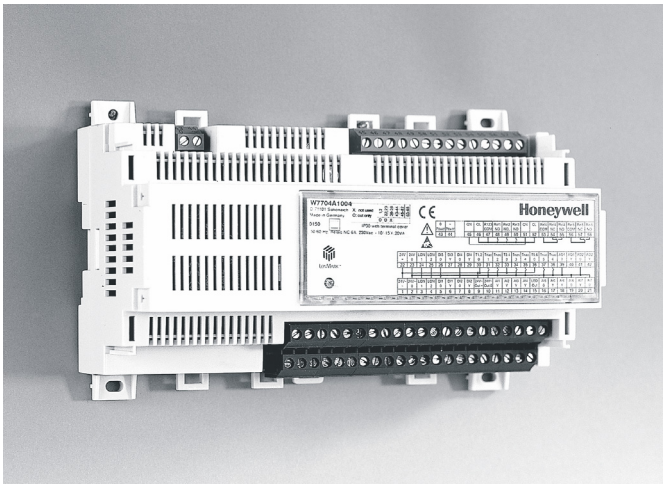
Honeywell

Excel 12

INTEGRATED ROOM CONTROL SOLUTIONS: FCU + LIGHT + SUNBLIND

PRODUCT DATA



FEATURES

- **Three-in-one controller for HVAC, Light, and Sunblind applications reduces hardware costs and engineering effort (one LONWORKS® node instead of three).**
- **Additional energy savings due to integrated room control, e.g. use of sunlight to heat unoccupied rooms.**
- **Increased comfort due to automatic light and sunblind control depending on available light and occupancy.**
- **LonMark® certified.**
- **Flash memory for downloading applications (thus increasing flexibility and facilitating future upgrading).**
- **Easily-accessible service button and service LED.**
- **DIN rail (wiring cabinet / fuse box) mounting and wall-mounting supported.**
- **230 Vac, 100 Vac, or 24 Vac power supply (depending upon model).**
- **Optional terminal protection covers for wall mounting.**
- **Optional swivel label holders for wiring information.**
- **2-wire FTT-10A LONWORKS® bus interface.**
- **Application can be configured to user-specific needs via LNS™-based plug-in.**

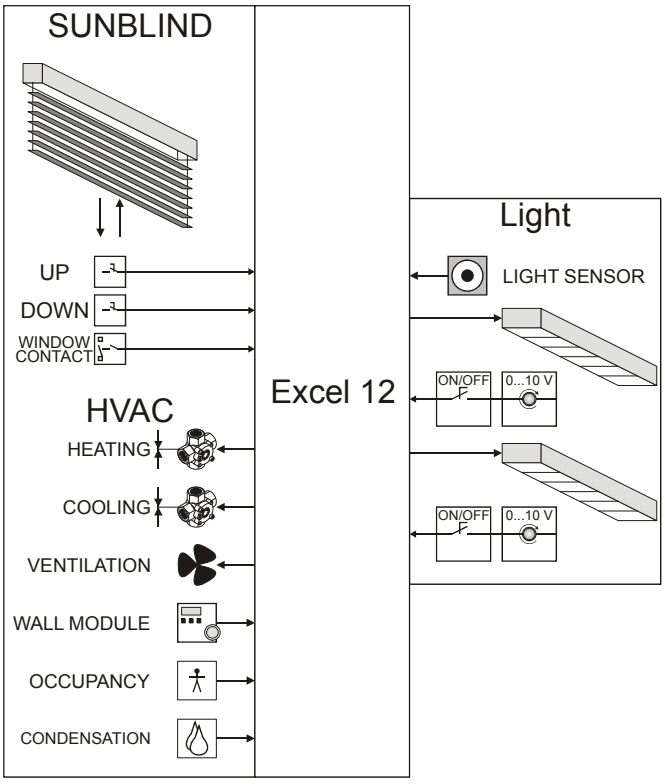


Fig. 1. Functional overview

GENERAL

Excel 12 controllers are LONMARK® certified devices, and can thus be used in all open LONWORKS® environments.

Excel 12 supports the following LONMARK® objects:

- 1 Node Object (LONMARK® object #0).
- 1 Space Comfort Controller Fan Coil Object (profile #8501).
- 2 Lamp Actuator Objects (profile #3040).
- 1 Occupancy Sensor Object (profile #1060).
- 1 Sunblind Actuator Object (object #4).

A variety of hardware models are available, with different power supplies.

Page 6 provides a detailed overview of the available models.

Select the model fitting your particular needs.

The application can be downloaded into the Excel 12's FLASH memory.

Honeywell's LNS™ plug-in allows you to configure the application to match your specific requirements (e.g. light switching or constant light control [depending upon the availability of daylight and/or the occupancy state]; sunblind up/down depending upon daylight, occupancy, and wind speed).

