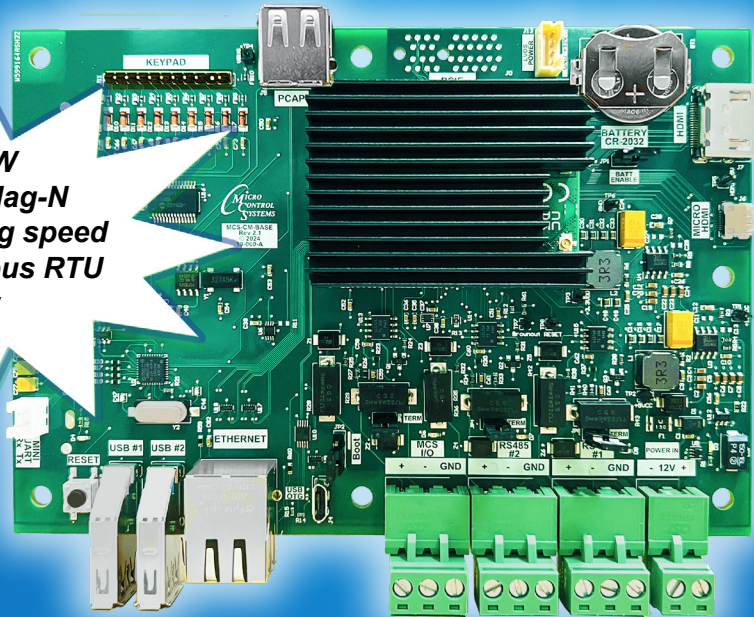


MCS-NitroMag-N

MODBUS GETTING STARTED

***The NEW
MCS-NitroMag-N
built for blazing speed
features Modbus RTU
Master***



***New
Generation of
MCS-MAGNUM
“Smaller
Footprint”***

Engineered for advanced HVAC/R applications

- Modbus RTU Master - Supports up to 20 Modbus devices e.g., VFD's KW Meter, Compressors.
(MCS-Modbus I/O no longer required).



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Introduction to the MCS-NitroMag

Introducing the latest additions to our product lineup.

There are six basic versions of the MCS-NITROMAG each will need to connect to an MCS Expansion Board to complete the system.

- MCS-NITROMAG-N
- MCS-NITROMAG-15.4
- MCS-OEM- (MCS-NITROMAG and Keypad)
- MCS-NITROMAG-DOOR (MCS-NITROMAG and Keypad)
- MCS-NITROMAG-DOOR-NEMA4 (MCS-NITROMAG and Keypad)
- MCS-NITROMAG-PANEL (MCS-NITROMAG and Keypad)

