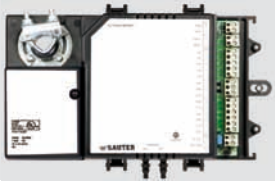
EY-RC415F001 VAV Application Specific Compact Variable Air Volume Controller
EY-RC415F002 Application Specific Compact Variable Air Volume Controller – Wireless EnOcean®
EY-RC416F001 Application Specific Variable Air Volume Controller
EY-RC416F002 Application Specific Variable Air Volume Controller – Wireless EnOcean®

en Guidelines for the electrician



Content

1 Product Description

This document describes the hardware installation procedures for the Application Specific Variable Air Volume Controller ecos16 and the Application Specific Compact Variable Air Volume ecos415 Controller. The SAUTER ecos Variable Air Volume Controller product line is designed to control various types of HVAC equipment such as baseboards, duct heaters, multi-stage heating and cooling systems, fans, valves, lights, etc.

These product lines are based on the LONWORKS® technology for peer-to-peer communication between controllers and are LONMARK® certified. This document describes the hardware installation procedures for the following controllers: EY-RC416F001, EY-RC416F002, EY-RC415F001 and EY-RC415F002.

- Unless otherwise indicated, the term VAV will be used in this document to represent all the models specified above.
- For more information on the specific layout and functionality of each controller, please refer to their individual datasheets and user guides.

2 General Installation Requirements

For proper installation and subsequent operation of the VAV controller, pay special attention to the following recommendations:

- Upon unpacking the product, inspect the contents of the carton for shipping damages. Do not install damaged controllers.
- Allow for proper clearance of controller enclosure, wiring terminals and service pin for easy access, hardware configuration and maintenance. Remember to record the Neuron® ID located on the side of the controller (in text and barcode format) for later commissioning.
- The controller is designed to operate under the following environmental conditions:
    - Ambient temperature from 0°C to 70°C
    - Relative humidity from 0% to 90%, non-condensing.
- Ensure proper ventilation of controller and avoid areas where corroding, deteriorating or explosive vapors, fumes or gases may be present. The controller must be oriented with the ventilation slots towards the top to permit proper heat dissipation.

Before the installation of a wireless controller, verify that local communication regulations allow the installation of wireless devices that operate at a frequency of 868.3MHz.

Take reasonable precautions to prevent electrostatic discharges to the controller when installing, servicing or operating the controller. Discharge accumulated static electricity by touching one's hand to a securely grounded object before working with this controller.

3 General Wiring Recommendations

⚠ WARNING **Danger of electrocution**
▶ Turn off power before any kind of servicing.

- All wiring must comply with electrical wiring diagrams as well as national and local electrical codes.
- To connect the wiring to the controller, use the terminal connectors. Use a small flat screwdriver to tighten the terminal connector screws once the wires have been inserted.
- Power type cables (i.e. for power, voltage and current inputs, as well as triac outputs) should be kept apart from other types of wiring to avoid any ambient noise transmission to other wires.
- The board connectors accept wires or flat cables ranging from 22 to 14AWG (0.644-1.630mm diameter) per pole. However, power cables must remain between 18 and 14AWG (1.024- 1.630mm diameter).
- Do not connect the universal inputs, analog/digital outputs or common terminals to earth or chassis ground (unless stated otherwise).
- The transformer powering the controller must be configured as a floating transformer (i.e. it should not be grounded).

4 Mounting Instructions

Each controller have been specially designed for easy installation. The integrated mounting bracket(s) on each controller have a hole diameter of 5mm and are designed to oppose the shaft torque. The controller can be mounted directly on an air duct or in a panel by using the integrated mounting bracket(s) and screw(s) that are provided with the controller.

1. Use the controller mounting bracket(s) to mark the location of any holes that need to be drilled.

2. Remove the controller and drill holes.

3. Clean the perforated surface, and fasten the controller using the appropriate screw types.

4. Ensure that the damper shaft is at least 40mm long to allow the damper bracket to fit securely around the damper shaft. If required, limit the maximum damper shaft rotation by modifying the position of the mechanical stops in 5º increments.