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APPLICATION

The Excel 12 Fan Coil Unit (FCU) + Light + Sunblind application encompasses the entire room, including one fan coil unit, two lights, and one sunblind.

The application is delivered together with the plug-in and must be downloaded into the Excel 12 controller's flash memory during start-up. Regardless of the given Excel 12 model, the user has the option of choosing from among the many different available Excel 12 applications. The user can customize the application using Honeywell's LNS™ plug-in with CARE or any LNS™ tool (e.g. LonMaker for Windows™). Customizations can be saved / reloaded for easy configuration of multiple devices.

Application Overview

One Fan-Coil Unit:

- Two sequences configurable for HEAT, COOL, and CHANGEOVER.
- Support of thermal actuators, floating actuators, PWM, 0...10 Vdc, and staged output via triac outputs or relay outputs.
- 3-stage fan via triac outputs or relay outputs.
- Binary inputs for condensation, occupancy sensor, window contact, etc.

Two Lights:

- ON / OFF switching dependent on:
  - Occupancy sensor.
  - Three effective occupancy modes (occupied / standby / unoccupied). Effective occupancy is determined on the basis of the occupancy sensor, the schedule, and override input (if any).
  - Light level (determined on the basis of data received via the LONWORKS® network or read from a hardwired sensor).
  - Manual switching (via hardwired switches or LONWORKS® wall module).
- Dimming / constant light control for two lights with just one sensor. Dimming / constant light control is performed via analog outputs (this requires an HFD [High-Frequency Device] for dimming with 1...10 Vdc input).

One Sunblind:

- Positioning dependent on:
  - The effective occupancy mode (occupied / standby / unoccupied) determined by occupancy sensor, the schedule, and override input (if any).
  - Light level (determined on the basis of data received via the LONWORKS® network).
  - Manual command.
  - Building supervisor command.
- Safety position dependent on:
  - Frost / rain from weather station or XL500, etc.
  - Wind speed (determined on the basis of data received via the LONWORKS® network).
  - Open windows (determined on the basis of data received via the LONWORKS® network or read from a hardwired sensor) inhibit moving of sunblind.

Occupancy Modes:

- *Occupied mode:* The Excel 12 operates according to the "occupied" heating and cooling set-points.
- *Bypass:* After the bypass button of a hardwired wall module has been pressed or when corresponding data is received via the LONWORKS® network, the Excel 12 operates temporarily according to the "occupied" heating and cooling set-points. When the bypass time has elapsed, the controller reverts to the previous mode. The bypass time can be configured via plug-in.
- *Standby mode:* The Excel 12 operates according to the "standby" heating and cooling set-points.
- *Unoccupied mode:* The Excel 12 operates according to the "unoccupied" heating and cooling set-points.
- *Occupancy sensor:* The occupancy sensor is used for FCU, light, and sunblind control. Hardwired and LONWORKS® occupancy sensors are supported. The occupancy sensor determines the effective occupancy mode during scheduled occupied periods. Depending upon the actual occupancy sensor state, the effective mode will be either "occupied" or "standby."

Wall Modules:

- LONWORKS® wall modules.
- Hardwired wall modules (e.g. T7460, T7560).
- Wireless wall modules (e.g. W7070+T7270 or RT7070).

Master / Slave Functionality:

The master / slave functionality allows easy adaptation to changed room usage.

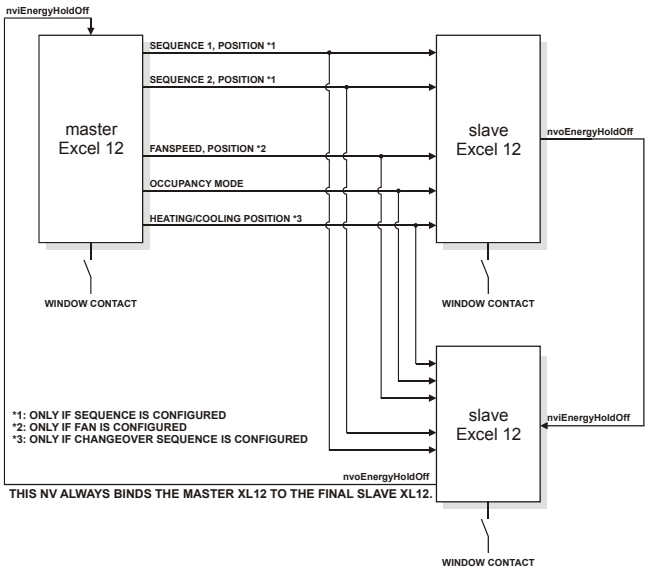


Fig. 2. Master/slave functionality and window contact

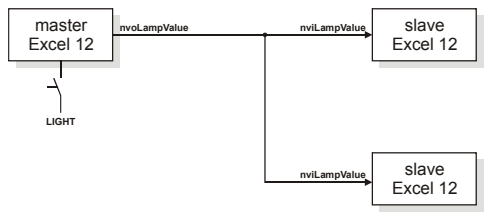


Fig. 3. All lights switched via master pushbutton

NOTE: Binding via LONWORKS results in a short delay between the switching of the different lamps.

