INSTRUCTION

OJ-Air2LON-A

OJ Air2
CONTROL SYSTEM FOR AIR HANDLING UNITS

OJ ELECTRONICS

Index

1. Introduction

This instruction describes the OJ-LON gateway, which provides connectivity for the OJ Electronics standard ventilation system, OJ Air2, to a LonWorks network.
This instruction applies to Model No: FPC-N35-102-401-1005

2. Product Program

Type	Product
OJ-Air2LON-A	LonWorks module

3. Function

The LonWorks gateway converts the signals on the OJ-Air2Masters local RS485 ModBus, to standard
LonMark Association SNVT's, such that it is possible to communicate with an AHU, which is equipped with an OJ-Air2 control system, from a LonWorks network.
An FTT-10A transceiver with a transmission speed of 78kbps free topology is used.

4. CE MARKING

Subject to the consequences of the law, OJ Electronics A/S declares that this product complies with Council
EMC Directive 92/31/EEC and subsequent modifications concerning electro-magnetic compatibility, and Council
Low Voltage Directive 72/23/EEC (LVD) and subsequent modifications concerning electric material for application within certain voltage limits.

5. Approvals

CE (EN55022;EN55024;EN60950),
UL916,
FCC Class A Part 15,
DNP3 Conformance Tested,
OPC Self-tested for Compliance,
RoHS Compliant,
CSA 205 Approved

Standards applied
Electromagnetic compatibility (EMC):
EN 61000-6-2 and EN 61000-6-3

The product is intended for installation in machines or assembly with other machine parts for installation in machines covered by the Council Machinery Directive 98/37/EEC - therefore it does not fulfil the provisions in this directive in all respects.

6. Technical data

6.1. Supply

CLASS 2
9-30 VDC or 12-24 VAC 2,5W

6.2. Mod-Bus connection

Signal . . . . . .RS 485(38,4kbaud)
Protocol . . . . . Modbus RS485
Connection . . . . . 6-pol Phoenix connector
OJ-Air2 connection . . . . . see Connections
Max. cable length 50m

6.3. LonWorks connection

Transceiver FTT-10A
Speed 78kbps
Connector . . . . . 2-pol Phoenix connector

6.4. Environmental data

Enclosure rating P20
Air humidity . . . . . 5-90% RH
Temperature range . . . . . -40°C to +75°C

7. Configuration of OJ-Air2Master

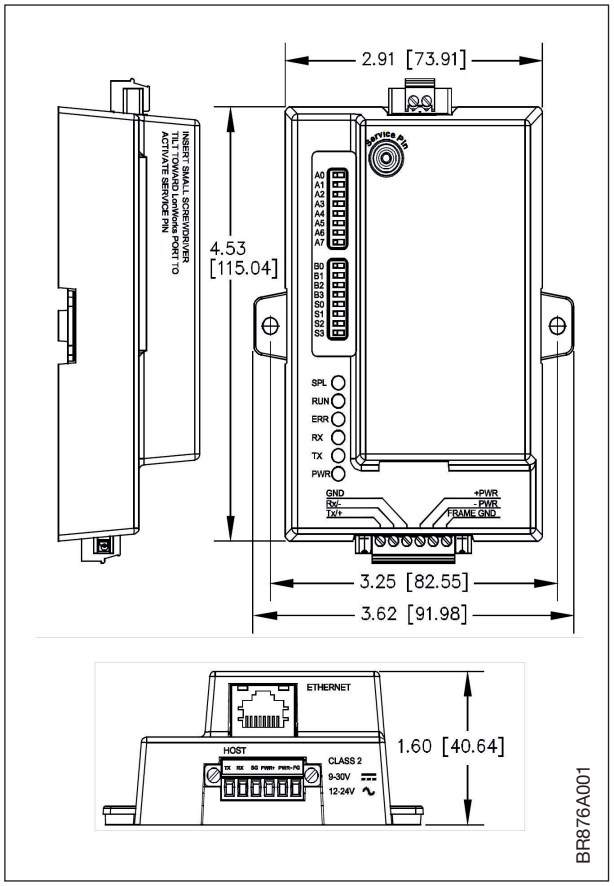
LON operation requires OJ-Air2Master software vers. 1.05 or higher.
The OJ-Air2Master requires no configuration for LON operation, since this is done automatically when the OJAir2LON module is connected to the OJ-Air2Master.
Once the LON module has been recognized, Alarm no. 15 ”Lon gateway (Air2Lon): No communication”, will be released, if the LON module is disconnected from the OJ-Air2Master.

8. Mechanical Installation

The LonWorks gateway is to be mounted on a 35mm DIN rail in an enclosure with the enclosure rating required by the installation. The gateway dimensions can be seen from Fig 1.

8.1. Fig. 1 Dimensions

Fig. 1 Dimensions



9. Electrical Installation

A. The network cable to the LonWorks network is connected to the LonWorks gateway LON port using the supplied 2-pole male connector.
B. Then connect one of the LonWorks Gateway ModBus ports to the OJ-Air2Master RS485 plug B or C using an RJ12/6 jack.

9.1. User interface

The user interface consists of 6 LEDs and a Service Pin button on the front of the module. The Service Pin button is used to identify the node on the control network and can be activated using a screwdriver or similar sharp implement (2 mm dia.).

9.2. LED colours and functions

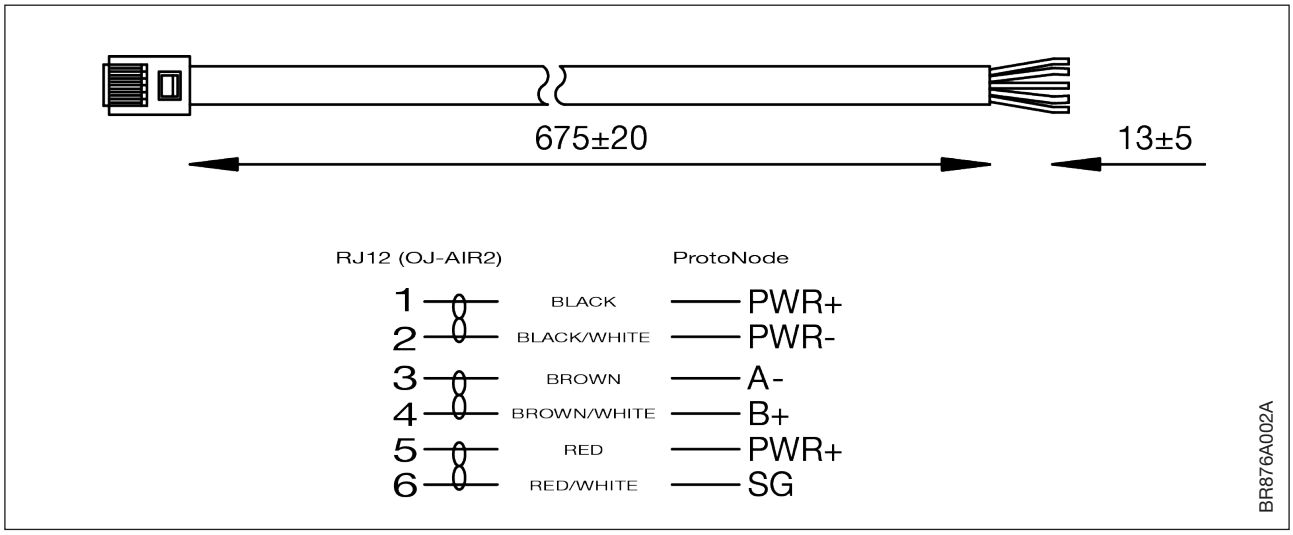
LED Name	Colour	Function
SPL	Blue	This blue LED is reserved for future use and is normally lit
RUN	Dark Green	This dark green RUN LED will start flashing 20 seconds after power up, indicating normal operation
ERR	Dark Red	The dark red SYS ERR LED will go on solid 15 seconds after power up. It will turn off after 5 seconds. A steady red light will indicate there is a system error on the ProtoNode. If this occurs, immediately report the related “system error” shown in the error screen of the RUI interface to AERCO International for evaluation
RX	Amber	The amber RX LED will flash when a message is received on the host port.
TX	Light Red	The light red LED will flash when a message is sent on the host Port.
PWR	Light Green	The light green LED should show steady green at all times when the ProtoNode is powered.

