

MU10 Series

BACnet Communications Gateway for NT10 Series Networking Thermostats

General

The MU10 master unit is a BACnet gateway which routes communication traffic between BACnet MS/TP network and Mega Controls proprietary FLink network.

While the master unit communicates on a RS-485 network at its NET1 communication port using the BACnet MS/TP protocol, it can support up to 32 Mega Controls NT10 Series networking thermostats (slaves) on a RS-485 network at its NET2 communication port using Mega Controls proprietary FLink protocol.

A master unit has 2 addresses. NET 2 address is always 0 which is the address of the FLink network. NET 1 address is the address of the BACnet MS/TP network which is set up for a maximum of 32 nodes. The NET 1 address is set via DIP switches in the unit.

If more than 32 masters are needed in the system, additional system device is required for the second BACnet MS/TP network.

The master unit is serving the RS-485 repeater role, network management role and also some of the major data storage role such as fan coil unit energy consumption.



The system architecture is as follows:

- System device is a building level network.
- Master is an application level network.
- NT10 slaves are zone level networks.

Mounting

The master unit can be mounted directly on a panel with two screws

Specifications

Product Model Number	MU10-1	
Power Requirements	Voltage	22-28 V 50/60 Hz or 16-30 VDC
	Current	Maximum 200 mA
Technology	CPU	32-bit ARM at 44M Clock
	ROM	128 kB Flash
	RAM	64 kB SRAM and 8 kB ferroelectric RAM
NET 1 Communication Port	Physical	RS-485
	Baud Rate	Field selectable 9600, 19200, 38400 or 76,800 bps (Factory Set 76,800 bps)
	Protocol	BACnet MS/TP
	Indicators	Red LED for Data Receiving and Green LED for Data Transmitting
	Device Address	Set via DIP Switches
	Maximum Number	32 Master Units in One BACnet MS/TP Network
	Service Supported Objects Supported	Who Is, Read Property, Read Property Multiples, Write Property Device, Analog Input, Analog Value, Analog Output, Digital Input, Digital Value, Digital Output, Multi-state Input, Multi-state Value, Multi-state
NET 2 Communication Port	Physical	RS-485 with Opto-coupler Isolation
	Baud Rate	19,200 bps
	Protocol	Mega Controls FLink
	Indicators	Red LED for Data Receiving and Green LED for Data Transmitting
	Device Address	Always 0
	Maximum Number	32 Slaves in One FLink Network
Ambient/Storage Temperature Limits	0 to 55 °C / -30 to 50 °C, 10 to 90% RH Non-condensing	
Wiring Class	Class II for 24 VAC Power Supply	
Power Wire & Connections	Removable Terminal Blocks, Wire Size 1 mm ² or 18 AWG Solid Copper Recommended	
Communication Wire & Connections	Removable Terminal Blocks, Balanced 100 to 120 Ω nominal Impedance Twisted Shielded Pair (TSP) Cable	
Shipping Weight	0.25 kg (1 lb)	
Dimensions	90 x 116 x 40 mm (W x L x D)	

*The performance specifications above are nominal and subject to tolerances and application variables of generally acceptable industry standards.
The manufacturer shall not be liable for damages resulting from misapplication or misuse of its products.*

Function Description

Fixed system setting objects

There are 2 fixed objects for system setup defined as:

Name	Type	Instance Number	Read/Write	Priority Array
*** Sys Select	AV	1	R/W	None
*** Sys Value	AV	2	R	None

Note: System setting can be changed by writing value to *** Sys Select.

Write Value	Description
2000	Clear all consumption accumulation objects. Enter a restart command 3003 followed by a clear all consumption accumulation objects command 2000.
2012	Change all descriptions to CHINESE. New setting will take effect after entering a restart command 3003 followed by reloading descriptors at the NT Manager.
2014	Change all descriptions to ENGLISH. New setting will take effect after entering a restart command 3003 followed by reloading descriptors at the NT Manager.
3002	Set all coefficient objects to default values
3003	Restart
2004	Set device ID. This is a two-step operation: after writing 2004 to ***Sys Select, wait until *** Sys Value changes to -1, then write an integer 'n' (where $0 < n < 256$) to ***Sys Select. Assuming the DIP switches' address is 'm', the device ID is 'n x 100 + m'. New setting will take effect after entering a restart command 3003.

Fixed Coefficient Objects

Name	Type	Instance Number	Read/Write	Priority Array
Coefficient - medium speed cooling	AV	331	R/W	None
Coefficient - medium speed heating	AV	332	R/W	None
Coefficient - low speed cooling	AV	333	R/W	None
Coefficient - low speed heating	AV	334	R/W	None

Dynamic Created Objects

MU10 spontaneously detects a NT10 slave that goes online in its NET 2 network and automatically creates 10 objects associated with this NT10 slave's address. When this NT10 slave goes offline, these objects will be automatically deleted.