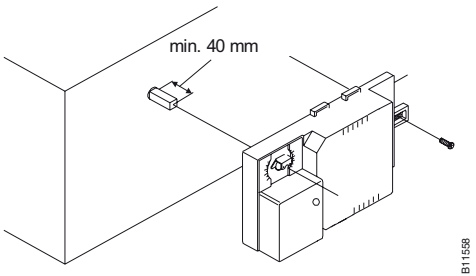


Fig. 1 Mounting a VAV controller on a damper shaft

5. To connect the high and low pressure sensors (Figure 6 and Figure 8), use flexible tubes with 6.4mm outside diameter and 4mm inside diameter.

5 Controller Dimensions & Components

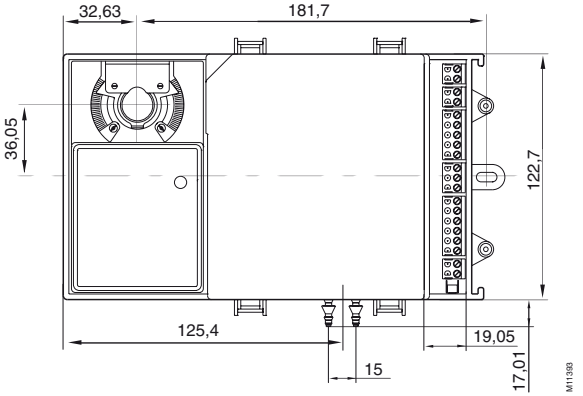


Fig. 2 ecos416 dimensions

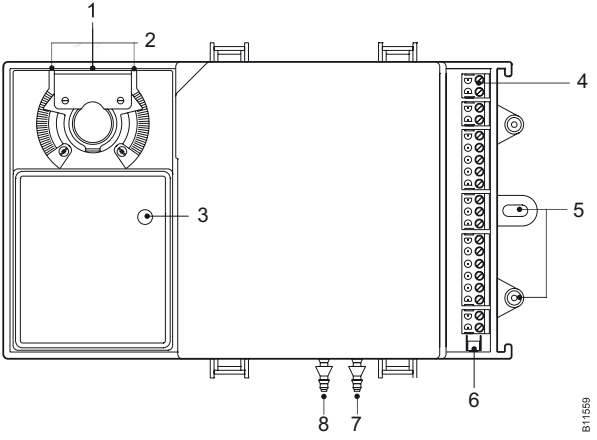


Fig. 3 ecos416 components

1	Opening for Damper Shaft
2	Mechanical Stops
3	Actuator Clutch for Manual Adjustment
4	Connectors
5	Integrated Mounting Brackets
6	Service Pin
7	Low Pressure Sensor Inputs
8	High Pressure Sensor Inputs

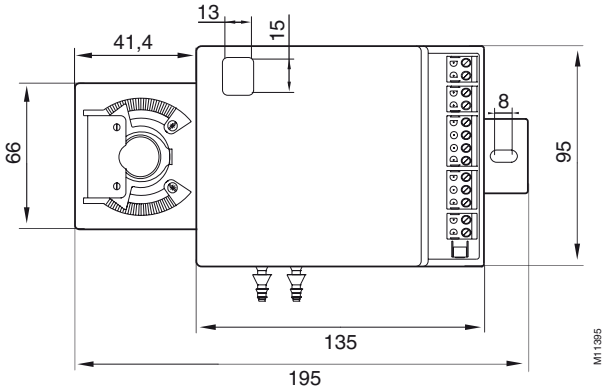


Fig. 4 ecos415 dimensions

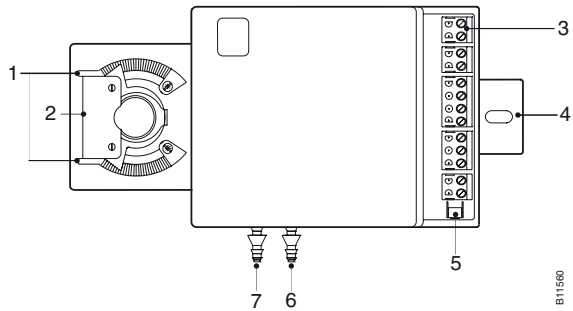


Fig. 5 ecos415 components

1	Mechanical Stops
2	Opening for Damper Shaft
3	Connectors
4	Integrated Mounting Brackets
5	Service Pin
6	Low Pressure Sensor Inputs
7	High Pressure Sensor Inputs

6 Power Wiring (connect SELV only)

Voltage: 24VAC/DC; ± 15%, from a power source with protection class II

Transformer for power supply as per EN 61558-2-6.