9.3. Connection to OJ-AIR2

OJ-AIR2LON-A is supplied with a pre-assembled cable with a RJ12/6 connector in one end. The cable could be shortened and extended. If the cable is extended, do this as per normal practice for RS485 network. The cable must not be extended so that the total cable length exceeds 50m.

9.4. Fig. 2 Cable connection

Fig. 2 Cable connection

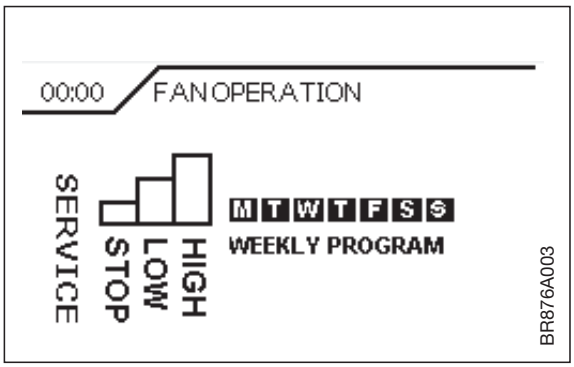


10. AHU Operation

Full control of the AHU by LON network, requires handterminal/HMI Fan Operation setting ”Weekly program”. See fig. 3 and 4

10.1. Fig. 3 Handterminal settings

Fig. 3 Handterminal settings

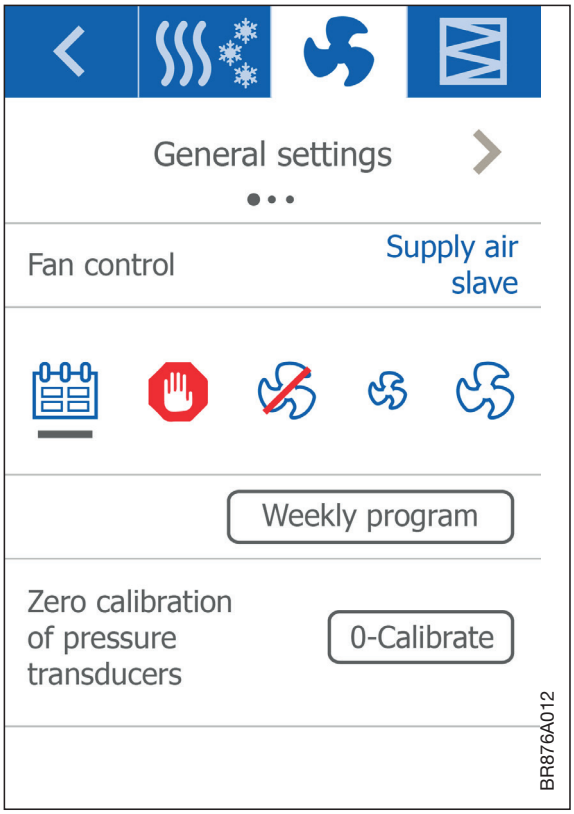


10.2. Fig. 4 OJ-Air2-HMI-35T settings

If the OJ-Air2 system is in STOP, will fan operation settings from LON have no effect. STOP has always high priority in the OJ-Air2 system, and can origin from different sources:

- OJ-Air2 Handterminal/HMI
- WEB settings
- Hardwired digital input
- Modbus/RS485
- Modbus/TCP-IP
- LON

Fig. 4 OJ-Air2-HMI-35T settings



10.3. Neuron ID

The actual LON module Neuron ID can be readout in the handterminal or in theOJ-Air2 WEB under menu ”INSTALLER -> COMMUNICATION -> LON CONNECTION”.

10.4. LonWorks software conformity

The LonWorks module is designed to connect an OJ Air2 ventilation system to an open LonWorks control network in compliance with LonMark International guidelines.
For use in connection with LonWorks installation tools and to document conformity, the following data files can be requested from OJ Electronics A/S

10.5. **Xternal Interface File**

The LonWorks module is designed to connect an OJ Air2 ventilation system to an open LonWorks control network in compliance with LonMark International guidelines.

10.6. **Tables**

Lists of LonMark objects are shown in tables 1-6. Function blocks are shown in fig. 3-4.

For further information regarding LON Functional Profiles see:
http://www.lonmark.org/technical_resources/guidelines/docs/profiles/8090_10.pdf

