Interactive-Intelligence
Embedded Controller
16A

Embedded Interactive Intelligence Installation Manual

Embedded Interactive Intelligence Installation Manual

Printed: November 2021.

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Foreword

Important: Retain these instructions

These instructions shall be used by trained service personnel only.

If the equipment is used in a manner not specified by these instructions, the protection and operation provided by the equipment may be impaired.

Part I

Introduction

1 Introduction

1.1 Preamble

This manual is intended for use by trained systems integrators, oem's and any other Toshiba Carrier UK trained persons who need to install or manage a ***Interactive Intelligence Embedded Controller*** device from the ***Interactive Intelligence®*** series of controllers. The information contained herein is current at the time of publication but may be updated or added to at any time.

The ***Interactive Intelligence Embedded Controller*** device is a fully programmable multi protocol controller with the following features::

- Freely Programmable
- 8 MB User application memory
- 2 GB Storage for logs and graphics
- Ethernet
- Embedded HMI / SCADA functionality
- Data Logging facilities
- Alarm Handling and Re-transmission
- Logs & Alarm Emailing client
- Configurable I/O.
- PID Loops
- Function Modules
- Logic Modules

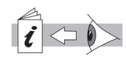
Some of the protocols that the ***Interactive Intelligence Embedded Controller*** can communicate with are:

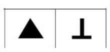
- BACnet MS/TP
- BACnet IP
- Modbus/ModbusIP
- Certain Toshiba® U3/U4 - UH based devices
- Crestron®
- Lutron®
- Trend® IQ1®, IQ2®, IQ3®, IQ4® (CNC, EINC, VNC)®
- iLIGHT®
- SNMP
- Ethernet
- SMS Alarm Messaging (with gsm modem)

Contact Controls@Toshiba-AC.com for an updated list of supported protocols.

1.2 Information Icons

Icons and information labels used within this document

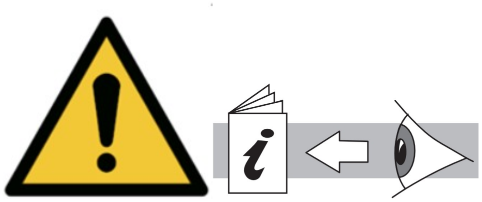
 **Caution, consult documentation**	 **Caution, possibility of fire**	 **Caution, possibility of electric shock**
 **Caution, observe static precautions**	 **Information**	 **Read manual completely**

 **Analog and Digital Inputs**	 **Analog Outputs**	 **Digital Outputs**
 **Expansion Connector**	 **RS485 Connector**	 **Power Input**
U3 U4 **U3/U4 - UH Connector**		

1.3 Aims

This manual will guide you through the steps needed to install and configure the hardware of a ***Interactive Intelligence Embedded Controller*** controller and how to wire to the various I/O ports.

The controller contains a basic unit control program for more advanced functionality please contact Toshiba Carrier UK.



Please read all of this instruction manual before installing or operating the device.

In case of any questions after reading this document, please contact the Toshiba Carrier UK Support Team at Controls@Toshiba-AC.com.

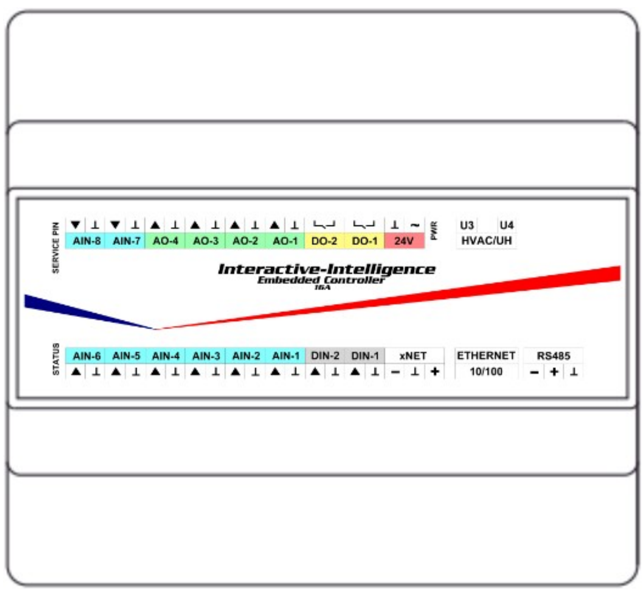
1.4 Prerequisites

This manual will not cover items outside of the scope of the ***Interactive Intelligence Embedded Controller*** device. Readers are expected to have an existing working knowledge of the following as required...

- U3/U4 - UH network installation
- RS485 network installation
- Ethernet network installation
- TCP/IP Networking
- Modbus
- BACnet
- Other systems as required.

1.5 Box Contents

The protective cardboard box contains one Interactive Intelligence Embedded Controller with connectors.



1.6 Environmental Protection

Disposing of packaging:
The packaging materials are environmentally compatible and can be re-cycled.

WEEE Directive:
At the end of their useful life the product should be disposed of by a suitable recycling centre.
Do not dispose of with normal household waste.
Do not burn.

1.7 Maintenance

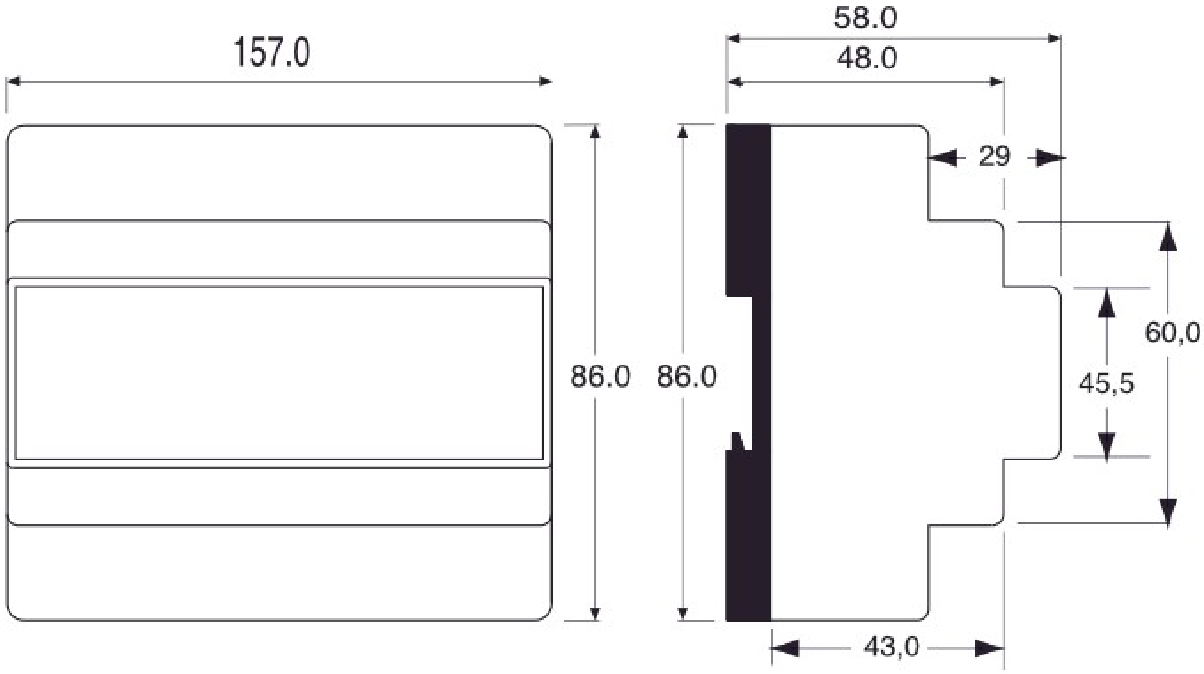
WARNING: Contains no serviceable parts.

1.8 Specifications

Power supply	DC: 30–36 V; AC: 24 V ±10%		
Universal inputs	8 x voltage, current, resistance, dry contact		
Digital inputs	2 x dry contact input, pulse counter		
Analog outputs	4 x 0–10V DC output, maximum load up to 20 mA per channel, 80 mA maximum total load for analog outputs		
Digital outputs	2 x relay output	Maximum ratings	
	Resistive load max.	1 A @ 24 V AC 1 A @ 30 V DC	
	Inductive load max.	2 VA @ 24 V AC 8W @ 30 V DC	
Interface	RS485, Modbus or BACnet, up to 128 devices on the bus Ethernet, Modbus TCP/IP or BACnet IP		
Address	Set by software in range from 0 to 254		
Baudrate	Set by software in range from 2400 to 115200 bps		
Ingress protection rating	IP20 for indoor installation		
Temperature	Operating: –10°C to +50°C (14°F to 122°F) Storage: –25°C to +60°C (–13°F to 150°F)		
Relative humidity	0 to 90% RH (without condensation)		
Connectors	2 Part, max 2.5 mm² (18 – 12 AWG)		
Dimension	157x86x58 mm		
Mounting	DIN rail mounting (DIN EN 50022 norm)		
Housing material	Plastic, self-extinguishing PC/ABS		

1.9 Dimensions

Enclosure dimensions in millimeters without connectors plugged in.



