

Installation and Maintenance Manual

IM 969-7

Group: **Controls**

Part Number: **IM 969**

Date: **October 2023**

MicroTech® Chiller Unit Controller Modbus® Communication Module

Models AGZ and AMZ Trailblazer® Air-cooled Scroll Chiller

Models AWS and AWV Pathfinder® Air-cooled Screw Chiller

Model ADS Air-cooled Global Screw Chiller

Model WME, B Vintage, Magnitude® Magnetic Bearing Centrifugal Chiller

Model WWV, Navigator® Water-cooled Screw Chiller



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Introduction

This manual contains information regarding the network integration system used with MicroTech III and MicroTech 4 Chiller Unit Controllers, subsequently referred to as the MicroTech Chiller Unit Controller. It describes how to install or replace a Modbus communication module on a MicroTech Chiller Unit Controller. It also explains how to set network parameters and establish communication between the chiller and Modbus network.

Revision History

IM 969	Jan 2010	Initial release.
IM 969-1	Oct 2010	Updated screen image on p.12, updated reference to OMM 998 to OM 1051. Changed location of Baud Rate in Table 1. Added Model AGZ-D.
IM 969-2	Jul 2011	Updated Table 1 baud rates, note at the bottom, and default response delay time.
IM 969-2	Mar 2012	Updated Daikin McQuay logo and associated references.
IM 969-3	Jan 2017	Updated Daikin Applied brand logo and associated references. Updated document part numbers. Major formatting with new images of hardware and HMI screens. Added Troubleshooting details.
IM 969-4	Mar 2017	Added AMZ chiller model to data tables, Reference Documents, and other associated references.
IM 969-5	Jan 2018	Added WME & WWV chiller models.
IM 969-6	Apr 2022	Updated firmware version. Change to Network Parameters table.
IM 969-7	Aug 2023	Addition of MicroTech 4 controller. Updated LED descriptions.

Reference Documents

Company	Number	Title	Source
Daikin Applied	IOM 1242	Pathfinder Model AWV Air Cooled Chiller Installation, Operation, and Maintenance Manual	www.DaikinApplied.com
Daikin Applied	IOM 1206	Trailblazer® Model AGZ Air Cooled Chiller Installation, Operation and Maintenance Manual	www.DaikinApplied.com
Daikin Applied	IOM 1207	Trailblazer® Model AGZ Air Cooled Chiller Installation, Operation and Maintenance Manual - Pump Package and Remote Evaporator	www.DaikinApplied.com
Daikin Applied	IOM 1243	Trailblazer Model AMZ Air Cooled Chiller Installation, Operation, and Maintenance Manual	www.DaikinApplied.com
Daikin Applied	IOM 1264	Navigator Model WWV Water-cooled Chiller Installation, Operation, and Maintenance Manual	www.DaikinApplied.com
Daikin Applied	IOM 1202 (Legacy)	Pathfinder® Model AWS Air Cooled Chiller Installation, Operation, and Maintenance Manual	www.DaikinApplied.com
Daikin Applied	IOMM 1033-6 (Legacy)	Magnitude Model WME, B vintage Magnetic Bearing Centrifugal Chiller Installation, Operation, and Maintenance Manual	www.DaikinApplied.com
Daikin Applied	ED 15121	MicroTech Chiller Unit Controller Protocol Information, Modbus Networks	www.DaikinApplied.com
Modbus		Modbus over Serial Line Specification and Implementation Guide, v1.0	www.Modbus.org

Software Revision

This document supports BSP (Board Support Package) Modbus communication module firmware version 10.14 and all subsequent versions until otherwise indicated.

Limited Warranty

Consult your local Daikin Applied representative for warranty details. To find your local Daikin Applied representative, go to www.DaikinApplied.com.

Hazard Identification Information

Recognize Safety Symbols, Words and Labels

The following symbols and labels are used throughout this manual to indicate immediate or potential hazards. It is the owner and installer's responsibility to read and comply with all safety information and instructions accompanying these symbols. Failure to heed safety information increases the risk of property damage and/or product damage, serious personal injury or death. Improper installation, operation and maintenance can void the warranty.



DANGER

Danger indicates a hazardous situation, which will result in death or serious injury if not avoided.



