

# Installation and Maintenance Manual

**IM 743-6**

Group: **Controls**

Part Number: **IM 743**

Date: **March 2017**

## MicroTech® II Chiller Modbus® Communication Module

ACZ	Air-Cooled Scroll Condensing Unit
AGS	Air-Cooled Global Screw
AGZ	Air-Cooled Global Scroll
HDC	Water-Cooled Dual-Compressor Centrifugal, Heat Recovery
HSC	Water-Cooled Single-Compressor Centrifugal, Heat Recovery
TGZ	Templifier® Water Heater
TSC	Water-Cooled Single-Compressor Centrifugal, Templifier®
WCC	Water-Cooled Centrifugal, Dual Compressor Series Counterflow
WDC	Water-Cooled Centrifugal, Dual-Compressor
WGS	Water-Cooled Global Screw
WGZ	Water-Cooled Global Scroll
WMC	Water-Cooled Centrifugal, Magnetic Bearing
WPV	Water-Cooled Centrifugal, Single-Compressor
WSC	Water-Cooled Centrifugal, Single-Compressor



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This manual contains information regarding the network integration system used with MicroTech® II unit controllers on Daikin Applied chillers. It describes how to install or replace a Modbus® communication module on a MicroTech II chiller unit controller. It also explains how to set network parameters and establish communication between the chiller and Modbus network.

## Revision History

IM 743-0	April 2003	Initial release.
IM 743-1	May 2005	Removed references to RS 232 serial connection. Added WGS, WMC, HSC, TSC, and HDC models to Reference Documents section and cover page. Corrected pin connections on Figure 6. Added notes under Unit Setup for Network Control and Network Address and Baud Rate sections.
IM 743-2	November 2005	Added setup for screw and scroll chillers.
IM 743-3	April 2007	Removed RS-485 part number from replacement parts list.
IM 743-4	April 2009	Added TGZ model. Corrected Figure 2 and corresponding table with proper network pin connections. Changed Unit Setup for Modbus Network Control section to refer to unit keypad.
IM 743-5	December 2010	Updated chiller models on cover page and password menu screens.
IM 743-6	March 2017	Updated Daikin Applied branding and associated reference, document part numbers, major formatting revisions, added specs, troubleshooting, figures and revised Setup Unit for Network Control and Configuration sections.

## Notice

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## Software Revision

**Keypad Menu Path Main Menu>About Chiller\_App Version=**

The software part number is encoded in the controller's memory and is available via the keypad/display.

This document supports all versions of the standard MicroTech II Chiller Unit Controller application and all subsequent versions until otherwise indicated. However, if your software is of a later version, some of the information in this document may not completely describe your application.

You can determine the revision of the application software from the keypad/display. The path from the main menu is Main Menu>About Chiller\_App Version=

## Limited Warranty

Consult your local Daikin Applied representative for warranty details. To find your local Daikin Applied representative, go to [www.DaikinApplied.com](http://www.DaikinApplied.com).

## Reference Documents

Company	Number	Title	Source
Modbus-IDA.ORG		Modbus Application Protocol Specification V1.1b	<a href="http://www.Modbus.org">www.Modbus.org</a>
Modbus-IDA.ORG		Modbus over Serial Line Specification and Implementation Guide V1.02	<a href="http://www.Modbus.org">www.Modbus.org</a>
Daikin Applied	ED 15063	MicroTech II Modbus Chiller Unit Controller Protocol Document	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	IOMM ACZ/AGZ	MicroTech II Air-Cooled Condensing Unit Installation, Operation, and Maintenance Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	OMM ACZ	MicroTech II Air-Cooled Condensing Unit Operation and Maintenance Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	IOMM AGZ	MicroTech II Air-Cooled Scroll Chiller Installation, Operation, and Maintenance Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	OMM WGS	MicroTech II Water-Cooled Scroll Chiller Operation and Maintenance Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	IOMM WPV	MicroTech II Centrifugal Chiller Installation, Operation, and Maintenance Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	IOMM WSC/WDC	MicroTech II Chiller Unit Controller Installation, Operation, and Maintenance Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	OM AGS	MicroTech II Air-Cooled Screw Chiller Operating Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	OM CentrifMicro II	MicroTech II Unit Controller for Centrifugal Chillers and Templifiers Operating Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	OM WGS	MicroTech II Water-Cooled Screw Chiller Operating Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	IOM WMC	MicroTech II Magnetic Bearing Compressor Chiller Installation, Operation, and Maintenance Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	IOMM TSC	MicroTech II Templifier Single Compressor Centrifugal Installation, Operation, and Maintenance Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>
Daikin Applied	OMM TGZ	MicroTech II Templifier TGZ Heat Recovery Water Heaters Operating Manual	<a href="http://www.DaikinApplied.com">www.DaikinApplied.com</a>