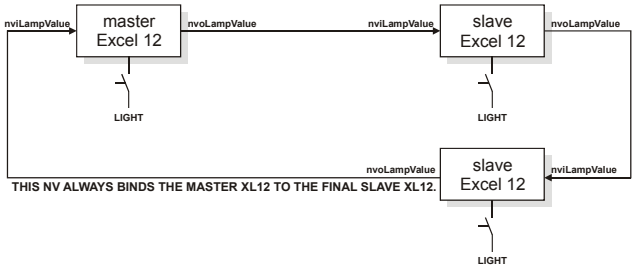


Fig. 4. All lights switched on via any pushbutton

NOTE: This binding shall not be used for applications involving dimming or constant light control. Binding via LONWORKS results in a short delay between the switching of the different lamps. Pressing the pushbutton repeatedly and rapidly may cause toggle effects.

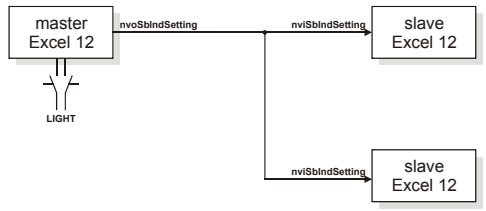


Fig. 5. All sunblinds controlled via master pushbuttons

NOTE: Binding via LONWORKS results in a short delay between the switching of the different sunblinds.

Benefits of Integrated Room Control

The Excel 12's light management functionality provides you with a number of significant advantages:

Considerable Reduction in Energy Consumption:

- 25...75% savings on electrical energy consumption for illumination.
- Decreased heat generated by electric lights or incoming solar radiation (by closing sunblind), thus reducing cooling energy requirements.
- Decreased electrical energy consumption due to constant light control (see section "Constant Light Control" on page 7).
- Sunlight can be used to heat the room (sunblind up) if the room is unoccupied and to avoid unnecessary cooling demands (sunblind down), as needed.

Increased Convenience:

- Occupancy sensor switches the light ON/OFF automatically.
- Constant light control always provides the correct lighting.
- The sunblind is lowered if the current outdoor light level exceeds a configurable limit and is raised if the current light outdoor level drops below the desired limit, or in case of strong winds.
- Usage styles (e.g. presentation, working, etc.) can be configured in conjunction with the Web Office Console.
- Wireless control via ZAPP (see ZAPP System Engineering, EN0B-0286GE51).

Increased Flexibility:

- Flexible room usage if a LONWORKS® wall module or ZAPP (wireless remote control) is used.

Reduced Engineering Effort / Expenses:

- Just one LONWORKS® node (instead of three) is required to cover HVAC, Light, and Sunblind.
  - + reduced engineering and installation effort (e.g. wiring, binding, commissioning, etc.)
  - + lower cost due to reduced number of LNS™ credits
  - + lower hardware total loop costs

Interoperability

The Excel 12 has been certified as per LONMARK® Application Layer Guidelines V 3.2. and is thus interoperable with all other devices in open LONWORKS® networks (including third-party devices).

Device Configuration

The controller is configured using Honeywell's LNS™ plug-in. The plug-in can be started from CARE 4.0 or any LNS™ tool (e.g. LonMaker for Windows™).

LONMARK® Objects Network Variables

The Excel 12 supports the following LONMARK® objects:

- 1 node object (see Fig. 8)
- 1 space comfort controller object (#8501 SCC – Fan Coil) (see Fig. 6)
- 2 lamp actuator objects (#3040) (see Fig. 9)
- 1 occupancy sensor object (#1060) (see Fig. 7)
- 1 sunblind / closed-loop actuator object (#4) (see Fig. 10). Insofar as a generally agreed-upon LonMark® object is not yet available, sunblind control is achieved in a generic fashion.

See also Table 6 through Table 10 in section "Network Interface" on page 8.