WARNING

Warning indicates a potentially hazardous situations, which can result in property damage, personal injury, or death if not avoided.



CAUTION

Caution indicates a potentially hazardous situations, which can result in minor injury or equipment damage if not avoided.

NOTICE

Notice indicates practices not related to physical injury.

NOTE: Indicates important details or clarifying statements for information presented.

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. Daikin disclaims any liability resulting from any interference or for the correction thereof.

The Modbus communication module connects the MicroTech Chiller Unit Controller to a building automation system (BAS). This interface enables the exchange of Modbus objects between the unit controller and the network.

The Modbus communication module, together with the unit controller, support the Modbus RTU standard protocol.

Features

- Integration into a building automation and control system via Modbus RTU
- Simple attachment to a MicroTech Chiller Unit Controller
- LEDs that indicate communication status and network activity
- Network addressing and baud rate set directly from the unit controller
- Circuit board components enclosed in protective housing

Specifications

The following section provides a summary of technical data and conformance to agency listings.

General	
Dimensions	W × H × D: 1.77 × 4.33 × 2.95 in (45 × 110 × 75 mm)
Weight	3.5 oz (98 g)
Material	Base - plastic, pigeon-blue Housing - plastic, light-gray
Operating	
Temperature	-40 – 158°F (-40 – 70°C)
Humidity	<90% RH
Atmospheric pressure	Min. 10 psi (70kPa), corresponding to max. 9,842 ft (3,000 m) above sea level
Storage and Transportation	
Temperature	-40 – 158°F (-40 – 70°C)
Humidity	<95% RH
Atmospheric pressure	Min. 3.77 psi (26 kPa), corresponding to max. 32,808 ft (10,000 m) above sea level
Electrical	
Power	Supplied via unit controller DC 5 V (+5% / -5%), max. 270 mA
Network connection	RS-485 (EIA-485) - T1 and T2 3-wire twisted pair, shielded
Bus connection/ Transceiver	Galvanically isolated
	+, -, REF (3 wires)
	Isolated transceiver with fail-safe circuitry 1/8 Unit load
Bus termination	680 Ω / 120 Ω +1 nF / 680 Ω (switch by software)
Baud rate	4800, 9600, 19200, and 38400
Additional Components	
Board-to-board connector	10-pin plug between communication module and unit controller
Modbus network connector	RS-485 connection plug, 3-pin spring cage top entry
Agency Listings	
US	UL916, UL873
Canada	CSA C22.2M205
Europe	
EMC directive	2004/108/EC
Low-voltage directive	2006/95/EC Listings
RoHS directive	2002/95/EC

Dimensions

Figure 1 and Figure 2 provide key dimensional data.

Figure 1: Modbus Communication Module Top View

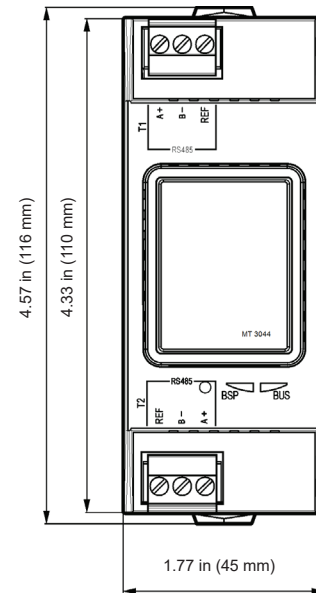
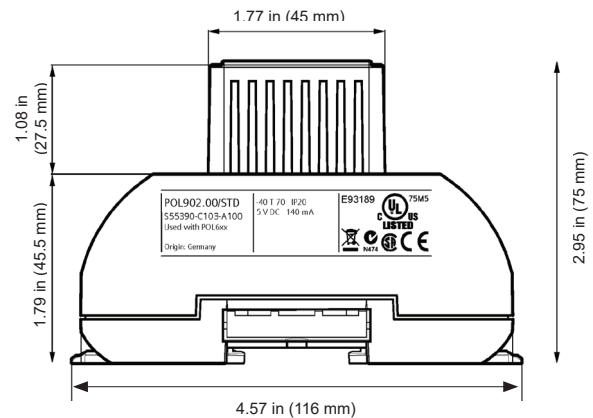