MCS-NitroMag - Microprocessor @ 1.5GHz

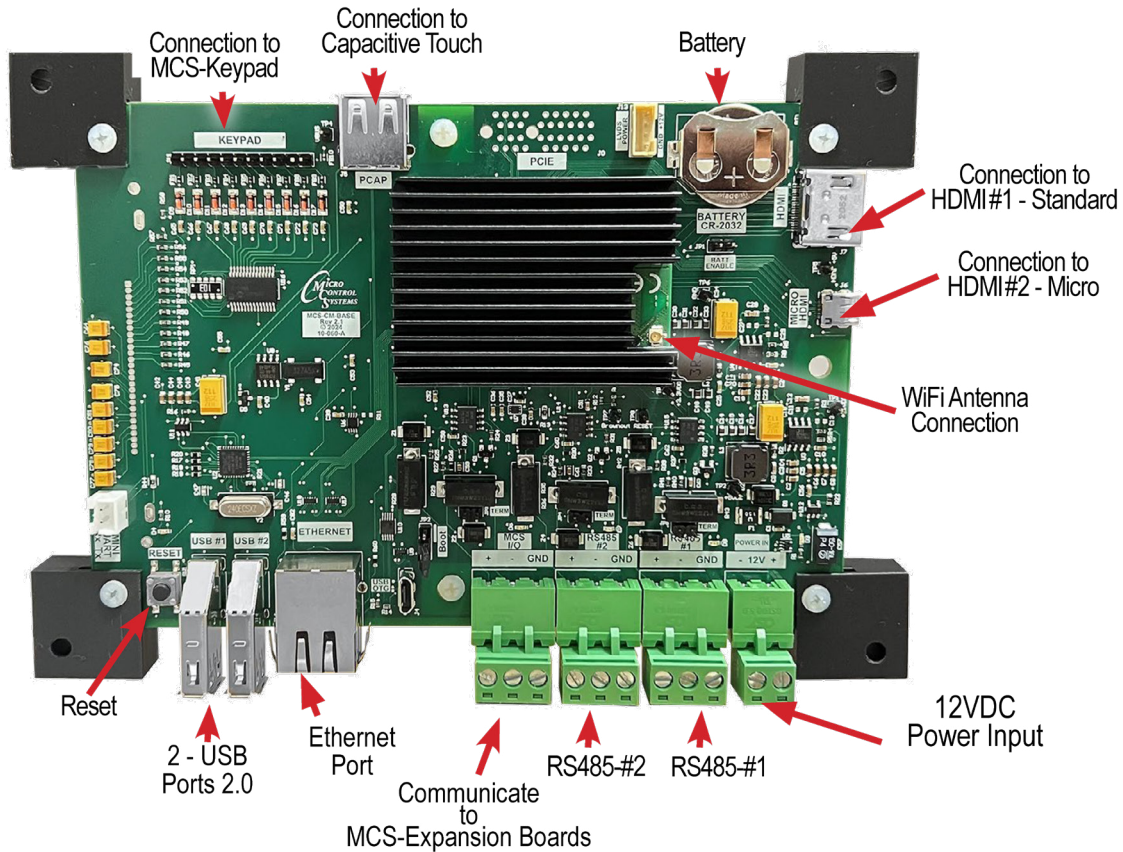
- The MCS-NitroMag is a powerful, next-generation microprocessor-based controller engineered for advanced HVAC/R applications. At its core is a Broadcom quad-core processor running at 1.5GHz, providing the processing power necessary to handle complex operations with speed and efficiency. Designed for integration flexibility, the MCS-NitroMag interfaces seamlessly with MCS expansion and extension boards, supporting up to 144 sensor inputs (SI), 90 relay outputs (RO), and 36 analog outputs (AO), making it highly adaptable for a variety of system configurations.
- Connectivity is a standout feature of the NitroMag controller, with built-in WiFi, dual HDMI ports, Ethernet (supporting 10/100Mbps/1Gbps), two USB 2.0 ports, and two user-configurable RS485 ports that support baud rates up to 115200. These options provide robust and versatile communication capabilities for both local and remote access. The MCS-NitroMag also features a significant upgrade in memory compared to previous MCS controllers, offering 16 GB of eMMC flash storage and 2 GB of DDR3 RAM—more than double the available memory of earlier models—allowing for faster performance and increased data handling capacity.
- In terms of protocol support, the NitroMag controller functions as a Modbus RTU Master capable of supporting up to 20 Modbus devices. It also supports BACnet IP, BACnet MSTP, Modbus IP, and Modbus RTU, enabling seamless integration with building automation and control systems. This combination of processing power, connectivity, memory, and protocol compatibility makes the MCS-NitroMag an ideal solution for modern, high-performance HVAC/R control applications.

