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## Medium User Interface v2 MUI v2 Display

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# Introduction to MUI v.2 display

## Introduction



**Figure 1 : Medium User Interface v.2**

The Medium User Interface Version 2(MUI) v.2) display is a remote network display unit for the FX16 Master Controller series.

It's designed for the end user, the operator or the maintenance people who needs a straightforward way to monitor and adjust controller points. In fact its application allows Monitoring, Alarm signaling and Commissioning of the connected FX device.

Information are presented in a textual format on 4x20 LCD backlit display. The display also provides immediate notifications for predefined situations as Home Page View, Alarms Active and parameters Edit Mode through its front panel status LEDs.

The display can be used as a portable, hand-held unit, or permanently mounted in a panel or on the wall.

MUI V.2 device is a fully configurable user interface. It is a slave display, in fact loads its application directly from the FX controller, it is connected to.

The display application is built, at design time, using the FX-Builder Tool package.

This Medium User Interface unit represents the right compromise between dimension, visualisation capabilities and cost effectiveness.

## Key Concepts

### MUI v.2 Display



Figure 2 : MUI Display v.2

#### Features

The Medium User Interface v.2 unit:

- ❑ Fully configurable user interface composed by a 4x20 LCD backlight display, 10 status LEDs, 6 buttons with system and customisable functionalities and 1 buzzer embedded.
- ❑ Manages Password Access with up to 8 configurable users with different configurable privileges providing protection against unauthorised users.
- ❑ Allows Menu Access providing easy / intuitive operation – select from a list of tags to monitor and control the system.
- ❑ Allows to customise button tasks enabling users to create short-cuts to the most used pages or parameters or to set their preferred Alarm Acknowledge Command which may be either a button or a combination of them.
- ❑ Provides notifications in case of Active Alarms, Home Page View and Editing Mode through its ten dedicated front panel LEDs.
- ❑ Allows immediate notification, through its Event Summary page and dedicated LED indicator, in the case an Event (Alarm or System Event) condition is verified.
- ❑ Maintains an Event Summary of up to 20 points currently in alarm states both active or not acknowledged.
- ❑ Maintains an Event History of the latest 10, active and no more active, triggered Alarms.
- ❑ Allows tracing the Trend of up to 16 points, for monitoring purpose.
- ❑ Allows the possibility to customize the display look and feel through the FX-Tools II software package.

### ***Theory of Operation***

The MUI V.2 display can be connected to the FX16 Master Controller through its dedicated Display Bus.

The Medium User Interface is a slave network display unit and loads its configuration directly from the FX controller it is connected to allowing easy access to all of the system functions available at the user's password level.

A MUI V.2 unit is operated through a keypad and menu system to provide access to data stored locally on the display, as the Event History, and to parameters of the connected FX controller.

### ***Display Configuration***

The MUI V.2 Display look and feel can be customised as required for different applications.

The display application is built, at design time, using the appropriate Plug-In, that FX-Builder Tool package offers.

While defining a configuration the User can:

- ❑ create and customise visualisation pages;
- ❑ add references of the pages on the access Menu;
- ❑ customise keypad button tasks to be used as short-cut to pages or to Acknowledge alarms.
- ❑ map controller parameters describing them by point names, point units and digital (binary) state names;
- ❑ indicate whether a specific point can be commanded (adjusted or overridden) by the end User describing also the edit range;
- ❑ add Alarms by defining their messages, triggering conditions, priority levels, password protection levels and deciding if an Acknowledge is required to reset the alarm condition;

The display configuration will be stored in the FX controller. When the User connect MUI V.2 Display to a controller, the FX unit will upload its own configuration (i.e. User Interface Application) to the display unit.

Both FX controller application and MUI V.2 Display configuration are defined using software configuration Tools being part of the FX-Builder tool . The configurations are then downloaded to the FX controller unit through its network communication interface, either N2Open or LON.

## Chapter2

# Installation

## *Introduction*

The FX16 Master Controller can be connected to up to 2 remote MUI V.2 displays with the possibility to display / edit all the data point and information of the running application. The display application is fully configurable at design time.

The configuration is **LOCAL**, i.e. panel mount (up to 3 mt) or **REMOTE**, i.e. wall mount (up to 1 km).

The FX16 can support 1 panel mount display + 1 wall mount display or 2 wall mount ones. For the panel mount connection use the pre-cabled connection kit (LP-KIT007-000C), 3 mt long, with a phone jack on the MUI V.2 side and a pre-assembled screw connector on the FX16 side.

This chapter describes how to:

- ❑ mount the MUI V.2 Display on a wall
- ❑ mount the MUI V.2 Display in a panel
- ❑ cable it as a permanently mounted device

## Key Concepts

### Considering Unit Dimensions

Figure 3 shows the overall dimensions of MUI v.2 Display. For panel cut-out dimensions or wall bracket drill hole spacing, see Detailed Procedures in this chapter.

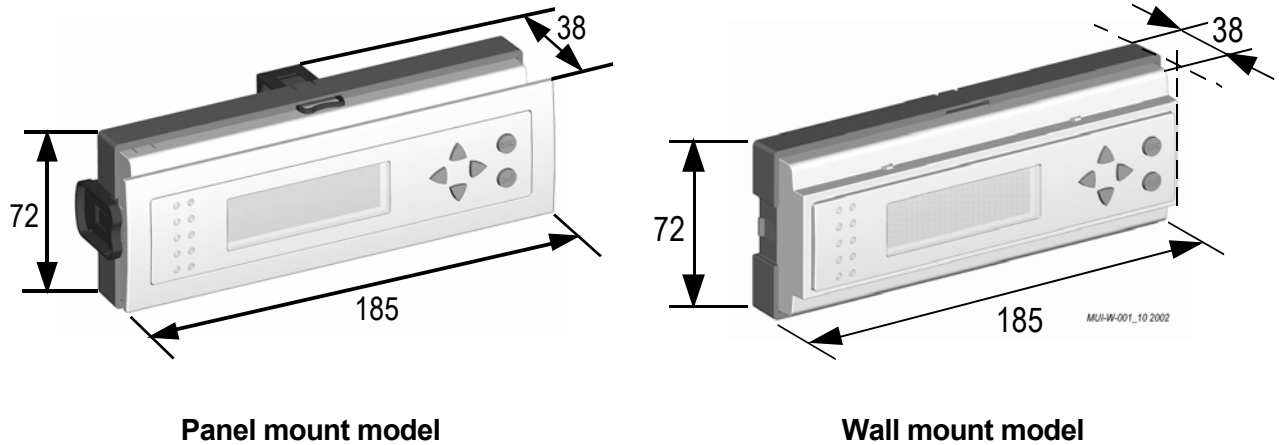


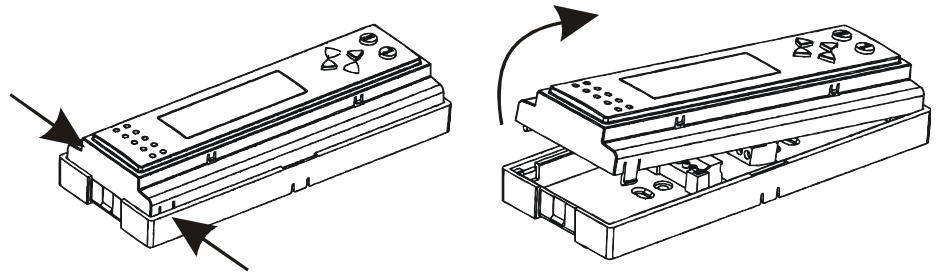
Figure 3 : MUI V.2 dimensions

## Detailed Procedure

### Mounting MUI V.2 display on a wall

The MUI V.2 wall mount version comes with a specific ordering code (LP-DIS60P11-0C). This version is isolated and can be connected up to 1 km from the controller. It has to be independently powered. The power supply that the MUI V.2 accepts is universal: 12 ÷ 24 VAC, 9 ÷ 48 VDC, 200 mA.

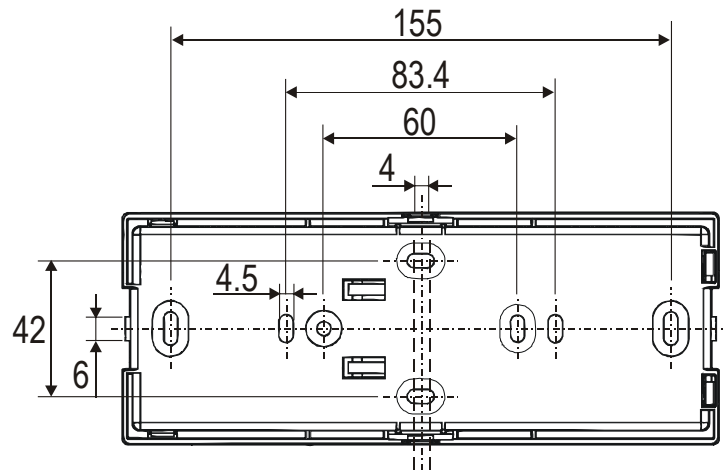
1. To open the display, press the two lateral indentation (indicated by the arrows) and pull.



MUI-W-002\_10 2002

**Figure 4 : open the MUI V.2 display**

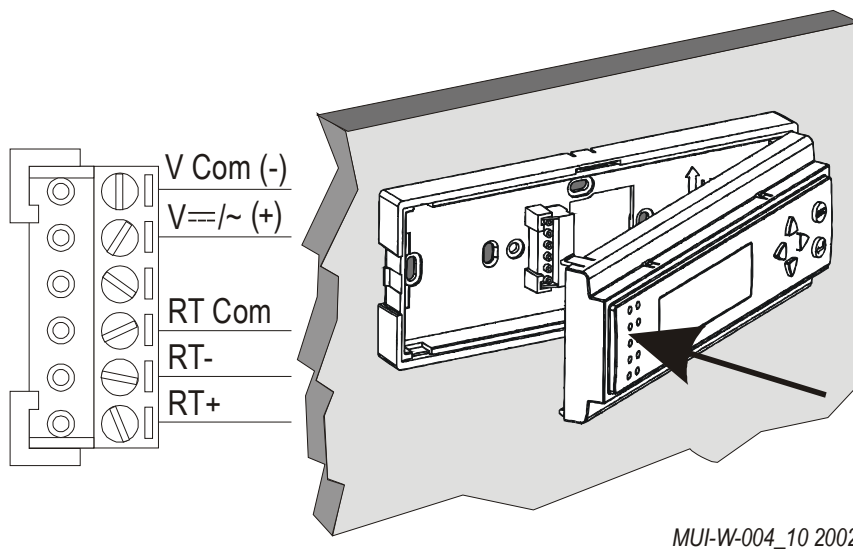
2. Drill appropriate holes for the wall-mounting base using the dimensions shown in the picture below.



MUI-W-003\_10 2002

**Figure 5 : MUI V.2 wall mount dimensions**

3. Reposition the display on top of the base aligning the two right end side. Make sure the male pins of the terminal block are aligned with the female connector on the base. Close the display pushing down the left side as indicated by the arrow. Connect the serial cable and power supply to the terminal block.



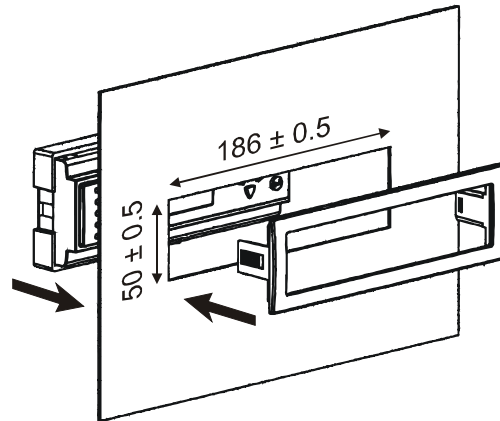
MUI-W-004\_10 2002

**Figure 6 : Pins Details**

## Mounting MUI V.2 display in a panel

The panel mounting kit is supplied as a standard equipment by ordering the MUI V.2 panel mount version (LP-DIS60P10-0C). This version is not isolated and can be mounted to a panel or cabinet door at max 3 mt from the controller and directly powered by it.

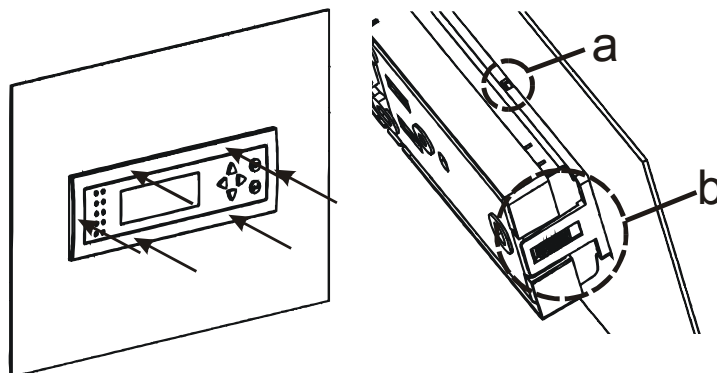
1. Use the cut-out dimensions and insert the display and the frame as shown.



MUI-P-002\_10 2002

**Figure 7 : MUI V.2 panel mount cut-out dimension**

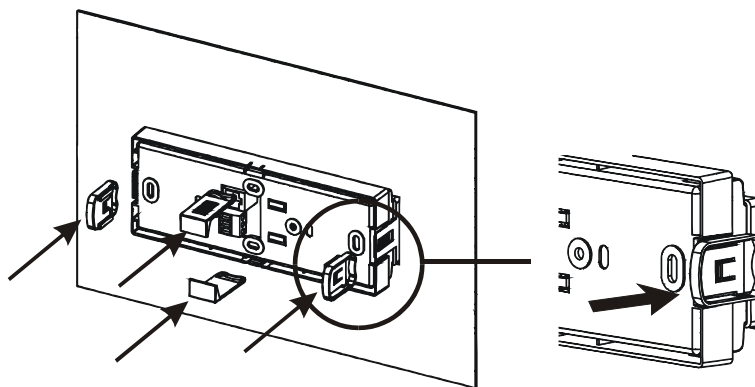
2. Holding firmly the display from the back of the panel, press down firmly the frame (until you hear a “clack”) in the 6 points indicated by the arrows.



MUI-P-003\_10 2002

**Figure 8 : hold MUI V.2 display in a panel**

3. Holding firmly the frame from the front of the panel insert the locking clips as indicated.



MUI-P-004\_10 2002

**Figure 9 : Hold the MUI V.2 frame in a panel**

To assure IP54 protection make sure that:

- ❑ Cut-out dimensions are respected within tolerances
- ❑ The panel surface is clean and plane

From the rear of the panel, connect the serial cable between the MUI V.2 display and the controller unit.

## Connecting the MUI V.2 to the FX16 Master Controller

The FX16 Master Controller can support up to 2 MUI V.2 displays at the same time.

The configuration is again panel mount (up to 3 mt) or wall mount (up to 1 km), the FX16 can support 1 panel mount display + 1 wall mount display or 2 wall mount ones (see Fig. 8 and 9). For the panel mount connection use the pre-cabled connection kit (LP-KIT007-000C), 3 mt long, with a phone jack on the MUI V.2 side and a pre-assembled screw connector on the FX15 side.

