# Table of Contents

1. Introduction ............................................................................................................................. 1
2. Laboratory Environment..........................................................................................................1
3. Installed Systems and Devices ............................................................................................... 1
   3.1. Building Control and Automation Devices ........................................................... 1
      3.1.1. iLON100 e2 ......................................................................................... 2
      3.1.2. RUT-G ................................................................................................. 2
      3.1.3. REG-S8DIM ........................................................................................ 2
      3.1.4. LON4MSE 120I ................................................................................... 3
      3.1.5. SRC-FTT ............................................................................................. 3
      3.1.6. UK24LON ............................................................................................ 3
      3.1.7. LN-PRG8B-0 ....................................................................................... 3
   3.2. Environmental Systems....................................................................................... 3
      3.2.1. Lighting Fixtures.................................................................................. 3
         3.2.1.1. Wall Washer Fixtures ................................................................ 4
         3.2.1.2. Recessed Fixtures..................................................................... 4
         3.2.1.3. Ceiling Fixtures.......................................................................... 4
      3.2.2. Electronic Ballasts............................................................................... 4
      3.2.3. Window Controller and Actuator w/ Rain Sensor................................ 4
      3.2.4. Dual-Duct VAV Box............................................................................. 4
      3.2.5. Louver ................................................................................................. 4
   3.3. Sensors and Actuators ........................................................................................ 5
      3.3.1. EnOcean ............................................................................................. 5
         3.3.1.1. Dual Rocker Switch ................................................................. 5
         3.3.1.2. Single Rocker Switch................................................................. 5
         3.3.1.3. SR65 ........................................................................................ 5
         3.3.1.4. SR04PrH................................................................. 5
         3.3.1.5. SR04PST................................................................. 5
         3.3.1.6. STM250 ................................................................. 5
      3.3.2. KELE ................................................................................................... 5
         3.3.2.1. RI-4............................................................................................ 5
         3.3.2.2. RO-4 .......................................................................................... 5
         3.3.2.3. RDO-2........................................................................................ 5
         3.3.2.4. RTR-1 ........................................................................................ 5
         3.3.2.5. RTU-4 ........................................................................................ 5
         3.3.2.6. RTU-0 ........................................................................................ 5
      3.3.3. BELIMO NMVD2M.............................................................................. 5
3.3.4. BRAND? Model? Illuminance Sensor ................................................. 5
4. Network Operating Software................................................................................................... 5
  4.1. LonMaker Professional..................................................................................................... 5
5. Network Programming ............................................................................................................6
  5.1. Louver Control ................................................................................................................ 6
    5.1.1. Living Room ............................................................................................................ 8
    5.1.2. Bedroom ................................................................................................................ 9
  5.2. Lighting and Scene Control ......................................................................................... 9
    5.2.1. Living Room ........................................................................................................... 10
      5.2.1.1. Web Binding ..................................................................................................... 12
    5.2.2. Bedroom ............................................................................................................... 12
      5.2.2.1. Web Binding ..................................................................................................... 13
    5.2.3. Kitchen and Task Area ........................................................................................ 13
      5.2.3.1. Web Binding ..................................................................................................... 13
    5.2.4. Hallway ................................................................................................................ 13
      5.2.4.1. Web Binding ..................................................................................................... 14
  5.3. Window Control ........................................................................................................... 14
    5.3.1. Living Room ........................................................................................................... 14
      5.3.1.1. Web Binding ..................................................................................................... 15
      5.3.1.2. Programmable Logic .................................................................................... 15
    5.3.2. Bedroom ............................................................................................................... 15
      5.3.2.1. Web Binding ..................................................................................................... 15
      5.3.2.2. Programmable Logic .................................................................................... 15
  5.4. Temperature Control .................................................................................................... 15
    5.4.1. Living Room ........................................................................................................... 15
    5.4.2. Bedroom ................................................................................................................ 16
  5.5. Handheld Remote Control .......................................................................................... 16
  5.6. iLON100 Webserver Web Binding ............................................................................. 17
  5.7. Device Plug-Ins ............................................................................................................ 17
    5.7.1. Kele Frontier Configure ......................................................................................... 18
    5.7.2. SVEA Universal Plug-In ...................................................................................... 18
    5.7.3. SVEA LON DALI-Controller Plug-In ................................................................. 18
    5.7.4. JCI Free Programming Tool ................................................................................... 18
    5.7.5. Belimo Damper Actuator Object Configure ................................................... 18
    5.7.6. MSE – Controller RPI30009 ................................................................................. 18
    5.7.7. Echelon iLON100 AppDevice Configure ......................................................... 18
  5.8. Application Profiles ..................................................................................................... 19
    5.8.1. Thermokon ............................................................................................................ 19
List of Figures

Figure 1: Floor plan - WSEC329B ....................................................................................... 1
Figure 2: iLON100 e2...........................................................................................................2
Figure 3: REG-S8DIM DALI Gateway ................................................................................. 2
Figure 4: WSEC329B – lighting fixtures .............................................................................. 3
Figure 5: Louver – slat angle ............................................................................................... 4
Figure 6: Louver control – living room ................................................................................. 8
Figure 7: Louver control - bedroom ..................................................................................... 9
Figure 8: DALI group allocation .......................................................................................... 10
Figure 9: Lighting and scene control – living room ............................................................ 12
Figure 10: Lighting and scene control - bedroom .............................................................. 13
Figure 11: Lighting and scene control – kitchen and task area .......................................... 13
Figure 12: Lighting control - hallway .................................................................................. 14
Figure 13: Window control – living room ............................................................................ 14
Figure 14: Window control - bedroom ................................................................................ 15
Figure 15: Temperature control – living room .................................................................... 16
Figure 16: Temperature control - bedroom ........................................................................ 16
Figure 17: Handheld remote control .................................................................................. 17

