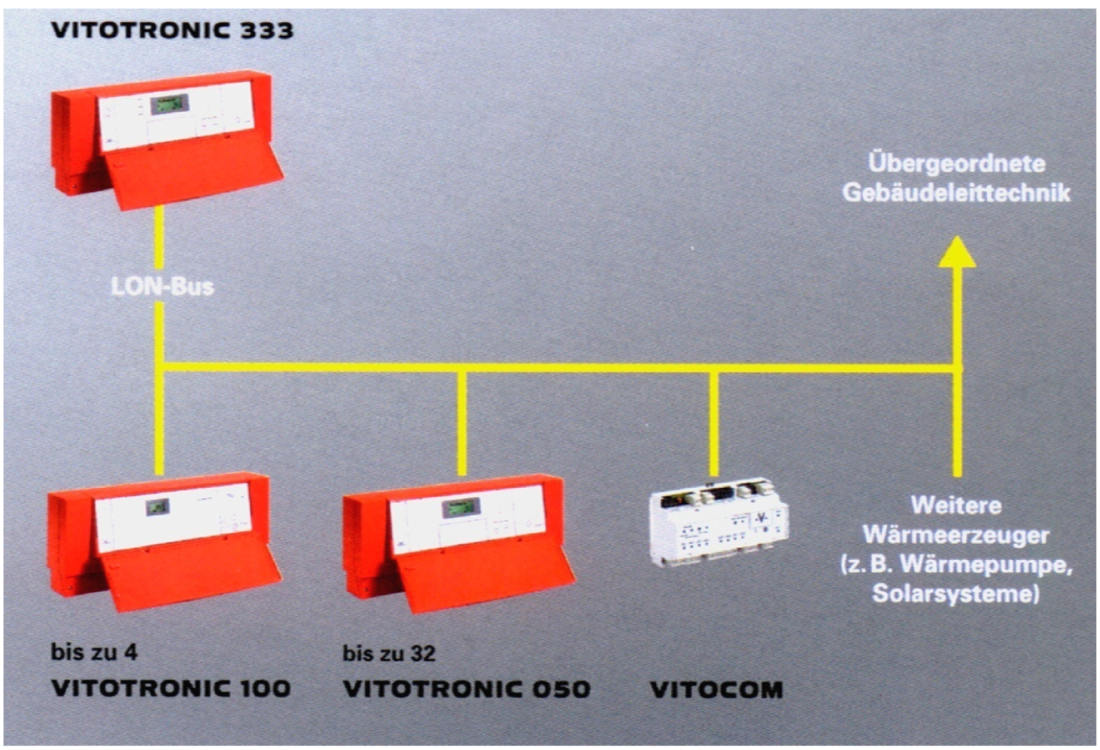
LON Handbook

For commercial and industrial heating systems

Vitotronic 050, Model HK1M
Vitotronic 050, Model HK1W
Vitotronic 050, Model HK1S
Vitotronic 050, Model HK3W
Vitotronic 050, Model HK3S
Vitotronic 100, Model GC1
Vitotronic 200, Model GW1
Vitotronic 300, Model GW2
Vitotronic 333, Model MW1
Vitotronic 333, Model MW1S

For wall-mounted and gas-fired boilers

Vitotronic 200, Model HO1
Vitotronic 333, Model MW2



General Information

Safety Information

Please ensure that these instructions are read and understood before commencing installation. Failure to comply with the instructions listed below can cause **product/ property damage, severe personal injury** and/or **loss of life.**

Licensed professional heating contractor
The installation, adjustment, service, and maintenance of this equipment *must be* performed by a licensed professional heating contractor.

Working on the equipment
The installation, adjustment, service, and maintenance of this product must be done by a **licensed professional heating contractor** who is qualified and experienced in the installation, service, and maintenance of hot water boilers. There are no user serviceable parts on the boiler, burner, or control.

Power supply
Install power supply in accordance with the regulations of the authorities having jurisdiction or, in absence of such requirements, in accordance with National Codes. Viessmann recommends the installation of a disconnect switch to the 120 V power supply outside of the boiler room. The installer must provide maximum 15 A overcurrent protection for the 120 V power supply (fuse or circuit breaker).

Ensure **main power** supply to equipment, the heating system and all external controls has been **deactivated**. **Close main oil or gas supply valve**. Take precautions in all instances to avoid accidental activation of power during service work.

Field-supplied electrical equipment must be type-tested.

When opening the control unit is required, no static discharge must take place via internal electrical parts.

Service
Service on safety-related parts is not permissible.

Initial Start-up
Initial start-up must be performed by a licensed professional heating contractor; all test results must be recorded appropriately.

Informing the System Operator
The licensed professional heating contractor must ensure the system operator has been supplied with the applicable Operating Instructions and must introduce the system operator to the operation of this equipment.

Safety Information
Please refer to subsection "Physical Network Structuring" for safety information regarding external equipment connected to the control.

Revision: 04/02/2009

Product Information/ Applicability Information

The information stated in this handbook applies to the following controls:

Vitotronic 050, Model HK1M
Vitotronic 050, Model HK1W
Vitotronic 050, Model HK1S
Vitotronic 050, Model HK3W
Vitotronic 050, Model HK3S

Vitotronic 100, Model GC1
Vitotronic 200, Model GW1
Vitotronic 300, Model GW2

Vitotronic 333, Model MW1
Vitotronic 333, Model MW1S
Vitotronic 333, Model MW2

Vitotronic 200, Model H01

The part numbers are available from the current Viessmann price lists.

The above listed controls must be equipped with one of the following communication modules:

Communication module	**For use with:**
LON module for heating circuits and boiler controller	Vitotronic 050, Model HK1M (accessory) Vitotronic 050, Model HK1W (accessory) Vitotronic 050, Model HK1S (standard equipment) Vitotronic 050, Model HK3W (accessory) Vitotronic 050, Model HK3S (standard equipment) Vitotronic 100, Model GC1 (accessory) Vitotronic 200, Model GW1 (accessory) Vitotronic 300, Model GW2 (accessory) Vitotronic 200, Model H01 (accessory)
LON module for cascade control	Vitotronic 333, Model MW1 (standard equipment) Vitotronic 333, Model MW1S (standard equipment) Vitotronic 333, Model MW2 (accessory)

Contents

Introduction

This document has been created with various purposes and for use by various target groups:

The chapter "**LON Technology**" is directed toward heating contractors of central heating systems and other target groups which are confronted with this kind of technology for the first time. This chapter then, provides these target groups with a general overview of LON Technology without detailed information regarding Viessmann control units and their communication.

The chapter "**Physical Network Structure**" outlines network wiring information and is directed toward network planning specialists and heating contractors of central heating systems. This chapter provides recommendations for network development with Viessmann controls.

The chapter "**Start-up of LON Networks with Viessmann Controls**" describes the settings to be performed on each control for communication between devices. This chapter targets heating contractors of central heating systems and system integration specialists who initialize network communications.

The chapter "**Overview: Functional Objects of Devices**" offers an overview of functional objects and network variables contained in devices. It targets network planning and system integration specialists wanting to exchange data between Viessmann controls and other devices.

The chapter "**Description of Functional Objects**" is directed toward network planning and system integration specialists and describes how network variables operate, i.e. what needs to be done for the creation of interoperable functions by means of network variables.

The chapter "**Information for Logical Connection**" is designed for system integration specialists. It outlines the connection of Viessmann controls and allows the system integration specialist to recreate connections produced in the selfbinding and in the toolbinding mode.

The chapter "**Additional Information**" features a listing of applicable publications and webpage addresses for further information on this topic.

LON Technology

Fundamentals of the LON Network

What does "LON" mean?

"LON" means "Local Operating Network Technology". It constitutes a network technology for the creation of automated networks. "Local Operating" refers to the fact that network participants are governed by their own 'intelligence', allowing for independent, local decisions, without relying on assistance from the central network node. These network participants – which within the LONWORKS Technology structure are called **nodes** – can be control units, sensors, computers and communication devices, etc. Transmitted data consists of measured values, metered values, messages as well as activation and deactivation signals.

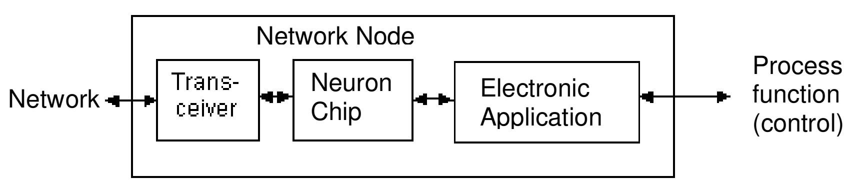
Who is who?

The LONWORKS Technology originated at the U.S. based **Echelon Corporation**, established in 1986. The U.S. based "**LONMARK Interoperability Association**" is an independent union of manufacturers, end users and system integration specialists with more than 100 companies worldwide. It sets guidelines, supports and fosters the LONMARK interoperability standard worldwide and awards the LONMARK prize for interoperable products. Viessmann is a member of this organisation.

LONWORKS Components

The LONWORKS Technology encompasses all components required for the development, start-up, and operation of automated networks: hardware, software and know-how.

The **neuron chip**, an electric circuit developed by Toshiba and Cypress specifically for the LONWORKS Technology, constitutes the principal hardware component within the LON Technology. The chip is physically located on the network node – in Viessmann networks on the communication module – and allows data exchange between individual control units.



Transceivers are used to interface with the transfer medium. The transfer medium can be anything from a simple twisted pair of wires to a radio transceiver. A **transceiver** is a component that can act both as a transmitter as well as a receiver. The transceiver is responsible for the physical connection to the network and ensures that network nodes of different manufacturers on the respective transfer medium comply with the physical requirements for communication.

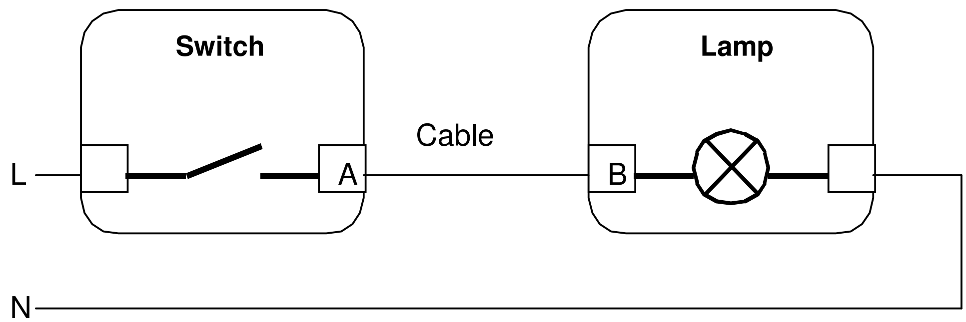
The network node extracts "intelligence" from the **software** contained in the neuron chip. This software is both the **application program**, which ensures functioning of the node as part of an application process, as well as the **operating system**, which supplies all communication functions. When communicating, the **LonTalk Protocol** is used. The LonTalk Protocol is a communication protocol stored in the neuron chip. This protocol ensures that the structure of the message exchange between network nodes adheres to strict rules. Similar to the worldwide telephone system, strict requirements were put in place within the LON Technology to ensure that data exchange between devices of different manufacturers can take place.

Another significant component when creating interoperable network nodes is the **know-how.** Options contained in the LONWORKS concept such as the implementation of **standard network variable types** (SNVTs) support the development of network nodes that can communicate with foreign network nodes without prior correspondence.

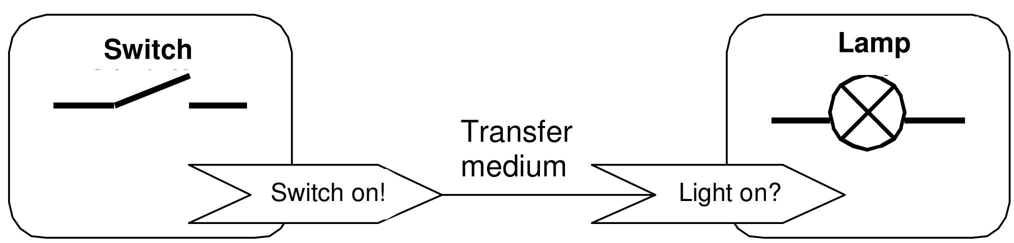
Network Variable Concept

A network node communicates with other nodes of the same network with the help of so-called **network variables** (NVs). The function of network variables shall be illustrated in the following analogy: in case of an electrical installation, terminal A of a switch is connected with terminal B of a lamp to turn the lamp on and off.

Electrical Installation



Network Variables Communication



When communicating with network variables, the application program in the node “switch” interprets the signal of the electrical contact and writes it, in case of change, to the output network variable “switch on!” The neuron in turn ensures that the network variable is released to the transfer medium (network). Upon arrival of the information at node “lamp”, the information is interpreted by the application program and the lamp is switched on.

Now the neuron of the switch requires information which node is designated to receive the sent data. The receiving node “lamp” also requires information regarding which data and from which sender it is to receive with the input network variable “light on”. This information is generated at the so-called **binding** process. **Binding** also determines which output network variable (see terminals in electrical installation, which switch controls which lamp) of a sender is to be connected with which input network variable of which receiver. (See wiring of a cable in electrical installation.)

Logical Connections

In the LON Network physical connection between devices takes place via the respective transfer media. For example, all devices are connected with a twisted pair of wires and are equipped with a matching transceiver. This physical connection alone, however, is not sufficient for data exchange and cooperation of the connected devices.

Because physically all devices are connected to ‘the same wire‘, and all devices have access to all information through input network variables (see terminal in electrical installation example), each device must be informed as to which information is addressed to it.

Such settings – which data must be sent to which receiver or which data must be received by which sender – are referred to as **logical connections.** Such logical connections are generated when binding. This can take place with the help of a computer (e.g. Notebook PC), that is connected to the network and a software package – LONWORKS start-up software (binding tool).

Should a system contain only Viessmann control units, which are set up for communication as recommended by Viessmann, the connection (binding) takes place in a different manner: Viessmann controls are equipped with a built-in start-up program, which generates the logical connections required by Viessmann controls for joint operation. This requires only a few configuration adjustments. This procedure is called **self-binding**.

Addressing and Logical Network Structuring

Aside from its physical structure any large network also requires a logical structure. The purpose of a network consists of data exchange between various network participants. In order for a LON node to address another node or even a completely different group of nodes, each node within the network requires an individual address.

A comparison to the telephone network shall clarify this. Within the telephone network each participant has his/her own worldwide applicable “address”, consisting of the country code (e.g. 001 for Canada), area code (e.g. 519) as well as a participant’s phone number (e.g. 123 4567).

Similarly, each LON node is designated with its individual **logical address** within the LON Network. Designation of an address takes place when binding each node to the network, either with the binding tool or, as is the case for Viessmann control units, with manual configuration of a system and participant address at time of start-up.

The logical address of a LON node is structured into three hierarchical parts: domain number, subnet number and node number, or in network terms: Domain ID, Subnet ID and Node ID.

LON Network			**Comparison: Telephone network**
Structure	**Number range**	**controls via selfbinding derived from:**	
Domain ID	1 … 2^{48}	Always fixed	Country code
Subnet ID	1 … 255	System number	Area code
Node ID	1 … 127	Participant number	Participant number

If a node wants to send a message to another node (because the value of a connected network variable has changed, for example), it will use the logical address as receiver address (e.g.: Domain: 001, Subnet: 15, Node: 27).

In addition to the logical address each neuron chip has a physical address of an individual 48-bit serial number, called **Neuron ID**. Usually this one is not used when exchanging data between nodes; instead the logical address is used. The neuron ID is used for the initial introduction of a node into a network as well as for network management and diagnostic purposes.

Logical Address Structure offers the following advantages:

- Defective nodes can be replaced more easily.
- Data messaging is shorter than when the neuron ID is used.
- In large-scale networks the BUS load can be reduced by using routers. With routers, networks can be divided into various subnets. Routers ensure that only messages that are intended for participants of a specific subnet make it into the subnet. This way the BUS load of respective subnets can be reduced.

Group Address Structure

Aside from structuring the LON Network into domains and subnets, nodes may be divided into logical groups. This becomes especially practical when more than one participant is to receive the same message. This way for instance a main disconnect button can send the shut-off message in one single message to all participants of group “lamps”. Without this group definition, a message would have to be sent to each lamp individually.

The following limits apply to the group address structure: up to 256 groups may be defined within a domain. Each node can participate in up to 15 groups.

Viessmann control units also use the group address structure. Accordingly, all devices containing a heating circuit controller may belong to a group called “load”. These now behave in accordance with certain messages regarding heat production.

Transmitter Media

The neuron chip is designed for the connection to various transfer media. Transmission via a twisted pair of wires at different transmission speeds with and without superimposed direct current for power supply of smaller network nodes is most often used. Alternately, information exchange can take place using existing power lines. Light wave conductors and radio transmission are other transfer media that are available. Within one system various forms of transmission may be used. In order to copy data from one medium to the other, **routers** are used. Viessmann controls can be equipped with communication modules for the twisted pair of wires.

Communication Characteristics

When using the existing “Viessmann 2-wire-BUS” (so far used for the communication of Viessmann controls) one device adopts the function of the BUS master. This means that this device is responsible for the communication procedure. No other device (all other devices are called “slaves”) is allowed to send data to the BUS without having permission from the BUS master.

