# Smart EMergency Master SEMM THE MANUAL

Version 2.0

Users Guide Hardware Installation Manual Software Installation Manual Operations Manual Technical Reference

JEWOO CORPORATION LTD.

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# **Special Notes**

It is the responsibility of the system owner to ensure that only qualified and trained personnel are allowed to install and maintain this equipment. To ensure that all applicable international and local Electrical standards and rulings are followed. To ensure that safe electrical working practices are followed

These instructions are meant only to be an additional source of information for the Smart EM Master.

The device is designed to allow the operator to follow the instructions intuitively. Therefore these instructions (where applicable) will lead the operator to the function while the operational characteristics of the system GUI will complete the operation of the function.

The Operations Guide assumes a level of knowledge equivalent to a suitably trained DALI technician. No one of a lower level of knowledge can safely work in the environment and should cease immediately until a qualified technician is available.

Making a mistake in a DALI Environment can have fatal consequences

#### **INSTALLATION DATA & System Documentation**

## Essential Work to do before attempting the installation

There are 3 files available from our website that are essential to make the whole process of owning and installing a Smart EM Master System a breeze. These 3 documents, and a drawing of the premises, with Emergency and EXIT fitting locations marked, will be required at every step of the installation and later Maintenance processes.

Further, they will make the job of fault finding very simple (and therefore save time and money for everyone).

Please download these files and complete them, ready for use and store them for later reference. Please be professional and put these documents into a binder and present them to the Client so they can keep them onsite for any Technician who needs them.

 ${\sf SEMM\_PrecommissioningDocuments\_1.pdf}$ 

SEMM PrecommissioningDocuments 2.pdf

SEMM\_PrecommissioningDocuments\_3.pdf

#### **RELEVANT STANDARDS**

EN 61347-2-11 .... Automatic electrical controls for household and similar use

EN 62386 (VO, V1) Digital Addressable Lighting Interface

EN 62034 .... Automatic test systems for emergency escape lighting equipment
EN 60950-1 .... Information Technology Equipment – Safety – General Requirements
EN 61000-3-2 .... Electromagnetic Compatibility (EMC) – Limits for Harmonic Emissions

EN 61000-3-3 .... Electromagnetic Compatibility (EMC) – Limitation of Voltage Changes, Voltage

Fluctuations and Flicker in Public Low-Voltage Supply systems

EN 61547 .... Equipment for general lighting purposes - EMC immunity requirements
EN 55015 .... Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

EN 55022 ... Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement

EN 55024 ... Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement

EN 62493 ... Assessment of Lighting Equipment Related to Human Exposure to an Electromagnetic Field

EN 62311 ... Assessment of Lighting Equipment Related to Human Exposure to Electromagnetic Fields (0Hz – 300Hz)

This device is independently tested and Certified as compliant with the above Standards, by an internationally accredited Testing Authority.

Testing against the DALI Standard is carried out predominantly by our own Testing Facility, which is equipped with the necessary Testing Equipment to comply with the requirements of the A. G. Dali group.

# DALI Compliance Statement

Smart EM Master is designed and tested to comply with the DALI Standard EN 62386 (VO and V1), for emergency lighting components. A Client purchasing product that incorporates the DALI protocol must accept full system responsibility for the integration of the Smart EM Master modules into the DALI system. It is essential that the Client, or his installer, have the experience and resource to accept this responsibility. Our product warranty does not extend to cover the system integration process.

JEWoo Corp Ltd Reserves the right to alter the specification at any time without notice.

Smart EM Master operates without a need for permanent connection to a PC or network. The controller is designed to make use of intuitive controls, allowing simple control and change to its attached DALI networks.

Reports may be viewed on the screen, displayed directly. Alternatively, the reports can be transferred to a LAN connected PC and be printed for hardcopy use or storage.

Smart EM Master is designed to control and monitor Class 1 DALI EXIT & Emergency Fittings ONLY. It does not have support for any other class of DALI component. Future Versions of the Software will accommodate other Classes of Fitting. The software is not field or factory upgradeable.