MCS-NitroMag-N

1. Components of MCS-NitroMag-N

NITROMAG OPERATION SYSTEM - REV 1.05 & up

NITROMAG HVAC FIRMWARE - REV 19.00E & up

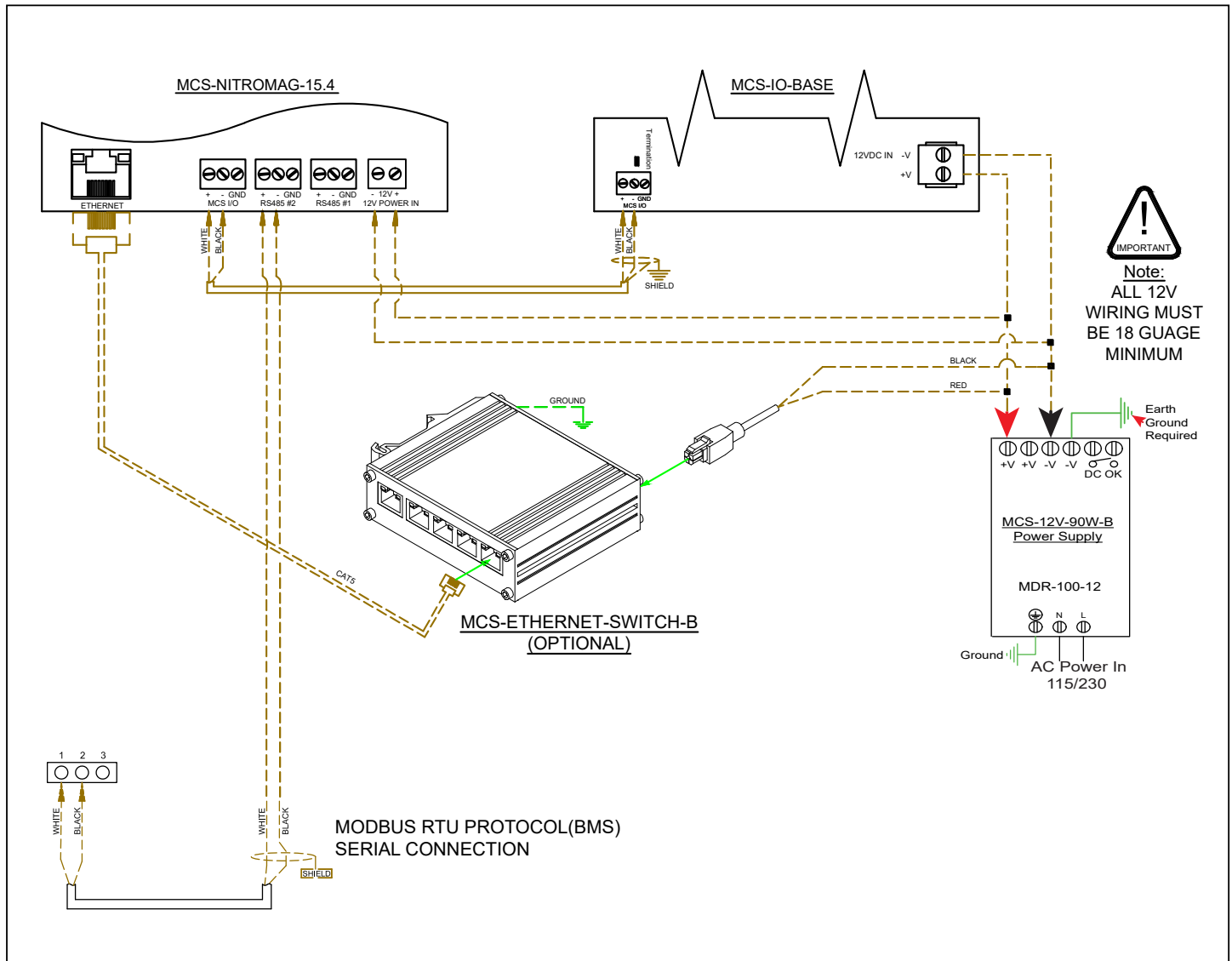


- **RS-485 PORTS**
Each port supports up to 115200 baud rate.
- **BMS NETWORK CONNECTIVITY**
BUILD IN SUPPORT - Modbus RTU Master
Protocols - BACnet IP, BACnet MSTP, Modbus IP, Modbus RTU Slave
(N2 coming soon) (LonTalk requires MCS-BMS-GATEWAY)
- **MODBUS MASTER**
BUILD IN SUPPORT - Supports up to 20 Modbus devices e.g., VFD's KW Meter, Compressors.
(MCS-Modbus I/O no longer required).