When powering one or multiple controllers, use the following method to calculate the power requirements of the required transformer:

- Add up the maximum power consumption of all controllers and multiply this sum by 1.3.
- If the resulting number is higher than 100VA, consider using multiple transformers.

Use an external fuse on the 24VAC side (secondary side) of the transformer, as shown in Figure 6, to protect all controllers against power line spikes.

Maintain consistent polarity when connecting controllers and devices to the transformer. That is, the COM terminal of each controller and each peripheral should be connected to the same terminal on the secondary side of the transformer.

NOTICE **Damage to equipment caused by short circuits**

The controllers are half-wave rectified. Connecting two half-wave power supplies to the same transformer without maintaining polarity will cause a short circuit.

► Installation should be carried out by a qualified technician.

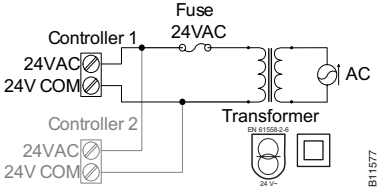


Fig. 6 Power wiring

NOTICE **Damage to equipment caused by short circuits**

The COM terminals of the controller are internally wired to the 24V COM terminal of the power supply. Therefore, if powering peripherals and controllers with the same transformer, it is essential to maintain polarity. Failure to do so will result in a short circuit and/or a damaged controller.

► Installation should be carried out by a qualified technician.

7 Input Wiring

Each controller has physical connections for inputs that are software configurable from within the controller's LNS® plug-in. Each input can be configured for digital, resistive, current or voltage signals. Input types must be configured properly in the software plug-in to ensure proper input readings.

NOTICE **Incorrect installation of field equipment**

- Before connecting any input equipment to the controller, refer to the installation guide of the equipment manufacturer.

7.1 Wiring Digital and Resistive 10kΩ Inputs

This input configuration is used to monitor digital dry contacts as well as 10kΩ potentiometers and 10kΩ NTC thermistors.

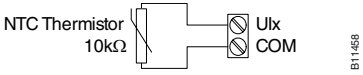


Fig. 7 10kΩ NTC Thermistor input

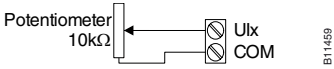


Fig. 8 10-kΩ-Potentiometer input

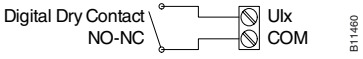


Fig. 9 Digital dry contact (NO & NC)

7.2 Resistive 1kΩ Inputs

This input configuration is used to monitor 1kΩ platinum RTDs.

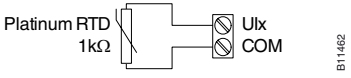


Fig. 10 1kΩ Platinum RTD input

7.3 Resistive PT100 Inputs

This input configuration is used to monitor PT100 platinum RTDs.

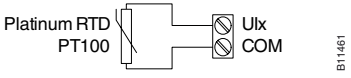


Fig. 11 PT100 Platinum RTD input

7.4 Wiring Current Inputs

Current inputs have a range of 4 to 20mA. Connect the current input according to the following figure if a 2-wire, 4-20mA transducer is being used.

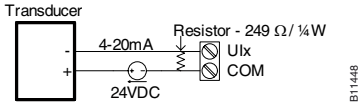


Fig. 12 Current input - 2-wire transducer

Connect the current input according to the following figure if the transducer is powered by its own power source.

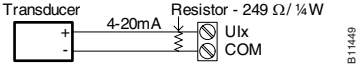


Fig. 13 Current input – Transducer with its own power source

7.5 Wiring Voltage Inputs

Voltage inputs have a range of 0 to 10VDC. Connect the voltage input according to the following figure.

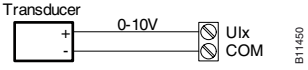


Fig. 14 Voltage input – Transducer with its own power source

8 Wiring of Room Units

Each VAV controller is compatible with the EY-RU481 line of standard room sensors. Each controller is also compatible with the EY-RU484F001, an advanced sensor with an LCD display and VAV balancing capabilities. Refer to the relating Hardware Installation Guides for wiring details.