Figure 2: Modbus Communication Module Side View

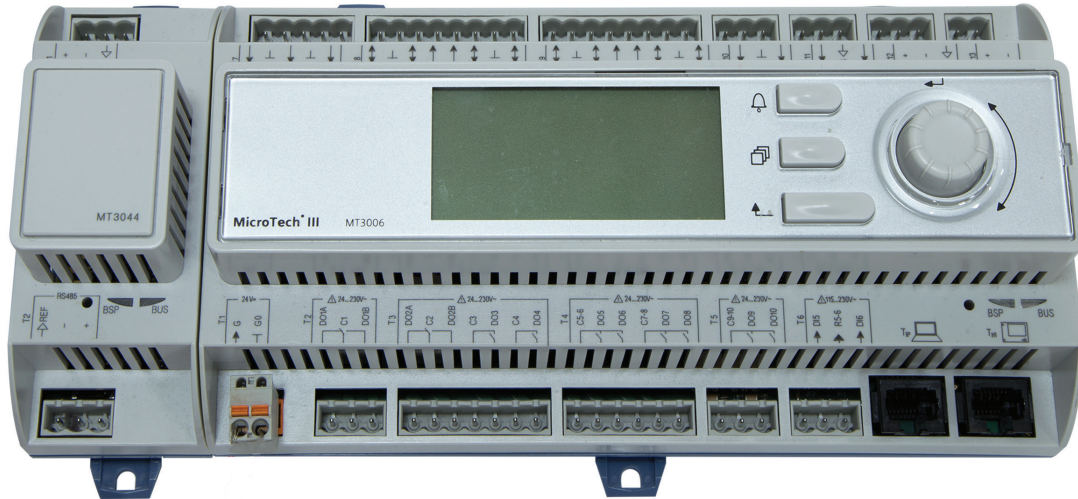


Component Data

The Modbus communication module is a printed circuit board with a plastic enclosure. It connects directly to the left-hand side of the MicroTech Chiller Unit Controller as shown in [Figure 3](#). It may be possible that another module is also connected

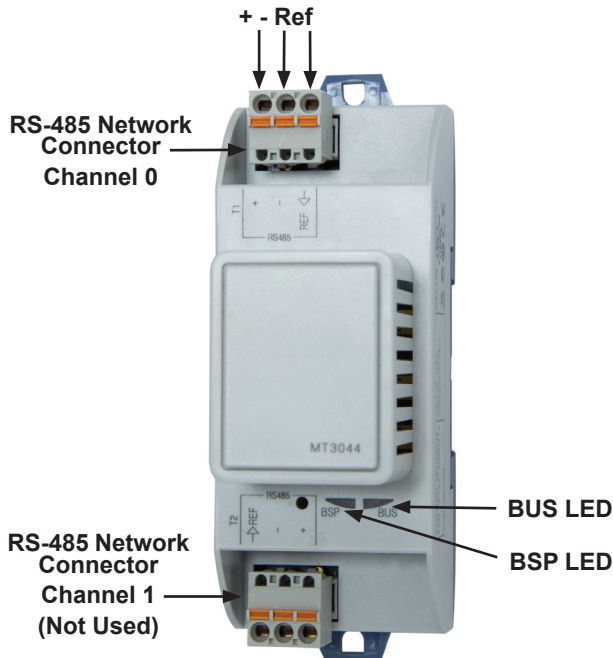
to the unit controller. In this case, the Modbus communication module simply attaches directly to the left side of the existing module instead of the unit controller.

Figure 3: Modbus Communication Module Attached to Unit Controller (MicroTech III controller shown)



[Figure 4](#) shows the important features of the Modbus communication module, which are described in the following section.

Figure 4: Modbus Communication Module



Light Emitting Diodes (LEDs)

The Modbus communication module has a BSP LED and a BUS LED to indicate communication activity and status of the Modbus communication module. These indicators are visible when the module is connected to a MicroTech Chiller Unit Controller and the unit is powered on ([Figure 4](#)).

BSP LED

The BSP LED indicates the communication state between the Modbus communication module and the MicroTech Chiller Unit Controller. [Table 1](#) describes the status of the BSP LED.

