HTC Gateway

User Manual

A-HRIO

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aparian

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Revision History

Revision	Date	Comment
1.0	22 September 2017	Initial document

1. PREFACE

1.1. INTRODUCTION TO THE HTC GATEWAY

This manual describes the installation, operation, and diagnostics of the Aparian HTC Gateway. The HTC Gateway, (hereafter referred to as the **module**,) provides intelligent data routing between EtherNet/IP and legacy Hitachi IO and Drive (RIW/ROW) systems.

This allows the user to integrate legacy Hitachi IO and Drives into a Rockwell Logix platform (e.g. ControlLogix or CompactLogix) with minimal effort.

The module can be configured to act as either a legacy Hitachi IO Master (RIOH Master), legacy Hitachi IO Slave (RIOH Slave), or legacy Hitachi Drive module. Data can easily be accessed in the Logix input and output assemblies.

Three example applications are described below:

The first example application uses the HTC Gateway to exchange data between legacy Hitachi IO and a ControlLogix controller. In this mode, the HTC Gateway is configured as an IO Master and will request data from input modules (e.g. Digital Inputs) and send data to output modules (e.g. Digital Outputs). In this mode legacy Hitachi IO can be left in operation whilst the user can upgrade the control system to a Rockwell Automation Logix platform.

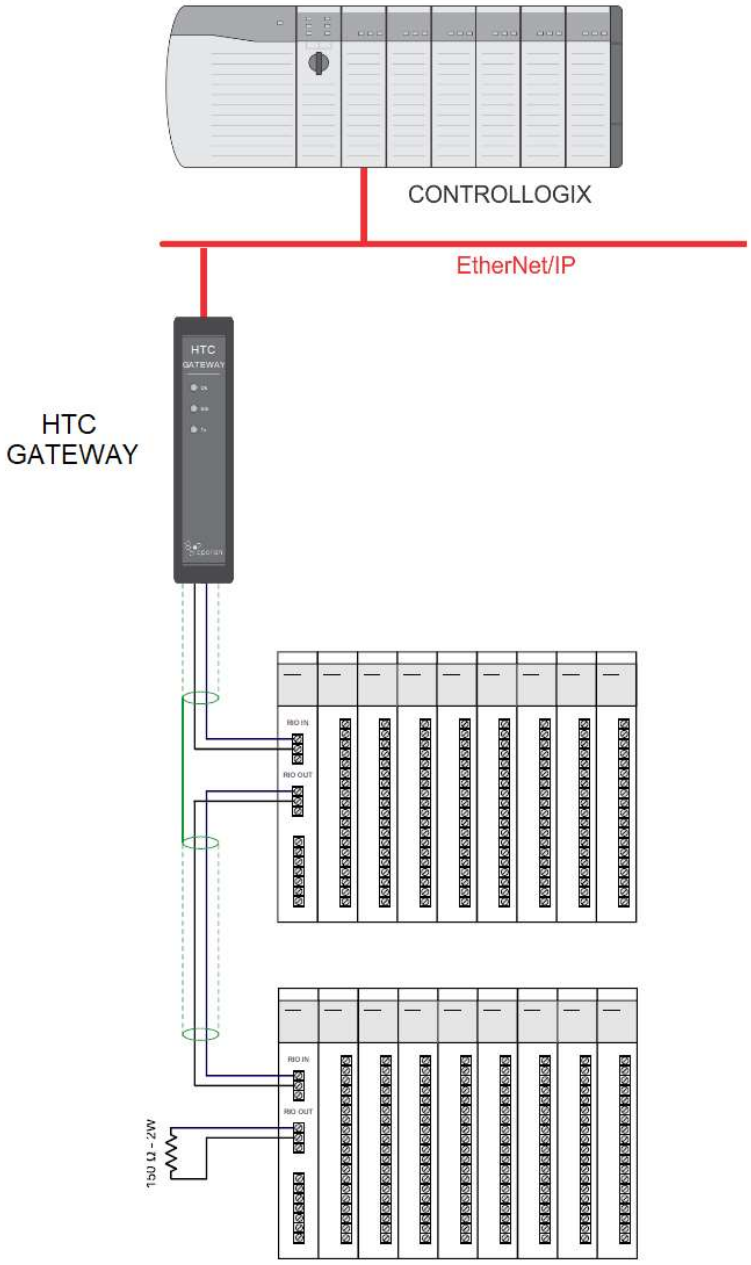


Figure 1.1. – Application Example 1

The second example has two HTC Gateways configured as drive interfaces and can be connected to a legacy Hitachi drive to exchange data. In this mode legacy drives can be left in operation whilst the user can upgrade the control system to an Rockwell Automation Logix platform.