9 Wireless Networking

The EY-RC416F002 and the EY-RC415F002 controllers are compatible with a wide selection of wireless devices including temperature sensors, duct sensors, window/door contacts and light switches. These devices are easy to install, highly adaptable and have no limitations as to the building materials to which they can be mounted.

Before connecting any wireless equipment to the controller, refer to the Wireless Battery-less Sensors and Switches Solutions Guide.

9.1 Mounting Instructions

When installing the wireless equipment it is important to ensure that distances and obstructions do not impede transmission. As a rule of thumb and in normal conditions, the

equipment will transmit over a distance of 30m in a normal office environment. Even under those conditions, it may be necessary to check actual transmission quality using a “field strength meter”. One such meter is the EPM100 field strength meter. This unit tests the actual transmission strength and the quality of the received data. Using this device will help select the most appropriate location for transmission.

The sensor mounting location should not be on the same wall or plane as the receiver, i.e. the wireless controller. Radio waves are rather subject to interfering leaks or reflections. Side or opposite walls are better locations.

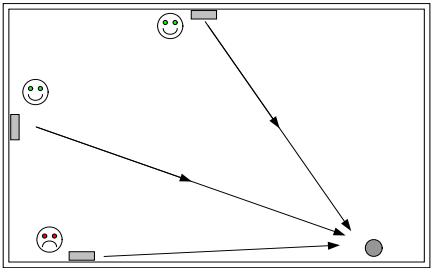


Fig. 15 Location of transmitters (wireless devices) relative to receiver (wireless controller)

Transmitter Receiver

The distance of the receiver to other unrelated transmitters (e.g. GSM / DECT / Wireless LAN / EnOcean® Transmitters) must be at least 2m.

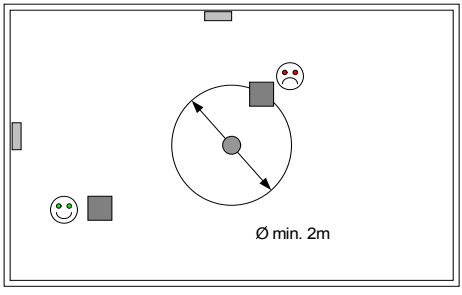


Fig. 16 Location of unrelated transmitters (wireless devices) relative to receiver (wireless controller)

Transmitter Receiver GSM, DECT, Wireless Lan or other transceiver

10 Output Wiring

The VAV controllers have physical connections for either digital or universal outputs, depending on the type and model. The power source type for digital outputs is hardware configurable and must be configured by changing the jumper settings on the printed circuit board. The universal outputs are software configurable.

NOTICE

Incorrect installation of field equipment

▶ Before connecting any output equipment to the controller, refer to the installation guide of the equipment manufacturer.

10.1 Wiring Digital Outputs

The digital outputs can be configured as either powered outputs or non-powered outputs and output wiring must be done accordingly.

- The non-powered output type does not have any voltage on the output terminals when the output is active. Power must be supplied externally.
- The powered output type has 24VAC on the output terminals when the output is active. Power is therefore supplied internally by the controller.

NOTICE

It should be noted that all controllers are shipped with all digital outputs configured as powered outputs. Maximum output current for all digital outputs (whether powered or non-powered) is 1A.

DO1 and DO2 share the same C1-2 common terminal and are controlled by a single jumper and must therefore be set identically. Similarly, DO3 and DO4 (EY-RC416 product line) share the same C3-4 common terminal and are controlled by a single jumper and must therefore be set identically. The jumpers are used to specify whether an internal or external power source is being used.

NOTICE

To measure the state of a triac output, an external load must be connected.

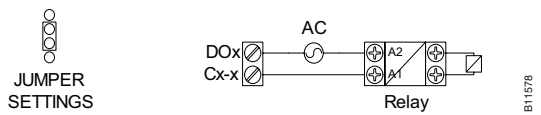


Fig. 17 Digital output with external power supply

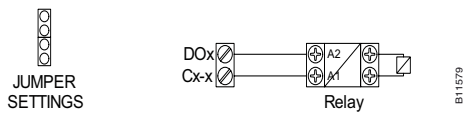


Fig. 18 Digital output with internal power supply (for floating actuators)

When controlling a floating actuator, wire the controller to the actuator as shown in Figure 22.

