MCS-Magnum Magnetic Bearing Centrifugal Controller-12

Controls for New Magnetic Bearing Centrifugal Compressors including Hanbell RTM

RTM 090 Magnetic Bearing Compressor

Providing HVAC/R Solutions Worldwide

MCS-Magnum Magnetic Bearing Centrifugal Controller-12

Complete Control of Chiller

- RTM 090 Comp.
- EVAP. or COND. LEVEL CONTROL
- CONDENSER CONTROL
- CHILLED WATER PUMP CONTROL

The **MCS-MAGNUM Magnetic Bearing Centrifugal Controller** runs advanced firmware for the new Magnetic Bearing compressors saving energy through optimization with an oil free VFD compressor, **MCS-EXV Drivers** and **MCS-MODBUS I/O control**.

The MAGNUM is capable of controlling four Magnetic Bearing Compressors on a single chiller as shown in the enclosure above..

The MCS-Magnum Magnetic Centrifugal enclosures are 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 to the display. This box is intended for use in an environment protected from the weather.

MCS-MAGNUM Magnetic Bearing Centrifugal Controller enclosure consists of a MCS-MAGNUM, an MCS-SI-Base expansion board, a MCS-TOUCH 15.4"display, MCS-MODBUS-I/O-12, Five (5) port Ethernet Switch and a GFCI Electrical outlet.

The MCS-TOUCH-15.4 is a field proven touchscreen interface designed to simplify user access with the MCS-MAGNUM utilizing MCS-CONNECT. It provides both graphics and service mode access to technicians.

Information and graphics on the MCS-MAGNUM Magnetic Bearing Centrifugal Controller are shown on the 15.4" high resolution (1280x800) LCD display with LED backlighting, which guarantees long- life operation.

An RS-485 port is provided for communication with other manufacturers' systems. Other new features include the integration of BACnet IP, Modbus IP and Modbus RTU into the Magnum.

An **MCS-BMS-GATEWAY** is available, allowing communication via BACnet MSTP and LonWorks. Data format is available to give the user to direct communication.

Additional options are available. Call MCS sales for more information.

Specifications

NEMA Rating – Type 1 Enclosure - 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.

Enclosure – Medium Large Box

Dimensions..........................22"w x 28.50"h x 8"d
Mounting Holes....................Mounts with four pre drilled 15/32" holes

Temp. Range for Enclosure & 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 Specification

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

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

Touch Screen 15.4 - Specification

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
1 USB On-The-Go (OTG)
2 USB Host 2.0
Real Time Clock (RTC) w/ Battery
LVDS for 15.4" LCD 5-wire touch
3 RS485 communication ports
(max. baud rate 115k)
Mini PCIe Interface

MCS-Magnum Magnetic Bearing Centrifugal Controller-12

Centrifugal, two-stage, magnetic-bearing chiller compressors equipped with variable-speed drives are a relatively new technology that operates at a high efficiency. Based on a recent case study, magnetic bearing compressors operate more efficiently than reciprocating and screw compressors, especially during partial load conditions.

The magnetic bearings allow the compressor to operate without the use of oil for lubrication, which reduces energy losses due to friction and increases the heat transfer efficiency of the chiller, because no oil enters the evaporator or the condenser. A variable speed drive on the motor allows the compressor to operate much more efficiently at partial loads than standard compressors. The oil-free system also eliminates the need for oil maintenance, resulting in operations and maintenance savings.

MCS recognized the need for the development of firmware for the control of these new chillers being manufactured today and have been working with OEM manufacturers to supply controls for their units.

The technology is ideally suited for chillers that run at partial load for most of the year. Energy savings are about equal, or near, full load. Magnetic bearing compressors can be applied to air-cooled and water-cooled chillers.

The new variable-speed Magnetic Bearing Centrifugal Compressor technology is a notable improvement over existing reciprocating and screw compressors. In addition to energy and cost savings, the new technology is lighter and quieter.

Making sure your investment is secure and operating at the optimal energy efficiency, install the latest MCS-MAGNUM MAGNETIC BEARING CENTRIFUGAL CONTROLLER and Hanbell RTM 090 Compressors on your chiller.