Table 1: BSP LED Activity

BSP LED Color	Flashing Frequency	Description
Red/Green	1s red / 1 s green	Broad Support Package (BSP) firmware upgrade in progress
Green	Steady "on"	BSP is running. Communication is established between the unit controller and the communication module
Orange	Steady "on"	The communication module is capable of communicating to the unit controller. However, communication is not established
Red	Flashing at 2 Hz	BSP (software) error ¹
Red	Steady "on"	Hardware error ¹

¹ In the event that this should occur, cycle power to the unit controller. Contact the Daikin Applied Controls Customer Support group at 866-462-7829 for additional assistance if necessary.

BUS LEDs

The BUS LED indicates the communication status between the Modbus communication module and the Modbus network. [Table 2](#) describes the status of the BUS LED.

Table 2: BUS LED Activity

BUS LED Color	Flashing Frequency	Description
Green ²	Steady "on"	The unit controller is capable of communicating to the network.
Red ¹	Steady "on"	Communication error. The unit controller is not capable of communicating to the network.
Orange	Steady "on"	Communication module is initializing

¹ If the Com LED Timeout parameter is set to 0, the timeout feature is disabled. See [Table 3](#) for additional information.
² If the timeout is set to 0 and therefore disabled, the LED remains green even in the event of a communication error.

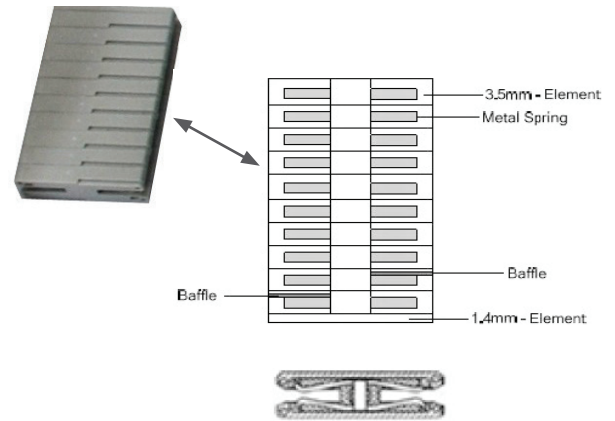
Modbus Network Connector

An RS-485 connection port connects the Modbus communication module to the Modbus Network. It has three pins: +, -, and Ref. The module has two RS-485 ports, but only the top connector (Channel 0) is used ([Figure 4](#)).

Board-To-Board Connector

The 10-pin board-to-board connector connects the MicroTech Chiller Unit Controller to the Modbus communication module ([Figure 5](#) and [Figure 8](#)).

Figure 5: Board-to-Board Connector



Installation

Installation and Mounting

The following section describes how to field install a new Modbus communication module or replace an existing module on a MicroTech Chiller Unit Controller.

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 communication module, you need to touch a grounded object, such as the metal enclosure, in order to discharge the electrostatic potential from your body.

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.

Field Installation Kit

The Modbus communication module field-installed kit ships with the following items:

- The Modbus communication module with RS-485 network connector
- Board-to-board connector - [Figure 5](#)
- This manual (IM 969)

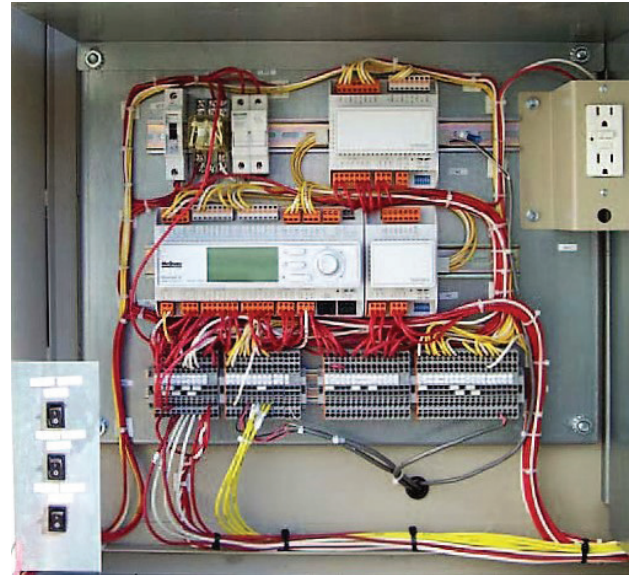
Installing a new Communication Module

Follow these steps to install a Modbus communication module on the unit controller. The communication module can be connected directly to the unit controller itself or to an existing module, if one is attached.