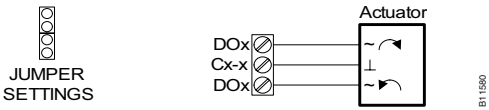


Fig. 19 Connecting to an external floating actuator

10.2 Wiring Universal Outputs

EY-RC416 product line

Universal outputs can be configured to provide either a linear signal ranging from 0 to 10VDC or a discrete signal of 0 or 12VDC. The discrete signal can be used to generate a pulse wave modulation (PWM) signal or a simple two-state signal. These outputs are protected by an auto-reset fuse.

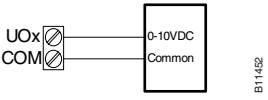


Fig. 20 0 to 10VDC analog output

When controlling a relay with a universal output, a diode must be connected in parallel to protect the controller from back-emf current which occurs when the relay is turned off. It is recommended to use diodes that are part of the 1N400x family and they should be placed closer to the relay.

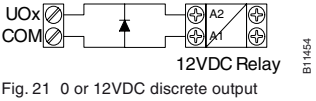


Fig. 21 0 or 12VDC discrete output

When controlling an analog actuator, wire the controller to the actuator as shown in Figure 25.

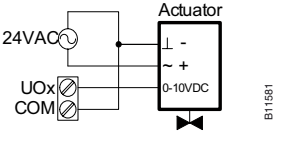


Fig. 22 Connecting to an external analog actuator

11 Communications Wiring

The recommended cable type for LON® communications is 22AWG (0.65 mm), twisted pair, unshielded. The LON communication wire is polarity insensitive and can be laid out in a bus, star, loop or free topology. For loop topology, polarity is important, special care must be taken when connecting the LON network to avoid short circuit.

Es wird empfohlen, für jegliche LON-Busverdrahtung das Netzwerk in einer Bustopologie aufzubauen, da diese eine einfache Fehlersuche im Netzwerk gestattet.

Connect both wires to the LON 1 or 2 terminals of the controller. If inserting multiple wires in the terminals, ensure to properly twist wires together prior to inserting them in the terminal connectors.

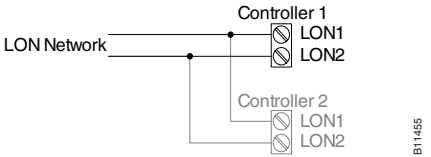


Fig. 23 Communications wiring

For more information and detailed explanations on network topology and wire length restrictions, please refer to the Junction Box and Wiring Guideline for Twisted Pair LonWorks® Networks, published by Echelon® Corporation.

It is important to use proper network terminators depending on the type of network topology used. Failure to do so might result in communication errors between controllers. Do not use multiple gauges of cable on the same communication bus, as this may also result in communication errors.

11.1 Selecting Network Terminators

Topology	Accessory part no.
Bus	09704800 10
Free	09704800 12

For a bus topology, 2 network terminators are required (1 at each end of the bus topology channel). For a free topology, 1 network terminator is required and it can be put anywhere on the channel.

12 Memory Erase Jumper

Each controller features a memory erase jumper that can be used to erase the Neuron chip's memory. If an incorrect APB file is loaded into the controller, the Neuron chip's memory will be corrupted and no communication with the controller will be possible. The memory erase jumper can be used to correct this problem by resetting the Neuron chip's memory; the chip will then be in an application-less state. The memory erase jumper is labeled J22 on the EY-RC416 product line controllers and J9 on the EY-RC415 product line controllers.