Space Comfort Controller Object

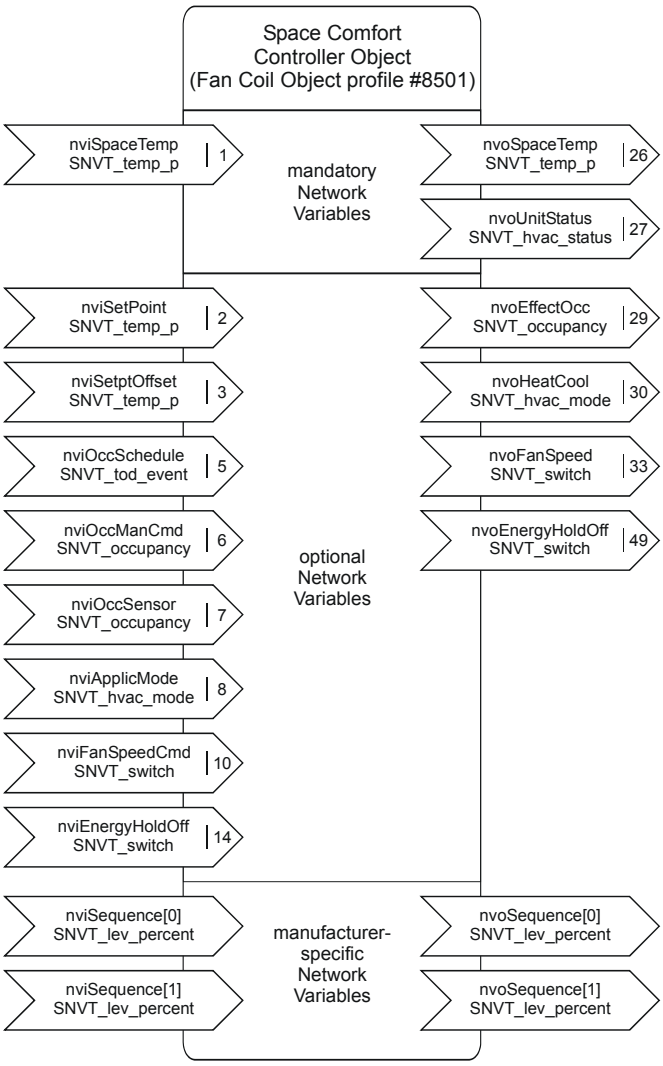


Fig. 6. Space Comfort Controller Object

Occupancy Sensor Object

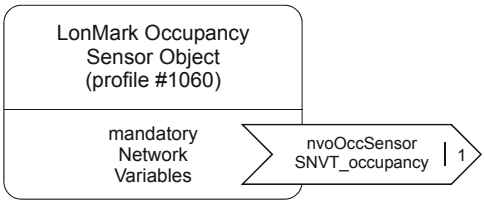


Fig. 7. Occupancy Sensor Object

Node Object

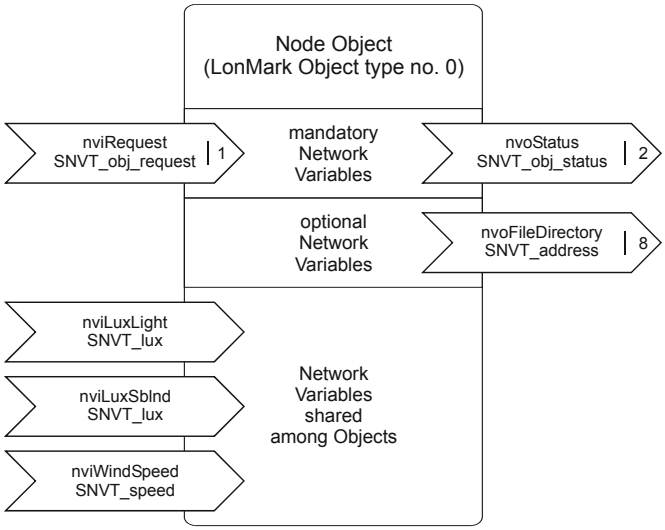


Fig. 8. Node Object

Lamp Actuator Object

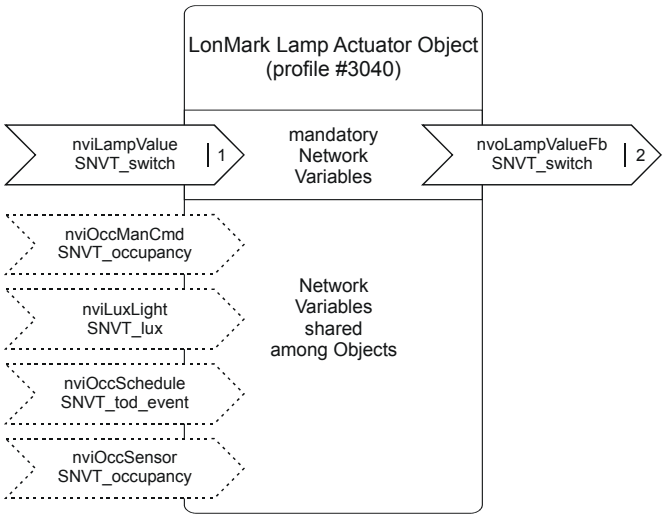


Fig. 9. Lamp Actuator Object

Sunblind Actuator Object

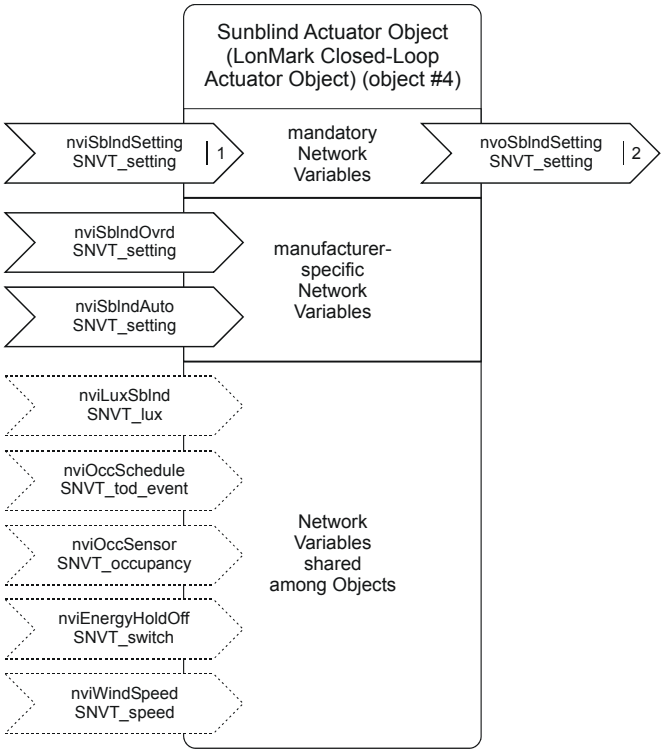


Fig. 10. Sunblind Actuator Object

LONWORKS® Network Interface

The Excel 12 communicates within the LONWORKS® network at a rate of 78 kbs via an FTT-10A Free Topology Transceiver, which provides transformer isolation; the bus wiring is thus insensitive to polarity.

Devices so equipped can be wired in daisy chain, star, loop, or any combination thereof as long as the max. wire length requirements are met. The recommended configuration is a daisy chain with two termination modules. This layout allows for max. bus length and has the highest communication reliability, particularly when adding on to an existing bus. Refer also to http://www.echelon.com

Configuration and Binding

Configuration is performed using Honeywell's LNS™ plug-in, which can be started from CARE 4.0 or any LNS™ tool (e.g. LonMaker for Windows™). Likewise, binding is performed using CARE 4.0 or any LNS™ tool.

LONWORKS® Service Button and LED

All models feature a LONWORKS® service button (accessible from the outside on top of the module).

The service pin message is broadcast:

- whenever the LONWORKS® service button is pressed;
- after each reset due to power-up, software reset;
- if a hardwired push button for lighting or sunblind is pushed for more than 10 seconds.