## Hazardous Information Messages

### 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.

#### CAUTION

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

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

#### WARNING

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

#### DANGER

Dangers indicate a hazardous situation which will result in death or serious injury if not avoided. Electric shock hazard. Can cause personal injury or equipment damage. This equipment must be properly grounded. Connections and service to the MicroTech II Unit Controller must be performed only by personnel knowledgeable in the operation of the equipment being controlled.

#### 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 II chiller unit controller to a building automation system (BAS). This interface enables the exchange of Modbus data points 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 once inserted into the unit controller
- LEDs that indicate communication status and network activity
- Network addressing and baud rate set directly from the unit controller
- Modbus application pre-installed and ready for custom configuration

## Specifications

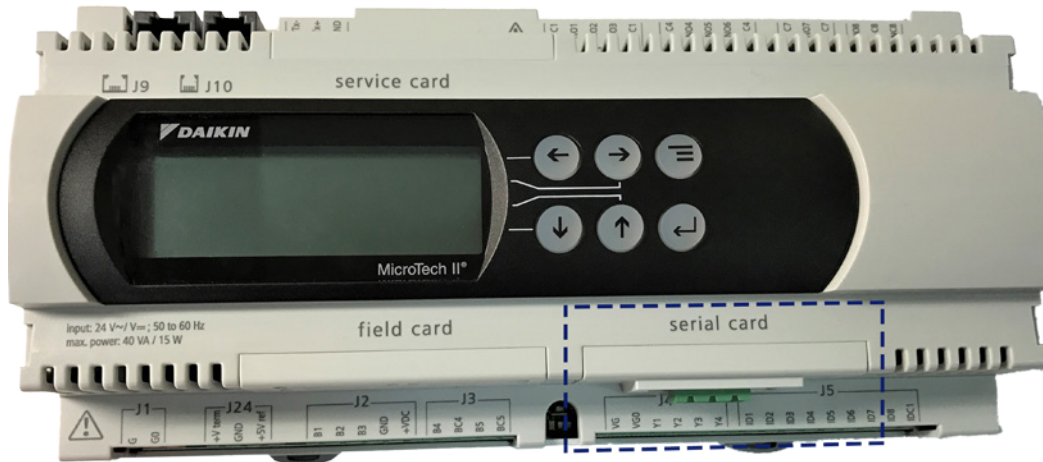
The following section provides a summary of technical data and conformance to agency listings.

General	
Dimensions	2 3/8" x 1 3/4" (60 x 30 mm)
Operating	
Temperature	14 - 140°F (-10 - 60°C)
Humidity	90% RH
Storage and Transportation	
Temperature	-4 - 158°F (-20 - 70°C)
Humidity	90% RH
Electrical	
Power	8-38 VDC (+5% / -5%) bus connector, max. 1W
Network cable	RS-485 (EIA-485) two-wire twisted pair, shielded AWG 20-22, max 3281 ft 888(1000 m)
Bus connection/ Transceiver	Opto-isolated A-, B+, GND (2 wires)
Bus termination	120 Ω end of line resistor for units at start or end of trunk
Data transmission (baud rate)	1200, 2400, 4800, 9600, 19200, (default) bps
Additional Components	
Modbus network connector	RS-485 connection plug
Agency Listings - Unit Controller	
US	UL 873
Canada	CSA C22.2 No. 24-93

## Component Data

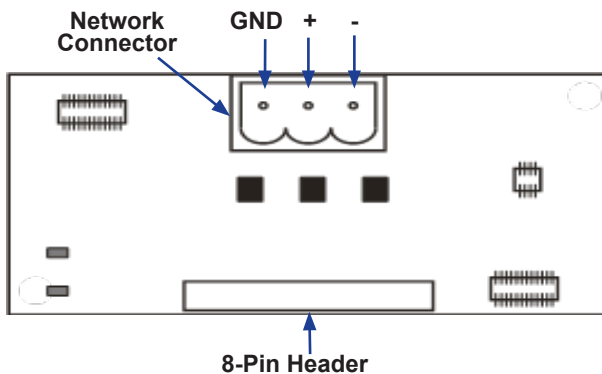
The Modbus communication module is a printed circuit board that inserts directly into the serial card slot of the MicroTech II chiller unit controller as shown in [Figure 1](#).