To erase the Neuron chip's memory using the memory erase jumper, do the following:

1. Disconnect the power to the controller.

2. Place a jumper on the proper pins on the controller.

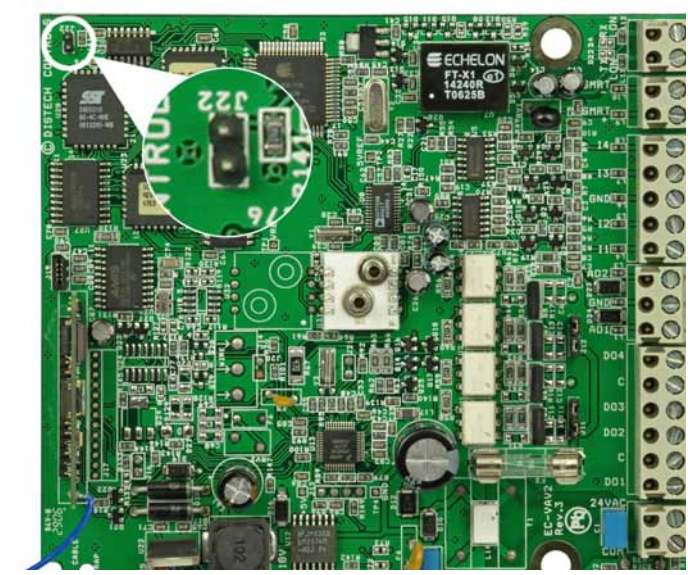


Fig. 24 Memory erase jumper location (J22) on ecos416

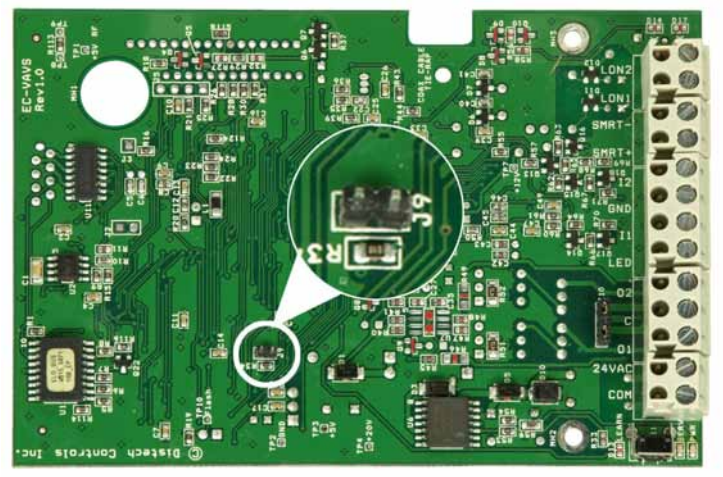


Fig. 25 Memory erase jumper location (J9) on ecos415

3. Reconnect power to the controller.

4. The orange-colored service LED will blink rapidly indicating that it is erasing the Neuron chip's memory. When the service LED stops blinking and remains solid, the erase procedure will be complete. The erase procedure typically takes between 2 and 10 seconds.

5. Disconnect the power to the controller and remove the jumper.

6. Reconnect the power. The service LED will blink twice and become solid indicating that the controller is application-less.

7. The proper APB (using the Commission or Load option in LNS, e.g. SAUTER CASE LON Engine) can now be loaded into the controller.

13 Maintenance

⚠ WARNING **Danger of electrocution**
▶ Turn off power before any kind of servicing.

Each controller requires minimal maintenance, but it is important to take note of the following:

- If it is necessary to clean the outside of the front plate and/or the inside of the back plate, use a dry cloth.
- Verify the tension of all wires and cables whenever the controller is serviced.

14 Disposal

Products must be disposed of at the end of their useful life according to local regulations.

15 Troubleshooting guide

Controller is powered but does not turn on

Fuse has blown	Check the fuse integrity; also ensure that the green power LED is on.
Power supply polarity	Verify that consistent polarity is maintained between all controllers and the transformer. Ensure that the COM terminal of each controller is connected to the same terminal on the secondary side of the transformer. See Figure 5.

Controller cannot communicate on an FTT network

Absent or incorrect supply voltage	1. Check power supply voltage between 24VAC ±15% and COM pins and ensure that it is within acceptable limits. 2. Check for tripped fuse or circuit breaker.
Overloaded power transformer	Verify that the transformer used is powerful enough to supply all controllers.
Network not wired properly	Double check that the wire connections are correct.

