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MicroTech II[®] Alerton[®] BACtalk[®] Integration Information for MicroTech II Applied Rooftop and Self-Contained Unit Controllers

Alerton BACtalk Building Automation System

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Revision History

ED 15080-1	June 5, 2002	Initial release
ED 15080-2	March 27, 2006	Changed default MS/TP MAX APDU length to 501 on p.4

Reference Documents

Company	Number	Title	Source
McQuay International	IM 703	MicroTech II® BACnet® Communication Module– BACnet/IP	www.mcquay.com
McQuay International	IM 704	MicroTech II BACnet Communication Module– MS/TP	www.mcquay.com
McQuay International	OM 137	MicroTech II Applied Rooftop Unit Controller– Discharge Air Control	www.mcquay.com
McQuay International	OM 138	MicroTech II Applied Rooftop Unit Controller– Space Comfort Control	www.mcquay.com
McQuay International	OM 711	MicroTech II Vertical Self-Contained Unit Controller-Discharge Air Control	www.mcquay.com
McQuay International	OM 712	MicroTech II Vertical Self-Contained Unit Controller-Space Comfort Control	www.mcquay.com
McQuay International	ED 15060	MicroTech II Protocol Information – Applied Rooftop	www.mcquay.com
McQuay International	ED 15061	MicroTech II Protocol Information – Vertical Self- Contained	www.mcquay.com
ASHRAE	ANSI/ASHRAE 135-2001	BACnet A Data Communication Protocol for Building Automation and Control Networks	www.ahsrae.org
Alerton®	LTBT-TM- Network	BACnet Networks with BACtalk® Products	www.alerton.com

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Introduction

This document contains the information you need to incorporate a MicroTech II[®] Unit Controller into an Alerton[®] Building Automation System. It includes configuration details and a list of the known integration issues.

Hardware and Software Requirements

- MicroTech II Applied Rooftop or Self-Contained Unit Controller
- BACnet[®] Communication Module: BACnet IP or BACnet MS/TP (factory or field-installed)
- Alerton BACtalk[®] for Windows[®] Workstation
- Alerton Controller (LSi or BTi)
- McQuay ServiceTools[™] for MicroTech II Applied Air Handling Unit Controllers (this software tool runs on PC with a Windows 98 second edition, Windows NT, or Windows 2000 operation system)

Connection

The MicroTech II unit controller is a third party BACnet device that must be physically wired into the BACnet network like any other Alerton device. McQuay provides communication over multiple BACnet data link layers by offering BACnet/IP or BACnet MS/TP daughter board communication modules that mount onto the main control board. Mounting and wiring instructions for the MicroTech II BACnet Communication Module can be found in the appropriate Installation Manual (IM703 or IM704). Follow the networking rules provided by Alerton to wire the MicroTech II device to the physical network.

Note: Alerton BACnet networks can communicate via BACnet IP, BACnet Ethernet, or BACnet MS/TP. However, McQuay MicroTech II Applied Rooftop or Self-Contained unit controllers communicate via BACnet IP or BACnet MS/TP only.

Communication

After the MicroTech II unit controller is physically connected to the BACnet network, the controller must be configured to communicate on the Alerton network. The network configuration properties of the controller are adjusted using McQuay ServiceTools for MicroTech II Applied Air Handling Unit Controllers (ServiceTools for AAHU). The configuration can be broken down into the following points:

1. Assign the Device Object Instance of the MicroTech II unit controller to be unique throughout the BACnet Network.
2. Set the Communications Option property of the MicroTech II unit controller Device Object.
3. Set the MAX_APDU_Length_Accepted property of the MicroTech II unit controller Device Object.
4. For BACnet/IP, set the following properties of the MicroTech II unit controller Device Object:
 - a. IP Address and IP Subnet Mask
 - b. UDP Port Number
 - c. IP Router Address
 - d. Network Address
5. For BACnet MS/TP, set the following properties of the MicroTech II unit controller Device Object:
 - a. MS/TP baud rate
 - b. MS/TP MAC address
 - c. MS/TP network address

Device Instance

The instance number of the Device Object of each device on the BACnet network must be unique to allow communication. The valid range for the device instance in a BACnet network is 0–4194303. The default device instance in a Rooftop unit controller is 10. The default device instance in a Self-Contained unit controller is 100. If you are integrating more than one unit controller (or if any other device already has device instance 10 or 100), you must change device instances before communication can occur.