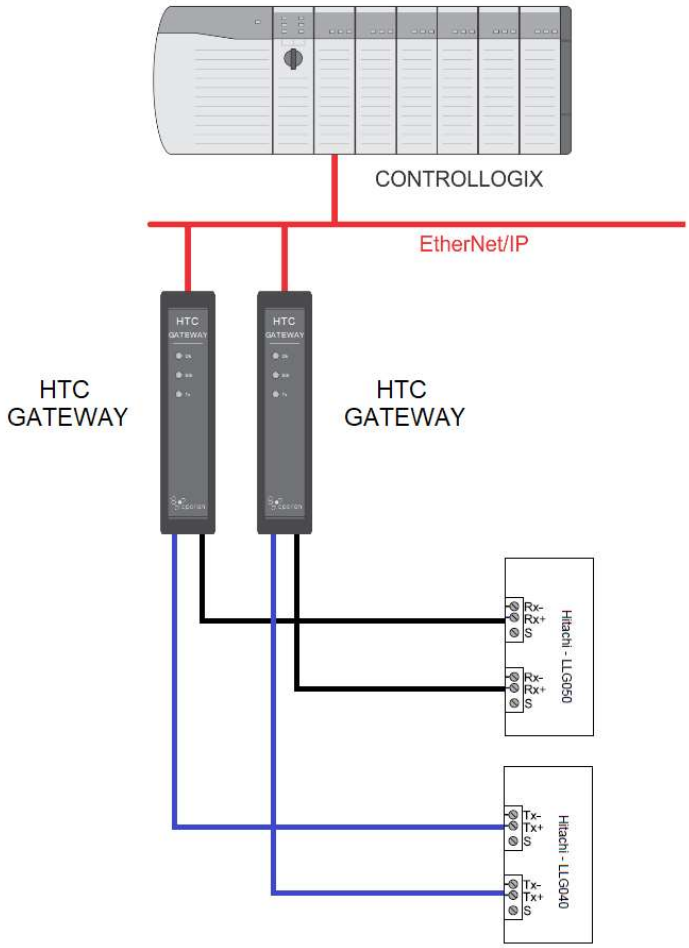


Figure 1.2. – Application Example 2

The third example application uses the HTC Gateway to exchange data between legacy Hitachi IO and a ControlLogix controller. In this mode, the HTC Gateway is configured as an IO Slave and will mimic legacy IO: Receiving output data from a legacy Hitachi CPU (e.g. Digital Outputs) and sending input data to the legacy Hitachi CPU. In this mode legacy Hitachi IO Masters (Hitachi CPU) can be left in operation while the user can upgrade the IO to modern Rockwell Automation IO (via a Logix platform).

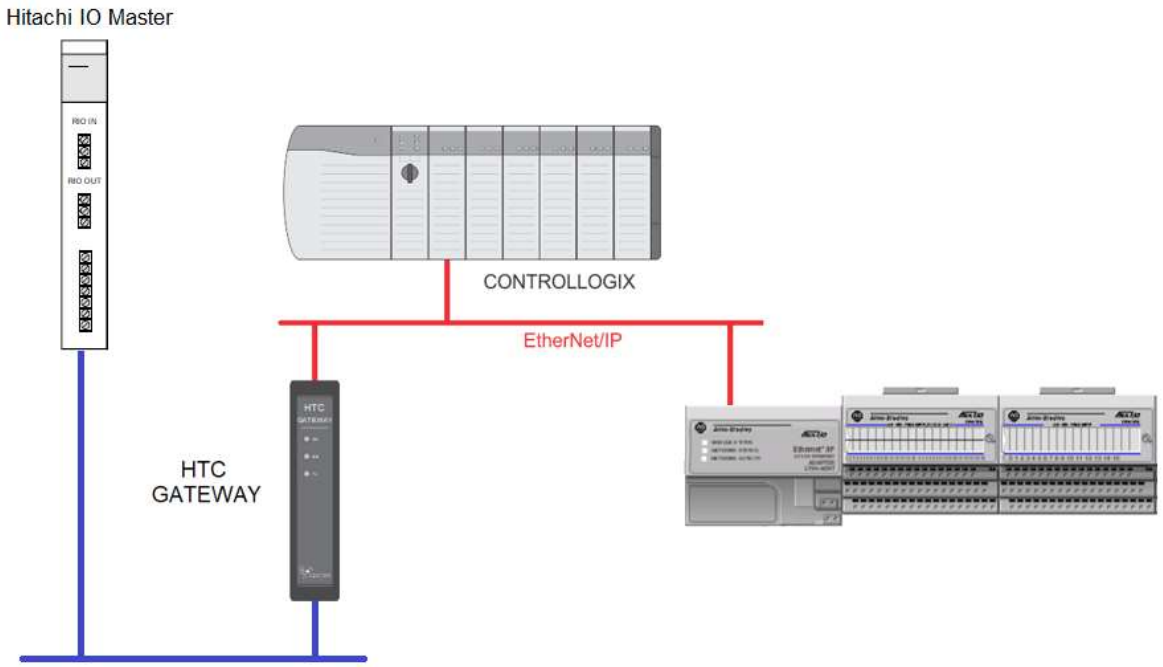


Figure 1.3. – Application Example 3

The HTC Gateway is configured using the Aparian Slate application. This program can be downloaded from www.aparian.com free of charge.

The module also provides a range of statistics to help fault find any problems. The Hitachi interface port uses a terminal block for convenient installation.

A built-in webserver provides detailed diagnostics of system configuration and operation, including the display of Hitachi interface operation and communication statistics, without the need for any additional software.

1.2. ADDITIONAL INFORMATION

The following documents contain additional information that can assist the user with the module installation and operation.

Resource	Link
Slate Installation	http://www.aparian.com/software/slate
HTC Gateway User Manual HTC Gateway Datasheet Example Code & UDTs Tech Notes	http://www.aparian.com/products/htcgateway
Ethernet wiring standard	www.cisco.com/c/en/us/td/docs/video/cds/cde/cde205_220_420/installation/guide/cde205_220_420_hig/Connectors.html
CIP Routing	The CIP Networks Library, Volume 1, Appendix C: Data Management

Table 1.1. - Additional Information

1.3. SUPPORT

Technical support is provided via the Web (in the form of user manuals, FAQ, datasheets etc.) to assist with installation, operation, and diagnostics.

For additional support the user can use either of the following:

Resource	Link
Contact Us web link	www.aparian.com/contact-us
Support email	support@aparian.com

Table 1.2. – Support Details

2. INSTALLATION

2.1. MODULE LAYOUT

The module has three ports at the bottom of the enclosure as shown in the figure below. The ports are used for Ethernet, legacy Hitachi Interface port, and power. The power port uses a three-way connector which is used for the DC power supply positive and negative (or ground) voltage as well as the earth connection.