MUI-007\_20040210

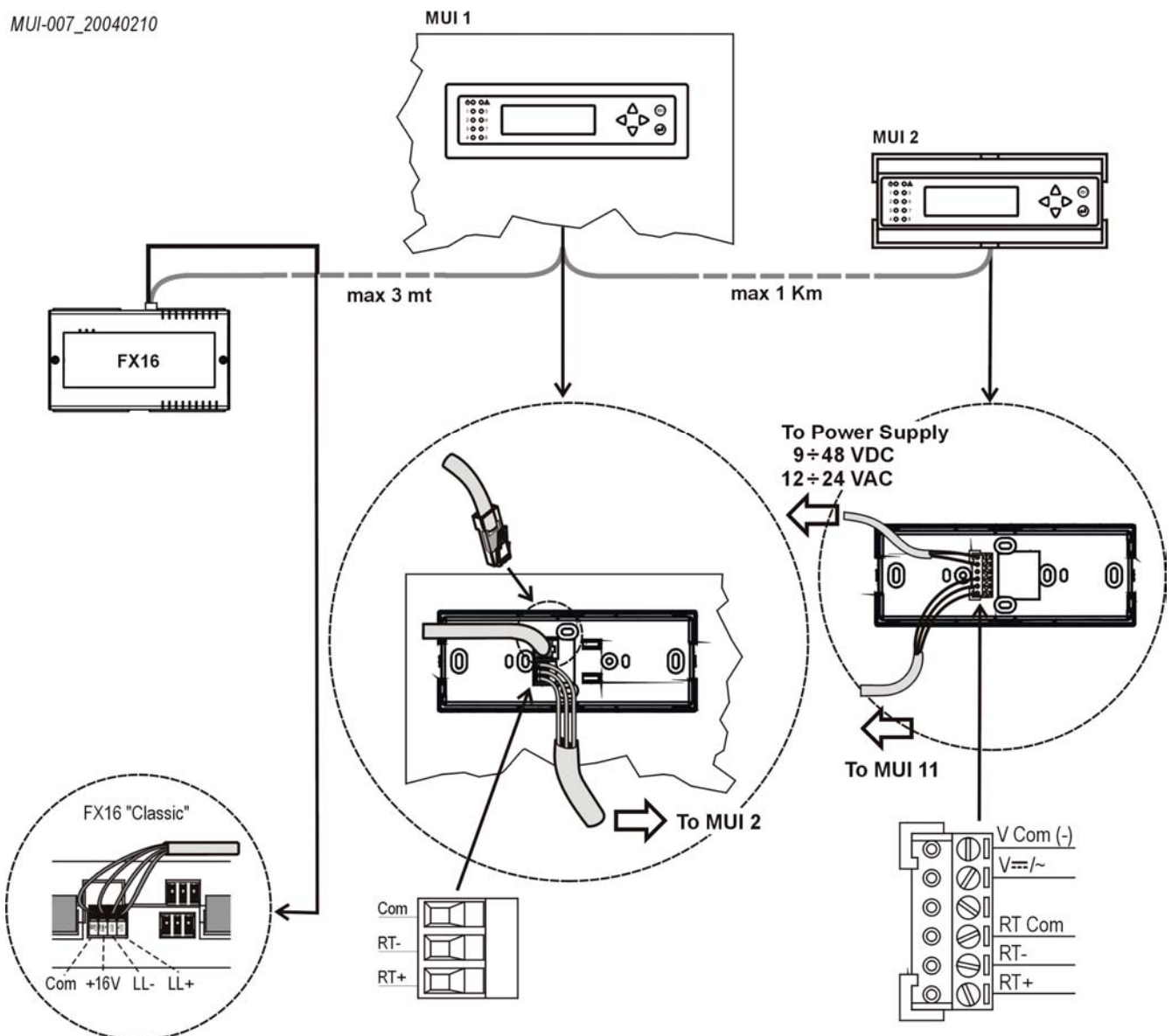


Figure 10 : Local + remote installation

MUI-008\_10 2002

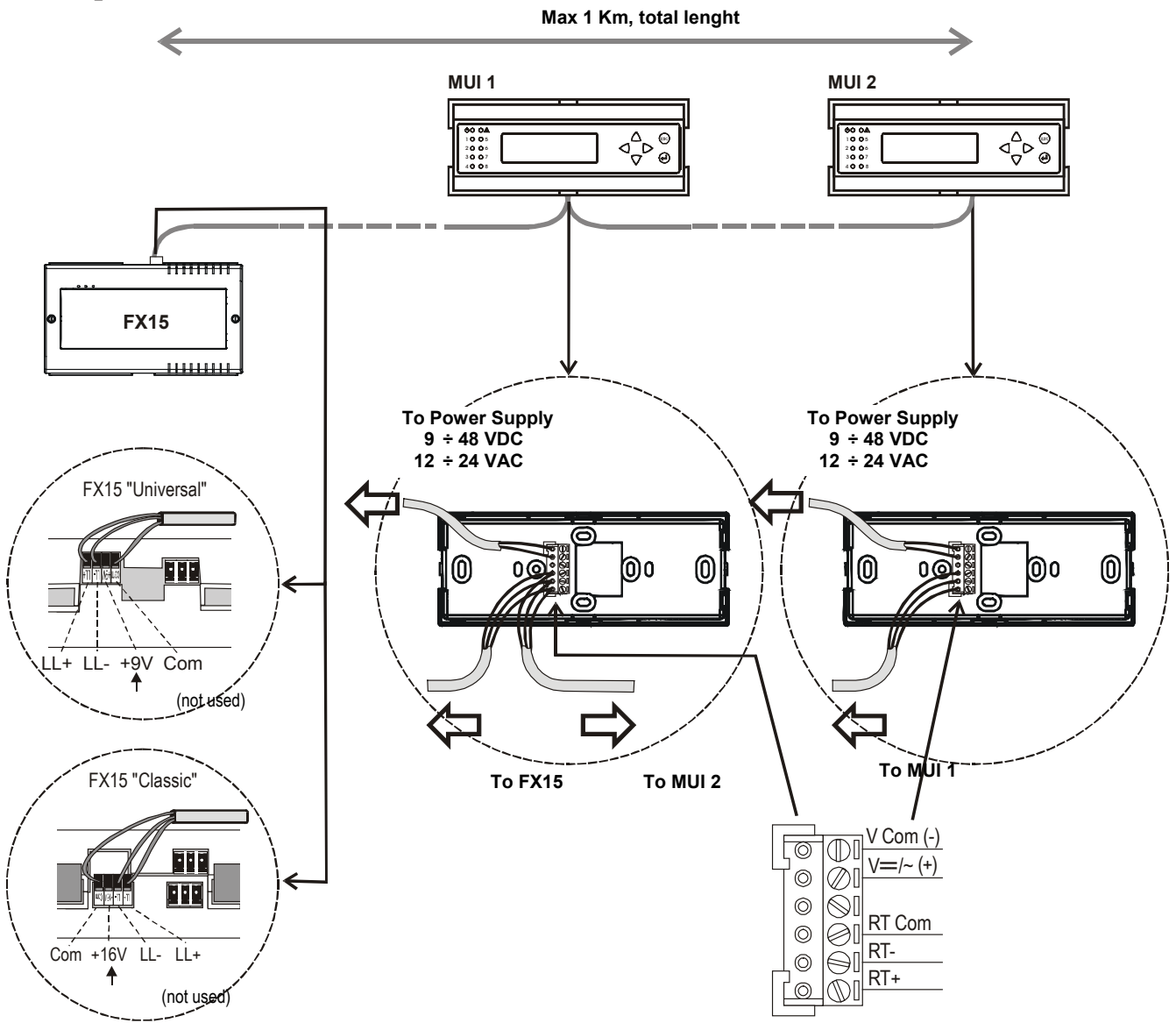


Figure 11 : Two Wall mount installations

# Operation

## ***Introduction***

The MUI V.2 Display is operated through a simple keypad and menu system interface that provides easy, intuitive access to the data and parameters stored in the FX16 controller. It provides password protection for those functions that could change data in the FX controller such as adjusting/overriding Application point values, editing setpoint parameters, history/trend data visualisation, etc. This section describes how to:

- ❑ establish communication with an FX16 controller
- ❑ display the Home Page
- ❑ navigate the Menu
- ❑ enter a password
- ❑ view Application & System points
- ❑ adjust configuration parameters
- ❑ view Event summary
- ❑ view Event history
- ❑ view Trend data
- ❑ resource Editing options

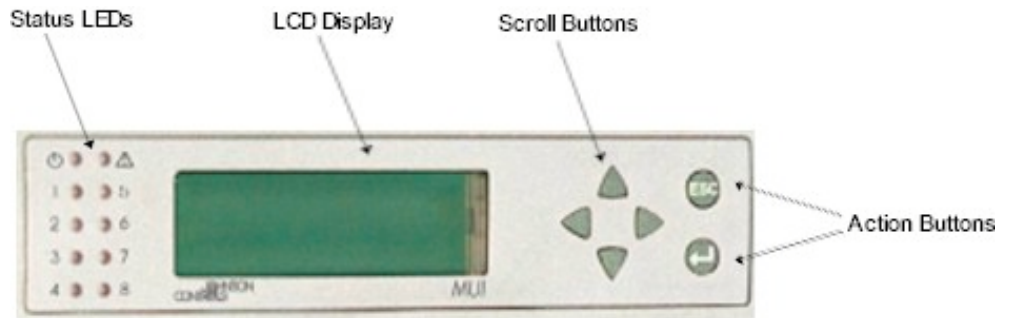
## ***Key Concepts***

- ❑ Page navigation : Display, keypad, home page, menu page;
- ❑ Password
- ❑ Data points
- ❑ Event Notification
- ❑ Trend Visualisation;
- ❑ Resource Configuration : Modem, SMS, e-mail, Web).

## Detailed Procedures

### Page Navigation



The MUI V.2 front panel is composed by a 4x20 Backlit Display with 10 Status Light-Emitting Diodes (LED) and 6 operation buttons.



**Figure 12 : Front Panel**







### Status LEDs







The Status LEDs are used to indicate important, predefined application states as reported in the following table.

<i>Name</i>	<i>Symbol</i>	<i>Description</i>
Power Supply LED		The signaling LED indicate the Power Supply status. It's ON when the device is properly connected to the power supply and properly power up.
Alarm Active		It blinks in the case an Alarm condition is present. It is steady ON when no Alarm conditions are active but at least an Alarm Acknowledgement is still required. The OFF condition indicates that there are not Alarm conditions actually active in the system and the required Acknowledgements have been given by the user.
Status LED	1..8	These LEDs indicate operating parameters status. They are completely configurable from the FX-Builder tool package.

**Table 1 - Status LEDs**

### Keypad

The operation buttons      and  have specific functions that are independent from the display application loaded and are related to the status of the page visualised.

<i>Name</i>	<i>Symbol</i>	<i>Description</i>
Left/Right	 	Move between menu items, visualization pages.
Up/Down	 	Move between menu items, visualization pages and allow to change values of parameter if in Edit mode.
Escape		Toggle between Welcome Page and Main Menu, leave or abort a menu/submenu or adjust/command procedure.
Enter		Confirm an action, for example, when choosing a menu option or commanding/adjusting a value.




**Table 2 - Keys**


Each button or combination can be also customised by the user in order to get shortcuts to the most common used pages or to perform system tasks as the Alarm Acknowledgement. These customising actions can be performed via FX-Builder as well as configure buttons to perform auto-repeat on pressure for faster navigation.

### Home Page

The Home Page automatically appears as the default screen when the MUI V.2 Display gets connected to an FX16 Controller and downloads its User Interface Configuration. The download operation can take few time, a scrolling bar will inform about the download percentage.

Each display configuration can have a different Home Page. The Home Page is customisable and can contain System Info-points (i.e. Hour, Minute, Day, Month and Year), Text Tags, Preference system points (i.e. Unit of Measurement) as well as data points from the FX controller the MUI V.2 is connected to.

In case that more points have been mapped on the Home Page, as the MUI V.2 is able to show only four point per page view (maximun 16 points displayed), the points can be scrolled through the  and  buttons and selected by the  key.

The Home Page can be used to contain the most important parameters of the connected FX and it's directly linked to the menu page by pressing the  key.

For all the parameters is possible to define the tag and the value, allowing parameter identification. If no tag is defined for the parameter, its value is directly shown on the screen.



Figure 13 : FX Builder "Home Page"

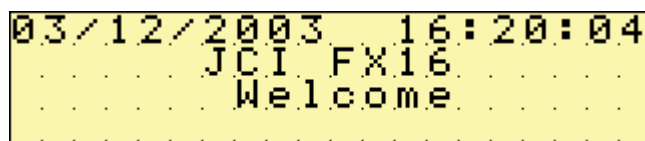


Figure 14 : Home Page visualised on the MUI V.2

 key allows to enter in the Menu page.

### Menu Page

The Menu Page is accessible, if present, from the home page by pressing the **ESC** key. If the **ESC** key is pushed while navigating the Menu and/or when page timeout expires, the menu is closed and the MUI V.2 will go back to the Home page visualization.

The Menu Page is fully configurable via the FX-builder and may also be omitted. In the Menu Page only the Menu Links are displayed, if no menu links have been defined the access operation to this page is not executed.

The Menu Links represents the list of all available user shortcuts to the pages, it's displayed in circular mode.

Each Menu Item links different System Pages, as the Event Summary, the Event History and the Password Management pages or Group of Pages customized by the user containing the application information.

Each Link has the possibility to be restricted at different levels of user password. In case the user have not the required privilege to access a linked page, its Menu Item will be hidden and the access denied.

The Item will be shown only once the user access level is the right one or greater.

As a configurable component the Menu Page can be customized by Application Engineers to fit customer needs. Following is shown an example of Menu Page containing Menu Links line with five links: Values, System, Events, Contacts and Password. Refer to Programming chapter for details on configuring the Menu Page.

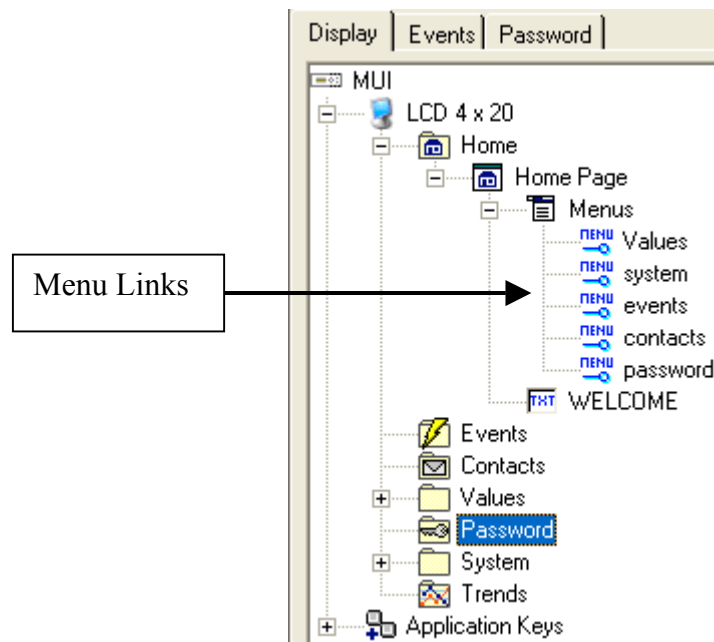
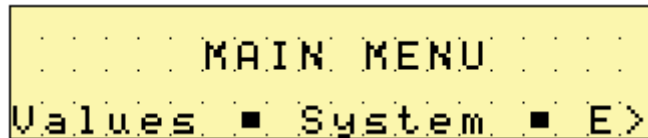











Figure 15 : FX Builder “Menu links”









**Figure 16 : Menu page visualised on the MUI V.2**


The navigation button      and  have specific functions that are independent from the display application loaded and are related to the status of the page visualised.

 and  buttons allow scrolling among the horizontal tag menus in IDLE mode, while  buttons visualise the cursor and enter ACTIVE mode.

