

Group: Controls

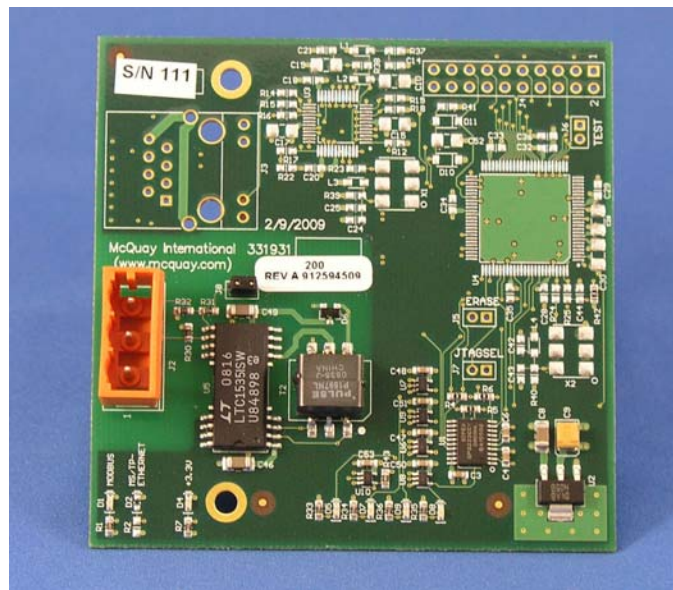
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Supercedes: IM 993

# Magnitude™ Chiller Unit Controller Modbus® Communication Module

Magnitude Frictionless Centrifugal Chiller, Single-Compressor Model WME



## NOTICE

Use this manual to physically install the Modbus Communication Module into the chiller unit controller and connect the chiller unit controller to your network. Use the appropriate McQuay Engineering Data (ED), known as the Protocol Information document, to integrate the unit into your network. The Protocol Information document contains addressing details, protocol information, and a list of the data points available to the network. See the Reference Documents section of this manual for details. Magnitude Chiller control integration literature is available from your local McQuay International sales representative and [www.mcquay.com](http://www.mcquay.com).

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## Revision History

IM 993	April 2010	Initial release.
IM 993-1	July 2010	Changed kit part number in Parts List.

## Reference Documents

Number	Company	Title	Source
ED 15118	McQuay International	Protocol Information for Magnitude™ Chiller Unit Controllers, Modbus Networks	www.mcquay.com
OM 1034	McQuay International	Magnitude Frictionless Centrifugal Chiller Operation and Maintenance Manual	www.mcquay.com
-	Modbus	Modbus over Serial Line Specification & Implementation Guide v1.0	www.Modbus.org

## Limited Warranty

Consult your local McQuay Representative for warranty details. Refer to Form 933-43285Y. To find your local McQuay Representative, go to [www.mcquay.com](http://www.mcquay.com).

### Notice

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# General Information

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This manual contains the information you need to install the Modbus® Communication Module on a Magnitude™ Chiller Unit Controller, incorporate it into the Modbus network, and maintain it.

## DANGER

Dangers indicate a hazardous situation that will result in death or serious injury if not avoided.

## WARNING

Warnings indicate potentially hazardous situations, which can result in property damage, severe personal injury, or death if not avoided.

## CAUTION

Cautions indicate potentially hazardous situations, which can result in personal injury or equipment damage if not avoided.

## WARNING

### **Electric shock hazard. Can cause personal injury or equipment damage.**

This equipment must be properly grounded. Only personnel knowledgeable in the operation of the equipment being controlled must perform connections and service to the Magnitude Chiller Unit Controller.

## CAUTION

### **Static sensitive components. Can cause equipment damage.**

Discharge any static electrical charge by touching the bare metal inside the control panel before performing any service work. Never unplug cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

## NOTICE

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense. **McQuay International disclaims any liability resulting from any interference or for the correction thereof.**

# Description

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## Description

The Modbus Communication Module incorporates a Magnitude Chiller Unit Controller into a Modbus local area network (LAN). The Modbus Communication Module is a printed circuit board that attaches to the upper left section of the Magnitude Chiller’s main unit controller circuit board. This area is labeled “BAS Interface Board”. The main unit controller circuit board itself is labeled “Chiller I/O Backplane” and will be referred to as such for the remainder of this document.