Part II

Installation

2 Installation

2.1 Installation Guide

WARNING:

- Before wiring or removing/mounting the product, make sure to turn the power off. Failure to do so might cause an electric shock.
- Improper wiring of the product can damage it and lead to other hazards. Make sure that the product has been correctly wired before turning the power on.
- Do not touch electrically charged parts such as power terminals. Doing so might cause an electric shock.
- Do not disassemble the product. Doing so might cause an electric shock or faulty operation.

WARNING:

- Use the product only within the operating ranges recommended in the specification (temperature, humidity, voltage, shock, mounting direction, atmosphere, etc.). Failure to do so might cause a fire or faulty operation.
- Firmly tighten the wires to the terminal. Failure to do so might cause a fire.
- Avoid installing the product in close proximity to high-power electrical devices and cables, inductive loads, and switching devices. Proximity of such objects may cause an uncontrolled interference, resulting in an instable operation of the product.
- Proper arrangement of the power and signal cabling affects the operation of the entire control system. Avoid laying the power and signal wiring in parallel cable trays. It can cause interferences in monitored and control signals.
- It is recommended to power controllers/modules with AC/DC power suppliers. They provide better and more stable insulation for devices compared to AC/AC transformer systems, which transmit disturbances and transient phenomena like surges and bursts to devices. They also isolate products from inductive phenomena from other transformers and loads.
- Power supply systems for the product should be protected by external devices limiting over voltage and effects of lightning discharges.
- Avoid powering the product and its controlled/monitored devices, especially high power and inductive loads, from a single power source. Powering devices from a single power source causes a risk of introducing disturbances from the loads to the control devices.
- If an AC/AC transformer is used to supply control devices, it is strongly recommended to use a maximum 50 VA Class 2 transformer to avoid unwanted inductive effects, which are dangerous for devices.
- Long monitoring and control lines may cause loops in connection with the shared power supply, causing disturbances in the operation of devices, including external communication. It is

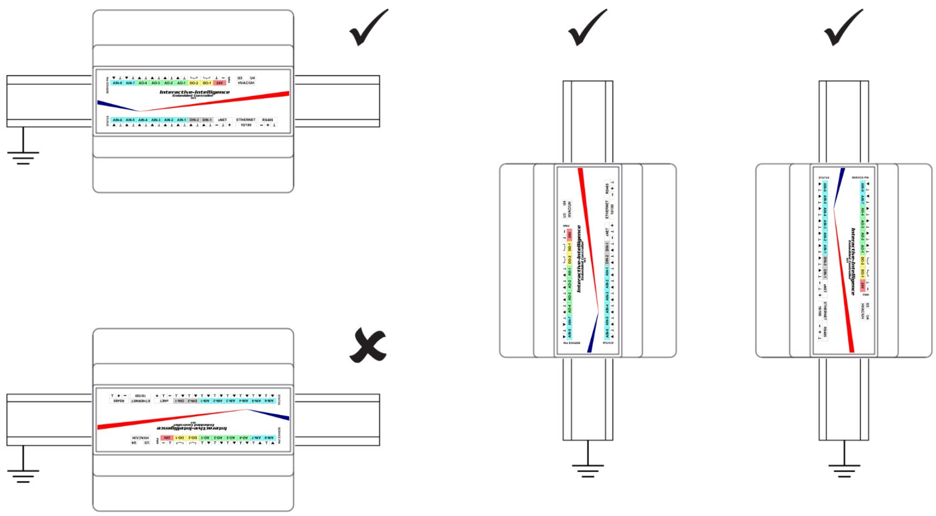
recommended to use galvanic separators.

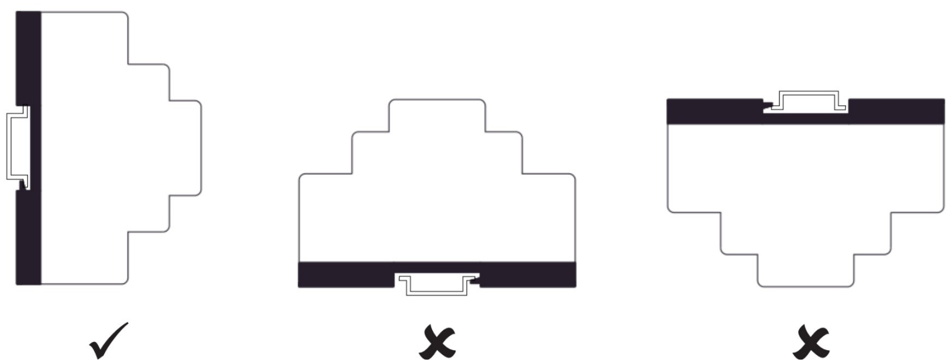
- To protect signal and communication lines against external electromagnetic interferences, use properly grounded shielded cables and ferrite beads.
- Switching the digital output relays of large (exceeding specification) inductive loads can cause interference pulses to the electronics installed inside the product. Therefore, it is recommended to use external relays/contactors, etc. to switch such loads. The use of controllers with triac outputs also limits similar over voltage phenomena.
- Many cases of disturbances and over voltage in control systems are generated by switched, inductive loads supplied by alternating mains voltage (AC 120/230 V). If they do not have appropriate built-in noise reduction circuits, it is recommended to use external circuits such as snubbers, varistors, or protection diodes to limit these effects.

CAUTION: Electrical installation of this product must be done in accordance with national wiring codes and conform to local regulations.

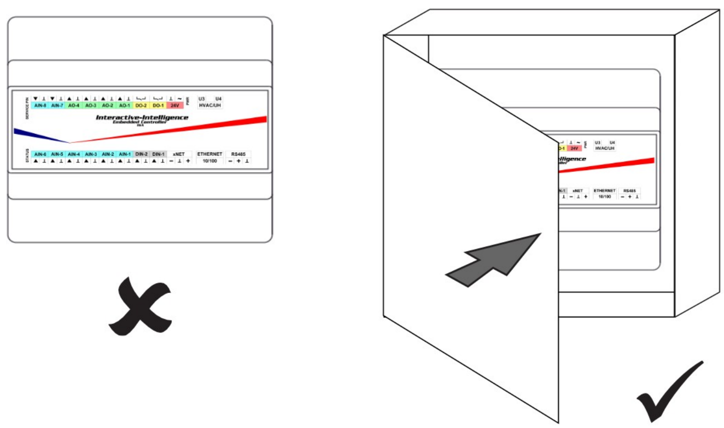
2.2 Mounting Requirements

WARNING: Failure to mount device in an accepted orientation may result in failure or fire.
WARNING: Device should be mounted on DIN rail and the DIN Rail MUST be earthed (grounded) to avoid potential electric shock.

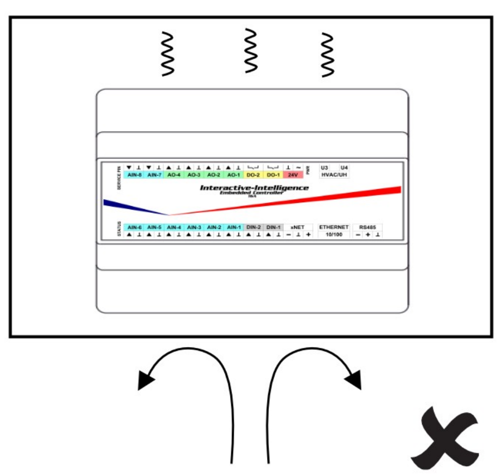




WARNING: Device should be installed in an enclosure or outside normal reach (e.g. in a plenum).