MCS-MAGNUM MAGNETIC BEARING CENTRIFUGAL CONTROLLER can be used in applications controlling Magnetic Bearing Compressors
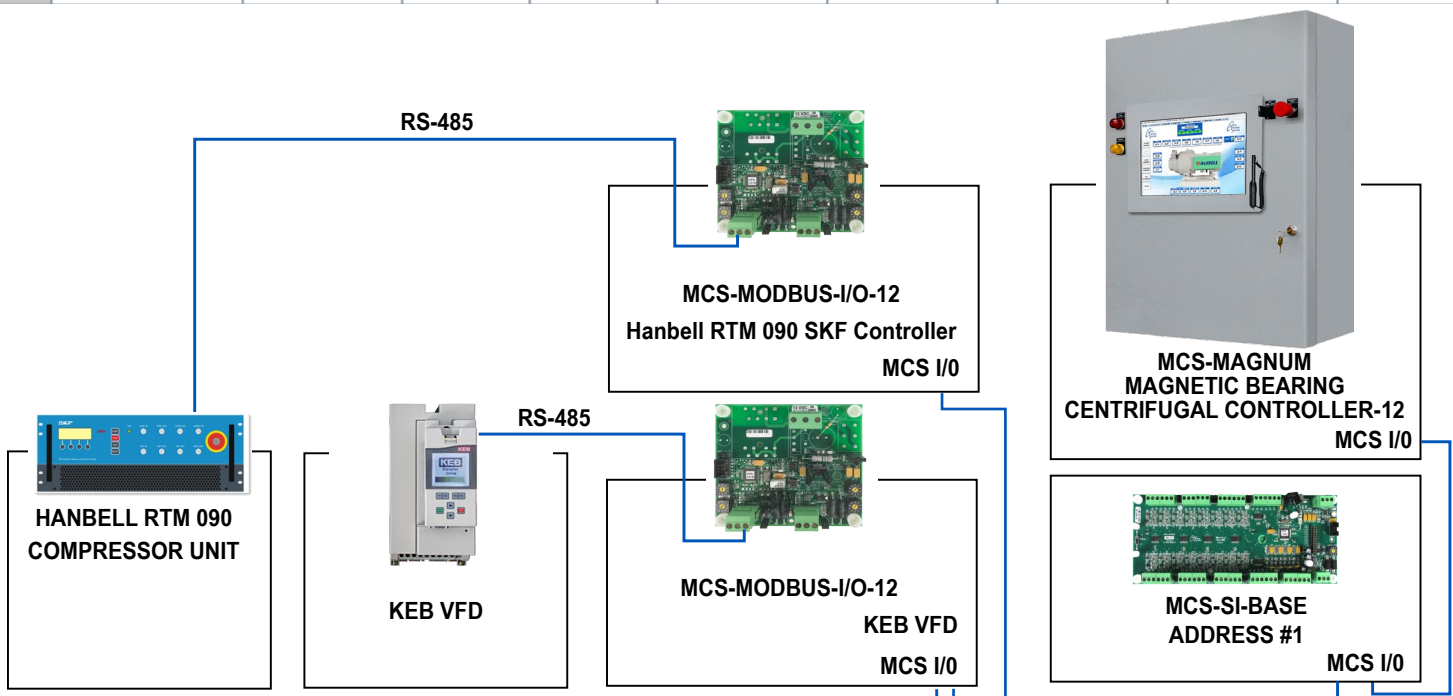
MCS-Magnum Magnetic Bearing Centrifugal Controller-12

MCS-MODBUS I/O-12

The **MCS-MODBUS-I/O** gives the MCS-MAGNUM the ability to act as a Modbus Master using the Modbus RTU Protocol over RS-485 network. This allows the **MCS-MAGNUM** to communicate to Modbus slave devices, (such as SKF Magnetic Bearing Controller and KEB Variable Frequency Drive) to send and access parameters.

Screen capture from MCS-CONNECT showing SKF and KEB data points being read by MCS-MAGNUM through the MCS-MODBUS I/O.

