

## ZAPP WIRELESS SYSTEM

### HONEYWELL EXCEL 5000 OPEN SYSTEM

#### SYSTEM ENGINEERING

## INTRODUCTION

### Organization of this Manual

This manual is organized to guide you through the engineering of a project from start to finish or adding to or changing an existing system. Sections "Introduction" and "Application Steps" provide the information needed to make accurate ordering decisions. These steps are guidelines intended to aid understanding of the product options, bus arrangement choices, configuration options, and the wireless ZAPP system role in the overall EXCEL 5000 System architecture.

### Description of Devices

The ZAPP system consists of the W7070A ZAPP Wireless Receiver and up to eight rooms, each containing a ZAPP **room unit**. There are four types of ZAPP room units:

- the RT7070A Wireless Handheld,
- the T7270A1001 Analog Wall Module (with temperature sensor and setpoint),
- the T7270A1019 Analog Wall Module (with temperature sensor), and
- the T7270B1009 LCD Wall Module (for HVAC, light, and sunblind applications).

**NOTE:** Since the RT7070A Wireless Handheld is not equipped with a temperature sensor, the W7070A will receive no temperature information from a room in which an RT7070A is not supported by an additional T7270A1001 or T7270A1019 located in that same room.

The W7070A receives commands from ZAPP room units (handhelds or wall modules) and then forwards them to the controllers (e.g. the Excel 10 or Excel 12) connected within the same LONWORKS network (see Fig. 1).

#### **IMPORTANT!**

*The W7070A may be used only in countries where use of ISM 433 MHz band is permitted.*

*The W7070A currently has a radio-frequency registration in most European countries (A, B, CH, D, DK, E, F, FIN, IT, LUX, N, NL, and UK).*

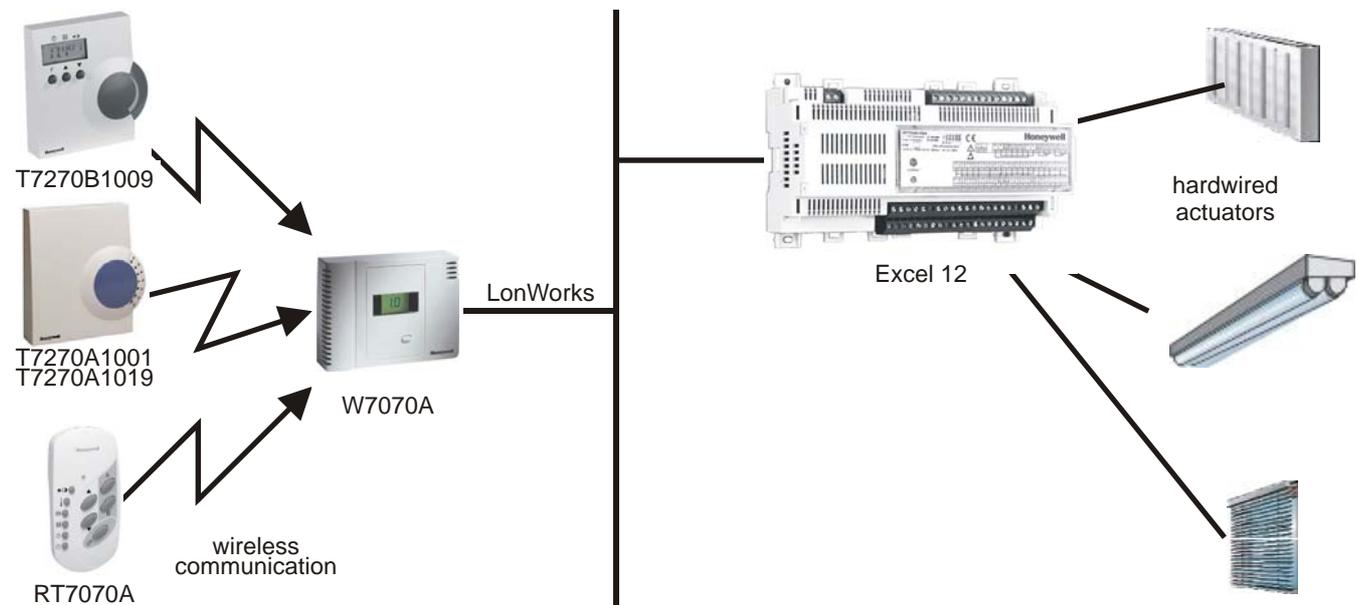


Fig. 1. System overview

## APPLICATION STEPS

### Overview

Steps one through seven describe the engineering. These steps are guidelines intended to aid understanding of the product options, bus arrangement choices, configuration options and ZAPP's role in the overall EXCEL 5000® System architecture.