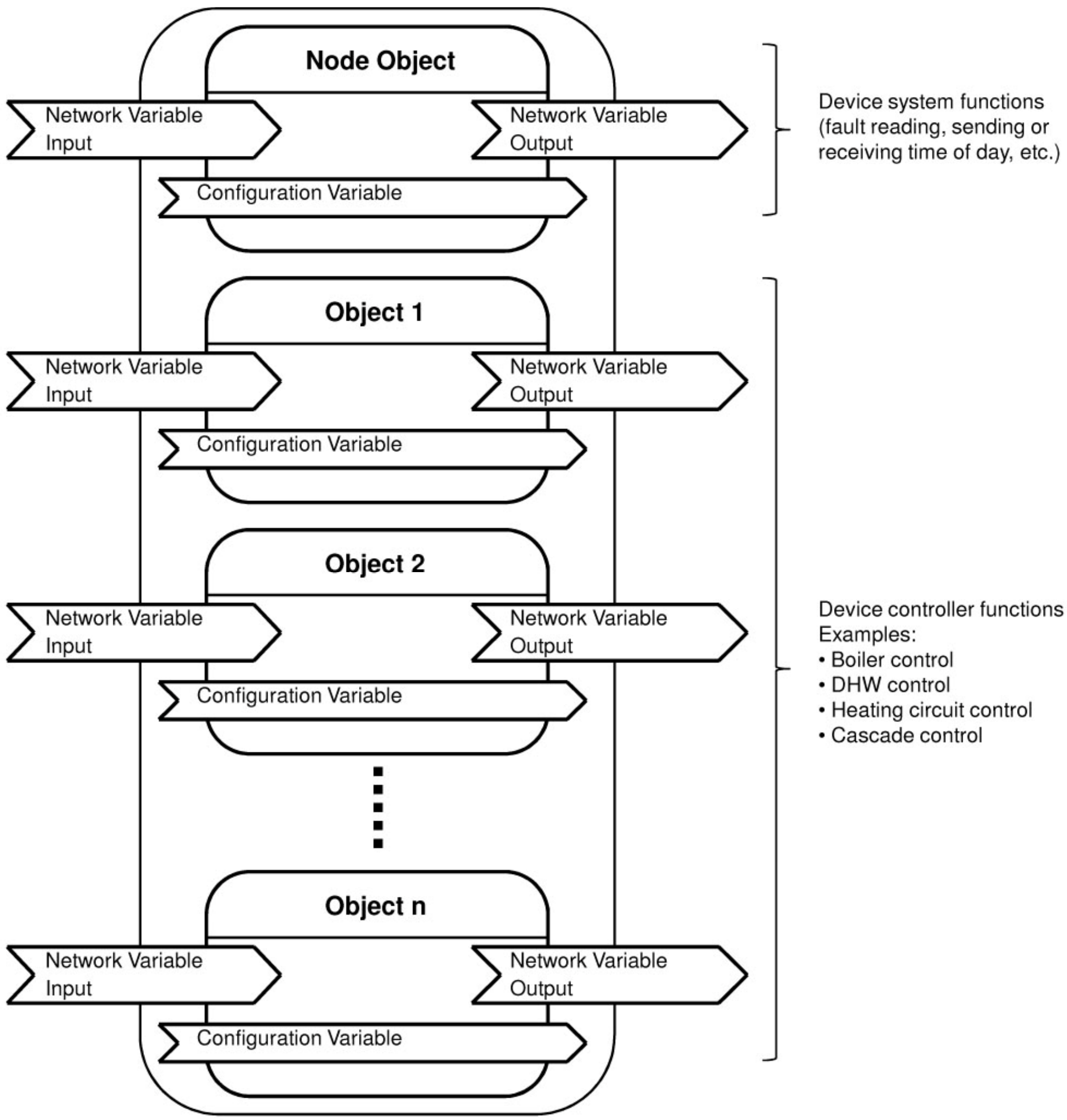
In a LONWORKS Network the situation is different. All devices are equal; there is no BUS master permitting transmission. The design of the neuron chips ensures that message collision is prevented. Nevertheless collisions can never be completely avoided, especially in networks with a high communication rate.

Various mechanisms ensure that, depending on the importance of the message, these arrive at their final destination. In a standard procedure, data is transmitted without a return receipt (unacknowledged). In case of important data repeated message sending, a message receipt (acknowledged) or a request-response procedure can verify a safe transmission. These connection characteristics can be selected during start-up for each individual connection, using the binding tool.

Graphical Layout of Information Structure

In order to illustrate the complex functional structure of a LONWORKS node in a structured and clear manner, an illustration of each function segment is required:

Illustration of a Node



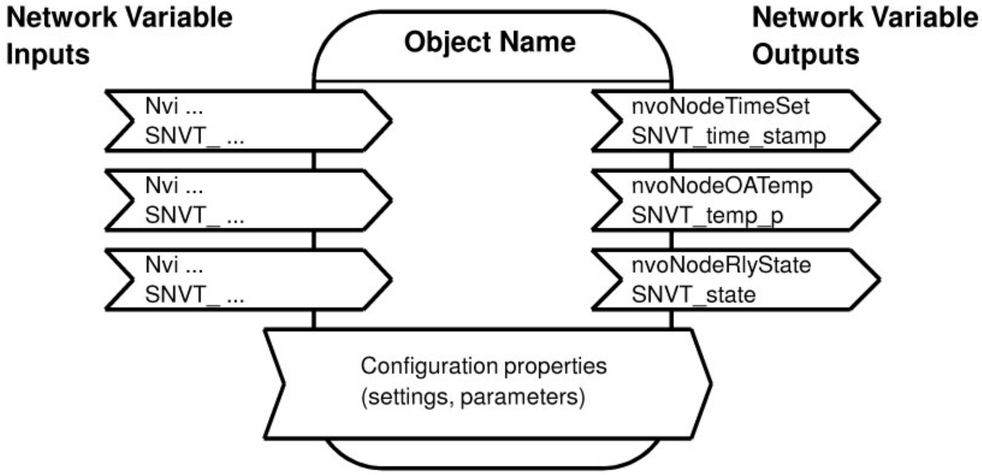
The node – i.e. the device and its functions as a whole – is first divided into its functional components. One functional component can be a heating circuit control, for example. A functional component comprises all input and output configuration variables for the applicable circuit control.

In place of "functional component" the term "**functional object**" or "**object**" is used. One node can have more than one functional object.

In addition to the application functions of a device, a node may contain a node object, in which all network variables are stored that must be attributed to the node as a whole and not to a single application function.

The following illustration is used for the exact correlation of an object (functional object) within a node:

General Illustration of an Object



The object itself is illustrated by a rounded rectangle; a description may be inserted into the upper segment. Input variables are represented by arrows on the left whose names start with letters “nvi”. Output variables are shown as arrows on the right, their names start with letters “nvo”.

Physical Network Structuring

For each transfer medium - more precisely, for each transceiver type – specific requirements apply, which must be followed to ensure "clean" communication between all participating BUS devices. These requirements are as follows:

- wiring structure (topology) of LON devices
- maximum wire lengths
- maximum permissible number of devices
- layout of BUS end

Viessmann communication modules contain a transceiver type FTT 10-A. The following will list the requirements applicable to this transceiver type. For further information regarding specific requirements for wiring, etc. visit www.echelon.com.

Maximum Number of Nodes

For transceiver type FTT 10-A a **maximum of 64 nodes** are feasible for one network segment. For large-scale networks, a division into network segments is required (see chapter entitled "Large Scale Networks").

Safety Instructions

When connecting devices or installing wires, take note that in all instances the requirements of low and extra voltage circuits, i.e. 0.3 inches/ 8 mm air distance and access clearance to live components, are observed. In case of field supplied and installed components, an "electrically safe separation" must be ensured.

Topologies

BUS or Line Topologies

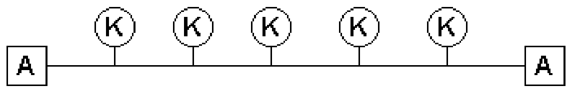
Networks with a FTT 10-A receiver can be composed of different topologies.
Viessmann, however, recommends, where possible, the use of line or BUS structures for the following reasons:

- As opposed to free topology, this unique form of network topology allows for an increase of the maximum admissible wire length. Within this structure, the maximum cable length for FTT 10-A networks is reached.

- Viessmann communication modules, with two RJ45 plug-in connectors each and ready-made connecting cables, allow for easy installation.

- When using line structuring, not like ring topology, wiring is not polarity sensitive. This means that the BUS wires can be reversed.

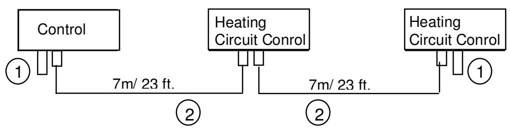
BUS or Line Topology

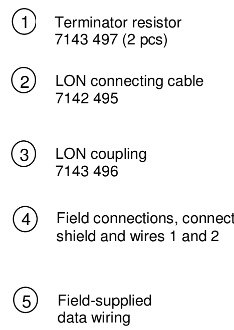


K = Network node
A = Terminator resistor

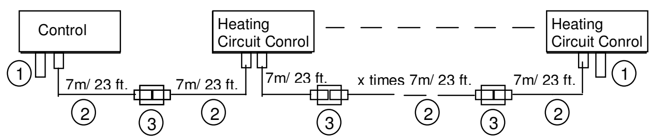
Networks with BUS or line structuring using Viessmann components can be set up as follows:

a) With system wiring

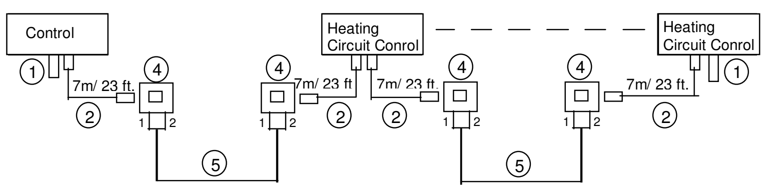




b) With system wiring and coupling for extension



c) With field-supplied connection box and extension



For networks with BUS or line topologies, a terminator resistor (Viessmann Part No. 7243 497, package of two) must be installed on both ends of the network segments, in order to buffer reflections of data signals at the cable ends. This terminator resistor is not a standard resistor, but rather a specific RC circuit. It is equipped with an RJ45 plug-in connector and can be plugged in at the communication module.

For networks with FTT 10-A, the following maximum values are possible for BUS and line topologies:

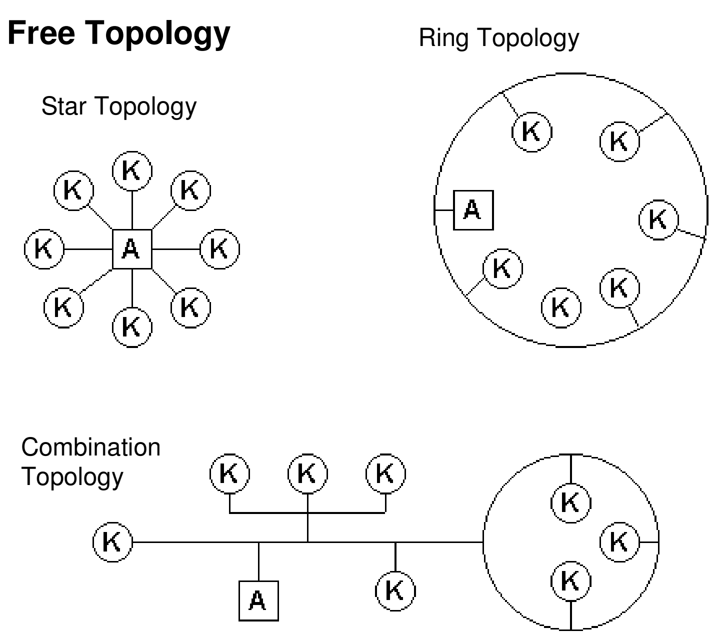
Recommended cable type	**Total maximum cable length**
TIA 568 Category 5 (Cat. 5) cable	2950 ft/ 900m
JY(ST)Y 2x2x0.8 mm (telephone cable)	2460 ft/ 750m

For transition to field-supplied wiring, the LON Connection Terminal (Viessmann part number: 7171 784) can be used.

For communication, wires 1 and 2, as well as shielding are required.

Free Topology

Free topology allows the installation of any network, regardless of structure, in buildings. As the name FTT (free topology transceiver) indicates, the BUS line can be installed in any given branching combination when this transceiver type FTT 10-A is used. Star-shaped, ring-shaped and line structures are possible, as well as any kind of combination.



K = Network node
A = Terminator resistor

For networks with free topology, a network segment with a special terminator resistor (not supplied by Viessmann – e.g. available from Echelon) must be connected in order to dampen reflections of data signals at cable ends.

For networks with FTT 10-A and free topology, the following maximum values are possible:

Recommended cable type	**Max. distance between nodes**	**Max. cable length**
TIA 568 Category 5 (Cat. 5) cable	823 ft/ 250 m	1476 ft/ 450 m
JY(ST)Y 2x2x0.8 mm (telephone cable)	1049 ft/ 320 m	1640 ft/ 500 m

The maximum distances between nodes as stated in table on the previous page refer to distances between **any** two nodes – not solely to the maximum distance between neighbouring nodes! Listed maximum distances also apply to distances between each node and the BUS termination; in other words, depending on the type of cable no node may be installed more than 820 or 1050 ft/ 250 or 320 m cable length away from the terminator resistor.

Large-scale Networks

Large-scale networks require the division into several network segments to function properly. With each additional network segment, another 64 nodes can be installed. Maximum cable lengths are applicable to one segment only.

For the connection of network segments, routers and repeaters are used:

Repeaters are devices with two BUS connections, reinforcing the signal strength. Since repeaters only amplify messages (as opposed to reproducing), a maximum of three repeaters may be connected in a logical series. After that, a router for message reproduction is required.

Like repeaters, **routers** are devices with two BUS connectors. Their application range, however, exceeds that of the repeater. Routers have a message filter function and can thereby decide which message to send on (to the other BUS side) and which not to, in case no device is supposed to receive the message on the other side. This function allows the reduction of the communication load (= number of messages per time unit) within individual network segments.

The decision of whether or not to forward the message is made by the router by evaluating the logical destination address in the message header. This way, the router must be seen as a device which performs logical network structuring, rather than one of physical network structuring.

Another difference between repeaters and routers is the fact that routers can be equipped with two different transceivers. This allows different transfer media to be connected to each other. This way, for example, an extension to a building may be built using a twisted pair of wires, while in the existing building Power Line Technology (information transfer via 120/ 240V line voltage) was used.

Start-up of LON Network with Viessmann Controls

Start-up Procedure

In this chapter we will discuss the required steps for the start-up of the LON Network with Viessmann controls.

1. Installation and Connection
All controls must be installed and connected according to the accompanying Installation Instructions. The communication module must be connected as outlined in the applicable Installation Instructions.

2. Network Installation
The communication modules of the control units must either be connected via BUS cables or must be field connected (for longer cable lengths). All terminator resistors must be connected as described in the chapter entitled “Physical Network Structure”.

3. Network Configuration
When activating the control units, they connect themselves into one system automatically, using the integrated self-installation mechanism. For complete start-up of all communication functions, the following steps are required (depending on system type):

3a. System without Data Exchange with Devices from Other Manufacturers
For systems with Viessmann control units without data exchange with devices of other manufacturers, the following configuration parameter (coding address) adjustments are required:

Vitotronic 100 GC1:

CA (hex)	Description: Function	Value	Adjustment necessary?
01	**Single/ Multiple boiler system:** determines whether it is dealing with a single or multiple boiler system	 **1** 2	*Only for a multiple boiler system:* Single boiler system Multiple boiler system with Vitotronic 333 MW1
07	**Boiler number:** determines the boiler number of a boiler in a multiple boiler system	**1** … 4	*Only for a multiple boiler system* Boiler number 1 … 4
77	**Participant number:** determines node address via selfbinding	**1** … 99	*Only if participant number “1” is already taken by an other participant:* Participant number 1 ... 99
98	**System number:** determines subnet number via selfbinding	**1** ... 5	*Only if several independent heating systems are in one network*: System number 1 ... 5
79	**System fault manager:** determines whether device is to record all fault messages of the heating system, checks participants for failure and generate a compiled fault message	**0** 1	*Only if device is to check other devices for fault/ failure (please note: only one control unit per heating system must be fault manager):* Device is not fault manager Device is the fault manager

CA = Coding Address

Vitotronic 200 GW1, Vitotronic 300 GW2 and Vitotronic 200 HO1:

CA (hex)	Description: Function	Value	Adjustment necessary?
77	**Participant number:** determines node address via selfbinding	 **1** … 99	*Only if participant number "1" is already taken by an other participant:* Participant number 1...99
98	**System number:** determines subnet address via selfbinding	 **1** ... 5	*Only if several independent heating systems are present in one:* System number 1 ... 5
79	**System fault manager:** determines whether device is to record all fault messages of the heating system, check participants for failure and generate a compiled fault message	 0 **1**	*Only if this device is **NOT** to check other devices for fault/ failure (please note: only one control unit per heating system must be fault manager):* Device is not the system fault manager Device is fault manager
7B	**Sending time information:** allows the device to send the time to all other nodes in the domain	 0 **1**	*Only if the device is **NOT** to send its time to the network (please note: only one device per network must provide time information):* Device does not send time Device provides time information
81	**Receiving time information from LON:** allows the setting of a node clock according to time information provided by the network	 0 **1** 2 3	*Only if device is to use the time provided by network to set its real time clock:* Internal clock (without daylight saving time) Internal clock (with daylight saving time) Radio clock Device takes time from network
97	**Sending/ Receiving of outdoor temperature:** allows the sending and receiving of the outdoor temperature within a subnet (please note: only one participant within a system must send the outdoor temperature)	 0 1 **2**	*Only if the device is to send the measured outdoor temperature to other devices or is to adopt the network outdoor temperature:* Use local outdoor temperature Adopt outdoor temperature from LON Use outdoor temperature from outdoor sensor and send to LON

CA = Coding Address

Vitotronic 333 MW1, Vitotronic 333 MW1S and **Vitotronic 333 MW2:**

CA (hex)	Description: Function	Value	Adjustment necessary?
35	**Number of boilers:** determines number of boilers in a system	1 ... **4**	*Only if it is not a four-boiler system:* Number of boilers 1 ... 4
77	**Participant number:** determines the node address via selfbinding	1 ... 99 **5**	*Only if participant number “1” is already taken by another participant:* Participant number 1 ... 99 Participant number (default factory setting)
98	**System number:** determines subnet address via selfbinding	**1** ... 5	*Only if several independent heating systems are present in one network:* System number 1 ... 5
79	**System fault manager:** determines whether device is to record all fault messages of the heating system, check participants for failure and generate a compiled fault message	0 **1**	*Only if device is **NOT** to check other devices for fault/ failure (please note: only one control unit per heating system must be fault manager):* Device is not the fault manager Device is the fault manager
7B	**Sending Time Information:** allows the device to send the time to all other nodes in the domain	0 **1**	*Only if the device is **NOT** to send its time to the network (please note: only one device per network must provide time information):* Device does not send time information Device provides time information
81	**Receiving Time Information from LON:** allows the setting of a node clock according to time information provided by the network	0 **1** 2 3	*Only if device is to use the time provided by the network to set its real time clock:* Internal clock (without daylight saving time) Internal clock (with daylight saving time) Radio clock Device takes time from network
97	**Sending/ Receiving of Outdoor Temperature:** allows the sending and receiving of the outdoor temperature within a subnet (please note: only one participant within a system must send the outdoor temperature)	0 1 **2**	*Only if the device is to send the measured outdoor temperature to other devices or is to adopt the network outdoor temperature:* Use local outdoor Adopt outdoor temperature from LON Use outdoor temperature from outdoor sensor and send to LON

CA = Coding Address

Vitotronic 050 HK1W, Vitotronic 050 HK1S, Vitotronic 050 HK1M, Vitotronic 050 HK3W and Vitotronic 050 HK3S:

CA (hex)	Description: Function	Value	Adjustment necessary?
77	**Participant number:** determines the node address via selfbinding	 1 ... 99 **10**	*Only if participant number "10" is already taken by another participant*: Participant number 1 ... 99 Participant number 10 (default factory setting)
98	**System number:** determines subnet address via selfbinding	 **1** ... 5	*Only if several independent heating systems are in one network:* System number 1 ... 5
79	**System fault manager (not available with Vitotronic 050HK1M):** determines whether device is to record all fault messages of the heating system, check participants for failure and generate a compiled fault message	 **0** 1	*Only if devices is to check other devices for fault/ failure (please note: only one control unit per heating system must be fault manager):* Device is not the fault manager Device is the fault manager
7B	**Sending Time Information:** allows the device to send the time to all other nodes in the domain	 **0** 1	Only if the device is to send its time to the network (please note: only one device per network must provide time information): Device does not send time information Device provides time information
81	**Receiving Time Information from LON:** allows the setting of a node clock according to time information provided by the network	 0 **1** 2 3	*Only if device is to use the time provided by the network to set its real time clock:* Internal clock (without daylight saving time) Internal clock (with daylight saving time) Radio clock Devices take time from network
97	**Sending/ Receiving of Outdoor Temperature:** allows the sending and receiving of the outdoor temperature within a subnet (please note: only one participant within a system must send the outdoor temperature)	 **0** 1 2	*Only if the device is to send the measured outdoor temperature to other devices or is to adopt the network outdoor temperature:* Use local outdoor temperature Adopt outdoor temperature from LON Use outdoor temperature from outdoor sensor and send to LON

CA = Coding Address

3b. System with Data Exchange with Devices from Other Manufacturers

For systems with data exchange with other devices from other manufacturers, or for systems with Viessmann controls located on opposite sides of a router that must correspond with each other, start-up software (binding tool) is required for the logical connection of these devices. The toolbinding process is to be performed by the system integrator. It is his/her task to logically combine the various devices in a system to one main function. In chapter “Connecting Devices via Start-up Software (Toolbinding)” all logical connections required for the harmonization of Viessmann devices are described.