#### Installation Procedure

#### **INSTALLATION DATA**

Rated voltage and Frequency 100 - 240V @ 50/60Hz, consuming 12.0W total

**Temperature range** 0°C to +50°C

Weight 873g without power supplies and controls

**Dimensions W x H x D** 213mmx150mmx35mm (including Surface mount housing

Cutout Size 198mm x 117mm

**Protection rating** IP20 - Suitable for indoor use only

Memory Capacity 4 years of report Storage

#### **CONNECTIONS**

#### **CABLE REQUIREMENTS**

USB Not for End User Use
Power 3-core TPS Twin & Earth

1.5mm<sup>2</sup> minimum

Network Cat 5e Ethernet Cable RJ45
DALI 1 and 2 2-core Mains Rated 1.0 to

1.5mm<sup>2</sup>

#### Mains Supply

Mains Supply with Suitable protection at external source

#### Network

Connection by RJ45 Cable to LAN network via Network switch or other suitable network products

#### **DALI 1 & 2**

2-core Cable Mains Rated. Can be laid tightly coupled with the Mains Wiring. May also be within the same sheath as the Mains cable.

The DALI Cables must be mains rated. Capable of carrying the full mains voltage. Since under certain fault conditions the DALI bus can become live at the mains voltage.

Maximum lengths of cables permitted to be connected to the DALI network, depends on the size of cable used. This is the sum of the main lead cable and all the sub-branches.

Do not allow any loop of cable to be formed.

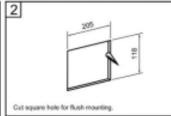
1.0mm<sup>2</sup> < 200metres 1.5mm<sup>2</sup> < 300metres

**Recommended Mounting Height: 1.5Metres AFFL** 

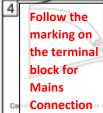
#### INSTALLATION INSTRUCTIONS

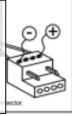
#### Flush Mounting

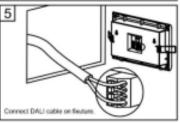


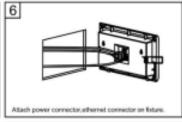


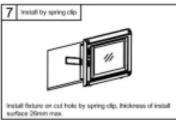
SEMM-1 now only requires mains to be connected to it. All necessary power supplies (including the DALI Power supplies) are internal to the SEMM-1 unit

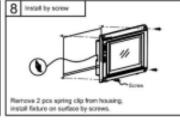


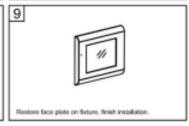






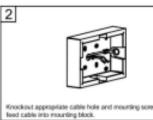


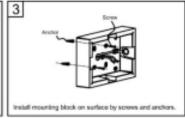


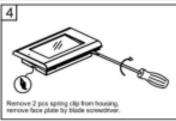


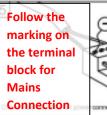
#### Surface Mounting

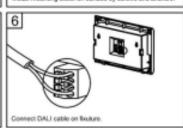
SEMM-1 now only requires mains to be connected to it. All necessary power supplies (including the DALI Power supplies) are internal to the SEMM-1 unit

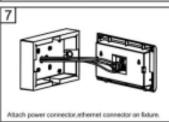


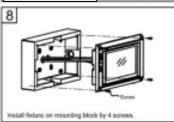


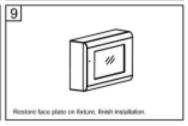












#### Planning for a TroubleFree DALI Installation

From many years of field experience, we are wanting to suggest a different method for installation than you may have tried in the past.

Success with DALI installations is directly related to the amount of planning and preparation applied.

#### **ON COMMISSIONING:**

To help with the planning and preparation you will find some things in the SEMM box: Pre-planning addressing and grouping sheets. These are downloadable from the company website. And labelling stickers. ( 2 sets of both A0 - 64 and B0 - 64).

The fastest method of installing and commissioning the fittings is :

- 1. to pre-program the units BEFORE installation.
  This saves a lot of walking, talking and time wasting at installation commissioning day.
- 2. Once Mains power is supplied to the fittings, leave them alone for 24 hours to perform their Internally programmed Commissioning.

(This is controlled by the program in the DALI Controller in the fitting.