List of Tables

Table 1: Variable Bindings for Louver Operation................................................................. 6
Table 2: WebServer Web Binding ..................................................................................... 17
1. **Introduction**

- organization of manual
- description of installed devices and systems
- basic description of LONMaker
- detailed description of programming
- how to design a website for web based control

2. **Laboratory Environment**

Located in Lincoln, Nebraska on UNL campus situated in Walter Scott Building on the third floor in room 329B, commonly referred to Smart Space

describe proposed zoning concept (virtual as no partitions installed)

![Floor plan - WSEC329B](image)

3. **Installed Systems and Devices**

Insert schematic of the entire BAS network

3.1. **Building Control and Automation Devices**

Include picture of automation enclosure right here
3.1.1. iLON100 e2

Figure 2: iLON100 e2

3.1.2. RUT-G

3.1.3. REG-S8DIM

Blubb

Figure 3: REG-S8DIM DALI Gateway
3.1.4. LON4MSE 120I

3.1.5. SRC-FTT

3.1.6. UK24LON

3.1.7. LN-PRG8B-0

3.2. Environmental Systems

3.2.1. Lighting Fixtures

Figure 4: WSEC329B – lighting fixtures
3.2.1.1. Wall Washer Fixtures

3.2.1.2. Recessed Fixtures

3.2.1.3. Ceiling Fixtures

3.2.2. Electronic Ballasts

3.2.3. Window Controller and Actuator w/ Rain Sensor

3.2.4. Dual-Duct VAV Box

3.2.5. Louver

   Short description of louver, such as manufacturer, louver length, louver width, slat width, perforated aluminum slats for diffuse natural lighting

![Louver Diagram]

   Length = 100%
   Slat angle = + 72° (closed)

   Length = 100%
   Slat angle = + 0° (neutral)

   Length = 100%
   Slat angle = - 72° (open)

Figure 5: Louver – slat angle
3.3. Sensors and Actuators

3.3.1. EnOcean

3.3.1.1. Dual Rocker Switch

3.3.1.2. Single Rocker Switch

3.3.1.3. SR65

3.3.1.4. SR04PrH

3.3.1.5. SR04PST

3.3.1.6. STM250

3.3.2. KELE

3.3.2.1. RI-4

3.3.2.2. RO-4

3.3.2.3. RDO-2

3.3.2.4. RTR-1

3.3.2.5. RTU-4

3.3.2.6. RTU-0

3.3.3. BELIMO NMVD2M

3.3.4. BRAND? Model? Illuminance Sensor

4. Network Operating Software

4.1. LonMaker Professional

Visio drawing, database structure (folder structure), device templates, device resource files, functional blocks, commissioning credits, lonmaker browser as generic plug-in
BASIC RULE: ONLY SNVT’S OF SAME TYPE CAN BE CONNECTED THROUGH A VARIABLE BINDING

5. Network Programming

The following chapters provide detailed information about the functionalities and sequences of operation as set up in each zone of WSEC329B by simultaneously referring to the corresponding setup/programming within the LONMaker software.

5.1. Louver Control

Two louvers are installed (living room, bedroom) and can be operated separately from each other through a variety of interfaces. Both actuators (electric tubular motors) are controlled by a single controller, which is mounted above the suspended ceiling between the larger and two smaller windows, connecting through its FTT-10A transceiver via the twisted pair bus cable (brown) with the main automation enclosure at the east entrance of the room.

The following paragraphs are written with permanent reference to illustrations shown in Figure 6 and Figure 7 on page 8 and page 9, respectively. Since the programming of both louvers exclusively differs in the configuration of network variables, Table 1 applies to the network programming displayed in chapter 5.1.1 and chapter 5.1.2.

Table 1: Variable Bindings for Louver Operation

<table>
<thead>
<tr>
<th>Binding No.</th>
<th>Functionality</th>
<th>Telegram</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>transmits up/down, open/close signal</td>
<td>SNVT_Setting</td>
</tr>
<tr>
<td>2</td>
<td>transmits up/down, open/close signal and auxiliary relevant operation</td>
<td>SNVT_Setting</td>
</tr>
<tr>
<td>3</td>
<td>transmits up/down, open/close signal; auxiliary and controller relevant operation</td>
<td>SNVT_Setting</td>
</tr>
<tr>
<td>4</td>
<td>feeds back position of louver</td>
<td>SNVT_Setting</td>
</tr>
<tr>
<td>4.1</td>
<td>feeds back position of louver</td>
<td>SNVT_Setting</td>
</tr>
</tbody>
</table>

The single rocker switch for manual operation in this setup named ‘Single Rocker Switch PTM_0’/‘Single Rocker Switch PTM_5’ has been commissioned with Thermokon’s software application for louver control (refer to chapter 5.8.1.1 on page 19) in order to conform to standardized operation prescribed by the louver’s controller (‘LON4MSE120I’) and is currently assigned to the SRC-FTT transceiver termed ‘SRC_FTT_PTM_JAL_01’. The following random sequence of operation describes a typical operation of the louver with reference to the louver’s possible settings as displayed in Figure 5 on page 4.