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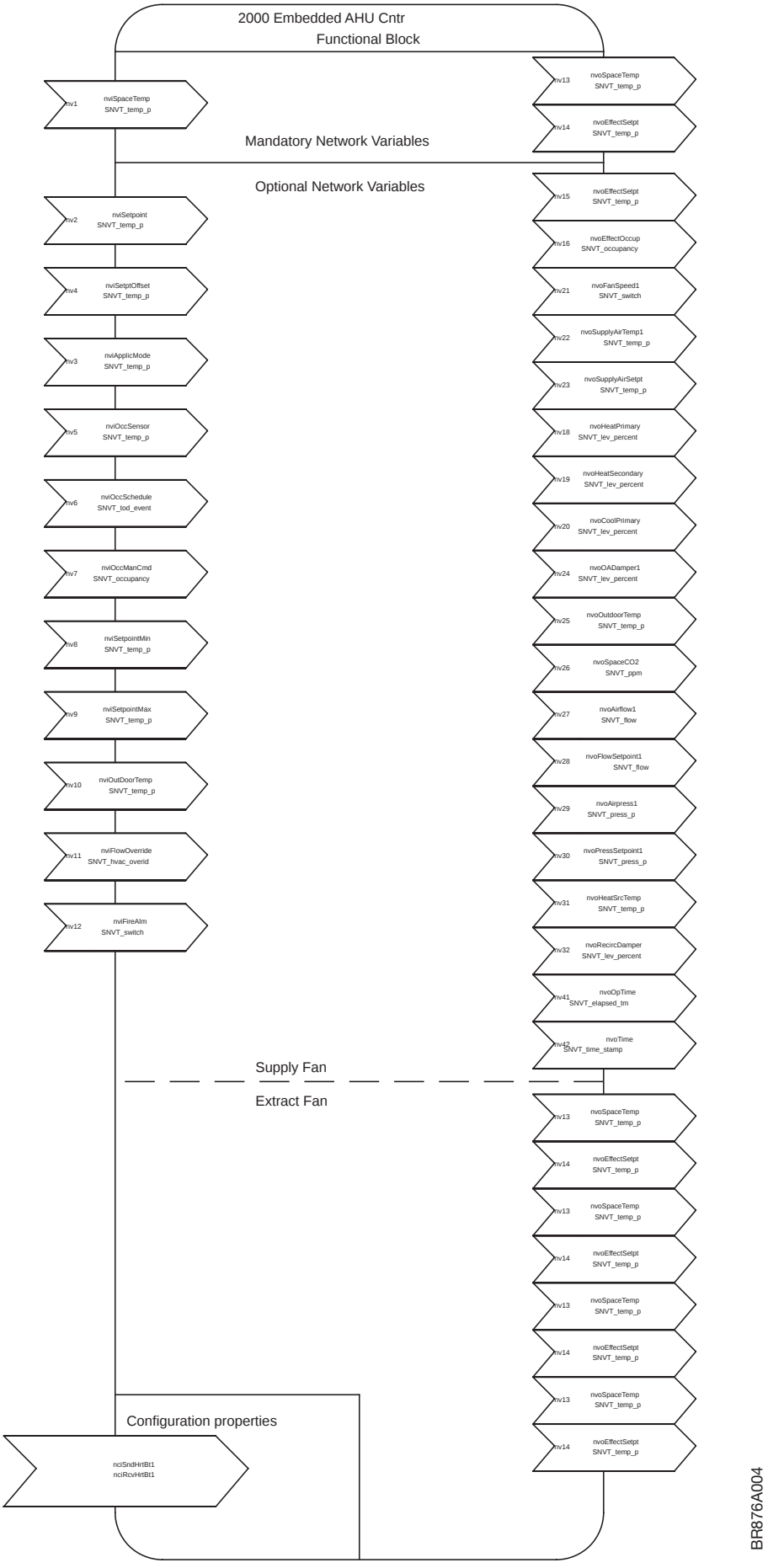
10.7. **Application**

This section descripts standard applications for typical use.

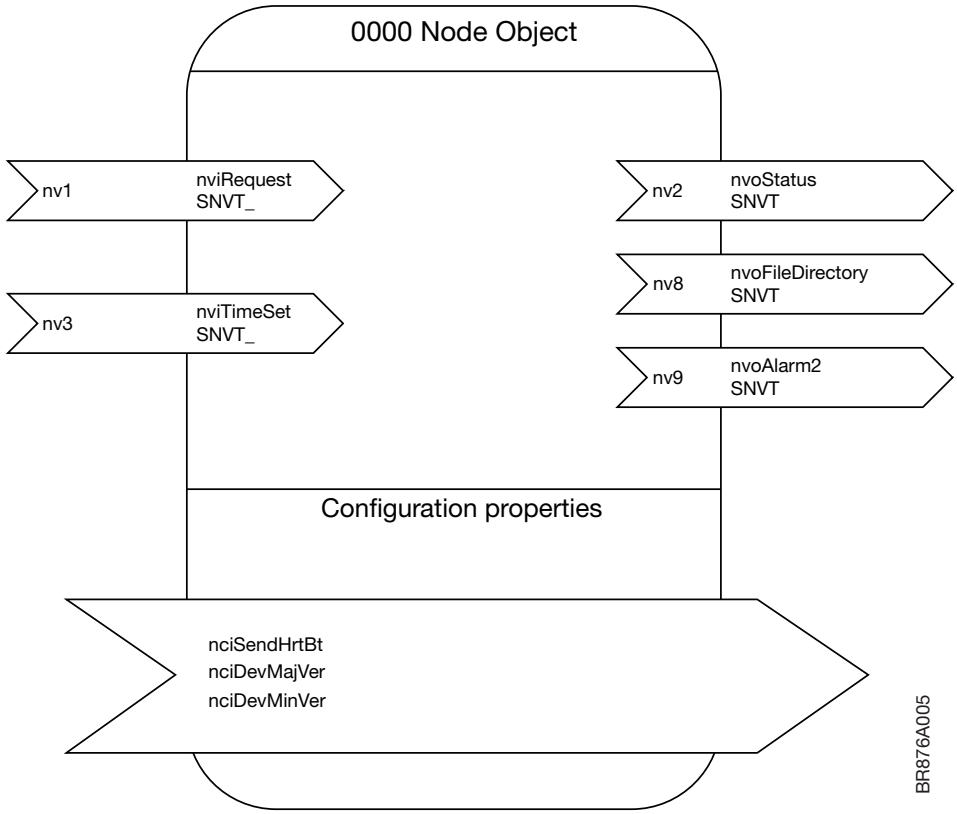
10.8. **Stop/Low speed/High speed**

SNVT	Command	Output
nviApplicMode	HVAC_AUTO	
nviOccManCmd	OC_UNOCCUPIED	STOP
	OC_STANDBY	Low speed
	OC_OCCUPIED	High speed

10.9. **Fig. 5 Functional block UFTP Embedded AHU cntr**



10.10. **Fig. 6 Function block Node Object**



10.11. **Table 1: Network Variable Inputs, UFTP Embedded AHU cntr**

NV # (M/O)*	Variable Name	Recv HrtBt	SNVT Name	SNVT Index	Class	Description
1 (M)	nviSpaceTemp	Yes	SNVT_temp_p	105	RAM	Space Temperature Input
2 (O)	nviSetpoint	No	SNVT_temp_p	105	RAM	Temperature Setpoint Input (absolute)
3 (O)	nviApplicMode	Yes	SNVT_hvac_mode	108	RAM	Application Mode Input
4 (O)	nviSetptOffset	Yes	SNVT_temp_p	105	RAM	Setpoint Offset Input
5 (O)	nviOccSensor	Yes	SNVT_occupancy	109	RAM	Occupancy Sensor Input
6 (O)	nviOccSchedule	Yes	SNVT_tod_event	128	RAM	Occupancy Scheduler Input
7 (O)	nviOccManCmd	No	SNVT_occupancy	109	RAM	Occupancy Override Input
8 (O)	nviSetpointMin	Yes	SNVT_temp_p	105	RAM	Setpoint supply air min. temperature
9 (O)	nviSetpointMax	Yes	SNVT_temp_p	105	RAM	Setpoint supply air max. temperature
10 (O)	nviOutdoorTemp	Yes	SNVT_temp_p	105	RAM	Outdoor Air Temperature Input
11 (O)	nviFlowOverride	No	SNVT_hvac_overid	111	RAM	Air Flow Override Input
12 (O)	nviFireAlm	Yes	SNVT_switch	95	RAM	Fire Alarm Input