step	description
1	System Planning
2	Range of RF Transmission
3	LonWorks Communication
4	Power Supply
5	Configuring the W7070A
6	Teach-in

### Step 1: System Planning

Plan the use of ZAPP according to the required functionality and the sensor or actuator usage.

When planning the system layout, consider potential expansion possibilities to allow for future growth.

### Step 2: Range of RF Transmission

Because of interference from other devices and the building structure, it is not possible to exactly define the wireless transmission range.

#### General Guideline

The max. distance between the W7070A and ZAPP room units should be less than 30 meters, and there should be no more than two walls between the W7070A and ZAPP room units.



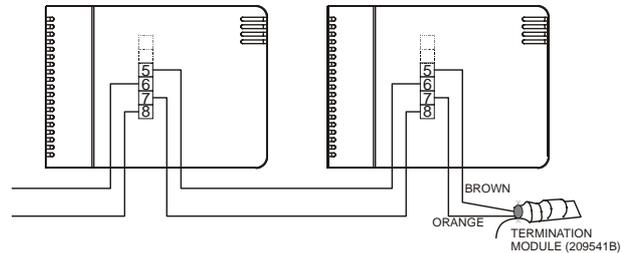
**RF transmission between the W7070A and ZAPP room units may be disrupted by interference from metal objects in the building (metal cabinets / doors, mirrors, concrete ceilings, iron grills, aluminum laminated plates), other radio transmitters (e.g. wireless phones), and power switching devices.**

- Establish and check radio communication of the ZAPP room units with regards to interference, e.g. Use LonMaker or EXCELON in conjunction with nvoRfState.LastCommand to verify a successful transmission from the ZAPP room units to the W7070A.
- If interference occurs, select an alternative location for installation.

### Step 3: LonWorks Communications

The W7070A utilizes a free-topology transceiver (FTT10A) Link Power compatible LONWORKS® network that allows daisy-chain, loop, and star network configurations or any combination thereof (see also Excel 50/500 LONWORKS Mechanisms Interface Description, Product Literature No.: EN0B-0270GE51, for a complete description of possible layouts and wiring details, including max. lengths).

Depending upon the LONWORKS® network configuration used, one or two termination modules may be required (see Fig. 2). Different connections to the termination module are necessary, depending upon whether it is used in a single- or double-terminated network configuration.



**Fig. 2. Termination module connection (daisy-chain network configuration shown)**

**NOTE:** The LONWORKS® network is insensitive to polarity, eliminating installation errors due to miswiring

Wire the W7070A's LonWorks® communications network using level IV 22 AWG or plenum-rated level IV 22 AWG non-shielded, twisted pair, solid conductor wire.

#### IMPORTANT!

*Do not bundle wires carrying field device signals or LonWorks communications together with high-voltage power supply or relay cables. Specifically, maintain a min. separation of 80 mm between such cables. Local wiring codes may take precedence over this recommendation.*

#### IMPORTANT!

*Try to avoid installing in areas of high electromagnetic noise (EMI).*

The LonWorks network is connected to terminals 5 and 7. Terminals 6 and 8 may be used to connect further devices to the same LonWorks network.

### Step 4: Power Supply

#### IMPORTANT!

*Local wiring guidelines (e.g. VDE 0100) may take precedence over recommendations provided in these recommendations.*

All wiring must comply with applicable electrical codes and ordinances. Refer to job or manufacturers' drawings for details. Use a min. of 18 AWG (1.0 mm<sup>2</sup>) and a max. of 14 AWG (2.5 mm<sup>2</sup>) for all power wiring.

The power supply (24 Vac [±20%], 50 or 60 Hz) is connected to terminals 1 and 3. Terminals 2 and 4 may be used to connect further devices to the same 24 Vac power supply.

