Act Net

User Guide

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Important changes are listed in **Document revision history** at the end of this document.

Contents

What is Act Net?

The Actuator Network or Act Net is a communication protocol between a controller and a network of smart actuators. Act Net allows for information such as address, position, and speed to be transmitted to and from a controller. The Act Net bus is limited to 8 smart actuators.

Act Net Terminology

Term	Definition
Adaptation	• Adaptation is the process of learning the physical end positions of actuators or valves, measuring the force required to move them, and identifying any resistance encountered. • This allows the actuator to optimize its performance for energy efficiency and precise control. • Treat as Self Calibration and compensation for Wear and Tear. • Over time, the components of an HVAC system can experience wear and tear, which may alter their operating characteristics. • Adaptation helps the actuator to continuously adjust and recalibrate itself to maintain optimal performance despite these changes.
Sync	Sync is the process of aligning the actuator's position with the control signal, ensuring that the actuator's actual position matches the position commanded by the control system. This is crucial for precise control of the HVAC system.
Power on adaptation	When the actuator or valve is powered on, it performs an automatic calibration (adaptation) to determine the physical end positions, measure the force required to move, and identify any resistance encountered.
Delayed power on adaptation in VAV system under AHU	Delayed power on adaptation in a VAV system under an AHU is a feature that postpones the automatic calibration process until after a specified delay period following power restoration. This allows the system to stabilize and ensures that all VAVs do not close simultaneously, which helps avoid a static pressure increase in the duct. The delay is calculated based on the last octet of the controller's IP address in BACnet IP-based controllers.
Target position and current position in actuator or valve	• The target position is the desired or commanded position to which the actuator or valve should move. This position is set by the control system based on the operational requirements of the HVAC system. • The current position is the actual, real-time position of the actuator or valve at any given moment. This is where the actuator or valve is physically located within its range of motion. • The control system continuously adjusts the actuator to minimize the difference between these two positions for precise and efficient operation.

Wiring devices to the Act Net port

Supports a combination of up to 8 Act Net addresses, as follows:

- Smart Valve - one address

- Actuator - one address

- ZASF-A - occupies Act Net address 2 and 3

Act Net devices

- Require a class 2 power source (24 Vac +/- 20% or 24 Vdc +/- 10%)

- Cannot be powered by a 24 Vac transformer

⚠️ **CAUTIONS**

- If the power source for the Act Net devices require a connection to earth ground, you must place it in the same control panel as the controller, so that it shares a common earth ground reference, thereby reducing the potential for ground loops.

- A remote Act Net power source, installed near the Act Net devices, should be floating (no local connection to earth ground).

The controller provides an orange, three-pin removable screw terminal connector for the Act Net port. See example below:

Ground (Black)
Data line (Orange or white)
No connection (Red)
Wire junction for Act Net power
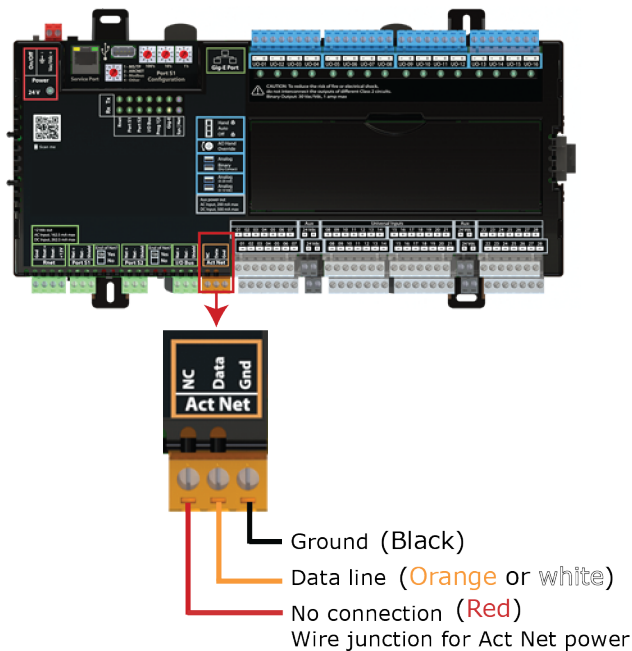
The Act Net port's **NC** (not connected) terminal does not connect to any internal circuitry. It is strictly for terminating wires in a daisy chain bus configuration.