During toolbinding, all necessary information for connecting the devices is produced with the help of a computer and the LONWORKS Binding Tool software (connected to the network) and is written to the nodes. The process is as follows:

- All devices in the network are identified and introduced to the tool.
- Objects used by these devices are identified and named.
- On the monitor, the user connects all output variables to the input variables of the objects. Depending on which tool is used, this takes place in a graphics or text format. Everything else is usually done by the application program.
- The tool sends a series of network management messages via BUS to the nodes, reconfiguring them.
- The toolbinding option also requires the adjustment of the configuration parameter (coding addresses) as described in 3a. This is the only way to assure the desired function.

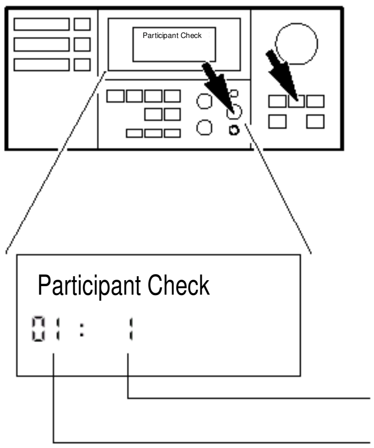
From this point on, the node will automatically send changes to its output variables to all predetermined recipients, while its input variables will receive all data from the BUS addressed to it.

4. Participant Check

After the binding and setting of the parameter, a **participant check** should be performed. This participant check shows if all Viessmann control units are communicating with each other. Before doing this, update the participant list of the fault manager (press the ▸|◂ button during the participant check to erase the list, and wait for ca. 2 minutes until the list reappears).

Communication of control units connected to the fault manager is checked with the Participant Check.
Prerequisite:

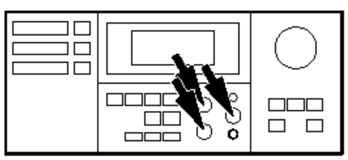
- *Control must be programmed as fault manager (coding "79:1")*
- *The LON Participant Number has to e programmed in all controls*
- *Participant list in fault manager has to be current*



1. Press and (OK) simultaneously for 2 seconds. → *Participant Check is activated.*

Participant Number

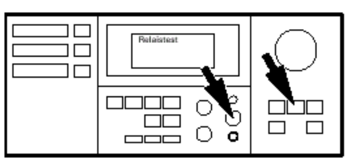
Serial List Number



2. Select desired Participant with (+) or (−).

3. Activate Check with (OK). Display will indicate "**Check OK**" if communication between both control units is established. If no communication is the case, "**Check not OK**" is displayed. → *"**Check**" is flashing in display until Participant Check is finished. Display and all LEDs are flashing for 60 seconds on dialed-up participant.* → *Check for LON connections and fault messages on respective control unit.*

4. To check other participants refer to points 2 and 3.



5. Press and (OK) simultaneously for 2 seconds. → *Participant Check is finished.*

5. Configuration for the Heating System

Following the participant check, a configuration for the heating system (adjustment of hydraulic layout, burner, etc.) of the system may be performed. For more detailed information, please refer to the Installation and Service Instructions of Viessmann controls as well as those of other system components.

Overview: Functional Objects of Devices

General Information

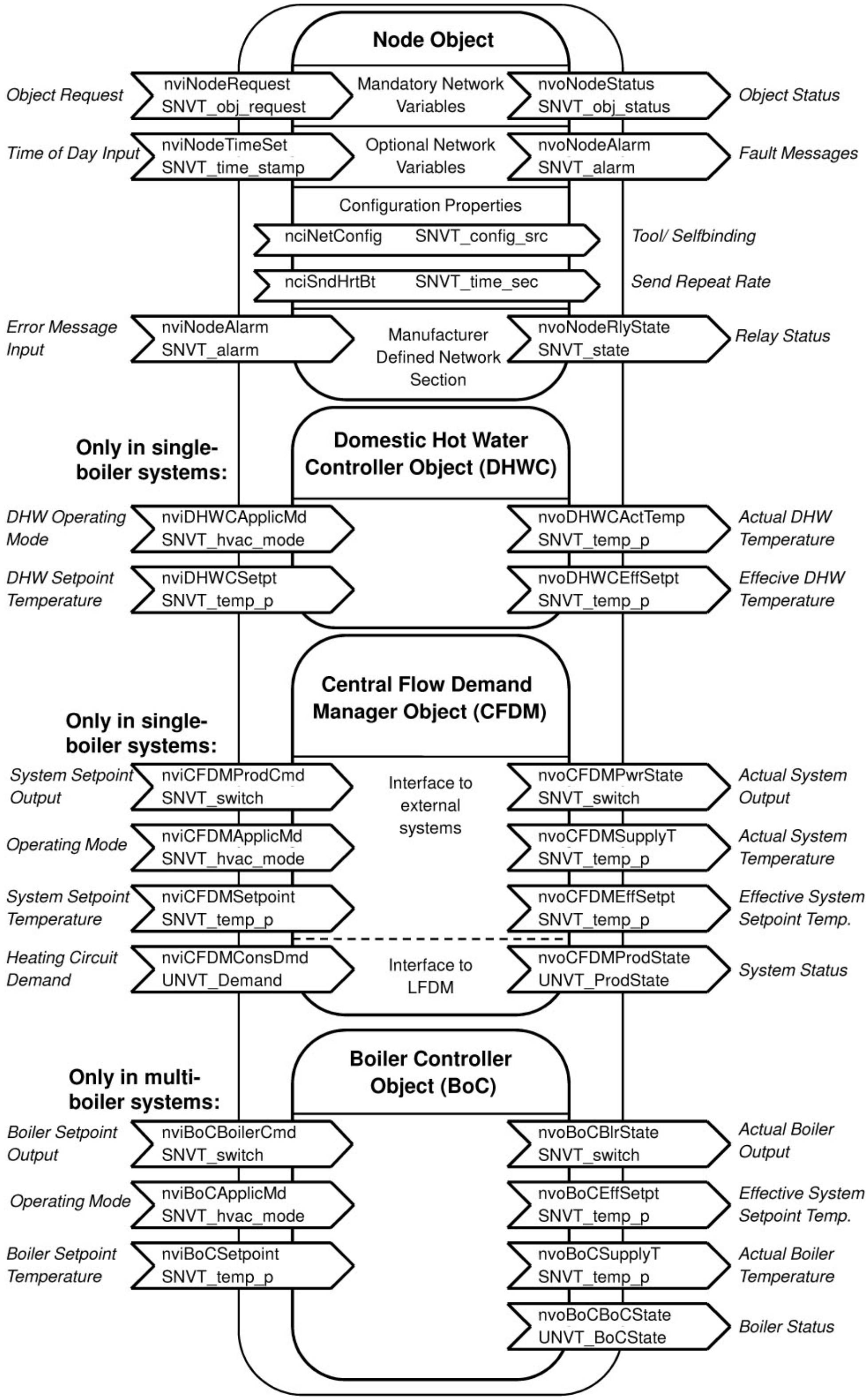
Viessmann control units require two different types of communication modules:

Communication module	For use with:
LON module for heating circuits and boiler controller	Vitotronic 050, Model HK1M (accessory) Vitotronic 050, Model HK1W (accessory) Vitotronic 050, Model HK1S (standard equipment) Vitotronic 050, Model HK3W (accessory) Vitotronic 050, Model HK3S (standard equipment) Vitotronic 100, Model GC1 (accessory) Vitotronic 200, Model GW1 (accessory) Vitotronic 300, Model GW2 (accessory) Vitotronic 200, Model HO1 (accessory)
LON module for cascade control	Vitotronic 333, Model MW1 (standard equipment) Vitotronic 333, Model MW1S (standard equipment) Vitotronic 333, Model MW2 (accessory)

Should the wrong version of the communication module be connected, fault code "bF" – wrong communication module – will appear.

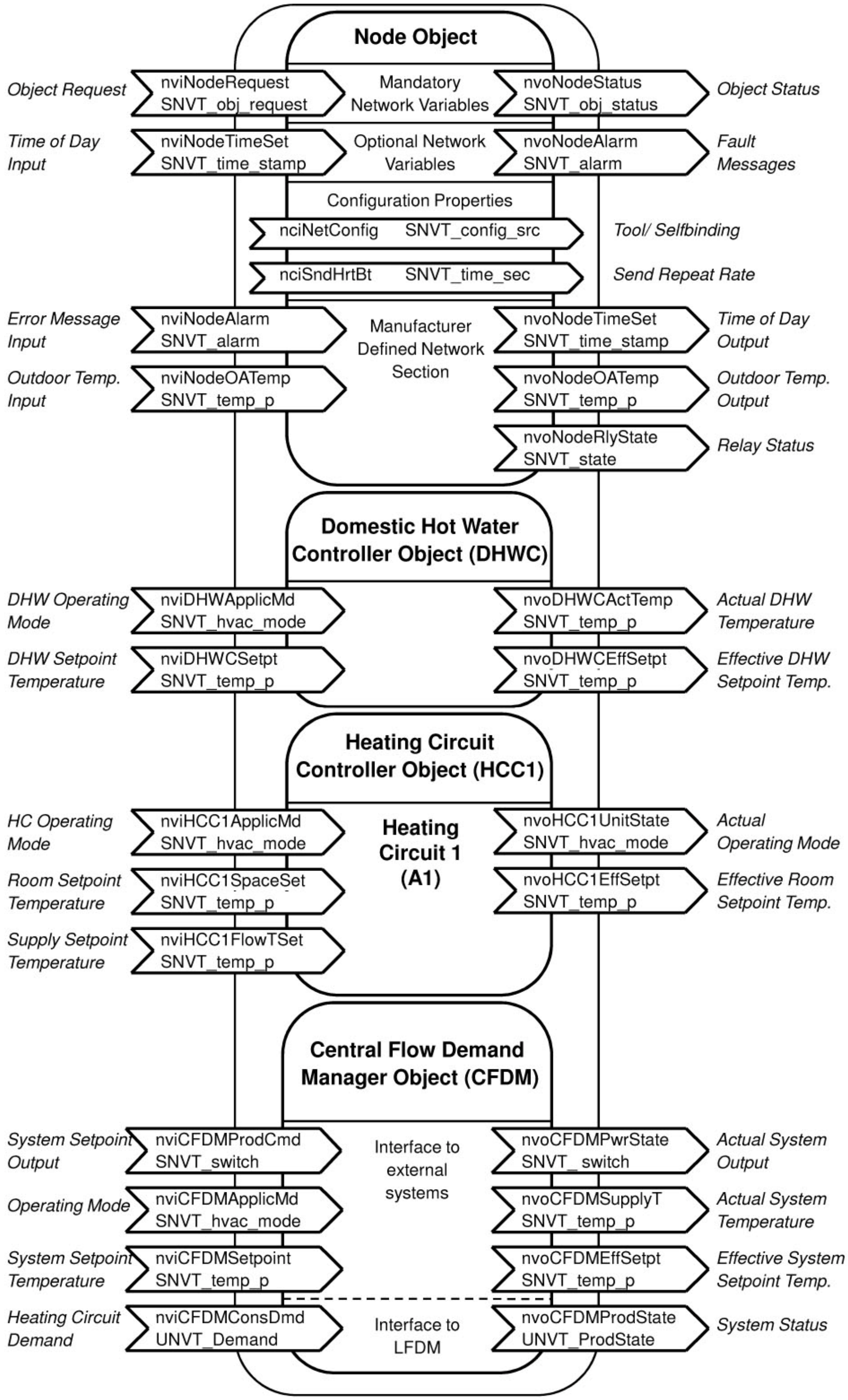
Communication module Part No. 7143 426 provides the required functional objects and network variables required by all devices. **Depending on device and its configuration, network variables or entire objects may not be functional.**

Vitotronic 100, Model GC1



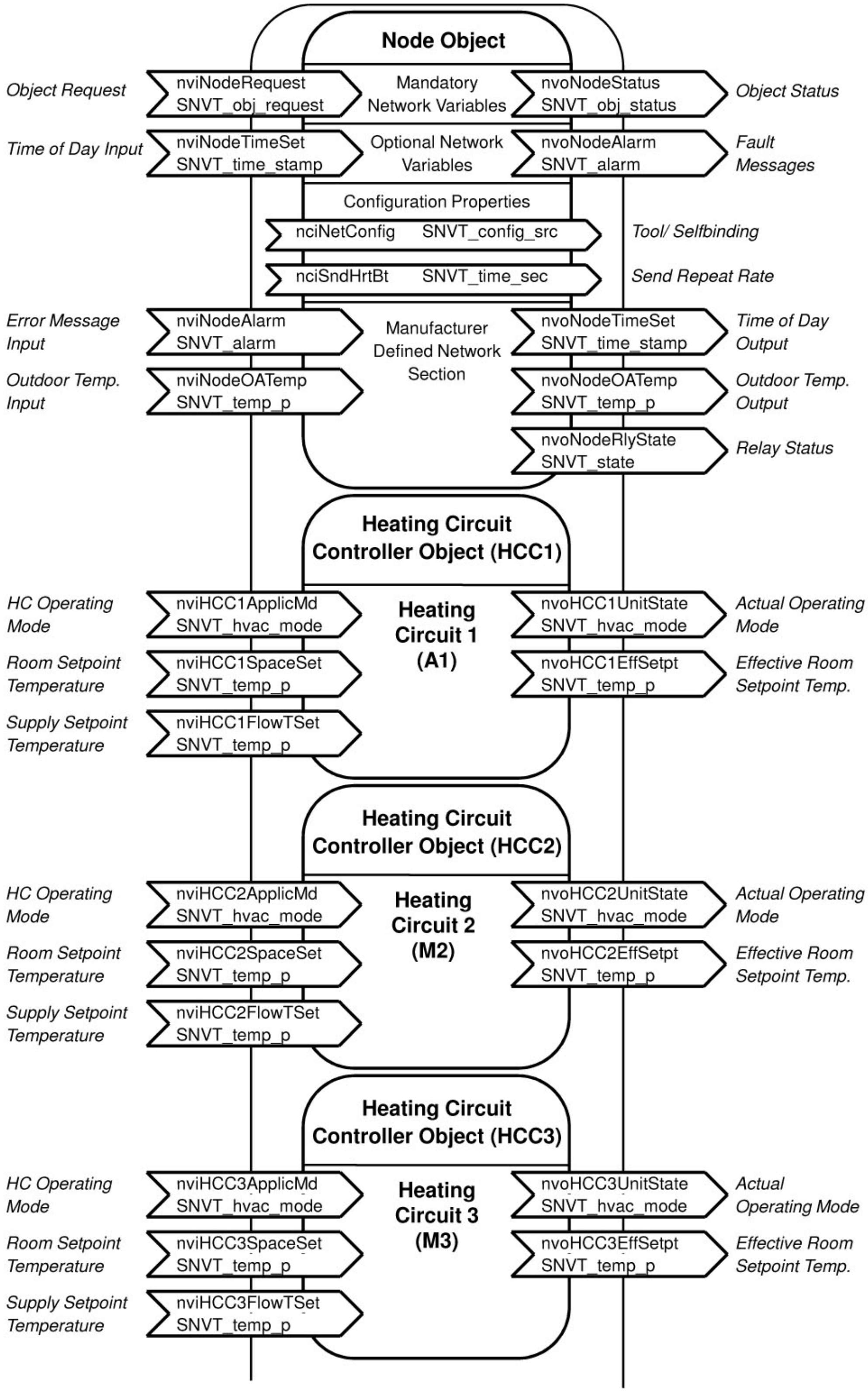
Please note: Depending on the system configuration, some functional objects or network variables may not be functional.

Vitotronic 200, Model GW1



Please note: Depending on the system configuration, some functional objects or network variables may not be functional.

