.625"h (140mm x 219mm)  
Mounting..... Mounts on a backplane using four #6 (6-32) sheet metal screws  
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)  
Connection ..... 6 conductor shielded cable  
..... (max length of cable is 10 feet)  
Operating Temperature..... -4°F to +185°F (-20°C to +85°C)  
Operating Humidity..... 0-95% Non-Condensing  
Input Power (Standard) ..... +12vdc at 0.6amps (fully loaded)

#### Controller

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

INPUT	MINIMUM	NOMINAL	MAXIMUM
VOLTAGE	10	12	12.5
AMPS	x		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 coming soon)

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

Power Detection ..... Automatic power fail reset

### POWER SUPPLY NOT INCLUDED

#### Packaging

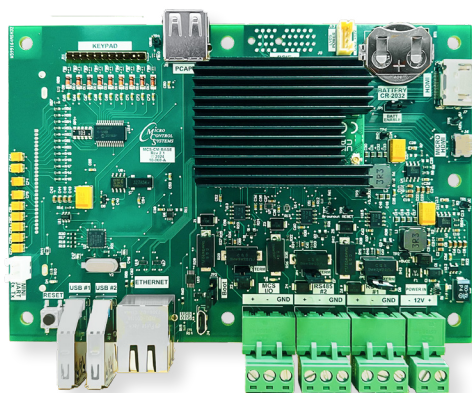
Keypad w/MCS-NitroMag controller installed, WiFi Antenna

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

Box Dimensions..... 14" x 9.5" x 2.5" (approx)



# 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.

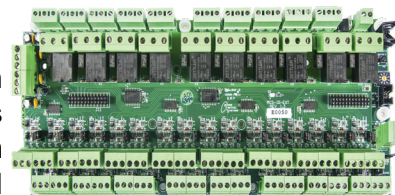
The MCS-NitroMag-N controller connects with MCS Expansion boards and Extension boards, allowing for a maximum of 144 SI inputs, 90 RO outputs, and 36 AO outputs.

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

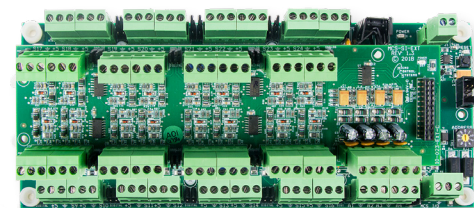
## MCS-IO-Base & MCS-IO-EXT

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 outputs. 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.

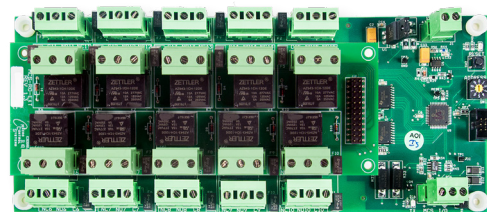
## MCS-RO-Base & MCS-RO-EXT

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 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.

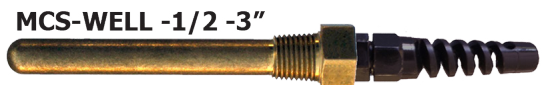
## MCS-T100 Temp Sensor

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 30HXC 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 30HXC 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-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 10<sup>5</sup> psi
- Shear Strength ..... 700 psi



# Example Typical Control Upgrade

## MCS-T100-AVG-20

The MCS-T100-AVG-20 comprised of four MCS-T100-20s in addition to a Nema 4X mounting enclosure is used to read the average temperature. The Nema 4X is a durable, weatherproof enclosure which is suited to be mounted inside or outside. By mounting four MCS-T100-20 temperature sensors in different locations in the duct, the MCS-T100-AVG-20 provides an average duct temperature



## 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:

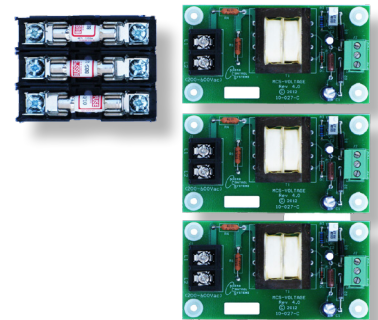
1. For slide valve control on screw machines
2. For high amp motor overload protection
3. For verification of device on / off