If the NT10's address is [nn], its associated objects are:

Name	Type	Instance Number	Read/Write	Priority Array
#[nn]FCU - heating capacity	AV	[nn]x10+1	R/W	None
#[nn]FCU - cooling capacity	AV	[nn]x10+2	R/W	None
#[nn]FCU - consumption accumulation	AV	[nn]x10+3	R	None
#[nn]FCU - temperature setting	AO	[nn]x10+1	R/W	Yes
#[nn]FCU - room temperature	AV	[nn]x10+4	R	None
#[nn]FCU - control mode	MO	[nn]x10+1	R/W	Yes
#[nn]FCU - fan speed	MO	[nn]x10+2	R/W	Yes
#[nn]FCU - temperature engineering unit	BV	[nn]x10+1	R	None
#[nn]FCU - user status	BV	[nn]x10+2	R	None
#[nn]FCU - operation mode	BO	[nn]x10+1	R/W	Yes
#[nn]FCU - binary input	BI	[nn]x10+1	R	None

Energy Consumption Calculation

The calculation associates with 2 parameters P1 and P2 and 1 time element, where P1 is the coefficient of working status and P2 is the fan coil unit's cooling or heating capacity.

P1 Equals to	When			
	Operation Mode	Control Mode	Fan Speed	Valve
1	Run	Cooling	High	Open
1	Run	Heating	High	Open
0	Run	Ventilation	High	*
0	Run	*	High	Closed
Coefficient - medium speed cooling	Run	Cooling	Medium	Open
Coefficient - medium speed heating	Run	Heating	Medium	Open
0	Run	Ventilation	Medium	*
0	Run	*	Medium	Closed
Coefficient - low speed cooling	Run	Cooling	Low	Open
Coefficient - low speed heating	Run	Heating	Low	Open
0	Run	Ventilation	Low	*
0	Run	*	Low	Closed
0	Stop	*	*	*

* = Don't care.

If a NT10 slave's address is [nn], P2 = #[nn]FCU's cooling capacity or heating capacity.

The formula of energy consumption stored in #[nn]FCU's consumption accumulation is:

$$\int_0^t P1 \times P2 \, dt$$

Where t is the number of hours elapsed since MU10 is first powered on. It is a floating number and its precision can be up to 1 ms.

Data Storage

All coefficient associated objects and consumption accumulation associated objects are stored in the ferroelectric RAM and its non-volatile RAM. These objects will be kept for 10 years when power is turned off.

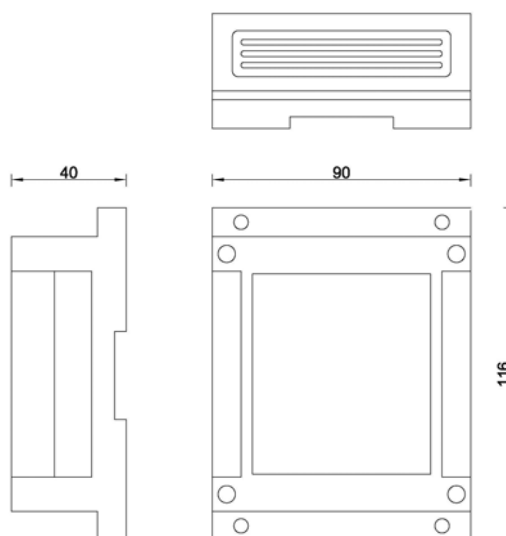
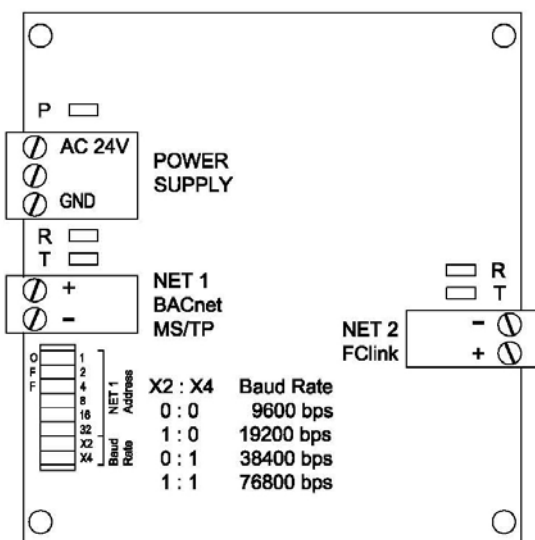
Network & Cabling Requirements

To ensure network stability and reliable communications, particularly at high speeds on a BACnet MS/TP network for a number of devices, it is imperative that the following network and cabling requirements are adhered to:

Item	Description
Cabling	For BACnet MS/TP and FLink networks, it is recommended to use networking cabling that matches the following specifications: <ul style="list-style-type: none"> Balanced 100 to 120 ohms nominal impedance, 22 or 24 AWG Twisted Shielded Pair (TSP) Cable Nominal capacitance of 52 pF/m or lower Nominal velocity of propagation of 66% or higher
Topology	Ensure the MS/TP or FLink network cable is installed as a daisy chain from one device to the next.
Maximum Nodes	The maximum number of devices per MS/TP or FLink network without any repeaters is 32.
Terminator	A terminator of 120-ohm impedance must be installed at each end of each MS/TP or FLink network segment, or two per MS/TP or FLink network. Ensure that this requirement is not overlooked in laying out the network architecture and ordering product.
Repeater	A repeater is not necessary unless MS/TP or FLink network is extended beyond 1,000 m.

Termination Diagram

Dimensions in mm



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