10.12. **Table 2: Supported nviApplicMode functions**

Value	nviApplicMode	nvoEffectOccup		AHU Fan operation
0	HVAC_AUTO	See table 3		See table 3
6	HVAC_OFF	OC_UNOCCUPIED	6	Stop
13	HVAC_ECONOMY	OC_STANDBY	13	Low speed
0xFF	HVAC_NUL	Same as HVAC_AUTO	18	Fan speed controlled by AHU

10.13. **Table 3: nviApplicMode in HVAC_Auto (0)**

LON Inputs			**LON Output**		**AHU Output**
nviOccManCmd	**nviOccSchedule[1]**	**nviOccSensor[2]**	**nvoEffectOccup**		**Fan operation**
OC_OCCUPIED[3]	*NOT USED*	*NOT USED*	OC_OCCUPIED	18	High Speed
OC_UNOCCUPIED[3]			OC_UNOCCUPIED	6	Stop
OC_BYPASS	OC_OCCUPIED[3]		OC_OCCUPIED	18	High Speed
	OC_UNOCCUPIED[3]		OC_UNOCCUPIED	6	Stop
	OC_STANDBY[3]	OC_OCCUPIED	OC_OCCUPIED	18	High speed
		OC_UNOCCUPIED	OC_OCCUPIED	18	High Speed afterrun[5]
			OC_STANDBY	13	Low Speed
	OC_NUL[4]	OC_OCCUPIED	OC_OCCUPIED	18	High Speed
		OC_UNOCCUPIED	Controlled by OJ-Air2 scheduler		
OC_STANDBY	*NOT USED*	*NOT USED*	OC_STANDBY	13	Low speed
OC_NUL	OC_OCCUPIED[3]	*NOT USED*	OC_OCCUPIED	18	High Speed
	OC_UNOCCUPIED[3]		OC_UNOCCUPIED	6	Stop
	OC_STANDBY[3]	OC_OCCUPIED	OC_OCCUPIED	18	High Speed
		OC_UNOCCUPIED	OC_OCCUPIED5	18	High Speed afterrun[5]
			OC_STANDBY	13	Low speed
	OC_NUL[4]	OC_OCCUPIED	OC_OCCUPIED	18	High Speed
		OC_UNOCCUPIED	Controlled by OJ-Air2 scheduler		

Note

10.14. **Table 3: Notes**

1) For nviOccSchedule, this refers to the ”current_state” field.
”next_state” and ”time_to_next_state” fields are not active.

2) The Occupancy sensor can be a local input or a LON network input.
If both are used, OC_OCCUPIED from one source override OC_UNOCCUPIED from the other source.
OC_NUL is same as OC_UNOCCUPIED

3) Disables device scheduler embedded in OJ-Air2 Master.

4) Default value. Enables device scheduler embedded in OJ-Air2 Master.

5) nvoEffectOccup will be OC_OCCUPIED during afterrun time embedded in OJ-Air2 Master, if initiated by a Occupancy sensor.

10.15. **Table 4: Supported nviFlowOverride functions**

nviFlowOverride	**Description**	**Fan Operation**
0	HVO_OFF	Normal control
2	HVO_FLOW_VALUE	Supply Air setpoint in l/s
3	HVO_FLOW_PERCENT	Supply Fan speed in %
8	HVO_UNUSED_8	Extract Air setpoint in l/s
9	HVO_UNUSED_9	Extract Fan speed in %
0xFF	Same as HVO_OFF	Same as HVO_OFF

10.16. **Table 5: Network Variable Outputs, UFTP Embedded AHU cntr**

NV # (M/O)*	Variable Name	Recv HrtBt	SNVT Name	SNVT Index	Class	Description
13 (M)	nvoSpaceTemp	Yes	SNVT_temp_p	105	RAM	Effective Space Temperature Output
14 (O)	nvoUnitStatus	Yes	SNVT_hvac_status	112	RAM	Unit Status Output
15 (O)	nvoEffectSetpt	Yes	SNVT_temp_p	105	RAM	Effective Setpoint Output
16 (O)	nvoEffectOccup	No	SNVT_occupancy	109	RAM	Effective Occupancy Output
18 (O)	nvoHeatPrimary	Yes	SNVT_lev_percent	81	RAM	Primary Heat Output
19 (O)	nvoHeatSecondary	Yes	SNVT_lev_percent	81	RAM	Secondary Heat Output
20 (O)	nvoCoolPrimary	Yes	SNVT_lev_percent	81	RAM	Primary Cool Output
21 (O)	nvoFanSpeed1	Yes	SNVT_switch	95	RAM	Fan1 Speed Output
22 (O)	nvoSupplyAirTemp1	No	SNVT_temp_p	105	RAM	Supply Air Temperature Output
23 (O)	nvoSupplyAirSetpt	Yes	SNVT_temp_p	105	RAM	Supply Air Temperature Setpoint Output
24 (O)	nvoOADamper1	Yes	SNVT_lev_percent	81	RAM	Outdoor Air Damper1 Output
25 (O)	nvoOutdoorTemp	Yes	SNVT_temp_p	105	RAM	Outdoor Air Temperature Output
26 (O)	nvoSpaceCO2	Yes	SNVT_ppm	29	RAM	Space CO2 Sensor Output
27 (O)	nvoAirflow1	Yes	SNVT_flow	15	RAM	Air Flow1 Output
28 (O)	nvoFlowSetpoint1	Yes	SNVT_flow	15	RAM	Air Flow1 Setpoint Output
29 (O)	nvoAirPress1	Yes	SNVT_press_p	113	RAM	Air Pressure1 Output
30 (O)	nvoPressSetpoint1	Yes	SNVT_press_p	113	RAM	Air Pressure1 Setpoint Output
31 (O)	nvoHeatSrcTemp	Yes	SNVT_temp_p	105	RAM	Heat Source Temperature Output
32 (O)	nvoRecircDamper	Yes	SNVT_lev_percent	81	RAM	Recirculation Air Damper Output
33 (O)	nvoExtractTemp2	Yes	SNVT_temp_p	105	RAM	Extract Air Temperature Output
34 (O)	nvoFanSpeed2	Yes	SNVT_switch	95	RAM	Fan2 Speed Output
35 (O)	nvoDischAirTemp2	No	SNVT_temp_p	105	RAM	Discharge Air2 Temperature Output
36 (O)	nvoOADamper2	Yes	SNVT_lev_percent	81	RAM	Outdoor Air Damper2 Output
37 (O)	nvoAirflow2	Yes	SNVT_flow	15	RAM	Air Flow2 Output
38 (O)	nvoFlowsetpoint2	Yes	SNVT_flow	15	RAM	Air Flow2 Setpoint Output
39 (O)	nvoAirpress2	Yes	SNVT_press_p	113	RAM	Air Pressure2 Output
40 (O)	nvoPressSetpoint2	Yes	SNVT_flow	15	RAM	Air Pressure2 Setpoint Output
41 (O)	nvoOpTime	No	SNVT_elapsed_tm	87	RAM	Reports device's total accumulated operating time
42 (O)	nvoTime	No	SNVT_time_stamp	84	RAM	Reports device's internal real time clock