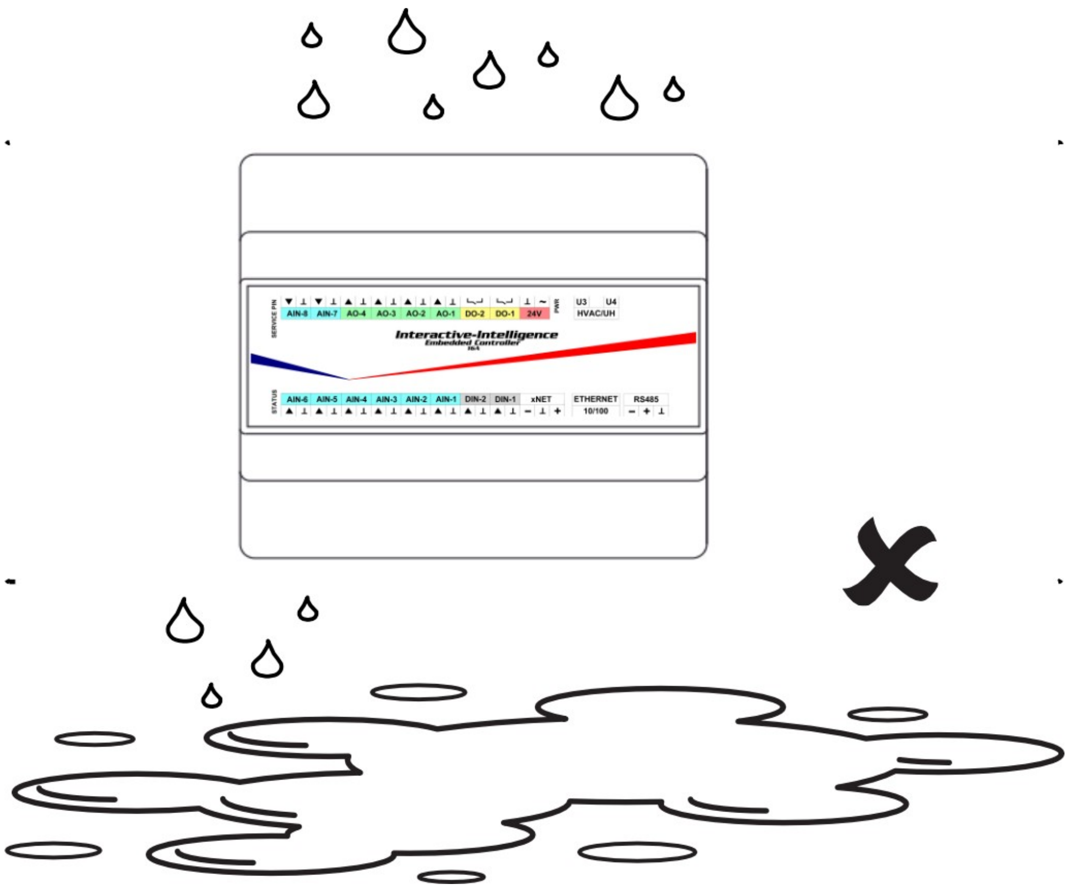
WARNING: Enclosure or chosen mounting place must be ventilated. Failure to meet this requirement may result in failure or fire.



2.3 Environmental Requirements

WARNING: Failure to meet these requirements may result in failure or fire.

Operating temperature range is -10°C (14°F) to +50°C (122°F). Storage temperature range is -25°C (-13°F) to +60°C (150°F).
Operating relative humidity range is 0 to 90% RH with NO CONDENSATION ON OR IN the device.
Storage relative humidity range is 0 to 90% RH with NO CONDENSATION ON OR IN the device.



2.4 Power Requirements

WARNING: Failure to meet these requirements may result in failure or fire.

This device is designed to be powered with either an SELV or PELV supply of 24V AC (+/-10%) or 30V - 36V DC.

- Electrical safety in the building automation and control systems is essentially based on the use of extra low voltage which is strictly separated from the mains voltage. This low voltage is either SELV or PELV according to EN 60730-1.
- Protection against electric shock is ensured by the following measures:

    1. limitation of voltage (low voltage AC/DC 24V supply, either SELV or PELV)
    2. protective-separation of the SELV-system from all circuits other than SELV and PELV
    3. simple-separation of the SELV-system from other SELV-systems, from PELV-systems and earth

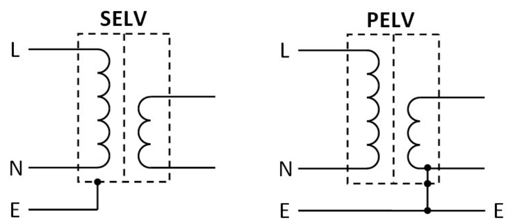
- Field devices such as sensors, status contacts and actuators connected to the low-voltage inputs and outputs of I/O modules must comply with the requirements for SELV or PELV. The interfaces of field devices and other systems must also satisfy SELV or PELV requirements.
- When the supply of SELV or PELV circuits is obtained from supply mains of higher voltages it shall be provided by safety transformer or a converter designed for continuous operation to supply SELV or PELV circuits.

ELV (Extra Low Voltage) is used in order to reduce the danger of electric shock. With ELV the danger of serious harm is significantly smaller when compared to normal mains voltage (e.g. 220-240V in the UK).

Such voltages can be generated with the use of a safety isolating transformer.

Extra low-voltage transformers:

- SELV (separated, electrostatic screen and enclosure is connected to earth/ground, but secondary winding is floating)
- PELV (protective, electrostatic screen, enclosure, and secondary winding are connected to earth/ground)



SELV

In a ***separated extra-low voltage*** (SELV) system the low-voltage output is electrically separated (galvanically) from earth and other systems. Therefore, a single fault cannot create a risk of an electric shock. There should be no provision for earthing of an SELV circuit.

In certain locations, e.g. swimming pools or for medical apparatus it is the only measure permitted. However, because there is always a risk of electric shock then the requirements can be even more stringent, e.g. nominal voltage limited to 12 V AC or 30 V DC.

SELV voltage can be generated for instance from a battery.

However, it can be also generated by means of a ***SELV transformer***, but the construction requires high-integrity equipment and materials. This is in order to ensure adequate isolation from the primary voltage (mains voltage) which is much more dangerous. This is achieved for instance by double insulation or reinforced insulation.

A ***SELV transformer*** must be an isolation safety transformer and must comply for instance with the requirements of EN 61558. The design requires special insulation tests to verify the integration of the construction.

WARNING: By definition, SELV is an unearthed system, so where required overcurrent devices must be fitted in both live conductors.

PELV

In a ***protective extra-low voltage*** (PELV) system there is no separation from earth, but otherwise the system satisfies all other requirements for SELV, including the voltage levels.

In a ***PELV transformer*** (similarly to a SELV transformer) the magnetic core and the enclosure can be connected to earth (see the image).

2.5 Wiring Requirements

CAUTION: Failure to follow these guidelines may result in erratic device or program behaviour.

- Line power cables must be routed with spatial separation from signal and data transmission cables.
- Analog and digital signal cables should also be separated.
- It is recommended to use shielded cables for analog signals, cable shields should not be interrupted by intermediate terminals.
- The shielding should be earthed directly after the cable enters the cabinet.
- It is recommended to install interference suppressors when switching inductive loads (e.g. coils of contactors, relays, solenoid valves). RC snubbers or varistors are suitable for AC voltage and freewheeling diodes for DC voltage loads. The suppressing elements must be connected as close to the coil as possible.

Part III

I/O Configuration, Connections & LED's

3 I/O Configuration, Connections & LED's

3.1 I/O & Connection Overview

CAUTION: Standard electrostatic discharge precautions should be observed when handling the inside of the device to prevent damage.

Analog Inputs

The ***Interactive Intelligence Embedded Controller*** has 8 analog inputs which are *'Universal'* and can be configured to read the following types of signals:

- 0-10 Volts
- 0-20 mA
- Thermistor / Resistive
- Dry contact or TTL compatible switches and relays

The analog inputs are configured using jumpers which are covered later in this chapter.

Any unused analog inputs should be configured as Thermistor / Resistive type to prevent reading errors on adjacent channels.

When using un-powered current sensors an external DC supply must be used to feed the current loop.

Analog Outputs

The ***Interactive Intelligence Embedded Controller*** has 4 analog outputs which output 0-10 Volts @ up to 20 mA each.

Digital Inputs

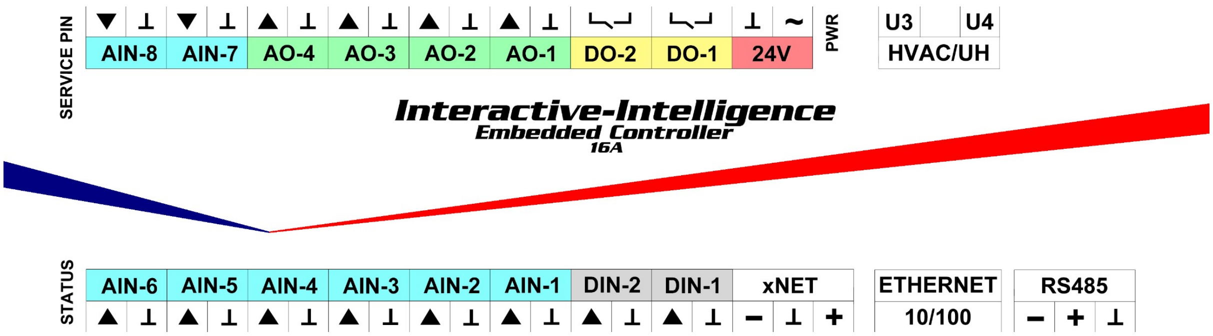
The ***Interactive Intelligence Embedded Controller*** has 2 digital inputs which can be driven by dry contact or TTL compatible switches and relays. These inputs can also be used as pulse counters.