Before it does ANYTHING else, it will in turn do this sequence:

- 2A. Charge the battery for 20 hours
- 2B. Perform a commissioning Duration Test

(length depending on the setting of the D/T jumper [1, 2, or 3 hours]) (this is to ensure the battery, though brand new, can actually run the fitting for the regulated time ... if it cannot now, it never will)

(This step completely discharges the battery so you have to complete one more step [2C], before normal operation can be performed.)

2C. Charge the battery again for 20hours

When the Installer selects the option for system setup, the system will give a message stating: "Return Commission Test Result after 28 hours, Please Wait" This is simply to remind the installer that after pressing the "New Devices" or "System Initialisation" Buttons, it will be 28hours (or thereabouts) before you will see the results of the Commissioning Duration Tests.

To pre-program the units BEFORE installation, let's be clear on what is meant here,

- take each fitting out of its box,
- temporarily connect to your DALI controller (SEMM) DALI Terminals

And to Mains power to enable the DALI gear to communicate with the controller

- and run through the commissioning process.
- mark up the fitting on your building drawings
- and note its address, Change the address now to what you want it to be.
- and the group it is connected to. Change the group to what you want it to be.
- Use the editor and keyboard to update the location and Fitting type details.

<u>Note</u> ... it is much easier to Change address and group now (while it is the only one fitting connected and it's on the desk in front of you) ..... Far easier than it ever is, wandering about looking for a flashing LED, up on the ceiling. (Onlookers think you are lost and wasting time!!)

- Attach one sticky address label onto the fitting. (Address labels are provided and there is extra space if you want write something special on the label)
- Attach the other sticky label to the box the fitting came from. (So you can see what the pre programmed address is, and get the right fitting to the right location)
- Put the fitting back in the box and store till it is time to install the fitting on the site.
- when you perform your commissioning, choose the "**SYSTEM EXTENSION**" option and all your programming will be picked up, without change.

EVERYTHING WILL ALREADY BE IN THE RIGHT PLACE.

- use your walkie-talkie with an assistant, to walk the installation in address order. <u>If everything goes to plan, you will only need to walk the installation once.</u>

GoTo Home page on SEMM, and Using the **Maintenance** Option, send each fitting, in turn, a Function Test. (on that option, the fittings will already be in address order.)

----Your assistant should be able to confirm the function test by seeing the LED flash and the lamp change from Mains, to Battery, to Mains again.

-----He/she just moves through the location following the numeric order.

#### (The BIG commissioning time wasters)

#### Bitter Experience

EXIT and emergency fittings always seem to be the last things going into a building, whether they be new or renovation.

Often with the Client trying to move in at the same time. Or assembly of the office furniture.

I am sure you would be experiencing this already.

The nature of construction work often means delays have forced the Electricians to be installing the Emergency fittings with the Customer in place.

The smoother you can make the commissioning the better.

Try it our way just once, and we think you will like the method we suggest.

We are confident you will make it your method of practice also.

SEMM will make this method really easy for you, and we have provided everything you need.

All that equipment and documentation will come with every order.

-----

#### **ON IDENTIFICATION:**

How to identify a fitting.

There are several methods:

# 1. Using the Lamp ON and Lamp OFF and LAMP Flashing controls. Identifying a LINE of Fittings

This is class 1 DALI.

Therefore there are a couple of types of fittings >>

- 1. An EXIT Sign. Today These are mostly 'Maintained'. So the Main Lamp will flash ON or OFF as directed by the controls.
- 2. An Emergency Fitting. Could be Maintained or Non Maintained.

For maintained the Main Lamp will flash.

For Non Maintained, the switch controlling the fitting should be turned on for the identification of the line.

These controls were provided to allow the Installer a simple method to ensure everything that should be on Line A, is in fact, on Line A. ...... And the same for line B items, on Line B.

We have provided these controls to help you resolve any poor connection or faulty fittings (the most common problems) at the start of the commissioning process.

When everything is working properly, on the correct line, then go on to the commissioning.

#### 2. **To Identify a Single Fitting** (for any other purpose)

We use the **Maintenance** Option from the Home Menu.

Here the Connected fittings are laid out in a numerically sorted list.

Select the line for the device you are testing/repairing by touching the line (it will highlight)

Then send the device a Function Test. Press the Function Test button.

(This will give ample visual confirmation that the device is the right one, The fitting will go into Emergency Mode for 10-30seconds. The Main lamp will go from Mains to Battery Supply, and after the predefined period will drop back to Mains Mode. During the Test the Indicator LED will Flash.)