All models feature a LONWORKS® service LED for commissioning and troubleshooting. The service LED displays numerous different behaviors indicating various module states for use in troubleshooting.

See also Excel 12 Installation Instructions (EN1B-0201GE51) for more-detailed information.

Priority of Received/Read Sunblind Input

Depending upon the last command received/read before the wind speed exceeds the set limit, the sunblinds will either return to the required position or remain in the UP position (see Table 1). Fig. 11 presents the priorities of sunblind input received/read by the Excel 12.

Table 1. Wind-dependent behavior of sunblinds

last command	return to required pos.	remain UP
UP/DOWN button	--	YES
nviSblndSetting	--	YES
nviSblndAuto	YES	--
nviSblndOvrd	YES	--
light sensor	YES	--
energy optimization	YES	--

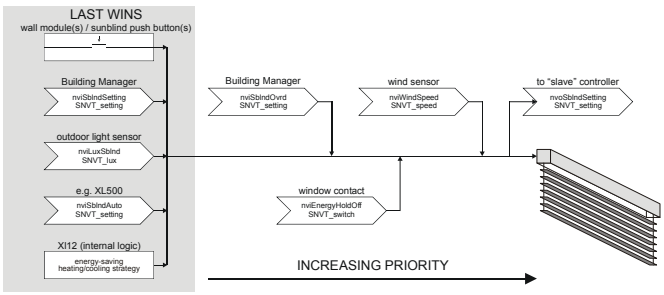


Fig. 11. Priority of sunblind input

Models

Table 2. Overview of Excel 12 models

	short housing	long housing	24 Vac	230 Vac	binary input 1	binary input 2	binary input 3	binary input 4	relay 1 (N-O)	relay 2 (N-O)	relay 3 (N-O)	relay 4 (C-O)	relay 5 (C-O)	triac 1	triac 2	triac 3	traic 4	triac 5	triac 6	wall module LED output	AI1 (NTC20k + V)	AI2 (NTC20k)	AI3 (fan speed / bypass)	AI4 (setpoint)	AI5 (NTC20k + V)	AI6 (NTC20k)	AI7 (NTC20k + V)	AO1 (0...10 Vdc)	AO2 (0...10 Vdc)
W7704A1004*[1]		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X
W7704B1002*[1]		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W7704C1000*[1]	X		X		X	X	X	X						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W7704D1008	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W7704D1016		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W7704F1003*[1]*[2]		X		X	X	X	X	X	X	X	X	X														X	X	X	X

*[1] These hardware versions have been discontinued.