Given the louver is in its default position (length = 0%, slat angle = +72°), upon pressing the rocker “DOWN” for a period shorter than two seconds, binding No.1 transmits an interval telegram, causing the actuator incrementally lowering the louver for a default length with subsequently stopping it upon releasing the rocker. Furthermore, upon holding “DOWN” for a prolonged period greater than two seconds with subsequent release, forces the actuator to lower the louver to its fully extended position (length = 100%, slat angle = +72°).
During downward travel, pressing the rocker “UP” stops the louver at the current length. With the louver at its extended or intermediate position, incrementally pressing “UP” forces the actuator to rotate the slats from its closed position and toggle it through neutral into an open position (refer to Figure 5) and vice versa upon pressing “DOWN”.

When the slats have reached their maximum open angle, pressing the rocker “UP” for a period shorter than two seconds, transmits an interval telegram causing the actuator to incrementally lift the louver upwards with subsequently stopping it upon releasing the pushbutton. Identically as for continuous downward travel, pressing the rocker “UP” for a prolonged period greater than two seconds with a subsequently release, forces the actuator to lift the louver to its fully closed position (length = 100%, slat angle = -72°).

However, opposed to manual operation using the dedicated single rocker switch, the JavaClient/IntelligentAgent polls the current louver setting and writes “state” telegrams to the variables ‘nviSetting01_200’/’nviSetting01_201’ configured on the functional block of the iLON’s dedicated webserver ‘Web Server - Living Room’/’Web Server Bedroom’. The state telegram differs from the previously described operation, as it contains a set value (defined by JavaClient/IntelligentAgent) for the louver’s length (0%...100%) and slat angle (+72°...-72°), according to the users input from the Intelligent Agent. The actuator in this case corresponds to the following sequence of operation. Given the louver is in its default position as above and the webserver receives a state telegram, e.g. “SET STATE 50.0 0” forces the actuator to lower the louver until it’s length reaches 50% with subsequent opening of the slats into a neutral position. Similarly, for the case of receiving a telegram, e.g. “SET STATE 35.0 -45” causes the actuator to retract the louver until its length reaches 35% with subsequent opening the slats for an angle of -45°.

In addition, auxiliary control might also be provided through a website, which presently has not been fully configured yet. In this case, a website located in the i.LON100 would also address the variable ‘nviSetting01_200’/’nviSetting01_201’ and transmit a state telegram as previously described (refer to chapter 6.1 on page 20) depending on the adjustments through the website. During the previous procedure, the corresponding telegrams are forwarded through the i.LON’s web binding No.15 (refer to chapter 5.6 and Table 2 on page 17) onto binding No.2 (Table 1). Thus, binding No.2 now also carries the information of auxiliary louver control (refer to chapter 6.2 on page 20 and chapter 6.1 on page 20) as previously described.

The functional block ‘Controller_Louver_Living Room’ currently does not modify the telegram while forwarding it onto binding No. 3 because it is presently not configured. The functional block of a controller (refer to chapter 5.7.6 on page 18) would be typically used for more sophisticated automated functionality. One example is day lighting control accomplished by programatically controlling the amount of natural day light entering the zone as well as scene and temperature control (heating/cooling the zone by controlling amount of transmitted solar radiation). The
functional block would override any user and auxiliary dependent operation by adjusting the position and slat angle of the louver according to the specified controller program.

Binding No.3 transmits the joint control message from manual, auxiliary and controller dependent operation to the functional block of the actuator ‘Actuator_Louver_Living_Room’/’Actuator_Louver_Bedroom’. At any given time, the position and command of the louver’s length and slat angle, derived from the actuator, is fed back through binding No.4 and binding No.4.1 to the functional blocks of the controller and webserver, respectively.

Feedback as a stringent requirement, allows the auxiliary and controller dependent operation to identify the current setting of the louver and issue adjustments accordingly.

5.1.1. Living Room

Figure 6: Louver control – living room
5.1.2. Bedroom

![Diagram of Bedroom Lighting Control]

5.2. Lighting and Scene Control

A variety of three different light fixtures has been installed in the four virtual zones of WSEC329B. Almost each fixture (except wall washer units, one ballast serves two fixtures) has been equipped with a dedicated DALI enabled electronic dimmable ballast and connects through the purple DALI bus cable to the SVEA REG-S8DIM controller mounted in the main automation enclosure at the east entrance of the room. In combination with Figure 4 on page 3, the following Figure 8, obtained from SVEA’s LON DALI-Controller plug-in (refer to chapter 5.7.3 on page 18), shows the group allocation of the installed ballasts. In which a group of ballasts (differentiated by fixture type) is assigned to a functional block termed lamp actuator. The SVEA DALI gateway currently administers 15 ballasts assigned to lamp actuator object 0...7. The detailed configuration of specific properties (e.g. turn on(turn off/scene changeover delay, etc.) of a lamp actuator functional block is carried out within the SVEA Universal Plug-In (5.7.2 on page 18) whereas the LONMaker is primarily used to edit the network variable bindings of the said functional blocks.

Although the programming of the lighting and scene control in all of the virtual zones is different in regards to the utilize devices (switches) and assigned network variables (programming profile), a generalized sequence of operation is described herein and details are provided for each zone’s programming in the corresponding chapters.

A manual dual rocker switch has been assigned to each group of lamp actuators allowing the user to switch on/off and brighten/darken the corresponding set of lights. For selected lamp actuators, scene control has been implemented allowing the user to switch back and forth be-
between predefined sets of luminance levels. Identically as described in the previous chapters, a webserver functional block has been configured, allowing auxiliary control of the lamp actuator via the JavaClient/IntelligentAgent and a website.