Communication Option

MicroTech II unit controllers provide the option to communicate over two separate BACnet data link layers, BACnet/IP and BACnet MS/TP. The default is BACnet MS/TP. To change to the BACnet/IP communication option, use ServiceTools for AAHU and change the COMMUNICATION OPTION property of the device object from “MSTP” to “NONE”.

Note: After changing the communication option, perform an “archive” on the MicroTech II device. Follow the instructions provided in the ServiceTools for AAHU software.

MAX_APDU_Length_Accepted Property

The MAX_APDU_Length_Accepted property of the device object refers to the size of the data packet transferred over the network. Since MicroTech II devices can communicate over either BACnet/IP or BACnet MS/TP networks, there are two distinct settings for this property. The unit controller originally defaults to BACnet MS/TP, and the MAX_APDU_Length_Accepted property value is 501 (unless the unit controller is factory configured for BACnet IP). The MAX_APDU_Length_Accepted property value for BACnet/IP is 1024. This is the maximum value allowed for BACnet/IP networks.

In order to switch from BACnet MS/TP to BACnet/IP, the network parameter “Communication Option” must be reset. If you are changing from BACnet MS/TP to BACnet/IP, the Communication Option must be changed from “MS/TP” to “None.” When the Communication Option is changed, the MAX_APDU_Length_Accepted property value automatically switches from 501 to 1024. Alternatively, if you wish to switch from BACnet/IP to BACnet MS/TP, you must change the Communication Option from “None” to “MS/TP”. The MAX_APDU_Length_Accepted property value will automatically switch from 1024 to 501.

You can also change this value over the network with BACtalk® for Windows by writing to the MAX_APDU_Length_Accepted property of the Device Object.

Configuring for BACnet/IP Communication

IP Address and IP Subnet Mask

The IP Address and Subnet Mask work together to define the logical IP location of the MicroTech II device on the BACnet network. The IP Address (e.g., 172.16.162.8) is broken down into a network portion and a host portion. The Subnet Mask defines what makes up the network portion and what makes up the host portion of an IP Address.

The Subnet Mask is written as a “dotted quad” of decimal numbers (e.g., 255.255.0.0). These numbers must be thought of in binary form (e.g., 11111111.11111111.00000000.00000000). Now imagine overlaying the binary version of the Subnet Mask over the top of the binary version of the IP Address. Any portion of the IP Address that is overlaid by a “1” from the Subnet Mask goes in the network portion, and any portion overlaid by a “0” goes in the host portion of the IP Address. So, in our example using IP Address 172.16.162.8 and Subnet Mask 255.255.0.0, the network portion is 172.16 and the host portion is 162.8.

To achieve communication between two BACnet/IP devices on an Alerton network; the network portion of each IP Address must be exactly the same, the host portion of each IP Address must be unique, and the Subnet Masks must be the same. In our example, any Alerton device must have an IP Address that starts with 172.16 and a Subnet Mask of 255.255.0.0 to communicate with the MicroTech II device.

ServiceTools for AAHU may be used to change the IP Address and Subnet Mask to integrate the MicroTech II device into an existing office Ethernet network or an established dedicated BACnet/IP Ethernet network.

UDP Port Number

The default UDP Port Number in the MicroTech II Unit Controller is 47808. This default value may be changed using ServiceTools but normally is not unless there are multiple IP subnets on the BACnet network.

IP Router Address

The IP Router Address to enter into the MicroTech II Device Object is the IP address of the LAN IP router. This router address is used to send and receive dedicated (non-broadcast) messages through the IP cloud to and from BACnet devices on different LANs.

If the BACnet network consists of only devices on the LAN (i.e. no messages transmitted through an IP router) the value of the IP Router Address in the controller is irrelevant.

Whenever BACnet messages are routed from one LAN to another, a BACnet Broadcast Management Device (BBMD) is required. The MicroTech II device does not function as a BBMD. The Alerton LSi/BTi is used as the BBMD.

Network Address

The network address of the MicroTech II device should be set the same as the BACnet Network Number of the BACtalk Workstation and the Virtual Network number of the LSi. MicroTech II devices on the same BACnet network segment (all Ethernet segments of the WAN) should have the same Network Address. The default network address is 1001.

Note that this is not the Ethernet network number in BACtalk. MicroTech II applied rooftop or self-contained unit controllers do not have a property equivalent to BACtalk Ethernet network number.