*[2] The hardware variant W7704F1003 is cost-optimized for light control and does not support hardwired wall modules.

Long and Short Housings

Models powered with line power (W7704A, B, D1016, and D1024) are equipped with a built-in transformer and feature a long housing (W X L X H = 180 X 76 X 110 mm).

Models powered with 24 Vac (W7704C, D1008, E1005) require an external 24 Vac power supply and feature a short housing (W X L X H = 126 X 76 X 110 mm).

Binary Inputs

The Excel 12 is equipped with four dry-contact binary inputs. The binary inputs are fast (i.e. the signal must be stable for at least 25 ms).

Binary Outputs

The triac outputs or relay outputs can be configured for different functions.

Relay Outputs

The Excel 12 is equipped with up to two change-over (C-O) relays and up to three normally-open (N-O) relays.

Analog Outputs

The Excel 12 is equipped with up to two 0...11 Vdc analog outputs (with the exception of the W7704E1005, which supports only a single such analog output), each of which can drive a max. of ±1.1 mA.

Example: Floating Drives

You can configure the two triac outputs or two relays to connect a floating drive (no mixing of triac outputs and relays allowed). Once the outputs have been configured using Honeywell's LNS™ plug-in, floating actuators can be directly connected to them.

Analog Inputs

The Excel 12 is equipped with up to 7 analog inputs, all of which can be configured as slow binary inputs (in which case the signal must be stable for at least 1.25 sec) for the detection of a slow signals (e.g. from a window contact).

Table 3. Analog input usage (with wall modules)

analog input	voltage	NTC	wall module
AI1	X	X	
AI2[3]		X	room temperature[1]
AI3[3]			fan speed or bypass[2]
AI4[3]			set-point
AI5	X	X	
AI6		X	
AI7[3]	X	X	

[1] For all NTC inputs, temperatures of ≤ -50...-45 °C are interpreted as being due to a sensor break, and temperatures of ≥ +145...+155 °C are interpreted as being due to a sensor short-circuit.

[2] A contact open for ≥ 10 seconds is interpreted as a sensor failure.

[3] A resistance of > 15k Ω is interpreted as being due to a sensor break, a resistance of < 100 Ω is interpreted as being due to a sensor short-circuit.

Hardware Limits

- In order to ensure a reliable contact, a min. current of 50 mA is required.
- The normally-open contacts are designed for a max. continuous current of 16 A. The normally-closed contacts are designed for a max. continuous current of 1 A.
- In order to reduce the build-up of heat in the housing, the max. combined allowable current flowing through all relays simultaneously is 24 A (continuous).
- The max. peak in-rush current (20 ms) at the normally-open contact is 80 A.

Triac Outputs

The Excel 12 is equipped with up to six triac outputs.

Hardware Limits for Excel 12 with Line Power Supply

- Low signal: 0 V; high signal: 24 Vac
- **Max. 250 mA** continuous current in sum for all triac outputs together
- 550 mA for max. 10 sec.
- cos φ > 0.5

Hardware Limits for Excel 12 with 24 Vac Power Supply

- Low signal: 0 V; high signal: 24 Vac
- **Max. 500 mA** continuous current in sum for all triac outputs together
- 800 mA for max. 10 sec.
- cos φ > 0.5

NOTE: For controlling thermal actuators, we recommend using the 24 Vac models, which provide more current.

CONSTANT LIGHT CONTROL

If, when configuring your Excel 12 application, you provide for a light sensor (by selecting the "Daylight Sensing" checkbox in the appropriate sub-screen), you must specify, in lux, the desired minimum and maximum light levels ("Daylight: dark level" and "Daylight bright level, respectively). The values you choose will then be used to switch the lights ON and OFF.

NOTE: The light sensor employed for constant light control must be suitable for artificial light, and should be mounted more towards the corridor.

Constant light control helps save additional energy. Over their lifecycle, fluorescent tubes normally lose about 15% of their illumination. To compensate for this, rooms are therefore usually dimensioned with 15% more illumination than actually necessary. With constant light control, the light level can drop as low as 85%, and the required brightness can still be achieved. Further savings and comfort can be achieved if there is a constant light level in the room and the light is automatically dimmed when more outside light enters. The Excel 12 supports window correction in order to reduce the light output of the window light. Via the plug-in, this can be selected and the offset also adjusted.

Example: The corridor light provides 400 lux and the window light 320 lux. It is possible to override the constant light control by manually dimming the light.

For constant light control, you must specify the set-point, the darkness level, a correction for window lights (in general, during the daytime, the window light has a lower light level than the floor light), and also whether you want it to be possible to switch on the light manually (e.g. in case of a bright room).