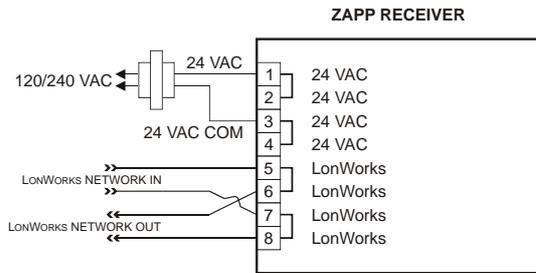


Fig. 3. W7070A terminal assignments

### Step 5: Configuring the W7070A

The W7070A is configured using a plug-in which may be used with CARE or any other LNS-based tool such as LonMaker™ for Windows.

If the factory pre-configuration already fits your needs, configuration is not necessary (see Appendix).

**NOTE:** If communication between the W7070A's neuron processor and its co-processor is interrupted, the W7070A will display an error message (see Fig. 4). This will occur e.g. when an unconfigured W7070A is powered up. To resume normal operation, set the W7070A to "configured online"

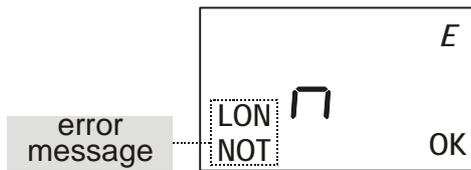


Fig. 4. Error message (no LonWorks® communication)

### Step 6: Teach-In Procedure

Teach-in is a procedure required to allocate ZAPP room units located in the various different rooms to the W7070A. Up to eight rooms, each containing a room unit, can be allocated to a single W7070A. After successful completion of the teach-in procedure for each individual room unit, the W7070A will then recognize commands it receives from them.

Teaching-in can be done as described in the following sections or by using the plug-in.

**NOTE:** When using the plug-in to teach in the room units, it is necessary that you stop teaching in a given room unit before starting to teach in the next room unit. This is because the W7070A will remain in the teach-in mode for 5 minutes, and you may accidentally teach in the device again if you do not wait sufficiently long before teaching in the next device.

#### 1) Enabling the Teach-In Mode

Press the button on the W7070A for at least two seconds. "TEACH" and "1" is displayed, thus indicating that the W7070A is now in the teach-in mode for room 1.

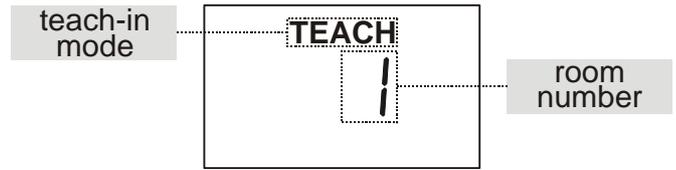


Fig. 5. W7070A in teach-in mode

**NOTE:** If you enter no input within 3 minutes, the W7070A will revert back to the normal mode.

**NOTE:** W7070A's manufactured before date code 0438 have factory settings which do not support allocation of the T7270B1009. In order to nonetheless allocate a T7270B1009, you must press the teach-in button for 20 seconds during power up. **This command deletes all previous teach-in information!**

#### 2) Selecting a Unique Number

You must now assign a unique number (1 through 8) to the given room unit by pressing the button on the W7070A as many times necessary.

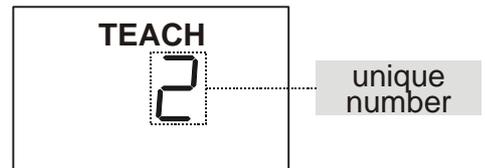


Fig. 6. Assigning unique number

Since the RT7070A Wireless Handheld is not equipped with a temperature sensor, in order for the W7070A to receive information on room temperature, you must assign the same unique number to both the RT7070A in a particular room and the T7270A1001 or T7270A1019 located in that same room. The W7070A is now ready to receive teach-in messages from the room units.

#### 3) Teaching-In a Room Unit

##### 3a) Teaching-In an RT7070A

On the RT7070A, press "UP," "B," and "OK" simultaneously to send the teach message to the W7070A.

If the teach-in was successful, the W7070A will display the corresponding texts ("PRESENT" and "OK").

The appearance of the L symbol indicates that the device which has been taught-in is an RT7070A.