#### Commissioning

#### The Commissioning Program:

Put First things first. Check that the DALI network is connected correctly and

- 1. Take a moment to go over the network and ensure that everything has been connected correctly.
- 2. Once this is complete,

and the reference documentation has been updated, apply power to the Network and the Smart EM Master

From power up,

it will take 2 minutes for SEMM to check the 2 DALI networks for available addresses and complete this step with either a Tick, or Cross indication of the status found.

3. To continue please check that all your devices are now attached to the appropriate network. Take special note of the comments above regarding the Device Internal Commissioning

TIP: There is a FLASH function on the setup page.

Use this to ensure that all devices are attached to the correct network.

- >> If not flashing ... fix that first.
- --It is useless and Time wasting to investigate problems, if the device cannot respond to even the most basic commands
- --Remember that to perform a Flash function (Broadcast ON and OFF, continuously sent), the attached Device must be "Maintained"
- 4. Then from HOME Page >> goto >

Setup >

755 (Default Password) >

Time to choose an Option for Commissioning ....

(Tip ...Commissioning screens are inside the Software Section of these instructions

#### **Explanation:**

( Add New Devices ) will only add new Devices. Current Programming on the DALI line is left unchanged

( **New System Re-Initialize** ) This option will give you a Confirm Dialogue.

Because, if confirmed as okay to go, it will cause every device it finds on the DALI Lines to Randomise. Therefore all the Short Addresses will be changed. And if you had devices previously programmed, the whole installation on this controller will be different. It could take hours to return it to the way it was.

5. Once Commissioning is complete:

Press ( Search for Devices ). The SEMM will now build a list of all the connected devices.

Press ( EDIT Devices ) Only if you need to :

change a Short Address

Enter or Update a location or Device type detail

Remember to Press the Store Icon, otherwise changes are discarded

- 6. Check that the dates and times for your Duration & Function Testing are as you would like them.
- 7. Make sure that all the addresses programmed into the fittings match the locations shown on your drawing. Finding fittings that need attention later will take much longer if the drawing is not correct.
- 8. Store your documentation and drawings for later use.

Commissioning Tests will be running for fittings that have just been powered on. This is a function of the DALI Ballast or Controller. Not a function of the SEMM.

Take a moment to think through the process of ensuring that you are happy that everything is properly documented.

A little time taken now, will save many hours of frustrating messing about later.

Operations Manual &

Software Operating Instructions & Notes

#### Opening Screen ... Displayed As soon as power is on



This is the opening screen and it will be displayed as soon as power is applied. While it is displayed the Application Controller is scanning the two DALI lines and establishing what is connected.

The program reads the contents of all the status bytes and concludes with displaying the Tick (OK) or Cross (Something Needs attention) as appropriate to the conditions on the network.

This screen leads to the normal home screen. You need to do nothing while this is happening, and it may take around 2 minutes to complete.

#### Main Menu Page



The HOME button will always bring you here, to this page

#### Maintenance

To perform Manual Functions Start / Stop Duration or Function Tests To Set / Reset various modes and features

#### Status

Displays the current status of the connected devices, and allows the Technician to extract the current status bytes

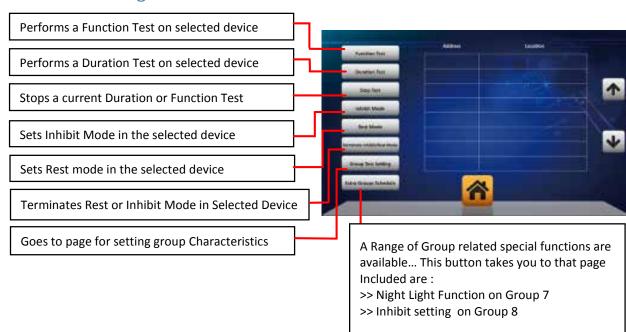
#### Test Results

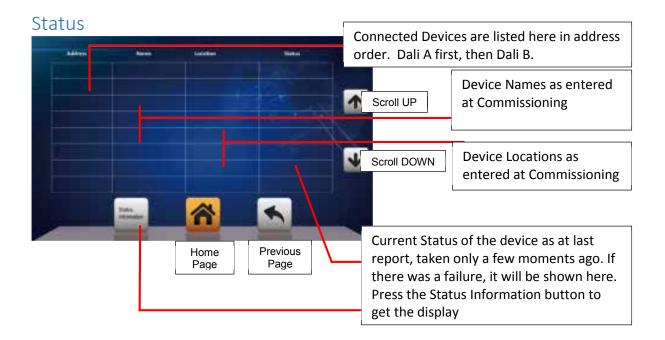
Go here to see the results of the Testing