WIRING TO SLAVE / MCS-IO-BASE

MCS-NitroMag-N communicated through the MCS-I/O communication port at 38,400 baud rate.

The firmware includes a MODBUS INTERFACE which enables it to act as a MODBUS MASTER using the MODBUS RTU protocol, which allows communication with the MODBUS slave for parameter access over the RS485 communication port on the MCS-Nitromag-N.



The MCS-NitroMag-N is configured through the MCS-CONFIG firmware. The MODBUS RTU MASTER supports up to 20 MODBUS devices e.g., VFD's, KW Meter, Compressors.

Using MCS-CONFIG, a configuration file is created based on the slave parameters.

Each parameter is assigned a pre-programmed register number.

Those register numbers are named in the configuration file, which will display in MCS-CONNECT when viewing the controller.

The register parameters will be assigned to Sensors inputs, Relay outputs and Analog outputs to relay the information from the MODBUS slave.

The next pages shows information on how this is setup in the MCS-CONFIG file.

MODBUS / MCS-CONFIG Setup

RS 485 ports Communication with MCS-NitroMag-N

MCS-CONFIG version 18.xxx.xx and up allows the programming of the RS485 ports in the setup section.

- Up to 20 MODBUS devices can be set up.
- RS 485 #1 and RS 485 #2 ports can be assigned as shown on the right.
- RS485 port #1 Protocol type can be set up as Modbus RTU Master.
- Port #2 can be set up as a MODBUS RTU slave.
- Check with the slave manufacturer to change the Baud Rate, Parity, and Stop Bits.

The image shows a screenshot of the MCS-CONFIG software interface, specifically the RS485 setup section. It features two main configuration panels, one for RS485 #1 and one for RS485 #2, both highlighted with yellow borders. The RS485 #1 panel is titled 'RS485 #1' and contains several dropdown menus for configuration: Protocol Type (set to 'Modbus RTU Master'), Baud Rate (set to '38400'), Parity (set to 'No Parity'), Stop Bits (set to '1'), Poll Delay (ms) (set to '200'), Poll Timeout (ms) (set to '500'), and Bits Per Byte (set to '8'). The RS485 #2 panel is titled 'RS485 #2' and includes a 'Modbus Slave Address' field with the value '1' and a directional arrow button, a 'Protocol Type' dropdown set to 'Modbus RTU Slave', and a 'Baud Rate' dropdown set to '9600'.

RS485 #1	
Protocol Type	Modbus RTU Master
Baud Rate	38400
Parity	No Parity
Stop Bits	1
Poll Delay (ms)	200
Poll Timeout (ms)	500
Bits Per Byte	8

RS485 #2	
Modbus Slave Address	1
Protocol Type	Modbus RTU Slave
Baud Rate	9600

1. Modbus RTU Master

BUILT IN SUPPORT

MCS-NitroMag-N Supports up to 20 Modbus devices e.g., VFD's KW, compressors.

(Modbus I/O no longer required)

Supports protocols BACnet IP, BACnet MSTP, Modbus IP, Modbus RTU slave, Modbus RTU Master.

(Lontalk needs MCS-BMS-GATEWAY), N2 coming soon)

1.1. MODBUS SLAVES

Slaves are pre-programmed in the configuration file setup for your controller when shipped.

A sample configuration file is shown below and on the next page. MCS-NitroMag can be pre-programmed with the MODBUS write registers found in documentation supplied by the manufacturer using MCS-CONFIG software.