NOTE   Be careful to wire the Act Net port terminals on the controller to the matching terminal on the supported device. They may not be in the same order. See example below.
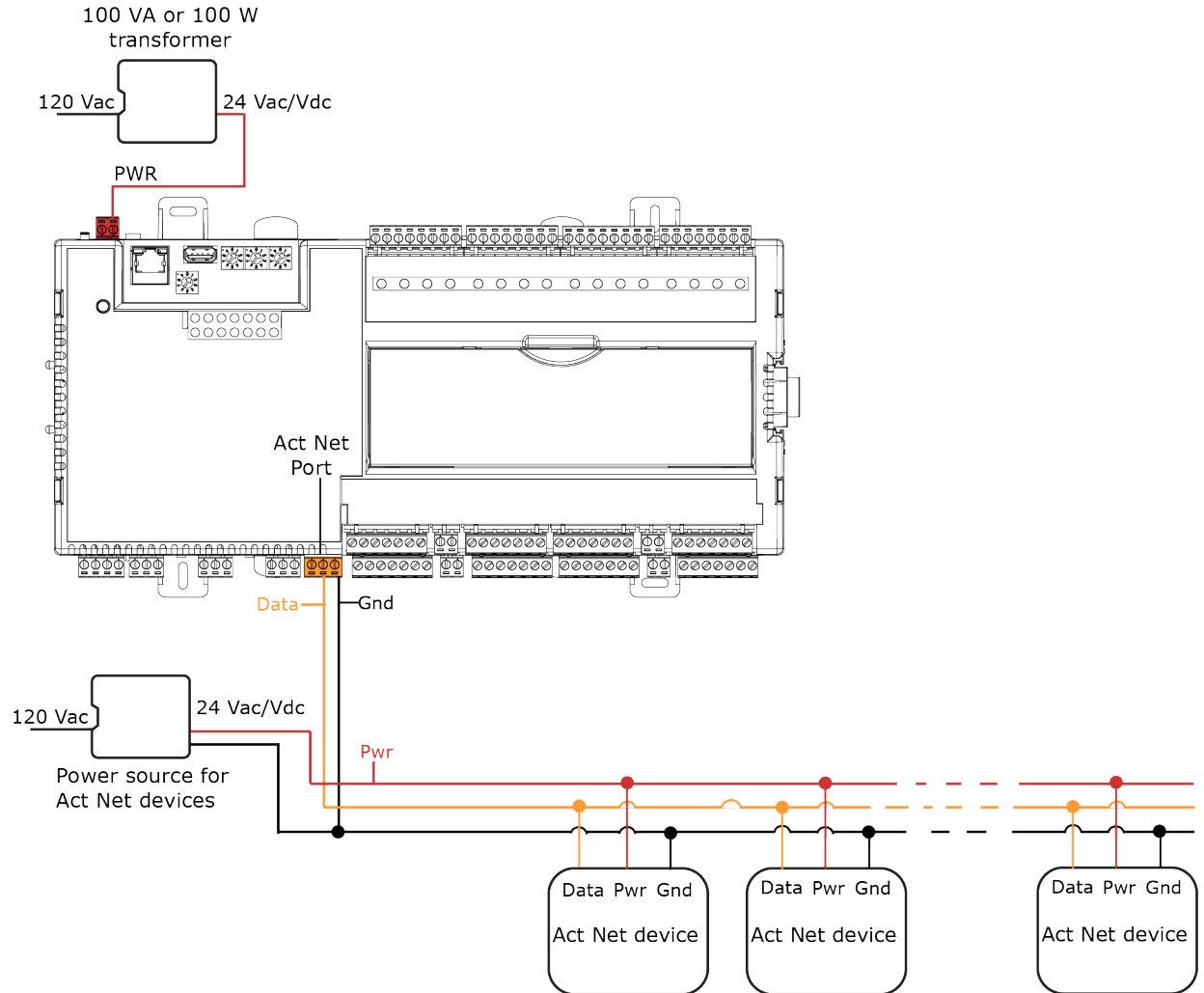
Act Net communication to the Act Net devices on a bus has a maximum length of 300 feet (91.44 meters). The bus should be wired with copper conductors of an appropriate size (18 AWG or larger) to compensate for voltage drop and ensure that bus voltage does not drop below 19.2 Vac or 21.6 Vdc.