#### Set Up

Here are the controls for the Commissioning processes. The Commissioning tools, and controls for the system are here also.

## Maintenance Page

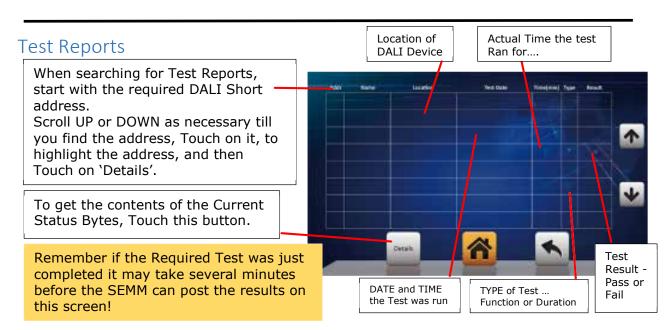




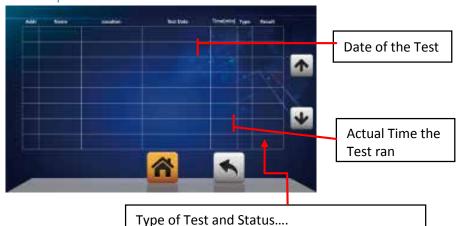
#### Displaying the current Status Bytes



This is the first of the Status bytes from a DALI device.
The data here may take up to 2 minutes to load, depending where the Application
Controller is in its polling cycle and how far that is from the selected device address



#### **Test Reports**



When a Test (Duration or Function) is run, the result is stored for safe keeping in memory. For up to 4 Years Reports are displayed in Short Address order, then by date and time

#### Set Up Code Entry Page



To enter the Setup Pages the User must first enter an access code.

The Default code is "755"

For example: "F/T" and "Pass" or "Fail"

This code can be changed on the Commissioning Page.

Record your code carefully. It cannot be "JailBroken"

### Set UP Page



Addressing Wizard .... Goes to the Commissioning Wizard.

Time Setting .... Goes to the Time Setting Page

Factory Defaults .... Allows resetting to Factory Defaults

Ethernet Configuration .... Allows for setting the LAN parameters

Password Setting .... Allows User to change the main password

Software Management .... Allows software Updating

DALI Operating .... Tools to make Setup easier

Touch Screen Calibration .... Allows for Screen Alignment

Screensaver Time .... Change the length of screen activity

See All these Functions further described below

#### Addressing Wizard

If your system is existing with devices already addressed, use this option to search out new devices on the DALI networks

For NEW Systems ...Be sure that you want to do this! All Devices will be randomised and each device will be given new addressing.

Any prior programming is lost!

Allows the system to search for any device on the Network and rebuild the list of Current Devices



Gives a list of Current Devices which can then be chosen for EDIT of Name and location details

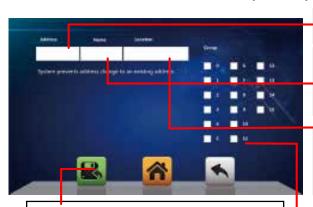
#### **Editing Devices and Adding Text**



When Editing devices, the full list of Devices is first displayed. Touch the line of the device you want to edit

When the chosen device is highlighted, touch the EDIT button to go to the Editing page ........

#### EDITING DEVICES .... Short Address, Name, Location, Group Assigning



Change the Short Address of the Chosen Device

Change the Name of the Chosen Device. This is 16 characters free for any Text Numeric or Special. Touch here to bring up the Keypad for typing

Change the Location of the Chosen Device. This is 16 characters free for any Text Numeric or Special. Touch here to bring up the Keypad for typing

If you have changed anything .....
Remember to Touch the SAVE
BUTTON, or your input will be ignored

Change the Group of the Chosen Device. Touch the box for the Group you wish to choose. A device can belong to more than 1 group if required.