Vitotronic 300, Model GW2



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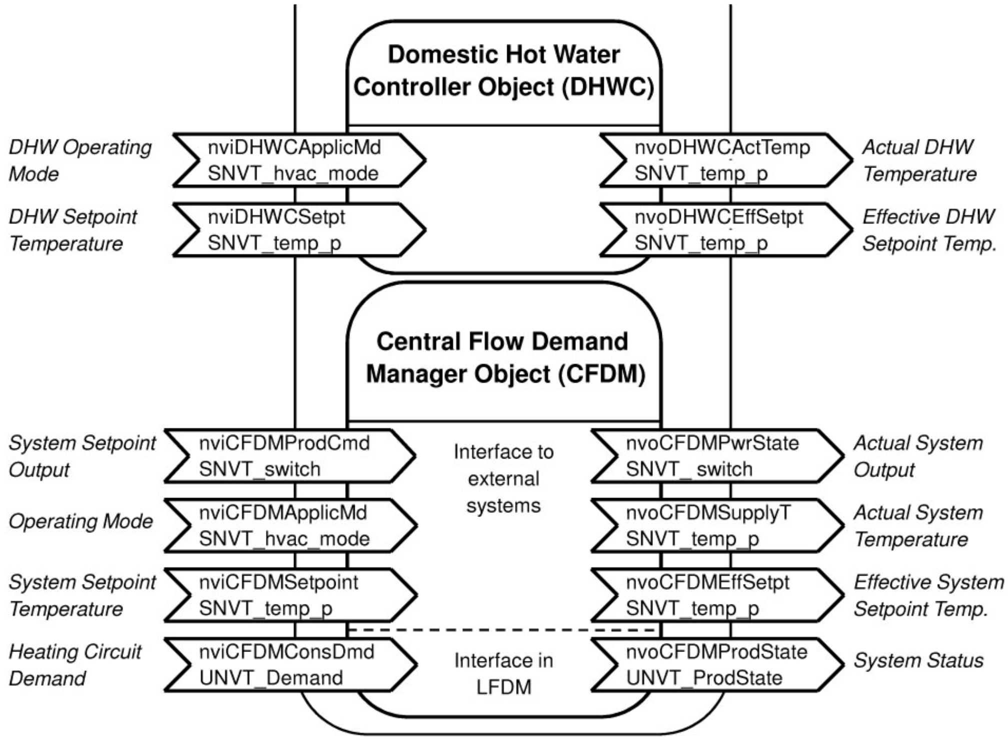
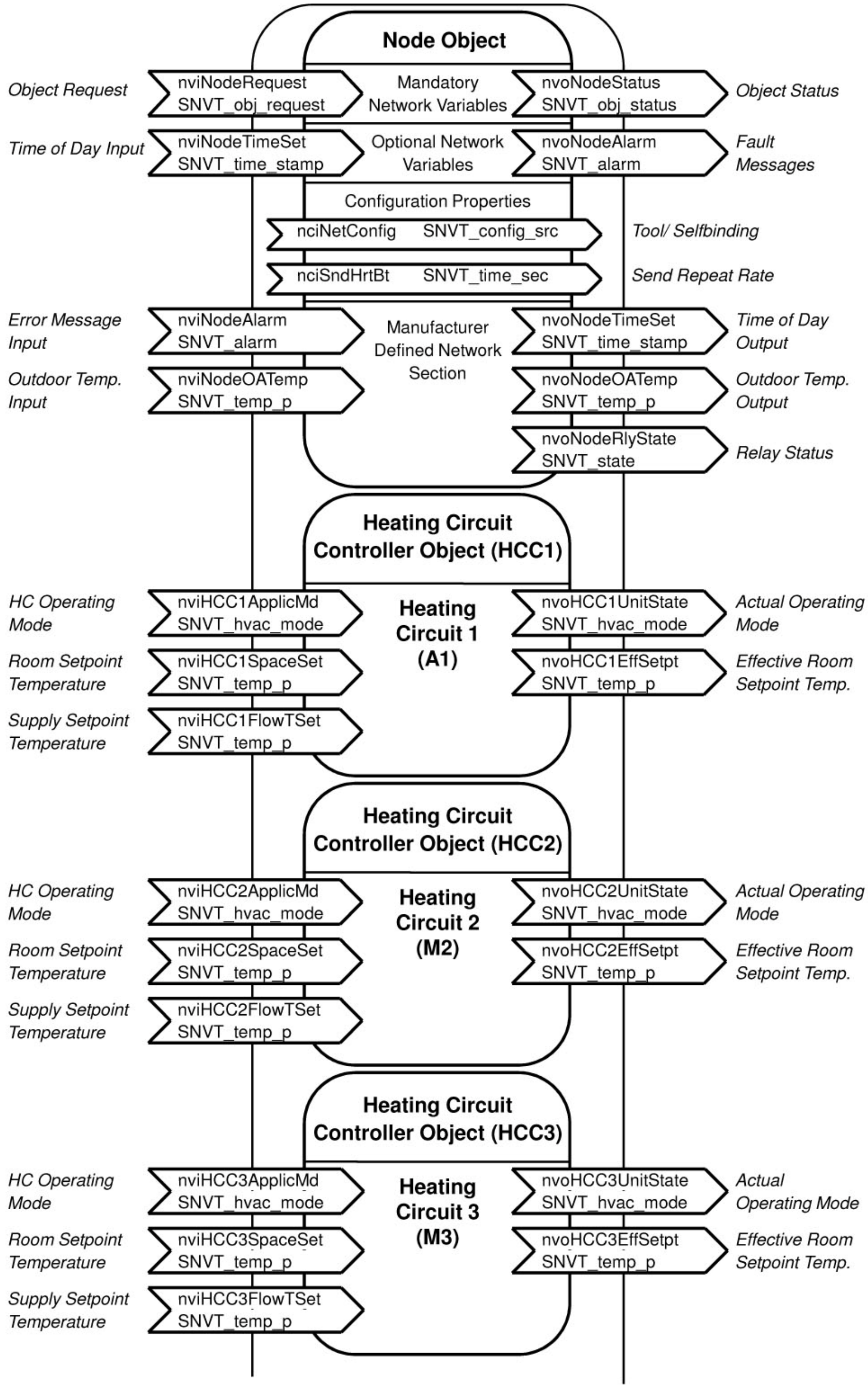
Continued: Vitotronic 300, Model GW2



Please note: Depending on the system configuration, some functional objects or network variables may not be functional.

Vitotronic 333, Models MW1, MW1S and MW2



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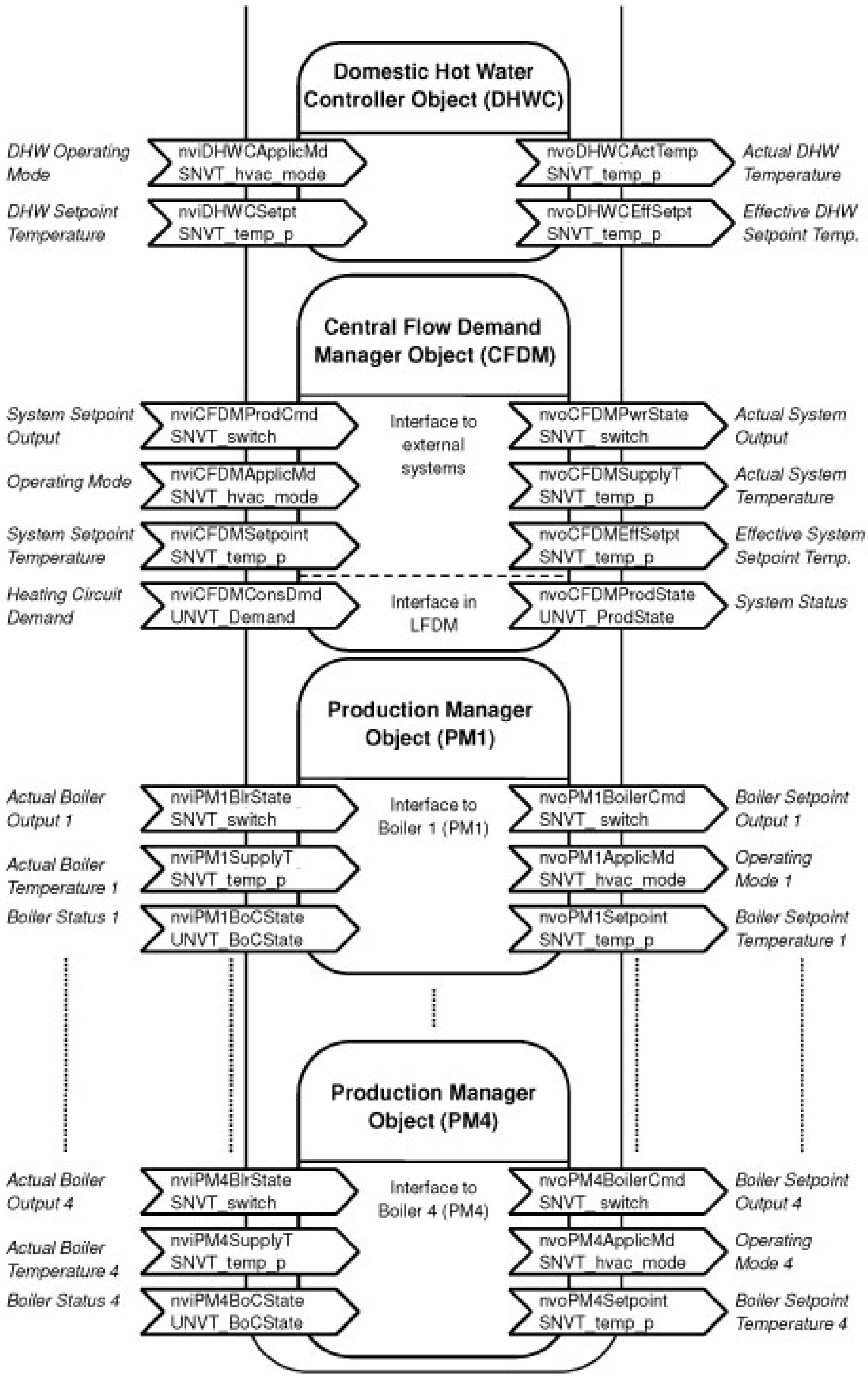
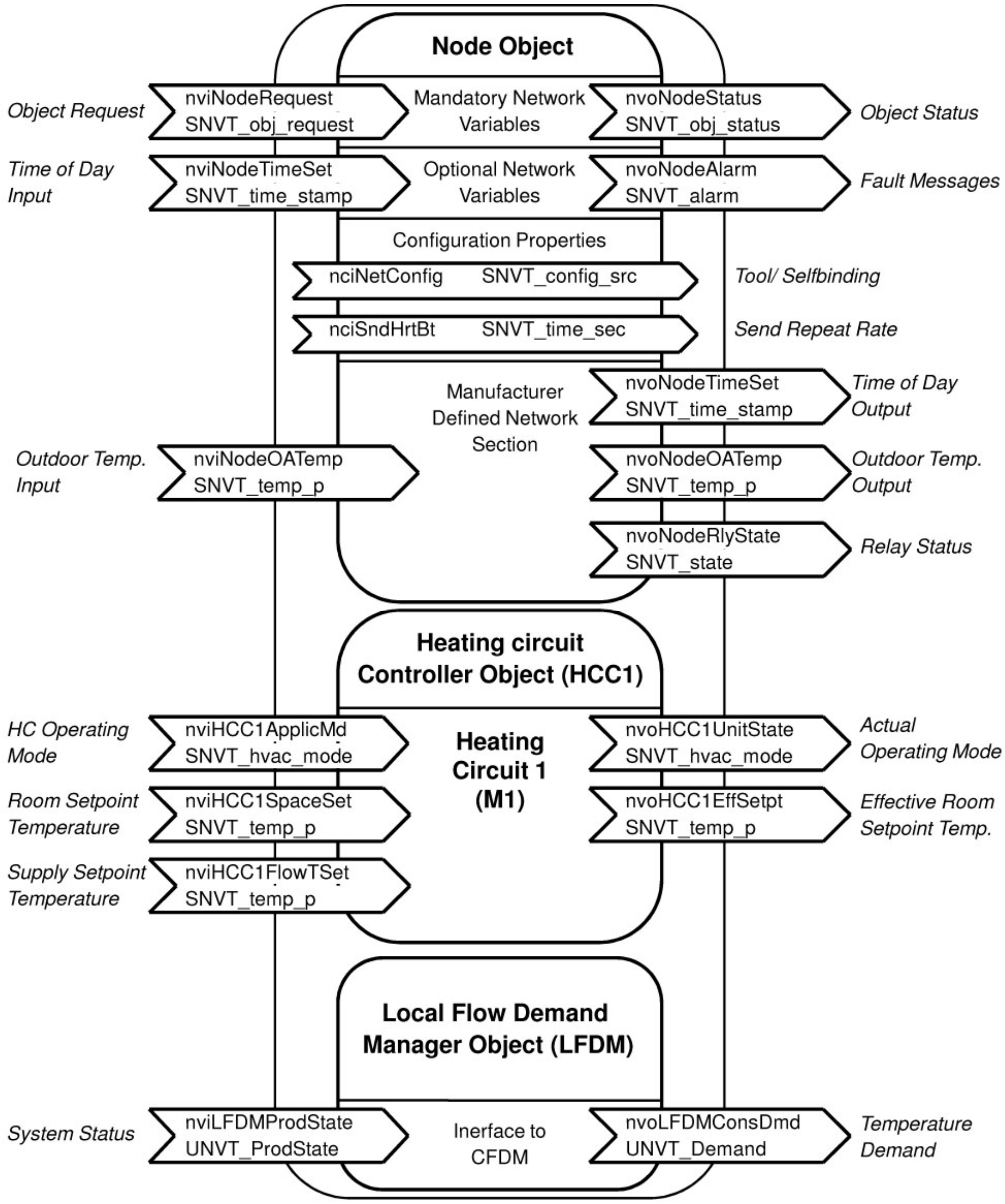
Continued: Vitotronic 333, Models MW1, MW1S and MW2



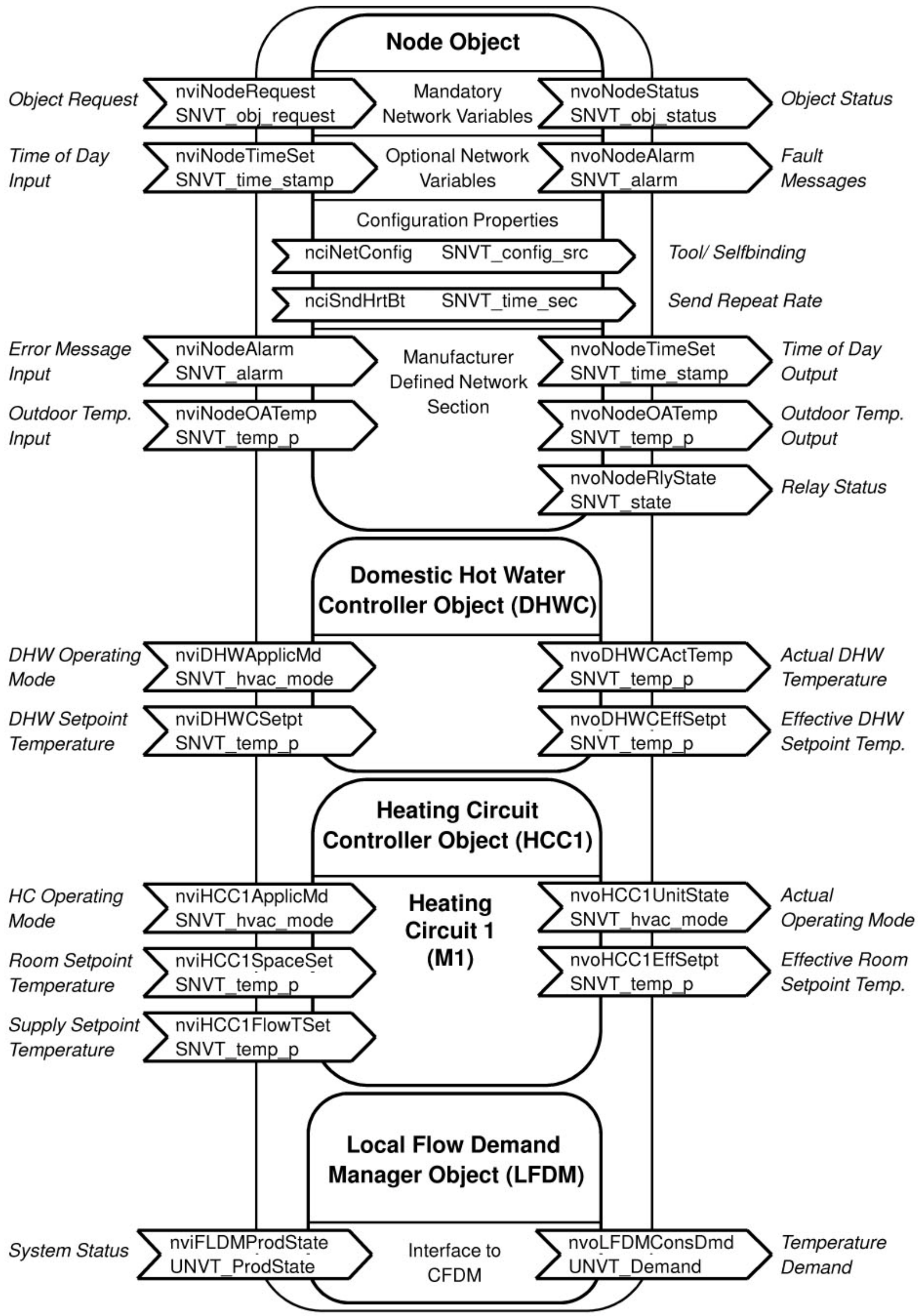
Please note: Depending on the system configuration, some functional objects or network variables may not be functional.

Vitotronic 050, Model HK1M



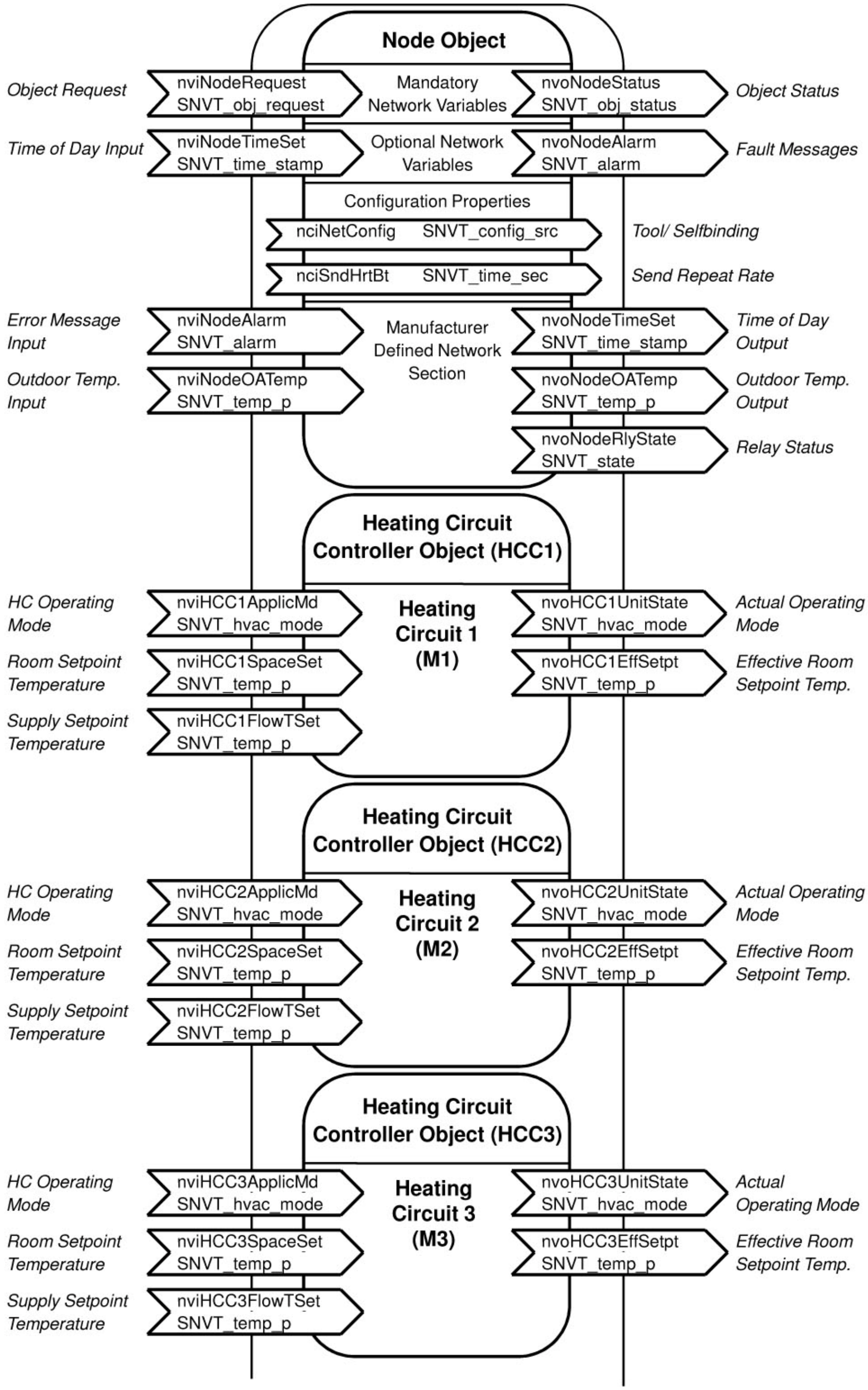
Please note: Depending on the system configuration, some functional objects or network variables may not be functional.

