BACIX

RAPIX to BACnet/IP Gateway

Quick Start User Guide

IEL-BACIX-RW

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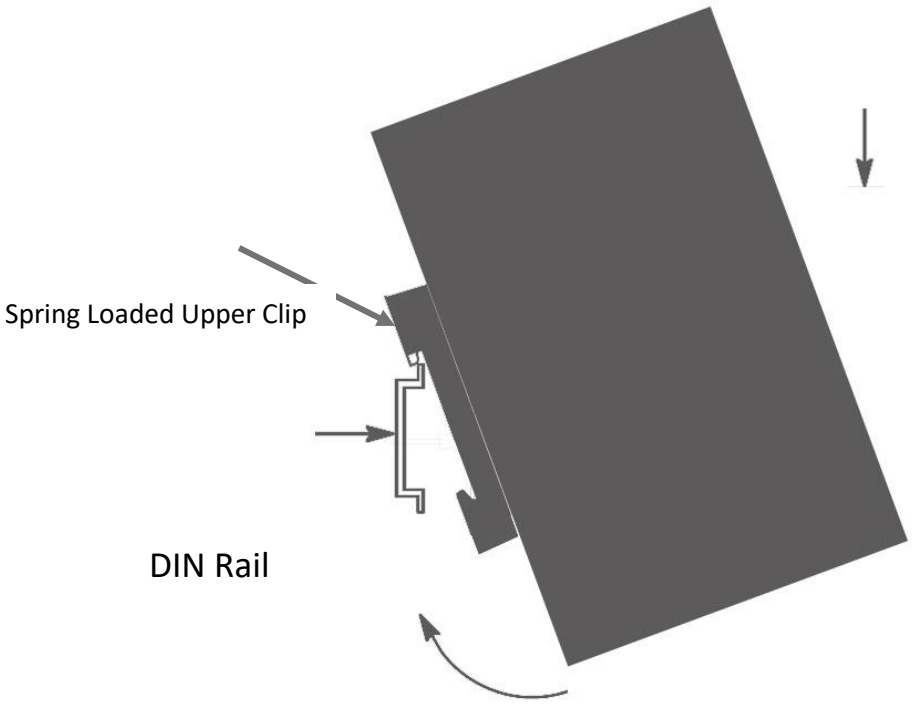
REV	DATE	DESCRIPTION
1.0	26/09/2018	Product Release

Mounting on DIN Rail

Installing the device:

Follow these steps to install your interface converter.

1) Mount your DIN Rail;
2) Hook the top mounting flange over the DIN Rail;
3) While pressing the gateway against the rail, press down to engage the spring loaded upper clip and rotate the unit parallel to the DIN Rail;
4) Release downward pressure.



Removing the device:

Follow these steps to remove your interface converter.

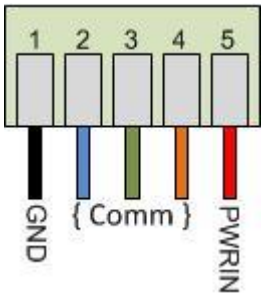
1) Press down on unit to engage the spring loaded upper clip;
2) Swing bottom of unit away from DIN Rail.

Powering the Gateway

Upon removing the device from the box you can either power the device via the supplied power adapter or tinned soldered bare end fly-lead. If wiring to the terminal strip ensure correct polarity (0VDC Terminal 1 & 12-24VDC Terminal 5). See below detail & information.

The following steps will allow you to properly and safely power the gateway.

Warning improper wiring will cause unit failure
Use the Barrel Connector OR the Screw Terminals power connection, NOT both



1) Connect a 12-24VDC power source to the gateway.

- The unit draws 125 mA at 24VDC
- The gateway has a voltage operating range from 8-28VDC. 12-24VDC is recommended.

Hazardous Environment Power & Installation Instructions

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D, or non-hazardous locations only.

WARNING – EXPLOSION HAZARD - Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

WARNING – EXPLOSION HAZARD - Substitution of components may impair suitability for Class I, Division 2.

THIS EQUIPMENT IS AN OPEN-TYPE DEVICE AND IS MEANT TO BE INSTALLED IN AN ENCLOSURE SUITABLE FOR THE ENVIRONMENT SUCH THAT THE EQUIPMENT IS ONLY ACCESSIBLE WITH THE USE OF A TOOL.

WARNING – POWER JACK (Barrel Connector, J1) IS FOR MAINTENANCE USE ONLY AND MAY ONLY BE USED WHILE THE AREA IS KNOWN TO BE FREE OF IGNITIBLE CONCENTRATIONS OF FLAMMABLE GASES OR VAPOURS. IT IS NOT TO BE CONNECTED UNDER NORMAL OPERATION.

In Hazardous Environments the unit must be powered with between 12-24 VDC, 860 mA (6 W) max. Supervised. The unit is certified to be operated at -40°C to 50°C.

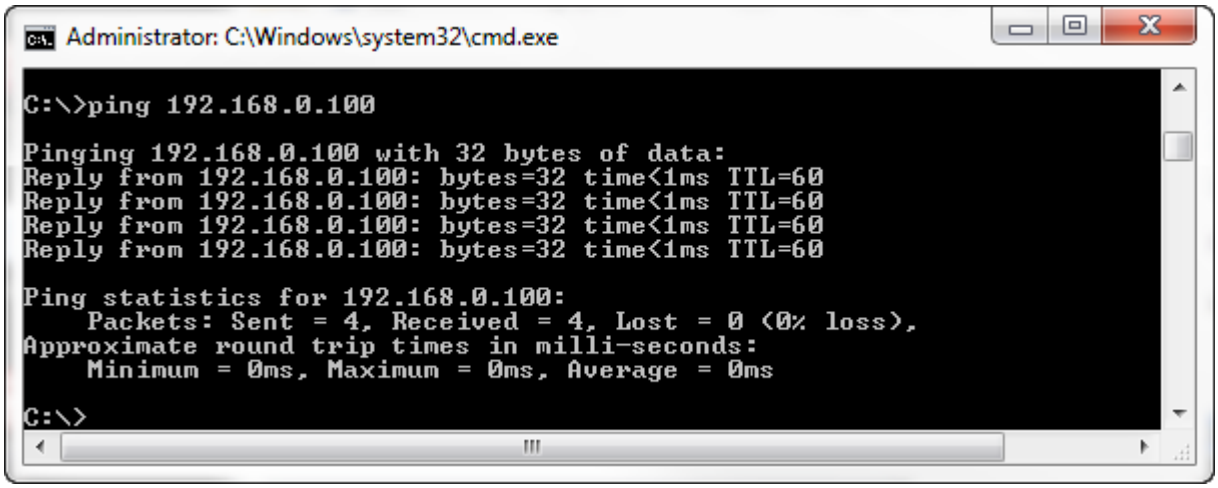
Access Main Page via a Browser

A default static IP Network address of 192.168.0.100 with a Subnet of 255.255.255.0 is configured within the unit for initial communication via the browser.

If the Main Page does not launch, please verify the following:

1) Check that the PC is set for a valid IP Address
    a. Open a MS-DOS Command Prompt
    b. Type “ipconfig” and press enter
    c. Note the PC’s IP Address, Subnet, and Default Gateway
2) The gateway must be on the same Network/Subnet as the PC whether it’s setup for DHCP or Static.

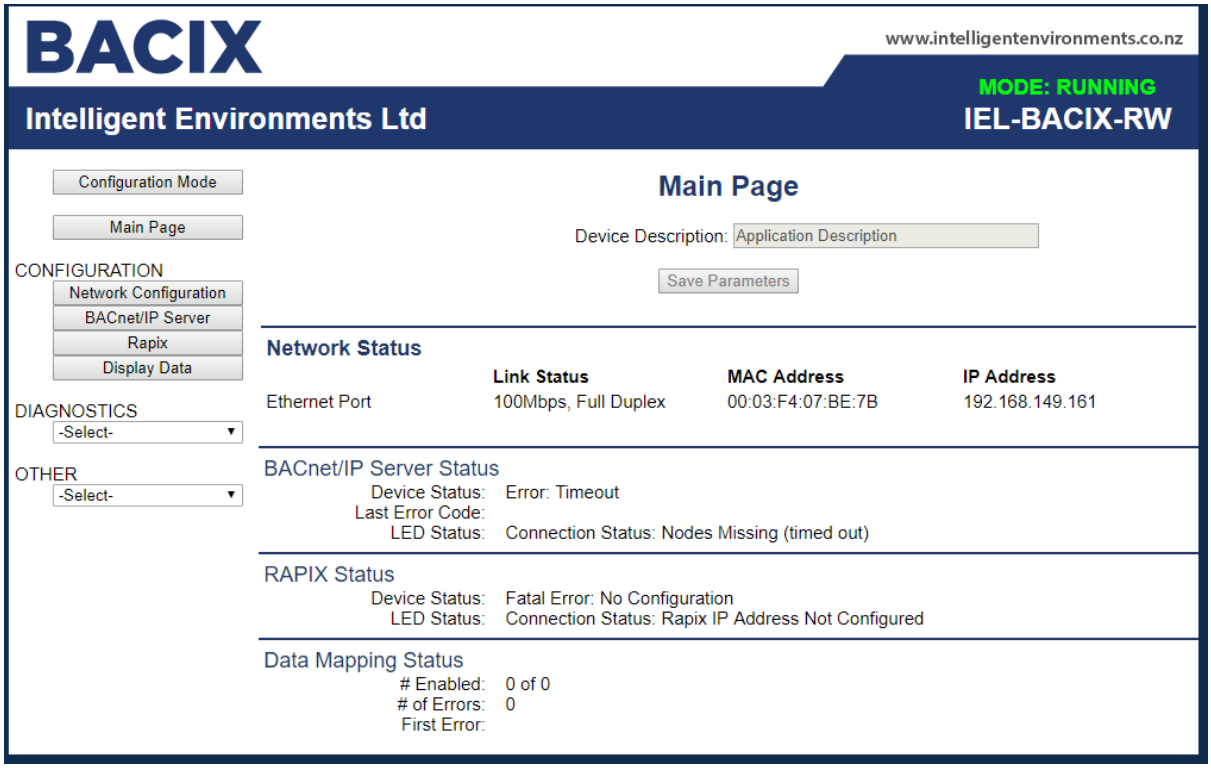
Once you have both devices on the same network, you should be able to ping the gateway using a MS-DOS Command Prompt.