The light intensities typically encountered in everyday life are listed in Table 4, while Table 5 presents the recommended light levels in various environments as set forth by DIN5035.

NOTE: One lux is equivalent to 0.0929 foot-candle.

Refer also to the plug-in help information for details.

Table 4. Typical light intensities

ambient conditions	intensity (lux)
summer day, cloudless	100,000
summer day, cloudy	20,000
winter day, cloudy	400
night, with full moon	0.3

Table 5. Recommended light intensities (DIN5035)

area	intensity (lux)
storage rooms	50...200
washrooms, cloakrooms, technical rooms, corridors	100
office rooms (near windows)	300
office rooms (minimal outside light)	500
open-plan office rooms	750
schools (daytime)	300
night schools	500
gymnasiums	200
show rooms	300
commercial kitchens	500

Accessories, Standards, Ratings, and Literature

Accessories

Swivel Label Holders

For short or long housings (required for modules equipped with manual override switches).

- 24 Vac models (short), order no.: **XAL_LAB_S**
- line power supply models (long), order no.: **XAL_LAB_L**

Terminal Protection Covers

For short or long housings (required for wall/ceiling mounting).

- 24 Vac models (short), order no.: **XAL_COV_S**
- line power supply models (long), order no.: **XAL_COV_L**

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**

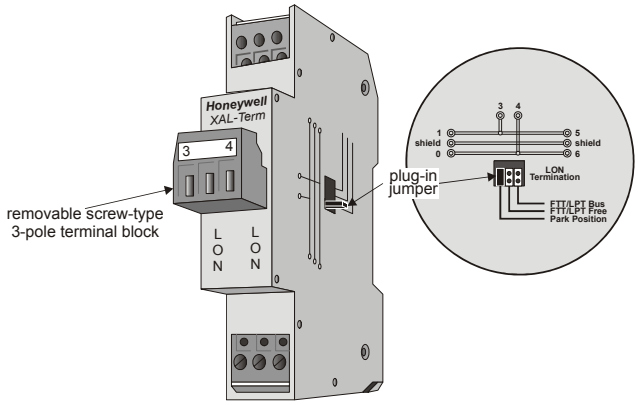


Fig. 12. Lonworks® connection and termination module

Approvals and Standards

- CE and EN 50081-1
- LONMARK® Application Layer Guidelines Version 3.2

Housings

- IP20 or IP30 (with optional terminal covers)

Environmental Ratings

- Operating temperature: 32...122 °F (0...50 °C)
- Shipping/storage temperature: -22...158 °F (-30...70 °C)
- Relative humidity (operation and storage): 5...90%, non-condensing

Applicable Literature

- Excel 12 Installation Instructions (EN1B-0201GE51)
- Excel 50/500 LONWORKS® Mechanisms (EN0B-0270GE51)
- Excel 10 FTT/LPT 209541B Termination Module Installation Instructions (95-7554)
- ZAPP System Engineering (EN0B-0286GE51)
- Honeywell's XL12 / Excel Smart I/O plug-in help

NETWORK INTERFACE

The following tables list the NV's associated with the various LONMARK® objects serving as network interfaces to the Excel 12 FCU + Light + Sunblind application.

Table 6. NV's associated with Space Comfort Controller FCU Object (profile # 8051)

name	type	heartbeat
nviSpaceTemp	SNVT_temp_p	yes
nviSetPoint	SNVT_temp_p	no
nviSetptOffset	SNVT_temp_p	yes
nviOccSchedule	SNVT_tod_event	yes
nviOccManCmd	SNVT_occupancy	no
nviOccSensor	SNVT_occupancy	yes
nviApplicMode	SNVT_hvac_mode	yes
nviFanSpeedCmd	SNVT_switch	no
nviEnergyHoldOff	SNVT_switch	yes
nviSequence[2]	SNVT_lev_percent	yes
nvoSequence[2]	SNVT_lev_percent	yes
nvoSpaceTemp	SNVT_temp_p	yes
nvoUnitStatus	SNVT_hvac_status	yes
nvoEffectOcc	SNVT_occupancy	no
nvoHeatCool	SNVT_hvac_mode	yes
nvoFanSpeed	SNVT_switch	yes
nvoEnergyHoldOff	SNVT_switch	yes

Table 7. NV's associated with Occupancy Sensor Object (profile #1060)

name	type	heartbeat
nvoOccSensor	SNVT_occupancy	yes

Table 8. NV's associated with Lamp Actuator Object (profile #3040)

name	type	heartbeat
nviLampValue[2]	SNVT_switch	no
nvoLampValueFb[2]	SNVT_switch	no