Digital Outputs

The ***Interactive Intelligence Embedded Controller*** has 2 relays with normally open contacts.

Connections

The ***Interactive Intelligence Embedded Controller*** terminal layout is displayed in the following image:

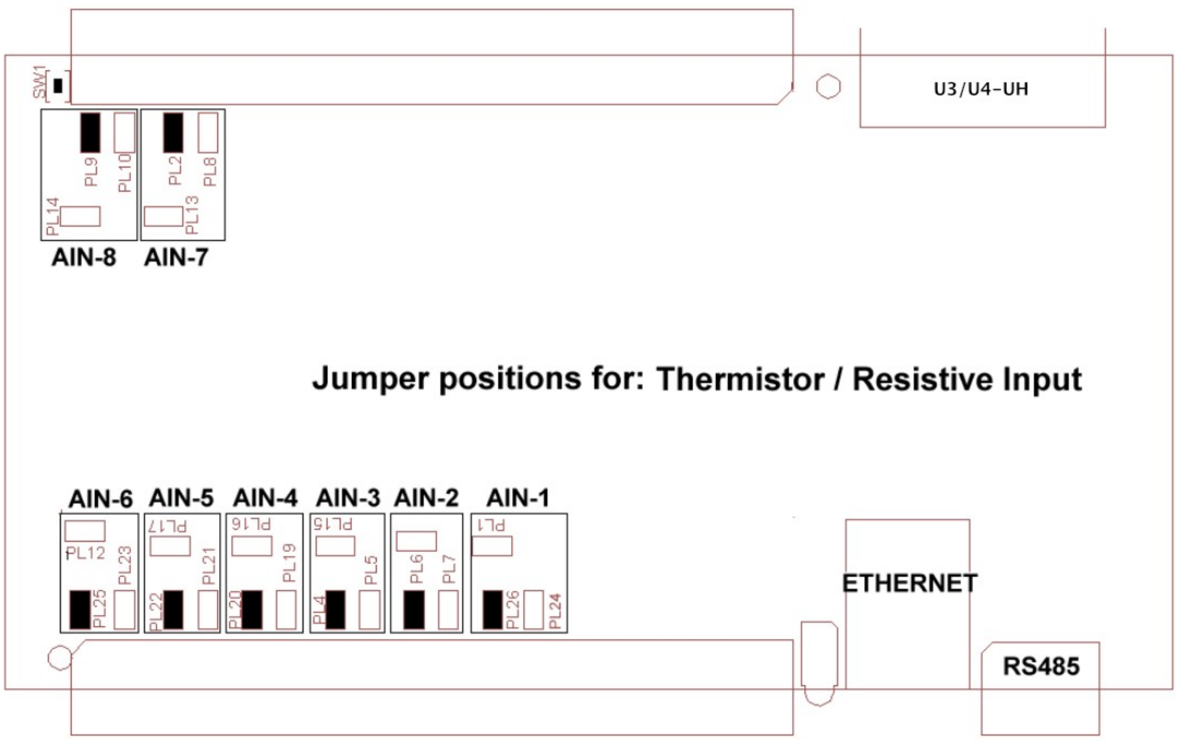


3.2 Analog Input Jumper Configuration

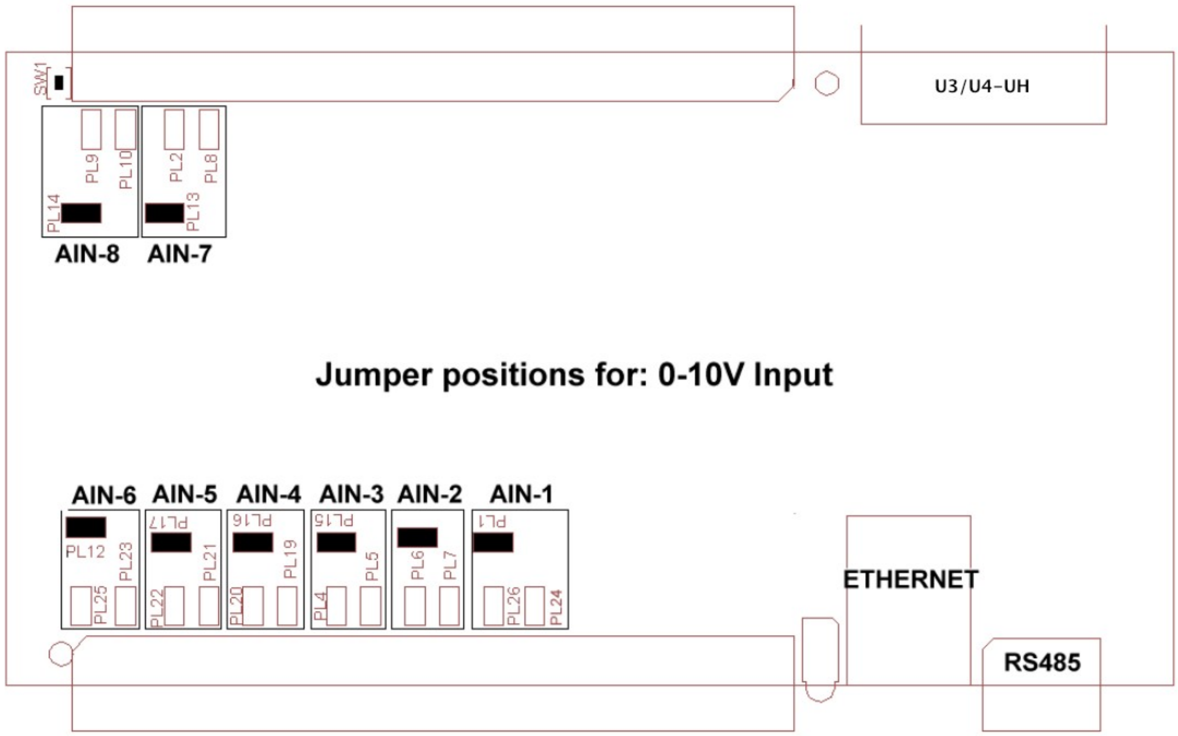
CAUTION: The analog inputs must be jumpered to correctly match the input signal. Failure to do so may damage the device.

As factory supplied all of the analog inputs are jumpered as Thermistor/Resistive inputs. The jumper '*on positions'* are denoted by a black fill and are summerised in the following diagrams:

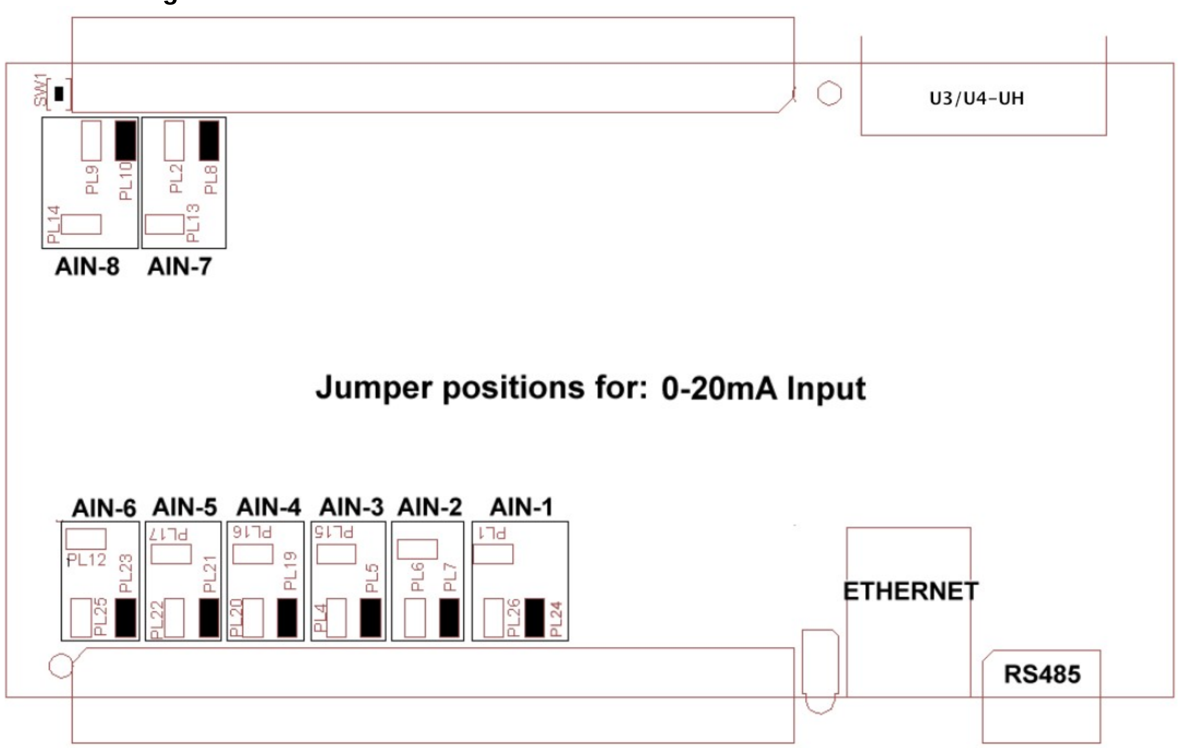
For Thermistor, Resistive & Dry Contact signals:



For 0-10V signals:



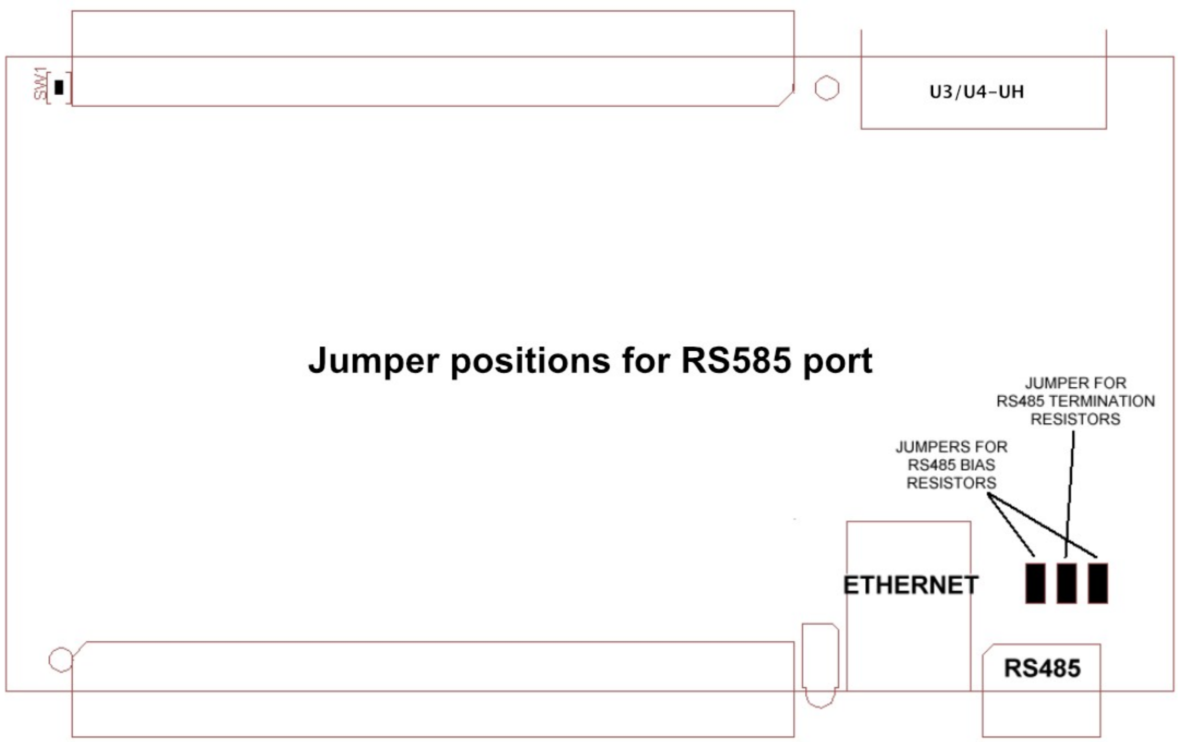
For 0-20mA signals:



3.3 RS484 Jumper Configuration

For correct RS485 communication there should be at least one set of bias resistors connected on the network bus. To enable the bias resistors, fit both of the bias resistor jumpers onto the linked position. Depending on the length of the network there may need to be further bias resistors fitted at different locations on the network bus.

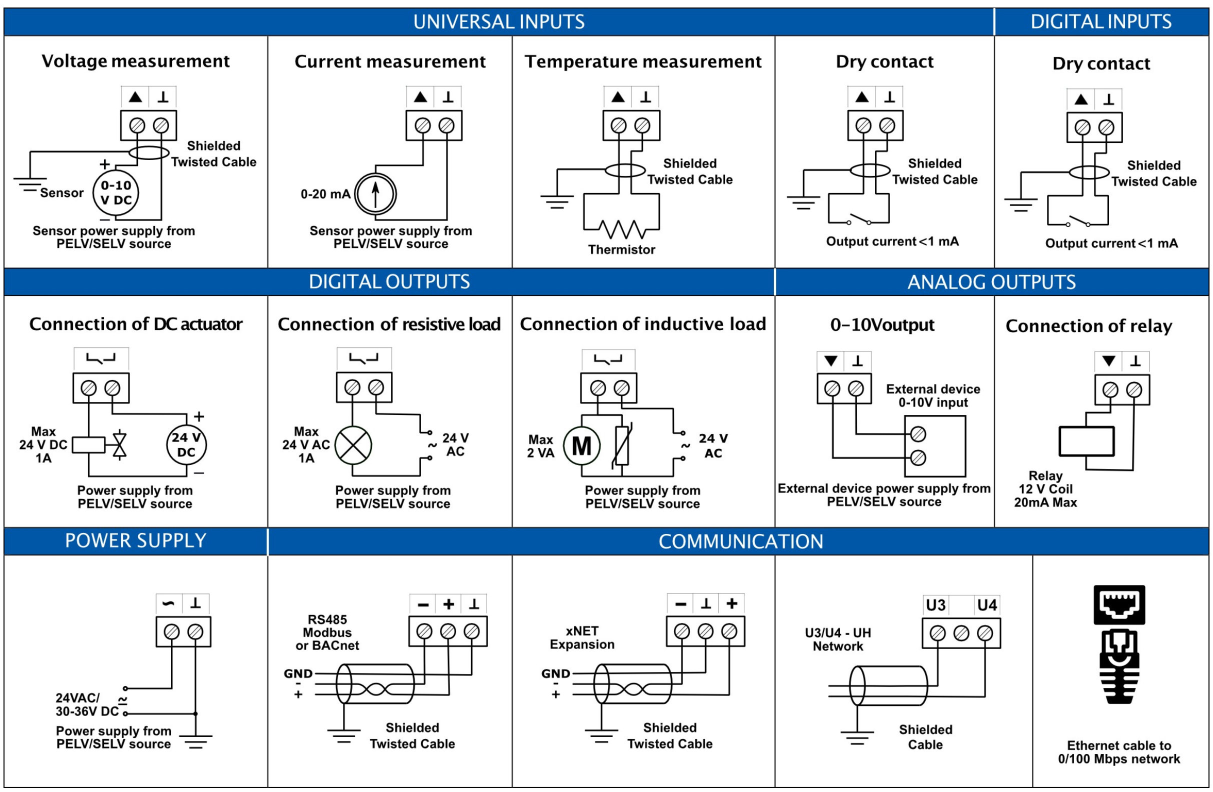
There must always be termination resistors fitted at each end of the network bus. If this device is located at one end of the network bus, the termination resistor jumper link should be fitted. There should also be a termination resistor fitted at the far end of the network. If the far end device does not have bias resistor capability, you should fit a 120 ohm resistor across the RS485 + & - connections (not GROUND).



3.4 Connection Detail

WARNING: Failure to correctly connect to the device may cause device failure, fire or electric shock.

The following diagrams show how to connect to the various I/O and communication ports.



3.5 LED Functions

LED's indicate various operating conditions of the ***Interactive Intelligence Embedded Controller*** and are described below:

PWR

- A solid green light indicates that the device is powered.

STATUS

- An error condition or an un-programmed device will cause the LED to flash fast (on/off every 250ms).
- During normal operation the LED will flash once a second.
- While the device is self programming its flash memory after a firmware upgrade the LED will go RED. **THE DEVICE MUST NOT BE POWERED OFF WHILE THE STATUS LED IS RED.**

3.6 Service Pin

The SERVICE PIN BUTTON is used to reset the device back to factory default settings and erase the programmed strategy.