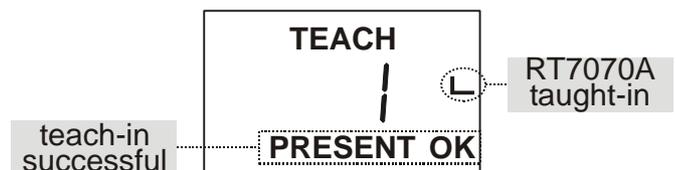


Fig. 7. RT7070A successfully taught-in

3b) Teaching-In a T7270A1001 or T7270A1019

In order to perform the teach-in procedure for a T7270A1001 or T7270A1019, you must first open its housing, revealing the battery compartment and (in the top right corner) transmission button.

If you then insert the battery or press the transmission button, the teach message will be sent to the W7070A.

If the teach-in was successful, the W7070A will display the corresponding texts ("PRESENT" and "OK").

The appearance of the  symbol indicates that the device which has been taught-in is a T7270A1001 or T7270A1019.

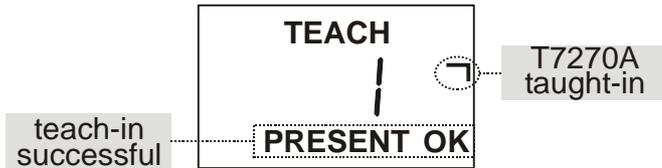


Fig. 8. T7270A successfully taught-in

The appearance also of both the  symbol and the  symbol indicates that an RT7070A and a T7270A (to both of which the same unique number has been assigned) have been taught-in to the same room.

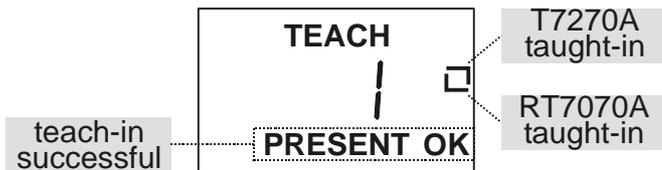


Fig. 9. T7270A and RT7070A successfully taught-in

3c) Teaching-In a T7270B1009

In order to perform the teach-in procedure for a T7270B1009, on the RT7070A, press F and "DOWN" simultaneously for 5 seconds, thus starting the display test and sending the teach message to the W7070A - or simply power-up the T7270B1009.

If the teach-in was successful, the W7070A will display the corresponding texts ("PRESENT" and "OK").

The appearance of the  symbols indicates that the device which has been taught-in is a T7270B (which incorporates HVAC, light, and sunblind functionality)

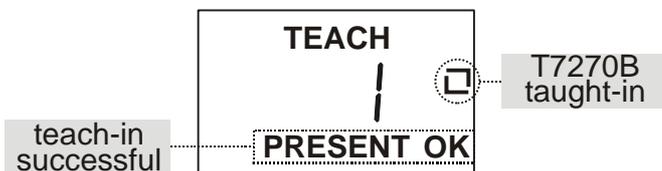


Fig. 10. T7270B successfully taught-in

4) Completion of the Teach-In Process

After successful completion of the teach-in procedure for each individual ZAPP room unit, the W7070A will then recognize commands it receives from them. Further, a symbol

for incoming commands together with the room number and the battery status of the room unit will be displayed

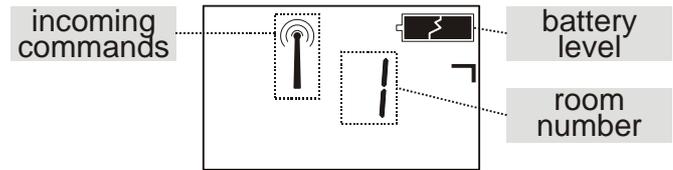


Fig. 11. Incoming commands / battery status

De-Teaching a Taught-In Room Unit

It is possible to de-teach (revoke) a taught-in room unit. This is done as follows:

1. Press the button on the W7070A for 5 seconds to enter the teach-in mode.
2. Select the room you want to de-teach by pressing the button on the W7070A as often as necessary until the unique number of the given room unit appears in the display.
3. Press the button on the W7070A continuously for at least five seconds until the word "PRESENT" in the display disappears

Checking the Status of a Room Unit

It is possible to check the status (i.e. taught-in status, battery level) of individual room units. This is done as follows:

1. Press the button on the W7070A. The status (including all relevant information) of the first room will appear.
2. To check the status of the next room, press the button on the W7070A (see also the examples in Fig. 12 through Fig. 14).