The Ethernet cable must be wired according to industry standards which can be found in the additional information section of this document.

The legacy Hitachi connector is used for IO (2-wire) and Drive (4-wire) communication. It also includes an earth connection, used for shielding the Hitachi interface cable in high noise environments.



Figure 2.1 – HTC Gateway side and bottom view

The module provides three diagnostic LEDs as shown in the front view figure below. These LEDs are used to provide information regarding the module system operation, the Ethernet interface, and the Hitachi communication.



Figure 2.2 - HTC Gateway front and top view

The module provides four DIP switches at the top of the enclosure as shown in the top view figure above.

DIP Switch	Description
DIP Switch 1	Used to force the module into “Safe Mode”. When in “Safe Mode” the module will not load the application firmware and will wait for new firmware to be downloaded. This should only be used in the rare occasion when a firmware update was interrupted at a critical stage.
DIP Switch 2	This will force the module into DHCP mode which is useful when the user has forgotten the IP address of the module.
DIP Switch 3	Reserved
DIP Switch 4	Reserved

Table 2.1. - DIP Switch Settings

2.2. MODULE MOUNTING

The module provides a DIN rail clip to mount onto a 35mm DIN rail.

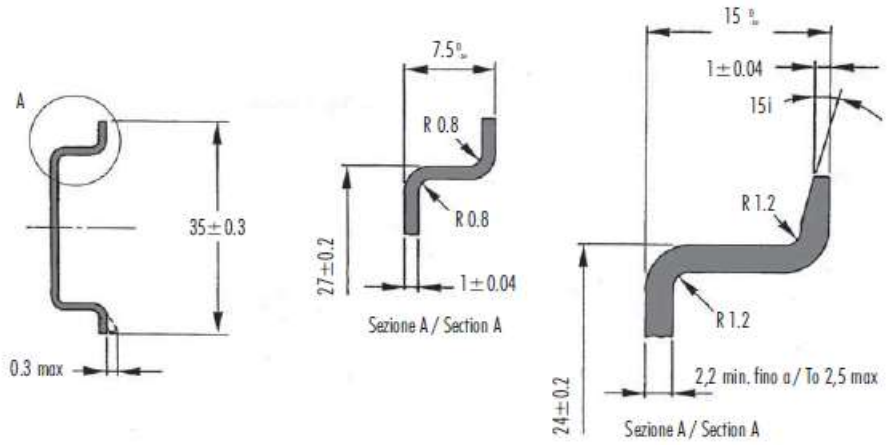


Figure 2.3 - DIN rail specification

The DIN rail clip is mounted on the bottom of the module at the back as shown in the figure below. Use a flat screw driver to pull the clip downward. This will enable the user to mount the module onto the DIN rail. Once the module is mounted onto the DIN rail the clip must be pushed upwards to lock the module onto the DIN rail.



Figure 2.4 - DIN rail mounting

2.3. POWER

A 3-way power connector is used to connect Power+, Power– (GND), and earth. The module requires an input voltage of 18 – 28Vdc. **Refer** to the technical specifications section in this document.

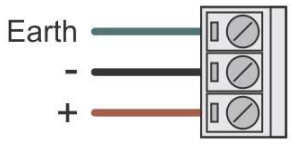


Figure 2.5 - Power connector

2.4. HITACHI PORT

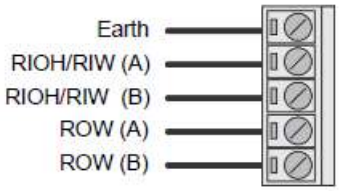


Figure 2.6 – Hitachi interface connector

The 5-way Hitachi interface connector is used to connect to either the legacy Hitachi IO (2-wire) or the legacy Hitachi Drive (4-wire). The earth terminal can be used for shielded cable in high noise environments.

NOTE: When using a shielded cable, it is important that only one end of the shield is connected to earth to avoid current loops.

The Hitachi interface connection depends on the mode selection.

Connections for various configurations is illustrated in the following examples:

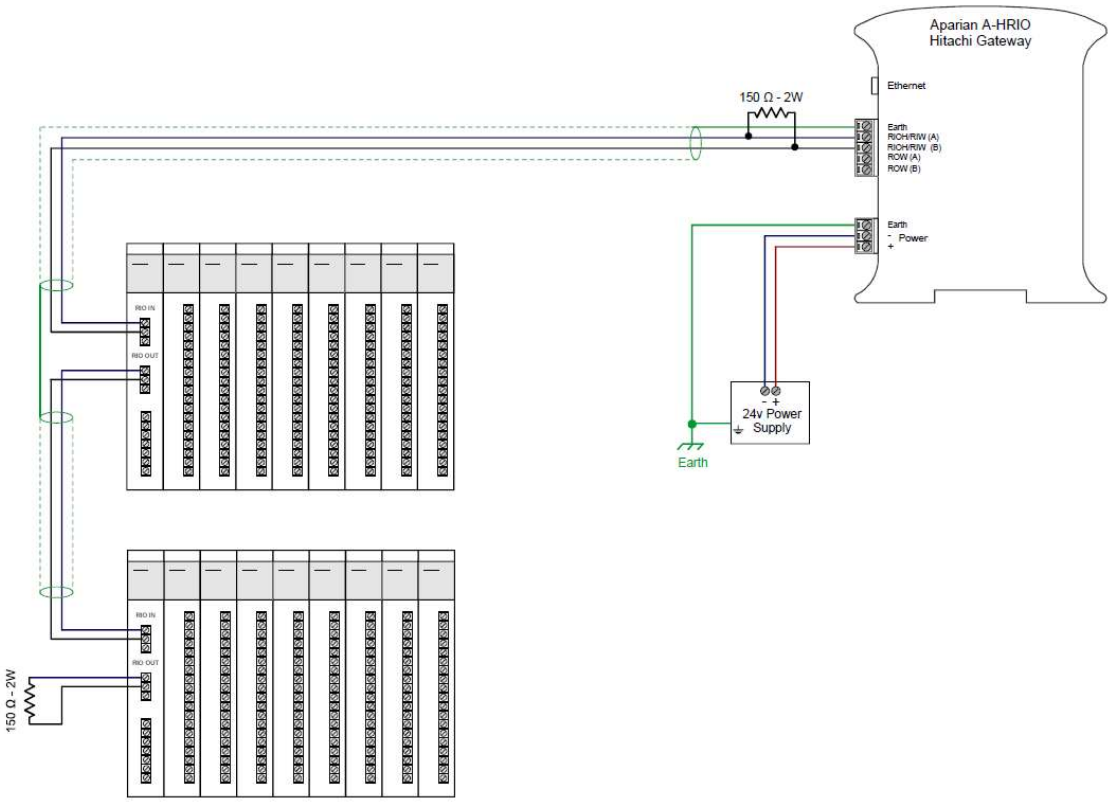


Figure 2.7 – HTC Gateway as a IO Master (RIOH Master)

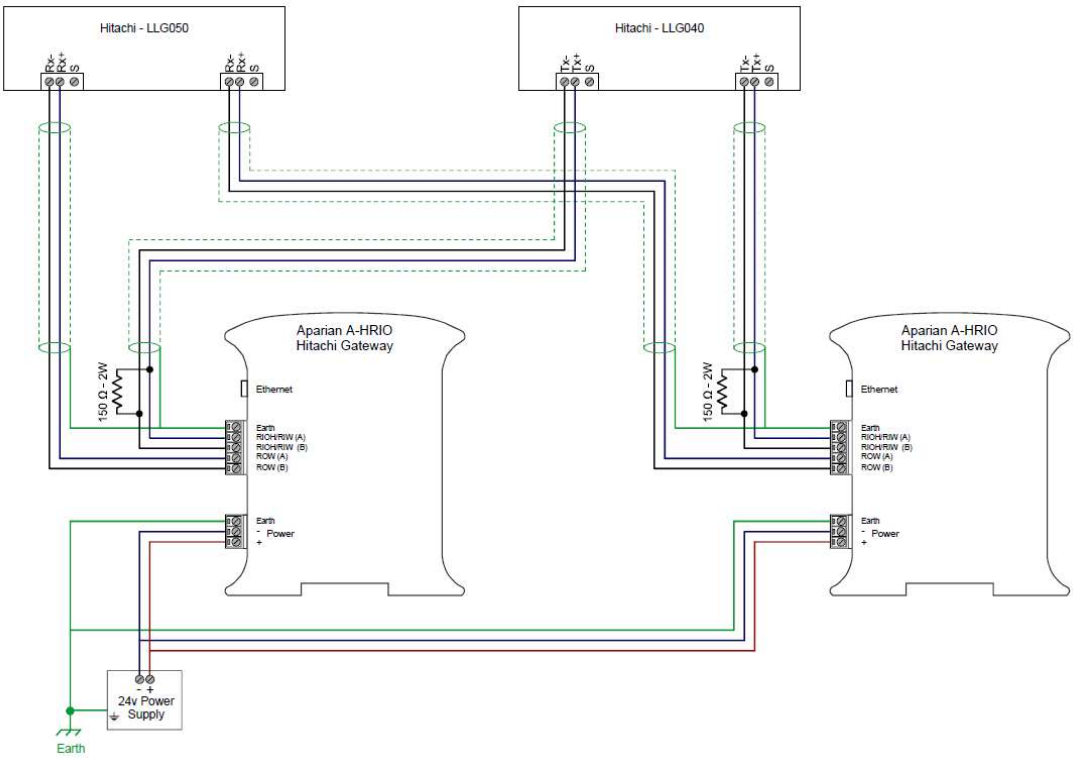


Figure 2.8 - HTC Gateway in Drive Mode

2.5. TERMINATION

When operating in IO mode (HTC Gateway is configured as a Hitachi IO Master or Slave) the Hitachi network must be terminated at the extremities (start- and end-points) of the communication cable. The termination is achieved by placing a resistor between the A and B communication conductor. The value of the resistor must be 150 Ohm, and be capable of dissipating at least 2W.

When operating in Drive mode (HTC Gateway is configured to communicate with a Hitachi Drive) the Hitachi network must be terminated at the receiving end of the communication conductor. The termination is achieved by placing a resistor between the positive and negative communication conductors. The value of the resistor will depend on the characteristic impedance of the cable chosen, but generally ranges from 100 Ohm to 150 Ohm. This resistor must be capable of dissipating 2W.

2.6. ETHERNET PORT

The Ethernet connector should be wired according to industry standards. **Refer** to the additional information section in this document for further details.

3. SETUP

3.1. INSTALL CONFIGURATION SOFTWARE

All the network setup and configuration of the module is achieved by means of the Aparian Slate device configuration environment. This software can be downloaded from http://www.aparian.com/software/slate.