The Screenshot above shows a gateway that is currently set to a static IP Address of 192.168.0.100.

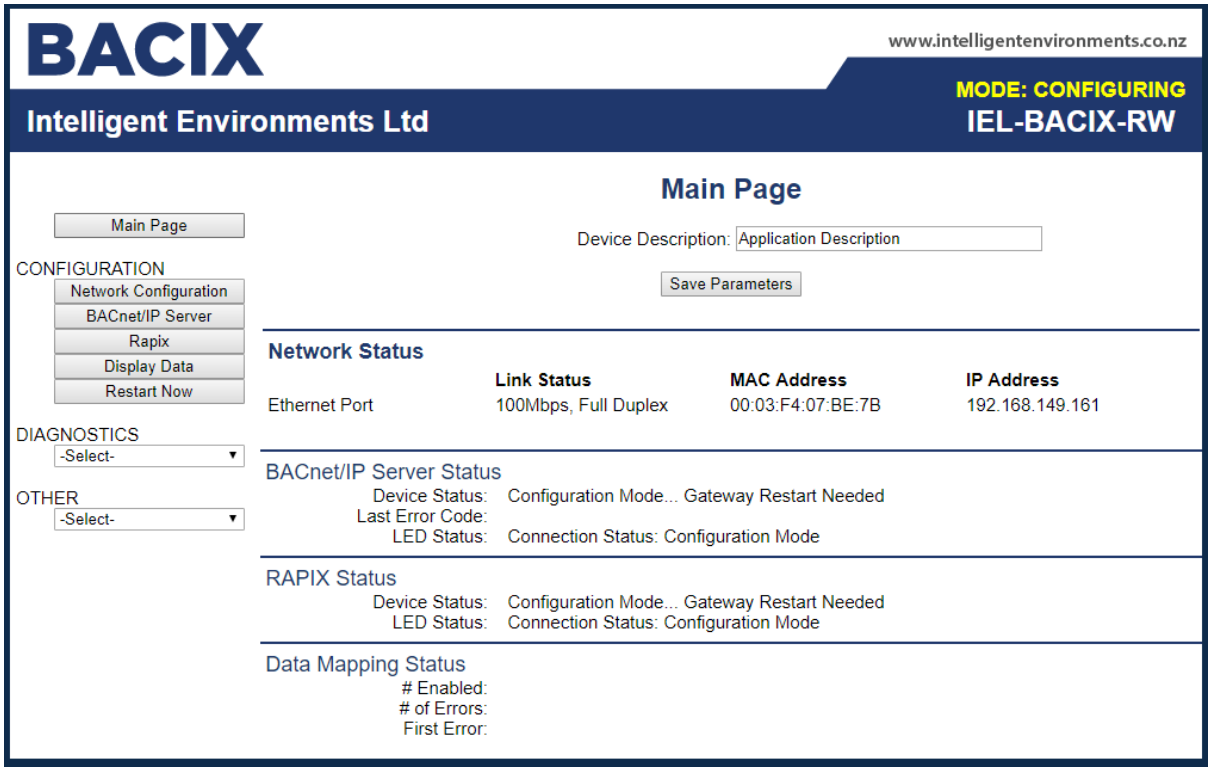
If you are able to successfully ping your gateway, open a browser and try to view the main page of the gateway by entering the IP Address of the gateway as the URL.

Main Page View



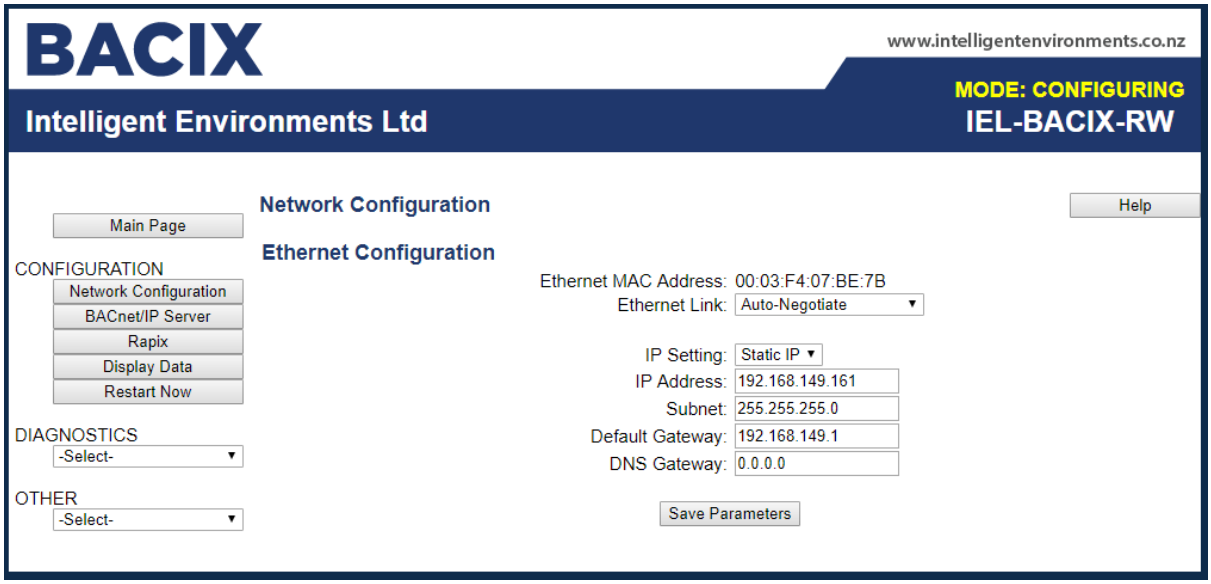
Unit will be shipped un-configured in the 'Running Mode'; **Change to Configuration Mode** by pressing the top menu button. This will stop the gateway operation and allow configuration.

Step 1 – Configuration Mode



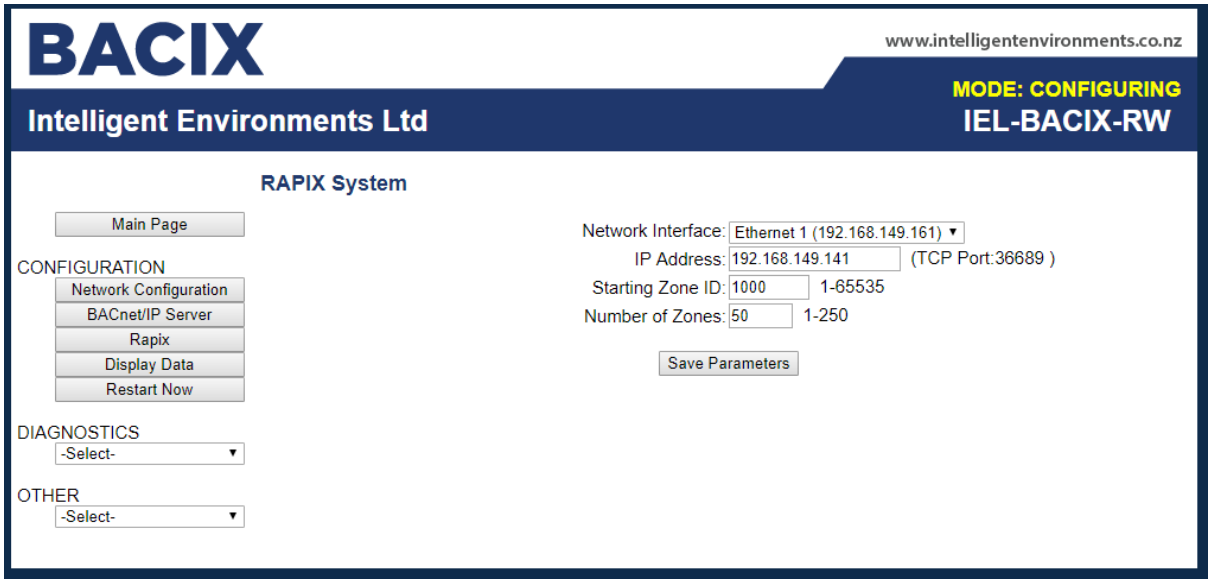
The Device Description field can be customized to help describe where or how the gateway is being used. This is helpful especially when configuring multiple gateways on the same network and is not utilised within any functionality of the gateway.

Step 2 – Network Configuration



See Help tab for relevant detail. Enter your relevant IP settings to suit your application's network configuration.