NOTE: There is a limit of three devices that can be attached to the left side of the unit controller.

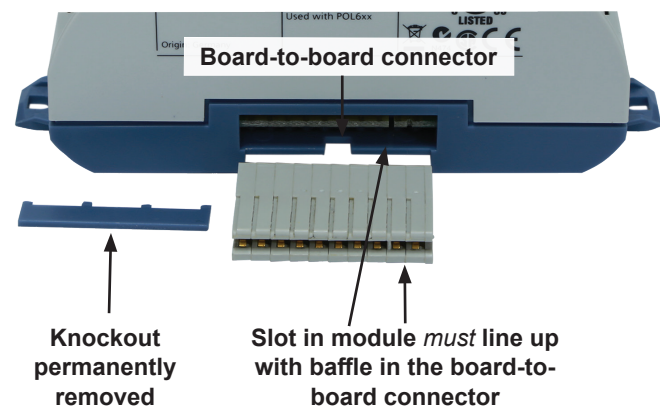
1. Disable the chiller by setting the Unit On/Off Switch to "Off" from inside the control panel of the unit. This must be done prior to installing a new communication module. See [Figure 6](#) for switch location.

Figure 6: Chiller Unit Controller On/Off Switch



2. Remove power from the unit controller.
3. Carefully remove the blue plastic knockout strip on the far left end of the unit controller itself (or additional module, if present). [Figure 7](#) shows the knockout strip after it has been removed from the unit controller.
To prevent damage to the unit controller, insert a small flathead screwdriver or similar tool into the tab on the bottom of the unit controller and pull the screwdriver away from the controller.
4. Carefully remove the blue plastic knockout strip on the right side of the Modbus communication module.

Figure 7: Communication Module and Knockout



5. Insert the board-to-board connector into the Modbus communication module. Note that it only fits one way and that the baffles must line up with corresponding slots in the communication module and the unit controller ([Figure 7](#) and [Figure 8](#)).

Figure 8: Communication Module with Board-to-Board Connector Inserted



6. Insert the other end of the board-to-board connector to the far-left side of the unit controller or other module, if attached.
7. Insert the network cable into the Modbus communication module's top network connector, Channel 0 ([Figure 4](#)).
8. Apply power to the unit controller.

NOTE: The unit controller automatically resets itself approximately 30 seconds after power has been applied to it. This reset is necessary so that the Modbus communication module can synchronize with the unit controller.

9. Set the Unit On/Off Switch to "On" from inside the control panel of the unit.

Replacing a Communication Module

Follow these steps to remove an existing Modbus communication module from the unit controller and replace it with a new module.

1. Disable the chiller by setting the Unit On/Off Switch to "Off" from inside the control panel of the unit. This must be done prior to replacing a communication module. See [Figure 6](#) for switch location.
2. Remove power from the unit controller.
3. Locate the Modbus communication module to the left of the unit controller ([Figure 3](#)).
4. Gently pull the network cable connector from the Modbus communication module ([Figure 4](#)).
5. Grasp the Modbus communication module and carefully pull it from the unit controller (or from an adjacent module, if it is attached to one).
6. Install the new Modbus communication module:

NOTE: To prevent damage to the unit controller, insert a small flathead screwdriver or similar tool into the tab on the bottom of the unit controller and pull the screwdriver away from the controller.

- a. Carefully remove the blue plastic knockout strip on the right side of the Modbus communication module.
- b. Insert the board-to-board connector into the Modbus communication module. Note that it only fits one way and that the baffles must line up with corresponding slots in Modbus communication module and the unit controller ([Figure 7](#) and [Figure 8](#)).

7. Insert network cable into the Modbus communication module's top network connector, Channel 0 ([Figure 4](#)).

8. Apply power to the unit controller.

NOTE: The unit controller automatically resets itself approximately 30 seconds after power has been applied to it. This reset is necessary so that the Modbus communication module can synchronize with the unit controller.