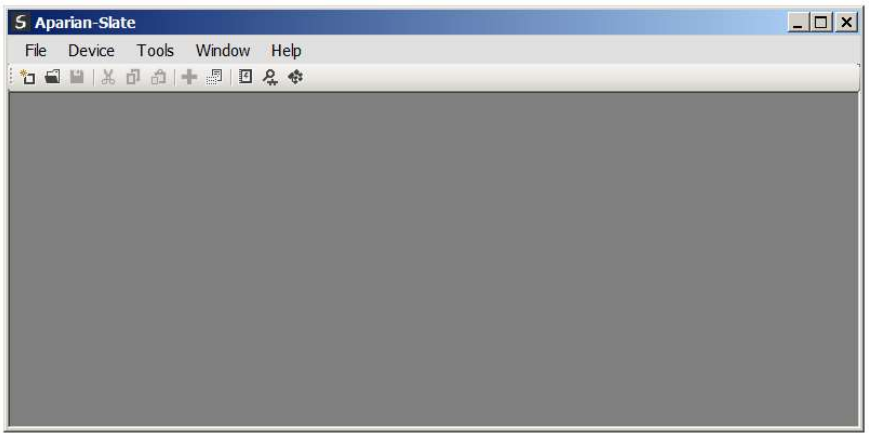


Figure 3.1. - Aparian Slate Environment

3.2. NETWORK PARAMETERS

The module will have DHCP (Dynamic Host Configuration Protocol) enabled as factory default. Therefore, a DHCP server must be used to provide the module with the required network parameters (IP address, subnet mask, etc.). There are a number of DHCP utilities available, however it is recommended that the DHCP server in Slate be used.

Within the Slate environment, the DHCP server can be found under the Tools menu.

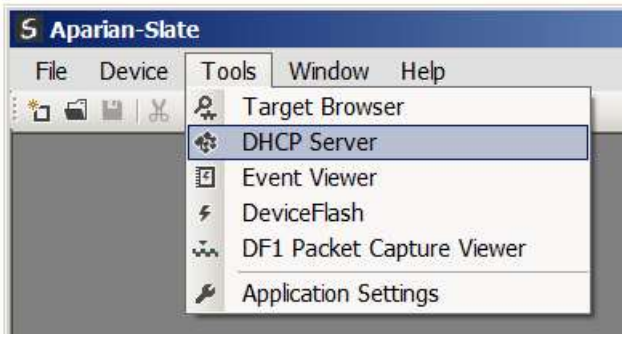


Figure 3.2. - Selecting DHCP Server

Once opened, the DHCP server will listen on all available network adapters for DHCP requests and display their corresponding MAC addresses.

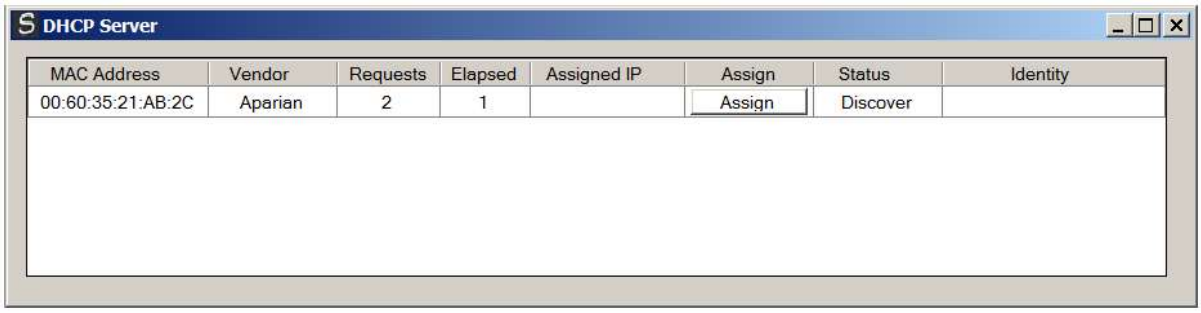


Figure 3.3. - DHCP Server

NOTE: If the DHCP requests are not displayed in the DHCP Server it may be due to the local PC's firewall. During installation, the necessary firewall rules are automatically created for the Windows firewall. Another possibility is that another DHCP Server is operational on the network and it has assigned the IP address.

To assign an IP address, click on the corresponding "Assign" button. The IP Address Assignment window will open.

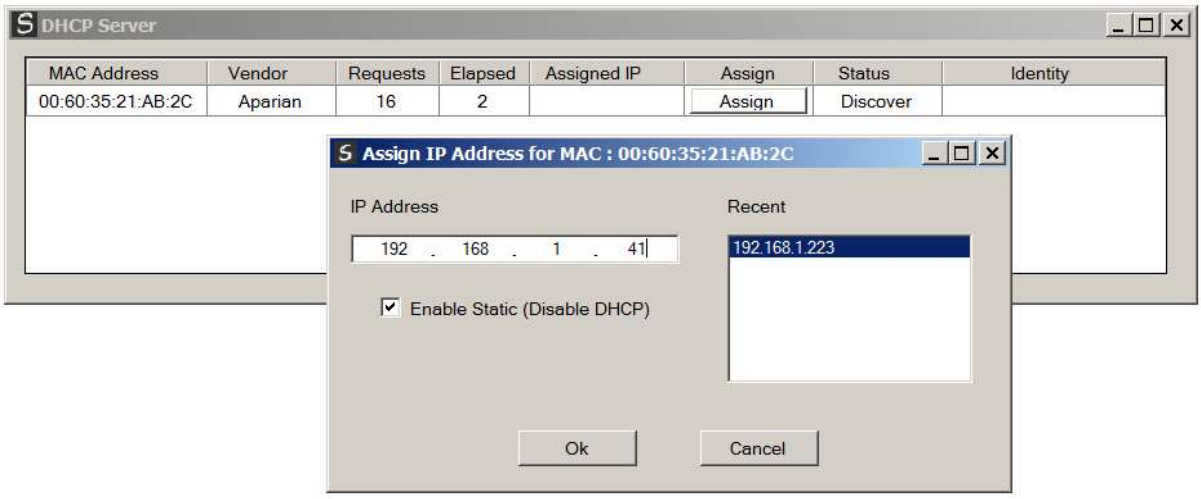


Figure 3.4. - Assigning IP Address

The required IP address can then be either entered, or a recently used IP address can be selected by clicking on an item in the Recent List.