Step 3 – RAPIX System

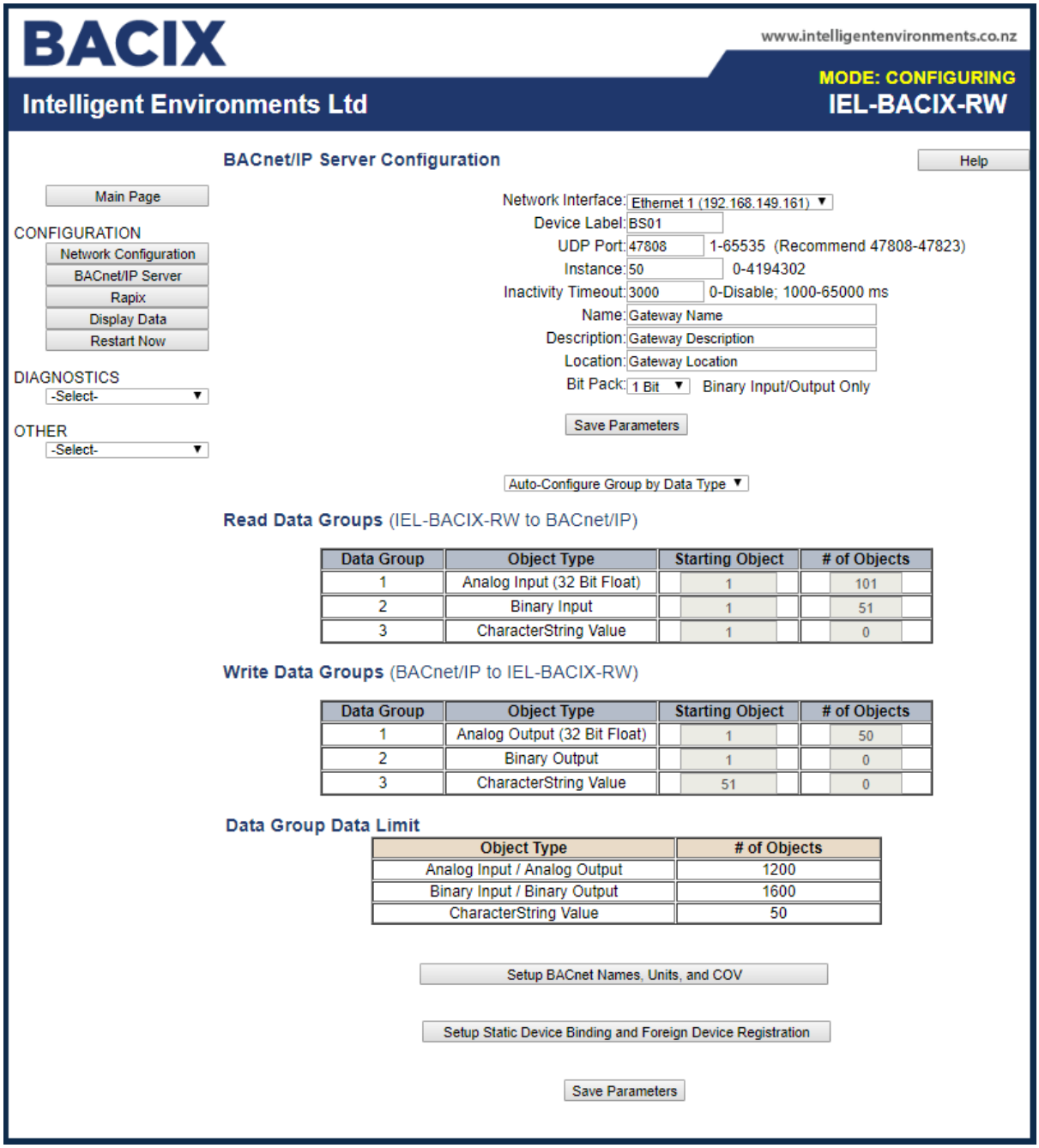


1. Add IP Address of the Zone Controller.
2. Add starting Zone ID.
3. Add number of Zones.

The only caveat is the zones to be integrated to BACnet must be in consecutive order from the 'Starting Zone ID' from within the RAPIX zone controller. Thus it is recommended to start a subset of zones within 'Rapix Integrator' padded away from the main project zones allowing you to easily

compartmentalise your integration zones. For example; in the above screen shot you can see a Starting Zone ID of 1000 with 50 zones, therefore RAPIX zones 1000-1049 can be integrated within the BACnet network.

Step 4 – BACnet/IP Server Configuration

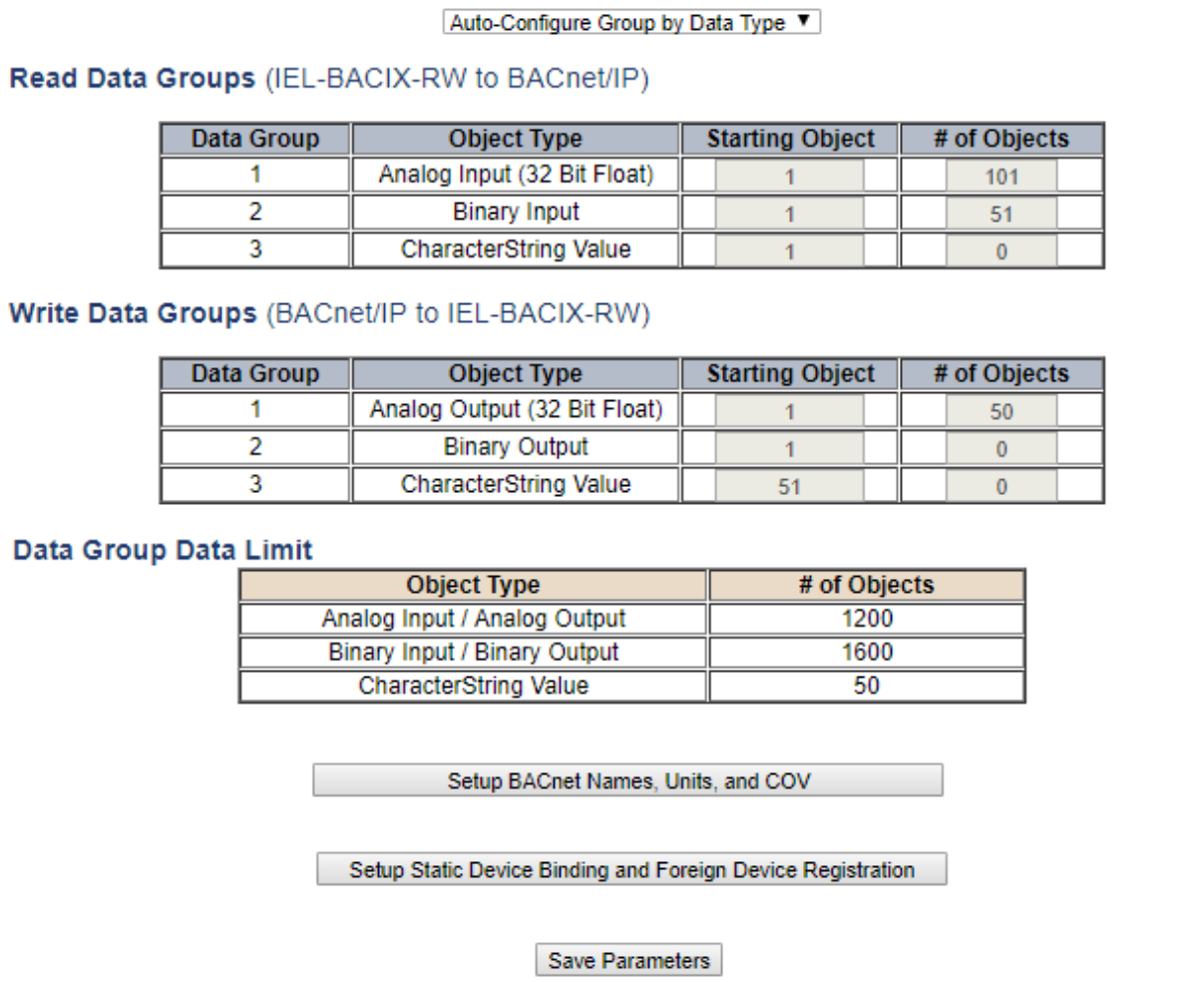


BACnet/IP Server Configuration Main Page - See Help tab for relevant detail regarding BACnet server settings.

1. Select which **Network Interface** to use for this BACnet/IP connection.
2. Enter a **Device Label.** (This is an internal device alias used during data mapping).
3. Enter the decimal value of the **UDP Port** that the gateway will communicate on (Default is 47808 (0xBAC0)). Confirm with BACnet network owner.

4. Enter a unique **Instance** identifier for the gateway. This Instance must be unique on the BACnet/IP network. Confirm with BACnet network owner.
5. **Inactivity Timeout**: Enter the amount of time, in milliseconds, the gateway should wait before a timeout state is declared. If the BACnet/IP Client does not initiate communication within this time frame the BACnet/IP LED will flash red and the timeout counter will increment. Enter 0 to disable this feature. Note: As the gateway is a server it is not the role of this device to manage a connection state, it is that of the BACnet client. The BACnet client connection frequency may vary depending on 3rd party configuration from site to site, this parameter just allows the gateway to declare this condition in line with the timeout value entered. If timed out the gateway will continue to function as intended.
6. Enter a **Name**, **Description** and **Location** for the gateway. These are used to identify the gateway on the BACnet/IP network.
7. **Bit Pack**: Select the formatting of the Binary Input/Output. Automap will use this packing size to map binary objects to/from the other protocol. **Leave as default**.

Auto Configure BACnet Objects



Note that the correct numbers of BACnet Objects (**# of Objects)** have been automatically assigned. This is part of the **'Auto-Configure Group by Data Type'** feature applied when defining the RAPIX settings within Step 3 (Starting Zone ID & Number of Zones).

This is the total number of BACnet IO objects which will hold all the RAPIX data for integration into the BACnet network.

In the example of 50 x RAPIX zones the gateway has created 202 x BACnet objects:

- **101 x AI (Analogue Input) Object:**
  - 50 x Rapix Zone Level.
  - 50 x Rapix Error Code.
  - 1 x Gateway Diagnostic Value – Gateway Scan Cycles per second (free running counter to indicate the gateway is executing its task whilst in 'Running Mode').
- **51 x BI (Binary Input) Object:**
  - 50 x Rapix Common Error (The gateway decodes the error code presented by the Zone Controller to provide a common error signal). This is a much simpler signal for the BACnet System Integrator to alarm, and have an end user contact the Lighting System Integrator for further diagnosis.
  - 1 x Gateway Diagnostic Value – Connected Signal - when this value is high a TCP socket connection is active with the Zone Controller. The gateway sets this value to low after several timeout connection attempts allowing the BMS system to alarm, and have an end user contact the Lighting System Integrator for further diagnosis.
- **50 x AO (Analogue Output) Object:**
  - 50 x Rapix Zone Level Set.