## 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** is an programmable 3-phase line voltage monitor with 25-fault memory, high temperature LCD display, easy setup and clear diagnostic readout of system faults. The MCS-PHASE 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

## MCS-USB-RS485

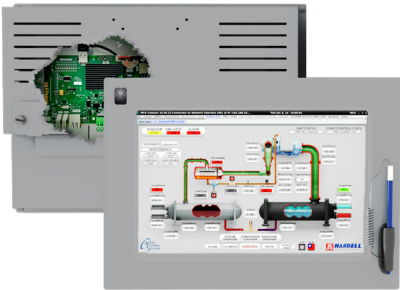
The **MCS-USB-RS485** is a USB to RS485 cable that provides a fast simple way to connect an **MCS-MAGNUM** to a Laptop or PC.

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).



## Typical Options

### 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.

### 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.





# Example Typical Points List with Optional Boards

## Relay Outputs (MCS-IO-BASE)

#	Output Name	Type	Description
1-1	CompA1	Standard	1st Compressor A1 Contactor
1-2	Lls A	Standard	Liquid Line Solenoid A
1-3	CompB1	Standard	2nd Compressor B1 Contactor
1-4	Lls B	Standard	Liquid Line Solenoid B
1-5	CompA2	Standard	3rd Compressor A2 Contactor
1-6	CompB2	Standard	4th Compressor B2 Contactor
1-7	SpareM-7	Standard	Not Used - Reserved for Expansion
1-8	BarlHeater	Standard	Barrel Heater
1-9	Warning	Standard	Warning Light: unit is in a safety condition prior to a lockout.
1-10	Alarm	Standard	Alarm Light: Unit is in a lockout

## Relay Outputs (MCS-IO-EXT)

2-1	CndFan1A	Standard	Condenser Fan 1A Contactor
2-2	CndFan2A	Standard	Condenser Fan 2A Contactor
2-3	CndFan3A	Standard	Condenser Fan 3A Contactor
2-4	CndFan1B	Standard	Condenser Fan 1B Contactor
2-5	CndFan2B	Standard	Condenser Fan 2B Contactor
2-6	CndFan3B	Standard	Condenser Fan 3B Contactor
2-7	Spare1-7	Standard	Not Used - Reserved for Expansion
2-8	Spare1-8	Standard	Not Used - Reserved for Expansion
2-9	Spare1-9	Standard	Not Used - Reserved for Expansion
2-10	Spare1-10	Standard	Not Used - Reserved for Expansion

## Sensor Inputs-(MCS-IO-BASE)

3-1	ChilWtr In	MCST100	Chil Water In
3-2	ChilWtrOut	MCST100	Chil Water Out
3-3	SuctPsi A	MCS-200	Suction Pressure Circuit A
3-4	DiscPsi A	MCS-500	Discharge Pressure Circuit A
3-5	SuctTmp A	MCST100	Suction Temperature Circuit A
3-6	DiscTmp 1A	MCST100	Discharge Temperature Circuit 1A
3-7	DiscTmp 2A	MCST100	Discharge Temperature Circuit 2A
3-8	CmpAmps1A	CT-300	Compressor Amps 1A
3-9	CmpAmps2A	CT-300	Compressor Amps 2A
3-10	CmpFault1A	DIGITAL	Compressor Fault 1A
3-11	CmpFault2A	DIGITAL	Compressor Fault 2A
3-12	Disable A	DIGITAL	Circuit A Disable Switch
3-13	ChlWtrFlow	DIGITAL	Chill Water Flow Switch
3-14	PhaseLoss	DIGITAL	Phase loss: Phase Imbalance Monitor