MODBUS Device Setup in MCS-CONFIG

Currently Editing Device Named: Test1

Modbus Devices Setup					
	#	Device Name	Device Address	RS485 Number	Configuration
▶	1	Test1	1	RS485-2	Custom - Sample Slave
	2	SPARE-2	0	Not Set	Not Used
	3	SPARE-3	0	Not Set	Not Used
	4	SPARE-4	0	Not Set	Not Used
	5	SPARE-5	0	Not Set	Not Used

- 20 Devices can be added - (drop down window)
- Device Name can be edited
- Device Address is assigned
- Rs485 port number is assigned (RS485-2 default)
- Configuration is the Name of Slave (additional slaves can be programmed using Custom setting)

General Read/Write Modbus Master Points						
Device Lockout	#	Register Number Offset	Register Number Offset (HEX)	Register Type	Modbus Data Types	
No Lockout	▶ 1	84	0x0054	(R-FC01) Coil Status	Single Bit	
No Lockout	2	0	0x0000	Not Set	Not Set	
No Lockout	3	0	0x0000	Not Set	Not Set	
No Lockout	4	0	0x0000	Not Set	Not Set	

- Register Number offset
- Register Number offset (HEX)
- Register Type (drop down window)
- Modbus data type (drop down window)

MODBUS / MCS-CONFIG Setup

1. MODBUS DEVICE LIST

Currently Editing Device Named: Comp1A1000

#	Device Name	Device Address	RS485 Number	Configuration
1	Comp1A1000	1	RS485-1	YASKAWA GA800/A1000
2	Comp2A1000	2	RS485-1	YASKAWA GA800/A1000
3	ApmPowerMete	3	RS485-2	POWER METER APM PWR APO
4	SPARE-4	0	Not Set	Not Used
5	SPARE-5	0	Not Set	Not Used

Line 1 information is added for the MODBUS Device

- Device Name
- Device Address
- RS485 Port Number
- Device Configuration setup
 - Information is programmed into the MCS-CONFIG file
- Sensors Inputs, Relay and Analog Outputs will populate when Configuration Device is chosen.

2. SENSORS INPUTS

#	Name (1 to 10 char)	Display Type	Manual Value or NC/NO (select to change)	Select Display Type
6-1	VfdFault 1	MB RTU Read	Closed=OFF	DIGITAL/SW
6-2	Vfd Hz 1	MB RTU Read	45	DEC1NOCH
6-3	Vfd KW 1	MB RTU Read	17	KW
6-4	VfdAmps 1	MB RTU Read	75	AMPS/CT
6-5	VfdVolts 1	MB RTU Read	460	VOLTS-1Dec
6-6	VfdDCBus 1	MB RTU Read	600	VOLTS-0Dec
6-7	VfdHsink 1	MB RTU Read	105	TEMP
6-8	VfdFlt #1	MB RTU Read	Open=OFF	DIGITAL/SW

Yaskawa HADR VFD

Yaskawa Point Mapping
(Register numbers below are 1-based)
Read Registers

Register	Value
VfdFault 1 (0x21)	VfdFault 1
VfdAmps 1 (0x27)	VfdAmps 1
VfdHsink 1 (0x69)	VfdHsink 1
Vfd Hz 1 (0x42)	Vfd Hz 1
VfdVolts 1 (0x26)	VfdVolts 1
VfdFlt #1 (0x81)	VfdFlt #1
Vfd KW 1 (0x28)	Vfd KW 1
VfdDCBus 1 (0x69)	VfdDCBus 1
Vfd Mode (0x2D)	Not Used
Vfd Frequency Reference (0x24)	Not Used
Drive Status (0x4C)	Not Used

Write Registers

Register	Value
Compressor Speed (0x03)	Comp 1 Hz
Compressor Commands (0x02)	Comp1Cmnd

3. RELAY OUTPUTS

#	Name
6-1	VfdFault 1
6-2	Vfd Hz 1
6-3	Vfd KW 1
6-4	VfdAmps 1
6-5	VfdVolts 1
6-6	VfdDCBus 1
6-7	VfdHsink 1
6-8	VfdFlt #1

- A popup screen will show the registers (points) assigned to the MODBUS Device in HEX numbers.
- Information for Sensors Inputs, Relay and Analog Outputs are populated after the Device Configuration is entered.