Once entered a page the possible actions are the following:

- , ,  and  button to move the cursor among the parameter values configured.
-  button to enter the page associated to the tag, set the parameter in EDIT mode.
-  goes back to the page previously loaded in IDLE mode.

In case the page has been configured to directly contain a value, being both logic or numeric, it can be represented either in Active or Edit modes. All the parameters shown in Edit mode are marked by the blinking cursor.

- In case the page is in Active mode, the value is initially represented as read-only then, by pressing the  button the page will enter in the Edit mode allowing the user to adjust the value.

If a page is directly shown in Edit mode the user is immediately allowed to adjust the represented value.

## Password

The MUI v.2 Display implements a password system, definable via FX- Builder tool, to access a group of pages, to edit and view Application data points, to acknowledge events and key or multiple-key association. To access a page or modify a parameter password protected the user must log-in with a password at the same or higher level than the one required.

By default, the FX builder introduces a link to the Password page in the Main Menu structure identified by the “Password” tag text. This page has to be set with the lowest user access priority level.

In case the user have not the required privilege to access a linked page or parameter, this link will be hidden and the access denied. The link will be shown once the user is logged with the correct access level or with another of greater priority.

If an user modify a password from the 2<sup>nd</sup> remote display connected to the same controller, this action will be notified the 1<sup>st</sup> display with the following message : “Pwd Updated by Net”.

Three fixed password levels are defined:

The **Level 3** user has the maximum priority and allows to access pages or parameters protected by any other password of the system.

The **Level 2** user can access pages or parameters protected by password of Level 2 and Level 1.

The **Level 1** user can only access pages or parameters protected by password of Level 1.

An additional level is defined as **Level 0** and means that password is not required.

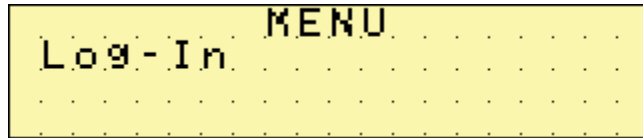
The passwords are up to 4 digit numbers, where each digit can be any sequence of numeric characters (0-9). Their values are defined through the FX-builder tool during the User Interface design process and stored in the display configuration.

Through the MUI V.2 front panel the user is allowed to enter and, if configured, to modify a Password value. These action are permitted through the “Log-In ” Page and “User Account” pages.

### **Password Management Page**

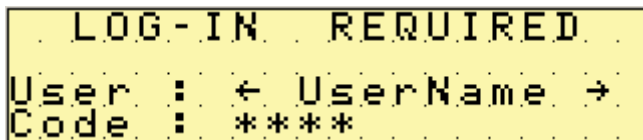
The Password Management page of the MUI V.2 Display allows the Users to Log-In with different privileges. If configured, this page can be accessible both through the Main Menu or via button shortcuts.

The default page is:





**Figure 17 : Password Page**

Log-In required page allows the user to log-in:




**Figure 18 : Log-In page**

Scroll  and  to select the proper user name and then enter the code. The blinking cursor will be automatically positioned on the first digit to edit with a zero default value.

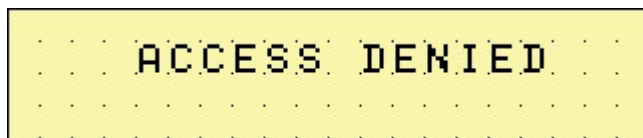
Pressing the  key on Log-In option, will start the entering session of the selected field.

The four digits password has to be entered one digit per time, hiding the other. Once a value is set and confirmed the MUI V.2 will allow the User to edit the next one.

Once the correct value for the editable digit is set, the user can confirm its value by pressing the  key. At this point the second digit becomes editable, with the same logic, insert the third / fourth digit adjustment.

When the last digit is confirmed by the User, if the Password is correct, the MUI V.2 shows the page requested.

In the case the entered Password results not valid, the Access Denied message will be displayed and any previously set User Access Level is Logged-Out.

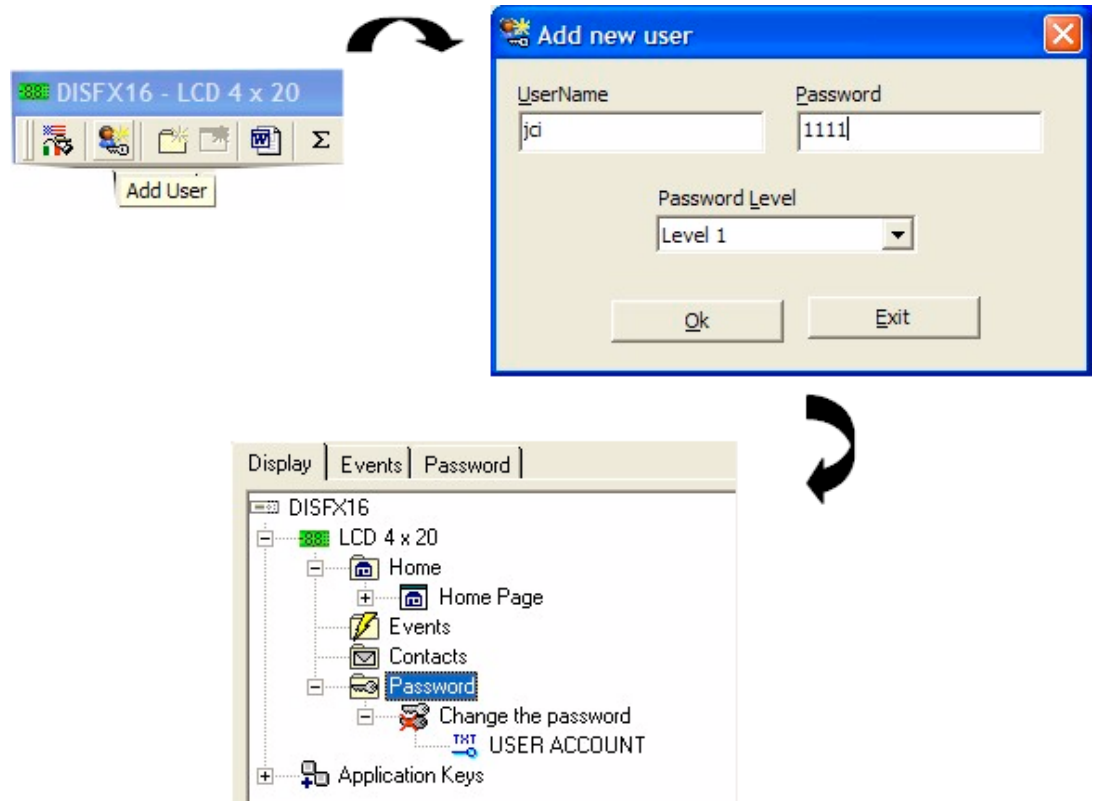


**Figure 19 : Access Denied**

Once the user has logged-in , the Home page will be newly displayed; at that moment, depending on the user privileges, the appropriate menu links will be hidden or visible.

### User Account page

The MUI V.2 Display, if properly configured through the FX Builder tool, allows users to change the password directly from the user interface unit without needs to modify the application.



**Figure 20 : FX Builder “Change the Password” Page**

In order to modify passwords, the user has to add this feature during the user interface development by mapping the “Change the Password” page on the menu, or Key, or Multiple Key. If this page is present in the configuration it has to be set with the lowest user access level available.



**Figure 21 : FX-Builder “Change the Password” Shortcut**

Once configured, pressing specific function key will allow the visualisation of “User Account” page.

This page contains the list of the configured password user (up to max 8) tags identified by this format :

USER_ID	Code (Cripted)	PASSWORD LEVEL
UsrName1	****	1
UsrName2	****	1
UsrName3	****	2
UsrName4	****	3

**Figure 22 : User Account Page, User Tag Level 1..3**

The User Access Level list is navigable through the ▲ and ▼ buttons. Once the MUI V.2 Display shows the desired user access level tag, the user can, by pressing the ↵ button, access the password entry session.

**IMPORTANT :** The user has to previously log-in with equal or greater privileges in order to change the password of a specific protection level otherwise when trying to access the desired level the “User Account” page will automatically close.

The password changing procedure is composed by two main steps (password entries):

- ❑ Define the new password for the selected protection level;
- ❑ Confirm the defined password value.

Once the user have selected the desired access level where it would change the password, the first digit adjust page, will be shown in order to enter the first digit of the new password value. For detailed information on how to enter a password please refer to the chapter above on this document.

During the new password entry the following symbols appears in the digits positions and have particular meanings:

- ❑ “0”, zero means the related digit is in edit mode, by pressing UP and DOWN buttons, the user can adjust its value in the range [0-9].

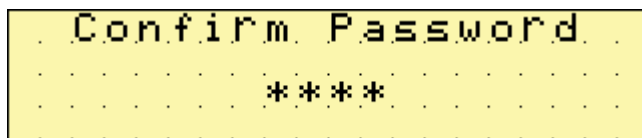
USER	ACCOUNT
JCI	0**** 1
MAINT	**** 2
USER	**** 3

**Figure 23 : JCI password editing**

When the fourth, last, digit is confirmed by the user, it will be required to enter again the password as a confirmation of the new value to be set.

With the same logic, during the confirmation entry the following symbols appears in the digits positions and have particular meanings:

- “0”, zero means the related digit is in edit mode, by pressing UP and DOWN buttons, the user can adjust its value in the range [0-9].



**Figure 24 : Confirm Password**

Once the correct value for the editable digit is set, the user can confirm its value by pressing the ENTER button. At this point the second digit becomes editable and following screen will be shown.

When the fourth, last digit is confirmed by pressing the Enter button, two different behaviours can be observed depending on the result of the changing password procedure :

- If the procedure has not been completed successfully, due to an error while entering the password digits in the way that the first password entered is not equal to the one required for confirmation, the Access Denied page (see Figure 19 : Access Denied) will appear on the screen. The Escape command, via dedicated button, is required to return to the normal operation condition.
- In the case the procedure succeed, the User Account page will appear, now the modification has been take effect.

### **Log-Off**

The user logged in can choose to log off in order to leave the restricted pages under password protection when he/she has finished operating on the display.

There are 2 ways to log off:

1. the user selects “Log-Off” in the Password Page;
2. the user press a specific key combination defined, at design time, as the log-off shortcut;

In any case, as a safe feature, after 15 minute of inactivity, the password will automatically expire and the “User Logged-OFF” message will be displayed; this message disappear automatically after 5 seconds or after key pressing.

## Data Points

The MUI V.2 Display can map the application data points for monitoring, adjusting or overriding purposes.

The display configuration is defined during the application development phase through the FX-Builder tool.

These points represent variables (i.e. Network Variable Inputs, Network Variable Outputs and Object Available References), working parameters and set-points (i.e. Configuration Parameters) defined for the specific application. Data Points can represent both Numeric and Logic values.

For each Data Point a tag can be specified allowing parameter identification (as shown in figure )




Setpoints	
Meat Room	xxx.x°C
Fish Room	xxx.x°C
Veg. Room	xxx.x°C
Dairy Room	xxx.x°C
Dry Prov.	xxx.x°C

**Figure 25 : Data Point Page**

All the structured variables and configuration parameters can be mapped to the display application through their fields.







Depending on the source of the point represented, the access is allowed in Read/Write mode as per the NVIs and the CPs or in Read-Only mode as in the case of NVOs and Object Available References. Write enabled points need to define the Edit Range in order to limit their adjustment range.

To adjust or override an Application point:

1. Go to the Application Point screens as described in the previous section.
2. Use  and  keys to page to the Application Point screen showing the Application point the User wants to change.
3. Press the  key to confirm your selection and enter into the ACTIVE mode. A blinking cursor will highlight on the moves from the point's description to its value.



**Figure 26 : Cursor Highlighted Value**

4. Use  and  keys to change the value. For numeric values,  increases the value and  decreases the value. For digital points, either key steps the value through its possible states.
5. Press the  key to confirm the new value, or press the  key at any time to abort the procedure. The cursor highlight returns to the Application point's description.

## System Points

In addition to Application Data Points which are substantially variables and parameters interacting with the control application, the MUI V.2 Display has the possibility to map points which directly interact with the Operative System (Real-Time Clock information, Unit of Measure, Language type, Date format).


A normal visualisation page can contain both Application & System points or System Parameters (Date/Time, Language, Unit of Measure), and depending on the configuration, these pages can have 3 possible states:

- ❑ **IDLE** state : only information scrolling operation is allowed;
- ❑ **ACTIVE** state : the user can scroll among the editable parameters displayed (cursor visible);
- ❑ **EDIT** state : editing operation is allowed (the cursor is not displayed).

## Event Notification

As soon as an alarm condition is reached, the “Event Notification” page will automatically pop-up, displaying the specific Event Message code.

This pop-up page shows only the message related to the first triggered Alarm.

By pressing the  key on the Event Notification page the Event will be considered “viewed”, the previously displayed page will be shown again.

The MUI V.2 display provides an “Events” page. That can collect every events (Alarms Logic, Alarm logic with Acknowledgement, System Event) sorted by priority.

The default page has this format :

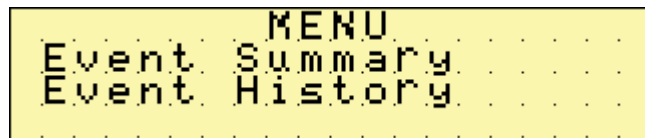


Figure 27 : Events Page

### Events Summary

The event with the highest priority is displayed on the top of the list. The System events (except the “Power Up” event visible only on the “Event History” page) are shown only once, all the system event logged will be erased after the page is closed and stored in the Event History page. The maximum depth is 20 Events collectable, system events included.

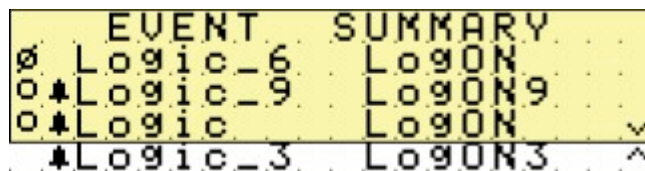


Figure 28 : Event Summary Page




<i>Symbol</i>	<i>Description</i>
	Bell displayed means ACTIVE event
	Event requires acknowledgement by user
	Event already acknowledged


Table 3 : Events symbol details

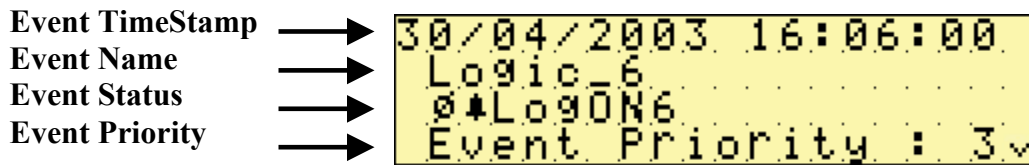
The events collected are the ones still Active or not yet Acknowledged. It's possible, via FX-Builder tool, to configure the Alarm Status LED on the MUI V.2 display in order to provide a visual Alarm status information.