**Figure 1: Modbus Communication Module Attached to Unit Controller**



[Figure 2](#) shows the two important features of the communication module circuit board (the Modbus network connector and 8-pin header), which are described in the following section.

**Figure 2: Communication Module Main Features**



### Modbus Network Connector

An RS-485 connector port connects the communication module to the Modbus network. See [Figure 2](#) for connector location and the table below for additional details.

Pin	Function
1	Reference (GND)
2	Data B (+)
3	Data A (-)

### 8-Pin Header

The 8-pin header connects the MicroTech II chiller unit controller to the communication module. See [Figure 2](#) for header location.

## Installation and Mounting

The following section describes how to field install a new Modbus communication module or replace an existing module on the MicroTech II 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 (attached to module)
- This manual (IM 743)

## Tools Required

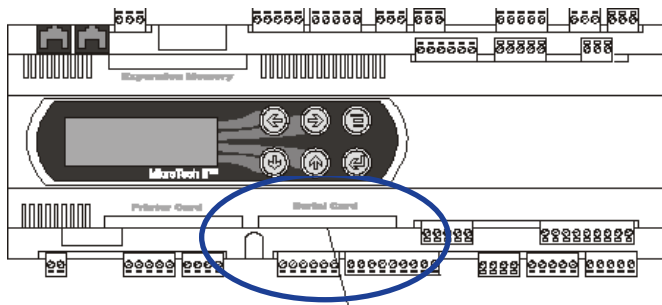
- A small flathead screwdriver or similar tool as shown in [Figure 4](#)
- Needle-nose pliers or similar tool as shown in [Figure 5](#)

## Installing a new Communication Module

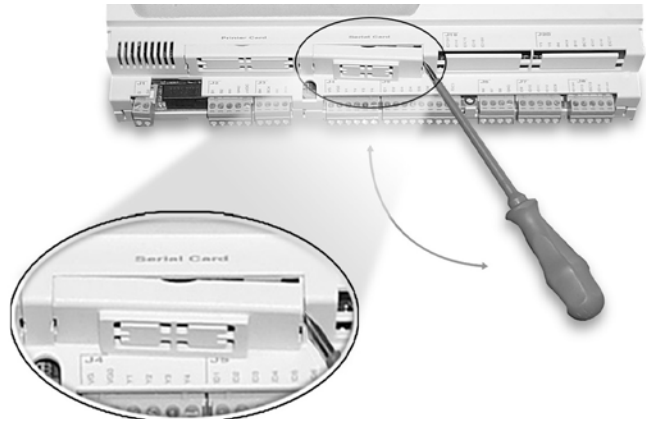
Follow these steps to install a new communication module on the unit controller.

1. Remove power from the unit controller.
2. Locate the serial card slot on the unit controller ([Figure 3](#)).
3. Remove the cover if it has not already been removed. Use a small screwdriver to carefully pry the cover off from one end ([Figure 4](#)).