Fig. 12. T7270A and RT7070A taught-in for room #1; battery level OK

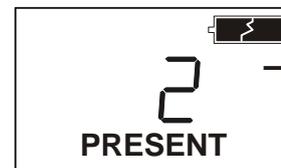


Fig. 13. T7270A taught-in for room #2; battery level OK

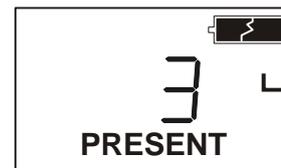


Fig. 14. T7270A taught-in for room #3; battery level OK

# APPENDIX: W7070A NETWORK VARIABLES

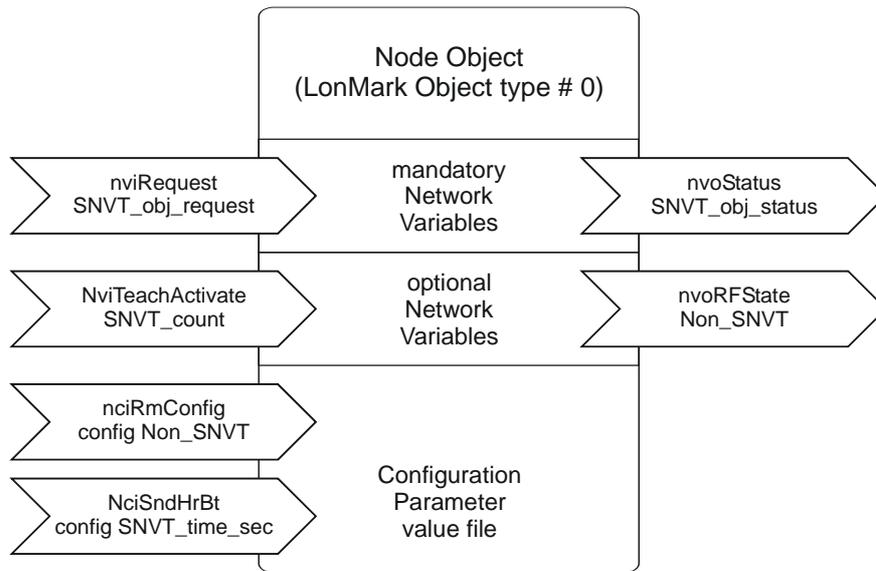


Fig. 15. Node Object

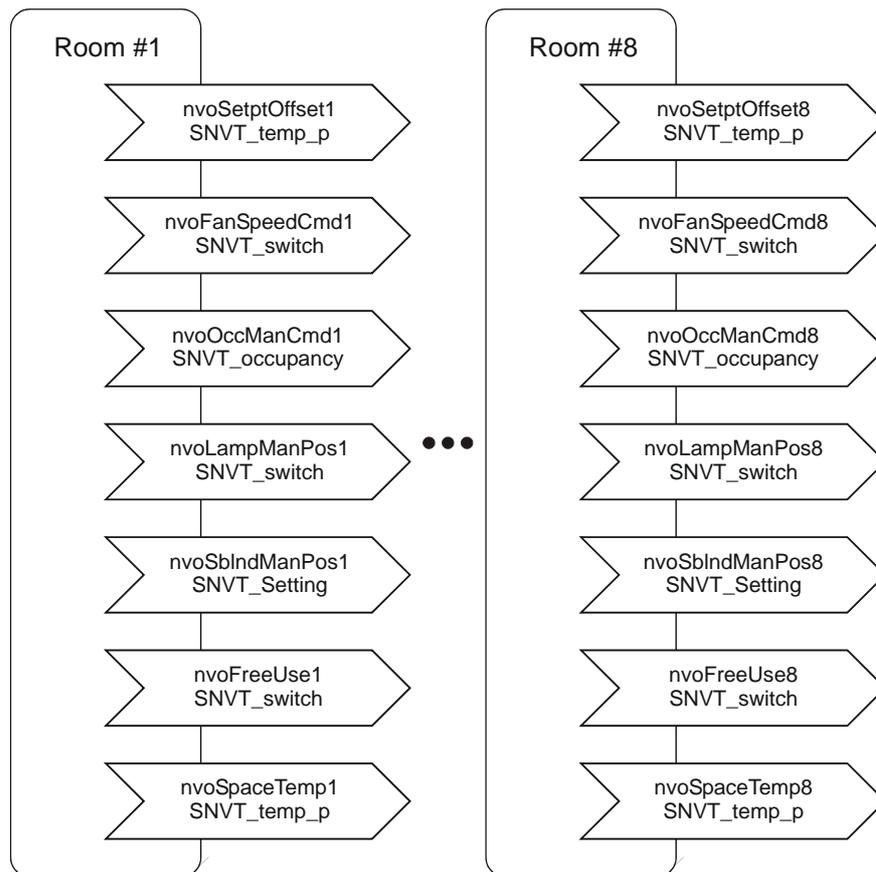


Fig. 16. Network Variables per room

The following tables list all network variables associated with the W7070A.

**Table A1. Configuration Network Variables associated with the W7070A**

NV Name	Field Name	Engineering Units: English (Metric) or States plus Range	Default	SH <sup>1</sup>	HB <sup>2</sup>	Comments
nciRmConfig	.low_setpt	SNVT_temp_p: 0..-5 Kelvin	-5			lower temperature setpoint offset limit
	.high_setpt	SNVT_temp_p: 0..+5 Kelvin	+5			upper temperature setpoint offset limit
	.fanstages	enum 0..3 0 = NO_FAN 1 = ONE_SPEED 2 = TWO_SPEED 3 = THREE_SPEED	THREE_SPEED			number of possible fanspeeds: 0 = no fan / 1..3 = 1..3 speeds (plus AUTO, OFF)
	.bypass	Bit 0 = NOT_ALLOWED 1 = ALLOWED	ALLOWED			Allows the OCCUPANCY functionality to be invoked via handheld.
	.unocc	Bit 0 = NOT_ALLOWED 1 = ALLOWED	ALLOWED			Enables manually changing occupancy state to "unoccupied."
	.occ	Bit 0 = NOT_ALLOWED 1 = ALLOWED	ALLOWED			Enables manually changing occupancy state to "occupied."
	.sblnd_runtime	SNVT_time_sec: 1..240s	60			maximum movement time fur sunblind <b>NOTE:</b> The sunblind runtime must be the same in the T7270B1009, the W7070A, and in the connected controller (e.g. an XL12).
	.lamp_runtime	SNVT_time_sec: 1..60s	10			button 5 (bright): max. time for brightening
	.lamp_start	1=100% 0= last level	0			button 5 (bright): Start dimming at 100% or at last light level
	.lamp_increment	SNVT_lev_percent: 0..100%	100			button 5 (bright): Step height for dimming
	.free_runtime	SNVT_time_sec: 1..60s	10			button 6 (free): max. time for brightening
	.free_start	1=100% 0= last level	0			button 6 (free): Start dimming at 100% or at last light level
.free_increment	SNVT_lev_percent: 0..100%	100			button 6 (free): Step height for dimming	