## Application

The Modbus Communication Module connects the unit controller to a building automation system (BAS) on a Modbus local area network. It is the interface for the exchange of Modbus objects between the network and the unit controller. Refer to the Magnitude Chiller Operation Manual, OM 1034, for user interface details. For a complete list of available Modbus points, refer to the Magnitude Chiller Unit Controller - Modbus Protocol Document, ED15118 (all literature available on [www.mcquay.com](http://www.mcquay.com)).

## Component Data

Figure 1 shows the Modbus Communication Module, located on the far left-hand side of the image below. Figure 2 shows the important features of the Modbus Communication Module, which include the LED locations and network connection.

*Figure 1. Modbus Communication Module Attached to the Magnitude Chiller I/O Backplane*

**Modbus communication  
module (attached)**

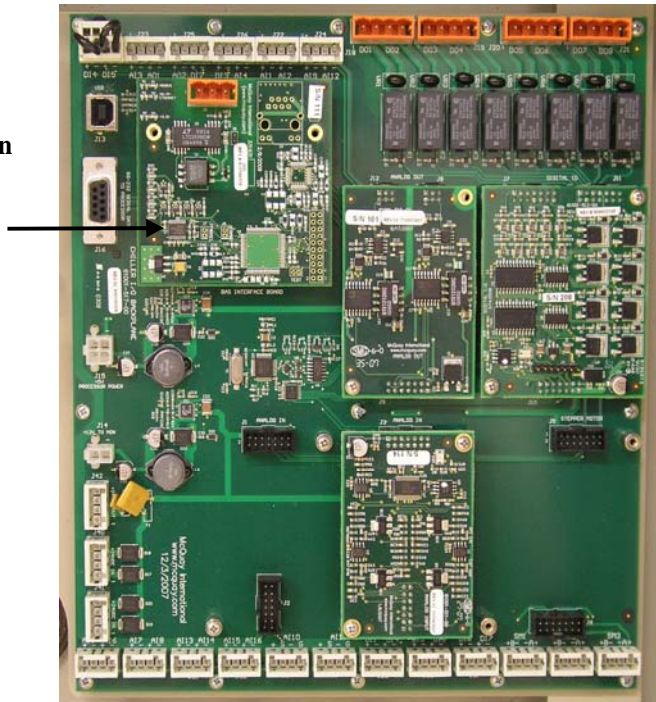
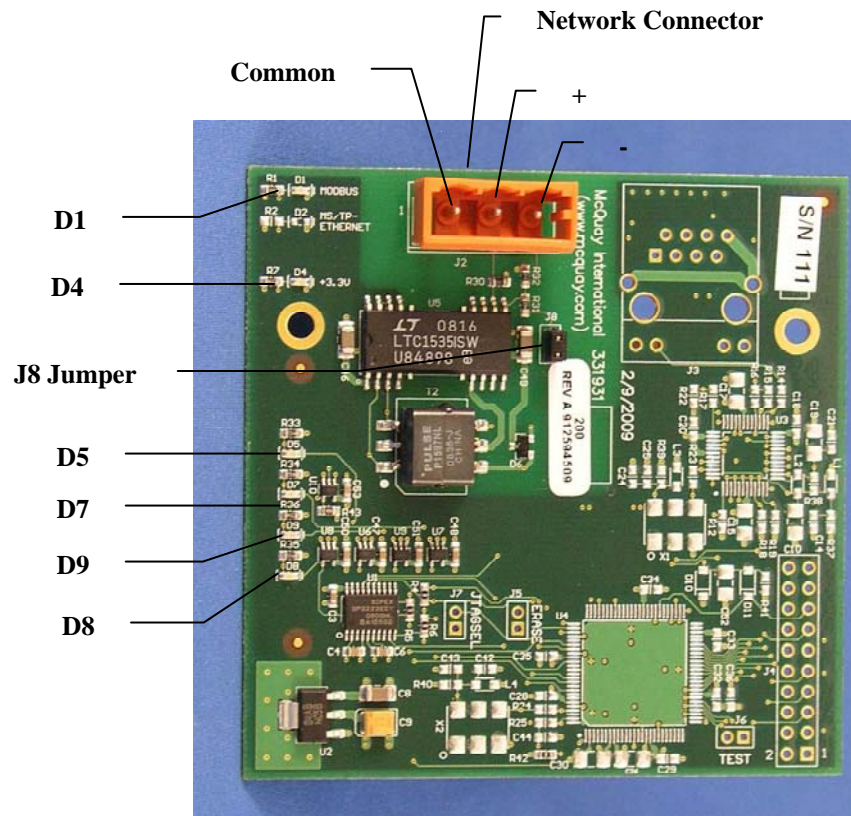


Figure 2. Modbus Communication Module Major Components



### Light Emitting Diodes (LEDs)

The Modbus Communication Module has six LEDs to indicate communication activity and data transmission status. These indicators are visible when the communication module is connected to the Magnitude Chiller I/O Backplane and the unit is powered on. See Figure 2 for LED locations and Table 1 for a description of LED activity.