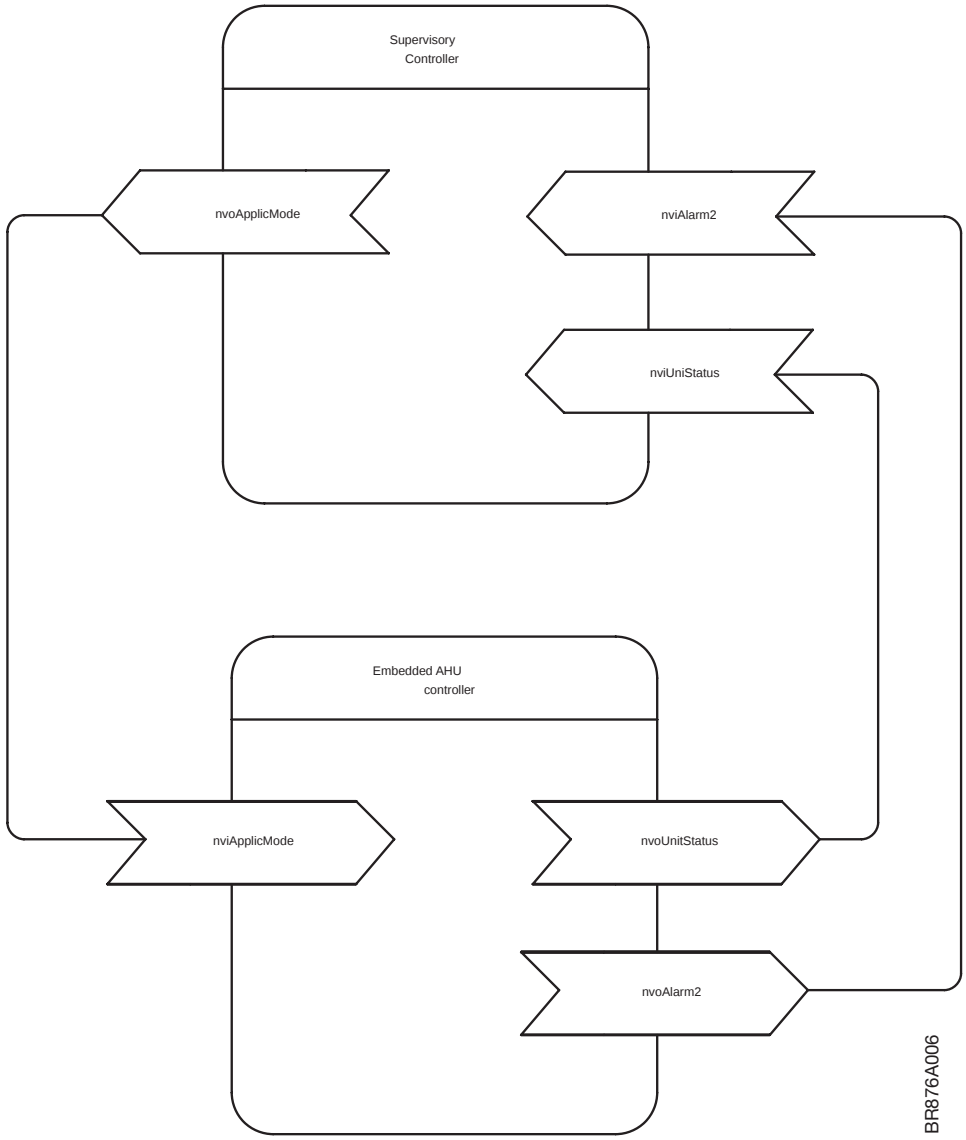
1) nvoUnitStatus provides a basic alarmstatus in SNVT_hvac_status field "in_alarm"
   0 = No alarm
   1 = A alarm (Alarm has stopped AHU, service required)
   2 = B alarm (Alarm AHU is operating with reduced perfomance, maintenance reqiured)
   3 = A + B alarm.

2) Suffix "1" applies in general to supply air, "2" applies to extract air.

10.17. **Table 6: Network Variable Inputs, Node Object**

NV # (M/O)*	Variable Name	SNVT Name	SNVT Index	Description
1 (M)	nviRequest	SNVT_obj_request	92	Requests a particular mode for a particular functional block in the device
2 (M)	nvoStatus	SNVT_obj_status	93	Reports the status of the requested functional block in the device
3 (O)	nviTimeSet	SNVT_time_stamp	84	Synchronize the device's internal real time clock with an external time source
8 (O)	nvoFileDirectory	SNVT_address	114	Address for the file directory containg descriptors for configuration files
9 (O)	nvoAlarm2	SNVT_alarm_2	164	Transmits alarm data for each functional block on a device whenever an alarm occurs or is cleared, and upon request.

10.18. **Basic system with Embedded AHU Controll**



ApplicMode sets actual mode:

a) HVAC_Auto (See table 3)
b) HVAC_Economy (Low speed)
c) HVAC_OFF (AHU Stop)