nciSndHrtBt		SNVT_time_sec	60			Length of timeout after which the W7070A sends nvoSetptOffset and nvoSpaceTemp out onto the network.

<sup>1</sup> SH: Sharable (bindable) points can be set up for data sharing either a data source or a destination.  
<sup>2</sup> HB: These points are sent out onto the network at a certain fixed interval (heartbeat).

Table A2. Input Network Variables associated with the W7070A

NV Name	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State / Value	Default	SH <sup>1</sup>	HB <sup>2</sup>	Comments
nviTeachActivate		SNVT_Count 1..16 0, FFFF		FFFFh			<p>W7070A supports up to eight rooms. Each room is split into two functional areas, the handheld area (1...8) and the sensor (wall module) area (9...16).</p> <p><b>NOTE:</b> If the application supports additional NVs (e.g. as may be the case with customized solutions), the actual number of supported rooms may in fact be lower.</p> <p>For ease of understanding, in this document, the term "sensor" is used for 9...16.</p> <p>The assignment is as follows:  room 1: handheld <b>1</b>; sensor <b>9</b>  room 2: handheld <b>2</b>; sensor <b>10</b>  ...  room 8: handheld <b>8</b>; sensor <b>16</b></p> <p>To teach-in the sensor in room 3, you must set nviTeachActivate = 11.</p> <p>nviTeachActive = 0 or FFFFh: no activity / stop process</p> <p>possible range:1..16, FFFFh</p> <p>The visual (LCD) behavior of the W7070A is equal to teach-in without tools. The result of teach-in can be read out of nvoRfState.teached.</p>
nviRequest	object_id	SNVT_obj_request 0 = NODE_OBJECT 1 = ROOM1 2 = ROOM2 .. 8 = ROOM8					This input variable belongs to the Node Object and provides the mechanism to request a particular mode for a particular object within a node.
	object_request	object_request_t RQ_NORMAL RQ_UPDATE_STATUS RQ_RESET	0 2 17				<p>See above. Commanding any modes other than the ones listed will result in an "invalid_request" when reading nvoStatus.</p> <p>Occupancy state is reset to "unoccupied" and nvoSetPtOffset is set to 0</p>
<sup>1</sup> SH: Sharable (bindable) points can be set up for data sharing either a data source or a destination. <sup>2</sup> HB: These points are sent out onto the network at a certain fixed interval (heartbeat).							