To effect a factory rest, power the device off, hold down the service pin button and power the device while keeping the button held down for 15 seconds.

3.7 Ethernet Port

The ethernet port supports 10Mbs or 100Mbs connections and should be connected to a suitable ethernet switch.

The ethernet port is used for:

- Configuration
- Programming
- SCADA access
- Emailed alarms
- Emailed logs
- OSS-NG alarm transmission
- NTP
- Any supported IP or Ethernet based protocols

Future firmware upgrades may add functionality and protocol capability to this port.

3.8 U3/U4 - UH Port

The U3/U4 - UH port is used for:

- Connecting to devices on the U3/U4 - UH network.

Future firmware upgrades may add functionality and protocol capability to this port.

3.9 RS485 Port

The RS485 ports is used for:

- BACNET MS/TP
- MODBUS IP
- Any other supported RS485 serial based protocol.

Future firmware upgrades may add functionality and protocol capability to this port.

Part IV

IP Settings

4 IP Settings

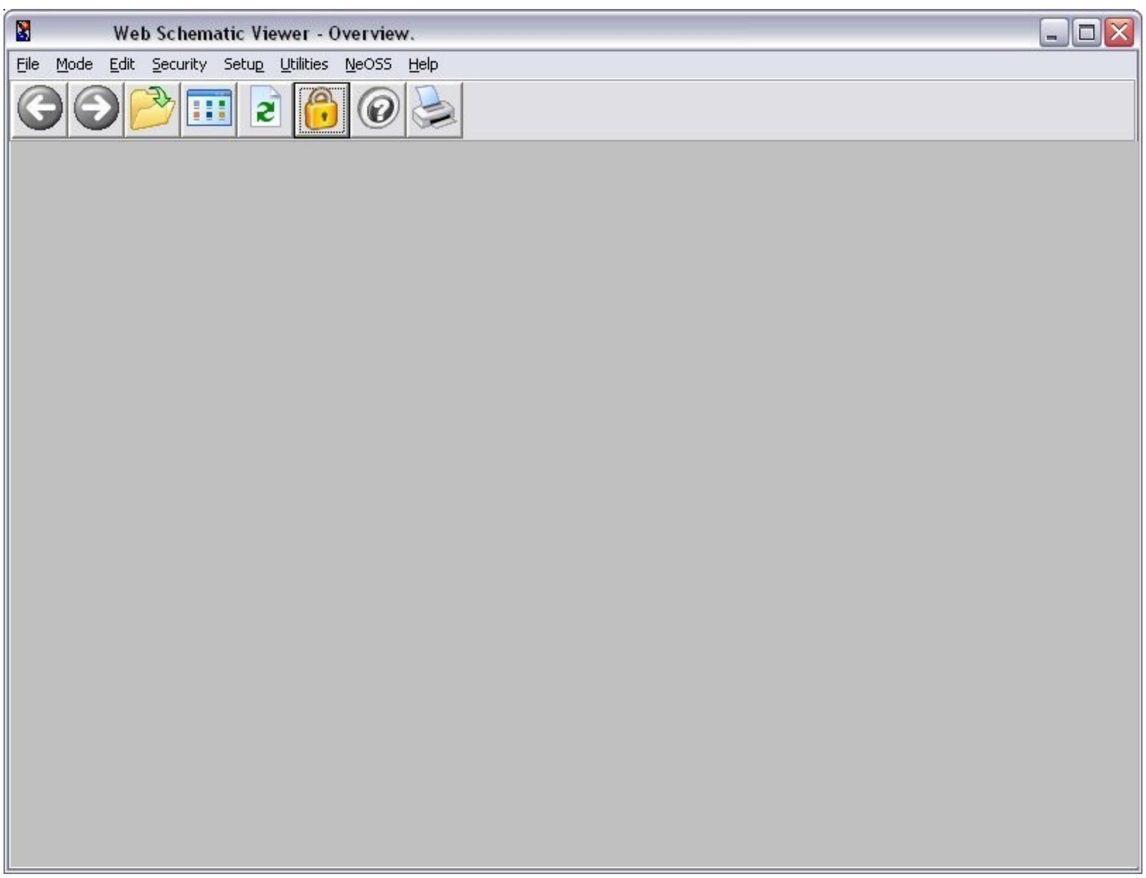
4.1 Connect and Log On

An ActiveX control for Internet Explorer and Edge can be downloaded from this link: Web Access Control

This control should be installed and works with Microsoft Internet Explorer and Microsoft Edge in Explorer mode. When a strategy is uploaded to the controller, HTML schematics can be included that allow access from any browser without the control.
Once you have a device powered up and on your network, use Internet Explorer to connect. The default connection information for a new device is...

- **IP Address:** 192.168.11.22
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 0.0.0.0
- **DNS Server:** 0.0.0.0
- **Default UserName:** admin
- **Default Password:** password

Each ***Interactive Intelligence Embedded Controller*** has a unique MAC address that can be located on the rear of the enclosure.
Upon connection a web page will open, the web page will display some text that says "*Click Here To Logon*".
Once connected and logged on, a access window will open.

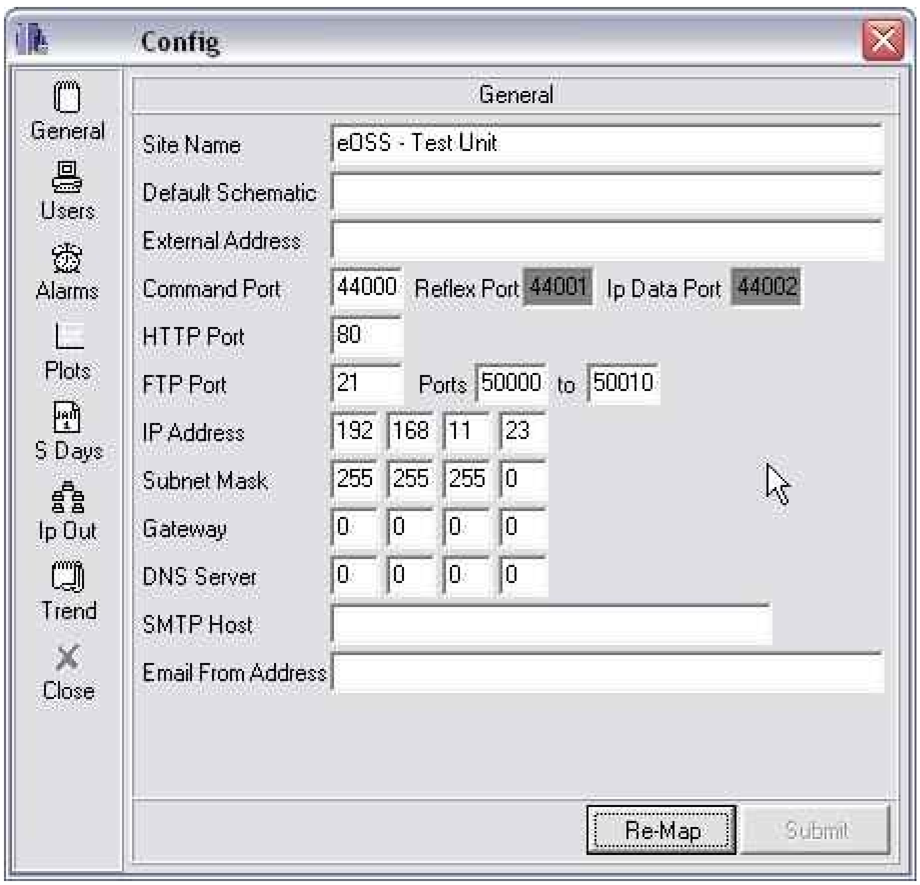


From here you can change the configuration settings of the device.

4.2 System Configuration

From the *NeOSS* menu select *Configuration*.