#### Keyboard entry



This is the Keyboard that will appear for data entry throughout the program

#### DALI OPERATING

A Series of tools to allow the installer to perform time saving operations.



The "Identify Command" causes the fitting to flash its LED status indicator with the 6 bit structure of the physical Short Address as set In the device

Time Setting Page



Touch the Clock Face to select the time setting page

The Clock Setting offers a keyboard entry requiring date and time to follow the format 20YY-MM-DD HH:MM:SS Remember to press the 'OK' key when finished.

#### Resetting to Factory Defaults



When resetting to Factory Defaults this screen will display to prevent the User making the Change in error.

Defaulting, as the name suggests, deletes all data and history. This cannot be reversed!

#### Touch Screen Calibration,

Like all touch screens the SEMM requires the screen to be calibrated. This is essentially lining up the points on the picture displayed on the screen, with the plastic touch membrane, overlaying the screen.

In this process the User will be shown 5 points, one at a time. The 4 corners and then the very centre. Simply touch each point in turn and the firmware in the screen will align the relationships between image and touch point and store the results.

#### Ethernet Configuration ---- LAN SetUp



For Setting your Network Characteristics.

Touch the section your wish to change and the Keyboard will come up for input

The MAC Address of this device is shown here

#### **Password Resetting**



The Default password is 123456
To change the password, complete the fields shown

Remember your password, and write it down for safe keeping

#### In the Event of Finding a Failure



This indication shows there is some attention needed on the system. This indication will not extinguish (there is no timeout). It is designed to make the user take action Touch for ... The Status Page

On the Status page you will find the status, and therefore any errors, for all the connected DALI Devices.

Some not so common indications that you may find are: >Type Error -- The Device is not DALI Device Type 1 >Framing Error - There are 2 devices on the network with the same Short Address.

#### **SEMM SOFTWARE UPDATE**

You will need to come here at the direction of Technical Support. You come here from the Setting Page >> Software Maintenance



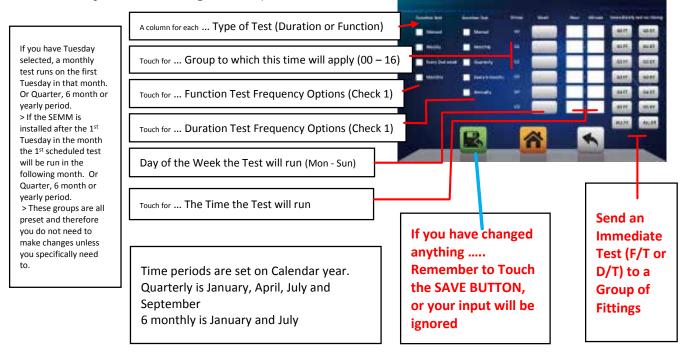
To use this function, you will need a file sent to you by Technical Support
The Tech Support team will guide you through the process.

The process uses the USB connector at the front of the touchscreen (under the front cover .. which you will remove to complete the process.)

The Current Version shows the version of firmware in the touchscreen now. The Latest Version shows the version in the USB delivered file provided by Tech Support.

#### **Group Settings**

Time & Day for the Testing to take place



# Using the Night Light Schedules Using the Inhibit Mode Scheduling

You come here from the Maintenance page

Enables The User to take advantage of DALI programming to Operate some lights as <u>Night Lights</u>. To enable this clever enhancement, simply set the fittings you wish to turn on and off at the scheduled times to Group 7. (Along with the other Groups that may Apply to this fitting.



<u>Inhibit mode scheduling</u> can be enacted for fittings in Group 8. This schedule will trigger inhibit On and Off at the allotted times.