The fixed values of the variables are described in the ZAPP Handheld User Manual (Product Literature No.: EN2B-0205GE51).

**Table A3. Output Network Variables associated with the W7070A**

NV Name	Field Name	Engineering Units: English (Metric) or States plus Range	Default	SH <sup>1</sup>	HB <sup>2</sup>	Comments
nvoOccManCmd*		SNVT_occupancy: 0 = OC_OCCUPIED 1 = OC_UNOCCUPIED 2 = OC_BYPASS 0xFF = OCC_NUL	0xFF = no override	X		Enables OCCUPANCY functionality.
nvoSetPtOffset*		SNVT_temp_p: -5..+5 K due to nciRmConfig	0	x	x	Enables SETPOINT OFFSET functionality.
nvoFanSpeedCmd*	.value	SNVT_switch.value: 0..100%	0%	x		Manual user override of fanspeed.
	.state	SNVT_switch.state: 0 = OFF 1 = ON 255 = NUL	NUL	x		
nvoSblndManPos*		SNVT_setting 3 = SET_UP 2 = SET_DOWN 4 = SET_STOP 255 = SET_NUL	SET_NUL= no action	x		Enables SUNBLIND functionality.
nvoLampManPos*		SNVT_switch.value: 0..100%	0	x		Enables LIGHT functionality.
		SNVT_switch.state: 0 = OFF 1 = ON 255 = NUL	NUL	x		Enables LIGHT functionality.
nvoFreeUse*	.value	SNVT_switch.value: 0..100%	0	x		Enables LIGHT functionality.
	.state	SNVT_switch.state: 0 = OFF 1 = ON 255 = NUL	NUL	x		Enables LIGHT functionality.
nvoSpaceTemp*		SNVT_temp_p 0..40° C	invalid	x	x	Contains info on room temperature of taught-in wall module.
nvoRfState <sup>3</sup>	.BatteryState1 ... .BatteryState16	Bit: 0 = battery ok 1 = battery low	0 = ok			Battery condition for handheld (1...8) or sensor (9...16) in the rooms. <b>NOTE:</b> If there is no communication from the wall module (e.g. because battery was removed), the battery state will be set to 1.
	.taught1 ... .taught16	Bit: 1 = taught 0 = no device taught	0, but saves value over power down			room 1: handheld 1; sensor 9 room 2: handheld 2; sensor 10... room 8: handheld 8; sensor 16
	.lastRfDevice	Byte: 0..16				Contains info on origin of last message received by W7070A room 1: handheld 1; sensor 9 room 2: handheld 2; sensor 10... room 8: handheld 8; sensor 16
<sup>1</sup> SH: Sharable (bindable) points can be set up for data sharing either a data source or a destination. <sup>2</sup> HB: These points are sent out onto the network at a certain fixed interval (heartbeat). <sup>3</sup> : If there is no RF communication with the wall module, the battery state will be set to 1. This may require up to 2 hours. *Each of these variables exists for rooms 1 through 8 and has a single-digit index of 1..8.						