Devices compatible with Act Net

The following devices are natively compatible on the Act Net Bus.

Safeties	Type	Damper	Valve and Actuator
Fail Safe	Spring Return	AFB	AFRB
		LF	LF
			TFRB
Fail Safe	Electronic	GKRB	-
		GKB	
Non Fail Safe	Non Spring Return	AMB	LMB
		GMB	ARB
		LMB	GRB
			LRB

Type	Valves and Actuators
ZoneTight	CQK24-MPL
	CQ-04-A

Torque Ratings for Compatible Devices

Actuator Type	Torque Rating	Damper	Valve
AFB	180 in-lb (20 Nm)	x	-
AFRB	180 in-lb (20 Nm)		x
AMB	180 in-lb (20 Nm)	x	-
ARB	180 in-lb (20 Nm)		x
GKB	360 in-lb (40 Nm)	x	-
GKRB	360 in-lb (40 Nm)	-	x
GMB	360 in-lb (40 Nm)	x	-
GRB	360 in-lb (40 Nm)	-	x
LF	35 in-lb (4 Nm)	x	x
LMB	45 in-lb (5 Nm)	x	-
LRB	45 in-lb (5 Nm)	-	x

Controlling and Monitoring of Current Position using Act Net

To monitor and control actuators

To monitor and control Act Net devices (actuators and valves) add BACnet Analog Input (AI), Binary Input (BI), Binary Output (BO), and Analog Output (AO) microblocks to the control program as needed. This enables you to view and control:

- Current Position

- Target Position

- Communication status

- Adaptation/Sync control/status

To configure Act Net

ActNet can be configured in the control program using either primary microblocks or airflow microblocks.

1 For controllers that have an onboard actuator and support ZASF, the Act Net device addresses 1, 2, and 3 are reserved. These addresses represent the Onboard actuator, ZASF actuator, and ZASF flow sensor, respectively. In these variants, Act Net device addresses 1, 2, and 3 can be configured using the Airflow microblock. Act Net device addresses 4 through 8 can be configured using primary microblocks.

2 For the other variants that support Act Net (Integrated Controllers and Zone Controllers with no ZASF and onboard actuator), Act Net device addresses 1 through 8 can be configured only using primary blocks.

NOTES

○ If the actuator is not configured in either airflow or primary microblocks, the status of the actuator in the driver page shows "Not used in Control Program".

○ In VAV and Zone Controllers with airflow, Act Net device addresses 1, 2, and 3 can be configured using both Airflow and primary microblocks.

○ In Zone Controllers with no ZASF connected, Act Net device addresses 1, 2, and 3 are not reserved. 1 and 2 can be configured using primary microblocks. But 3 is blocked and can not be configured for standalone actuator/valve. It is only reserved for ZASF flow sensor.

○ In Zone Controllers with no ZASF connected, Act Net device addresses 1, 2, and 3 are not reserved. 1 and 2 can be configured using primary microblocks, but 3 is blocked and can not be configured for standalone actuator/valve. Its only reserved for ZASF flow sensor.

To control and monitor the actuator using Primary microblocks (AI, BI, AO, BO)

Status / Attribute type	Microblock type	Expander number : Channel number	I/O type	Range	Description
Current position	AI	ACT ID (1 to8) : 1	ActNet	0 to 100%	The current position of the actuator
Communication status	BI	ACT ID (1 to8) : 2	ActNet	True or False	TRUE : Communication is active FALSE : No communication with device
Adaptation / Sync status	BI	ACT ID (1 to8) : 3	ActNet	True or False	TRUE : Adaptation/Sync is in progress FALSE: Adaptation/Sync is not in progress
Transit Time	AI	ACT ID (1 to8) : 4	ActNet	Based on device type	The run time of the actuator to move from one physical end to another MPL based actuators : 30s (high speed) - 150s (Normal speed) MFT based actuators: 90s (high speed) - Pre-Programmed value at Factory
Target Position	AO	ACT ID (1 to8) : 1	ActNet	0 to 100%	The target position of the actuator
Speed	BO	ACT ID (1 to8) : 2	ActNet	True or False	TRUE : Force the actuator to move in High speed FALSE: Normal speed
Adaptation control	BO	ACT ID (1 to8): 3	ActNet	True or False	TRUE : Issue Adaptation Command The input goes inactive/OFF once Adaptation status is TRUE
Sync control	BO	ACT ID (1 to8) : 4	ActNet	True or False	TRUE : Issue Sync Command The input goes inactive/OFF once Sync status is TRUE