#### **PRINTING**

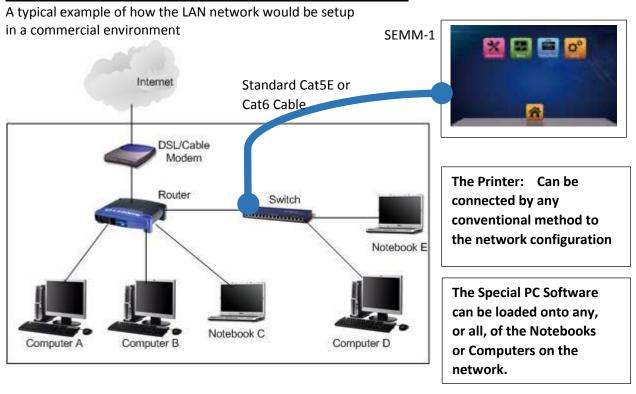
We really don't PRINT directly:

The process is to connect a PC to the SEMM via the LAN network and Using some special software on the PC, connect to the SEMM and The software will create an Excel file on the PC This file can be reviewed, copied, stored and printed exactly as any other Excel file.

Firstly, let's get connected:

#### Connect a PC via a LAN network, ....

#### This will be the normal way the controller will be connected.



With the Network cabled in, let's set the SEMM-1 Network screen variables.

The PC software performs thisstep for you automatically.

When you come to this screen on the SEMM it will already be filled in.

#### LAN SetUp



The Network characteristics (Addressing) are self setting

You get here from the Setup Page >> Setup >> Ethernet Setup

The MAC address of this device is provided for reference only.

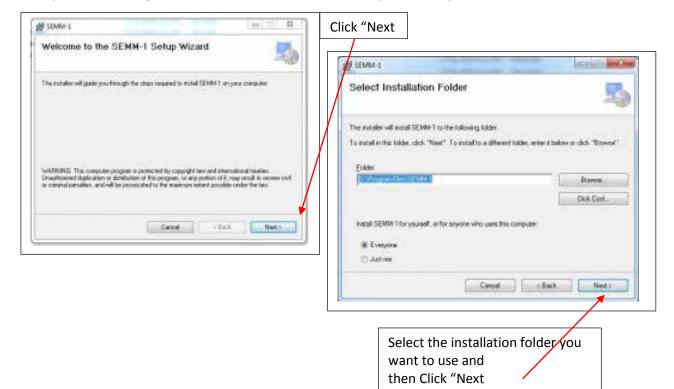
#### Loading the Printing Program onto your PC

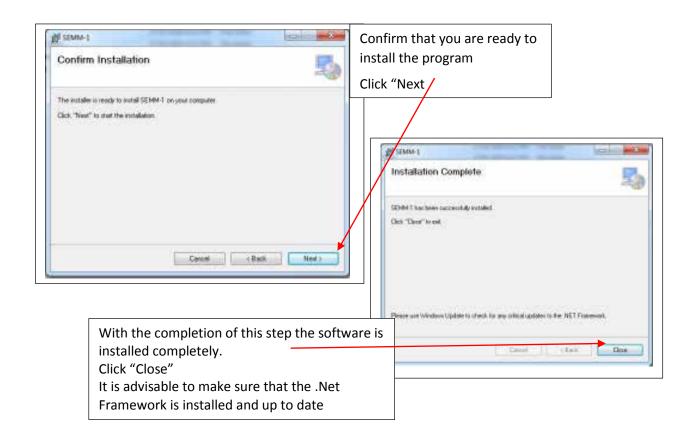
So now you are connected, and the SEMM LAN Connection is addressed ... let's load the program onto the PC ....

You need to have a copy of the program, which can be downloaded from your SEMM system supplier, or contact their sales office

Download or copy that program to your Desktop and Execute the Setup File in the normal fashion for your Operating system

The operation is straightforward and it will leave an Icon on your desktop.







There will be an Icon on your Desktop which starts the Data retrieval program.

Double Click to run it.

# Start the Program.

Program Home Page

The program will search for devices on the network. Make sure your SEMM-1 has a valid network address If no devices are found you will see this:





Program Home Page When all is normal this will be the Home Page you will see

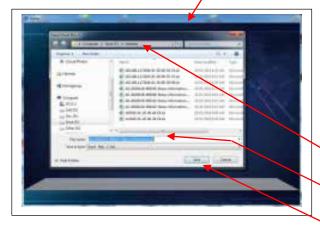
#### REPORT PRINTING: STATUS

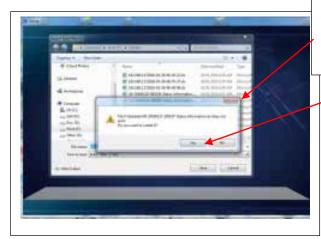
Press "Status" and this is what will be presented.