![DALI devices](image)

**Figure 8: DALI group allocation**

The corresponding network variable output of the webserver forwards the information onto the corresponding group of lamp actuators and scene controllers. The current status of the lamp actuator is fed back onto the webserver and the functional block of a manual switch (except for hallway configuration). Generally, scene control contains predefined settings of luminance levels (0...100%) and is usually applied to all ballasts formed by a lamp actuator object. However, for the case of the ceiling fixtures installed in the virtual zones living room and bedroom of WSEC329B, recalling “SCENE1”/“SCENE2” exclusively controls illumination levels for the fixtures named ‘OCL_NE’/’OCL_SE’ and ‘OCL_NW’/’OCL_SW’, demonstrating the ability to set a single fixture to a definable luminance level independently from the remaining fixtures within the corresponding group.

### 5.2.1. Living Room

The dual rocker switch termed ‘Dual Rocker Switch PTM_0’/’Dual Rocker Switch PTM_1’ commissioned through Thermokon’s software application for lighting control (refer to chapter 5.8.1.3 on page 19) conforms to standardized operation prescribed by the DALI gateway (‘REG-
S8DIM) and is currently assigned to the SRC-FTT transceiver termed ‘SRC_FTT_PTM_BEL_02’. The underlying programming of the network is depicted in Figure 9. Both manual switches feature the on/off and brighter/darker functionality on the left rocker. In addition, the right rocker of 'Dual Rocker Switch PTM_1' has been configured for scene control (ceiling fixtures only). The following sequence of operation applies for both types of fixtures when using the manual switches.

Given that the fixtures are off, upon pushing “BRIGHTER” for a brief period, binding No.1 transmits a telegram switching ‘Lamp Actuator 2’ to full brightness level. Pushing and holding “DARKER” for a prolonged period (>500ms), binding No.1 transmits a telegram, incrementally lowering illumination in steps of 5% up to a minimum value of 0% (=OFF). Moreover, pushing and holding “BRIGHTER” for a prolonged period, gradually increases illumination up to 100%. Pushing “DARKER” at any time for a brief period (<500ms) immediately switches the fixtures off, regardless of the current illumination level. During dimming, full illumination can only be achieved by pushing “BRIGHTER” for a prolonged period.

Currently the scene control is implemented for the living room’s ceiling fixtures and applies a brightness level of 100% for separate fixtures, but can be modified between 0...100%. The procedure is explained in detail in chapter 5.8.2 on page 19. Pushing “SCENE 1” and “SCENE 2” of ‘Dual Rocker Switch PTM_1’, separately switches on (100%) lighting fixture ‘OCL_SE’ and ‘OCL_NE’, respectively. In this case, the network variable output ‘nvoSwitchAll_2’ transmits the corresponding status (logic zero or one) information, whether the top of the right rocker (“SCENE 1”) or bottom (“SCENE 2”) were pushed, onto binding No.2 in the form of a state telegram. The pure payload information of the state telegram has a length of 16 bit, whereas in the current application ‘bit2’ takes on a value of a logic one when pushing and zero upon releasing the top of the right rocker. Identically, ‘bit3’ transmits a logic one upon pushing the bottom of the right rocker and zero upon releasing it.

However, the functional block of a scene controller ‘Scene - OCL – Living Room’ dedicated for the application (derived from programming profile of SVEA’s DALI gateway) uses a different format (SNVT_scene), different from the state format (SNVT_state). Thus, ‘Type Translator 10’, as part of the array of functional blocks derived from the iLON’s application profile, has been configured to convert the information from the state telegram into the required format (SNVT_state -> SNVT_scene). Details for the programming of the type translator are provided in chapter 5.9 on page 20.

Upon pushing “SCENE 1”/”SCENE 2”, binding No.4 and subsequently binding No.7 recalls scene setting No.1/No.2 in ‘Scene - OCL - Living Room’ of ‘Lamp Actuator 1’ but more specifically, within the corresponding ballast ‘OCL_SE’ and ‘OCL_NE’. In the current setup, once a scene has been recalled, the enabled light fixture can’t be dimmed by itself. Moreover and still given the lights were turned on by selecting a scene, leaving a scene or switching the lights off, requires briefly pushing “BRIGHTER” followed by briefly pushing “DARKER”. However, in the
case the lights were initially turned on by briefly pushing “BRIGHTER” with subsequent selection of a scene, switching off the lights is accomplished by briefly pushing “DARKER”.

Furthermore, for the case the lighting fixtures were switched on but subsequently dimmed, recalling a scene is carried out as previously explained. At this point should the individual decide to return to his previous setting, pushing a) “BRIGHTER” for a brief period (<500ms) or b) “DARKER” for a prolonged period (>500ms but shorter than <1000ms), recalls the previous dim level, but if c) “DARKER” is pushed for a brief period (<500ms), the lights turn off.

Similarly as in previous control sequences, a webserver ‘Web Server – Living Room’ allows for remote control through a website and the JavaClient/IntelligentAgent. Thus binding No.1 transmits a switch telegram (SNVT_switch) onto ‘nviSwitch01_200’ in which the information is forwarded onto ‘nvoLALampVal_200’.

![Figure 9: Lighting and scene control – living room](image)

5.2.1.1. **Web Binding**

| Insert table |

5.2.2. **Bedroom**
5.2.2.1. Web Binding

Insert table

5.2.3. Kitchen and Task Area

Description and explanation of variable bindings

5.2.3.1. Web Binding

Insert table

5.2.4. Hallway

Description and explanation of variable bindings
5.2.4.1. Web Binding

Insert table

5.3. Window Control

5.3.1. Living Room

Description and explanation of variable bindings

Figure 13: Window control – living room
5.3.1.1. Web Binding

Insert table

5.3.1.2. Programmable Logic

Insert corresponding part of control logic

5.3.2. Bedroom

Description and explanation of variable bindings

5.3.2.1. Web Binding

The binding of the corresponding network variables of the web server is displayed in Table 2.