SI #	Sensor Inputs	Value	Manual Status	Filter/ Offset	Sensor Type	Last On/ MAX TDY	Last Off/ MIN TDY	Run TDY/ Avg TDY	Cycles TDY
3- 1	VFD Fault	OFF	AUTO	0 / 0	MODBUS	-121:00:00	00:71:-5	371170:25:05	0
3- 2	VFD Hertz	55.0	AUTO	0 / 0.0	MODBUS	102.3	0.0	4.7	
3- 3	VFD KW	50.0K	AUTO	0 / 0.0K	MODBUS	50.0K	0.0K	1.1K	
3- 4	VFD Amps	45.0A	AUTO	0 / 0.0A	MODBUS	45.0A	0.0A	39.2A	
3- 5	VFD Volts	240.0V	AUTO	0 / 0.0V	MODBUS	240.0V	0.0V	1.9V	
3- 6	VFD DC Bus	220V	AUTO	0 / 0V	MODBUS	2200V	0V	35V	
3- 7	VFD HSink	32.0F	AUTO	0 / 0.0F	MODBUS	75.2F	0.0F	34.2F	
3- 8	VFD CFault	0	AUTO	0 / 0	MODBUS	83	0	3	
3- 9	VFD Fault1	0	AUTO	0 / 0	MODBUS	182	0	7	
3-10	VFD InMan	0	AUTO	0 / 0	MODBUS	215	0	9	
3-11	VFD FLTRST	0	AUTO	0 / 0	USER LOGIC	5132	0	115	
3-12	VFD RST HI	0	AUTO	0 / 0	USER LOGIC	1080	0	48	
3-13	VFD CMD	0c	AUTO	0 / 0c	USER LOGIC	0c	0c	0c	

RS-485

MCS-MODBUS-I/O-12
Hanbell RTM 090 SKF Controller
MCS I/0

MCS-MAGNUM
MAGNETIC BEARING
CENTRIFUGAL CONTROLLER-12
MCS I/0

HANBELL RTM 090
COMPRESSOR UNIT

KEB VFD

RS-485

MCS-MODBUS-I/O-12
KEB VFD
MCS I/0

MCS-SI-BASE
ADDRESS #1
MCS I/0

15.4 TOUCHSCREEN

The MCS-TOUCH-15.4 is a high resolution interface designed to simplify user access with the MCS-MAGNUM utilizing MCS-CONNECT to provide both graphics and service mode access to technicians. Information and graphics on the MCS-TOUCH-15.4 are shown on a 1280x800 LCD display with LED back lighting, which will guarantee long-life operation.

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

Your Touchscreen includes storage for site specific documents including your Configuration file, Electrical Drawings for all your components, and PDF Manuals, etc.

Features include . . .

- *Graphic Interface*
- *Alarm History/Capture*
- *Expanded History*
- *Email Alarms with Diagnostic Save*
- *SMS Alarms*

With Internet Connection:

The user is able to email 'ALARM ALERTS' back to a technician. The emails will include 'SAVE DIAGNOSTIC DATA' to help troubleshoot the alarm.
Also with the internet connection you can send 'SMS TEXT MESSAGES' with job site name and alarm, message only.

Without Internet Connection:

The user can save 'ALARM ALERT DATA' to a USB memory stick. Also, you can save 'EXTENDED HISTORY DATA to a USB memory stick for troubleshooting. This can be done with or without internet connection.
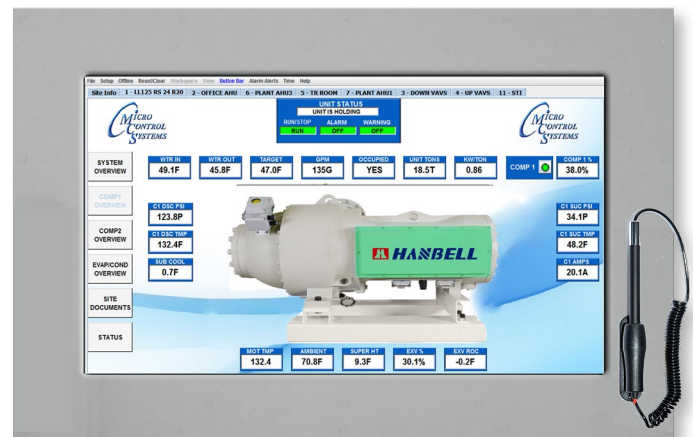
- Freescale i.MX6 Dual Core 800mhz
- 2Gb of 512mhz DDR3 RAM memory
- 16Gb of eMMC Flash memory
- 10m/100m/1G Ethernet
- Micro-SD Slots
- 1 USB On-The-Go (OTG)
- 2 USB Host 2.0
- Real Time Clock (RTC) w/ Battery
- LVDS for 15.4" LCD 5-wire touch
- 3 RS485 communication ports
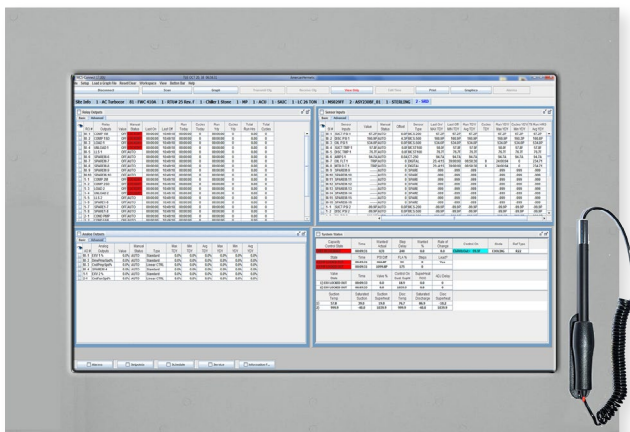
MCS-CONNECT STATUS SCREEN
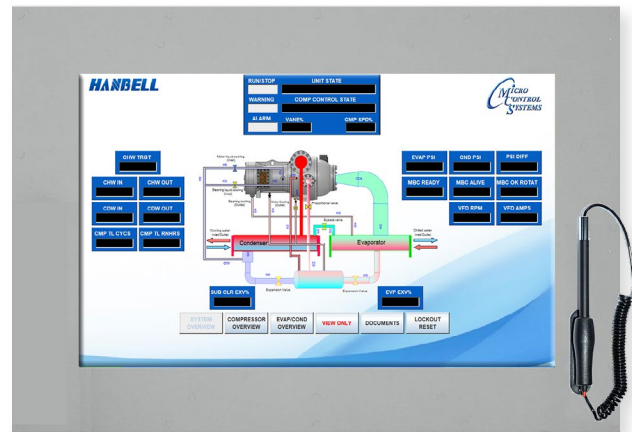
MCS-RTM SYSTEM OVERVIEW SCREEN