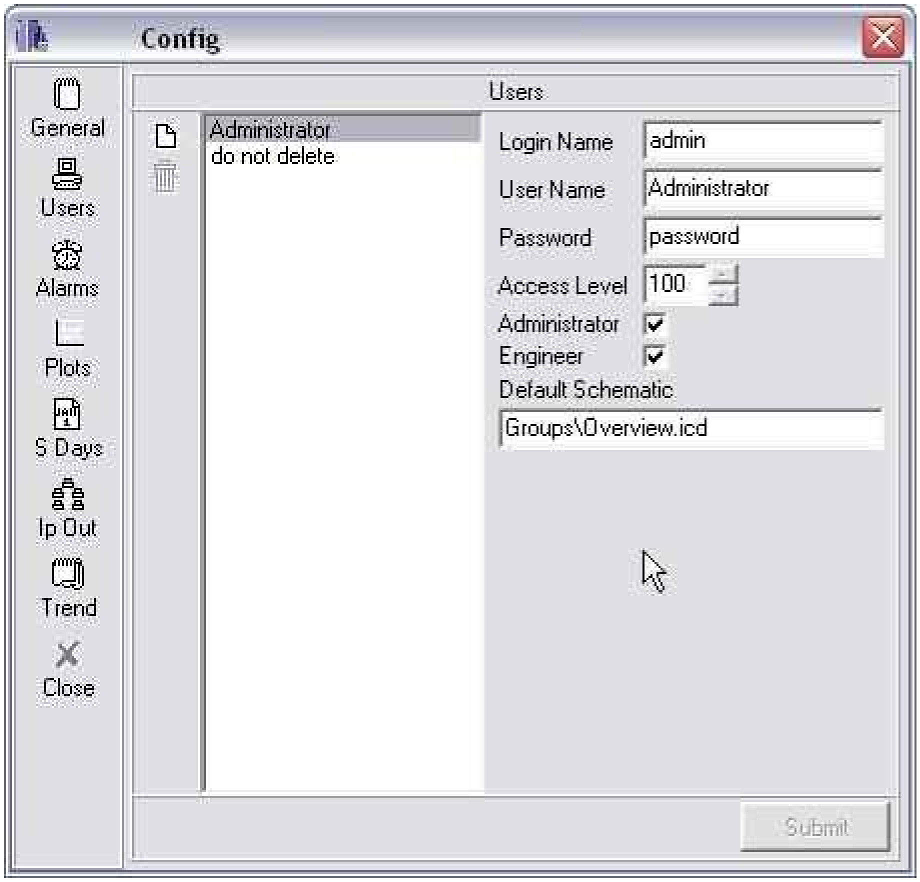
You will then be asked to log on again after which the following screen will be displayed.



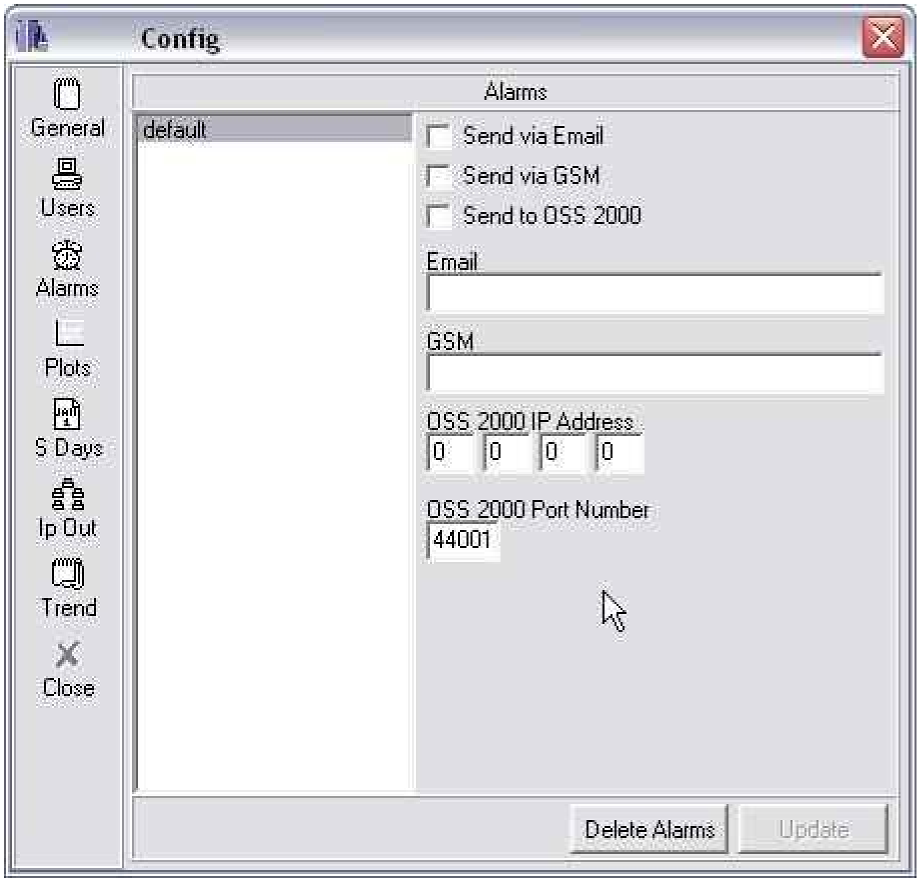
Each of the buttons on the left will take you to the corresponding config screen. The Close button will close the config screens and if necessary will re-boot the device.

If the device is to be used to monitor Emerson devices, the Re-Map button will be enabled. This will search a network and find Emerson devices and auto generate a project and supporting schematics.

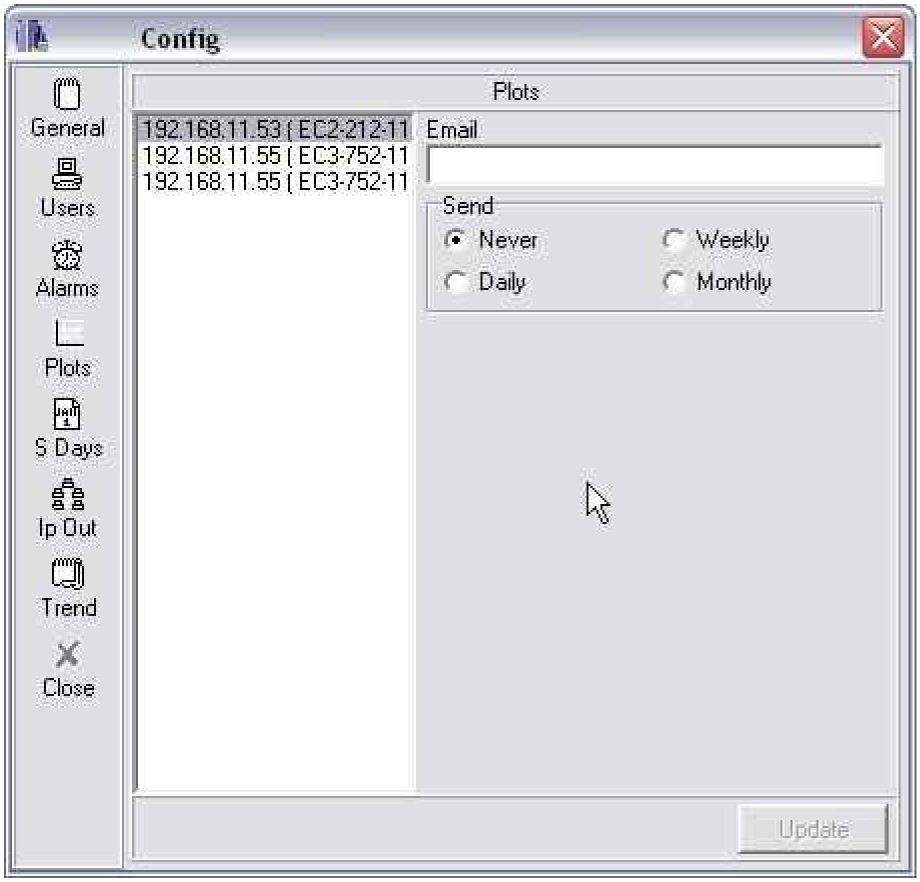
The *General* screen allows you to configure basic setup information for the device as shown in the screenshot above.