Vitotronic 050, Models HK1W and HK1S



Please note: Depending on the system configuration, some functional objects or network variables may not be functional.

Vitotronic 050, Models HK3W and HK3S



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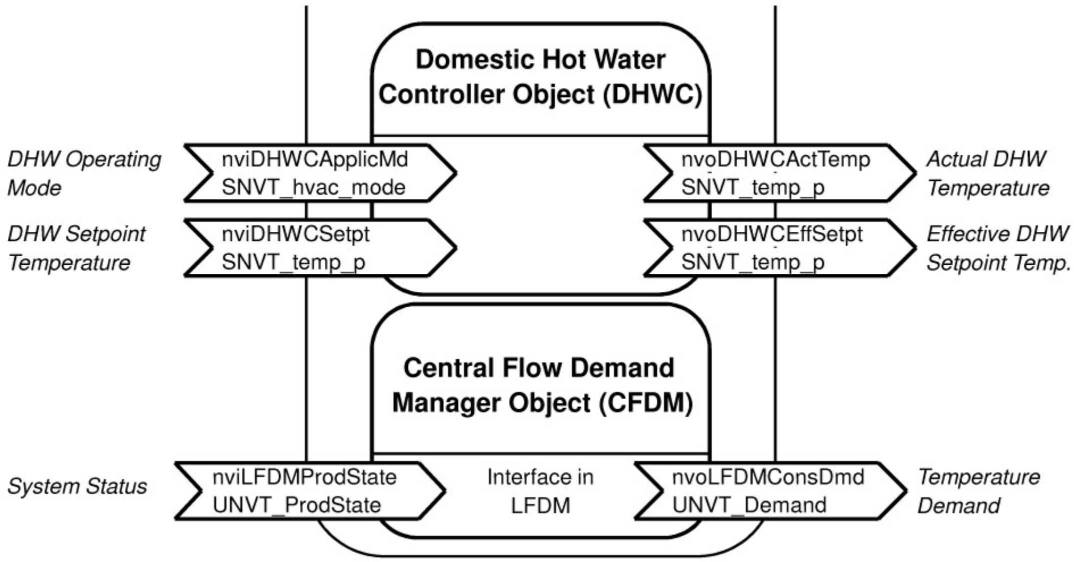
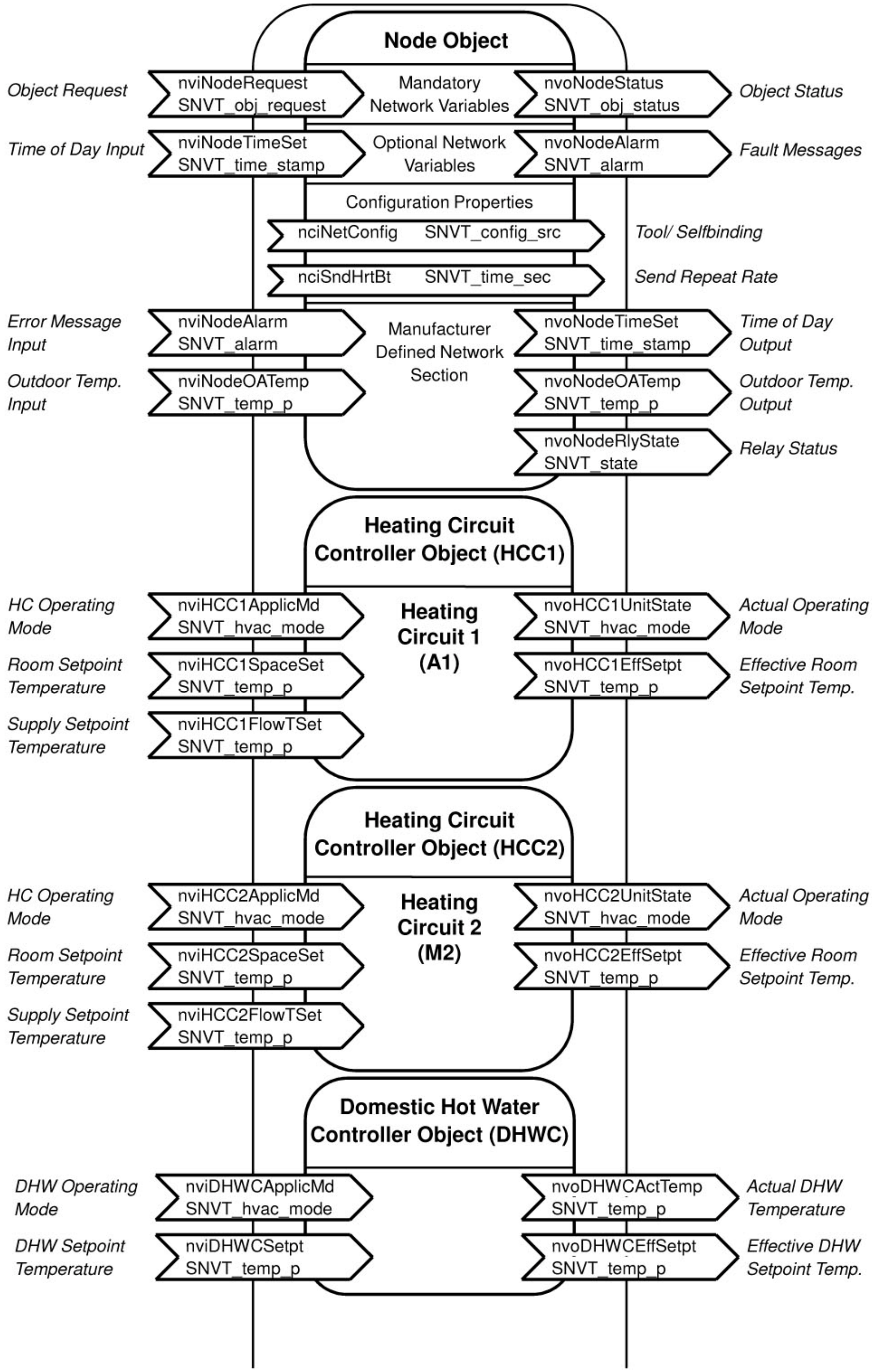
Continued: Vitotronic 050, Models HK3W and HK3S



Please note: Depending on the system configuration, some functional objects or network variables may not be functional.

Vitotronic 200, Model HO1



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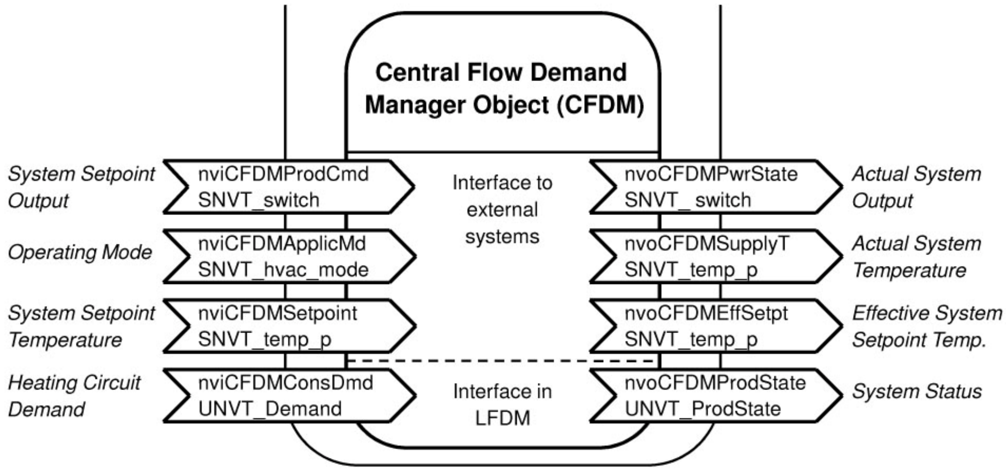
Continued: Vitotronic 200, Model HO1



Please note: Depending on the system configuration, some functional objects or network variables may not be functional.

Description of Functional Objects

General Information

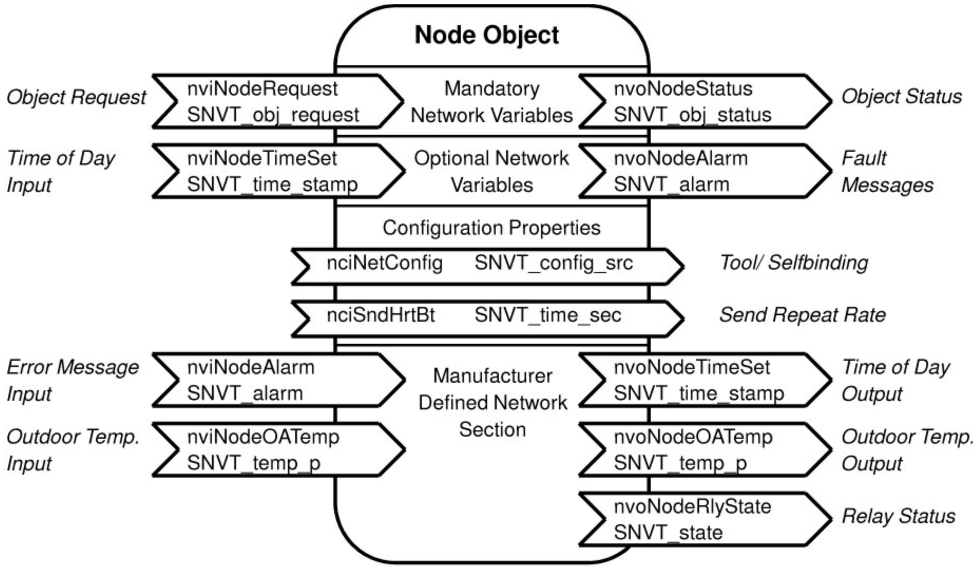
The description of functional objects of Viessmann control units explains in detail the meaning and function of each individual network variable. First, it must be determined whether a network variable is event-oriented or transmitted cyclically.

In the tables for the input network variables (nvi …), the column “RcvHrtBeat” indicates whether a cyclical reception of these network variables is expected. If “Yes” appears in this column, it is expected that the network variable is received cyclically. If no message was received during the “ReceiveHeartBeat-Time” for this network variable, the default value is used internally until another message is received. The “ReceiveHeartBeat-Time” is adjustable (in minutes) with coding address “9C” on the control unit. The factory default setting is set to 20 minutes. The “ReceiveHeartBeat-Time” should always constitute a multiple of the “SendHeartBeat-Time”. If “No” appears in the column “RcvHrtBeat”, the network variable is received sporadically.

In the tables for the output network variables (nvo …), the column “SendHrtBeat” indicates whether the network variable is sent cyclically. If “Yes” appears in this column, the network variable is sent cyclically. Cyclical sending takes place with the “SendHeartBeat-Time”. The “SendHeartBeat-Time” is adjustable via a binding tool as a configuration parameter “nciSndHrtBt” (in seconds). **The factory default setting is set to 60 seconds.** If the “SendHeartBeat-Time” is drastically increased, the “ReceiveHeartBeat-Time” is to be adjusted accordingly (see above). If “No” appears in the column “SndHrtBeat”, this network variable is only transmitted sporadically, e.g. when changing the value by a certain amount.

The column “SNVT Type” determines which data type or which data format is used. Data types starting with “SNVT...” are Standard Network Variable Types, i.e. data types defined as standard data formats by LONMARK. Data types starting with “UNVT...” are User Defined Network Variable Types, i.e. Viessmann-defined data formats.

Node Object



LONMARK requires a node object for each node. It contains variables, which are applicable to the device in general and not only to one single functional object. At the very least, network variables listed as “Mandatory Network Variable” must be available. Viessmann controls (for exceptions see chapter “Overview: Functional Objects of Devices”) generally provide the above illustrated network variables.

Configuration Parameter (configuration properties) of the node object:

Name	SNVT Type	Description	RcvHrt Beat
nciNetConfig	SNVT_config_src	Tool /Selfbinding: see “LONMARK Application Layer Interop-erability Guidelines”, version 3.2, chapter 3 (determines if selfbinding or toolbinding occurs), 0 = CFG_LOCAL (Factory default setting, self-installed) 1 = CFG_EXTERNAL (tool-installed)	No
nciSndHrtBt	SNVT_time_sec	SendHeartBeat, send repeat rate: time for cyclical transmis-sion of network variables in segments of 100 milliseconds, factory default setting = 60.0 sec.	No

Both of these configuration parameters can be changed with a binding tool. “nciNetConfig” determines if a node is bound by tool or by selfbinding. The factory default setting is “CFG_LOCAL” (selfbinding).

With “nciSndHrtBt” the “SendHeartBeat-Time” is set. It determines how often a cyclical transmission of the network variables takes place. This time interval should only be changed if absolutely neces-sary, for example when the communication load must be reduced. It should then be verified, if the Receive-Heart-Beat-Time (configuration parameter 9C) requires adjustment.

Input network variables of the node object:

Name	SNVT Type	Description	RcvHrt Beat
nviNode Request	SNVT_obj_request	Object request, see “LONMARK Application Layer Interop-erability Guidelines”, version 3.2, chapter 3	No
nviNode TimeSet	SNVT_time_ stamp	Time of day input: with this network variable the internal actual clock time of the device can be set. For Vitotronic 100, Model GC1, it is always activated, for all other control devices only if coding address “81:3” is selected. It is recommended to designate one device in the network as the time of day sender and the other devices as the time recipients. This ensures that the clocks of all devices in the network are synchronized.	No
nviNode Alarm	SNVT_alarm	Fault message input: this input variable receives fault messages from all other Viessmann devices in the system. This function is used by the central fault manager to receive cyclical fault messages of the participants. Fault messages are transmitted cyclically, using SendHeartBeat. This variable is only functional if coding address “79:1” is selected. (This variable is not available for Vitotronic 050, Model HK1M.)	No
nviNode OATemp	SNVT_temp_p	Outdoor ambient temperature, outdoor temperature input: instead of using the temperature measured by the outdoor temperature sensor installed directly on the device, the outdoor temperature measured by another device may be used. This outdoor temperature, received via nvi-NodeOATemp is only functional if coding address “97:1” has been selected. If no temperature value is received during the Receive-Heart-Beat-Time, a default value of 32°F/ 0°C is used.	Yes

Output network variables of the node object:

Name	**SNVT Type**	**Description**	**SndHrt Beat**
nvoNode Status	SNVT_obj_status	Object status: see "LONMARK Application Layer Interop-erability Guidelines", version 3.2, chapter 3	No
nvoNode Alarm	SNVT_alarm	Output for fault messages: the last error message is transmitted cyclically. If there is no fault, the fault code "00" is transmitted. (For content of data structure and meaning of fault code see below.)	Yes
nvoNode TimeSet	SNVT_time_stamp	Time of day output: output variable for the time synchroni-zation of other devices (only applicable for devices with own system clock). This network variable is only activated if coding address "7B:1" is selected.	Yes
nvoNode OATemp	SNVT_temp_p	Outdoor temperature output: sends the actual outdoor temperature to be used in other devices (only for devices that are equipped with a sensor input for outdoor tempera-ture). This variable is only activated if coding address "97:2" is selected.	Yes
nvoNode RlyState	SNVT_state	Relay status output: logical status of control signals of device: structure in which logical signals of the control unit are being exported. If corresponding signals are available for each control unit (see below), the following applies: 1=on, 0=off or not available.	Yes

Logical signals of control units in nvoNodeRlyState:

Bit	Logical Signal	Vitotronic								
		100 GC1	200 GW1	300 GW2	333 MW1	050 HK1M	050 HK1W	050 HK3W	333 MW2	200 HO1
0	DHW loading pump	k	k	k	k	-	k	k	k	k
1	Recirculation pump	-	k	k	k	-	k	k	k	k
2	Heating circuit pump 1	-	x	k	k	x	x	k	k	x
3	Heating circuit pump 2	-	-	k	k	-	-	k	k	k
4	Heating circuit pump 3	-	-	k	k	-	-	k	k	-
5	Setback contact HCP 1	-	x	k	k	x	x	k	k	x
6	Setback contact HCP 2	-	-	k	k	-	-	k	k	k
7	Setback contact HCP 3	-	-	k	k	-	-	k	k	-
8	Supply pump	-	-	-	-	k	k	k	-	-
9	Primary pump heat exchanger set for DHW tank loading	k	k	k	k	-	k	k	k	-
	Pump for loading system	-	-	-	-	-	-	-	-	k
10	Boiler circuit or common supply pump	k	k	k	k	-	-	-	k	k
	Internal pump	-	-	-	-	-	-	-	-	x
11	Shunt pump	k	k	k	k	-	-	-	k	-
	Diverting valve in space heating position	-	-	-	-	-	-	-	-	k
12	Flue gas heat exchanger pump	x	x	x	-	-	-	-	-	-
13	ThermControl switching contact	k	k	k	-	-	-	-	-	-
	Diverting valve in DHW position	-	-	-	-	-	-	-	-	k
14	Burner stage 1	x	x	x	-	-	-	-	-	-
15	Burner fault	x	x	x	-	-	-	-	-	-
	Compiled fault message	-	-	-	-	-	-	-	-	x

x = always available for this device
k = dependent on configuration of device
- = not available for this device

The signals are “high active” i.e. a “1” means “contact closed” specifically “function activated”.