These are 3 possible configuration:


- The Alarm Status LED blinks in the case the Alarm shown is Active and requires an Acknowledge.
- The Alarm Status LED is presented as steady On if the current Alarm is Active but it does not require an Acknowledge or it has already been Acknowledged.
- Its Off status indicates that the Alarm shown is no more Active but it has not yet been Acknowledged.

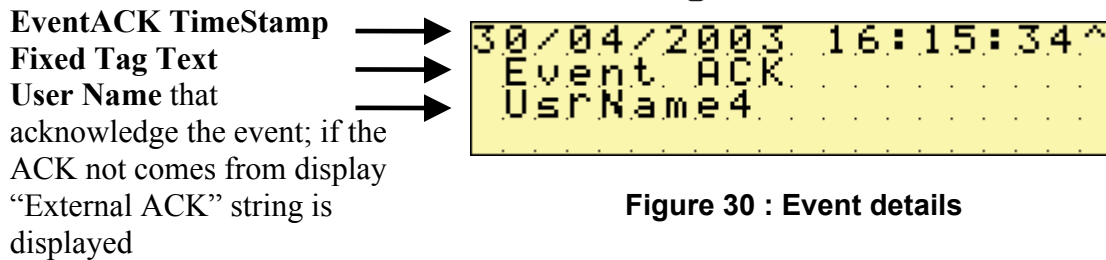
An event will be removed from the list when the alarm will be no higher active and the alarm has been acknowledged (if necessary). The maximum alarm list depth is **20** simultaneous events.

The events collected can be visualised in details by pressing the  key, as shown in figure :



**Figure 29 : Event details**

Scrolling down with the  button :

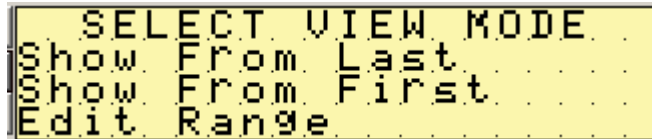


**Figure 30 : Event details**

### Event History

The MUI V.2 Display can map the “Event History” page. This page archives all the events triggered within the controlled system with monitoring purposes only, in fact user actions as the Alarm Acknowledge are not allowed on this page. The maximum depth of this page is **20**.

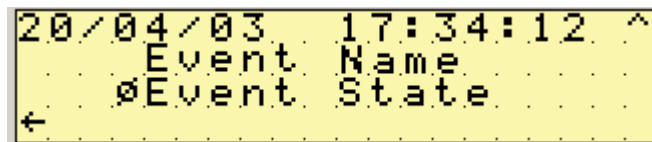
When the page is selected a view mode list appears, allowing the user to filter the event information, using :




**Figure 31 : View mode page**

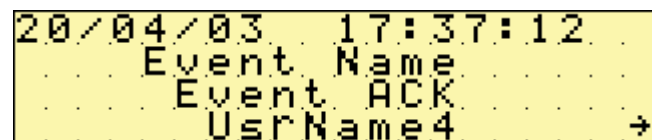
- Show from Last option;
- Show from First option;
- Edit Range option;

An Event is displayed as shown in figure:



**Figure 32 : Event History details**

The “Event History” page reports information about the event timestamp, the event name, the status and if it has been acknowledged, who made this action. Pressing the  key, additional information can be displayed :



**Figure 33 : Event History more details**

- Acknowledge TimeStamp;
- Event Name;
- Fixed Tag Text;
- User Name that ACK the event; if the event has been acknowledge from the network, an “External ACK” string is displayed, instead of the username.

Once an alarm is detected, its message will be reported also in the History view.

The entire Event History Log is stored in E2PROM for back-up purposes at each power failure and restored at next power-up.

## Trend

The MUI v.2 Display, if properly configured, can show the data trended by the connected FX16.

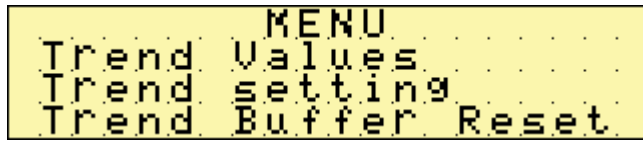


Figure 34 : Trend page

### Trend Values page

The “Trend Values” page allows the user to visualise the Application Points configured, under trend in the connected FX16.

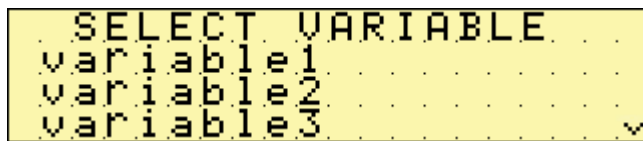


Figure 35 : Trend Values page

Pressing and keys allow to scroll the trended variable and key allows to select the view mode list:

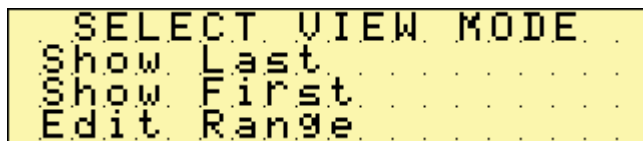


Figure 36 : View Mode page

The trend page has the following format:

- Logic variable (TimeStamp, Variable Status)

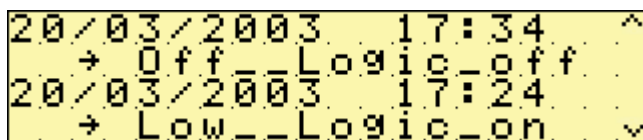


Figure 37 : Logic variable Trend page

- Floating variable (TimeStamp, Variable Value)

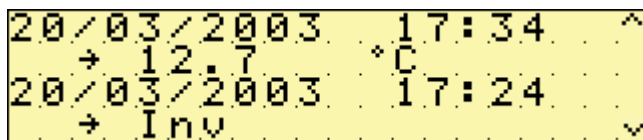
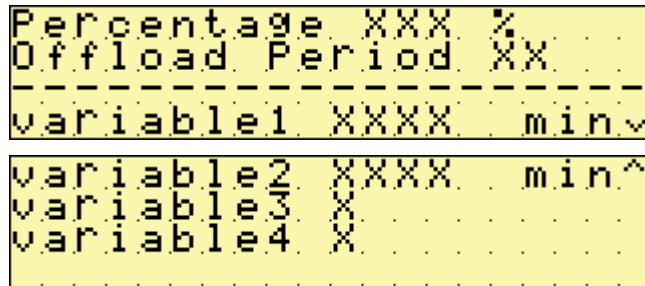


Figure 38 : Floating variable Trend Page

key allows to go back to the Trend page.

### Trend Setting page

The “Trend Setting” page allows the User to set trend configuration parameters.



**Figure 39 : Trend Setting Page**

- *Percentage* : this is the buffer limit percentage. If the “BufferFull Notification” option is enable in the FX16 application, reaching this value, the FX16 controller will automatically send a notice to the user that the trend memory is close to saturation. The range goes from 1 to 100%.
- *OffLoad Period* : if the “Periodic OffLoad Notification” option is enabled in the FX16 application, at the expiry of this period the controller will send an e-mail with the trended data to the defined user(s). The range goes from 0 to 24 hours, where 0 means disabled.
- *Variable 1..2* : Numeric and floating point Application points can be trended establishing a *Sample Period*. The default value is 10 min and the range goes from 0 to 1440 min, where 0 means disable.
- *Variable 3..4* : Logic Application points can be trended upon a *Log Value Change*. Each time a logic variable changes its status, it will be logged using a sample default period equal to 1 minute. This Log Value Change can assume 2 values : 0 means trend disable, 1 trend enable.

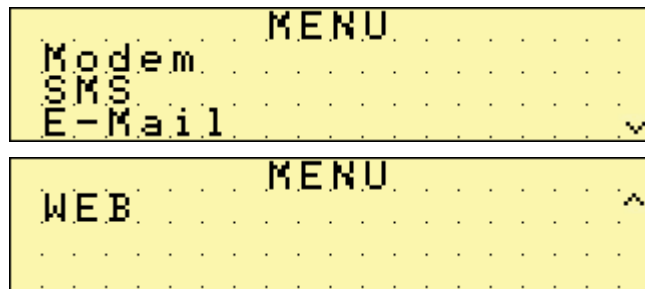
### Trend Buffer Reset

This option allows to reset the Trend buffer in order to clear memory space allotted for Trend purpose.

**IMPORTANT : It's strictly recommended to protect with password, the Trend page in order to avoid possible mistake clicking on Trend Buffer Reset option.**

## Contacts

The MUI V.2 display provides also a “Resources Configuration” page that summaries the FX16 controller available resources:





**Figure 40 : Contacts**

The FX16 Master Controller can be connected to a modem (GSM or standard) for email and SMS messages (only GSM) sending.

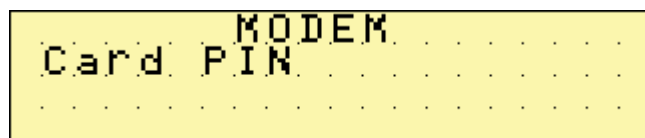
It features an embedded web server that allows the remote user, running Internet Explorer, to dial in and establish a point to point communication with the FX16 and browse the web pages containing information about the running application.

Through the “Resources Configuration” page, configuration parameters as mail address, phone numbers, ISP parameters, etc... can be set.


Scroll down the menu using the  and  buttons in order to display all the resources.

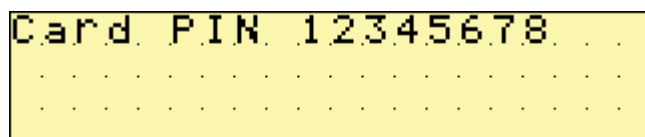
### **Modem page**

Through the modem page the user can modify the GSM modem PIN number of the used SIM.



**Figure 41 : Modem Page**

To edit that value press  key.



**Figure 42 : Edit SIM Card PIN**

### SMS page

Through the MUI V.2 it's also possible to visualise the SMS configuration page.

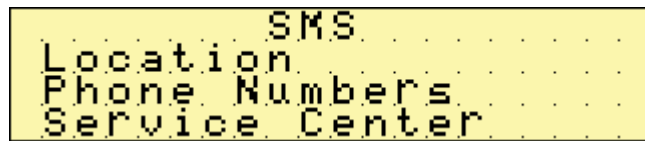



Figure 43 : SMS page

These are the options available:

- *Location option* : allows the user to modify the location used for the SMS text report. The location is fully editable, pressing the  key and using the scrolling keys.

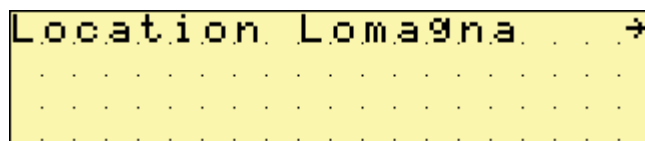



Figure 44 : Edit SMS Location

- *Phone Numbers page* : these are the GSM phone numbers the SMS messages are going to be sent to. The page allows the user to edit the contact list previously created at design time. The page is fully editable pressing  key and using the scrolling key.

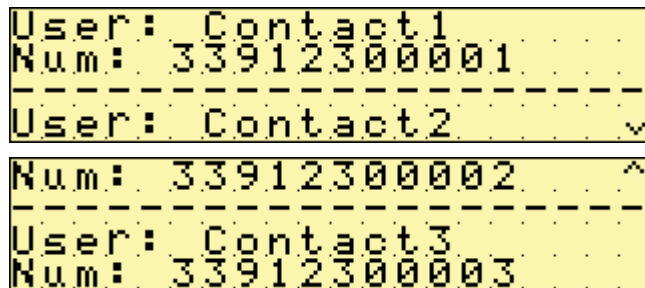



Figure 45 : Edit Contacts list

- *Service Center option* : allows the user to view and edit the Service Center needed to send SMS messages. This number is automatically read from the SIM card used in the GSM Modem and usually there is non need to edit it. The option is fully editable pressing  key and using the scrolling key.

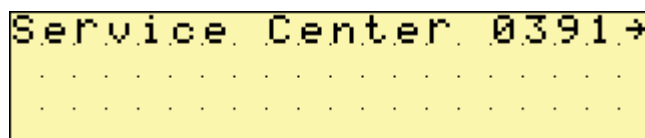
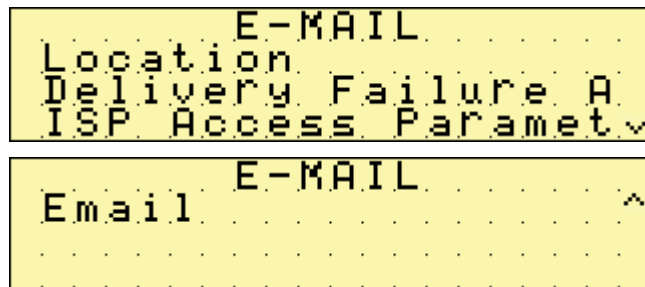


Figure 46 : Edit Service Center number



### **E-MAIL page**

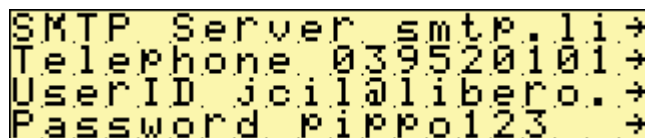
If properly configured via FX builder tool, the MUI V.2 display allows to show the E-MAIL configuration page.




**Figure 47 : E-mail page**

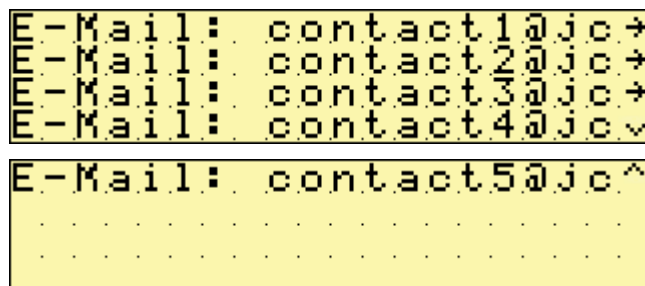
These are the options available:

- *Location option* : allows the user to modify the location use for the E-MAIL report. The location is fully editable, pressing the  key and using the scrolling keys.
- *Delivery Failure Address* : allows the user to view and set a return e-mail address in case of e-mail delivery failure. The address is fully editable, pressing the  key and using the scrolling keys.
- *ISP Access Parameters* : allows the user to view and set the Internet provider parameters in order to connect the FX16 to the Internet network. SMTP Server, Telephone number, User ID and PW for the remote connection.



**Figure 48 : Edit ISP Access Parameters**

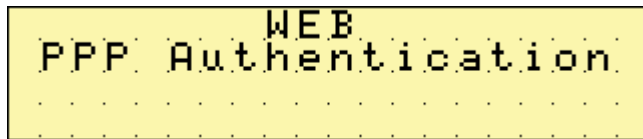
- *Mail addresses* : This is the list of e-mail addresses the FX16 will send the e-mails to. The page allows the user to view and edit the E-MAIL contact list created at design time. The page is fully editable pressing  key and using the scrolling key.