MCS-Magnum Magnetic Bearing Centrifugal Controller-12

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-200C   MCS-500C

MCS-EXV DRIVER

The **MCS-EXV-DRIVER-XX** is used for the positioning and control of 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-XX supports multiple electronic valve manufacturers including Sporlan, Alco,Danfoss and Carel. The MCS-EXV-DRIVER also supports overdriving on full opened and full closed voltage signals. The display decimal notifies when overdriving by blinking. Another advantage of using the MCS-EXV-DRIVER-XX is that it eliminates the need for having a liquid line solenoid. The MCS-EXV-DRIVER has capacitors that store enough power to close the valve when input power fails. The LED light indicates status of the internal backup supply and the on-time of the LED increases as the internal backup supply gets charged.
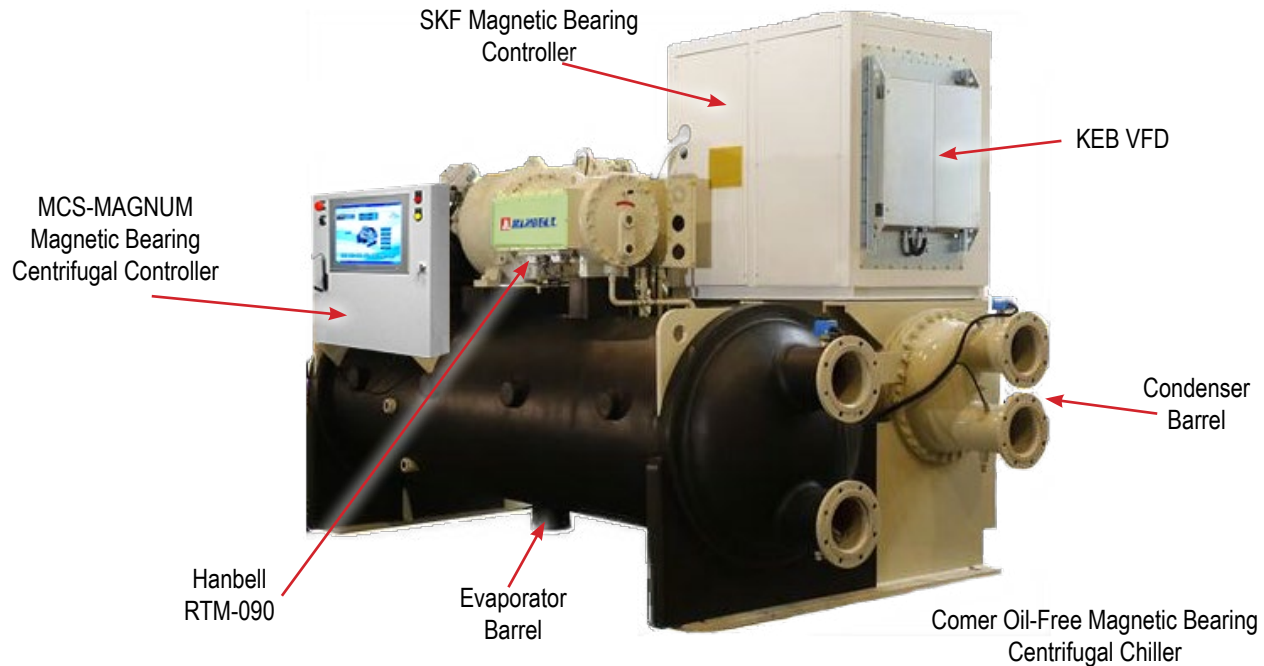
MCS-CT-750

MCS **C**urrent 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

The MCS-CT series are the solid-core version, where the conductor runs through the sensor. No cutting, taping or rerouting is required. The current sensors are accurate, reliable, easy to install and require no service.
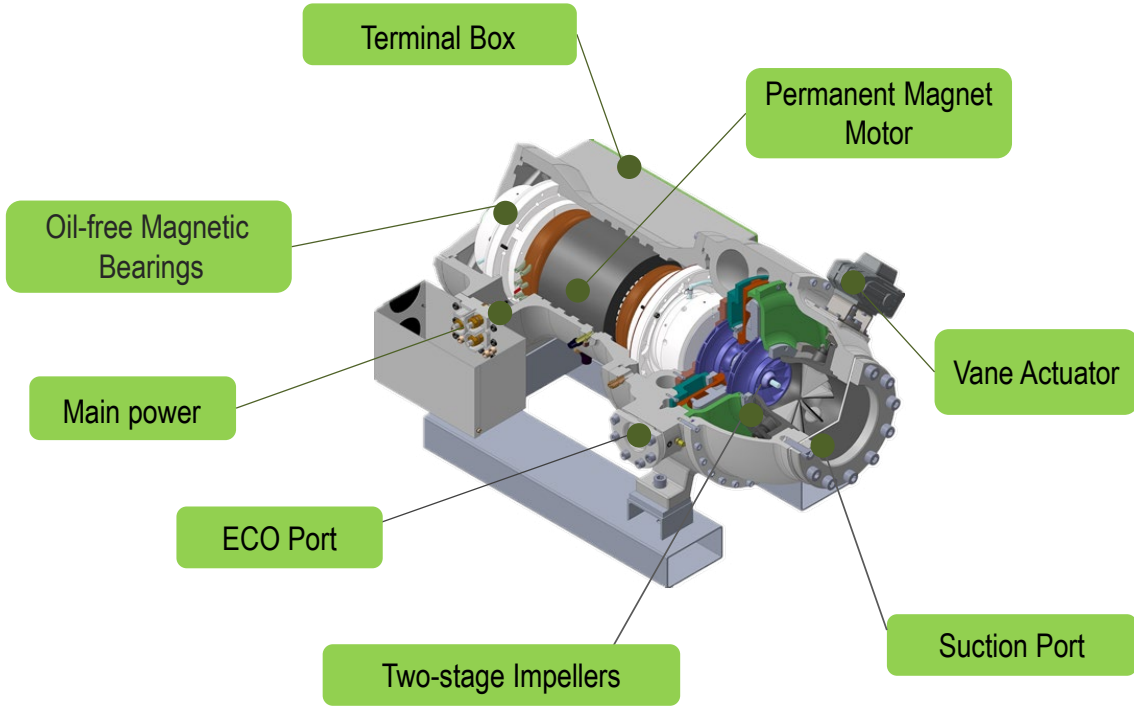
SKF Magnetic Bearing Controller