5.3.2.2. Programmable Logic

Insert corresponding part of control logic

5.4. Temperature Control

Presently, basic and direct temperature control functionality has been implemented using the wall mounted thermostat in the living room, only. Refer to chapter 7.2 - 7.4 for further guidance on expanding the capabilities.

5.4.1. Living Room

Description and explanation of variable bindings
5.4.2. Bedroom

Description and explanation of variable bindings

Figure 15: Temperature control – living room

5.5. Handheld Remote Control

Independent of zoning concept as presently employed for feedback of JAVA client description and explanation of variable bindings

Figure 16: Temperature control - bedroom
5.6. **iLON100 Webserver Web Binding**

Explain the procedures and purpose of connecting nvi’s to nvo’s on a webserver functional block through the iLon’s web interface.

**Table 2: WebServer Web Binding**

<table>
<thead>
<tr>
<th>Binding No.</th>
<th>Source Data Points</th>
<th>Destination Data Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ILON100/NVL/dynamic/NVL_nviMF11_200</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoMF11_200</td>
</tr>
<tr>
<td>2</td>
<td>ILON100/NVL/dynamic/NVL_nviMF15_201</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoMF15_201</td>
</tr>
<tr>
<td>3</td>
<td>ILON100/NVL/dynamic/NVL_nvHVACTemp_201</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoHVACTemp_201</td>
</tr>
<tr>
<td>4</td>
<td>ILON100/NVL/dynamic/NVL_nviLALampVal_202</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoLALampVal_202</td>
</tr>
<tr>
<td>5</td>
<td>ILON100/NVL/dynamic/NVL_nviLALampVal_203</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoLALampVal_203</td>
</tr>
<tr>
<td>6</td>
<td>ILON100/NVL/dynamic/NVL_nvMultiOut1_200</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoMultiOut1_200</td>
</tr>
<tr>
<td>7</td>
<td>ILON100/NVL/dynamic/NVL_nvMultiOut1_201</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoMultiOut1_201</td>
</tr>
<tr>
<td>8</td>
<td>ILON100/NVL/dynamic/NVL_nvMultiOut_200</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoFP14_200</td>
</tr>
<tr>
<td>9</td>
<td>ILON100/NVL/dynamic/NVL_nvMultiOut_201</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoFP14_201</td>
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<tr>
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<td>ILON100/NVL/dynamic/NVL_nvSCScene1_200</td>
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</tr>
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<td>19</td>
<td>ILON100/NVL/dynamic/NVL_nvSwitch01_202</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoLALampVal_202</td>
</tr>
<tr>
<td>20</td>
<td>ILON100/NVL/dynamic/NVL_nvSwitch02_200</td>
<td>Turnaround/ILON100/NVL/dynamic/NVL_nvoLALampVal_200</td>
</tr>
</tbody>
</table>

5.7. **Device Plug-Ins**

In addition to the configuration process of interconnecting different devices on the network by connecting their nvi’s and nvo’s between the corresponding functional blocks, most manufacturers provide device and application specific plug-ins, allowing specialized configuration of the intended tasks e.g. define latency times for lighting and scene control, configuration of schedules and modulating control.

In most cases, the LonMaker’s internal generic plug-in (LonMaker Browser) is able to access the said configuration properties in its entirety, whereas for some applications, certain func-
tions are exclusively unlocked by the visual interface of the manufacturer specific plug-in, which in addition eases navigation and provides a larger overview.

5.7.1. Kele Frontier Configure

How to access?
Information provided?
Modifications allowed?

5.7.2. SVEA Universal Plug-In

How to access?
Information provided?
Modifications allowed?

5.7.3. SVEA LON DALI-Controller Plug-In

How to access?
Information provided?
Modifications allowed?

5.7.4. JCI Free Programming Tool

How to access?
Information provided?
Modifications allowed?

5.7.5. Belimo Damper Actuator Object Configure

How to access?
Information provided?
Modifications allowed?

5.7.6. MSE – Controller RPI30009

How to access?
Information provided?
Modifications allowed?

5.7.7. Echelon iLON100 AppDevice Configure

How to access?
Information provided?
Modifications allowed?
5.8. Application Profiles

5.8.1. Thermokon

How to access?
Information provided?
Modifications allowed?

5.8.1.1. Thermokon SRC_FTT_JAL_01

include a description/table of commissioned switches and their assignment to the application profile, e.g. switch named ‘xxx_PTM_0′ in which PTM_0 refers to the first switch, etc.
NeuronID: 049817A70100

5.8.1.2. Thermokon SRC_FTT_8SR_03

include a description/table of commissioned switches and their assignment to the application profile, e.g. switch named ‘xxx_PTM_0′ in which PTM_0 refers to the first switch, etc.
NeuronID: 04E7C0970100

5.8.1.3. Thermokon SRC_FTT_BEL_02

include a description/table of commissioned switches and their assignment to the application profile, e.g. switch named ‘xxx_PTM_0′ in which PTM_0 refers to the first switch, etc.
NeuronID: 04BA4D190100

5.8.2. SVEA - Application 232LC03C

emphasize on using Plug-In for setting up independent (fixture by fixture) scene control together with configuring the functional block scene controller for setting up scenes, also emphasize on requirement resetting scene controller by sending unconfigured/unknown scene number (refer to chapter 8.3) for proper operation