# Example Typical Points List with Optional Boards

## Sensor Inputs-(MCS-IO-BASE continued)

#	Output Name	Type	Description
3-15	Run/Stop	DIGITAL	Run/Stop Switch
3-16	Emg/Stop	DIGITAL	Emergency stop switch

## Sensor Inputs-(MCS-IO-EXT)

4-1	SuctPsi B	MCS-200	Suction Pressure Circuit B
4-2	DiscPsi B	MCS-500	Discharge Pressure Circuit B
4-3	SuctTmp B	MCST100	Suction Temperature Circuit B
4-4	DiscTmp 1B	MCST100	Discharge Temperature Circuit 1B
4-5	DiscTmp 2B	MCST100	Discharge Temperature Circuit 2B
4-6	CmpAmps1B	CT-300	Compressor 1B Amps
4-7	CmpAmps2B	CT-300	Compressor 2B Amps
4-8	CmpFault1B	DIGITAL	Compressor Fault 1B
4-9	CmpFault2B	DIGITAL	Compressor Fault 2B
4-10	Disable B	DIGITAL	Circuit B Disable Switch
4-11	Ambient	MCST100	Outdoor Air Temperature
4-12	LiqTemp A	MCST100	Liquid Line Temperature Circuit A
4-13	LiqTemp B	MCST100	Liquid Line Temperature Circuit B
4-14	MechHiPsiA	DIGITAL	Mechanical Hi Pressure Safety Switch Circuit A
4-15	MechHiPsiB	DIGITAL	Mechanical Hi Pressure Safety Switch Circuit B
4-16	Spare1-16	SPARE	Not Used - Reserved for Expansion

## Sensor Inputs-(MCS-SI-BASE)

5-1	SupHeat A	User Logic	Suction superheat for Circuit A
5-2	SupHeat B	User Logic	Suction superheat for Circuit B
5-3	Subcool A	User Logic	Subcooling for Circuit A
5-4	Subcool B	User Logic	Subcooling for Circuit B
5-5	Volts A	600VAC4	Volts A - Line 1, Line 2
5-6	Volts B	600VAC4	Volts B - Line 2, Line 3
5-7	Volts C	600VAC4	Volts C - Line 3, Line 1
5-8	LiqPsi A	MCS-500	Liquid Line Pressure Circuit A
5-9	LiqPsi B	MCS-500	Liquid Line Pressure Circuit B
5-10	Spare2-10	SPARE	Not Used - Reserved for Expansion
5-11	Spare2-11	SPARE	Not Used - Reserved for Expansion
5-12	Spare2-12	SPARE	Not Used - Reserved for Expansion
5-13	Spare2-13	SPARE	Not Used - Reserved for Expansion
5-14	Spare2-14	SPARE	Not Used - Reserved for Expansion
5-15	Spare2-15	SPARE	Not Used - Reserved for Expansion
5-16	Spare2-16	SPARE	Not Used - Reserved for Expansion



# Example Typical Points List with Optional Boards

## Analog Outputs (MCS-IO-BASE)

#	Output Name	Description
1-1	Spare	Not Used - Reserved for Expansion
1-2	Spare	Not Used - Reserved for Expansion
1-3	Spare	Not Used - Reserved for Expansion
1-4	Spare	Not Used - Reserved for Expansion

## Analog Outputs (MCS-IO-EXT)

2-1	Spare	Not Used - Reserved for Expansion
2-2	Spare	Not Used - Reserved for Expansion
2-3	Spare	Not Used - Reserved for Expansion
2-4	Spare	Not Used - Reserved for Expansion

## Analog Outputs (MCS-SI-BASE)

3-1	Spare	Not Used - Reserved for Expansion
3-2	Spare	Not Used - Reserved for Expansion
3-3	Spare	Not Used - Reserved for Expansion
2-4	Spare	Not Used - Reserved for Expansion

# Sample Questionnaire

Visit <https://www.mcscontrols.com/brochures.html> for a fillable form to email to [sales@mcscontrols.com](mailto: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, or I/O BUS? \_\_\_\_\_

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 Temperature? ☐ Yes ☐ No.

## COMMENTS (Is there any other information 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](mailto: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](mailto:sales@mcscontrols.com)







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