It is important to understand how the **'Auto-Configure Group by Data Type'** maps the RAPIX data to the BACnet objects to present and order the data model via the BACnet server. In the example of 50 x Rapix zones:

Data Model:

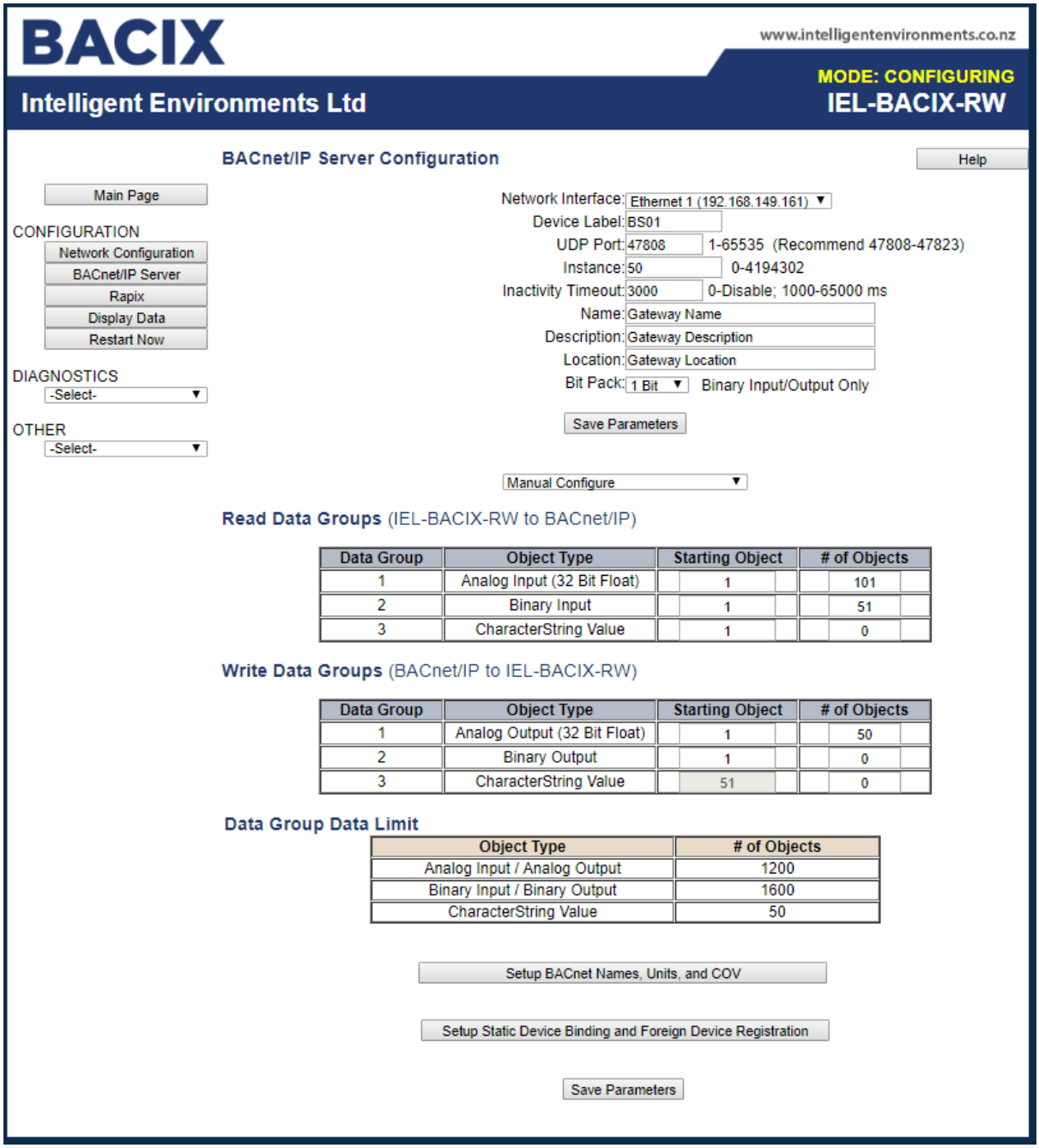
a. Number of Zones (50) - RAPIX Target Level to BACnet **AI Object** 1-50
b. Number of Zones (50) - Error Code to BACnet **AI Object** 51-100
c. Gateway Diagnostic Value - Scan Cycles p/sec to BACnet **AI Object** 101
d. Number of Zones (50) - Error Condition to BACnet **BI Object** 1-50
e. Gateway Diagnostic Value - Rapix Controller Connected to BACnet **BI Object** 51
f. Number of Zones (50) - BACnet **AO Object** to 1-50 RAPIX Target Level

To further consolidate this understanding see below model for the full complement: of 250 x Rapix zones:

Data Model:

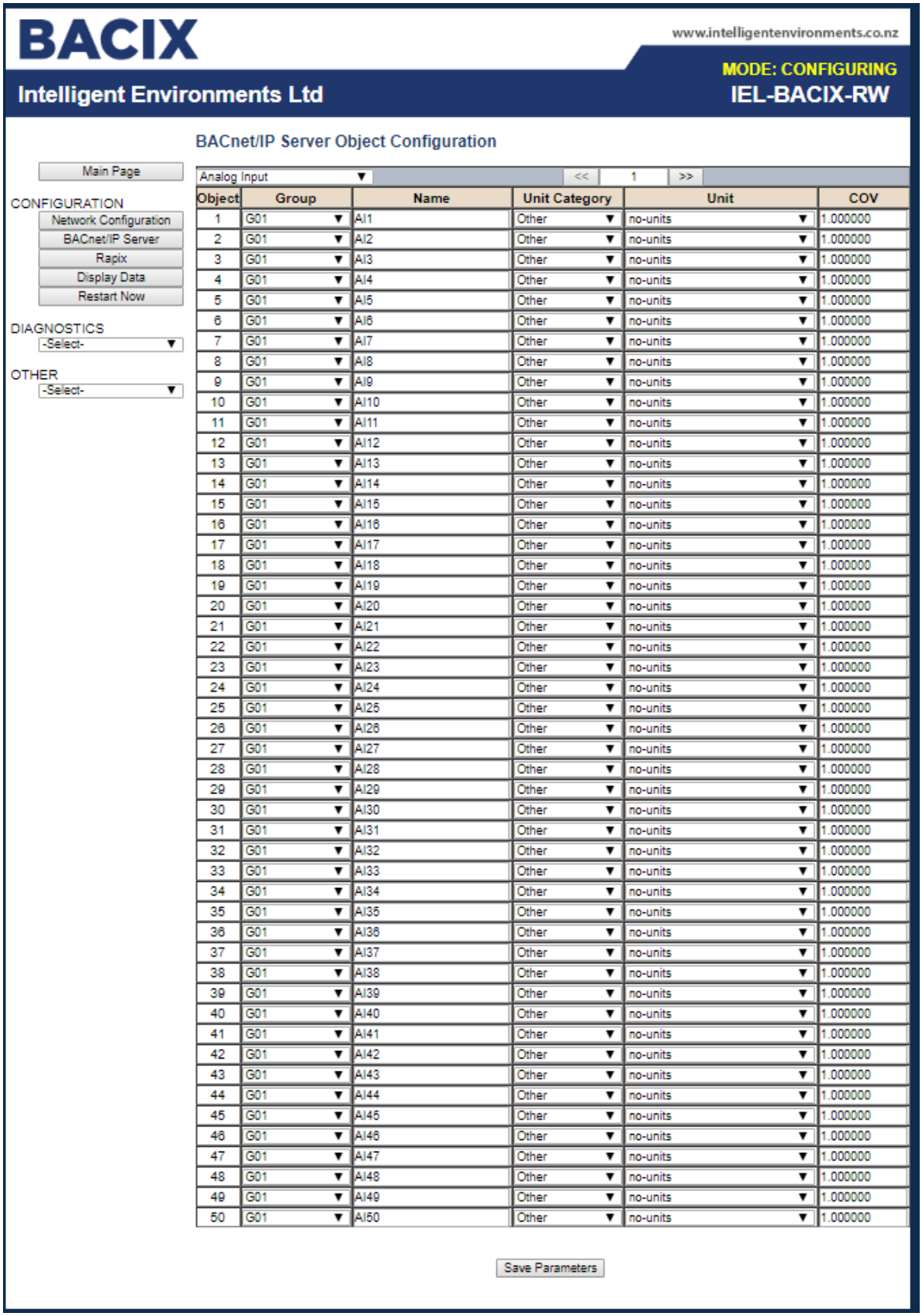
a. Number of Zones (250) - RAPIX Target Level to BACnet **AI Object** 1-250
b. Number of Zones (250) - Error Code to BACnet **AI Object** 251-500
c. Gateway Diagnostic Value - Scan Cycles p/sec to BACnet **AI Object** 501
d. Number of Zones (250) - Error Condition to BACnet **BI Object** 1-250
e. Gateway Diagnostic Value - Rapix Controller Connected to BACnet **BI Object** 251
f. Number of Zones (250) - BACnet **AO Object** to 1-250 RAPIX Target Level

Step 5 – Naming of BACnet Objects



Naming is not mandatory but helpful in creating a meaningful BACnet data model for the BACnet network.

From within the drop-down selector, change the selection from '**Auto-Configure Group by Data Type**' to '**Manual Configure**'. You are now able to select the button 'Setup BACnet Names, Units & COV' to change the default names. You can think of these fields as Meta Data for each Input Output Object Type.