**Figure 49 : Edit E-mail contact list**

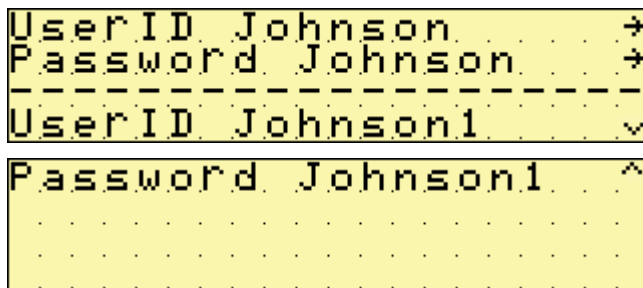
### WEB page

The MUI V.2 display allows to show the WEB configuration page.



**Figure 50 : WEB page**

- *PPP Authentication* : allows the user to view and modify the remote connection configuration. User IDs & PWs to connect to the web site stored on board the FX16. The page is fully editable pressing  key and using the scrolling key.



**Figure 51 : Edit PPP Authentication**

# Programming

## ***Introduction***

This chapter will go through the process of building a MUI v.2 display application with the FX Builder Tool.

This chapter describes how to:

- Starting from a FX16 Master Controller application and build the display configuration;
- Make successive display configuration modifications.

## Key Concepts




- ❑ The MUI v.2 display is a configurable, powerful user interface that can be connected to the FX16 Master Controller of the FX series.
- ❑ The MUI v.2 is configurable in the sense that the user / programmer can decide, at design/develop time, which are the information to be displayed and the way to show them.
- ❑ The Display configuration is now part of the application file; using the same tool, FX Builder, the user can develop all the features related to the application (display, trend maker, event maker, web maker).
- ❑ The Display part of the Application file (.apd) is automatically downloaded to the MUI V.2 as soon as it's connected to the Master Controller and powered up.

## Detailed Procedures

Follow these instruction step by step for each task in order to build the MUI v.2 display configuration.

### Launching Display Plug-In

The FX Builder has a plug-in software that allows the creation of the display application. To launch the plug-in right click on the  icon and choose the target display:

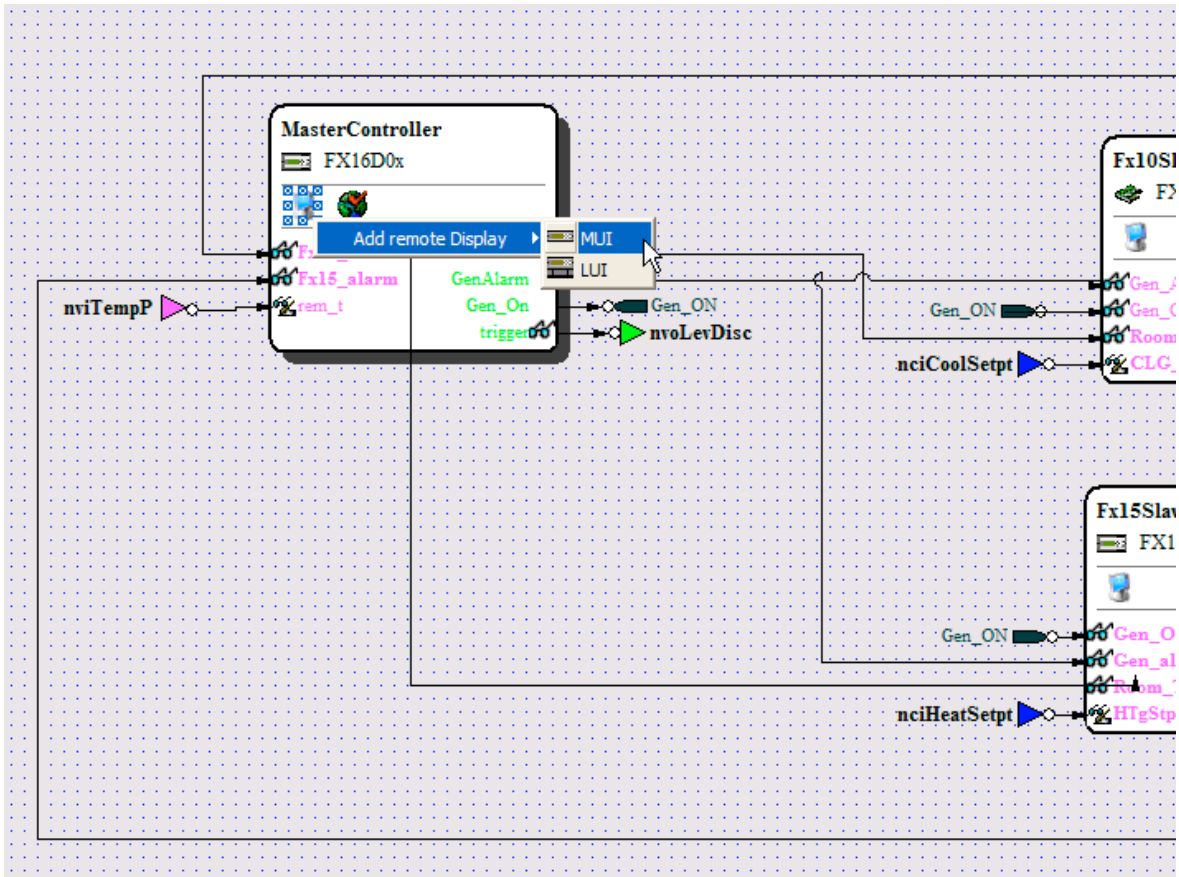

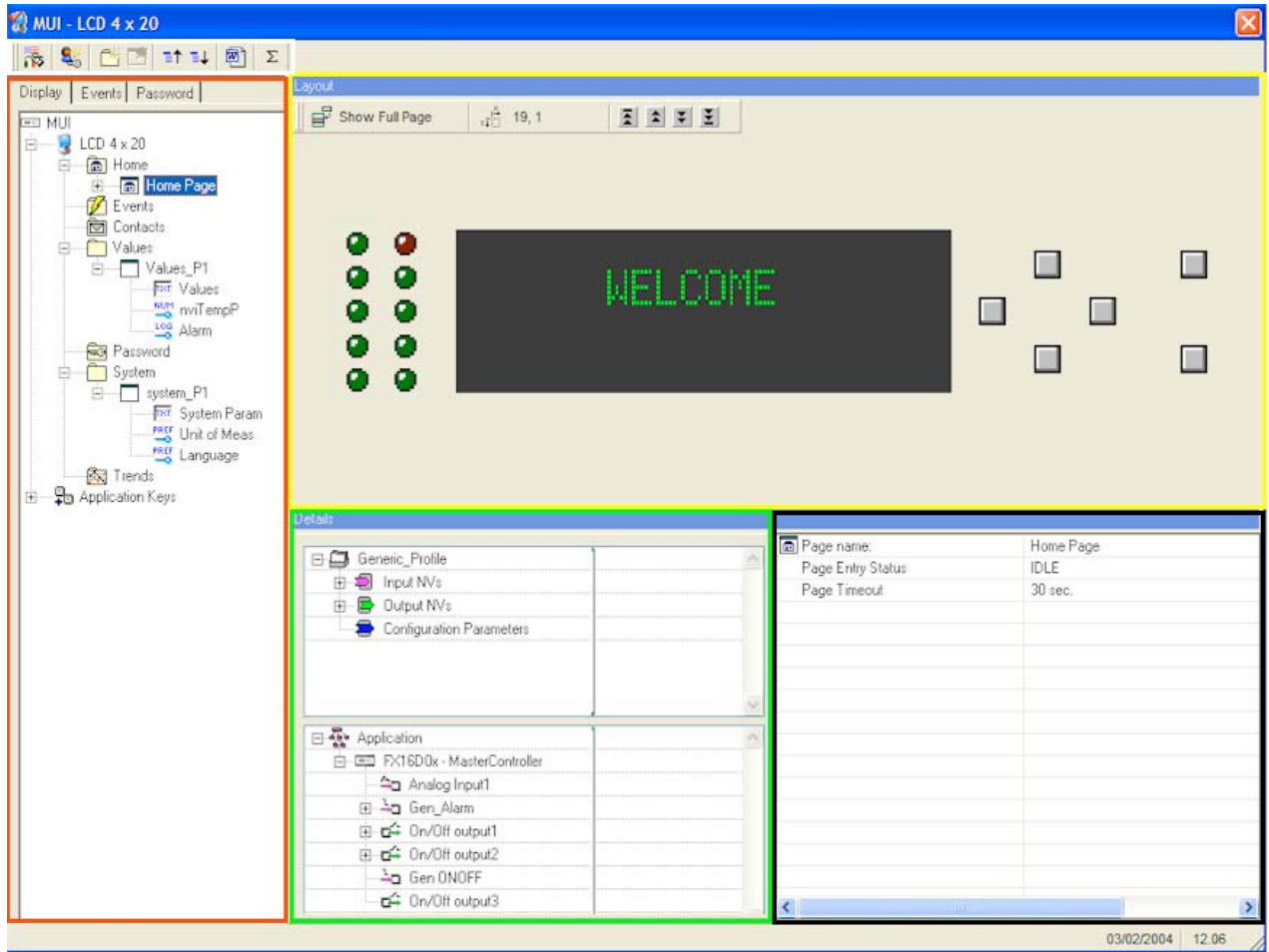


Figure 52 : Launching Display Plug-In

With the display application added the display icon will be shown as red checked : .



**Figure 53 : FX-Builder Display Plug-in**

Looking on the screen, five frames can be identified :

- *White Area* → Menu bar summarize all the main commands available;
- **Red Area** → composed by display structure folder, Events folder, Password folder.
- **Yellow Area** → Interactive Display layout.
- **Green Area** → Application & Profile view and details.
- **Black Area** → Page & Variables Details.

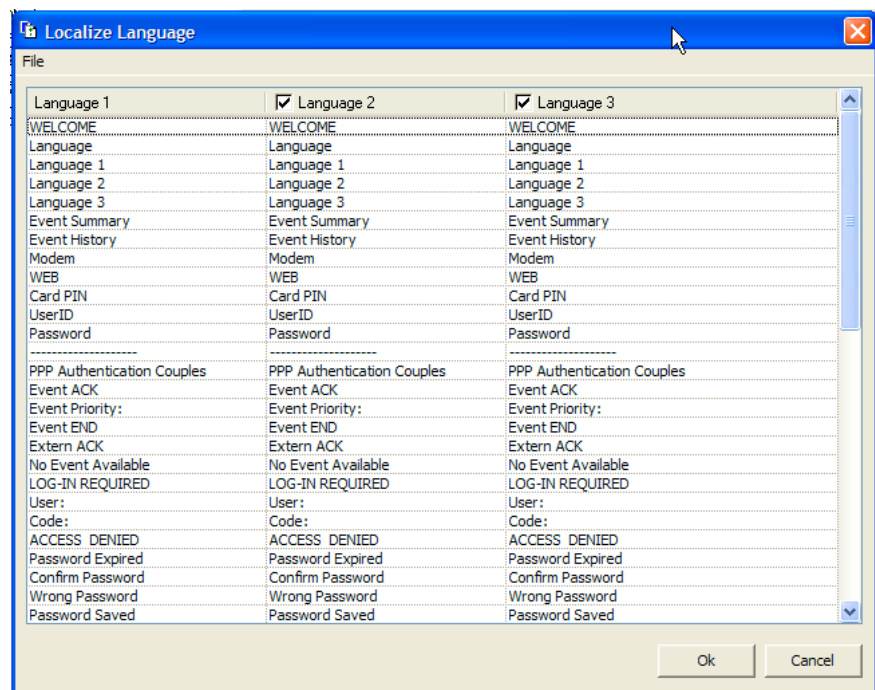
## Menu Bar Details



**Figure 54 : Menu Bar Icons**




These are the icons available:

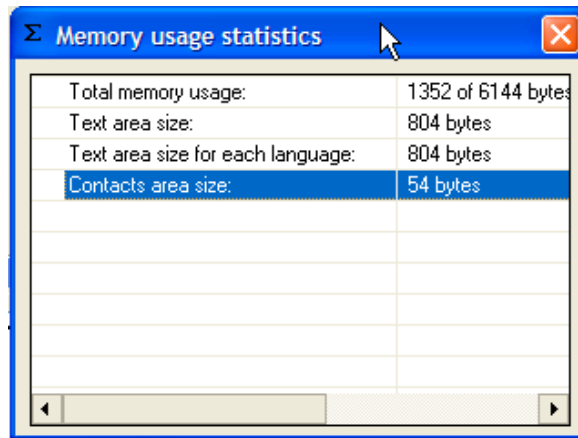
- *Localize Language Icon* : allows the user, by adding a “language” parameter on the Display, to choose different languages, at run time, previously configured using this features. Max 5 different languages can be downloaded to the controller at the same time and selected at run time by setting a parameter.



**Figure 55 : Language database**

- *Add User* : allows the programmer to add different authorization privileges by setting user name, password and one of the three levels available. Adding the first user will create automatically the password folder, with the “User Account” page.
- *New Folder* : allows the programmer to add new folders.
- *New Page* : once the programmer added a new folder, it's possible to add new page on that folder by clicking on this icon.

-  Shift Menu Links : once the programmer added a new page associated to the menu, it's possible to shift this links one position up or down in the menu tree.
-  *Generate Report* : allows the programmer to generate a Microsoft Windows Word compatible report reporting the display structure.
-  *Memory Usage Statistics* : allows the programmer to check the memory usage allocated for display configuration purpose.



Σ Memory usage statistics	
Total memory usage:	1352 of 6144 bytes
Text area size:	804 bytes
Text area size for each language:	804 bytes
Contacts area size:	54 bytes

**Figure 56 : Memory usage details**

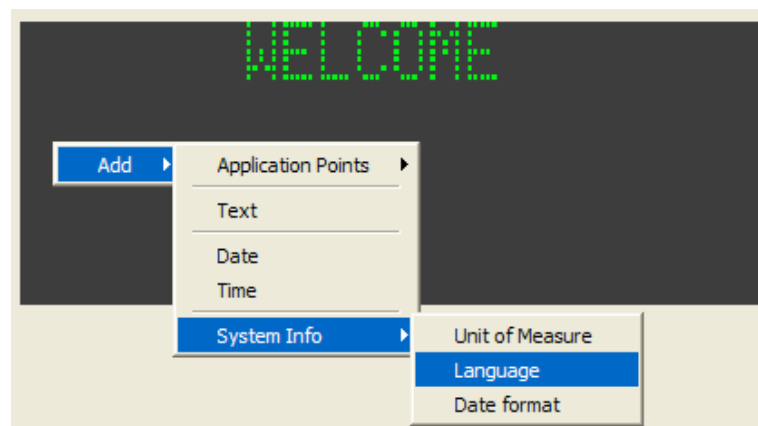
## Adding Multi-languages option

The application developed for the FX16 can be design with up to 5 different languages that can be then chosen from the end-user, through the display, at run time.

The Display Plug-In allows to develop the main display application in the chosen primary language, an export feature will then allow to export all the different strings, name of variables, etc to a file that can be translated. The translation will have to follow certain rules (max string length, etc).