9. Set the Unit On/Off Switch to "On" from inside the control panel of the unit.

Network Configuration

The following section describes how to configure the Modbus communication module for BAS network integration. Follow these instructions to set addressing parameters using the MicroTech Chiller Unit Controller.

Network Considerations

Standard Modbus network rules apply. The network is a daisy-chain of unit controllers including all slaves and the master. The Modbus standard recommends that the network be terminated on each end with the characteristic impedance of the network of approximately 120 ohms. Follow the guidelines stated in the Modbus specifications (www.Modbus.org).

Modbus Configuration

The Modbus communication module is configured using the keypad/display on the unit controller. The Modbus network address (ident number) and transmission (baud) rate must be set using the unit controller keypad display.

NOTE: You must set the network address within the valid range of 1-247 and also verify the baud rate before the unit controller can properly communicate on the Modbus network. These parameters are only available when the communication module is correctly attached to the controller.

Table 3 describes these and other network parameters used to establish communication between the unit controller and the BAS. The items shown in boldface are required for minimum network configuration.

A preview of the configuration procedure is listed directly below, followed by detailed instructions for each step.

1. Disable the chiller
2. Enter the password
3. Set the network address and baud rate - typically done during initial configuration
4. Set other network parameters as required (Table 3)
5. Save changes and cycle power to the unit controller
6. Enable the chiller

Disable the Chiller

1. Set the Unit On/Off Switch to "Off" from inside the control panel of the unit. See Figure 6 for switch location.

Enter Password

2. If you have not already entered a password and are on the Main Menu, turn the circular knob on the unit controller (Figure 9) until Enter Password is highlighted from the menu list (Figure 10). If you have already entered a password, skip to Step 4.
3. Select Enter Password by pressing down on the circular knob.

NOTE: If you are not at the Main Menu and need to enter a password, press the Back button from any other menu screen until you reach the Main Menu and then follow steps 1-3.

4. Enter Password 5321 and then press Enter.
5. Scroll down to View/Set Unit and press Enter.

Figure 9: Unit Controller Main Features

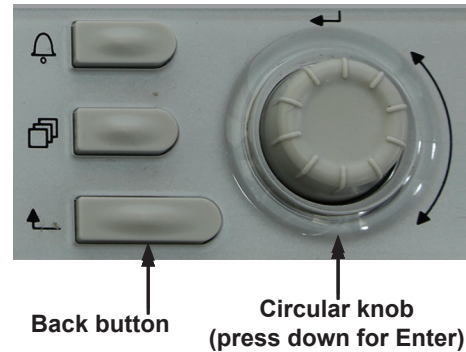
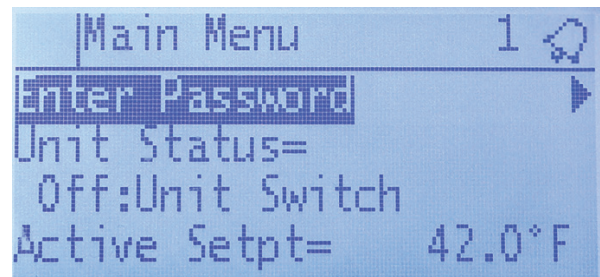


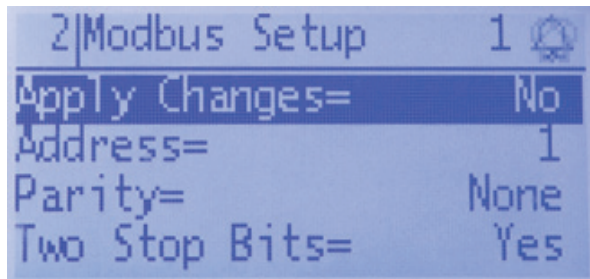
Figure 10: Modbus Setup Menu: Enter Password



Set the Network Address

1. Disable the chiller and enter a password if these two steps have not been done already.
2. Scroll down to Modbus Setup and press Enter.
3. Scroll down to Address and press Enter (Figure 11). Change this parameter to the value specified by the BAS network administrator.
4. Press Enter again to confirm selection.
5. Proceed to the next section and set the baud rate. If the baud rate does not need to be changed, there are two options:
 - a. Go to the [Set Additional Network Parameters](#) section and modify any remaining items.
 - b. Go to the [Save Changes and Cycle Power](#) section to complete the configuration process.