The above screen shot is of the default page which allows naming and other standard BACnet properties to be changed. For the purpose of the RAPIX lighting application **'Group', 'Name' & 'COV' need only be changed if required**.

Group Name is a predefined alias which concatenates as a prefix with the name field to makeup the total BACnet name available to the BACnet network. The purpose of this is to try and save repetitive input across the data model for the System Integrator. For example: a group could be renamed by selecting **'Group Name' via the drop-down input box** and perhaps adding the Building Level number and also naming a group as 'Gateway Diagnostic' *(see example below).* The group name is available to be selected when naming specific BACnet IO objects.

Group Name ▼

Group #	Group Name
1	Level 1
2	Level 2
3	Level 3
4	Gateway Diagnostic Value
5	G05

Once you are done configuring, click the **Save Parameters** button.

Analog Input ▼ << 1 >>

Object	Group	Name	Unit Category	Unit	COV
1	Level 1 ▼	Meeting Rm 1 Level	Other ▼	no-units ▼	1.000000
2	Level 2 ▼	Meeting Rm 1 Level	Other ▼	no-units ▼	1.000000
3	Level 3 ▼	Meeting Rm 1 Level	Other ▼	no-units ▼	1.000000
4	Level 1 ▼	AI4	Other ▼	no-units ▼	1.000000
5	Level 1 ▼	AI5	Other ▼	no-units ▼	1.000000

Note: 'Groups 1, 2 & 3' have been renamed and selected accordingly to match the Name field.
Once you are done configuring, click the **Save Parameters** button.

Analog Input ▼ << 101 >>

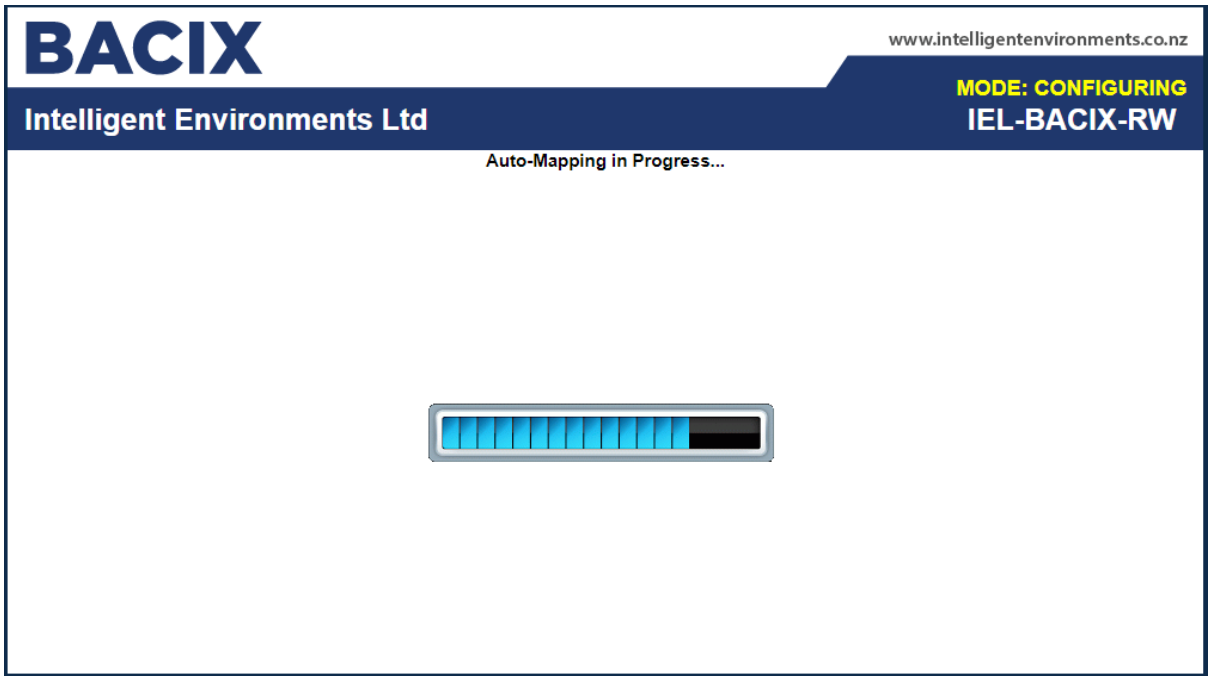
Object	Group	Name	Unit Category	Unit	COV
101	Gateway Diagnc ▼	Scan Cycles p/sec	Other ▼	no-units ▼	1000

Note: AI object 101 has been named accordingly as a Diagnostic Value, (**refer Step 4** as to why this example is using AI 101 for this value). Notice also that the COV (Change of Value) has been changed to 1000. As the device scans at 200 cycles per second the BACnet server automatically reports a value change every 5 seconds if a BACnet client registers with the COV service of the server. Otherwise the BACnet server will make all data available to a BACnet client independent of COV and upon a poll request at a frequency determined by the BACnet client.

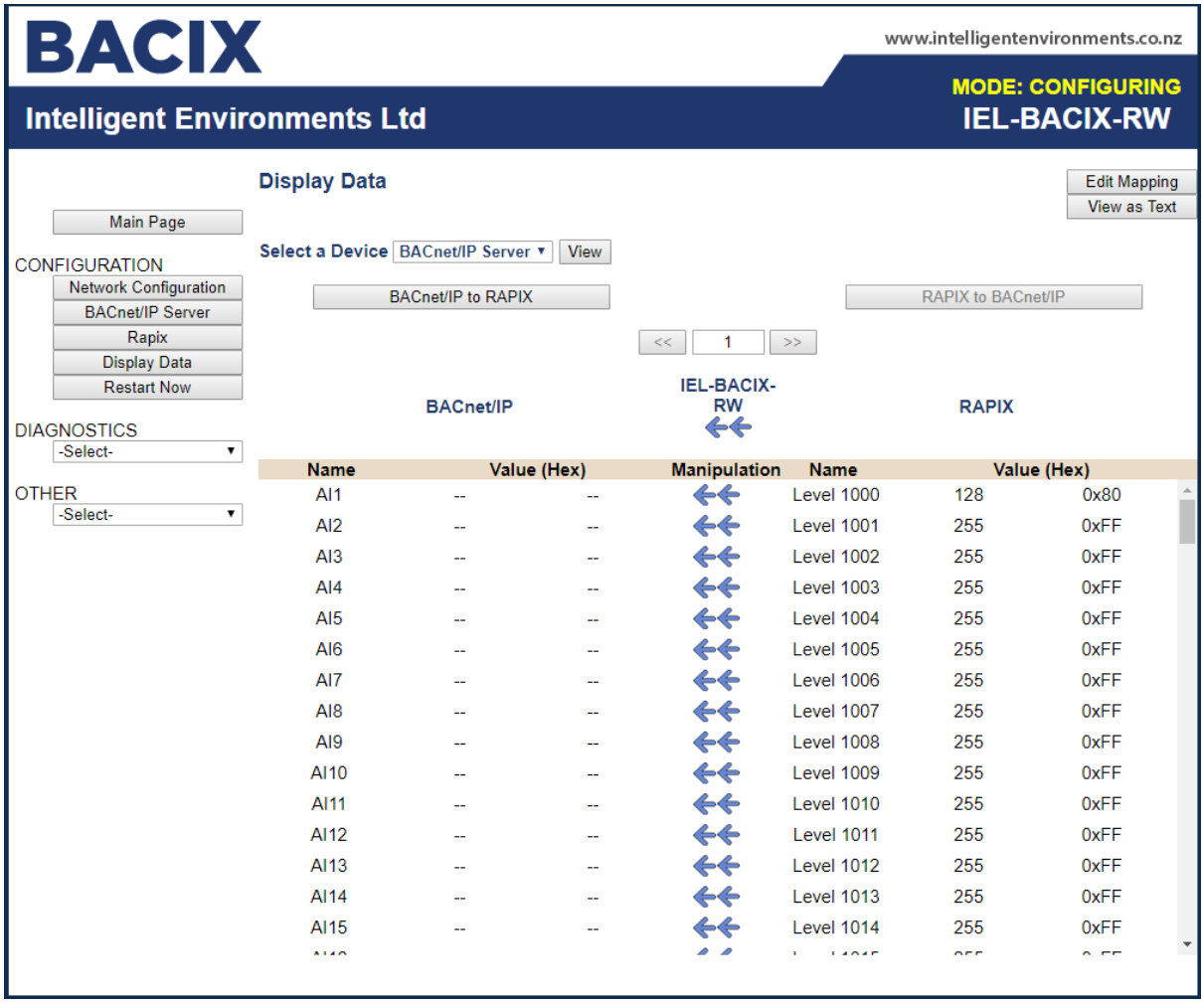
Step 6 – Display & Mapping Data

Now that all gateway configurations have been completed it is time to have the gateway automatically apply the mapping between RAPIX & BACnet data models. Upon completing this task the gateway can be switched to 'Running Mode' and you can view **LIVE** data from both the RAPIX & BACnet interfaces to confirm your throughput of data and greatly assist in reducing commissioning time.

Press the 'Display Data' button to begin the Auto-Mapping process. You will be presented with the progress page below.



Upon completion the 'Display Data' page will be displayed where you will see a default view of the mappings defined. This screen is where you can see all live data when you are connected to either or both networks/ systems.