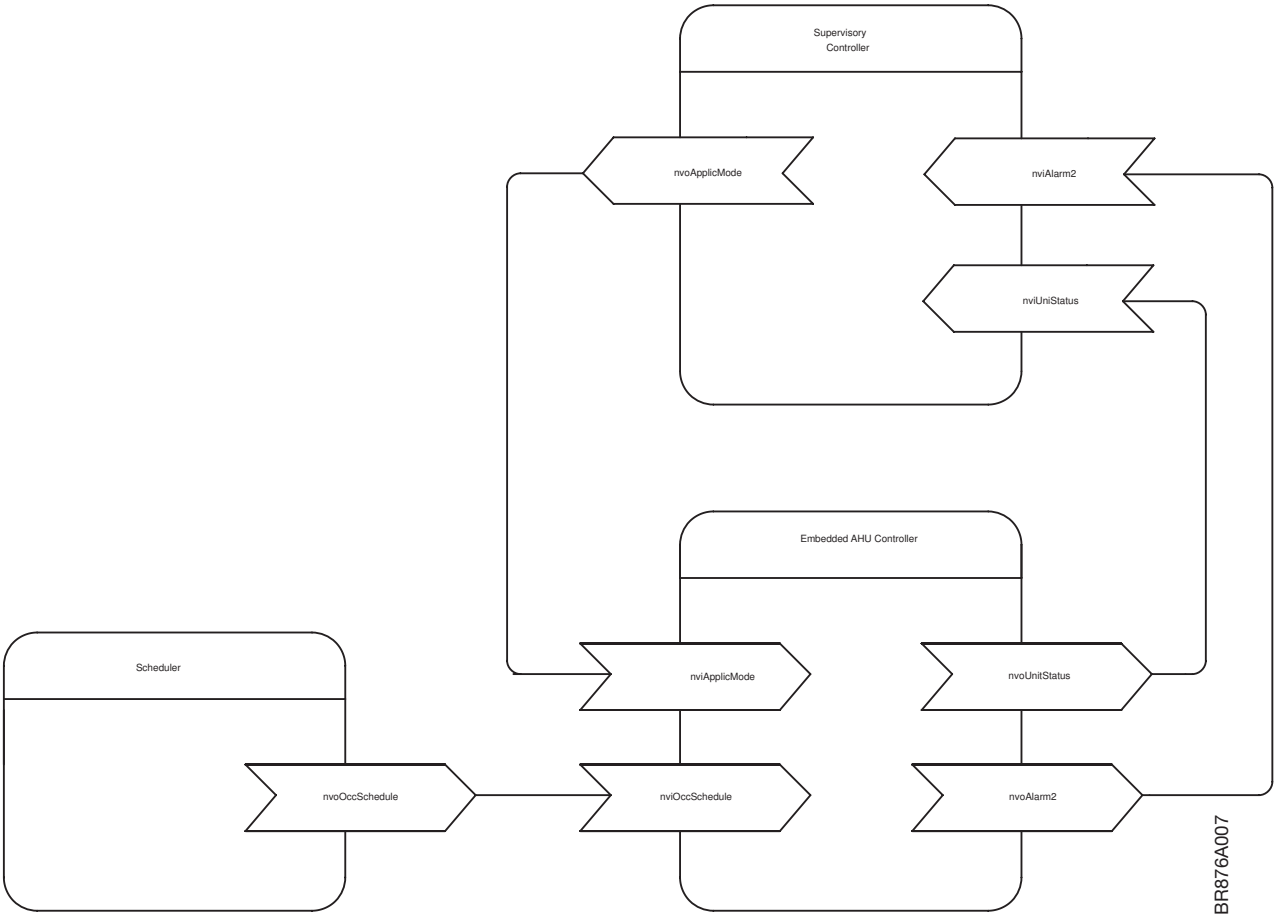
UnitStatus provide actual operation status:

a) Operation mode
b) % Heat recovery
c) % Heat
d) % Colling
e) % Fan speed
f) In_alarm A,B……

nviAlarm2 provide actual alarm:

a) Alarm type
b) Priority
c) Timestamp
d) Sequence number
e) Description text

10.19. **Small system with embedded AHU controller**



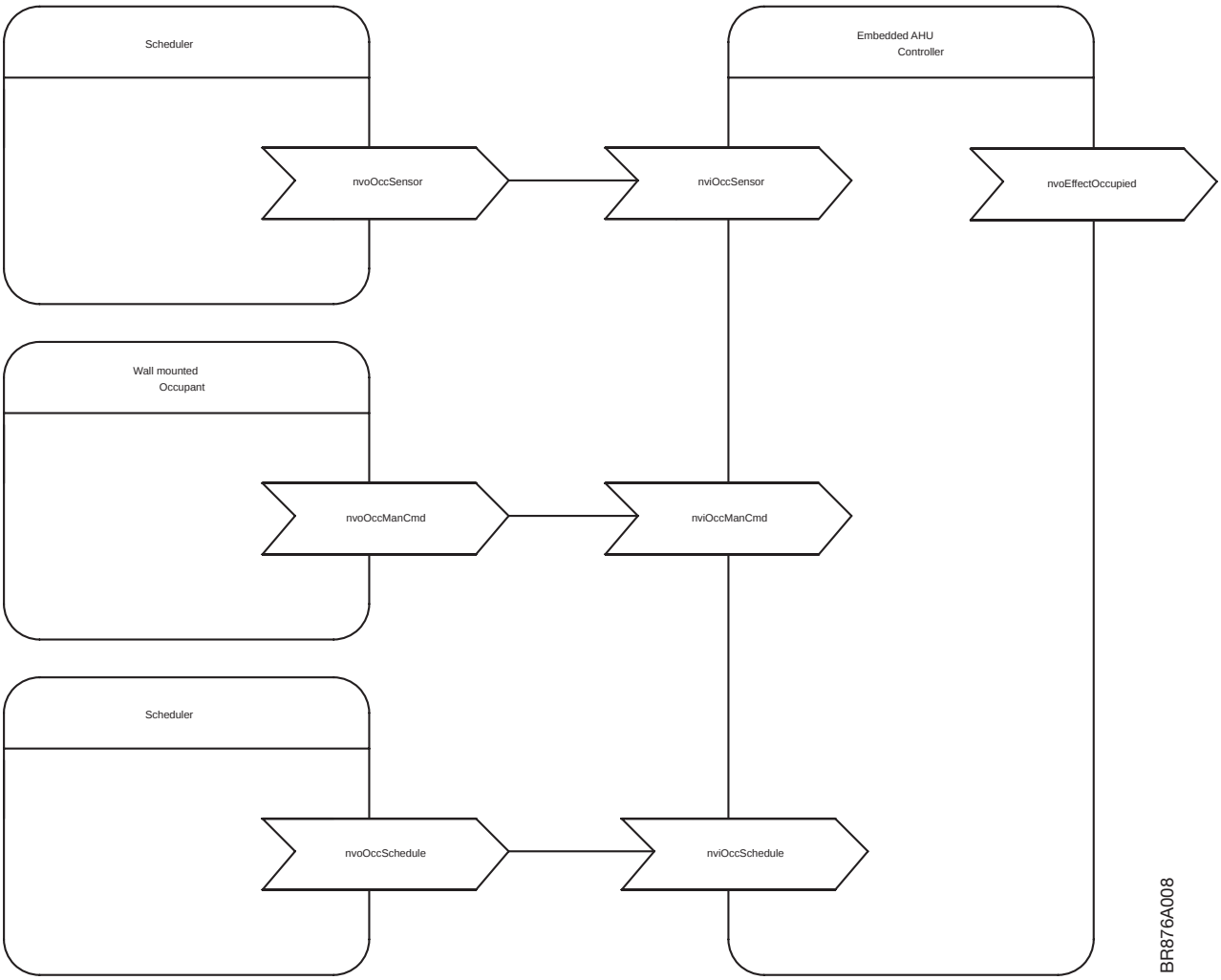
ApplicMode:

a) HVAC_AUTO

OccSchedule

a)	UnOccupied	(AHU stop)
b)	Standby (Economy mode)	(Low speed)
c)	Occupied	(High speed)