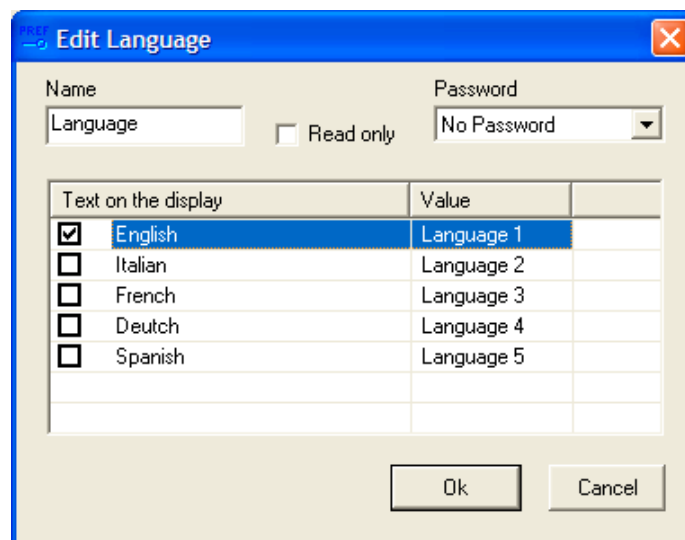
The importing feature of the Display Plug-in will insert the additional language databases into the display application, ready for the download.

As first the user has to add the link to the language database by selecting "Language" option in the pop-up menu:



**Figure 57 : Adding Language option**

Edit the Language name, as preferred.

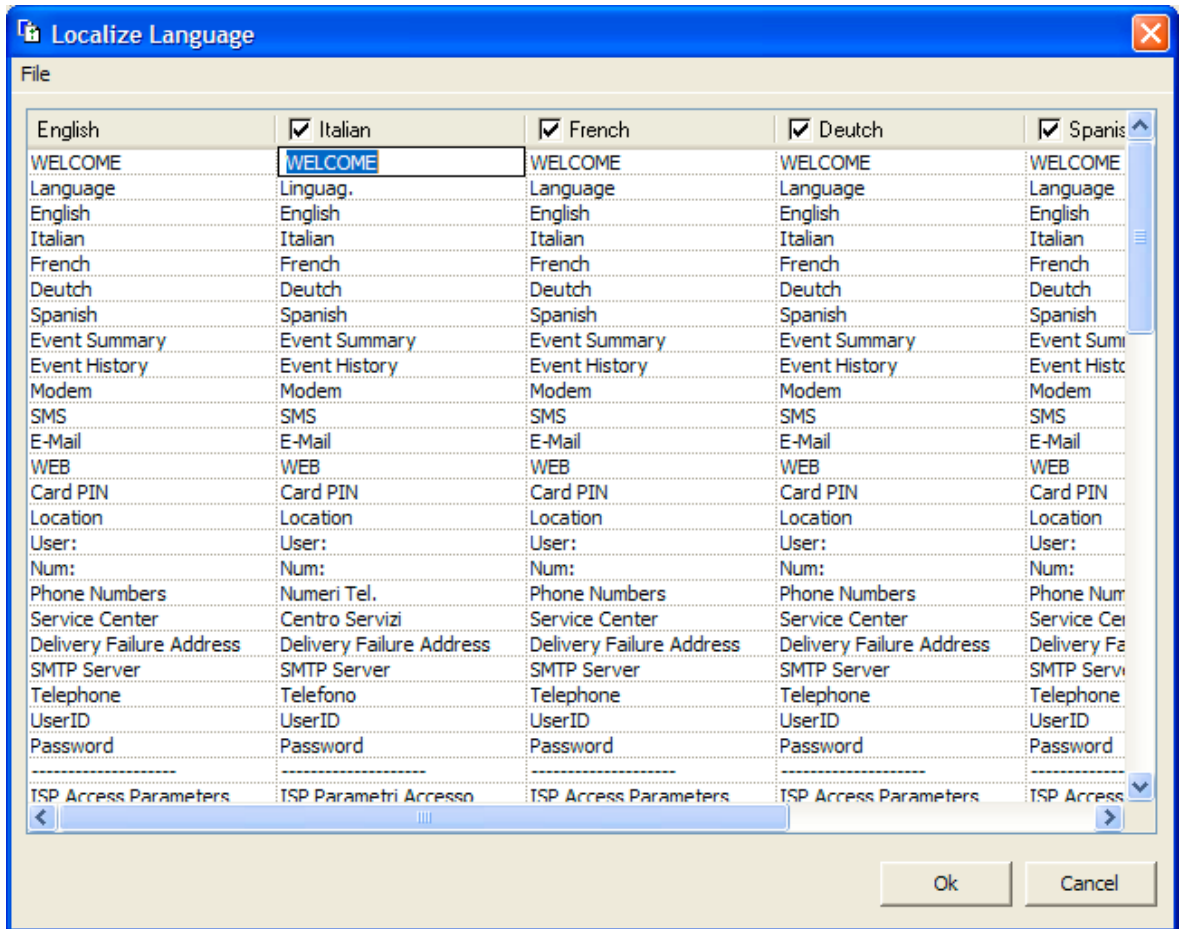


**Figure 58 : Edit language name**

Now the user can edit and translate the primary language into the others 4 format.

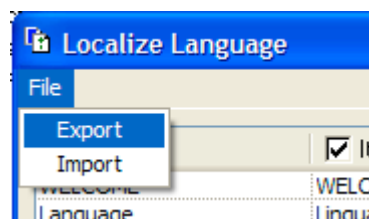
## Editing Multi-languages database

Click on the *Localize Language Icon*  in the Menu bar in order to edit the database.



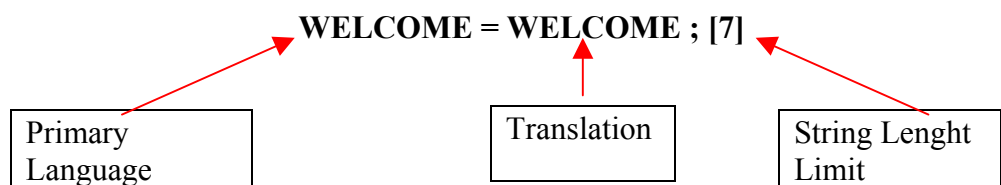
**Figure 59 : Edit Multi-language database**

"File" menu will allow the user to Export in txt format the database and import it when it has been translated.



**Figure 60 : File menu options**

The Export operation will generate a txt file with the following format :



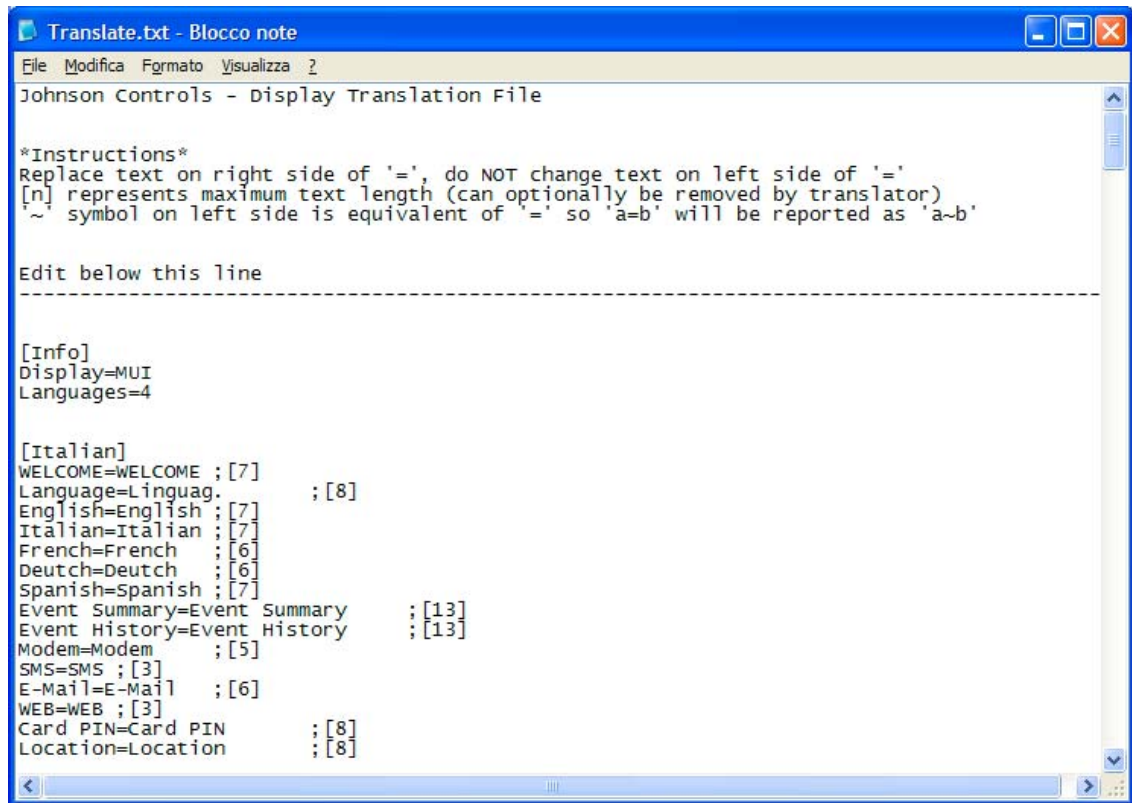


Figure 61 : Translate.txt file

## Saving Display Report

*Generate Report* feature allows the programmer to generate a Microsoft Windows Word compatible report reporting the display structure.

*Select* the destination folder as in figure:

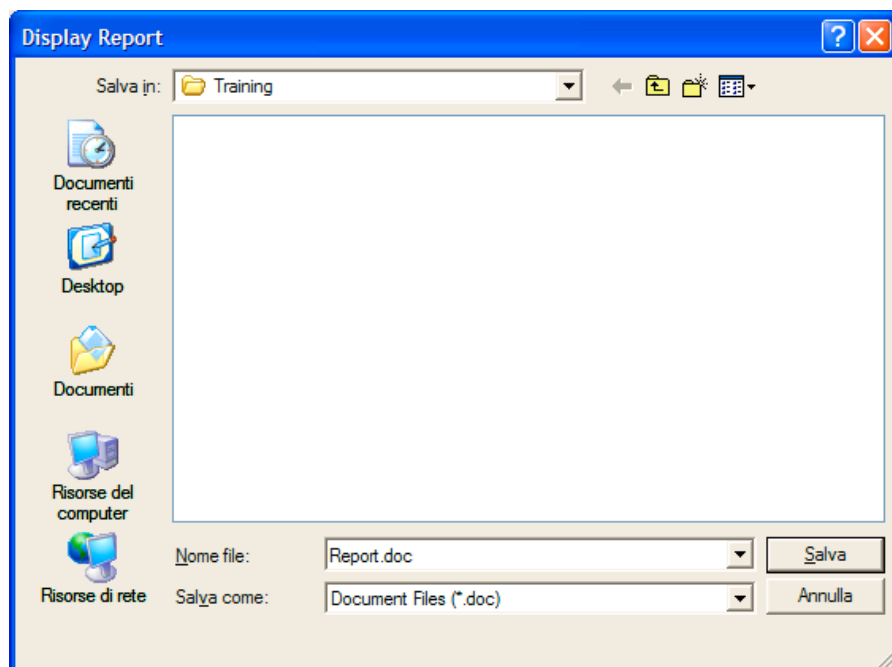
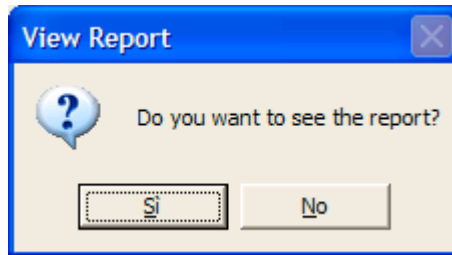


Figure 62 : Save report

Waiting for saving operation and automatically the FX-Builder will propose to the user to see the report.



**Figure 63 : Do you want to see the report**

Following an example has been reported :

### ***Display Overview***

- ***Model***                    *MUI*
- ***Description***            *LCD 4 x 20*

### ***Home Page***



- Entry State***            *0*
- Time-out Period***    *30 sec.*
- Menus***                    *parameters*  
                                   *Events*  
                                   *Trends*

**Folder: parameters**

**Inactive Keys:** None

**Password Level:** 0

**Activated by Menu:** parameters

**Page: parameters\_P1**



**Entry Status:** IDLE

**Time-Out period:** 30 sec.

**Shortcut:** None

**LEDs**

**Alarm\_Active**

<b>nvoStatus</b>	<b>BlinkMode</b>
Off__Logic_off	OFF
Low__Logic_on	On
Medium	OFF
High	OFF
On	OFF
Invalid	OFF

## Keys

### Up

<i>When Pressed</i>	<i>After Seconds</i>
<i>When Released</i>	<i>After Seconds</i>

### Left

<i>When Pressed</i>	<i>After Seconds</i>
<i>When Released</i>	<i>After Seconds</i>

### Down

<i>When Pressed</i>	<i>After Seconds</i>
<i>When Released</i>	<i>After Seconds</i>

### Right

<i>When Pressed</i>	<i>After Seconds</i>
<i>When Released</i>	<i>After Seconds</i>

### Escape

<i>When Pressed</i>	<i>After Seconds</i>
<i>When Released</i>	<i>After Seconds</i>

### Enter

<i>When Pressed</i>	<i>After Seconds</i>
<i>When Released</i>	<i>After Seconds</i>

### Up+Down

<i>When Pressed</i>	<i>After Seconds</i>
Alarm ACK	3000
<i>When Released</i>	<i>After Seconds</i>

## ***Passwords***

### ***Level: 0***

<b><i>User</i></b>	<b><i>Password</i></b>
-	<i>None</i>

### ***Level: 1***

<b><i>User</i></b>	<b><i>Password</i></b>
-	<i>None</i>

### ***Level: 2***

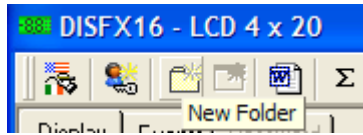
<b><i>User</i></b>	<b><i>Password</i></b>
-	<i>None</i>

### ***Level: 3***

<b><i>User</i></b>	<b><i>Password</i></b>
-	<i>None</i>

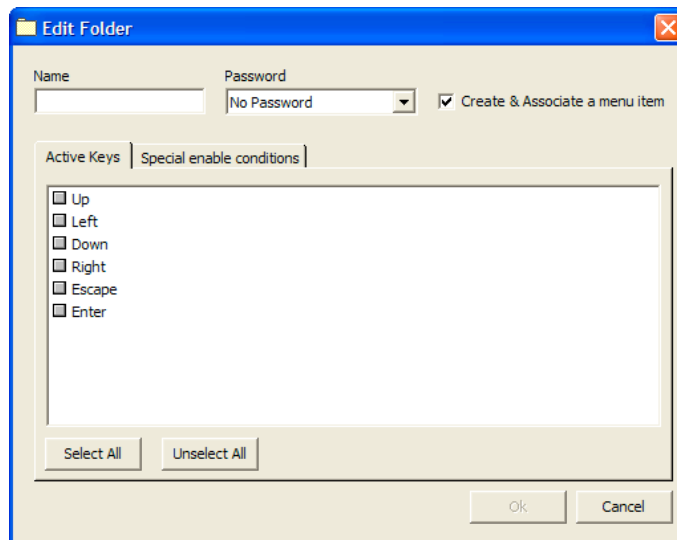
## Adding New Folder & Page

Go to the menu bar and click on New folder icon



**Figure 64 : New folder**

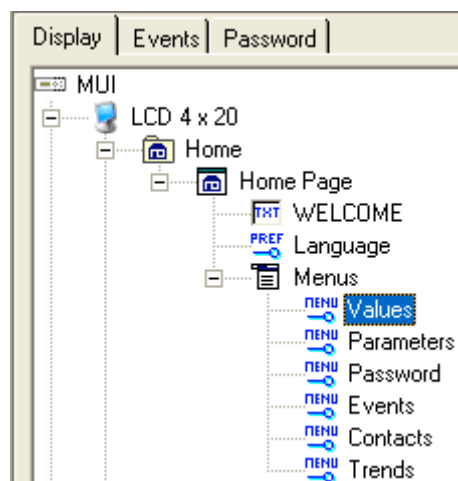
Insert the page details :



**Figure 65 : Edit folder**

- ❑ *Page Name;*
- ❑ *Password* : in order to restrict the page navigation;
- ❑ *Create & Associate a menu item* : this option, if checked, allows to automatically associate the link to this page in the menu tree;
- ❑ *Active Keys folder;*

The result of this action is the folder and page creation and the link associated to the menu:



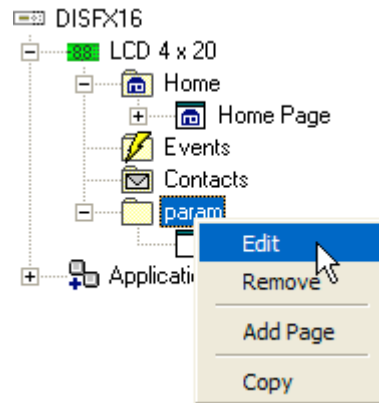
**Figure 66 : Menu tree**

## Editing Folder & Page Attributes

Both New folders / pages and Default pages attributes can be changed in order to suit the User need.