Table A3 (continued). Output Network Variables associated with the W7070A

NV Name	Field Name	Engineering Units: English (Metric) or States plus Range	Default	SH <sup>1</sup>	HB <sup>2</sup>	Comments
nvoRfState	.lastCommand	Enum: 0 = OFFS_HIGHER 1 = OFFS_LOWER 2 = OFFS_ZERO 3 = OFFS_MIN 4 = OFFS_MAX 5 = FAN_HIGHER 6 = FAN_LOWER 7 = FAN_AUTO 8 = FAN_MAX 9 = FAN_OFF 10 = OCC_BYP 11 = OCC_UNOCC 12 = OCC_NUL 13 = OCC_OCC 14 = LIGHT_MAX 15 = LIGHT_MIN 16 = LIGHT_START_DIM 17 = LIGHT_STOP_DIM 18 = SBL_UP 19 = SBL_DOWN 20 = SBL_STOP 21 = OFFICE_STYLE_1 22 = OFFICE_STYLE_2 23 = FREE_MAX 24 = FREE_MIN 25 = FREE_START_DIM 26 = FREE_STOP_DIM 27 = DIRECT_SETPT 28 = ROOM_TEMP 255 = CMD_NUL				Contains info on last message received by W7070A.
nvoRfState	.TeachActive	SNVT_count: <b>0..16</b>				Contains info on the number of the room unit currently in the teach-in mode. 0 = no teach-in process. room 1: handheld <b>1</b> ; sensor <b>9</b> room 2: handheld <b>2</b> ; sensor <b>10</b> ... room 8: handheld <b>8</b> ; sensor <b>16</b>
nroSwVersion	.major					W7070A neuron application software version
	.minor					
	.bug					
nvoStatus	.object_id	0 = NODE_OBJECT 1 = ROOM1 2 = ROOM2 3 = ROOM3 ... 8 = ROOM8				
	.invalid_id	0 = VALID_ID, 1 = INVALID_ID				
	.disabled	0 = ENABLED, 1 = DISABLED				
<sup>1</sup> SH: Sharable (bindable) points can be set up for data sharing either a data source or a destination. <sup>2</sup> HB: These points are sent out onto the network at a certain fixed interval (heartbeat).						

# ACCESSORIES, AGENCY LISTINGS, ABBREVIATIONS, AND LITERATURE

## Accessories

### Wall Holder for Handhelds

The RT 70-HRD20-Wall includes 10 wall holders for the RT7070A.

### LONWORKS® Termination

One or two LONWORKS® terminations are required, depending on the given LonWorks bus layout.

Two different LONWORKS® terminations are available:

- LONWORKS® termination module, order no.: **209541B**
- LONWORKS® connection / termination module (can be mounted on DIN rails and in fuse boxes), order no.: **XAL-Term**

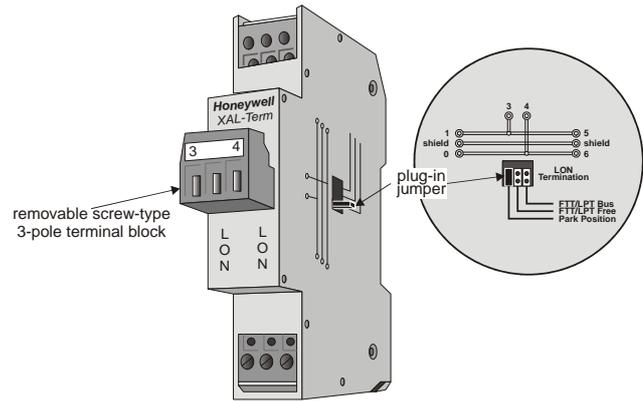


Fig. 17. Lonworks® connection and termination module

## Agency Listings

Table 1 provides information on agency listings for wireless ZAPP system products.

Table 1. Agency listings

Devices	Agency	Comments
W7070A T7270A T7270B	CE	General Immunity per European Consortium standards EN50081-1 (CISPR 22 Class B) and EN 50082-1: 1992 (based on Residential, Commercial, and Light Industrial). EN 61000-4-2 IEC 1000-4-2 (IEC 801-2) Electromagnetic Discharge. EN 50140, EN 50204 IEC 1000-4-3 (IEC 801-3) Radiated Electromagnetic Field. EN 61000-4-4 IEC 1000-4-4 (IEC 801-4) Electrical Fast Transient (Burst). Radiated Emissions and Conducted Emissions. EN 55022: 1987 Class B. CISPR-22: 1985.
	FCC	Complies with requirements in FCC Part 15 rules for a Class B computing device.

**Honeywell**

Manufactured for and on behalf of the Environmental and Combustion Controls Division of Honeywell Technologies Sarl, Ecublens, Route du Bois 37, Switzerland by its Authorized Representative:

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