ALSO: NUMBER OF SCENE CONTROLLER HAS TO CORRESPOND TO THE LAMP ACTUATOR OBJECT TO BE CONFIGURED FOR SCENE CONTROL (e.g. DaliScene[1] -> LampActuator[1])
5.8.3. KELE - 20NVI20NVO

5.8.4. WAREMA - Application 14412080a

5.8.5. JCI - Application PRG8B231

5.8.6. BELIMO - UK24LON V3.2

5.8.7. Echelon - iLON100FTT V12

5.9. Type Translator

List/tables and description of type translators and referenced rules used throughout the network

6. Web Based Control

how to design a website for monitoring and control (chapter 6.1 WebGen, page 20)

6.1. WebGen

6.2. Web based Auxiliary (JavaClient/IntelligentAgent) Control

Include a short description of the JavaClient/IntelligentAgent

7. Future Improvements and Additions

7.1. General Occupancy

Describe what to do in order to use the information from the cricket localization system to tell the zone status to the LON network, namely by adding input variables (nvi) to the corresponding webserver and use that information in the free programmable controller for higher function control

7.2. Occupied Zone Temperature Control

Description and explanation of variable bindings
7.3. Web based and Auxiliary (JavaClient/IntelligentAgent) Temperature Control

The following strategy allows the JavaClient/IntelligentAgent to determine the temperature setpoint in the current zone as obtained through questioning the user for comfort. Therefore, three network variables have to be added to the corresponding webserver (e.g. living room):

- ‘nviOcc_Unocc’ – configured as SNVT switch in which logic zero corresponds to zone unoccupied and logic one as occupied
- ‘nviEna_Dis’ – configured as SNVT switch in which logic one corresponds to the JavaClient/IntelligentAgent determining the current zones temperature setpoint and logic zero corresponds to the current zones temperature setpoint being defined through the installed thermostat
- ‘nviTempSP’ – configured as SNVT temp and incorporates the increase (+2°F) or decrease the (-2°F) current zones temperature setpoint based on the feedback from the user adjusted from the currently set temperature on the thermostat

7.4. Natural Ventilation Temperature Control

Description and explanation of variable bindings

7.5. Expanded Lighting and Scene Control

Description and explanation of variable bindings, most likely depends on additional purchase of a new DALI controller (SVEA) allowing to configure each single ballast as a single group but in turn requires more switches and thus SRC-FTT receiver, vast amount of additional switches will be confusing and may not be feasible for present application

8. Troubleshooting and Maintenance

During the installation and commissioning of the window controls numerous faults and errors occurred, whereas one specific fault occurs on a recurring basis. The following section is dedicated to identify this fault and to provide a troubleshooting sequence to solve or workaround the problem.

8.1. Window Control

Problem reported:
The windows do not open upon pushing the corresponding pushbutton.

Symptoms:
An inspection of the dedicated output transceivers “RO-4” (windows living room) and “RDO-2” (windows bedroom) indicates proper power supply through a red LED and green LED being constantly illuminated, respectively. Thus an error in the power supply for these nodes can be excluded.

Furthermore, upon removing power from the nodes and actual motor control blocks and subsequent restoring power supply, the corresponding window motors confirm operation through closing the window until reaching their manufacturer specific end positions. Therefore, an error through a faulty control module or motor is also excluded.

As a necessary and driving condition, a rain sensor maintains, given occurrence of sufficient mist collection on the actual sensor field, all of the windows shut by overriding any command from the corresponding pushbuttons. Hence, questioning the datapoint “RI-4 NVO_8” within the LONMaker drawing through opening the item using the LONMaker browser for the signal ‘0.0 0’, must indicate the absence of rain. Note, with rain being present or sufficient mist collecting on the sensor field this telegram takes on a value of ‘0.0 1’ and thus maintaining the closing relays “RO-4 DO_2”, “RO-4 DO_4” and “RDO-2 DO_2” enabled. With the absence of the previous condition, a fault through the rain sensor can be excluded.

**Diagnosis:**

Throughout the installation, commissioning and operation periods a single error occurred on a recurring basis, identifying the telegram/signal transmission between the KELE “RUT-G” gateway and its subordinate output points “RO-4” and “RDO-2” as insufficient and unstable. This phenomenon, currently unexplained, will be referred as the gateway loosing the configuration of its radio frequency (RF) output nodes.

Note, each RF node contains a RF transmitter ID, in the current case the “RO-4” module is labeled as 0102 whereas the “RDO-2” module transmits its status under 0101. Both of them report to the presently installed gateway with the specific facility code 0612. Also, the web interface of the KELE gateway (http://129.93.11.214) reports these values under “Gateway Manager” which are the true and accurate values opposed to the configuration provided by the Kele Frontier Plug-In within the LONMaker drawing, showing faulty and non-corresponding configuration values for the corresponding data points ‘NVI[0]’, ‘NVI[1]’, ‘NVI[2]’, ‘NVI[3]’, ‘NVI[4]’ and ‘NVI[5]’.

**Solution:**

The problem has been resolved by resetting the “RUT-G” gateway using the Kele Frontier Plug-In with subsequently removing and reapplying power to the gateway using the internal toggle switch (bottom of the gateway).

**Suggestion:**
Although the following step has been applied prior resetting and power interruption/restoration of the “RUT-G” gateway, it was not documented as part of this troubleshooting process, whereas it could not be clearly identified as the causing error, however it will be included as an optional preceding sequence towards the solution.