4. ANALOG OUTPUTS

#	Name	Control Type	Modbus Display Type	Device Name	Register Number Offset	Register Number Offset (HEX)
6-1	Comp 1 Hz	MB RTU AO Write	Spare	Comp1A1000	3	0x0003
6-2	Comp1Cmnd	MB RTU AO Write	Spare	Comp1A1000	2	0x0002

EXAMPLE OF CONFIG SETUP
FOR MODBUS SLAVES

MCS-CONNECT - Startup

MCS-CONNECT software is part of the MCS Support System. Its purpose is to provide both local and remote communication for MCS micro controllers either by themselves, or as part of a network.

MCS-CONNECT supports the following controllers:

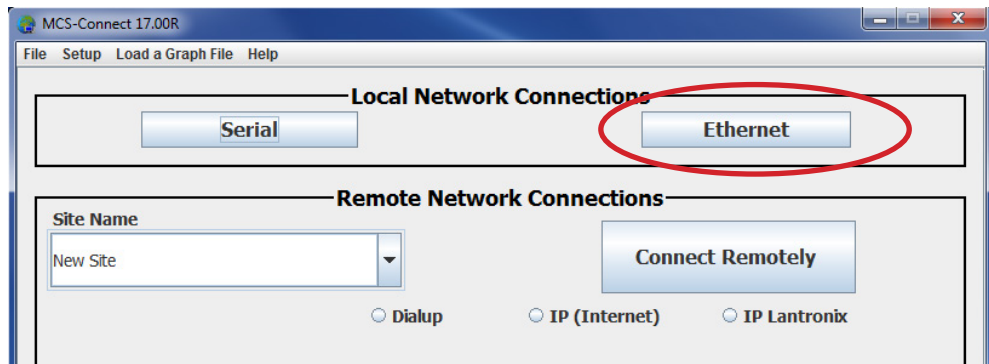
- MCS-MAGNUM controller
- MCS-NitroMag controller
- MicroMag controller

5. Communicating with MCS-CONNECT

1. MCS-CONNECT must be setup for the correct network address for your buildings IP address in order to connect to your controllers.
2. Configuration files and Firmware software can be changed based on your authorization to make those changes.
3. Information for making changes can be found in the MCS-CONNECT latest manual located on:
[www.https://mcscontrols.com/manuals.html](http://www.mcscontrols.com/manuals.html)

Scan for Controller

Once connected, click on the MCS-CONNECT program to open. Changes to the config and firmware software can be changed if you are authorized. Click on the Ethernet tab to open available controllers.



Next screen shows MCS-CONNECT scan for controller. Click anywhere in the row to open your controller. (if there is a RED line through your controller, you need to update the config file/firmware.)

Site Info 1 - ACCM ASHP-HR 1 - VANE CAL										
Address	HW Serial #	Cfg Name	Company Name	Unit Model #	Unit Serial #	Installed Date	Cfg Vers.	Firmware Vers.	Cfg Date	
192.168.18.111 (1)	E4:5f:01:cf:81:88	ACCM ASHP-HR	TEST	ASHP-030-460V	7176F01	02/10/2023	19	HVAC 19.00F	11/08/2024	
192.168.18.101 (1)	002135	VANE CAL	MICRO CONTROLS	WSC100-BBABR	STNU110800020	10/12/2023	17	CENT 17.95	05/08/2024	

Controller IP
Address #1

HW Serial #
MCS-NitroMag
starts with
Alpa letter



Config
Name

Company
Name

Unit
Model #

Unit
Serial #

Config
Installed
Date

Config
Version

Firmware
Version

Config
Date

6. RS485 PORTS SETUP(service menu, MCS-CONNECT)

RS-485 Ports..... 2 @ up to 115200 baud rate

Sample Screens for setup MODBUS slave (receive Cfg file received)