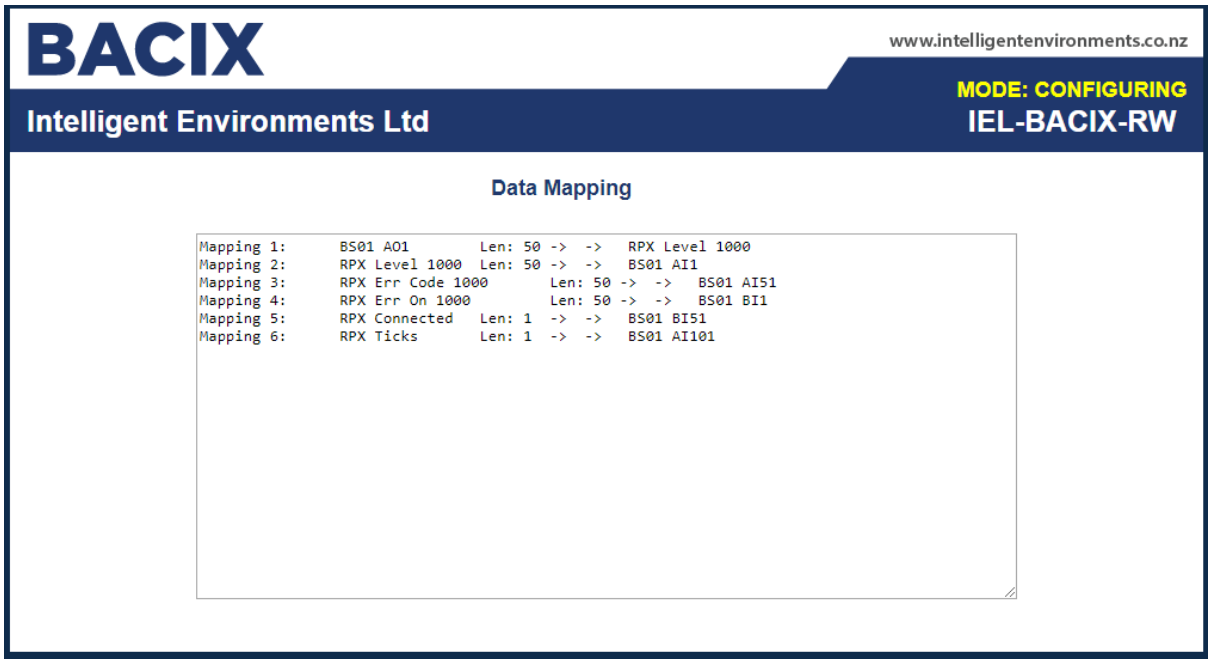
Note: You can **'Select a Device'** to be the master view for your display table and then below this you can select whether you want to view the data moving into or out of the gateway device from the selected device. You also have the ability to jump to or specifically select a table row # to have the display begin from. The table loads with a default of 200 rows which can be viewed via the scroll bar on the right hand side of the table or jump to the next batch of 200 rows using the Forward & Back arrows and the row #.

In order to update values within the loaded display data table please use your browser's **'Refresh Button'.**

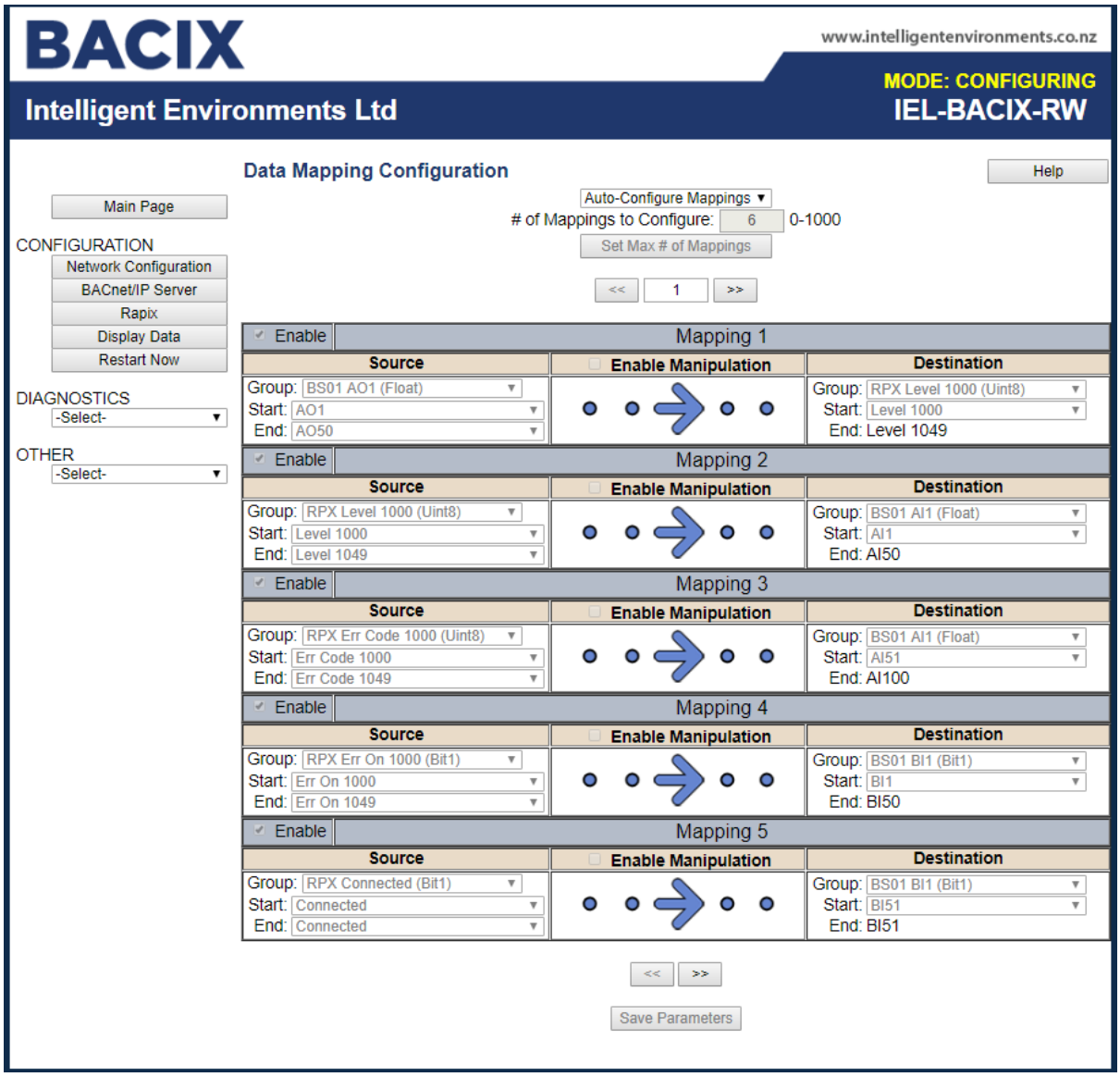
Further note: If changing any items within the gateway configuration related to either protocol interface the Auto Mapping process will repeat to ensure any changes to the data model mapping are up to date when re-loading to the 'Display Data' page.

General Information:
Press the 'View as Text' button to show the mappings between the interfaces in a simple manner. Press the 'Edit Mapping' button to be shown the mappings as presented within the gateway for further modification if required **'Not Recommended'**. In order to edit the mapping you will need to select the drop down list and change to the 'Manual Configure' option.

‘View as Text’ screen shot below from the IEL-BACIX-RW firmware; defining mapping between the 50 x zones including the internal diagnostic values.

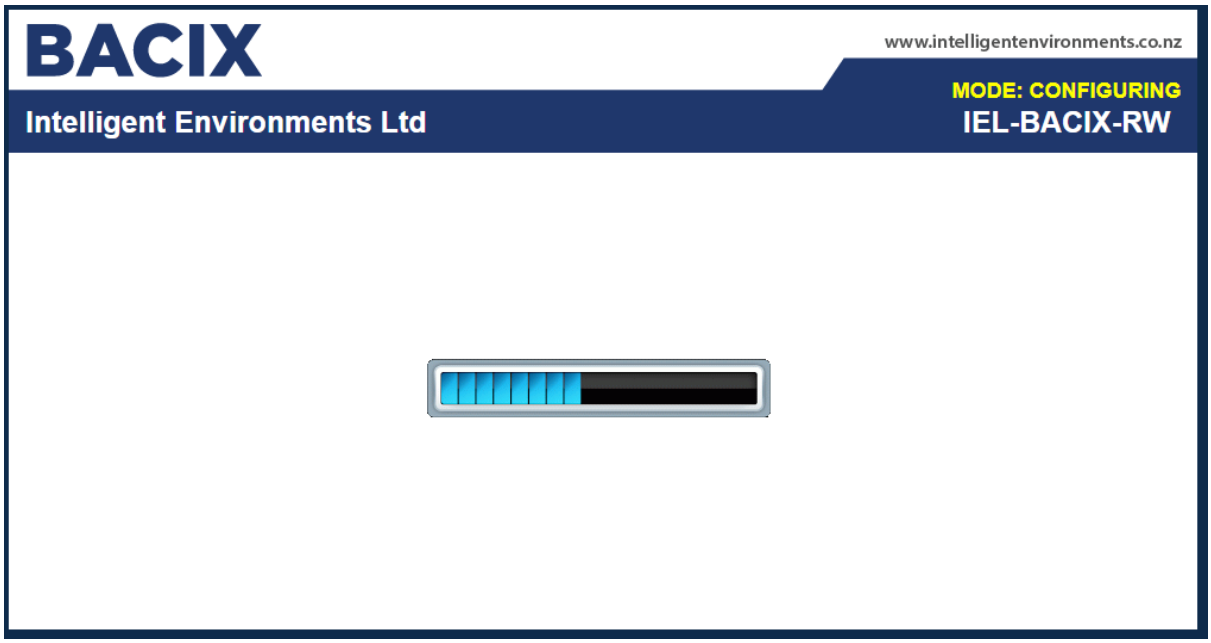


'Edit Mapping' screen shot below also defining the mappings applied within the gateway. This interface allows 'Manual Configure' of mappings– **however this is not recommended or required**.