Table 1. Description of LED Activity

LED	Color	Meaning
D1	Green	Communication module supports a Modbus network. If present, this LED will always be lit when 5VDC power (supplied from the chiller unit controller) is present.
D4	Yellow	Indicates local 3.3 VDC power is present.
D5	Yellow	Flashes when the communication module transmits data to the chiller unit controller.
D7	Green	Flashes when the communication module receives data from the chiller unit controller.
D8	Green	Flashes when the communication module receives data from the Modbus network.
D9	Yellow	Flashes when the communication module transmits data to the Modbus network.

## **Modbus Network Connector**

An RS-485 connector connects the Modbus Communication Module to the Modbus network and has three pins: +, -, and Common. See Figure 2 for location.

## **J8 Jumper**

The Modbus Communication Module has a built-in terminating resistor labeled “J8” on the circuit board. The communication module ships with the jumper installed, providing 120 Ohms of end-of-line resistance to the network. Typically, a network is terminated at each end of each segment. However, it is the responsibility of the system installer/integrator to recommend whether or not to terminate a device within the network. If the device does not require terminating resistance, or if an external terminating resistor is used, the jumper on J8 should be removed. See Figure 2 for location.

# Installation

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The following section describes how to field install a new Modbus Communication Module or replace an existing Modbus Communication Module on the Magnitude Chiller I/O backplane (i.e. unit controller main circuit board) so that it can be incorporated into the Modbus network.

## CAUTION

### **Electrostatic discharge hazard. Can cause equipment damage.**

This equipment contains sensitive electronic components that may be damaged by electrostatic discharge from your hands. Before you handle a communications module, you need to touch a grounded object, such as the metal enclosure, in order to discharge the electrostatic potential in your body.

## Contents of the Modbus Communication Module Kit

The following is the list of items included in the field-installed kit:

- The Modbus Communication Module
- Network connector (attached to communication module)
- Two screws
- Installation Manual (IM 993)

## Installing a new Modbus Communication Module

Follow these steps to install a new Modbus Communication Module on the Magnitude Chiller I/O backplane.

## WARNING

### **Electric shock hazard. Can cause personal injury or equipment damage.**

This equipment must be properly grounded. Only personnel knowledgeable in the operation of the equipment being controlled must perform connections and service to the unit controller.

1. Remove power from the Magnitude Chiller Unit Controller.
2. Connect the Modbus Communication Module to the upper left corner of the chiller I/O backplane, in the area labeled BAS Interface Board (see Figure 1). Carefully align the holes on the communication module with the two standoffs attached to the chiller I/O backplane.

## CAUTION

### **Carefully align the holes on the communication module with the standoffs on the chiller I/O backplane**

Powering up the controller with the communication module installed upside down can cause damage to the communication module.

3. Using the two screws that came with the communication module kit, attach the communication module to the standoffs located on the chiller I/O backplane.
4. Connect the communication module to the network (see Figure 2 for location of network connection).
5. Apply power to the unit controller.

# Replacing an Existing Modbus Communication Module

Follow these steps to remove an existing Modbus Communication Module from the chiller I/O backplane and replace it with a new Modbus Communication Module.

## **WARNING**

**Electric shock hazard. Can cause personal injury or equipment damage.**

This equipment must be properly grounded. Only personnel knowledgeable in the operation of the equipment being controlled must perform connections and service to the Magnitude Chiller Unit Controller.

1. Remove power from the unit controller.
2. Locate the communication module. It is situated at the upper left corner of the chiller I/O backplane (see Figure 1).
3. Remove the network cable connector from the communication module.
4. Remove the two screws holding the communication module in place.
5. Grasp the communication module and carefully pull it from the chiller I/O backplane.
6. Install the new communication module (see Steps 1-3 from previous section).
7. Re-attach the two screws to secure the communication module to the chiller I/O backplane.
8. Insert the network cable connector into the communication module.
9. Apply power to the unit controller.

# Integration

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Once the Modbus Communication Module has been properly installed on the unit controller, it is then possible to integrate the unit controller into a building automation system (BAS) via the Modbus network. The configuration process is described in the following section.