Configuring for BACnet MS/TP Communication

MS/TP Baud Rate

MicroTech II devices accept MS/TP communication at 9600, 19200, and 38400 bps. The default baud rate is 19200. The baud rate in the MicroTech II device must be set the same as the MS/TP baud rate in the LSi/BTi (and all other devices on the BACnet MS/TP segment) or it cannot communicate.

The default MS/TP baud rate of Alerton's LSi/BTi is 76800. This must be lowered when you integrate it with a MicroTech II device.

MS/TP MAC Address

The MS/TP MAC address of the MicroTech II device must be assigned to be unique within its BACnet MS/TP segment or communications are disrupted. The MAC address is set using the eight binary DIP switches located in the red switch rail on the BACnet MS/TP Communication Module mounted on the MicroTech II unit controller. After changing the DIP switch settings, power must be reset to the MicroTech II unit controller for the MAC address to change in the controller.

Each binary switch has an equivalent integer value as shown in the table below.

Binary Switch Number	1	2	3	4	5	6	7	8
Integer Value in Down Position	1	2	4	8	16	32	64	128

Add the integer values of all the down switches to produce the MAC address (e.g., MAC address 26 would be a result of binary switch 5, 4, and 2 set in the down position). The MAC address must be within the MS/TP master range of 0-127. If the MAC address is higher than 127 (i.e. DIP switch # 8 is down) the controller cannot communicate.

MS/TP Network Address

The MS/TP network address of the MicroTech II device should match that of the BACnet MS/TP segment in which it resides (Network # property in the MS/TP section of a LSi/BTi). The default MS/TP network address is 2001.

Data

Communication is achieved after the MicroTech II device responds to a device scan from the BACtalk for Windows server. After communication is achieved, the integrator can poll any Standard BACnet Object (e.g., Discharge Air Temperature) provided by the MicroTech II device for controlling the unit over the network. For a detailed description of these objects including object type and object instance, see the appropriate McQuay International Protocol Information (ED 15060 for Rooftop units and ED 15061 for Self-Contained units) available on www.mcquaybiz.com for McQuay sales representatives or www.mcquay.com for Alerton building automation systems integrator.

Integration History

Individual Alarms

MicroTech II Rooftop unit controllers use BACnet intrinsic reporting to distribute individual alarms through built in Notification Class Objects. There is currently a conflict between the message being sent from the MicroTech II unit controller and Alerton's equipment, resulting in the alarms not being displayed on the BACtalk workstation. This results in using the general (faults, problems, warnings) alarm clearing Binary Value objects which do not provide information on the individual alarm (e.g., smoke alarm).

Network Communications Interruptions Due To Broadcast Messages

The MicroTech II device repeatedly sends out two BACnet broadcast messages, WHO HAS "\$RS" and WHO HAS "Ethernet." These messages can cause Bsi/LSi controllers to reboot interrupting network communications due to the propagation of the broadcast through the network. These broadcast messages can cause problems on larger BACnet networks.

The application software introduced in April 2002 (v1.35 for rooftop units and v1.11 for self-contained units) fixes this issue. For unit controllers programmed earlier than March 2002, these broadcast messages can be stopped using a computer with McQuay's ServiceTools for AAHU software. Contact McQuay Controls Support Group at 1-866-4MCQUAY (462-7829) for instructions.

MS/TP Network Performance

MicroTech II Unit Controllers with firmware version 5.00 or earlier slow down the performance of a MS/TP network due to an improper response to a request that expects a reply. This issue was solved in firmware version 5.01 and higher. A unit controller with firmware version 5.01 sends a reply postponed frame, which advises the sender that MicroTech II Unit Controller will reply when it receives the token. This results in increased network speed and more efficient messaging.

This issue is known to affect networks with LSi controllers and multiple MicroTech II Unit Controllers; as more MicroTech II Unit Controllers are added to the network, communication fails. Also, properties such as outdoor air temperature cannot be transferred from the MicroTech II Unit Controller through an LSi/BTi to other BACnet devices until the upgrade to firmware version 5.01.

MS/TP MAC Addresses Can Not Be Sequential

MicroTech II Unit Controllers on MS/TP networks have shown communication problems if the MAC addresses are set to sequential numbers. For example, if two MicroTech II Unit Controllers had MAC addresses of 11 and 12, the BACtalk Workstation may not be able to read values from the unit with MAC address 11. Switching the MAC addresses on the two unit controllers to be 11 and 13 solves this communication problem.

The MAC address is a hardware value set on the BACnet MS/TP Communications Module. See MS/TP MAC Address on page 6.

This issue was resolved in firmware version 5.1 released in October 2002.