Figure 11: Modbus Setup Menu: Network Address



NOTE: The Modbus Setup menu only appears if the communication module is installed correctly (see [Installation and Mounting](#) section for details.) If the communication module is installed correctly and this menu still does not appear, cycle power to the unit controller and repeat the configuration process.

Set the Baud Rate



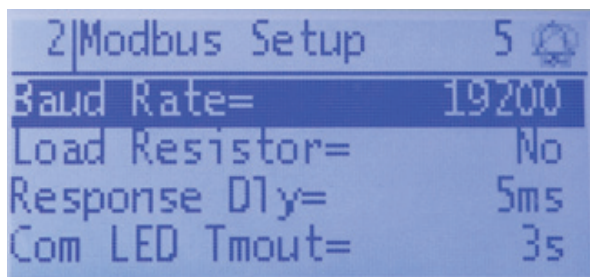
WARNING

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. Disable the chiller and enter a password if these two steps have not been done already.
2. Scroll down to Modbus Setup and press Enter.
3. Scroll to Baud Rate and press Enter to select the desired baud rate. [Figure 12](#) shows view a baud rate that has been set to 19200 bps.

Figure 12: Modbus Setup Menu: Change Baud Rate



NOTE: The Modbus communication module has a default baud rate of 38400 bps. Additional options are shown in [Table 3](#).

4. Press Enter again to confirm selection.
5. If any other parameters shown in [Table 3](#) require configuration, proceed to [Set Additional Network Parameters](#). Otherwise, go to the [Save Changes and Cycle Power](#) section to complete the configuration process.

NOTE: Make all changes before cycling power to the unit controller.

Set Additional Network Parameters

Adjust any other network parameters as shown in [Table 3](#) or change previously configured values as needed.

1. Disable the chiller and enter a password if these two steps have not been done already.
2. Scroll down to the Modbus Setup menu and press Enter.
3. Scroll down to the desired menu item and press Enter.
4. Change value as desired and press Enter again to confirm the selection.
5. Repeat steps 2-4 until all desired parameters are set.

Save Changes and Cycle Power

1. When all parameter settings have been modified, scroll to Apply Changes and set to Yes to save the changes and cycle power to the unit controller ([Figure 11](#)).
2. Navigate back to the Modbus Setup menu to verify the parameter setting(s). This procedure may take a minute while the Modbus communication module powers up.
3. Set the Unit On/Off Switch to "On" from inside the control panel of the unit.

NOTE: Refer to the applicable chiller Installation, Operation, and Maintenance (IOM) Manual for additional information on using keypad/display to set unit parameters and defaults for unit setpoints (see [Reference Documents](#) for literature numbers). Systems integrators should refer to Protocol Document ED 15121 for descriptions of the available Modbus registers www.DaikinApplied.com.

Configurable Parameters

Table 3 defines the network parameters of the Modbus communication module that are available on the Main Menu_View/Set Unit_Modbus Setup menu of the unit controller keypad/display. Change parameters as required for your network.

Table 3: Network Parameters

Parameter	Range/Default	Description/Notes
Apply Changes	Yes or No Default: No	Setting this to Yes cycles power to the unit controller, thus allowing the network setup changes to take place.
Network Address ^{1,2}	1-247 Default: 1	The Modbus Address of the communication module. This must be unique throughout the entire network.
Baud Rate ^{1,2}	4800, 9600, 19200, 38400 Default: 38400	Data transfer speed (bps) of the Modbus network.
Parity ¹	Even = 0 Odd = 1 None = 2 Default: None	Defines the parity (i.e. the use of checksums for detecting transmission errors) that is specified for the bus. This must also be identical for all nodes on the bus.
Two Stop Bits ¹	Yes or No Default: Yes	This defines the number of stop bits. Yes = 2 stop bits, No = 1 stop bit. Two stop bits are used unless this parameter is set to No. This value must also be coordinated with the other bus nodes.
Load Resistor	Yes or No Default: No	Set this parameter to Yes if this unit is the first or last slave on the segment. If an external terminating resistor is used, set this parameter to No.
Response Delay ¹	0 - 30000 milliseconds Default: 5 milliseconds	When a request is received, the response is delayed by this many milliseconds to avoid over-run of the master device. In most cases, it is not necessary to change this delay. However, Response Delay can be adjusted if the master is too slow.
Com LED Timeout	0 - 3600 seconds Default: 3 seconds	If the Com LED Timeout is set to 0, the BUS LED is always green and cannot be used to indicate communication to the master. If the master does not poll within this time, then the BUS LED turns red.
Modbus BSP	9.18 or newer	Board Support Package - indicates the Modbus communication module firmware version. The Modbus BSP is read-only.