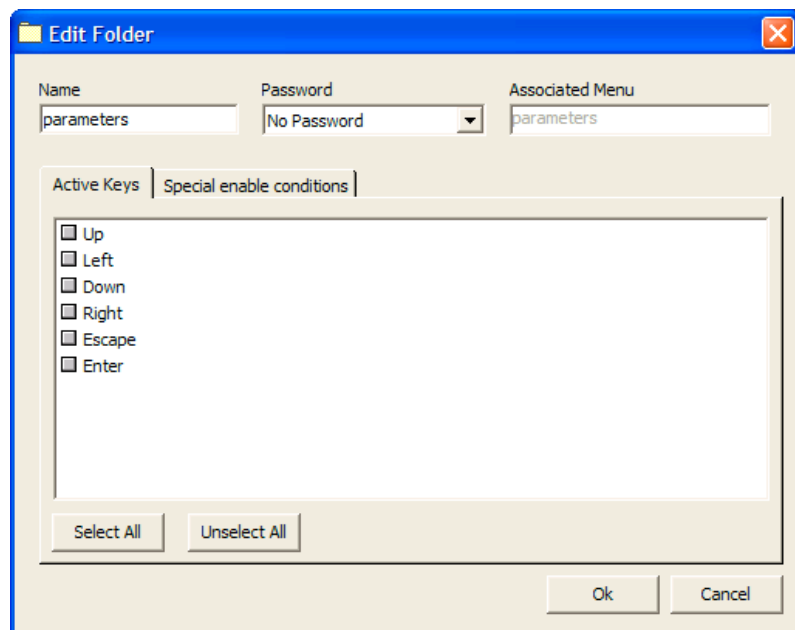
### **Folder Attributes**

To change a folder attributes, right click on it:



**Figure 67 : Edit folder attributes**

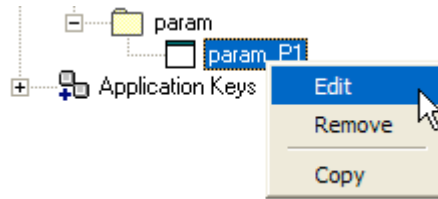
The pop-up window appears and the user can edit the password level, rename the folder, etc:



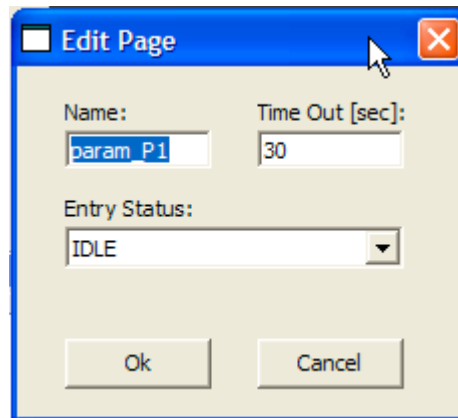
**Figure 68 : Folder attributes details**

### **Page Attributes**

Right clicking on a page, a pop up menu will appear:



**Figure 69 :**




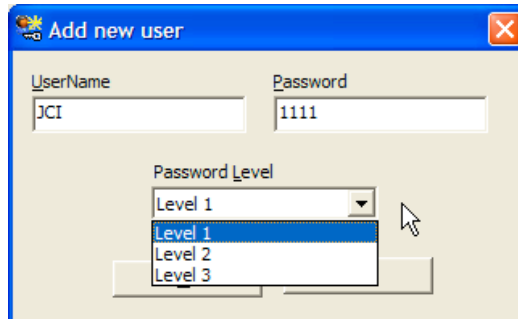
**Figure 70 : Edit Page attributes**

The user can edit the page Name, the Time Out time and the entry status.

## Adding / Editing Password

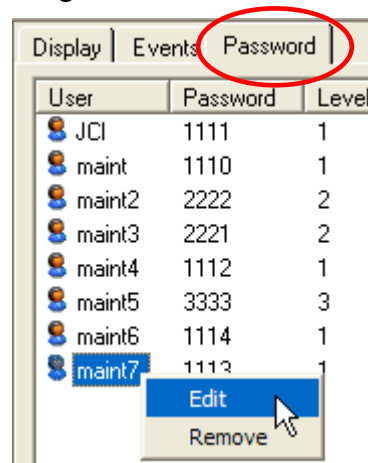
In order to restrict the navigation of the display, hiding any sensible application or system points, it's possible to define different accesses regulated by password and authorisation levels.

Clicking on the *Add User* icon , the Add New User window will appear:



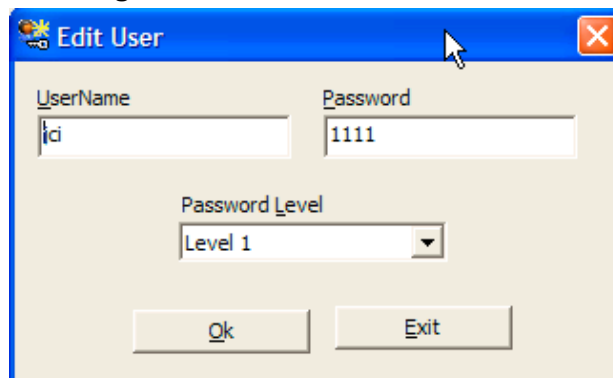
**Figure 71 : Add new user**

Up to 8 user can be added and in case of mistakes it's possible to check and edit the data previously defined, going through the *Password* folder as in figures:



User	Password	Level
JCI	1111	1
maint	1110	1
maint2	2222	2
maint3	2221	2
maint4	1112	1
maint5	3333	3
maint6	1114	1
maint7	1113	1

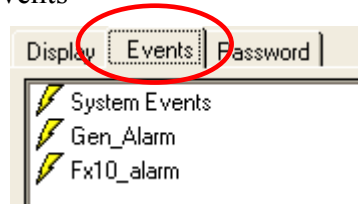
**Figure 72 : Edit User & Password**



**Figure 73 : Edit user**

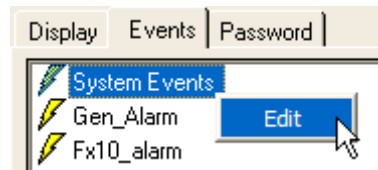
## Editing Events

Events folder resumes all the events previously configured using the Events Maker plus the default System Event. It's possible to visualise up to 20 Events



**Figure 74 : Events Folder**

Right click on a Event to enter the Edit Mode:



**Figure 75 : Edit events option**

Name	Value
General Alarm	LOG_ON

Event reporting

Name + Status
  Status Only
  Name Only

Summary

```
! Gen_Alarm General A
```

Details

```
Date      Time
Gen_Alarm
! General Alarm
PRIORITY 1
```

**Figure 76 : Edit event**

Edit the name considering that the User have 3 possible Viewing choices :

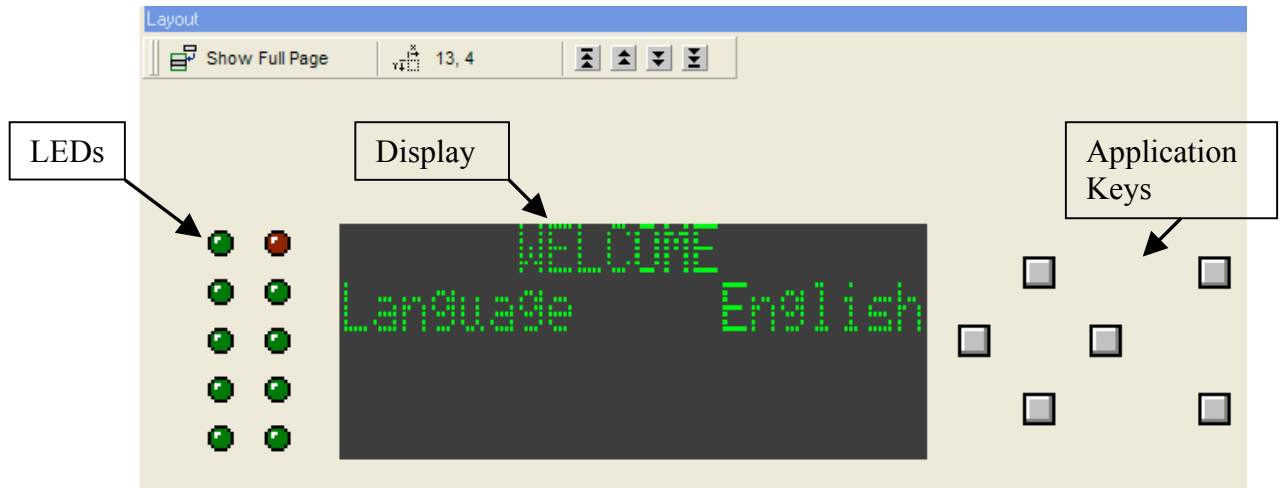
- Name + status;
- Status only;

- Name only;

The details window allows the user to have a display preview summarising all the options selected.


## Using the Interactive Display

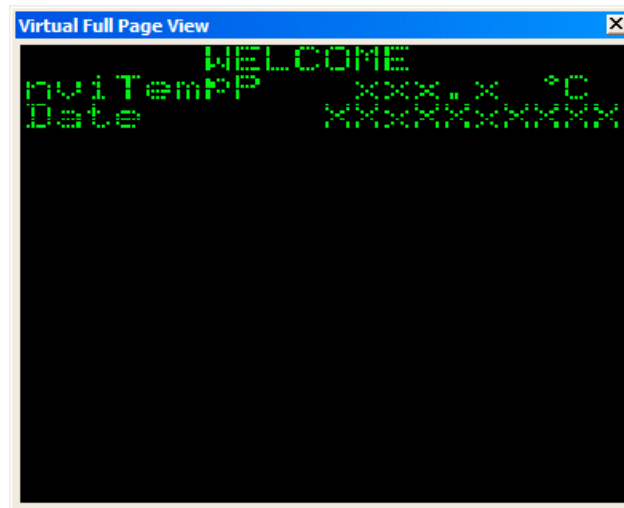
The Display plug-in allows the programmer to simulate the navigation of the display application, he/she has created.



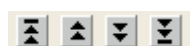
**Figure 77 : Interactive Display**

The layout commands provide to the User the main commands to scroll and visualise the current display page:

-  Show Full Page option allow to preview the current Display Page;



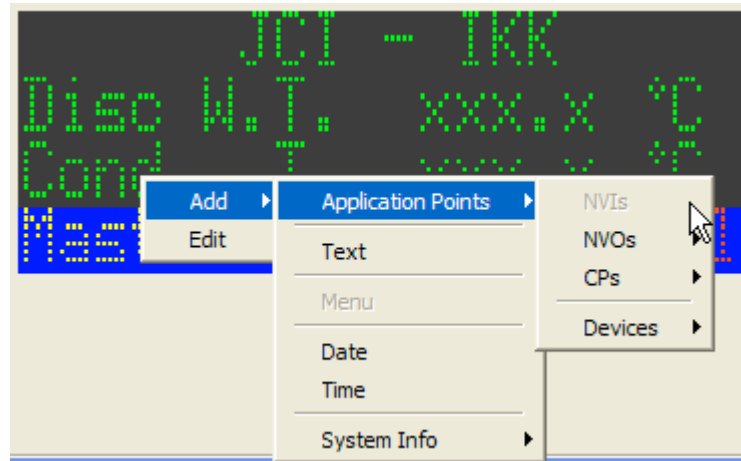
**Figure 78 : Show Full Page**

- Row & Column : Mouse cursor position feedback;
-  button to scroll the Display Page in vertical mode;

## Adding Application Points

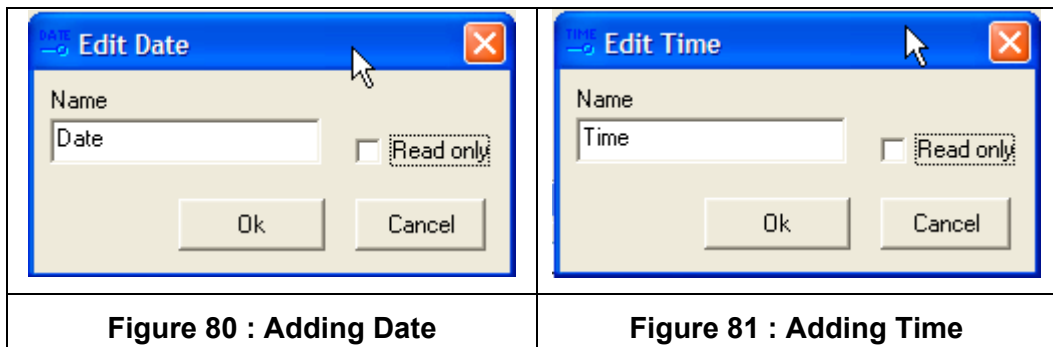
In the display area (black area assigned) is possible to add the following data:

- *Application Points* : Nvi, Nvo, CPs;



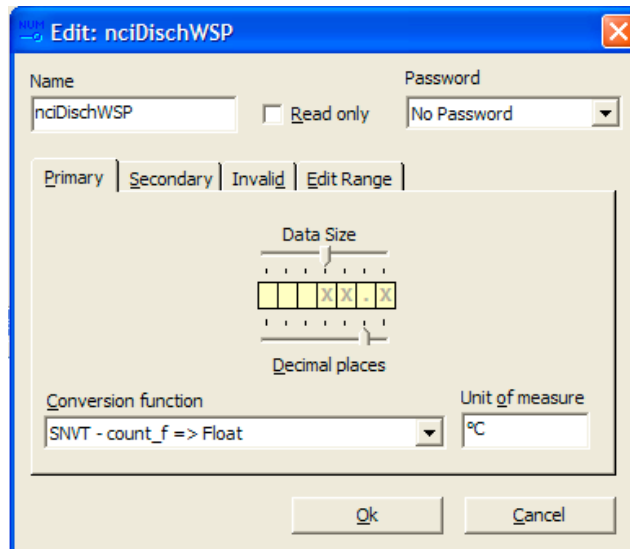
**Figure 79 : Adding Application Points**

- *Text*;
- *Date & Time info*;



- *System Points* : Unit of Measure, Language, Date Format.