**Figure 3: Serial Card Slot in Unit Controller**

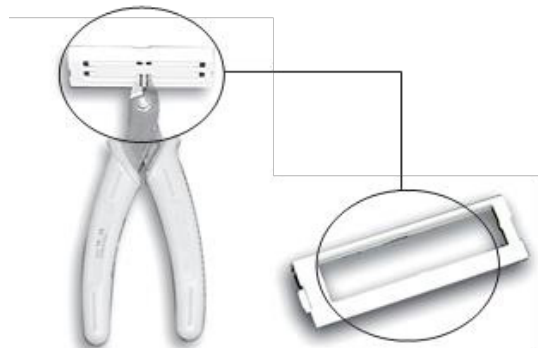


**Figure 4: Remove Serial Card Slot Cover**

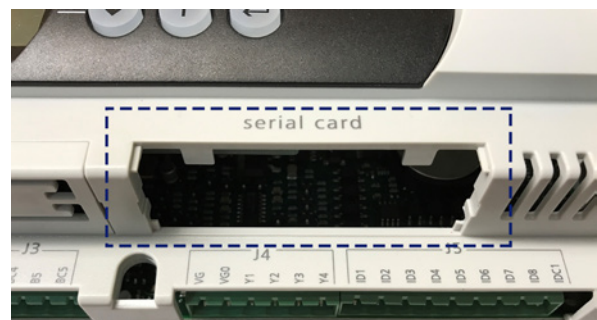


4. Using a needle-nose pliers or similar tool, remove the pre-cut plastic part of the serial card cover, making the hole for the network connector ([Figure 5](#) and [Figure 6](#)).

**Figure 5: Remove Plastic Cover**



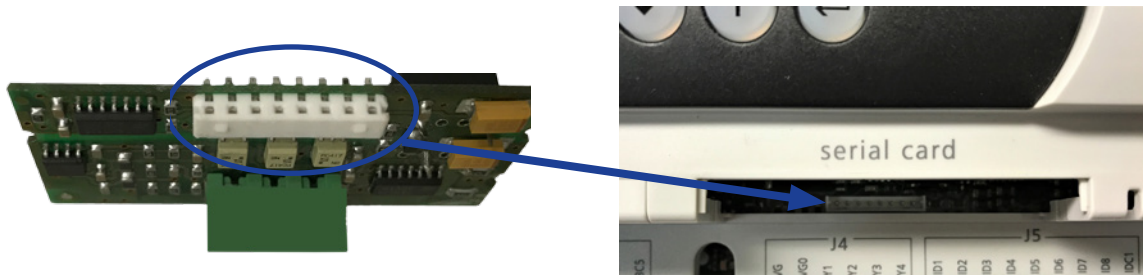
**Figure 6: Serial Card Cover Removed**



5. Grasp the communication module, with the network connector on the underside. The 8-pin header must mate to the 8-pin plug in the unit controller. The plug has a guide on each end to direct it into the mating guide on the communication module header. [Figure 7](#) shows the serial card slot with the 8-pin plug that mates to the header on the communication module.