Content of data structure SNVT_alarm for Viessmann control units:

Byte	Name	Content for Viessmann control units	
0 ... 5	location	Sending location (6 digits ASCII), factory default setting: "VI " (VI + 4 blanks)	
6 ... 7	objekt_id	Object identification of node object	
8	alarm_type	Alarm type: 0 = AL_NO_CONDITION (in case of no fault), 1 = AL_ALM_CONDITION (in case of fault)	
9	priority_level	Priority level: 0 = lowest priority (in case of no fault), 9 = HVAC alarms (in case of fault)	
10 … 11	index_to_SNVT	Always contains the nvoNodeAlarm index	
12 … 13	value[0 … 1]	Recognition of Viessmann devices: always 0x1917	
14	value[2]	Bit 2^7	unused
		Bit 2^6	
		Bit 2^5	0 = Participant is not the fault manager 1 = Participant is the fault manager
		Bit 2^4	Warning that content changed (content of fault buffer has changed since last receipt by Vitocom 300)
		Bit 2^3	System number
		Bit 2^2	
		Bit 2^1	
		Bit 2^0	
15	value[3]	Participant number	
16 … 17	year	Fault send time	
18	month		
19	day		
20	hour		
21	minute		
22	second		
23 … 24	millisecond	Always 0	
25 … 26	alarm_limit[0 … 1]	Always 0	
27	alarm_limit[2]	Fault code (high byte), in case of participant failure the fault manager inputs the participant number of the participant with failure, otherwise 0.	
28	alarm_limit[3]	Fault code (low byte), see fault codes	

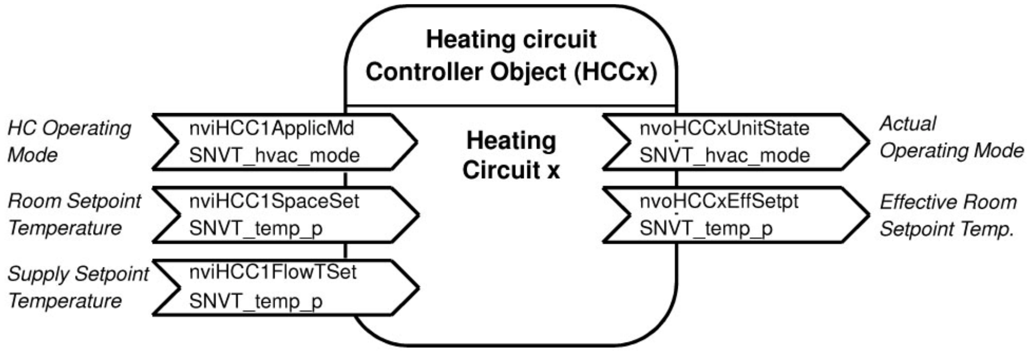
Fault codes for Viessmann control units:

Fault Codes (hex)	Description
00	System without fault
0F	Service required
10	Outdoor temperature sensor short circuit
18	Outdoor temperature sensor interruption
20	Supply temperature sensor HC1/ system short circuit
28	Supply temperature sensor HC1/ system interruption
30	Boiler water temperature sensor short circuit
38	Boiler water temperature sensor interruption
40	Supply temperature sensor heating circuit 2 short circuit
41	Return temperature sensor heating circuit 2 short circuit
44	Supply temperature sensor heating circuit 3 short circuit
45	Return temperature sensor heating circuit 3 short circuit
48	Supply temperature sensor heating circuit 2 interruption
49	Return temperature sensor heating circuit 2 interruption
4C	Supply temperature sensor heating circuit 3 interruption
4d	Return temperature sensor heating circuit 3 interruption

50	DHW tank temperature sensor short circuit
51	DHW tank temperature sensor 2 short circuit
58	DHW tank temperature sensor interruption
59	DHW tank temperature sensor 2 interruption
60	Return temperature sensor 17 short circuit
68	Return temperature sensor 17 interruption
70	Return/ supply temperature sensor 17B short circuit
78	Return/ supply temperature sensor 17B interruption
92	Solar: collector temperature sensor short circuit
93	Solar: collector return temperature sensor short circuit
94	Solar: DHW tank temperature sensor short circuit
9A	Solar: collector temperature sensor interruption
9B	Solar: collector return temperature sensor interruption
9C	Solar: DHW tank temperature sensor interruption
9F	Solar: general fault message
A7	Fault control unit (wireless clock module)
AE	Internal fault mixing value
AF	Internal fault mixing valve
b0	Flue gas temperature sensor short circuit
b1	Programming unit communication fault (internal)
b4	Internal fault
b5	Internal fault
b6	Internal fault invalid hardware recognition
b7	Internal fault boiler protection coding card
b8	Flue gas temperature sensor interruption
bA	Fault mixing valve module (KM-BUS)
bC	Fault Vitotrol heating circuit 1 (KM-BUS)
bd	Fault Vitotrol heating circuit 2 (KM-BUS)
bE	Fault Vitotrol heating circuit 3 (KM-BUS)
bF	Wrong LON module
C1	External fault message boiler
C2	Communication fault solar control (KM-BUS)
C5	Fault speed-controlled pump heating circuit 1 (KM-BUS)
C6	Fault speed-controlled pump heating circuit 2 (KM-BUS)
C7	Fault speed-controlled pump heating circuit 3 (KM-BUS)
C8	Fault water level control
C9	Fault maximum pressure
CA	Fault minimum pressure/ fault maximum pressure 2
Cb	Fault maximum pressure 2
CC	Reserved external periphery
Cd	Communication fault Vitocom 300 (KM-BUS)
CE	Communication fault, fault indicator module (KM-BUS)
CE	Communication fault expansion module (KM-BUS)
CF	Communication fault: LON module to control card **Warning**: this fault code also appears in toolbinding when the neuron status is “unconfigured”
d1	Burner fault boiler
d4	Fixed high limit fault boiler
d5	Cascade: boiler is not responding
d6	External error 1 plug adaptor
d7	External error 2 plug adaptor
d8	External error 3 plug adaptor
dA	Room temperature sensor heating circuit 1 short circuit
db	Room temperature sensor heating circuit 2 short circuit
dC	Room temperature sensor heating circuit 3 short circuit
dd	Room temperature sensor heating circuit 1 interruption

dE	Room temperature sensor heating circuit 2 interruption
dF	Room temperature sensor heating circuit 3 interruption
E0	Fault external participant number/ device connected to LON
E4	Fault power supply voltage
E5	Internal fault combustion control unit
E6	Flue gas/ air supply system clogged
E6	Fault return message oil pre-heater (with Vitoplus)
F0	Communication fault combustion control unit
F1	Flue gas temperature limiter has tripped
F2	Temperature limiter has tripped
F3	Flame signal is present at burner start
F4	Flame signal is not present
F5	Air pressure switch not open for burner start or not closed when ignition load is achieved
F6	Gas pressure switch not open for burner start or after flame stabilization not closed
F7	Air pressure sensor short circuit or offset value outside of tolerance
F8	Fuel valve closure delayed
F9	Blower speed too low at burner start
FA	Blower speed too high at burner start
FC	Control of modulation valve defect
FD	Fault combustion control unit
FE	Coding plug defect or wrong EMV-error
FF	Internal fault

Heating Circuit Controller Object



(x= 1, 2 or 3)

The heating circuit controller object constitutes the interface between the heating circuit control and room temperature control. The communication module provides a functional object of this type for each heating circuit control loop of a control. Within the control unit, however, certain heating circuits may be deactivated with coding address “00”. This means that the corresponding functional object is also not functional.

The table below shows the maximum number of accessories for each control unit:

Control unit	Heating circuit 1	Heating circuit 2	Heating circuit 3
Vitotronic 050 HK1M	Mixing valve circuit M1	-	-
Vitotronic 050 HK1W, Vitotronic 050 HK1S	Mixing valve circuit M1	-	-
Vitotronic 050 HK3W, Vitotronic 050 HK3S	Mixing valve circuit M1	Mixing valve circuit M2	Mixing valve circuit M3
Vitotronic 100 GC1	-	-	-
Vitotronic 200 GW1	System circuit A1	-	-
Vitotronic 300 GW2	System circuit A1	Mixing valve circuit M2	Mixing valve circuit M3
Vitotronic 333 MW1, Vitotronic 333 MW1S, Vitotronic 333 MW2	System circuit A1	Mixing valve circuit M22	Mixing valve circuit M3
Vitotronic 200 HO1	System circuit A1	Mixing valve circuit M2	-

Input network variables of the heating circuit controller object (HCC):

Name	SNVT Type	Description	RcvHrt Beat
nviHCCx ApplicMd	SNVT_ hvac_mode	Heating circuit operating mode: determines how the heating circuit is to be influenced, see description below. If no message is received during the Receive-Heart-Beat-Time, the default 0xFF (=HVAC_AUTO) is used.	Yes
nviHCCx SpaceSet	SNVT_ temp_p	Room setpoint temperature: only functions if nviHCCxApplicMd is set to HVAC_HEAT. If no message is received during the Receive-Heart-Beat-Time, a default value of 68°F/ 20°C is used.	Yes

Name	SNVT Type	Description	RcvHrt Beat
nviHCCx FlowTSet	SNVT_ temp_p	Supply setpoint temperature: functions only if nviHCCxAp-plicMd is set to HVAC_FLOW_TEMP. If no message is received during the Receive-Heart-Beat-Time, although nviHCCxApplicMd is still received with HVAC_FLOW_TEMP, a default value of 68°F/ 20°C is used.	Yes

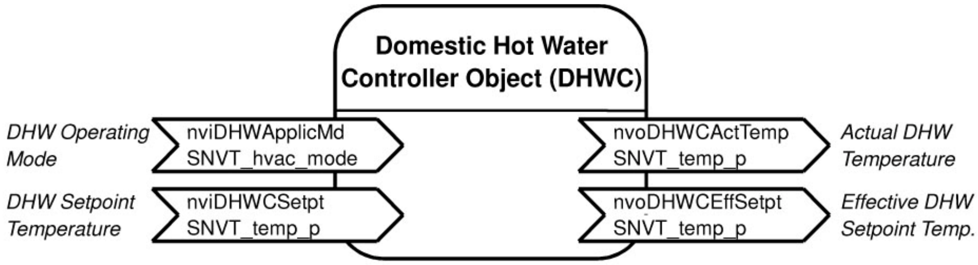
The network variable **nviHCCxApplicMode** of the heating circuit controller object has the following effect:

Value	Name	Description
0 0xFF	HVAC_AUTO (default value)	The heating circuit control operates according to the internal settings on the control unit. Network variables nviHCCxSpaceSet and nviHCCxFlowTSet are not functional. This is the factory default setting, which is also adopted if no message for viHCCxApplicMd is received during the “ReceiveHeartBeat-Time”.
1	HVAC_HEAT	The heating circuit control operates according to the heating curve and uses nviHCCxSpaceSet as room temperature setpoint, i.e. operating mode switch, timer and room setpoint temperature setting of the heating circuit are disabled. Frost protection and economy mode (e.g. automatic warm weather shut-down) can be activated. The network variable nviHCCxFlowTSet is not functional.
2	HVAC_MRNG_ WRM_UP	The heating circuit control operates according to the heating curve and uses the reduced room setpoint temperature of the control unit as room setpoint value, i.e. operating mode switch and timer of the heating circuit are disabled. Frost protec-tion and economy mode (e.g. automatic warm weather shut-down) can be acti-vated. Network variables nviHCCxSpaceSet and nviHCCxFlowTSet are not functional.
(3) (4) (5) 6	HVAC_OFF	The heating circuit control is turned off and only activates for frost protection (freeze-up temperature limit can be set with coding address) with a reduced room setpoint temperature. Network variables nviHCCxSpaceSet and nviHCCxFlowTSet are not functional.
7	HVAC_TEST	The heating circuit control operates according to the heating curve and uses normal room setpoint temperature of the control unit as room setpoint value, i.e. operating mode switch and timer of the heating circuit are disabled. Frost protec-tion and economy mode (e.g. automatic warm weather shut-down) can be acti-vated. Net variables nviHCCxSpaceSet and nviHCCxFlowTSet are not functional.
8	HVAC_EMERG_ HEAT	The heating circuit control operates with a set supply setpoint temperature of 68°F/ 20°C, i.e. heating curve, operating mode switch, timer, frost protection and economy mode are disabled. Net variables nviHCCxSpaceSet and nviHCCxFlowTSet are not functional.
100	HVAC_FLOW_ TEMP	The heating circuit control operates with a supply setpoint temperature according to nviHCCxFlowTSet, i.e. heating curve, operating mode switch, timer, frost protection and economy mode are disabled. The coding address for the supply temperature maximum remains active. Network variable nviHCCxSpaceSet is not functional.

Output network variables of heating circuit controller object (HCC):

Name	SNVT Type	Description	SndHrt Beat
nvoHCCxUnit State	UNVT_hvac_ mode	Actual operating status of heating circuit control: outputs the currently active value of nviHCCxApplicMd (see description above)	Yes
nvoHCCxEffRm Setp	SNVT_temp_p	Effective room setpoint temperature: outputs the currently effective room setpoint temperature	Yes

Domestic Hot Water Controller Object



The domestic hot water controller object allows for the possibility to influence domestic hot water production. With coding address "00" the domestic hot water control of the unit can be deactivated. At the same time, this functional object becomes non-functional.

Input network variables of the domestic hot water controller object (DHWC):

Name	SNVT Type	Description	RcvHrt Beat
nviDHWC Setpt	SNVT_ temp_p	DHW setpoint temperature is used if nviDHWCApplicMd = HVAC_HEAT	No
nviDHWC ApplicMd	SNVT_ hvac_ mode	Operating mode DHW: (See description below). If no mes-sage is received during the Receive-Heart-Beat-Time, default value 0xFF (=HVAC_AUTO) is used.	Yes

The network variable **nviDHWCApplicMd** has the following function:

Value	Name	Description
0 0xFF	HVAC_AUTO	Both the DHW controller and the recirculation pump operate according to the internal setting on the control unit. The network variable nviDHWCSetpt is not functional. This is the factory default setting, which is used in case no message is received for nviDHWCApplicMd during "ReceiveHeartBeat-Time".
1	HVAC_HEAT	The DHW controller is operational and uses nviDHWCSetpt as DHW setpoint temperature, i.e. operating mode switch, timer and DHW setpoint temperature of the control are disabled. The recirculation pump is activated with configuration parameter setting 64:1 and 64:2 and deactivated with 64:0.
(3) (4) (5) 6	HVAC_OFF	The DHW controller is turned off and only activates for frost protection (freeze-up temperature limit = DHW tank temperature 50°F/ 10°C). The network variable nviDHWCSetpt is not functional. The recirculation pump is turned off.

Output network variables of the domestic hot water controller:

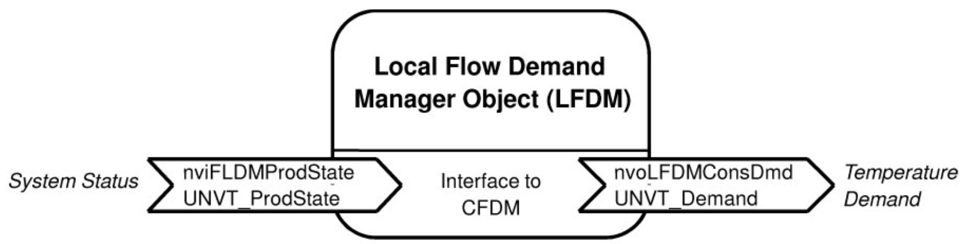
Name	SNVT Type	Description	SndHrt Beat
nvoDHWCAct Temp	SNVT_temp_p	Actual DHW temperature in °C	Yes
nvoDHWCEffSetpt	SNVT_temp_p	Actual resulting DHW setpoint temperature in °C	Yes

Local Flow Demand Manager Object

The local flow demand manager object facilitates data exchange among Viessmann control units and is not required for the integration of external components.

The local flow demand manager object collects all internal temperature requirements in a Viessmann control unit without its own heat production management (heating circuit controls Vitotronic 050). It then passes these on to a device which controls heat production. Upon return, the local flow demand manager object forwards status messages, received from the heat production management, to the internal heating loads (heating circuits and DHW heating).

The network variables of all LFDM objects in a system are connected to corresponding network variables of the CFDM objects in a system.



Input Network Variables of Local Flow Demand Managers (LFDM):

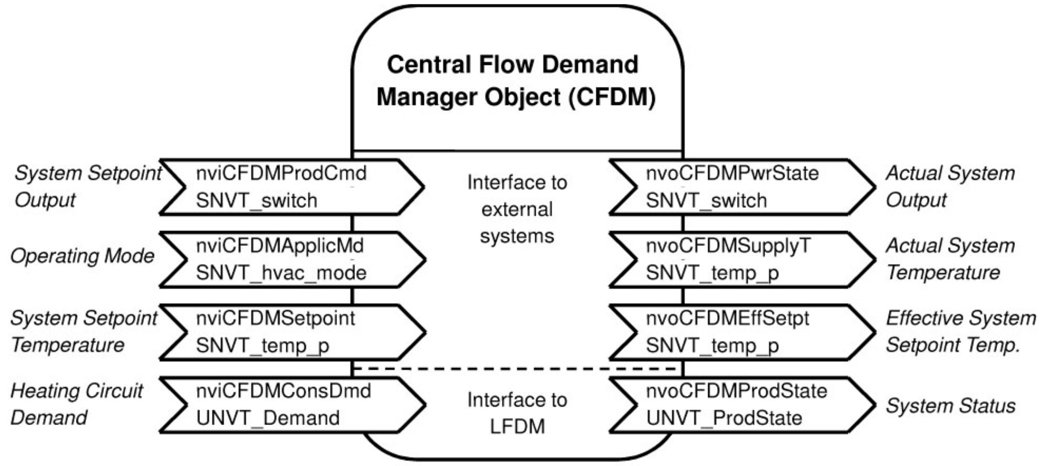
Name	SNVT Type	Description	RcvHrt Beat
nviLFDMProd State	UNVT_ProdState	System status: data structure (4 byte) for transmitting heat production status to the heat consumers: **Byte [0]**: output reduction in 0.5% increments (e.g. for TSA function) as requested by the consumers, 0 = default value **Byte [1]**: Reduction/ request for heat consumption: bit 0: output reduction is critical bit 1: active DHW tank load bit 2: DHW request to central DHW storage tank bit 3: unused bit 4: heat consumption requested due to critical excess heat (overheating) bit 5: likewise for non-critical excess heat (boiler water temperature is significantly higher than setpoint value) bit 6: residual heat in boiler (after end of heat demand) bit 7: unused 0x00 = default value **Byte [2]**: production status: at least one … bit 0: boiler is logged off (disabled or off) bit 1: boiler received log-off request (soft disabled) bit 2: boiler fault bit 3: boiler is set to override operation bit 4-7: unused default value: bit 0 = 1 (off), bit 1 … 3 = 0 **Byte [3]**: central functions: bit 0: central control activated bit 1: central holiday program bit 2: central operating mode “continuous standby mode” bit 3: central operating mode “DHW production only” bit 4: central operating mode “space heating and DHW production” bit 5-7: unused 0x00 = default value	Yes

Output Network Variables of Local Flow Demand Managers:

Meaning of Name	SNVT Type	Description	SndHrt Beat
nvoLFDMCon sDmd	UNVT_Demand	Supply temperature demand by heating circuit controls: Transfer of consumer demand for heat to heat production: **Byte[0], Byte[1]**: supply setpoint temperature (Temp_p) **Byte[2], Byte[3]**: attributes to heat demand (State): bit 0: temperature request is maximum value bit 1-7: unused bit 8: DHW request to storage tank in central device of heating system (independent of temperature request) bit 9-15: unused **Byte[4] ... Byte[9]**: neuron ID of sender (6 Bytes)	Yes

The network variable **nvoLFDMConsDmd** is the result of the maximum value calculation of the requested supply temperatures of all the consumers (e.g. heating circuits). The forwarded value contains (among other information) the neuron ID of the node.