If the "Enable Static" checkbox is checked, then the IP address will be set to static after the IP assignment, thereby disabling future DHCP requests.

Once the IP address window has been accepted, the DHCP server will automatically assign the IP address to the module and then read the Identity object Product name from the device.

The successful assignment of the IP address by the device is indicated by the green background of the associated row.

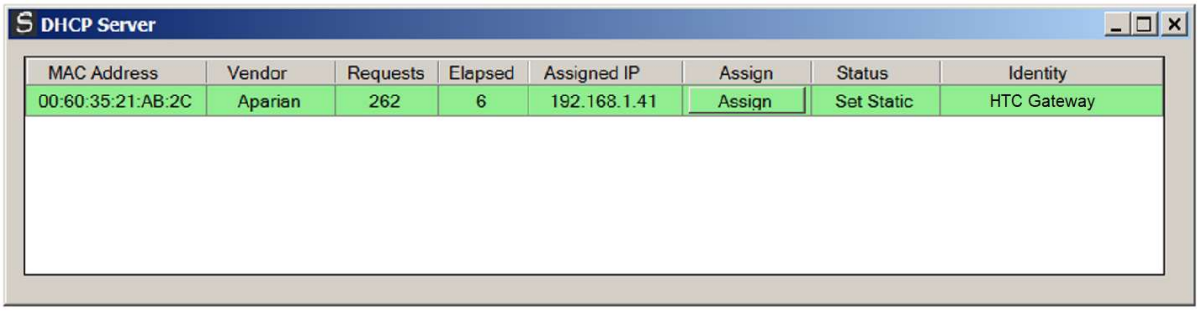


Figure 3.5. - Successful IP address assignment

It is possible to force the module back into DHCP mode by powering up the device with DIP switch 2 set to the On position.

A new IP address can then be assigned by repeating the previous steps.

NOTE: It is important to return DIP switch 2 back to the Off position after power-up, before the DHCP server is used to assign an address. Failing to do so, will result in the IP address being assigned as a dynamic address (not static) and the address will be reset after the next power cycle.

In addition to the setting the IP address, a number of other network parameters can be set during the DHCP process. These settings can be viewed and edited in Slate's Application Settings, in the DHCP Server tab.

Once the DHCP process has been completed, the network settings can be set using the Ethernet Port Configuration via the Target Browser.

The Target Browser can be accessed under the Tools menu.

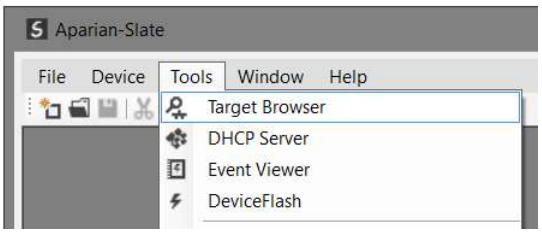


Figure 3.6. - Selecting the Target Browser

The Target Browser automatically scans the Ethernet network for EtherNet/IP devices.

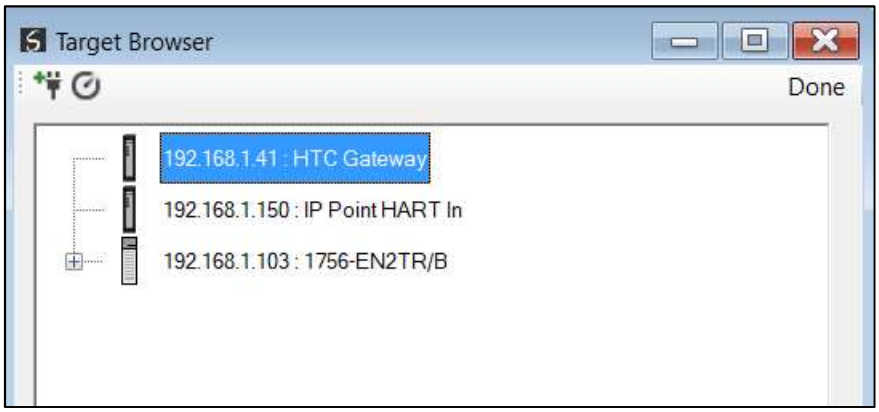


Figure 3.7. - Target Browser

Right-clicking on a device, reveals the context menu, including the Port Configuration option.

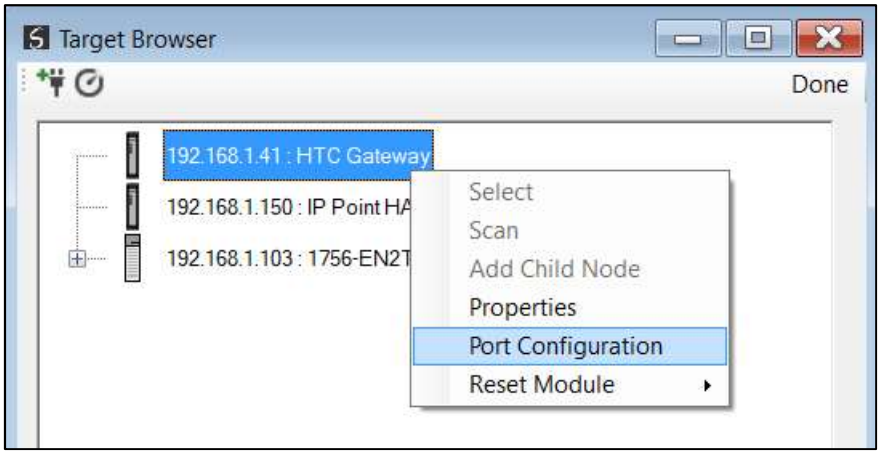


Figure 3.8. - Selecting Port Configuration

All the relevant Ethernet port configuration parameters can be modified using the Port Configuration window.