Figure 7: Serial Card Slot Connectors

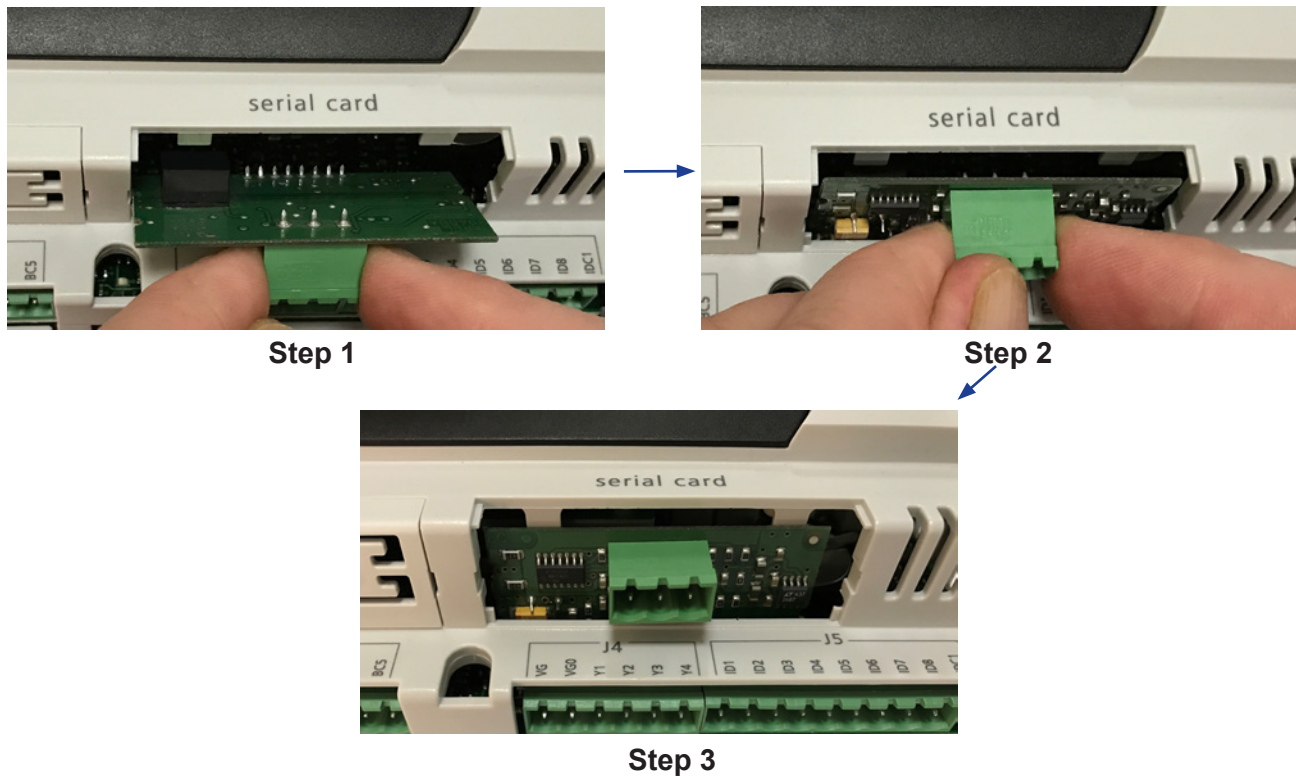


**NOTE:** This operation relies more on fitting the communication module into the connector than seeing the connectors mate.

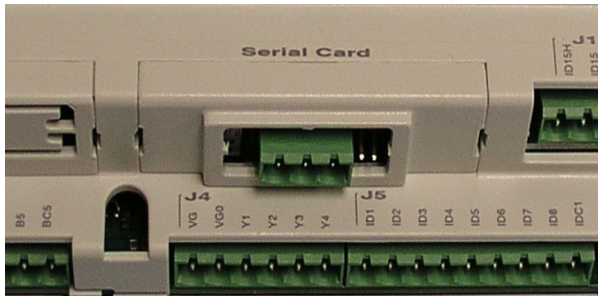
6. Insert the communication module, pointed up, into the slot. Keeping it *level*, roll the module into position as you guide it into the slot, feeling the connectors line up (Figure 8, Steps 1 and 2).
7. When you feel the connectors align, press the communication module into the plug. Verify that the module is firmly connected (Figure 8, Step 3).

8. Mount the plastic cover on the serial card slot. Slip the cover over the network connector plug (Figure 9).
9. Connect the communication module to the network (Figure 10 and Figure 11):
  - a. Route the network cable through the knockout and to the communication module.
  - b. Connect one wire of the network cable to Pin 2 of the connector plug.
  - c. Connect the other wire to Pin 3 of the connector plug. Note that no wire is connected to Pin 1 (GND).

Figure 8: Inserting the Modbus Communication Module



**Figure 9: Modbus Communication Module Cover**



## Replacing a Communication Module

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

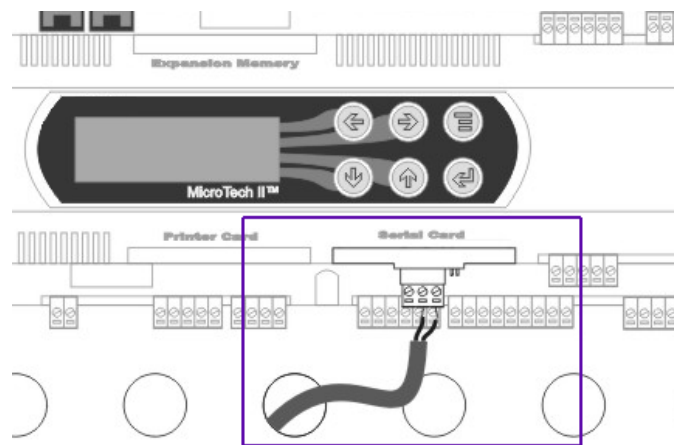
1. Remove power from the unit controller.
2. Locate the serial card slot on the unit controller (Figure 3).
3. Pull the network cable connector from the communication module.
4. Remove the cover from the serial card slot. Use a small screwdriver to carefully pry it off from one end (Figure 5 and Figure 6).
5. Grasp the communication module and carefully pull it from the unit controller.
6. Install the new communication module. Grasp the module, with the network connector on the underside. The 8-pin header must mate to the 8-pin plug in the unit controller. The plug has a guide on each end to direct it into the mating guide on the communication module header. Figure 7 shows the serial card slot with the 8-pin plug that mates to the header on the communication module.