NOTE The AO microblock with Device ID and Act Net is required so the device ID is configured in the bus, the driver page shows "Normal Operation", and Communication status as TRUE.

To control and monitor ID1, ID2, ID3 actuators in Airflow microblock

Flow Sensor	Damper Actuator	Description
Integral-onboard	Integral-onboard	configured as ID1 and reserved for onboard actuator
Integral-remote	Integral -remote	configured as ID2 and ID3 and reserved for ZASF device

Act Net Bus driver page

Act Net Bus Status: Provides current details of Act Net devices addresses 1 to 8 connected to Act net port

Act Net Bus Manual Configuration: Provides an option to change address of the actuator manually by entering the serial number and description using the **Edit** option

Act Net Bus Auto Configuration: Provides the option to obtain details of the actuator, such as the serial number and current address, by triggering an event on the actuator or valves. This allows you to manually set the desired address of the actuator. It also provides the option to automatically configure addresses via the module firmware.

Act Net Bus status

An Act Net device that is physically connected to the controller is automatically identified and the serial number and current status are displayed on the **Act Net Bus** page.

NOTE   You can edit the address and description on this page. Applying changes can take up to 20 seconds to complete.

Act Net Bus Status	This table shows devices connected to the Act Net port. All fields are read-only.	
Device Address	Act Net device address (1 to 8). The same address is used as exp# in the microblock configuration with the input/output number for all Act Net devices set to 1.	
Device Description	This text is editable in the **Act Net Bus Manual Configuration** table below.	
Serial Number	The serial number of the Act Net device. This number is printed on a label on the device.	
Device Status	Displays the current status of the device	
	Possible statuses	**Description**
	Normal Operation	Successful communication
	No Communication with the device	Controller has lost communication with the Act Net device
	Duplicate Address on the network	More than one device has the same Device Address.
	Unsupported Device Type	Device is not recognized or unsupported Act Net device
	Act Net Wiring Error	Loopback error on Act Net bus, possibly caused by wiring problem or hardware failure.
	Not Yet Discovered	Not detected by module or not in bus, but is configured in the control program
	Not used in Control Program	Not configured in control program Serial number is blank if the device is not connected to the bus Serial number present if the device is connected to bus and detected by module firmware

Act Net Bus Manual Configuration

Act Net Bus Manual Configuration	This page shows devices connected to the Act Net port, and allows you to edit the description and addressing of the device using the serial number. It can be auto-populated if the device is connected to the bus, or entered manually in the editable serial number field.
Current Address	Bus address of the Act Net device
Device Description	Edit the name if needed. Applying changes can take up to 20 seconds to appear.
Serial Number	Serial Number of the device corresponds to Current Address in the same row. This field is read-only if the corresponding device is in communication, otherwise becomes editable so that user can enter the serial number manually (can be found as a label on the actuator).
New Device Address	Select a new bus address from the drop-down list.
Configuration Status	Once all changes are accepted, after applying changes this fields shows success or fail statuses.

	Possible statuses	**Description**
	Success	Address selection successful. It may take a few seconds to update in the status table. Refresh the page to see the updated status table.
	In Progress	This string appears after accepting the changes and before success or fail messages appear. This message may not always appear due to data refresh rate.
	Invalid serial number format	A serial number that was entered manually has an invalid format. Correct format example: `01647-20212-250-160`.
	Device not found	Serial number format is valid, but the device with the number cannot be located
	Select unused address	If the **New Device Address** is a duplicate, select an unused address from the drop-down list. To update the table, click **Accept** after every change.
	Unknown Error	Firmware or bus error.
	Reserved Device address change not allowed	This string appears after accepting changes when attempting to chage addresses 1, 2, or 3 to other addresses on VAV models. This is not applicable to OF1628 and equivalent variants.