1. RS485 #1 - Setup for MCS I/O communicating -19,200 baud - address #1
2. RS485 #2 - Setup for MODBUS RTU MASTER - 38,400 BAUD. Bits per Byte=8, Stop Bits= 1

RS485 #1 Network

Protocol: **MCS**
 Address: **1**
 Baud Rate: **19200**

DROPDOWN WINDOW OPTIONS		
Protocol	Address	Baud Rate
MCS	1-99	38400
MODBUS RTU Slave		19200
CPM		57600
MODBUS RTU MASTER		115200
BACNET MSTP		

RS485 #2 Network

Protocol: **MODBUS RTU MASTER**
 Baud Rate: **38400**
 Poll Delay (ms): **100**
 Poll Timeout (ms): **500**
 Bits per Byte: **8**
 Parity: **None** Stop Bits: **1**

DROPDOWN WINDOW OPTIONS						
Protocol	Baud Rate	Poll Delay (ms)	Poll Timeout (ms)	Bits per Byte	Stop Bits	Parity
MCS	4800	10 ↓ 1000	100 ↓ 2000	7 or 8	1 or 2	None Even Odd
MODBUS RTU Slave	9600					
CPM	19200					
MODBUS RTU MASTER	38400					
	57600					
	115200					

7. SENSOR INPUTS

Sample - ABB MODBUS Read Sensor Inputs

9 Sensor Inputs pre-programmed into software. (receive Cfg file received)

Sensor Inputs											
Basic											
SI #	Sensor Inputs	Value	Manual Status	Filter/Offset	Sensor Type	Last On/ MAX TDY	Last Off/ MIN TDY	Run TDY/ Avg TDY	Cycles TDY	Run YD/ Max YD	
<input checked="" type="checkbox"/> 1-3	HotWtr In	-999	AUTO	0 / 0	MB RTU R	-999	-999	-999		0	
<input checked="" type="checkbox"/> 1-4	HotWtr Out	-999	AUTO	0 / 0	MB RTU R	-999	-999	-999		0	
<input checked="" type="checkbox"/> 1-5	SuctPsi 1A	-9.99	AUTO	0 / 0.00	MB RTU R	-9.99	-9.99	-9.99		0.00	
<input checked="" type="checkbox"/> 1-6	DiscPsi 1A	-9.99	AUTO	0 / 0.00	MB RTU R	-9.99	-9.99	-9.99		0.00	
<input checked="" type="checkbox"/> 1-7	SucTemp 1A	-99.9V	AUTO	0 / 0.0V	MB RTU R	-99.9V	-99.9V	-99.9V		0.0V	
<input checked="" type="checkbox"/> 1-14	DsbICkt 2B	-99.9%	AUTO	0 / 0.0%	MB RTU R	-99.9%	-99.9%	-99.9%		0.0%	
<input checked="" type="checkbox"/> 1-15	FlowSwitch	0	AUTO	0 / 0	MB RTU R	0	0	0		0	
<input checked="" type="checkbox"/> 2-9	ChwVlvPrfA	-999	AUTO	0 / 0	MB RTU R	-999	-999	-999		0	
<input checked="" type="checkbox"/> 3-4	Cmp1ARunul	OFF	AUTO	0 / 0	MB RTU R	00:00:00	00:00:00	00:00:00	0	00:00:21	