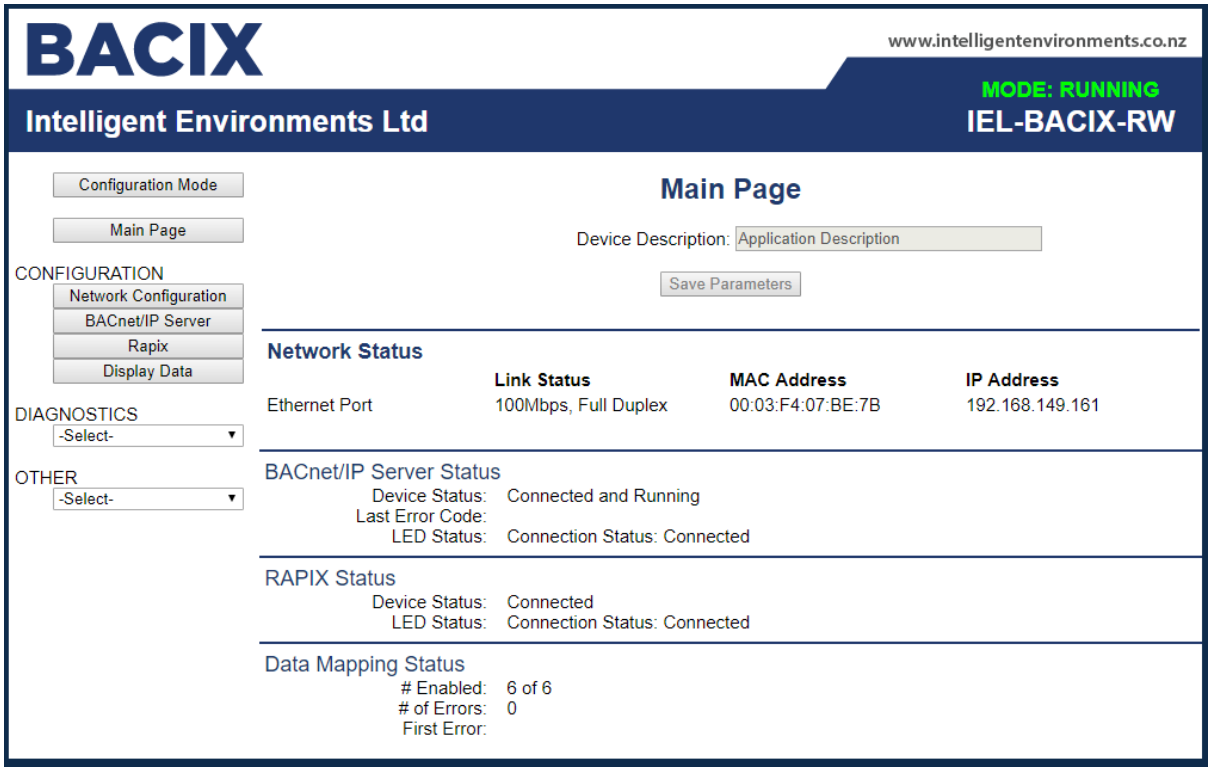


Running Mode

Press the **'Restart Now'** menu button to restart the gateway. The screen below will be displayed whilst the device is a conducting a reboot.

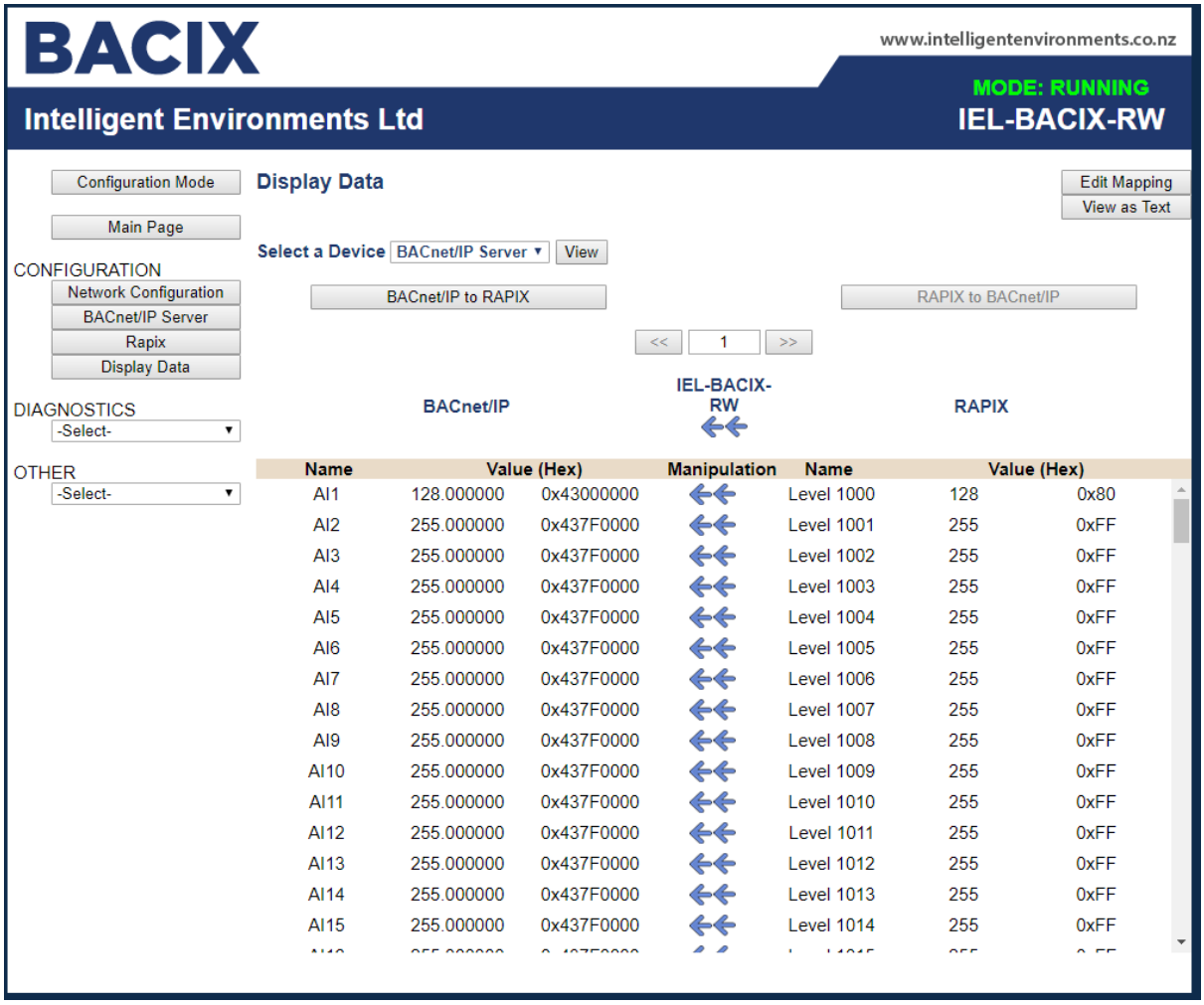


The main page is displayed upon reboot; note '**MODE: RUNNING**' & '**Network Status**' details both interfaces are connected