To manually de-address

1 Select '0' from **New Device Address**.

2 Click **Accept**.

3 That address is not free to use.

Act Net Bus Auto Configuration

Act Net Bus Auto Configuration	This table allows you to enable OnEvent mode communication. OnEvent allows you to obtain details of the actuator by triggering an event on the actuator or valves. You can then manually set the address of the actuator. It also provides an option to automatically configure addresses via the module firmware. Once the event is triggered on the ACTnet device, specific device information (serial number and current address) is populated in the table. The ACTnet device's movement can also be observed when the event is detected by the module firmware. You can then change the address using **New Device Address** in that row. On success, the current address is updated to reflect the changed address.
Current Address	Bus address of the Act Net device
Serial Number	Serial number of the Act Net device where the event is.
New Device Address	Select a new bus address from the drop-down list.
Configuration Status	Once all changes are accepted, after applying changes this fields shows success or fail statuses.

	Possible statuses	**Description**
	Success	Address selection successful. It may take a few seconds to update in the status table. Refresh the page to see the updated status table.
	In Progress	This string appears after accepting the changes and before success or fail messages appear. This message may not always appear due to data refresh rate.
	Invalid serial number format	A serial number that was entered manually has an invalid format. Correct format example: `01647-20212-250-160`.
	Device not found	Serial number format is valid, but the device with the number cannot be located
	Select unused address	If the **New Device Address** is a duplicate, select an unused address from the drop-down list. To update the table, click **Accept** after every change.
	Unknown Error	Firmware or bus error.
	Reserved Device address change not allowed	This string appears after accepting changes when attempting to chage addresses 1, 2, or 3 to other addresses on VAV models. This is not applicable to OF1628 and equivalent variants.

There are two options for addressing with OnEvent:

- **OnEvent Manual Addressing**

- **OnEvent Auto Addressing**

OnEvent Manual Addressing

This mode retrieves the serial number and address information by triggering an event on the actuator. The information received is then populated in the table. Using this data, you can manually assign an address by selecting from **New Device Address**. Additionally, the movement of the ACTnet device can be observed when the event is detected.

NOTE   **OnEvent** is automatically disabled after 5 minutes, but you can also disable it manually by clicking the checkbox. Once disabled, only the status updates are reflected in the **Act Net Bus Status** table.

1   Check **Enable OnEvent** and ensure that **Auto Addressing** is unchecked in the **Act Net Bus Auto Configuration** table.

2   Click **Accept**.

3   Trigger OnEvent.

4   The serial number appears with the current address.

5   Select a **New Device Address**.

6   Click **Accept**.

7   Verify the updates appear in **Configuration Status**.

Model/Type	Failsafe	Technology	Front Buttons/Lights	OnEvent Support	OnEvent Trigger
AFB24-MFT	Spring	MFT	-	yes	Direction Control (toggle)
AFRB24-MFT	Spring	MFT		yes	Direction Control (toggle)
AMB24-MPL	-	MFT	-	yes	TBD
ARB24-MPL	-	MFT	-	yes	TBD
GKB24-MFT	Supercap	MFT	Adapt:Status	yes	Status button
GKRB24-MFT	Supercap	MFT	Adapt:Status	yes	Status button
GMB24-MFT	-	MFT	Adapt:Status	yes	Status button
GRB24-MFT	-	MFT	Adapt:Status	yes	Status button
LF24-MFT	Spring	MFT	-	yes	Direction Control (toggle)
LRB24-MFT	-	MFT	Adapt:Status	yes	Status button
LMB24-MPL	-	MFT	-	yes	Gear Release
TFRB24-MFT	Spring	MFT	-		Reversing Switch
CKQ24-MPL	Supercap	MPL	Adapt:Address	yes	Address Button
CQ-04-A	-	MPL	Adapt:ActNetStatus	yes	ActNetStatus

OnEvent Auto Addressing

This mode retrieves serial number and address information by triggering an event on the actuator and then automatically assigns an available address from the bus. You can check the configuration status to verify success. If successful, the new address appears in the current address field. The Act Net device's movement can be observed when the event is detected by the module firmware.