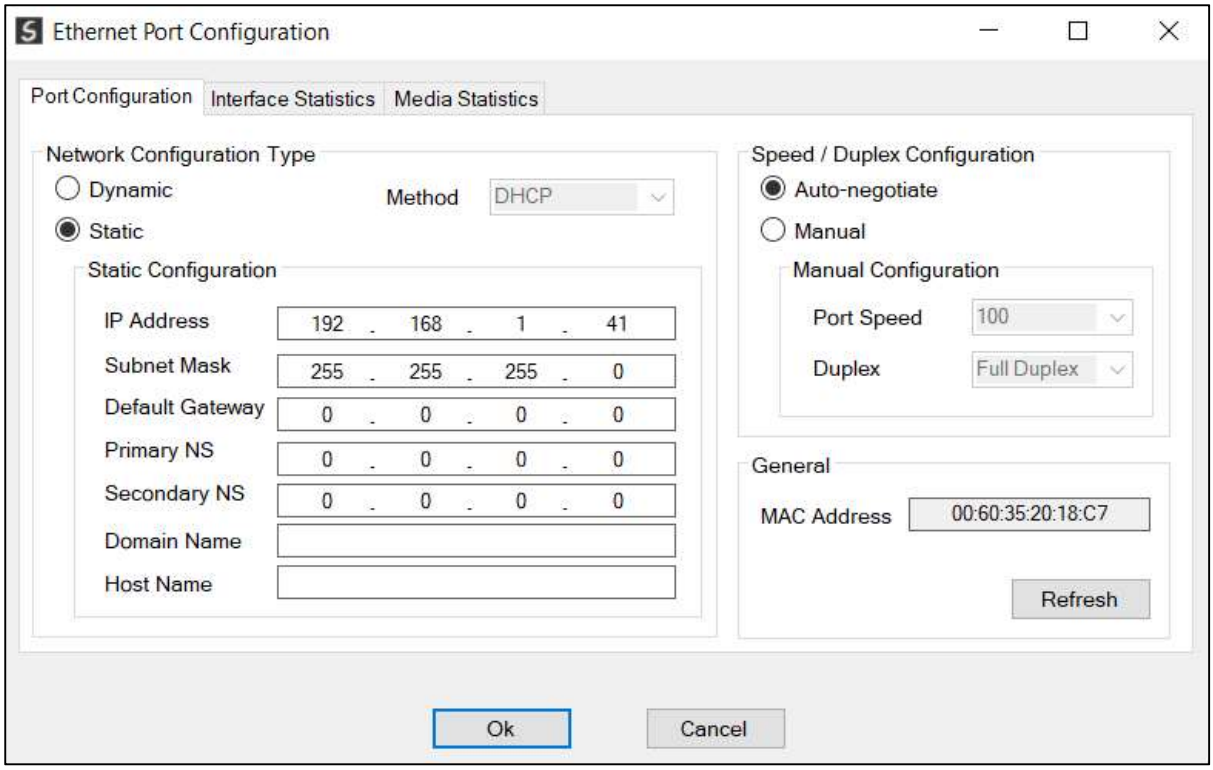


Figure 3.9. - Port Configuration

Alternatively, these parameters can be modified using Rockwell Automation's RSLinx software.

3.3. CREATING A NEW PROJECT

Before the user can configure the module, a new Slate project must be created. Under the ***File*** menu, select ***New***.

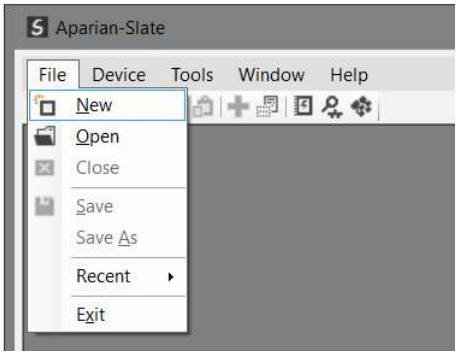


Figure 3.10. - Creating a new project

A Slate project will be created, showing the Project Explorer tree view. To save the project use the ***Save*** option under the File menu.

A new device can now be added by selecting ***Add*** under the Device menu.

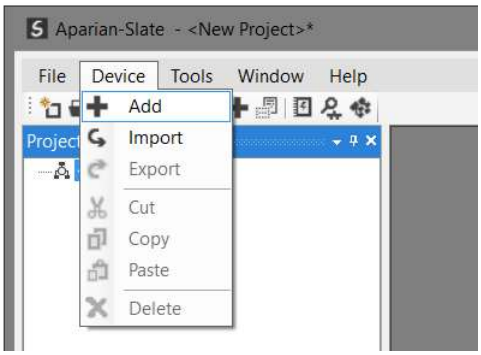


Figure 3.11. - Adding a new device

In the Add New Device window select the ***HTC Gateway***, and click the Ok button.