For example, adding a CP variable, the following window will appear :



**Figure 82 : Edit Application Point Details**

In this form the User have to fill in the fields require to configure the variable visualization :

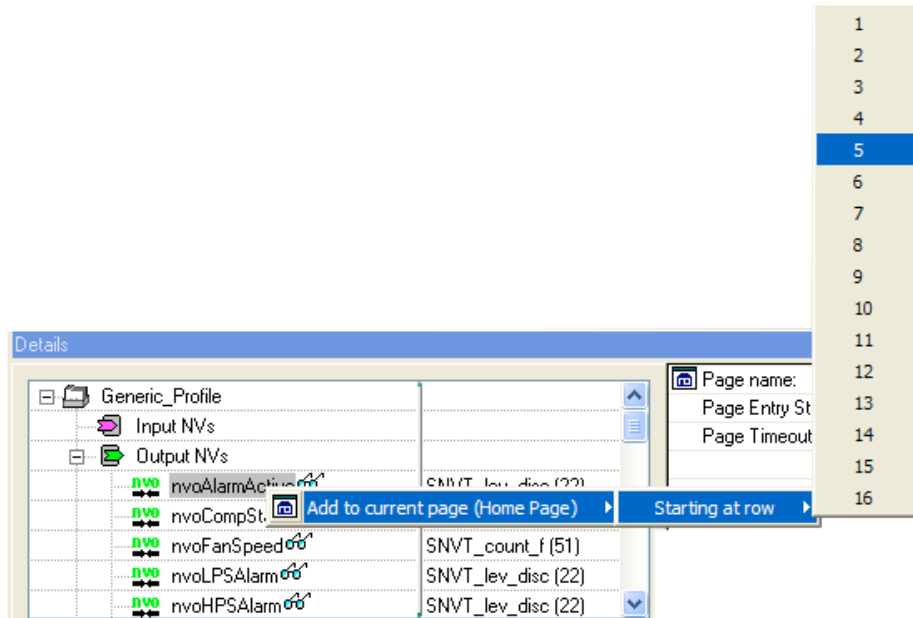
- ❑ *Variable name;*
- ❑ *Read only option;*
- ❑ *Password option : to secure sensible data;*
- ❑ *Data size & Decimal places;*
- ❑ *Convesion funtion;*
- ❑ *Unit of Measure;*

Folder Entry:

- ❑ *Primary visualisation (it differs from the Secondary visualisation for the type of unit of measure (°C));*
- ❑ *Secondary visualisation;*
- ❑ *Invalid visualisation;*
- ❑ *Edit Range limit configuration;*

Once Variable has been visualized on the display, the user can drag either the name, the value and the unit of meausre everywhere considering the display limits (lenght = 20 characters, height = 16 rows).

The same result could be obtained by adding Application Points from the **Application & Profile view**. Click with the right mouse button on the variable desired and specify the insertion row. Multiple Variables selection are allowed using **CTRL** keyboard button (Note: only same variable type selection).



**Figure 83 : Adding App. Points from the App. & Profile View**

## Alphanumeric & Special Characters

The MUI V.2 display supports Special Characters used in some European Region :

Represented Characters	LCD Code	ASCII Code
ä / Ä	0xE1 – 225	0xE4 – 228 / 0xC4 – 196
ö / Ö	0xEF – 239	0xF6 – 246 / 0xD6 – 214
ü / Ü	0xF5 – 245	0xFC – 252 / 0xDC – 220
ß	0xE2 – 226	0xDF – 223
ñ	0xEE – 238	0xF1 – 241
°	0x85 – 133 (Custom char)	0xB0 – 176

All the character are displayed in lower case; if the user inserts by tool an upper case character this is converted to a lower one.

## Key Pad Management

The MUI V.2 display features 6 Navigation Key, these buttons, in addition to the classic system function associated have one user-configurable function.

### Editing Key Pad attributes

Edit command comprises Autorepeat option, (particularly indicated for displayed parameters adjustment) and password level.

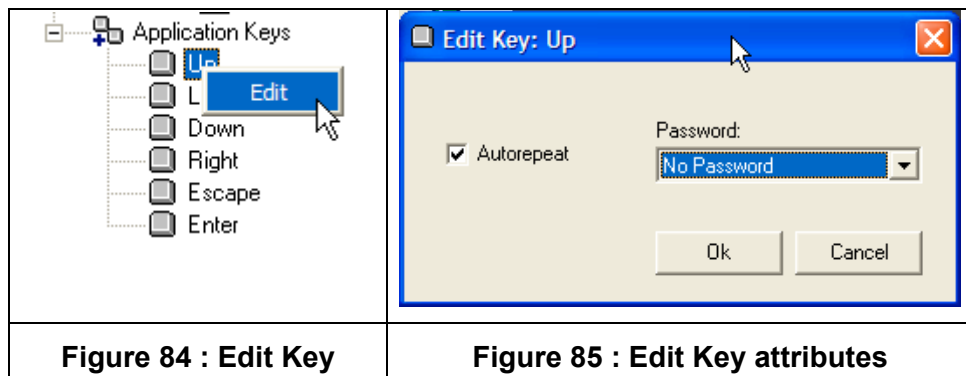


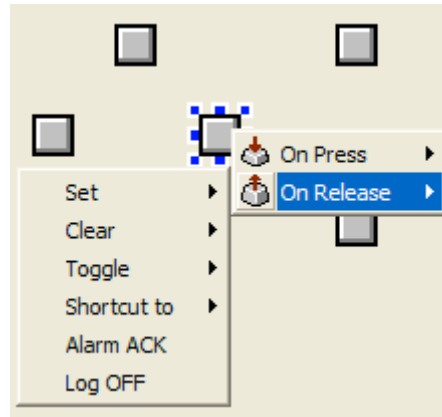
Figure 84 : Edit Key

Figure 85 : Edit Key attributes

### Adding Key Pad task

MUI V.2 display features 6 Application Key with one function freely configurable "on pressing" or "on release" action.

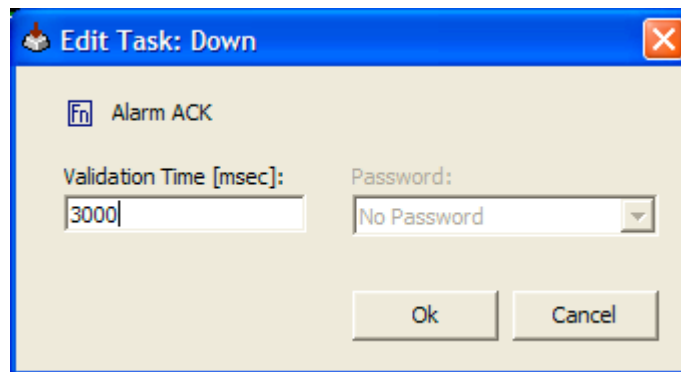
In order to edit this features, click with the right mouse button on the key preferred :



**Figure 86 : Adding Key pad function**

Function available:

- ❑ *Set/Clear* : allows the user to SET with **1** logic or CLEAR with **0** logic a Logic variable.
- ❑ *Toggle* : allows the user to toggle alternatively from **0** to **1** logic values.
- ❑ *Alarm ACK* : allow the user to acknowledge an alarm.



**Figure 87 : Alarm Ack details**

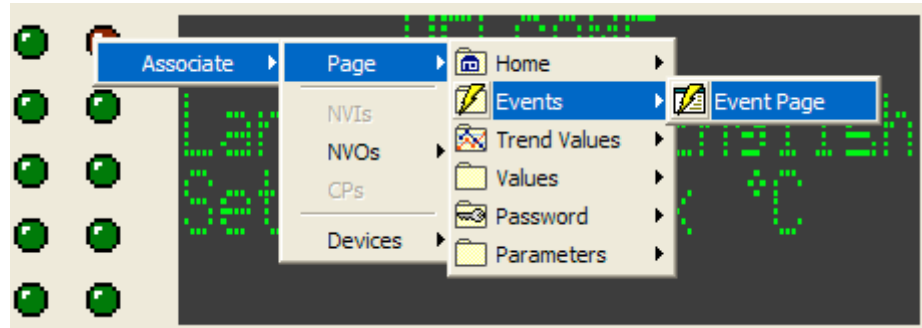
- ❑ *Log OFF*;

It's also possible to protect with password level the key, except for **Log OFF** and **Alarm ACK**. To execute whole the key function the User must have the requested level (or higher), otherwise a "Access Denied" message will be visualised.

## Led Association Management

The MUI v.2 display features **10** LEDs allowing the user a quick visualisation of specific events : alarms, status, etc.

In order to edit this feature, click with the right mouse button on the white area of the LED.

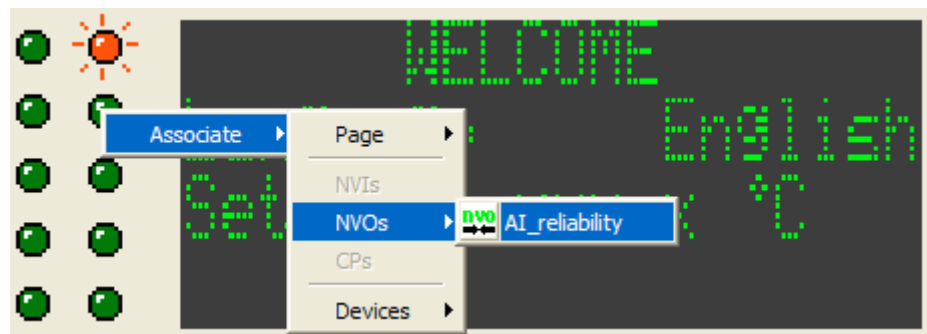


**Figure 88 : Page associated to a LED**

Different options can be selected:

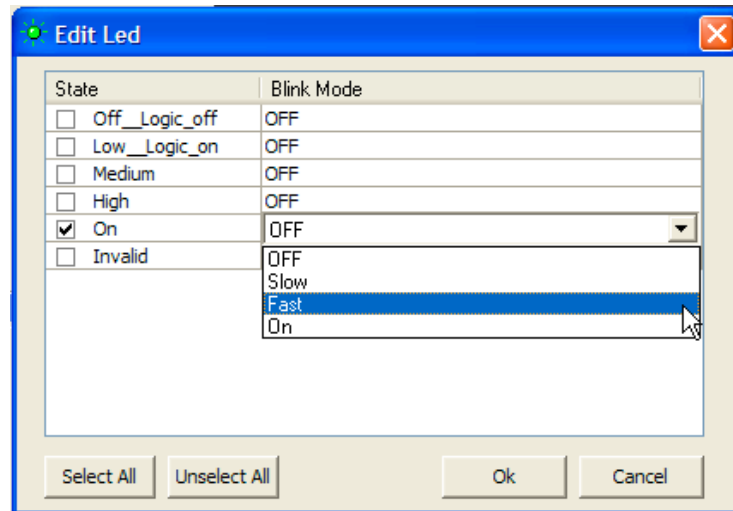
- ❑ *Pages* : usually Event Page;
- ❑ *LogicVariables* : Nvo, Nvi, CPs;
- ❑ *Device* : Slave controllers logic variables.

The result of this action is the Red/Green blinking LED .



**Figure 89 : Application Point associated to a LED**


Associating a logic variable, will open a configuration window :



**Figure 90 : Blink Mode & Rate**

The user can configure the Active State and the Blink rate as preferred.

### Saving and Exporting the Display configuration

Using the FX-Builder tool, it's not necessary to save & export the Display application because it becomes part of the application file (.apd format). The  button will save & compile the display application automatically.

### Downloading the Display configuration to the MUI v.2

The MUI V.2 display can be connected to the FX16 "Master Controller".

The display configuration will be stored in the FX controller. When the User connects MUI v.2 Display to the FX controller through its dedicated display bus, the FX unit will upload its own configuration (i.e. User Interface Application) to the display unit.

MUI v.2 establishes the connection to the FX16.

```

Device Offline
  
```

FX16 downloads the display application to the MUI

```

Connecting...
v.2.25
  
```

```

Downloading
██████████ 50%
  
```

MUI v.2 restarts itself in order to make effective the display configuration



Figure 91 : Downloading Process

## ***Troubleshooting***

### **Device Not Connected**

- ❑ **Error/Condition:** The MUI v.2 didn't connect to the FX 16 Master Controller.
- ❑ **Problem:** Happens in case the FX16 Application (.apd) downloading process (through FX-Loader tool) didn't end successfully or the application didn't incorporate the Display configuration.

- ❑ **Solution:**

Make sure the .apd file downloaded to the FX16 includes a display application, re-download the file to the FX16 and try re-connecting the MUI V.2 display.

Check the cables connection between the FX16 and the MUI V.2

# Specifications and Technical Data

## ***Introduction***

This chapter contains ordering codes and product specifications information.

## Ordering Codes

Item Code	Description
LP-DIS60P10-0C	Remote Medium User Interface, (4 x20) LCD backlit display, <b>panel mount</b> version.
LP-DIS60P11-0C	Remote Medium User Interface, (4 x20) LCD backlit display, <b>wall mount</b> isolated version.
LP-KIT007-000C	Link cable for the connection of the FX16 Master Controller to the MUI / LUI display - 3 mt.

# Specifications

## MUI v.2 Display Specifications and Technical Data

Product	MUI v.2 – Medium User Interface Version 2
<b>Power Requirements</b>	Directly powered from FX10, FX15, FX16 for panel mount version or Universal power supply: 9 to 48 VDC, 12 to 24 VAC
<b>Power Consumption</b>	2 VA
<b>Ambient Operating Conditions</b>	-20°C to +60°C 10 to 90%; RH (non-condensing)
<b>Ambient Storage Conditions</b>	-20°C to +70°C 10 to 90%; RH (non-condensing)
<b>Display and Keypad</b>	LCD 4 x 20 alphanumeric, backlit Keypad with 6 buttons and 10 LEDs
<b>Shipping Weight</b>	280 gr (Wall mount models); 300 gr (Panel mount models)
<b>Housing Protection</b>	IP30 for hand-held and wall mounting applications IP54 for panel mounting applications
<b>Housing Material</b>	Polycarbonate + ABS (GE CYCOLOY), self-extinguishing UL94V-0
<b>Dimensions (H x W x D)</b>	72 x 185 x 38 mm
<b>CE Compliance</b>	89/336 EEC directive: EN 61000-6-1 (EN 50082-1) 73/23 EEC directive: EN 60730 for applicable points (IP) UL873

*The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.*



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