**NOTE:** This operation relies more on fitting the communication module into the connector than seeing the connectors mate.

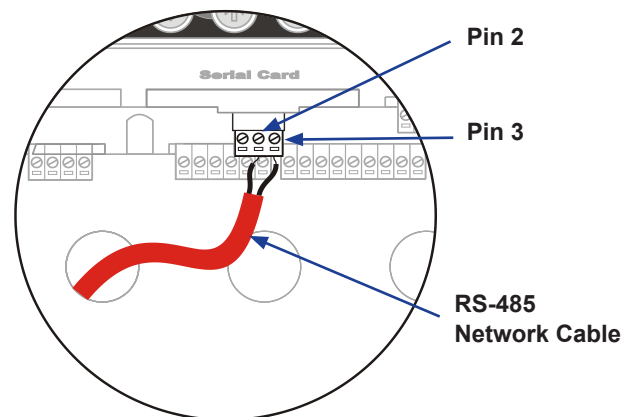
7. Insert the communication module, pointed up, into the slot. Keeping it *level*, roll the module into position as you guide it into the slot, feeling the connectors line up (Figure 8, Steps 1 and 2).
8. When you feel the connectors align, press the communication module into the connector. Verify that the communication module is firmly connected (Figure 8, Step 3).

9. Insert the plug-in connector to the communication module.
10. Replace the cover on the serial card slot. Slip the cover over the network connector plug (Figure 9).
11. Insert the network cable connector into the communication module.
12. Connect the communication module to the network (Figure 10 and Figure 11):
  - a. Connect one wire of the network cable to Pin 2 of the connector plug.
  - b. Connect the other wire to Pin 3 of the connector plug. Note that no wire is connected to Pin 1 (GND).

**Figure 10: Network Cable Routing and Connections**



**Figure 11: Network Connection Detail**





## Set up the Unit for Network Control

After the communication module has been installed, the next step is to configure the unit controller for network control. The BAS protocol must first be set to Modbus using either the MicroTech II chiller unit controller keypad/display or operator interface touch screen (OITS) as described below.

### Network Setup for Centrifugal Chillers

1. Disable the chiller. The chiller should not be operating while performing this procedure.
2. At the chiller unit controller keypad display:
  - a. Change the Set/Unit Setpoint menu Protocol = to Modbus.

**NOTE:** If using the OITS panel, in the SETPOINTS/MODE screen, set the #9 setpoint = to Modbus.

- b. Enter the password of "2001."
- c. As needed in the Set/Unit Setpoint menu, change Source = to Network.

**NOTE:** If using the OITS panel: as needed in the SETPOINTS/MODE screen, change the #3 setpoint, Control Source = to BAS.

3. Re-enable the chiller.
4. Verify that the chiller is operational from the BAS interface.

### Network Setup for all other Chillers

1. Disable the chiller. The chiller should not be operating while performing this procedure.
2. At the chiller unit controller keypad display:
  - a. Set the Protocol = to Modbus in the applicable menu screen.
  - b. Use [Table 1](#) to determine the operator password for the specific chiller model.
  - c. Enter the password.
3. As needed in the Set/Unit Setpoint menu, change Source = to Network.
4. Re-enable the chiller.
5. Verify that the chiller is operational from the BAS interface.

Once the BAS protocol has been set, proceed to the next section to set network addressing parameters.

**Table 1: Password Menu Screen**

Model	Menu Screen	Password
AGZ-A	12	2001
ACZ-A	6	2001
AGZ-B AGZ-C	9	2001
ACZ-B	7	2001
AGS-A AGS-B	12	8945
AGS-C	16	8453
AGS-D	17	8745
WGS	15	8745
WMC WSC WDC WCC WPV HSC HDC TSC	14	2001
WGZ/TGZ	10	2001

Note: Chiller models AGZ-A/B, ACZ-A/B, WGZ, and TGZ have a single unit controller. Models AGS-B/C and WGS have one unit controller with multiple circuit controllers. Unit settings for AGS-B/C and WGS models are adjusted from the unit controller.