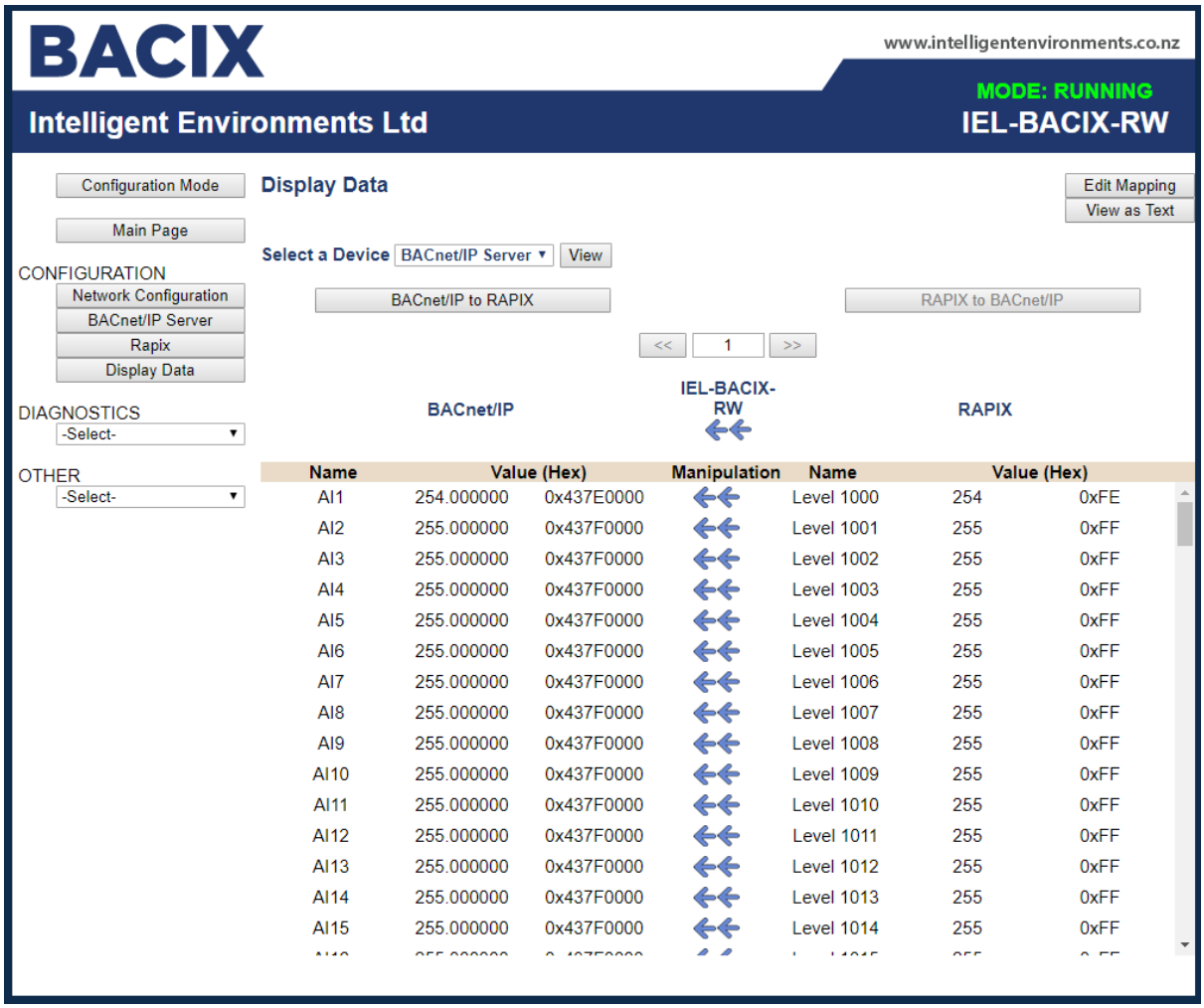
Display Data in Running Mode

Select ‘Display Data’ from menu to be presented with default display. Note the table is detailing RAPIX to BACnet/IP flow of data, RAPIX Zone ID 1000 Level is being moved into BACnet Object AI1 with a value of 128. All other zones in this example are set to a Default Value of 255 until a valid RAPIX Zone Level between 0-254 has been received by the RAPIX Zone Controller.



Note screen shot below has been refreshed and the RAPIX Zone Level has changed to 254 and the BACnet Object AI1 has also been updated to reflect this new value.

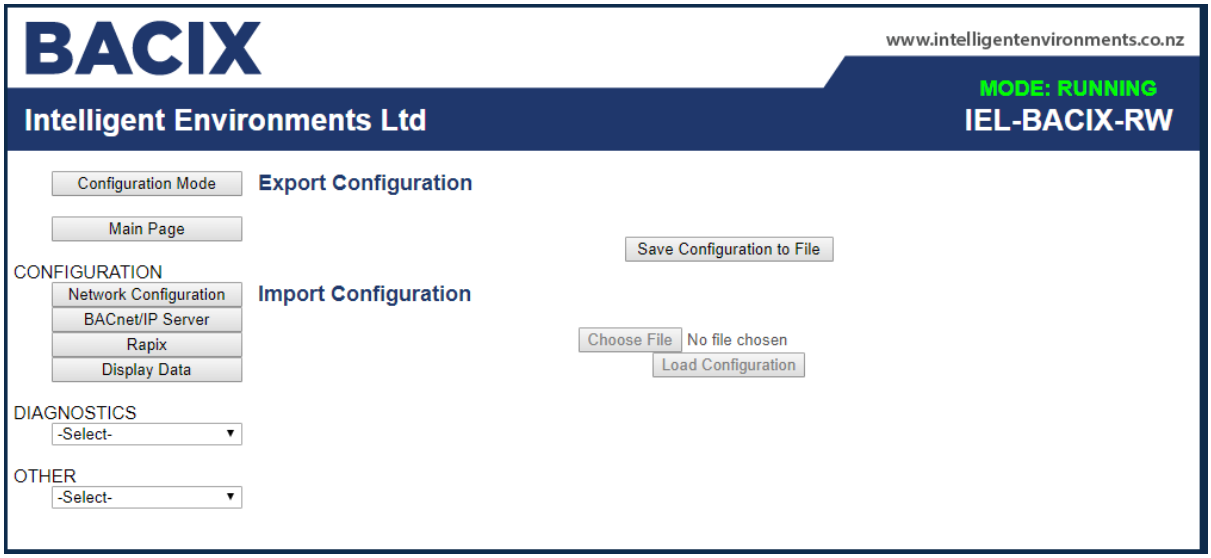
This is an example of how this **LIVE DISPLAY DATA** can greatly assist the Lighting System Integrator during commissioning.



Export / Import Configuration

The device allows an export or import of the configuration for backup and to save time when configuring multiple devices within an application or for future device configuration.

Select **'Export/ Import Config'** from the **'Other'** drop down selector to be presented with the screen below. Whilst in running mode only an export configuration is allowed. To import a configuration over the top of an existing configuration, the device will need to be placed into configuration mode.



APPENDIX

3rd Party BACnet Client Browse

See below tables for an example of what a 3rd party BACnet Client would discover from the BACIX device when configured as described within this document.

The 'Gateway Device' holds the data model defined within the 'Read/ Write Firmware' data model detailed within the section 'BACnet/IP Server Configuration' within this document. Here you can see all the BACnet object types (Analogue/Binary Input & Analogue Output) including the object description. The object description greatly assists the BMS Systems Integrator with their integration.

- Binary Input-11 (Level 1 BI11)
- Binary Input-12 (Level 1 BI12)
- Binary Input-13 (Level 1 BI13)
- Binary Input-14 (Level 1 BI14)
- Binary Input-15 (Level 1 BI15)
- Binary Input-16 (Level 1 BI16)
- Binary Input-17 (Level 1 BI17)
- Binary Input-18 (Level 1 BI18)
- Binary Input-19 (Level 1 BI19)
- Binary Input-20 (Level 1 BI20)
- Binary Input-21 (Level 1 BI21)
- Binary Input-22 (Level 1 BI22)
- Binary Input-23 (Level 1 BI23)
- Binary Input-24 (Level 1 BI24)
- Binary Input-25 (Level 1 BI25)
- Binary Input-26 (Level 1 BI26)
- Binary Input-27 (Level 1 BI27)
- Binary Input-28 (Level 1 BI28)
- Binary Input-29 (Level 1 BI29)
- Binary Input-30 (Level 1 BI30)
- Binary Input-31 (Level 1 BI31)
- Binary Input-32 (Level 1 BI32)
- Binary Input-33 (Level 1 BI33)
- Binary Input-34 (Level 1 BI34)
- Binary Input-35 (Level 1 BI35)
- Binary Input-36 (Level 1 BI36)
- Binary Input-37 (Level 1 BI37)
- Binary Input-38 (Level 1 BI38)
- Binary Input-39 (Level 1 BI39)
- Binary Input-40 (Level 1 BI40)
- Binary Input-41 (Level 1 BI41)
- Binary Input-42 (Level 1 BI42)
- Binary Input-43 (Level 1 BI43)
- Binary Input-44 (Level 1 BI44)
- Binary Input-45 (Level 1 BI45)
- Binary Input-46 (Level 1 BI46)
- Binary Input-47 (Level 1 BI47)
- Binary Input-48 (Level 1 BI48)
- Binary Input-49 (Level 1 BI49)
- Binary Input-50 (Level 1 BI50)
- Binary Input-51 (Gateway Diagnostic Value RAPIX System Connected)

- Analog Output-1 (Level 1 Meeting Rm 1 Level Set)
- Analog Output-2 (Level 2 Meeting Rm 2 Level Set)
- Analog Output-3 (Level 3 Meeting Rm 3 Level Set)
- Analog Output-4 (Level 1 AO4)
- Analog Output-5 (Level 1 AO5)
- Analog Output-6 (Level 1 AO6)
- Analog Output-7 (Level 1 AO7)
- Analog Output-8 (Level 1 AO8)
- Analog Output-9 (Level 1 AO9)
- Analog Output-10 (Level 1 AO10)
- Analog Output-11 (Level 1 AO11)
- Analog Output-12 (Level 1 AO12)
- Analog Output-13 (Level 1 AO13)
- Analog Output-14 (Level 1 AO14)
- Analog Output-15 (Level 1 AO15)
- Analog Output-16 (Level 1 AO16)
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- Analog Output-43 (Level 1 AO43)
- Analog Output-44 (Level 1 AO44)
- Analog Output-45 (Level 1 AO45)
- Analog Output-46 (Level 1 AO46)
- Analog Output-47 (Level 1 AO47)
- Analog Output-48 (Level 1 AO48)
- Analog Output-49 (Level 1 AO49)
- Analog Output-50 (Level 1 AO50)

RAPIX & BACnet Systems on Different IP Subnets – Foreign Device Routing Configuration

These settings are used when connecting with a BACnet/IP Client on a different subnet.

BACnet uses broadcasts to efficiently communicate public information. A broadcast is sent once and received by all other devices on the same network. IT infrastructure network routers that connect different networks together block broadcasts from crossing networks. Broadcasts are how BACnet devices announce that they exist and have points to share.

Foreign Device Registration is a mechanism which is recommended from this device in order to ensure broadcasts are received when sourced from another network. It is mandatory that this device has a 'Default Gateway IP address' defined to register as a Foreign Device on the other network.

Click the '**Set Up Static Device Binding and Foreign Device Registration'** button at the bottom of the BACnet/IP Server Configuration page to access the Routing Configuration page for this device.

There are 2 ways to cross subnets when communicating with the BACnet/IP protocol that are supported within the gateway:

1) Foreign Device Registration **(Recommended & Preferred):** This option can be used ONLY when the BBMD (BACnet/IP Broadcast Management Device - confirm availability with the BMS System Integrator) device on the other subnet (often integrated into Client devices) supports Foreign Device Registration (typically supported). To use, enter the IP Address of the BBMD device into the gateway and select a Time-To-Live (TTL), the TTL defines how often the gateway should send a message to the BBMD device alerting them of the gateways presence. This ensures whilst registered the BBMD is aware whom to forward broadcast messages to ensuring 3rd party BACnet Client discovery of server objects.

2) Static Device Binding: This option can be used only if the BACnet/IP Client supports Static Device Binding. This typically isn't supported. To use, simply enter the IP Address and Device Instance of the Client device. The Client device will also have to enter the IP Address and Device Instance of the gateway.