Central Flow Demand Manager Object



The central flow demand manager object collects the demands of the heat consumers in the network and calculates the maximum value of all the incoming temperature requests at input nciCFDmConsDmd (requests from Viessmann heating control units). The network variables nciCFDmConsDmd and nvoCFDMProdState are bound to the corresponding system network variables of all LFDM objects.

Superior systems (building management systems, air conditioning systems, ventilation systems, etc.) can influence the heat production via other input network variables. They can set additional temperature or load requests or also completely shut off heat production.

The functional object calculates from the maximum value of the requests of the external heat consumer (nciCFDmConsDmd), the other input network variables, and the internal requests of the control unit itself (heating circuit controller and other requests contained within the device, i.e. digital inputs) the resulting request to the heat production.

Furthermore, the CFDM passes on the signals for output reduction or forced heat absorption to the consumer, specifically the inferior LFDMs in its segment. The data from the internal heating circuits regarding the central heating circuit control and the data of the internal DHW tank control regarding the DHW loading status are likewise passed on to the external consumer.

Input Network variables of CFDM:

Name	SNVT Type	Description	RcvHrt Beat
nviCFDMProd Cmd	SNVT_switch	Systems or boiler setpoint output: **Byte [0]** Value: 0 … 200 in 0.5% intervals (200 = 100%) Minimum output in % of boiler/ system rated output, 0 = default value **Byte [1]** Status: 0 = boiler/ system off, 1 = boiler/ system on, 0xFF = auto = default value This input variable has priority over all other com-mands/ requests, e.g. when for example status = 0, then the boiler or system will be shut off, regardless of other remaining requests.	Yes
nviCFDMAp-plicMd	SNVT_hvac_mode	System operating mode (see table below)	Yes
nviCFDMSet-point	SNVT_temp_p	Supply setpoint temperature (the system can be selec-tively controlled by temperature or output, the output command has priority, see above), default value = 32℉/ 0℃	Yes
nviCFDMCons Dmd	UNVT_Demand	Supply temperature request by heating circuit controls: **Byte[0], Byte[1]**: Supply setpoint temperature (Temp_p) **Byte[2], Byte[3]**: Attribute to heat demand (State): bit 0: temperature request is maximum value bit 1 – 7: unused bit 8: DHW demand to central DHW tank (independent of the temperature request) bit 9 – 15: unused **Byte[4] ... Byte[9]**: Neuron ID of sender (6 bytes) Default values: Byte[0] … Byte[9] = 0 (request = 32℉/ 0℃)	Yes

The network variable **nviCFDMProdCmd** has highest priority. With it, an output preset for the system can be set. This preset overrides all other requests. For example, at status = 0, heat production is available for some control units. With status = 1, the boiler/ system output can be preset with the value; for values below the minimum boiler output, the minimum output is produced, etc. If no preset is made via input nviCFDMProdCmd or status = 0xFF, all other demands become effective, nviCFDMApplicMd is evaluated. The network variable **nviCFDMApplicMd** of the central flow demand manager object has the following effect:

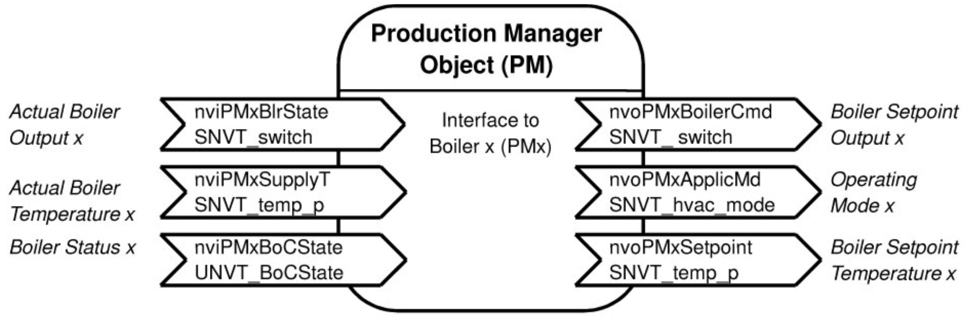
Value	Title	Description
0 1 0xFF	HVAVC_AUTO HVAC_HEAT (default value)	The internal demands of the control device (heating circuit controls and digital inputs), the demands of the external heating circuit controls via nviCFDMConsDmd and the demands via nviCFDMSetpoint are evaluated. If all demands go to 32℉/ 0℃, then under certain circumstances, mini-mum boiler water temperature is maintained.
2	HVAC_MRNG_ WRM_UP	The internal demands of the control unit (heating circuit controls and digital inputs), the demands by external heating circuit controls via nviCFDMConsDmd and the demands via nviCFDMSetpoint are ignored. However, the minimum boiler water temperature is maintained.
(3) (4) (5) 6 (9)	HVAC_OFF	Heat production is shut off. The internal demands of the control device (heating circuit controls and digital inputs), the demands of the external heating circuit controls via nviCFDMConsDmd and the demands via nviCFDMSetpoint are ignored. Minimum boiler water temperature is not maintained.

Value	Title	Description
7 111	HVAC_TEST HVAC_LOW_ FIRE	Heat production takes place at base boiler output, or for example, base output of the system lead boiler. The internal demands of the control unit (heating circuit controls and digital inputs), demands of the external heating circuit controls via nviCFDMConsDmd and demands through nviCFDMSetpoint are ignored. However, minimum and maximum boiler water temperatures are maintained.
8 112	HVAC_EMERG _HEAT HVAC_HIGH_ FIRE	Heat production works with rated output or total output of the system lead boiler. Internal demands of the control unit (heating circuit controls and digital inputs), demands of the external heating circuit controls via nviCFDMConsDmd and the demands via nviCFDMSetpoint are ignored. However, minimum and maximum boiler water temperatures are maintained, i.e. when the electronic maximum boiler water temperature limit is reached, under certain circumstances, boiler output is reduced.

Output Network Variables for CFDM:

Name	SNVT Type	Description	SndHrt Beat
nvoCFDMPwr State	SNVT_switch	Actual system output in % of rated system output: **Byte [0]** Value: 0 … 200 in 0.5% steps (200 = 100%) Minimum output in % of boiler/ system rated output, 0 = default value **Byte [1]** Status: 0 = boiler/ system off, 1 = boiler/ system on	Yes
nvoCFDMEff Setpt	SNVT_temp_p	Active system/ boiler setpoint temperature value	Yes
nvoCFDMSup plyT	SNVT_temp_p	System supply temperature/ actual boiler water temperature	Yes
nvoCFDMProd State	UNVT_Prod- State	System production status: information to the heat consumer (Viessmann heating circuit controls): **Byte [0]**: output reduction in 0.5% increments (i.e. for TSA function) as requested by the consumers **Bye [1]**: reduction/ request of heat consumption: bit 0: output reduction is critical bit 1: DHW tank load is active bit 2: DHW demand to central DHW tank bit 3: unused bit 4: heat consumption requested due to critical excess heat (overheating) bit 5: likewise with non-critical excess heat (boiler water temperature significantly higher than setpoint) bit 6: residual heat in boiler (after request ended) bit 7: unused **Byte [2]**: Production status: at least one … bit 0: boiler is logged off (disabled or off) bit 1: boiler received log off request (soft disabled) bit 2: boiler fault bit 3: boiler is set to override operation bit 4-7: unused **Byte [3]**: central functions: bit 0: central control active bit 1: central holiday program active bit 2: central operating mode “continuous standby mode” bit 3: central operating mode “DHW production only” bit 4: central operating mode “space heating and DHW production” bit 5-7: unused	Yes

Production Manager Object (Cascade control)



(x = 1, 2, 3 or 4)

The production manager object contains the technical control functions of the cascade control in a **multiple boiler system**. The purpose is to control the heat production with respect to the heat demand and heat consumption. Depending on heat demand, boiler status and internal settings, boilers are switched on or off. The production manager object contains interfaces PM1 … PM4 for data exchange between up to four boilers. Interfaces PM1 … PM4 are bound to the boiler controller objects of these boilers. Thus, always bind interfaces starting with PM1. In a two-boiler system, for example, boilers **must** be bound to interfaces PM1 and PM2.

Input Network Variables of the Production Manager (PM) per Boiler:

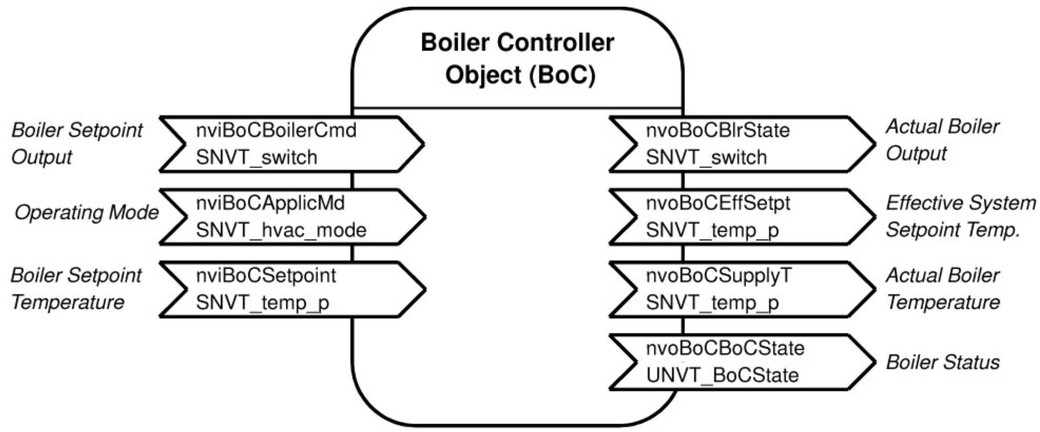
<table>
<tr><th>Name</th><th>SNVT Type</th><th colspan="4">Description</th><th>RcvHrt Beat</th></tr>
<tr><td rowspan="9">nviPMxBlrState</td><td rowspan="9">SNVT_switch</td><td colspan="4">Current actual boiler output in % of rated output:</td><td rowspan="9">Yes</td></tr>
<tr><th>Burner Type</th><th>Status</th><th>Byte[0]: Value</th><th>Byte[1]: Status</th></tr>
<tr><td rowspan="2">Single stage</td><td>OFF</td><td>0 = 0%</td><td>0 = OFF</td></tr>
<tr><td>ON</td><td>200 = 100%</td><td>1 = ON</td></tr>
<tr><td rowspan="3">Two stage</td><td>OFF1</td><td>0 = 0%</td><td>0 = OFF</td></tr>
<tr><td>STAGE1</td><td>100 = 50%</td><td>1 = ON</td></tr>
<tr><td>STATGE2</td><td>200 = 100%</td><td>1 = ON</td></tr>
<tr><td rowspan="2">Modulating</td><td>OFF</td><td>0 = 0%</td><td>0 = OFF</td></tr>
<tr><td>MOD</td><td>1….200 = 0.5…100%</td><td>1 = ON</td></tr>
<tr><td>nviPMxSupplyT</td><td>SNVT_temp_p</td><td colspan="4">Current actual boiler water temperature</td><td>Yes</td></tr>
<tr><td>nviPMxBoCState</td><td>UNVT_BoC State</td><td colspan="4">Boiler status: Boiler status to cascade control:
Byte [0]: output reduction in 0.5% increment (i.e. for TSA function) requested by consumers, default = 0%
Byte [1]: reduction/ request of heat consumption:
bit 2^0: output reduction is critical
bit 2^1 to bit2^3: reserved
bit 2^4: heat consumption requested due to critical excess heat (overheating)
bit 2^5: likewise for non-critical excess heat (boiler water temperature significantly higher than setpoint)
bit 2^6: residual heat in boiler (after request ended)
bit 2^7: unused
default = 0x00
Byte [2]: Boiler/ isolation valve status:
bit 2^0: boiler is logged off (disabled or off)
bit 2^1: boiler received log off request (soft disabled)
bit 2^2: boiler fault
bit 2^3: boiler is set to override operation
bit 2^4 to bit 2^7: isolation valve (IV) status: (enumeration)
0 – IV_CLOSED, 1 – IV_PREHEAT,
2 – IV_CONTROL_CLOSED, 3 – IV_CONTROL,
4 – IV_CONTROL_OPEN, 5 – IV_OPEN,
6 – IV_TIME_DELAY_CLOSED
Default values: bit 2^0 = 1 (off), bit 2^1...bit 2^3 = 0, bit 2^4...bit 2^7 = IV_CLOSED
Byte [3], Byte [4]: operating hours burner stage 1 (in hours), default = 0
Byte [5]: burner status:
bit 2^0 to bit 2^1: burner type (enumeration, like configuration parameter settings on boiler, with consideration to input “changeover staging/ modulating”)
bit 2^2 to bit 2^7: unused
default = two stage
Byte [6], Byte [7]: rated output in kW (configuration parameter), default = 0
Byte [8]: relative output of low-fire stage in 0.5% increments of rated burner output (configuration parameter is evaluated in full percentage)
Default = 60%
Byte [9]: return temperature control from boiler coding card (in full degree Celsius), default = 127°F/ 53°C</td><td>Yes</td></tr>
</table>

Output Network Variables of the Production Manager (PM) per Boiler:

<table>
<tr><th>Name</th><th>SNVT Type</th><th colspan="4">Description</th><th>RcvHrt Beat</th></tr>
<tr><td rowspan="11">nvoPMxBoiler Cmd</td><td rowspan="11">SNVT_switch</td><td colspan="4">Boiler setpoint output</td><td rowspan="11">Yes</td></tr>
<tr><td>Burner Type</td><td>Byte[0]: Value in 0.5% Steps</td><td>Byte[1]: Status</td><td>Burner Status</td></tr>
<tr><td>Single stage</td><td>0 = 0%</td><td>0 =OFF</td><td>OFF</td></tr>
<tr><td></td><td>1...200 = 100%</td><td>1 = ON</td><td>ON</td></tr>
<tr><td>Two stage</td><td>arbitrary</td><td>0 =OFF</td><td>OFF</td></tr>
<tr><td></td><td>1...100 = 50%</td><td>1 = ON</td><td>STAGE1</td></tr>
<tr><td></td><td>101...200 = 100%</td><td>1 = ON</td><td>STAGE2</td></tr>
<tr><td>Modulating</td><td>0 = 0%</td><td>0 =OFF</td><td>OFF</td></tr>
<tr><td></td><td>1 … 200 = 0.5 … 100%</td><td>1 = ON</td><td>MOD</td></tr>
<tr><td>All burners</td><td>Arbitrary</td><td>0xFF = default</td><td>After nvoPM-xApplicMd</td></tr>
<tr><td colspan="4">This network variable has priority over all other com-mands/ requests, i.e. when status = 0, the boiler will be shut off, regardless of the value of other input network variables.</td></tr>
<tr><td>nvoPM-xApplicMd</td><td>SNVT_hvac_ mode</td><td colspan="4">Boiler operating mode, see table in chapter “Boiler Con-troller Object”</td><td>Yes</td></tr>
<tr><td>nvoPMxSetpoint</td><td>SNVT_temp_p</td><td colspan="4">Boiler setpoint temperature: (the boiler can either be temperature controlled and/ or output controlled, the output command has priority, see above)</td><td>Yes</td></tr>
</table>

For description of the network variable function and operation of the boiler control, see following chapter.

Boiler Controller Object



The boiler controller object depicts the interface of the boiler control in a **multiple boiler system**. This object is not active in a single-boiler system – in a single-boiler system, external demands are bound to the CFDM object, the central demand manager of the system, and are processed together with the device demands of internal and external heating circuit control.

In a **multiple boiler** system the operation of the boiler control takes place via three input network variables. In this case, the boiler control is entirely mandated by the cascade control – the internal demands of the device (boiler setpoint temperature and DHW production of a Vitotronic 100, Model GC1) are not functional.

Depending on the chosen control strategy, a cascade control can request from the boiler an output in % of boiler rated output or the boiler setpoint temperature, or both.

Input Network Variables of a Boiler Controller (BoC):

<table>
<tr><th>Name</th><th>SNVT Type</th><th colspan="4">Description</th><th>RcvHrtBeat</th></tr>
<tr><td rowspan="11">nviBoC BoilerCmd</td><td rowspan="11">SNVT_switch</td><td colspan="4">Boiler setpoint output</td><td rowspan="11">Yes</td></tr>
<tr><td>Burner Type</td><td>Bye[0]: Value in 0.5% intervals</td><td>Byte[1]: Status</td><td>Burner Status</td></tr>
<tr><td rowspan="2">Single stage</td><td>0 = 0%</td><td>0 = OFF</td><td>OFF</td></tr>
<tr><td>1...200 = 100%</td><td>1 = ON</td><td>ON</td></tr>
<tr><td rowspan="3">Two stage</td><td>Arbitrary</td><td>0 = OFF</td><td>OFF</td></tr>
<tr><td>1…100 =50%</td><td>1 = ON</td><td>STAGE1</td></tr>
<tr><td>101...200 = 100%</td><td>1 = ON</td><td>STAGE2</td></tr>
<tr><td>Modulating</td><td>0 = 0%</td><td>0 = OFF</td><td>OFF</td></tr>
<tr><td></td><td>1…200 = 0.5…100%</td><td>1 = ON</td><td>MOD</td></tr>
<tr><td>All burners</td><td>Arbitrary</td><td>0xFF = default</td><td>After nviBoC-ApplicMd</td></tr>
<tr><td colspan="4">This network variable has priority over all other commands/ requests, i.e. when status = 0, then the boiler will be shut off, regardless of the value of the other input variables.</td></tr>
<tr><td>nviBoCAp-plicMd</td><td>SNVT_hvac_mode</td><td colspan="4">Boiler operating mode: see description below</td><td>Yes</td></tr>
<tr><td>nviBoC Setpoint</td><td>SNVT_temp_p</td><td colspan="4">Boiler setpoint temperature: (the boiler can either be temperature controlled or output controlled, the output command nviBoCBoilerCmd has priority, see above) default = 261°F/ 127°C</td><td>Yes</td></tr>
</table>

The network variable **nviBoCBoilerCmd** has highest priority. With it, an output preset for the boiler can be set. This preset overrides all other requests. For example, at status = 0, the boiler will be shut off. At status = 1, the boiler setpoint output can be preset with the value; for values below the minimum boiler output, the minimum output is produced, etc. If no preset is made via input nviBoCBoilerCmd or status = 0xFF, all other demands become effective, nviBoCApplicMd is first evaluated.