KEB VFD

MCS-MAGNUM Magnetic Bearing Centrifugal Controller

Condenser Barrel

Hanbell RTM-090

Evaporator Barrel

Comer Oil-Free Magnetic Bearing Centrifugal Chiller

Features of Oil-Free Magnetic Bearing Centrifugal Chiller

- Environment friendly refrigerant-HFC-134a

- Advanced SKF technology of magnetic bearings with the combination of mechanical and electrical control technology. The main shaft is held, rotated and controlled by electromagnetic field.

- SKF Magnetic Bearing Controller monitors each control position 15,000 times per second (both radial/axial direction).

- High Energy Efficiency - VFD Control meets the requirement of running at various working conditions and saving energy based on the load.

- With the DC inverter control technology and inlet guide vane actuator, the compressor can respond quickly to load changes.

- No gear transmission, results in high efficiency.

- Oil free, Zero pollution

- Compared with conventional oil lubricated models, there is no risk of damage to moving parts during power outages.

- Reduced maintenance cost.

- Free of oil problems and oil disposal.

Hanbell RTM-090 Components

Terminal Box

Permanent Magnet Motor

Oil-free Magnetic Bearings

Vane Actuator

Main power

ECO Port

Suction Port

Two-stage Impellers

Typical RTM-090 Chiller

RUN/STOP	UNIT STATE
RUN	UNIT LOADNG-VANE
WARNING	COMP CONTROL STATE
OFF	CMP OPEN VANES
ALARM	VANE%	CMP SPD%
OFF	20.0%	80.0%

CHW TRGT 44.0F

CHW IN 56.3F | CHW OUT 48.2F

CDW IN 87.0F | CDW OUT 95.6F

CMP TL CYCS 1 | CMP TL RNHRS 0.05

EVAP PSI 33.1P | CND PSI 134.1P | PSI DIFF 101.0P

MBC READY ON | MBC ALIVE ON | MBC OK ROTAT ON

VFD RPM 13522R | VFD AMPS 195.0A

Motor liquid cooling (Inlet)

Bearing liquid cooling (Inlet)

Bearing cooling (Outlet)

Motor Cooling (Outlet)

Proportional valve

Bypass valve

Cooling water Inlet/Outlet

Chilled water Inlet/Outlet

Condenser

Evaporator

SUB CLR EXV% 100.0%

Expansion Valve

Expansion Valve

EVP EXV% 70.0%

SYSTEM OVERVIEW | COMPRESSOR OVERVIEW | EVAP/COND OVERVIEW | VIEW ONLY | DOCUMENTS | LOCKOUT RESET

The MCS Commitment

The founders of Micro Control Systems Inc. have been in the manufacturing of Microprocessor Controls their entire careers and have over eight decades of combined HVAC/R Microprocessor Controls experience. MCS was founded to meet the needs of the Utility and HVAC/R Industries with products based on the following design criteria:

- ♦ **Quality & Service**
- ♦ **Cost Effectiveness**
- ♦ **Ease of Use**

Our commitment is to provide practical solutions for the industries needs and to be both a leader and partner in the effective use of Microprocessor Controls.

Visit our web site at:
www.mcscontrols.com
For more information send email
to: sales@mcscontrols.com

MICRO CONTROL SYSTEMS

HANBELL
North American Distributor