10.20. **Occupancy with embedded AHU controller**



ApplicMode:

a) HVAC_AUTO

OccManCmd:

a) UnOccupied (AHU stop)
b) Standby (Low speed)
c) ByPass (See table 3)
d) Occupied (High speed)
e) Nul (Not used)

OccSchedule

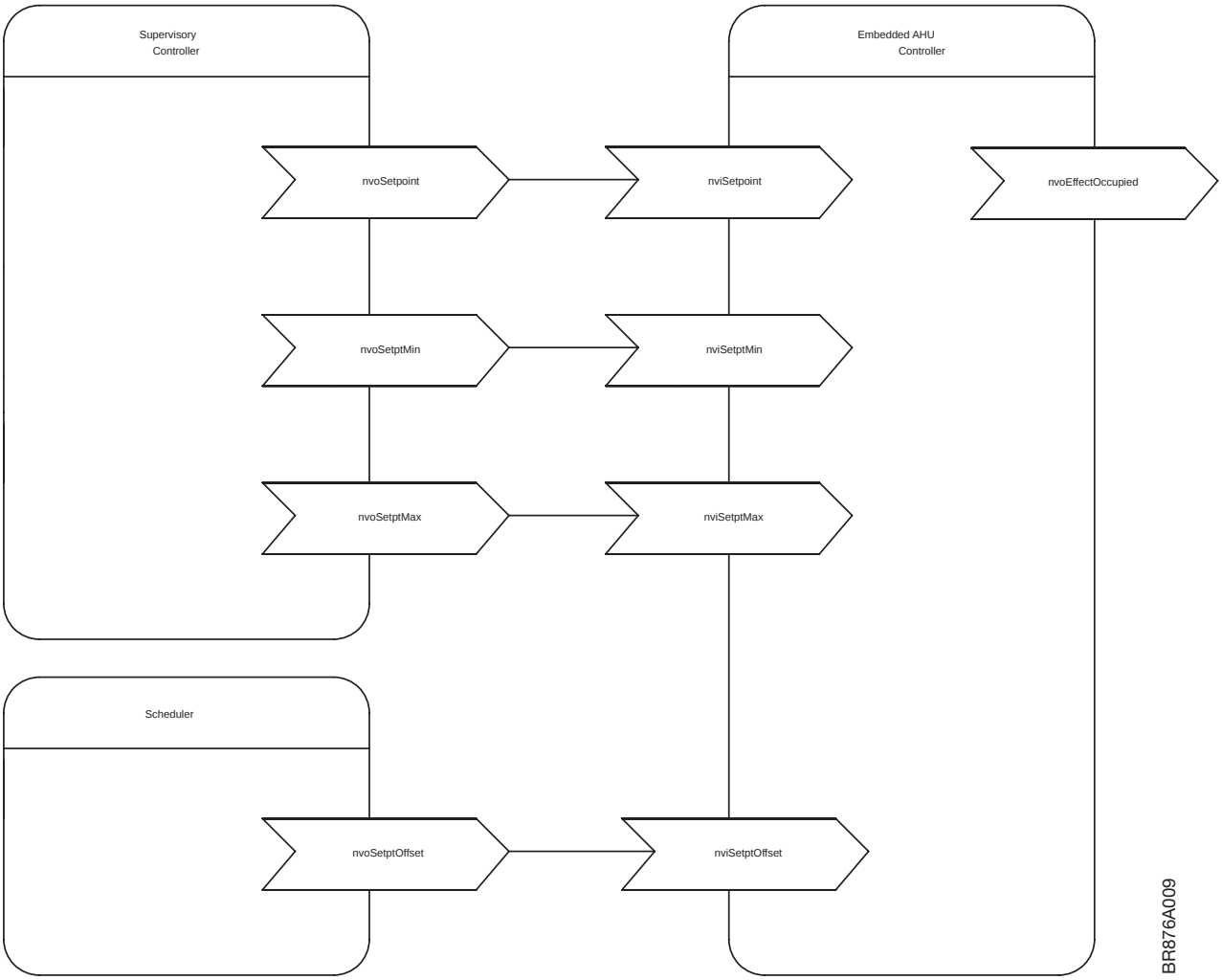
a) UnOccupied (AHU stop)
b) Standby (Low speed)
c) Occupied (High speed)
d) Nul (Not used)

OccSensor:

a) UnOccupied (AHU stop)
b) Occupied (High speed)
c) Nul (Not used)

EffectOccup: Actual Occupancy mode

10.21. **Temperature with embedded AHU controller**



Setpoint

a) Setpoint °C for actual temperature control mode
b) SetpointMin: Setpoint for minimum inlet temperature
c) SetpointMax: Setpoint for maximum inlet temperature