## Modbus Network Addressing

This section describes Modbus network requirements, followed by instructions on how to configure the communication module for BAS integration.

### Modbus Network Considerations

#### Network Topology

The unit controller and communication module follow standard Modbus network rules. The network is a daisy-chain of Modbus 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 120 ohms. Follow the guidelines stated in the Modbus specifications ([www.Modbus.org](http://www.Modbus.org)).

#### Addressing and Establishing Communications

Valid slave nodes addresses are in the range of 0 – 247 decimal. The individual slave devices are assigned addresses in the range of 1 – 247. A master addresses a slave by placing the slave address in the address field of the message. When the slave returns its response, it places its own address in the response address field to let the master know which slave is responding. Address 0 is the broadcast address. When the address is 0, all slaves respond to the message.

Follow these steps to configure the required parameters for the communication module. Refer to [Table 2](#) for default values and acceptable ranges.

**NOTE:** The Network Address (ID or Ident Number), along with the baud rate, must be set before you can communicate on the Modbus network. Both parameters are only available in the unit controller keypad/display after the BAS protocol is set to Modbus.

From the unit controller Set/Unit Setpoint menu screen:

1. Set the Network Address (ID Number) to match the Network Address of the unit controller. The Network Address of the communication module (slave) must be unique in the network. Contact the system integrator for the desired Network Address.
2. Set the baud rate to the desired network data transmission speed. The baud rate must match the other slave devices on the network.

**Table 2: Network Parameters**

Parameter	Default/Range	Description
Network Address	0-247 Default: 1	The Modbus Address (i.e. ID or Ident Number) of the communication module. This must be unique throughout the entire network
Baud Rate	1200, 2400, 4800, 9600, 19200 Default: 19200	Data transfer speed (bps) of the Modbus network.

## Additional Modbus Configuration Parameters

The communication module and unit controller support a number of Modbus setpoints. After the unit controller has been set up for Modbus communication, the default values of these setpoints can be modified to enable control or monitoring of chiller operation via the network. The setpoints may be changed from the BAS or the unit controller.

Refer to the MicroTech II Chiller Unit Controller Operation Manual ([Reference Documents](#)) for menu options and instructions. The MicroTech II Chiller Modbus Protocol Information Document, ED 15063, provides descriptions of all network parameters for BAS integration ([www.DaikinApplied.com](http://www.DaikinApplied.com)).

## Troubleshooting

Follow these general procedures if you can control the MicroTech II chiller unit controller from the keypad/display, but are not able to communicate with the unit from the network:

### General

- Confirm that the communication module is inserted properly (see [Installation](#) section).
- Verify the unit controller is set up to communicate Modbus using the keypad/display. Refer to the [Network Configuration](#) section or the MicroTech II Chiller Unit Controller OM ([Reference Documents](#)) for details.

### Network Parameters

- Verify that the Network Address of the communication module (slave) is unique in the network. In contrast, the Baud Rate must match the other slave devices on the network.
- Make sure there are no duplicate devices on the network and that Network Address and Baud Rate are set correctly as shown in [Table 2](#).

### 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 19200 bps baud.
- Verify that polarity is maintained.
- Check that there are end-of-line termination resistors (120  $\Omega$ ) 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 3: Replacement Parts List**

Description		Part Number
MicroTech II Modbus Communication Module kit Kit includes: Modbus communication module (RS-485 serial network board), network connector, and IM 743		350147402
Network connector	Wago	330803003
	Phoenix (shown in <a href="#">Figure 12</a> )	910108485

**Figure 12: Phoenix Network Connector**



To find your local parts office, visit [www.DaikinApplied.com](http://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 equipment, its care should be a high priority. For training information on all Daikin HVAC products, please visit us at [www.DaikinApplied.com](http://www.DaikinApplied.com) and click on Training, or call 540-248-9646 and ask for the Training Department.

### ***Warranty***

All Daikin 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](http://www.DaikinApplied.com).

### ***Aftermarket Services***

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

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