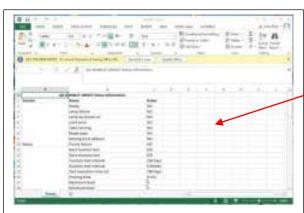
The Program is looking for the address you want to print.

Enter the short address here

The resulting page is like this:









The system will automatically create the following file: Its name format is:

ShortAddress-YearMonthDay-HourMinuteSeconds-Status information.xls

The User needs to confirm the location on the PC System where the file will be stored

If you would rather a different name for the file .... Now is the time to create it.

Once you Confirm creation with pressing the "Save" option, the program checks there is no file of a similar name in the location you have chosen. It then calls for Confirmation to create the file.

If all okay .... Press "Yes"

#### Special Note:

The user can change the file names to anything required. However we think that allowing the program to name the file by default ensures the file is easy to find

So upon pressing the Confirmation the file is created and then Excel is opened automatically and the file is displayed.

#### **EXCEL STATUS DISPLAY**

Opening the Excel file shows the data as recorded from the Device at the time stamped in the file name.

Now the User can choose to review the file on the screen or print as required

#### **PRINTING: TEST Results**



REPORT PRINTING: TEST RESULTS

From the Home Page Pressing "Test Results"



Pressing "Test Results" will bring up this display. Each device address displayed in numeric sequence.

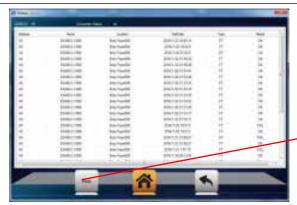
Choose a device by Touching/click on the line required. Once the line is selected the line selected will be highlighted.

Now the User can Choose "Details" or "Print"

<u>Details</u>: Jumps to a display of all the recorded tests for that Short Address.

<u>Print</u>: Starts the printing (Excel file development) of that entry, as selected.

#### Result of Pressing "Details"



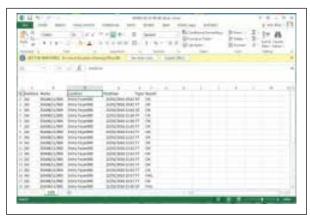
And then "Print"



Remember to check the file locations and names As was mentioned above.

Once the file is displayed by the Excel program the User can review the data on the screen or print the file as required.

Since the file is a standard Excel file it can be transported easily by disk or email.



# Our Range of Fittings that can be used with the SEMM

# **ESA Range EXIT Fittings**













#### Standard Feature

- · Compact retangular shape and decorative
- ABS housing
   Quick connection and easy installation (Ref ESA08)
- Single and Double face universal
- Replaceable pictogram design
   Bright SMD2835, CCT 6000K
   Input voltage 220-240V 50Hz

- Ni-Cd or Ni-Mn battery
  Maintained or Non-Maintain for 1hour or 3 hours
  Escape sign Max 1M long suspending wire
  (Suspended mounting)
  Wall mounting or Flush mounting
  Viewing distance: 30M
  MIZEO. Exhausters.

- IP20, Rohs compliant
   Auto test function optional.

#### Pictogram Insert









LUPG 41

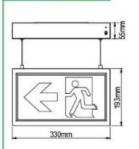


LUPG 33





#### Optical specification



45mn



# Gamma W (Exit sign)











#### Standard Feature

- · Compact and decorative design (Snglf size unit)

  • ABS bouning

  • Quick connection and easy metallishon

- Single face
   Replacostile pictogram divigin
   Begin SMI2835, OCT 8000K
   Input voltage: 220-247V 5/84e

- No Cd or N-Mh butlery
  Maintained or Non-Maintain for Shour or 3 hours
  Wall mounting or Flash recenting
  Viewing distance: 24M
  IPSS, Rote compliant
  Auto best function optional.

#### Pictogram insert





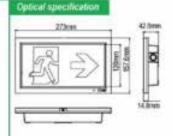






GMPC 33







180

Battery



Battery

LED Driver

LED Driver



**END OF DOCUMENT**