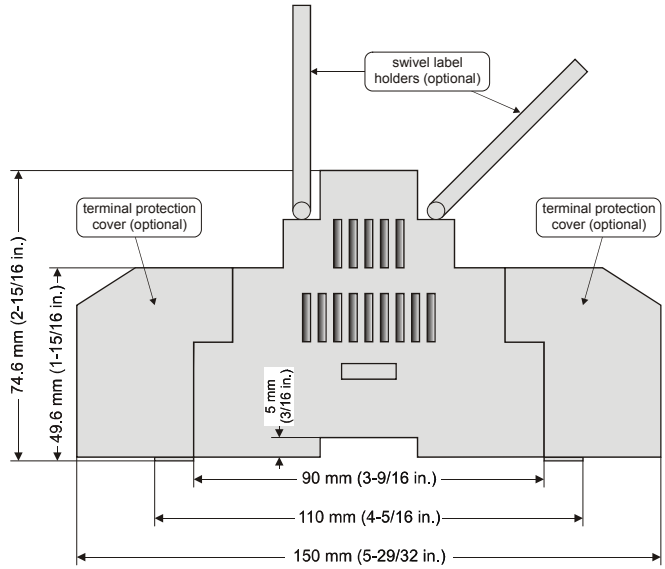
Table 9. NV's associated with Sunblind Actuator Object (object #4)

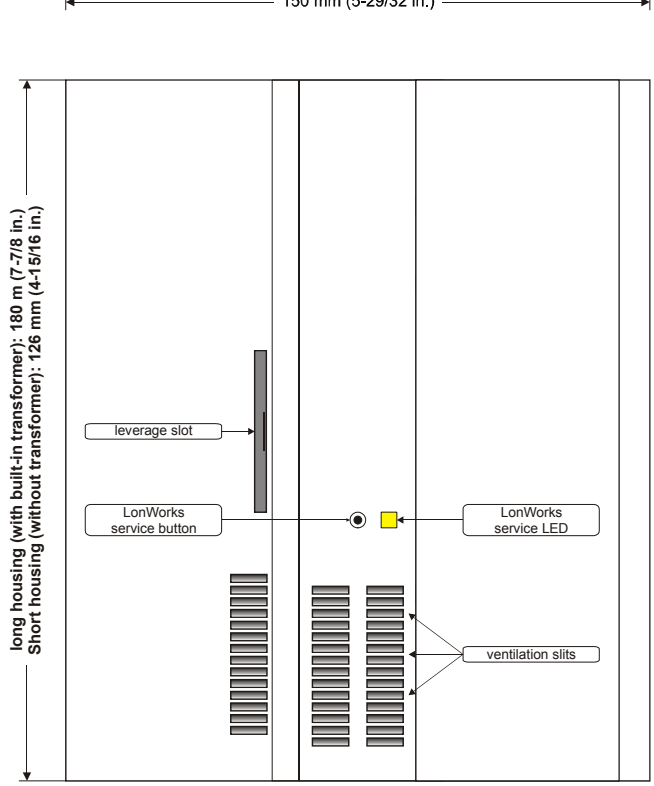
name	type	heartbeat
nviSblndSetting[1]	SNVT_setting	no
nviSblndOvrd[1]	SNVT_setting	no
nviSblndAuto[1]	SNVT_setting	yes
nvoSblndSetting[1]	SNVT_setting	yes

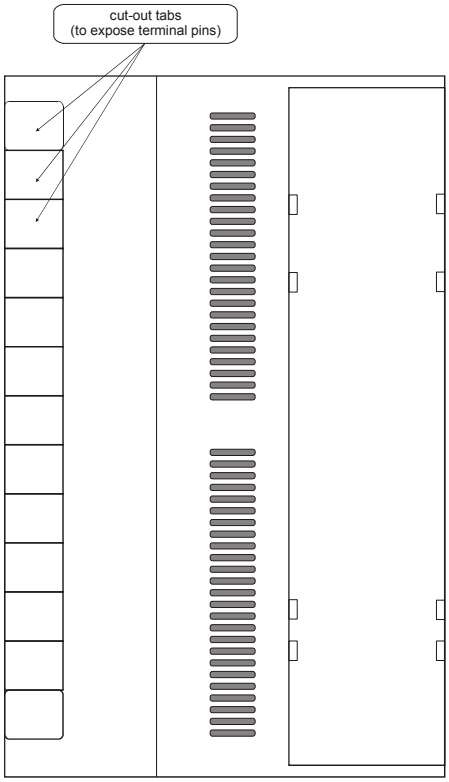
Table 10. NV's associated with the Node Object (LONMARK® object #0)

name	type	heartbeat
nviRequest	SNVT_obj_request	no
nviLuxLight	SNVT_lux	no
nviLuxSblnd	SNVT_lux	no
nviWindSpeed	SNVT_speed	yes
nvoStatus	SNVT_obj_status	yes
nvoFileDirectory	SNVT_address	n/a

DIMENSIONS







Honeywell

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