1. Parameter must be configured via the unit controller keypad/display.

2. Boldface indicates that the parameter is required for minimum network configuration.

NOTE: If the unit controller application software requires a field upgrade, the network configuration parameters revert to their default values. Please contact the Chiller Technical Response Center at 540-248-9239 (techresponse@daikinapplied.com) for assistance.

Parts and Service

Troubleshooting

Follow these procedures if you are not able to communicate with the chiller via the network:

General

- Review the [Installation and Mounting](#) section of this document to confirm that all procedures were followed correctly.
- Review the [Network Configuration](#) section of this document to confirm that all procedures were followed correctly.
- If the Modbus communication module is installed but LEDs are not active when the unit controller is powered up, remove the module and then follow the steps provided in the [Installing a new Communication Module section](#). If the issue persists, replace the module.
- Verify that the Modbus Setup menu appears in the unit controller keypad/display. If it does not, follow this procedure:
 1. Set the Unit On/Off Switch to "Off" from inside the control panel of the unit.
 2. Remove power from the unit controller, wait 10 seconds, then re-power the chiller unit controller. Within 45 seconds, the unit controller should recognize the attached Modbus communication module, and will cycle power.
 3. Verify that the Modbus Setup menu now appears in the unit controller keypad/display.

Network Parameters

- Verify that the network address of the Modbus communication module (slave) is unique in the network. In contrast, the baud rate, stop bit, and parity settings of the communication module must match the other slave devices on the network.
- Make sure there are no duplicate devices on the network and that network parameters are set correctly as shown in [Table 3](#).
- View the Modbus communication module's BUS and BSP LEDs. Refer to [Table 1](#) and [Table 2](#) for explanations of the communication status among the unit controller, communication module, and the network based on the LED activity.

Network wiring

If performance is unsatisfactory or network is experiencing issues such as noise or slow transmission:

- Confirm that the shield is landed at only one point in the trunk.
- Be aware that the recommended network topology is daisy-chain (no T-Taps or ring layout).
- Verify that network wiring does not exceed 4000 ft total distance limit (without repeaters) at 38400 bps baud.
- Verify that polarity is maintained.
- Check that there are end-of-line termination resistors (120 Ω) at the first and last device on the trunk. This is required by the EIA-485 specification.
- Verify that the network trunk avoids strong sources of electromagnetic interference (EMI).
- Note that the two-wire bus is not interchangeable and must be connected correctly.
- Verify that the network trunk is not located near a DC load switch (relay).

Network Performance

- If network traffic is slow, communication is intermittent, or the trunk is experiencing "noise," it may be necessary to use a network protocol analyzer or oscilloscope to determine the source of poor performance.
- Confirm power is applied to the unit controller.

Contact the Daikin Applied Controls Customer Support group at 866-462-7829 for additional assistance, if necessary.

Parts

Table 4: Replacement Parts List

Description	Part Number
MicroTech Modbus communication module kit Kit includes: Modbus communication module, board-to-board connector, network connector, and IM 969	350147413
Network connector (3-pin)	193410303
Board-to-board connector (10-pin)	300047027

To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787)



Daikin Applied Training and Development

Now that you have made an investment in modern, efficient Daikin Applied equipment, its care should be a high priority. For training information on all Daikin Applied HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 and ask for the Training Department.

Warranty

All Daikin Applied equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied Representative for warranty details. To find your local Daikin Applied Representative, go to www.DaikinApplied.com.

Aftermarket Services

To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787). To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to www.DaikinApplied.com.

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