8. ANALOG OUTPUTS

Sample - ABB MODBUS Read Analog Outputs

3 Analog Outputs pre-programmed into software. (receive Cfg file received)

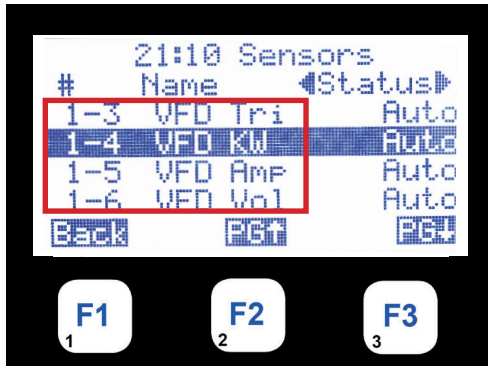
Analog Outputs											
Basic											
AO #	Analog Outputs	Value	Manual Status	Type	Max TDY	Min TDY	Avg TDY	Max YDY	Min YDY	Avg YDY	
<input checked="" type="checkbox"/> 1-3	SrcExv%1A	0	AUTO	MB RTU Write	0.0%	0.0%	0.0%	0.0%	0.0%	0	
<input checked="" type="checkbox"/> 2-1	HtGsVlv%1A	1	AUTO	MB RTU Write	0.1%	0.1%	0.1%	0.1%	0.1%	0	
<input checked="" type="checkbox"/> 2-4	Cond Fan B	20.0%	AUTO	MB RTU Write	20.0%	20.0%	20.0%	20.0%	20.0%	20	

MODBUS POINTS/REGISTERS VIEWED ON KEYPAD

1. SENSORS/RELAYS/ANALOG

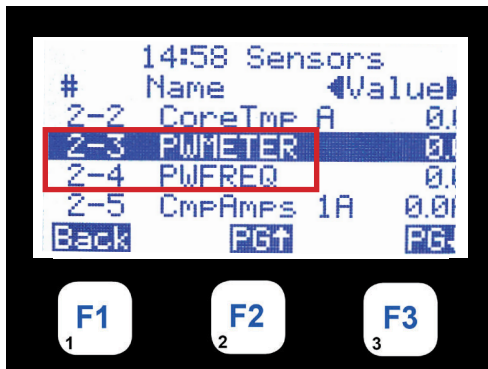
MODBUS RTU slave points are displayed on the Keypad under the “SENSOR, RELAY and ANALOG inputs and outputs as shown below.

The MCS-CONFIG setup is shown on the following pages as a reference as how they are programmed in the configuration file for your controller.



HH:MM

MODBUS SLAVE SENSORS SETUP IN CONFIGURATION FILE
FOR CONTROLLER
SENSORS SHOW MODBUS SETUP - RS 485 #1
PG ↓ CONTINUES TO NEXT SYSTEM INFO OR
PRESS ← MENU TO RETURN TO MAIN MENU



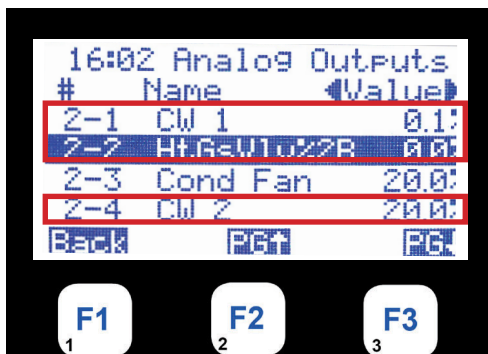
HH:MM

MODBUS SLAVE SENSORS SETUP IN CONFIGURATION FILE
FOR CONTROLLER
SENSORS SHOW MODBUS SETUP - RS 485 #2
PG ↓ CONTINUES TO NEXT SYSTEM INFO OR
PRESS ← MENU TO RETURN TO MAIN MENU



HH:MM

MODBUS SLAVE ANALOGS SETUP IN CONFIGURATION FILE
FOR CONTROLLER
PG ↓ CONTINUES TO NEXT SYSTEM INFO OR
PRESS ← MENU TO RETURN TO MAIN MENU



HH:MM

MODBUS SLAVE ANALOGS SETUP IN CONFIGURATION FILE
FOR CONTROLLER
PG ↓ CONTINUES TO NEXT SYSTEM INFO OR
PRESS ← MENU TO RETURN TO MAIN MENU



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