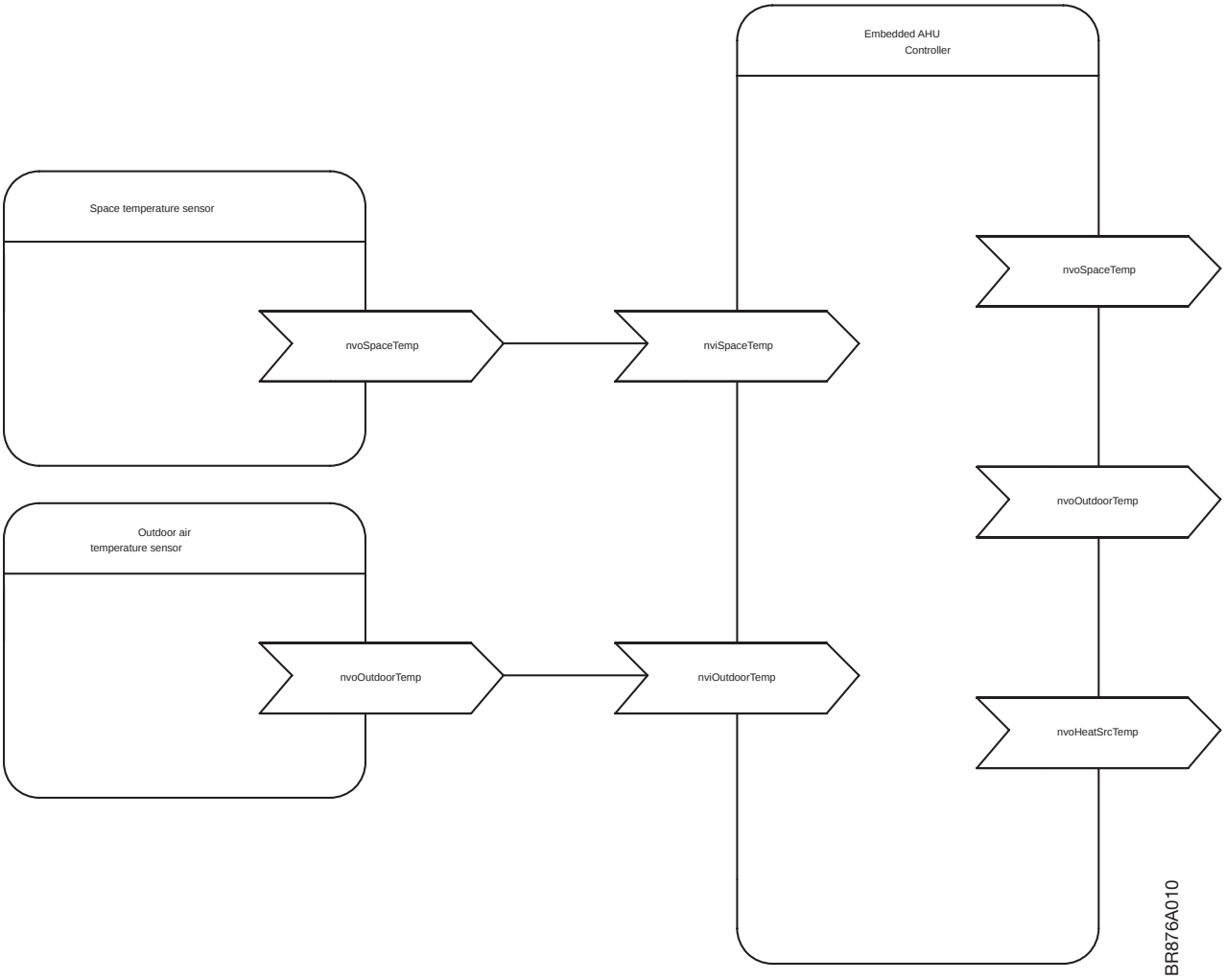
OccSchedule

a) Setpoint offset (-10°C to +10°C)

EffectSetpt: Actual setpoint °C

SupplyAirSetpt: Actual inlet setpoint.

10.22. **Temperature with embedded AHU controller**



SpaceTemp

- Space temperature (nvi)
- Effective space temperature (nvo)

If default value from LON sensor, locally wired sensor is used

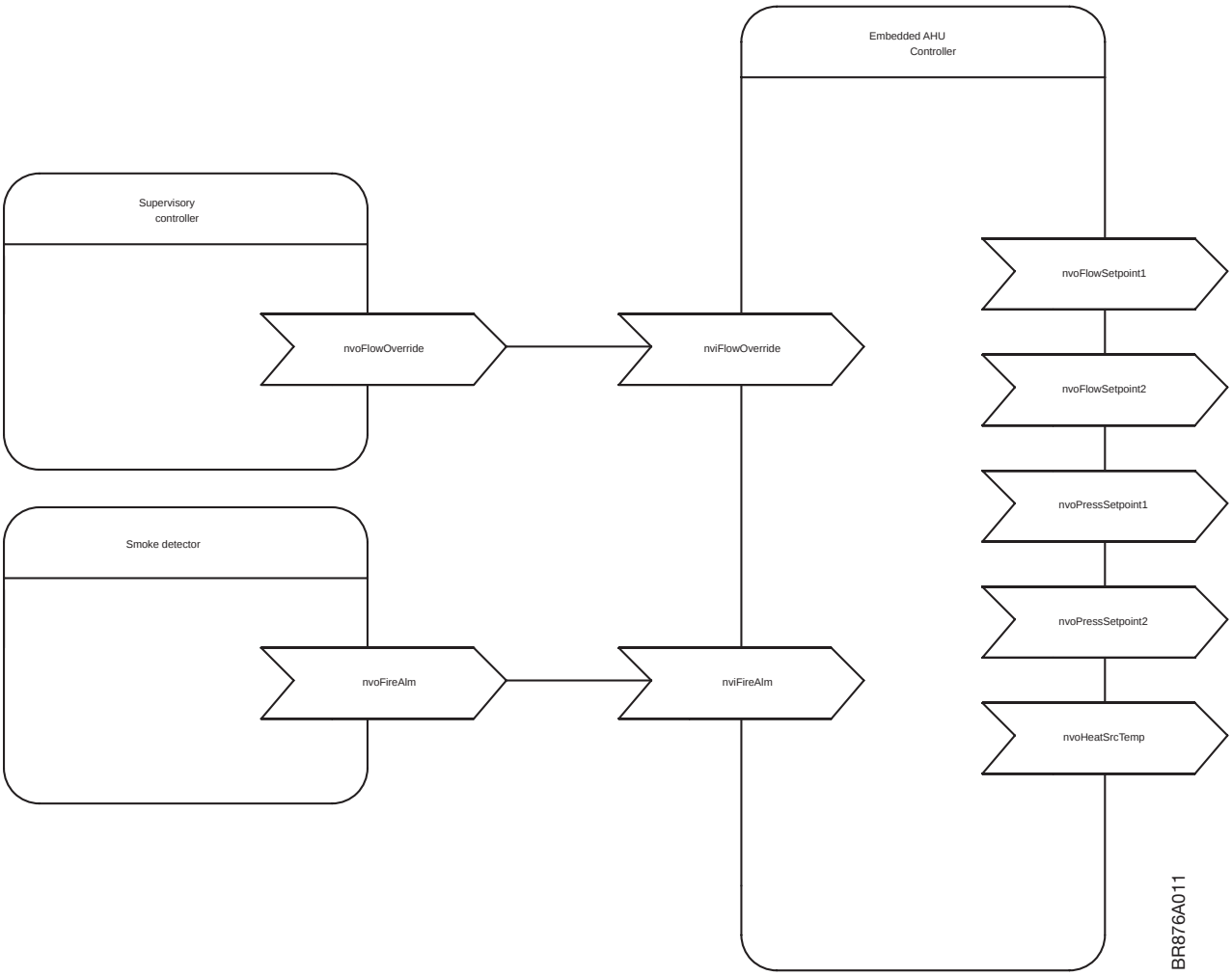
OutdoorTemp

- Outdoor temperature (nvi)
- *Effective outdoor temperature (nvo)*

HeatSrcTemp

- Actual return water temperature in water based heater

10.23. **Fan speed with embedded AHU controller**



FlowOverride

2 HVO_Flow_value:
Inlet air setpoint in m3/h (l/s)

3 HVO_Flow_percent:
Inlet fan setpoint in %

8 HVO_unused_8:
Extract/Exhaust air setpoint in m3/h (l/s)

9 HVO_unused_9:
Extract/Exhaust fan setpoint in %

FlowSetpoint

a) FlowSetpoint1:
Actual inlet fan setpoint in m3/h (l/s)

b) FlowSetpoint2:
Actual extract/exhaust fan setpoint in m3/h (l/s

c) PressSetpoint1:
Actual inlet air setpoint in Pa

d) PressSetpoint2:
Actual extract/exhaust air setpoint in Pa

Fire Alm

- Fire alarm from smoke/heat detector or Fire panel

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