## Connecting to the Network

### Modbus Network Topology

Standard Modbus network rules apply. The network is a daisy-chain of devices, including all slaves and the master. The Magnitude Chiller Unit Controller with corresponding communication module is considered a slave, and as such, can only respond to requests. The Modbus standard recommends that the network be terminated on each end with the characteristic impedance of the network (about 120 ohms). It is the responsibility of the system installer/integrator to determine whether or not to terminate a device within the network.

The Modbus Communication Module has a built-in terminating resistor labeled “J8” on the circuit board. The communication module ships with the jumper installed, providing 120 Ohms of end-of-line resistance to the network (see Figure 2). If the unit controller is not an end-of-line device, or if the installer is providing an external terminating resistor, the jumper on J8 should be removed. Follow the guidelines stated in the Modbus specifications (see Reference Documents section for details).

## Configuring the Modbus Communication Module

The Modbus Communication Module can be configured using the Magnitude chiller unit controller Operator Interface Touch Screen (OITS) display. The unit is ready to operate after you have configured the parameter values of the unit controller for your particular network. Refer to the Magnitude Chiller Operation and Maintenance Manual (OM 1034) for default values and unit controller OITS operating instructions. Refer to McQuay Protocol Document ED 15118 for descriptions of all the available Modbus variables.

Figures 3 and 4 show the chiller unit controller OITS display screens with the corresponding network parameters available for configuration. These two screens (BAS1 and BAS2) are accessed by clicking on the BAS button at the top of the right-hand column.

### Modbus Addressing

The Network Address of the Magnitude chiller unit controller must be set via the unit controller OITS display. The Modbus network address and data transmission rate (Baud Rate) is only available in the OITS display.

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**Note:** Refer to the Magnitude Chiller Operation and Maintenance Manual (OM 1034) for details regarding accessing and using the unit controller OITS display.

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### Configuring the Modbus Communication Module using the OITS Display

1. Open the Magnitude chiller unit controller OITS display screen.
2. Press the SET button, located at the bottom of the screen.
3. Press the BAS button from the top of the column on the right-hand side of the screen.
4. Press the 1 button, located to the right of the BAS Network Protocol field. The BAS Network Protocol field should now be highlighted (see Figure 3).
5. Press the Change button.
6. If prompted, enter the password 100 and press Enter. Otherwise, proceed to step 7.
7. Press the Change button.
8. Select Modbus from the drop-down menu.

9. Press the Enter button.
10. Press the BAS button to access BAS Screen 2 (BAS2).
11. Set the Modbus Network Address (or ident number) within the valid range of 1-247. See Figure 3.
12. Set the desired baud rate for the unit controller (see next section, Setting the Modbus Data Transmission Rate, for details).
13. Modify the remaining Modbus parameters as necessary. See Table 2 for a complete list.
14. Cycle power to the unit controller.

### Setting the Modbus Data Transmission Rate

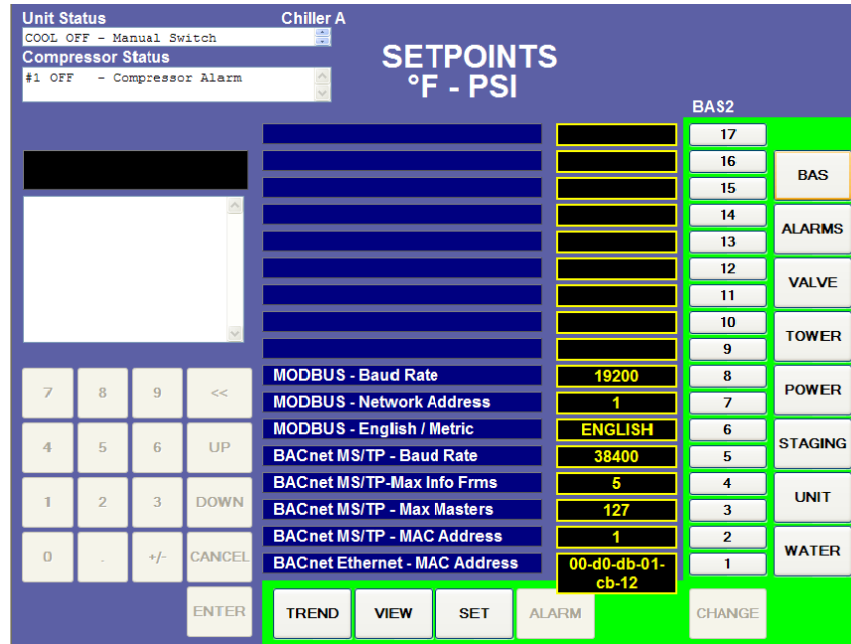
Modbus baud rate options (in bps) include: 2400, 4800, 9600 and 19200. The factory default baud rate is 19200 bps. Follow the steps below to change the baud rate for desired network speed via the OITS display:

1. If you are at the BAS2 screen, proceed to Step 4 (see Figure 4).
2. If you are on the BAS1 screen, press the BAS button and proceed to Step 4.
3. Press the SET button once and then press the BAS button twice.
4. Press the 8 button, located to the right of the MODBUS-Baud Rate field. The MODBUS-Baud Rate field should now be highlighted.
5. Press the Change button.
6. If prompted, enter the password 100 and press Enter. Otherwise, proceed to step 6.
7. Press the Change button.
8. Press the desired baud rate from the drop-down menu.
9. Press the Enter button.
10. Cycle power to the unit controller.

Figure 3. OITS Display of Network Parameters – BAS1

Parameter	Value	Unit
BACnet IP-Foreign Device Time	0	17
BACnet IP - BBMD IP Address	0.0.0.0	16
BACnet IP - Default Gateway	172.15.5.1	15
BACnet IP - UDP Port	47808	14
BACnet IP - Subnet Mask	255.255.255.0	13
BACnet IP - Network Address	172.15.5.8	12
BACnet (all) - UTC Offset	0	11
BACnet (all) - Daylight Savings	0	10
BACnet (all) - APDU Retries	3	9
BACnet (all) - APDU Timeout	3000	8
BACnet (all) - Description	Magnitude	7
BACnet (all) - Object Name	3000	6
BACnet (all) - Device Instance	ENGLISH	5
BACnet (all) - English / Metric	None	4
BAS Network Protocol		3
		2
		1

Figure 4. OITS Display of Network Parameters – BAS2



## Configurable Parameters

Table 2 defines the Modbus Communication Module network parameters that are configurable via the unit controller OITS display. Additional parameters are configurable from the Building Automation System (BAS). For a complete list of available Modbus points, refer to the Magnitude Chiller Unit Controller - Modbus Protocol Document, ED15118 (available on [www.mcquay.com](http://www.mcquay.com)).

At a minimum, you must set the following before establishing network communication between the unit controller and the BAS:

1. BAS Network Protocol
2. Network Address (ident number)
3. Verify the correct baud rate and change if necessary

Additional Modbus network parameters are shown below in Table 2.

Table 2. Network Configuration Menu

Parameter	Value (Range)/Definition	Initial Value/Note
BAS Network Protocol	None-Modbus-LONWORKS-BACnet IP-BACnet Ethernet-BACnet MS/TP/This point defines the protocol being used.	None/Set this value to Modbus. Cycle power to the unit controller after changing this parameter.
Modbus - Baud Rate	1200-2400-4800-9600-19200/Data transfer speed (bps).	19200/Cycle power to the unit controller after changing this parameter.
Modbus – Network Address	1-247/The Modbus Address of the communication module.	1/This must be unique throughout the entire Modbus network.
Modbus – English / Metric	English-Metric/Defines whether the data passed from the controller is passed in English or Metric units.	English/Changes to this parameter take effect immediately in the unit controller.

**Note:** If unit controller application software requires uploading in the field, the network configuration parameters revert to their default values. Please contact the Technical Response Center at 877-349-7782 for assistance with upgrading unit controller application software.

# Service Information

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## Test Procedures

If you can control the unit from the OITS display, but you are not able to communicate with unit via the network, follows these steps:

- Check the network wiring
- Check the network parameters and verify that they are correct and that there are no duplicate devices on the network
- Verify BAS Network Protocol is set correctly. Cycle power after changing this parameter.
- Check communications (see Table 1 for description of communication module LED activity).

If the Modbus Communication Module still does not respond, contact the McQuay Controls Customer Support Group at 866-4MCQUAY (866-462-7829).

## Parts List

### Installation Kit

Description	Part Number
Modbus Communication Module kit (kit includes communication module, two screws, and Installation Manual, IM 993)	332356903

This document contains the most current product information as of this printing. For the most current product information, please go to [www.mcquay.com](http://www.mcquay.com). All McQuay equipment is sold pursuant to McQuay's Standard Terms and Conditions of Sale and Limited Product Warranty.