Since the configuration properties shown within the Kele Frontier Plug-In for each RF node and datapoint are quite different and "non-related" to the actual and true configuration properties as shown in the web interface, it is suggested to transfer the Transmitter address (0102, 0101) and Point ID (1,2; 1,2,3,4) and repeat the configuration of the “RUT-G” gateway using the Kele Frontier Plug-In under the “NVI” tab, accordingly. The process is finished by applying the changes through pressing the ‘Apply’ button and subsequently downloading the configuration into the gateway by pressing the ‘DownLoad’ button.

Again, presently unexplained, the configuration process is now repeated using the web interface of the “RUT-G” gateway for the corresponding RF nodes (RO-4, RDO-2) and their associated datapoints by correcting the Transmitter address and Point ID.

8.2. Lighting Control

Problem reported:

Upon accessing the ‘SVEA LON DALI – Controller Plug-In’, an error message displaying ‘DALI communication failure!’ appears on a repetitive basis.

Diagnosis:

The error message occurs in general, upon starting the plug-in, but also upon exclusive selection of the following ballasts from the remaining list of DALI devices: OCL_CE, OCL_NW.

In addition, the plug-in reports “Please check if there are any double devices.” For the case of the ‘OCL_NW’ ballast, probably referring to identical devices connected on the bus, which meaning is presently not clear. Thus, the error might relate to a group or a single ballast malfunctioning in regards to the transmission and/or reception of signal telegrams.

Solution:

Does not affect functionality, therefore discard.

8.3. Lighting Scene Control

Initial situation

The following example assesses the limitations and merits for the exemplary setup of three OCL lighting fixtures installed in the bedroom. All three fixtures are assigned to the functional block ‘Lamp Actuator 0’ and thus are switched and/or dimmed in a synchronous fashion as
group 0, accordingly. This represents the traditional case, where the group is controlled through a
push button switch.

However, using the functional block of a scene controller enhances the traditional option. Hence, in a traditional configuration, all ballasts in a group are set to a specified light level, corresponding to a specified scene number (1...16). On the contrary, each ballast may be controlled independently from the remaining amount of actuators formed by a single group.

**Configuration**

The utilized switch in this example ‘SRC_FTT_PTM_BEL_02_PTM3’ (Dual Rocker Switch PTM_3) is currently assigned to a profile termed ‘SRC_FTT_PTM_BEL_02’ and thereby configured for the following function:

- **Left rocker:** top - on, bottom - off; both with incremental dimming in steps of 5%
- **Right rocker:** top - Scene 1, bottom - Scene 2.

Thus by pressing the right rocker to the top or bottom, forces the switch to transmit the command ‘SC_RECALL 1’ or ‘SC_RECALL 2’, respectively. The functional block ‘Scene - OCL - bedroom’ is presently configured (“learn”) for receiving the command of Scene 1, therefore switching the ballast termed ‘OCL_SW’ within Group 0 (Lamp Actuator 0) to 100% aside from the other two ballasts (OCL_CW, OCL_NW) remaining at 0%.

**Observation and test sequence**

**Case 0:** individual enters the room; lights are off; now the individual decides to switch on the lights by pressing the top of the left rocker

**Result:** all lighting fixtures are enabled (on)

**Case 1:** individual decision based on the previous case to switch to Scene 1 by pressing the top of the right rocker

**Result:** no change

**Conclusion:** Since the last command the scene controller has received was Scene 1 (‘SC_RECALL 1’), a repeated telegram for Scene 1 is obviously ignored.

**Solution:** If last telegram the scene controller received would have been Scene 2, thus showing ‘SC_RECALL 2’ a new telegram containing ‘SC_RECALL 1’ would obviously resemble a true update and thus recall the scene setting for Scene 1.
Case 1a: upon the individual taking notice of the non occurrence of an action, the individual is forced to press the bottom of the right rocker, thus recalling Scene 2 forcing the scene controller to change from ‘SC_RECALL 1’ to ‘SC_RECALL 2’ with subsequent pressing the top of the right rocker and again forcing the scene controller to ‘SC_RECALL 1’.

Result: Scene 2 is enabled but hasn’t been configured yet, therefore no change in the light level occurs, but subsequently Scene 1 is recalled according to the specifications in the chapter of configuration.

Conclusion: Not acceptable, jumping forward and backward between scenes in order to recall a single scene setting, based on the assumption that the individual may not recall his/her last setting, is very inconvenient.

Case 1b: based on case 1a, the individual decides to return to full brightness of all three fixtures by pressing the top of the left rocker

Result: no change

Conclusion: no clue

Solution: The individual has to press the bottom of the left rocker in order to switch on all three fixtures.

Conclusion: Although the individual wants to return to full brightness and seen from a logical standpoint presses rightfully the ‘On’ button is required to press the ‘Off’ button, which is not logical and therefore confusing thus not acceptable also, even by doing so, ‘Lamp Actuator 0’ returns 95% of the intended 100% as pressing the ‘Off’ button is interpreted as dimming command.

Case 2: based on case 1b, the individual decides to return to Scene 1, by pressing the top of the right rocker

Result: no change

Conclusion: Case 1a applies.

Solution: Case 1a applies.

Case 3: based on case 2, the individual decides to leave the room and wants to switch of the lights by pressing the bottom of the left rocker

Result: all lights are off
Conclusion: Acceptable.

Case 4: based on case 3, individual returns and chooses Scene 1
Result: no change

Conclusion: Case 1a applies.

Solution: Select Scene 2 followed by selecting Scene 1.

Case 5: based on case 4, individual decides to enable the entire group by switching the top of the left rocker
Result: all lights are enabled

Conclusion: Acceptable.