Absent or incorrect network termination	Check the network termination(s).
Incorrect APB/NXE file has been loaded	Use the memory erase jumper to reset the Neuron chip's memory, then load the proper APB into the controller using a network management tool (e.g. SAUTER CASE LON Engine).
Service pin not working	

Controller communicates well over a short network, but does not communicate on large network

Network length	Check that the total wire length does not exceed the specifications of the Junction Box and Wiring Guideline for Twisted Pair LonWorks Networks.
Wire type	Check that the wire type agrees with the specification of the Junction Box and Wiring Guideline for Twisted Pair LonWorks Networks.
Network wiring problem	Double check that the wire connections are correct.
Absent or incorrect network termination	Check the network termination(s). Incorrect or broken termination(s) will make the communication integrity dependent upon a controller's position on the network.
Extra capacitance	Make sure that no extra capacitance is being connected to the network other than the standard FTT circuit and a maximum of a 3 meter stub (in bus topology).
Number of controllers on network segment exceeded	The number of controllers on a channel should never exceed 64. Use a router or a repeater in accordance to the Junction Box and Wiring Guideline for Twisted Pair LonWorks Networks .
Network traffic	Query node statistics to check for errors. Use a LON protocol analyzer to check network traffic.

Hardware input is not reading the correct value

Input wiring problem	Check that the wiring is correct according to this manual and according to the peripheral device's manufacturer.
Open circuit or short circuit	Using a voltmeter, check the voltage on the input terminal. Short circuit (0V) and open circuit (5V).
Configuration problem	Using the controller configuration plug-in or wizard, check the configuration of the input. Refer to the controller's user guide for more information.

Hardware output is not operating correctly

Output wiring problem	Check that the wiring is correct according to this manual and according to the peripheral device's manufacturer.
Configuration problem	Using the controller configuration plug-in or wizard, check the configuration of the output. Refer to the controller's user guide for more information.

0-10 V output, 24 VAC powered actuator is not moving.	Check the polarity of the 24 VAC power supply connected to the actuator while connected to the controller. Reverse the 24 VAC wire if necessary. Check the jumper settings for the external power supply as shown in Figure 19

Wireless devices not working correctly

Device not associated to controller	Using the device configuration plug-in or wizard, check the configuration of the output. Refer to the device's user guide for more information.
Power discharge	Recharge device with light (if solar-powered) or replace battery (if battery-powered),
Device too far from controller	Reposition the device to be within the range of the controller. Refer to the Wireless Battery-less Sensors and Switches Solutions Guide for more information.
Configuration problem	Using the device configuration plug-in or wizard, check the configuration of the output. Refer to the Wireless Battery-less Sensors and Switches Solutions Guide for more information.

Flow sensor is not giving proper readings

Tubing connection problem	1. Make sure that the tubing is installed properly and that the tubing is not bent. 2. Verify that the high and low pressure sensors are not inversed.
Controller is not calibrated properly	Recalibrate the VAV controller. Refer to the controller's user guide for more information.

Damper is not opening or closing properly

Mechanical stops not in proper position	The two mechanical stops must be positioned to stop the damper motion when it is completely closed and completely opened. The mechanical stops can be moved by increments of 5°.
Rotation time not set up correctly for external damper	Check that the external damper drive time is set to the correct value (in the plug-in or wizard)
VAV still in Calibration Mode	Complete the calibration process.
Controller in Override	Set the Override to OFF in the object manage screen.

Service LED (Orange Color)

Off	The controller is in normal operation.
Repeated Blink	The controller is in normal operation. The LED will blink according to the controller code execution time.

On	The controller is application-less.
Slow Blink	Appropriate action: Reload the APB or NXE.
(1 sec. On, 1 sec. Off)	The controller is unconfigured.
Fast Blink	Appropriate action: Commission the controller
(0.3 sec. On, 1 sec. Off)	Watchdog time out. Application corrupted. Appropriate action: Use the memory erase jumper to reset the Neuron chip's memory, then load the proper APB into the controller using a network management tool (e.g. SAUTER CASE LON Engine).

16 Hardware Installation Guide

While all efforts have been made to verify the accuracy of information in this manual, SAUTER is not responsible for damages or claims arising from the use of this manual. Persons using this manual are assumed to be trained HVAC specialist / installers and are responsible for using the correct wiring procedures and maintaining safe working conditions with fail-safe environments.

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Printed in Switzerland