NOTE Both checkboxes automatically disable after 5 minutes, you can disable them manually by clicking them. Once disabled, only the status updates in the **Act Net Bus Status** table.

1 Select both **Enable OnEvent** and **Auto Addressing**.

2 Click **Accept**.

3 Trigger on event on the Act Net device as described in *OnEvent Manual Addressing* (page 11).

4 The serial number appears on the screen with a current address (if it already has an address) and assigns addresses automatically with available address in the bus.

5 The address is set automatically for the device. Verify the updates appear in **Configuration Status**.

   NOTES

- If the device has on-board actuators the address 1, 2, and 3 are reserved. Addressing must start from 4.

- The addresses already used in the bus are not assigned.

- If reheat valves are in the bus then address 4 and 5 are also reserved. Addresses must start from 6 in this instance.

To de-address an Act Net device

Option 1: Using Act Net Manual configuration

1 Identify the row of the device to be de-addressed.

2 Set **New Address** to "0" and click **Accept**.

3 Refresh the page.

4 Verify the configuration was successful. The serial number in that row is now editable.
   or
   Verify that the status table shows no communication with the device.

Option2: Unsing OnEvent Manual addressing

1 On the **Act Net Bus Auto configuration** table select enable **OnEvent** and uncheck **Auto addressing**.

2 Trigger an event on the Act Net device.

3 Locate the entry with the serial number, and set **New Device Address** to "0".

4 Click **Accept**.

5 Verify the configuration was successful. The current address should now be "0".

Troubleshooting

To resolve duplicate addresses on Act Net bus

When devices display the error **Duplicate Address on the network**, you can use either of the following methods to resolve the problem.

- Method 1: Using the **Act Net Bus Manual Configuration**.
    1. For each duplicate device, enter the **Serial Number**, which you can find on a sticker on the device.
    2. Select a **New Device Address**.
    3. Click **Accept**.
    4. Verify that there are no longer any **Duplicate Address on the network** errors.

- Method 2: Reinstalling the devices
    1. Remove all duplicate devices from the bus.
    2. Connect one of the removed devices and wait for the **Act Net Bus Status** table to update.
    3. Chose a unique address for the new device and click **Accept**. Wait until the operation is successful.
    4. Repeat the steps 2 and 3 for the remainder of the removed devices.
    5. Verify that there are no longer **Duplicate Address on the network** errors.

- Method 3: OnEvent Manual addressing
    1. In the **Act Net bus Auto configuration** table select **Enable OnEvent**.
    2. Trigger OnEvent on devices one by one.
    3. Review the serial numbers of Act Net devices. Look for two rows with the same address.
    4. Select **New Address** to change the appropriate address, and then click **Accept**.
    5. Uncheck **Enable OnEvent**.
    6. Verify the status page no longer contains duplicate address.

Physical connection

For physical connection to the actuators, use the ZTH tool.

OnEvent Mode

To trigger the OnEvent mode when addressing the actuators, use the below table for reference.

Model/Type	Failsafe	Technology	Front Buttons/Lights	OnEvent Support	OnEvent Trigger
AFB24-MFT	Spring	MFT	-	yes	Direction Control (toggle)
AFRB24-MFT	Spring	MFT		yes	Direction Control (toggle)
AMB24-MPL	-	MFT	-	yes	TBD
ARB24-MPL	-	MFT	-	yes	TBD
GKB24-MFT	Supercap	MFT	Adapt:Status	yes	Status button
GKRB24-MFT	Supercap	MFT	Adapt:Status	yes	Status button
GMB24-MFT	-	MFT	Adapt:Status	yes	Status button
GRB24-MFT	-	MFT	Adapt:Status	yes	Status button
LF24-MFT	Spring	MFT	-	yes	Direction Control (toggle)
LRB24-MFT	-	MFT	Adapt:Status	yes	Status button
LMB24-MPL	-	MFT	-	yes	Gear Release
TFRB24-MFT	Spring	MFT	-		Reversing Switch
CKQ24-MPL	Supercap	MPL	Adapt:Address	yes	Address Button
CQ-O4-A	-	MPL	Adapt:ActNetStatus	yes	ActNetStatus

Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
		No updates yet	

* For internal use only