Case 6: based on case 5, individual decides to dim the lights to a favorable light level by pressing the bottom of the left rocker
Result: synchronous dimming of all fixtures

Conclusion: Acceptable.

Case 7: based on case 6, individual decides to return to Scene 1, by pressing the top of the right rocker
Result: no change

Conclusion: Scene 1 was selected initially in case 4 and thus case 1a applies.

Conclusion
In the present configuration of the switches and scene controller, actual scene control is not always logical and resembles an inconvenient learning phase for the individual. Therefore, the present configuration of the scene control has been undone!

Initial situation
The present setup is identical with the initial situation described at the beginning of this document, however, this time, the following sequence investigates uniform scene control for each ballast assigned to ‘Lamp Actuator 0’.

Configuration
As specified in the analog configuration chapter, with the difference that the functional block ‘Scene - OCL - bedroom’ is presently configured ("learn") for receiving the command of Scene 1, therefore switching the ballast termed ‘OCL_SW’, ‘OCL_CW’ and ‘OCL_NW’ within Group 0 (Lamp Actuator 0) to 10%.

**Observation and test sequence (identical cases as previous)**

Case 0: individual enters the room; lights are off; now the individual decides to switch on the lights by pressing the top of the left rocker

Result: all lighting fixtures are enabled (on)

Case 1: individual decides based on the previous case to switch to Scene 1 by pressing the top of the right rocker.

Result: no change

Conclusion: Since the last command the scene controller has received was Scene 1 ("SC_RECALL 1"), a repeated telegram for Scene 1 is obviously ignored.

Solution: If last telegram the scene controller received would have been Scene 2, thus showing ‘SC_RECALL 2’ a new telegram containing ‘SC_RECALL 1’ would obviously resemble a true update and thus recall the scene setting for Scene 1.

Case 1a: upon the individual taking notice of the non occurrence of an action, the individual is forced to press the bottom of the right rocker, thus recalling Scene 2 forcing the scene controller to change from ‘SC_RECALL 1’ to ‘SC_RECALL 2’ with subsequent pressing the top of the right rocker and again forcing the scene controller to ‘SC_RECALL 1’

Result: scene 2 is enabled but hasn’t been configured yet, therefore no change in the light level occurs, but subsequently Scene 1 is recalled according to the specifications in the chapter of configuration

Conclusion: Not acceptable, jumping forward and backward between scenes in order to recall a single scene setting, based on the assumption that the individual may not recall his/her last setting, is very inconvenient

Case 1b: based on case 1a, the individual decides to return to full brightness of all three fixtures by pressing the top of the left rocker

Result: no change
Conclusion: ‘Lamp Actuator 0’ at 10% identically to the feedback input at the switch.

Solution: The individual has to press the top of the left rocker (long) in order to switch on all three fixtures to full brightness.

Conclusion: since the left rocker is configured for dimming, a short push of the rocker is still interpreted as dimming command (raises to 15%), given that the feedback at the switch takes on a value less than 100%

Case 2: based on case 1b, the individual decides to return to Scene 1, by pressing the top of the right rocker
Result: no change

Conclusion: Case 1a applies.

Solution: Case 1a applies

Case 3: based on case 2, the individual decides to leave the room and wants to switch off the lights by pressing the bottom of the left rocker
Result: all lights are off

Conclusion: Acceptable.

Case 4: based on case 3, individual returns and chooses Scene 1
Result: no change

Conclusion: Case 1a applies.

Solution: Select Scene 2 followed by selecting Scene 1.

Case 5: based on case 4, individual decides to enable the entire group by switching the top of the left rocker
Result: case 1b applies

Conclusion: Not acceptable.

Case 6: based on case 5, individual decides to dim the lights to a favorable light level by pressing the bottom of the left rocker
Result: synchronous dimming of all fixtures

Conclusion: Acceptable.

Case 7: based on case 6, individual decides to return to Scene 1, by pressing the top of the right rocker

Result: no change

Conclusion: Scene 1 was selected initially in case 4 and thus case 1a applies.

Conclusion

Identical yet different compared to the conclusions drawn in the previous setup of the test sequence, scene control for an entire group is not logical and induces further inconvenience.

Suggestion

Applying to both test sequences, the problem of jumping back and forth between scenes might be solved, by telling the scene controller some sort of neutral state immediately after selecting a scene, thus the scene controller would recall the specified light level within the selected ballasts of a group, perform the action and return to a neutral state without performing an action, yet interpreting the repetition of a scene command as an update rather than ignoring it. This would essentially allow the individual to select a scene, followed by custom adjustment of the lights (on/off; brighter/darker) and return to the same or different scene setting.

Suggestion Add-On

The neutral state may be achieved by sending the scene controller a non specified/configured scene number upon the individual manually adjusting the brightness level by pressing the top or bottom of the left rocker, thus updating the scene controller to any value besides 0 (preferably 17) forces the scene controller to interpret a repeated command of a identical scene as an update with the intermediate adjustment of the brightness level by the individual.

8.4. Sensor Maintenance

Rain sensor needs to be wiped clean 1x month
Batteries of Kele temperature sensors need to be replace 1x year

9. References and Contacts

Contact information of vendors
Refer to programmer of auxiliary JAVA client
10. **Inventory**
   
   Include a table of the existing non installed inventory of devices stored in cabinets in WSEC330

11. **Glossary**
   
   Insert excel table located in folder “tables”

12. **List of Appendices**

12.1. **Appendix A**
   
   Insert TOC

12.2. **Appendix B**
   
   Insert TOC

12.3. **Appendix C**
   
   Insert TOC