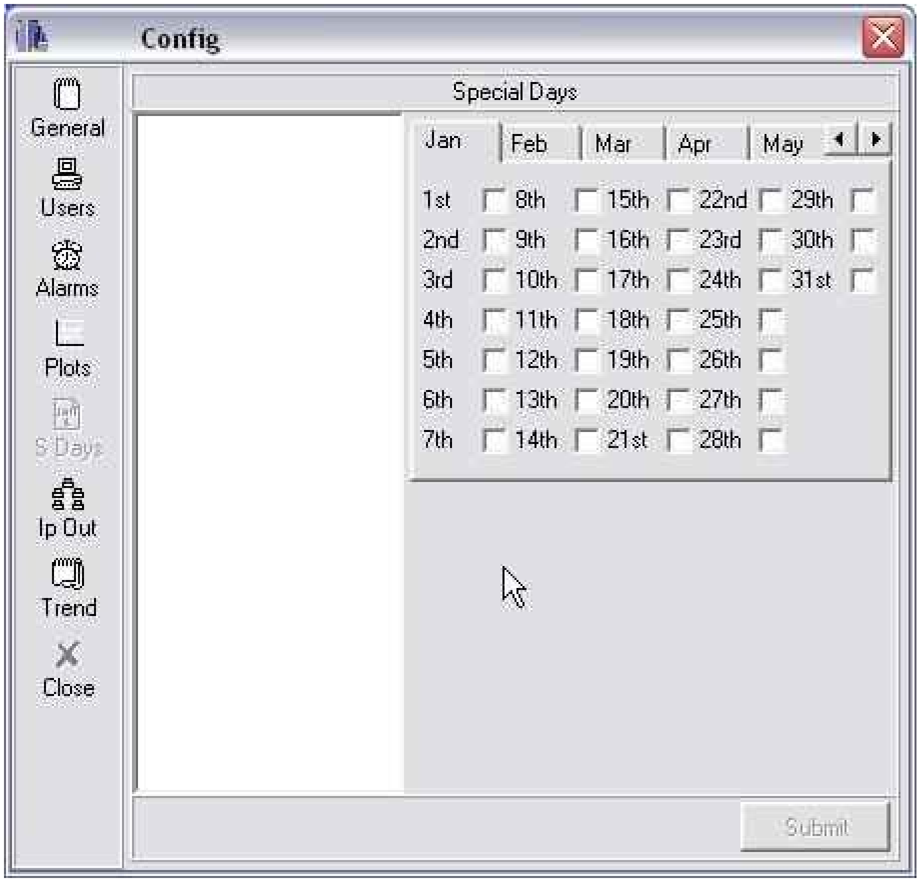
The *Users* screen allows you to manage the user database. Option buttons are available to add or remove a user. Access level is used for data point access on schematics. An administrator may add or remove users and an engineer can access all configuration options. Default schematic is the schematic to present when the selected user logs on.



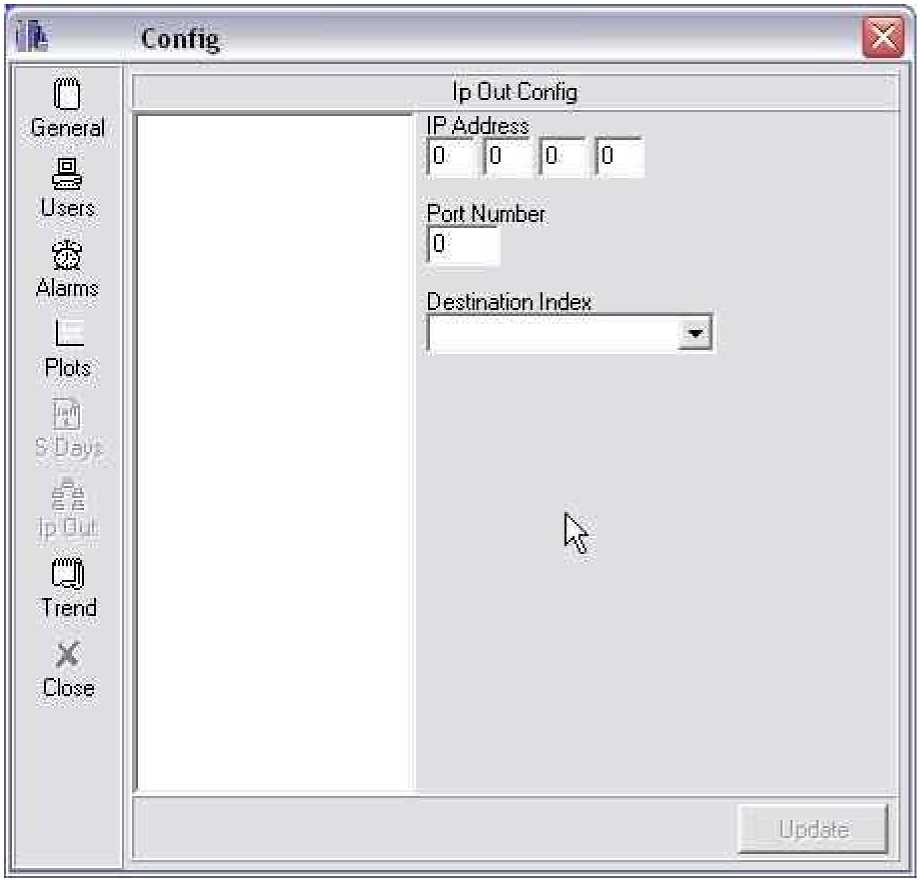
The *Alarms* screen allows you to configure re-transmission options for alarm groups.



The *Plots* screen allows you to configure when plots are emailed out.



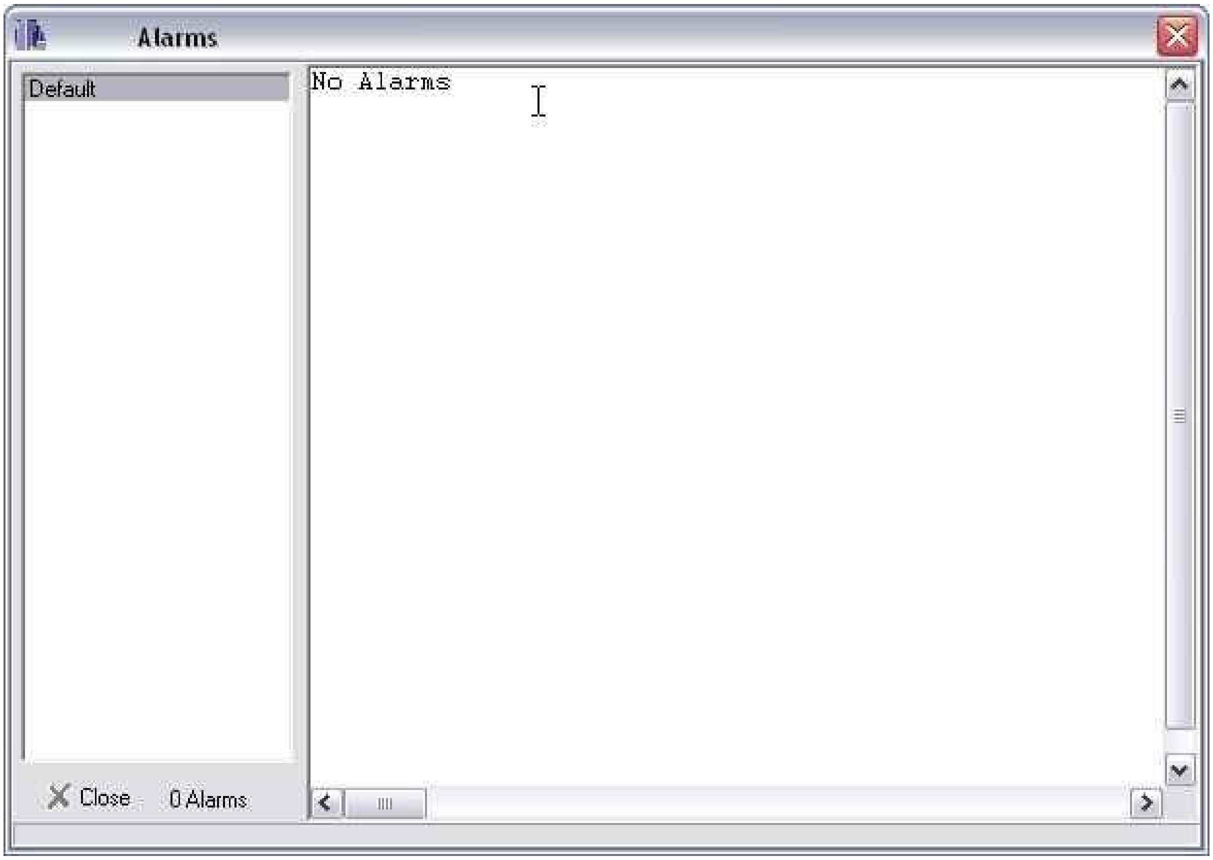
The *Special Days* screen allows you to setup any special day objects with the required dates.



The *Ip Out* screen allows you to set the destination of any IP output objects.

4.3 Alarms

Selecting the *NeOSS/Alarms* menu option will present the following screen.



Any alarms on the Interactive Intelligence Embedded Controller device will show up in this screen.

Part V

License's & Warrenty

5 License's & Warrenty

5.1 End User License Agreement

You have acquired a Interactive Intelligence Embedded Controller Controller (“Device”) that includes software licensed by Toshiba Carrier UK from one or more software licensors (“Toshiba Carrier UK Software Suppliers”). Such software products, as well as associated media printed materials and “online” or electronic documentation (“SOFTWARE”) are protected by international intellectual property laws and treaties. The SOFTWARE is licensed, not sold. All rights reserved.”

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5.2 Warranties and Liability

Contact Toshiba Carrier UK for warranty information.