The network variable **nviBoCApplicMd** of the boiler controller object has the following function, as described in the table below:

Value	Title	Description
0 1 0xFF	HVAC_AUTO HVAC_HEAT (default value)	The request through nviBoCSetpoint is evaluated. If nviBoCSetpoint goes to 32°F/ 0°C, then depending on the boiler model, under certain circumstances, the minimum boiler water temperature is maintained.
2	HVAC_MRNG_ WRM_UP	If there is no request to the boiler, then depending on boiler type, under certain circumstances, the minimum boiler water temperature is maintained.
(3) (4) (5) 6 (9)	HVAC_OFF	The boiler is shut off. The isolation value is closed. Requests via nviBoCSetpoint are ignored. Minimum boiler water temperature is not maintained.
7 111	HVAC_TEST HVAC_LOW_ FIRE	The boiler is running on low-fire. The request through nviBoCSetpoint is ignored. Minimum and maximum boiler water temperatures are, however, maintained.
8 112	HVAC_EMERG_ HEAT HVAC_HIGH_ FIRE	The boiler operates at rated output. The request through nviBoCSetpoint is ignored. Minimum and maximum boiler water temperatures are, however, maintained.
110	HVAC_SLAVE_ ACTIVE	The boiler takes temperature and output requests into consideration, i.e. at the very least, the boiler operates at the setpoint output transmitted by nviBoCBoilerCmd value and the setpoint temperature transmitted by nviBoCSetpoint, whereas the minimum and maximum boiler water temperatures are maintained.

The local input “disabled” is always evaluated and has priority, even with control via nviBoCBoilerCmd.

Output Network Variable of the Boiler Controller Object:

<table>
<tr><th>Name</th><th>SNVT Type</th><th colspan="4">Description</th><th>SndHrt Beat</th></tr>
<tr><td rowspan="9">nvoBoCBlr State</td><td rowspan="9">SNVT_switch</td><td colspan="4">Current actual boiler output in % of rated output:</td><td rowspan="9">Yes</td></tr>
<tr><td>Burner Type</td><td>Status</td><td>Byte[0]: Value</td><td>Byte[1]: Status</td></tr>
<tr><td rowspan="2">Single stage</td><td>OFF</td><td>0 = 0%</td><td>0 = OFF</td></tr>
<tr><td>ON</td><td>200 = 100%</td><td>1 = ON</td></tr>
<tr><td rowspan="3">Two stage</td><td>OFF1</td><td>0 = 0%</td><td>0 = OFF</td></tr>
<tr><td>STAGE1</td><td></td><td>1 = ON</td></tr>
<tr><td>STATGE2</td><td>200 = 100%</td><td>1 = ON</td></tr>
<tr><td rowspan="2">Modulating</td><td>OFF</td><td>0 = 0%</td><td>0 = OFF</td></tr>
<tr><td>MOD</td><td>1…200 = 0.5…100%</td><td>1 = ON</td></tr>
<tr><td>nvoBoCEff Setpt</td><td>SNVT_temp_p</td><td colspan="4">Current effective boiler setpoint temperature</td><td>Yes</td></tr>
<tr><td>nvoBoC Sup-plyT</td><td>SNVT_temp_p</td><td colspan="4">Current actual boiler water temperature</td><td>Yes</td></tr>
<tr><td>nvoBoC BocState</td><td>UNVT_BoC State</td><td colspan="4">Boiler status: Boiler status to cascade control:
Byte [0]: output reduction in 0.5% increments (i.e. for TSA function) demanded by the consumers
Byte [1]: reduction/ request of heat consumption:
bit 2^0: output reduction is critical
bit 2^1 to bit2^3: reserved
bit 2^4: heat consumption requested due to critical excess heat (overheating)
bit 2^5: likewise with non-critical excess heat (boiler water temperature significantly higher than setpoint)
bit 2^6: residual heat in boiler (after request ended)
bit 2^7: unused
Byte [2]: Boiler/ isolation valve status:
bit 2^0: boiler is logged off (disabled or off)
bit 2^1: boiler received log off request (soft disabled)
bit 2^2: boiler fault
bit 2^3: boiler is set to override operation
bit 2^4 to bit 2^7: isolation valve status: (enumeration)
0 – IV_CLOSED, 1 – IV_PREHEAT,
2 – IV_CONTROL_CLOSED, 3 – IV_CONTROL,
4 – IV_CONTROL_OPEN, 5 – IV_OPEN,
6 – IV_TIME_DELAY_CLOSED
Byte [3], Byte [4]: operating hours burner stage 1 (in hours)
Byte [5]: burner status:
bit 2^0 to bit 2^1: burner type (enumeration, like configuration parameter set on boiler, with consideration to the input “changeover staging/ modulating”)
bit 2^2 to bit 2^7: unused
Byte [6], Byte [7]: rated output in kW (configuration parame-ter)
Byte [8]: relative output of low-fire in 0.5% increments of rated burner output (configuration parameter is processed in full percentage points)
Byte [9]: setpoint value for return temperature control from boiler coding card (in full degree Celsius)</td><td>Yes</td></tr>
</table>

Information for Logical Binding

Information for Self-installation (Selfbinding)

Viessmann self- installation takes place as follows:

After activating power to the control, the processor of the electronic circuit board sends information regarding device type and several configuration parameters to the communication module. If the configuration parameter nciNetConfig is set to “CONFIG_LOCAL” (factory default setting), the self-installation process is started. The communication module completes the address table as well as network variable table with information based on configuration data received from the circuit board processor.

Certain parameters are established:

- All Viessmann devices belong to domain 07 when self-installed.
- The system number (coding address 98) becomes the subnet address.
- The participant number (coding address 77) becomes the node address.
- Depending on the configuration, group affiliations “alarm”, “producer”, “load” and “production manager” are entered into address table.
- In addition, depending on the device, address table entries for the domain broadcast and subnet broadcast are created.
- Depending on type of device and the setting of the configuration parameter, the required network variables are assigned to the corresponding address table information.

When self-installation is active, the configuration parameters 01, 07, 35, 77, 79, 7B, 81, 97 and 98 influence the logical connections between the devices **and** the control functions. If the devices are bound via start-up software (toolbinding), the logical connections of the devices have no effect. For proper function, setting of these configuration parameters is necessary.

Device Binding with Start-up Software (Toolbinding)

In the factory default setting, Viessmann control units are bound via self-installation process (selfbinding). This self-installation process establishes all necessary connections for data exchange between Viessmann control units. This, however, does not cover the entire range of requirements.

Especially the following requirements cannot be covered by the selfbinding process:

- If data must be exchanged between Viessmann control units and devices from other manufacturers.
- If, in addition to the relay outputs of the control, logical signals of the controls processor should be used via an in-/ output module.
- If, for example, via an external 0-10V analog signal, a heat demand is connected for heat production.
- If Viessmann control units in a system are located on both sides of a router due to long cabling.
- If data exchange between Viessmann control units must take place in a different manner than prescribed by the selfbinding process, e.g. if the outdoor temperatures of three sensors must be distributed to two devices.
- If more than five Viessmann heating plants are installed in a network.
- Other possible requirements

If one of the above requirements applies, the system must be configured via start-up software (toolbinding). When configuring with start-up software, all other bindings that would have been established by the self- installation process, must be performed as well.

For the support of the toolbinding configuration the control units provide the following functions:

- By pressing buttons **+** and **–** simultaneously (approx. 2 secs.), a **service pin message** is released.
- The **service LED** (VL2) on the communication module shows the node status according to generally applicable regulations. A second LED (VL1) shows by flashing (0.5 sec. on/1 sec. off) the proper operation of the second communication module processor.
- When a node receives the **Wink Message**, the entire display of the device and all LEDs of the operating unit flash for one minute or until any button is pressed.
- **XIF files** are available for the communication modules of Viessmann controls, or can be generated with the binding-tool from the self-documentation of the node.
- In the **diagnostic** level of the control units, selfbound or toolbound status of individual devices is shown. To update this display, after toolbinding is completed, the device must first be turned off and then turned on again.

Overview

A general overview of the connections established by the Viessmann selfbinding process is illustrated below:

Connections	Description
Between all LFDMs and the CFDM of the system	The network variables of the LFDMs of all heating circuit controls (devices without own heat production) are bound to the corresponding network variables of the CFDMs of the system. Only one CFDM per system may be active.
Between the BoCs and the PM of the system	In a multiple boiler installation the network variables of the BoCs are bound to the network variables of PM1…PM4 (starting with PM1).
Between the fault manager and all other devices of the system	Network variables nviNodeAlarm of the designated fault manager and potential Vitocom 300 receive data from all other device network variables nvoAlarm on the system.
Between the time of day information sender and the time of day information receiver	Network variable nvoNodeTimeSet of the unit designated as time of day sender is bound to network variable nviNodeTimeSet of all other units in the domain.
Between the outdoor temperature sender and the outdoor temperature receiver	The network variable nvoNodeOATemp of the device which is to send the outdoor temperature is bound to network variable nviNodeOATemp of all other units of the system.

Binding between the Central Flow Demand Manager (CFDM) of the system and all Local Flow Demand Managers (LFDM) of the system:

These bindings are required if one or more heating circuit controls (Vitotronic 050 HK1M, HK1W or HK3W) must send a demand for heat to a single boiler system (to Vitotronic 100 GC1, 200 GW1, 300 GW2, 200 HO1) or to a multiple boiler system (to Vitotronic 333 MW1 or MW2).

Device	Object	Network Variable	Comm.	Network variable	Object	Device
all Vitotronic 050 HK1M, 050 HK1W(S) and 050 HK3W(S) of a system	LFDM	nviLFDMProd State	←	nvoCFDMProd State	CFDM	In a single boiler system: Vitotronic 100 GC1, 200 GW1, 300 GW2 or 200 HO1 In a multi-boiler system: Vitotronic 333 MW1(S) or 333 MW2
		nvoLFDM ConsDmd	→	nviCFDM ConsDmd		

Binding between the Production Manager (PM) and the Boiler Controllers (BoC) in a multiple boiler system:

These bindings establish the connections between the cascade control of the multiple boiler system and the boiler controls of each individual boiler. These bindings are required for each multiple boiler system with Vitotronic 333 MW1 as cascade control and up to four Vitotronic 100 GC1s as individual boiler controls.

The number of boilers can be set using coding address 35 from 1 to 4 on the Vitotronic 333 MW1.

Boiler 1 of the system:

Device	Object	Network variable	Comm.	Network variable	Object	Device: Setting of coding addresses
Vitotronic 333 MW1(S) (Cascade control)	PM1	nviPM1BlrState	←	nvoBoCBlrState	BoC	Vitotronic 100 GC1 of the first boiler in a multiple boiler system: Coding address 01:2 (multiple boiler system) Coding address 07:1 (Boiler number, factory setting)
		nviPM1SupplyT	←	nvoBoCSupplyT		
		nviPM1BoCState	←	nvoBoCBoCState		
		nvoPM1BoilerCmd	→	nviBoCBoilerCmd		
		nvoPM1ApplicMd	→	nviBoCApplicMd		
		nvoPM1Setpoint	→	nviBoCSetpoint		

Boiler 2 (if applicable) of the system:

Device	Object	Network variable	Comm.	Network variable	Object	Device: Setting of coding addresses
Vitotronic 333 MW1 (Cascade control)	PM2	nviPM2BlrState	←	nvoBoCBlrState	BoC	Vitotronic 100 GC1 of second boiler (if applicable) in a multiple boiler system: Coding address 01:2 (Multiple boiler system) Coding address 07:2 (Boiler number)
		nviPM2SupplyT	←	nvoBoCSupplyT		
		nviPM2BoCState	←	nvoBoCBoCState		
		nvoPM2BoilerCmd	→	nviBoCBoilerCmd		
		nvoPM2ApplicMd	→	nviBoCApplicMd		
		nvoPM2Setpoint	→	nviBoCSetpoint		

Boiler 3 (if applicable) of the system:

Device	Object	Network variable	Comm.	Network variable	Object	Device: Setting of coding addresses
Vitotronic 333 MW1(S) (Cascade control)	PM3	nviPM3BlrState	←	nvoBoCBlrState	BoC	Vitotronic 100 GC1 of third boiler (if applicable) in a multiple boiler system: Coding address 01:2 (Multiple boiler system) Coding address 07:3 (Boiler number)
		nviPM3SupplyT	←	nvoBoCSupplyT		
		nviPM3BoCState	←	nvoBoCBoCState		
		nvoPM3BoilerCmd	→	nviBoCBoilerCmd		
		nvoPM3ApplicMd	→	nviBoCApplicMd		
		nvoPM3Setpoint	→	nviBoCSetpoint		

Boiler 4 (if applicable) of the system

Device	Object	Network variable	Comm.	Network variable	Object	Device: Setting of coding addresses
Vitotronic 333 MW1(S) (Cascade control)	PM4	nviPM4BlrState	←	nvoBoCBlrState	BoC	Vitotronic 100 GC1 of fourth boiler (if applicable) in a multiple boiler system: Coding address 01:2 (Multiple boiler system) Coding address 07:4 (Boiler number)
		nviPM4SupplyT	←	nvoBoCSupplyT		
		nviPM4BoCState	←	nvoBoCBoCState		
		nvoPM4BoilerCmd	→	nviBoCBoilerCmd		
		nvoPM4ApplicMd	→	nviBoCApplicMd		
		nvoPM4Setpoint	→	nviBoCSetpoint		

Bindings between the Fault Manager of the system and all other devices:

In a Viessmann heating system, any given control unit (except for Vitotronic 050 HK1M) can be designated as fault manager. This control unit monitors all other control units in the system for failure. If a participant drops out and its cyclical message nvoNodeAlarm is not received by the fault manager during the Receive-Heart-Beat-Time, a fault message is generated. In addition, the compiled fault function is activated and the "missing participant" is shown on the display. In the factory default setting, the Vitotronic 200 GW1, 300 GW2, 333 MW1(S), 333 MW2 and 200 HO1 are designated as fault managers, i.e. for these controls, coding address 79 is set to "1" as the factory default setting. The factory default setting for all other devices is "0", i.e. their input network variable nviNodeAlarm is not active.

In addition to the control unit which is designated as the fault manager of the system, the Vitocom 300 (if applicable) is also automatically the fault manager. This means that all network variables nvoNodeAlarm of all control units must also be bound to it.

Device: Setting of coding addresses	**Object**	**Network Variable**	**Comm.**	**Network variable**	**Object**	**Device: Setting of coding addresses**
All control units of the system except for fault manager: coding address 79:0	Node	nvoNodeAlarm	→	nviNodeAlarm	Node	Fault manager of system (can be any control unit except Vitotronic 050 HK1M): coding address 79:1
All control units of the system except Vitocom 300	Node	nvoNodeAlarm	→	nviNode Alarm1 **or** nviNode Alarm2 … depending on system number	Node	Vitocom 300 (if applicable)

Participant monitoring and fault messaging takes place with the registration of the participant number. This is why an individual participant number must be assigned at the time of toolbinding to each device of the heating system. Contrary to the node address, this number can be determined arbitrarily and is set in coding address 77. If there are several Viessmann heating systems in one network, system attribution of each individual device to systems 1….5 takes places in coding address 98 via toolbinding.

Binding between the Time of Day Sender and all other devices in a network:

Control units Vitotronic 200 GW1, 300 GW2, 333 MW1(S), 333 MW2 and 200 HO1 send their time and date via nvoNodeTimeSet in the factory-default setting and via selfbinding to the entire Viessmann domain.

It is recommended that the time on all devices be synchronized. This means that one device must be designated as the time of day sender – e.g. equipped with DCF77 radio receiver (Viessmann accessories) – and all other devices as time of day receivers. The Vitocom 300 (if applicable) must also be provided with the current time information.

Device: Setting of coding addresses	Object	Network variable	Comm.	Network variable	Object	Device: Setting of coding addresses
Time of day sender (one control within the network): Coding address 7B:1	Node	nvoNodeTime Set	→	nviNodeTime Set	Node	All other control units in the network: coding address 81:3
Time of day sender (one control within the network): Coding address 7B:1	Node	nvoNodeTime Set	→	nviNodeTime Set	Node	Vitocom 300 (if applicable)

Bindings between the outdoor temperature sender and the outdoor temperature receiver:

Control units Vitotronic 200 GW1, 300 GW2, 333 MW1(S) and 333 MW2 send the measured outdoor temperature via nvoNodeOATemp subnet-wide (factory setting and selfbinding) to the heating system. With coding address 97, this operation can be turned off, or can be activated on other control units equipped with outdoor temperature sensor.

During toolbinding, the distribution of the outdoor temperature can be set as desired within in the network. The distribution of the outdoor temperature within the network can be set as desired during toolbinding. This way, groups of devices with the same outdoor temperature may be formed. Please note that coding address 97 must be set to “2” for the outdoor temperature sender and to “1” for the outdoor temperature receiver.

Device: Setting of coding address	Object	Network variable	Comm.	Network variable	Object	Device: Setting of coding address
Outdoor temperature sender: Coding address 97:2	Node	nvoNode OATemp	→	nviNode OATemp	Node	Outdoor temperature receiver: Coding address 97:1

Additional Information on Toolbinding

Exchange of communication modules

In the Viessmann selfbinding process, the binding of devices is renewed each time the power is turned on and changes to relevant configuration parameter (coding addresses) have been made. The processor on the electronic circuit board relays all necessary parameters, which influence the self-binding process, to the neuron chip on the communication module.

If communication modules of the same type are exchanged in a selfbinding system, the binding is not influenced, as all required information is retrieved from the processor of the electric circuit board when the power is turned on.

For toolbinding, the situation is different. The binding tool writes the binding information to the neuron, i.e. the EEPROM. The configuration parameters of the control processor no longer influence the binding. Only the internal functions (i.e. sending/ receiving time of day information, sending/ receiving outdoor temperature, single/ multiple boiler system, etc.) are influenced by the configuration parameters.

If a communication module is exchanged in a tool-bound system, the binding within such a system must be renewed "by tool". If the communication module of boiler 1 in a tool-bound system is exchanged with that of boiler 2, boiler 1 now operates as boiler 2 and vice versa – although the display and the configuration parameter continues to show boiler 1. Because the participant check of the control units runs via the participant address, a reversal cannot be detected with this test. The binding can be checked only with the binding tool.

Fault management

Selfbinding takes place during initial start-up of the heating system. Vitotronic 200 GW1, Vitotronic 300 GW2, Vitotronic 333 MW1(S), Vitotronic 333 MW2 and Vitotronic 200 HO1 control units are set as fault managers by the factory default setting. These controls compile a participant list of all connected Viessmann devices. Recognition of a Viessmann device takes place, among other things, via the network address of the device.

If the system is subject to toolbinding at a later point - entailing a change of address - the participant list of the fault manager must be deleted (see page 21), so as to allow the fault manager to build a new, consistent list.

Index

Applicable Literature/ Websites

Literature

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