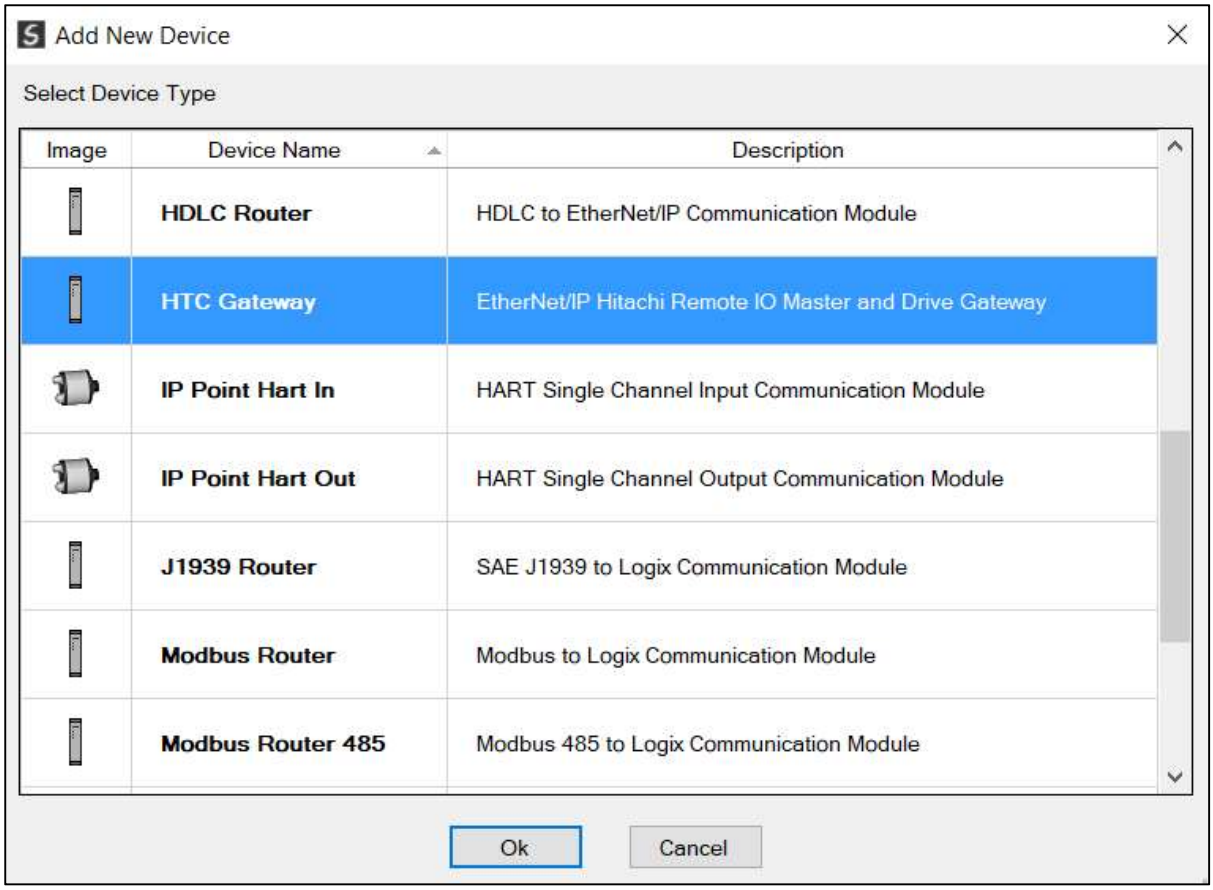


Figure 3.12 – Selecting a new HTC Gateway

The device will appear in the Project Explorer tree as shown below, and its configuration window opened.

The device configuration window can be reopened by either double clicking the module in the Project Explorer tree or right-clicking the module and selecting *Configuration*.

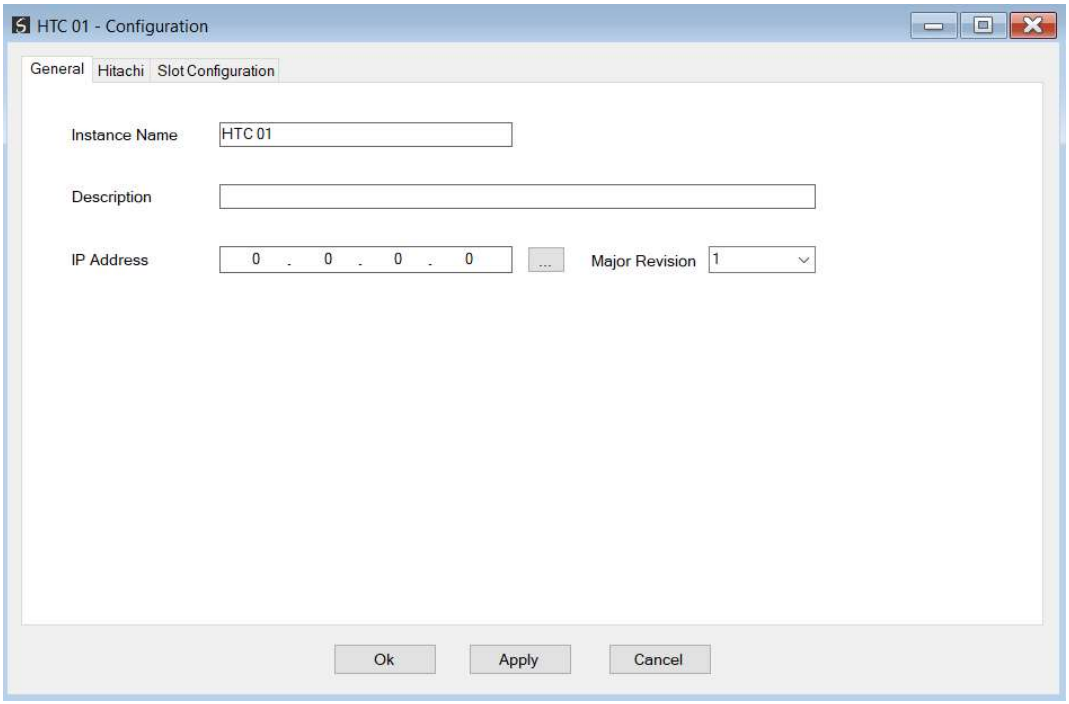


Figure 3.13. – HTC Gateway configuration

Refer to the additional information section in this document for Slate's installation and operation documentation.

3.4. HTC GATEWAY CONFIGURATION

The HTC Gateway configuration is configured using Slate. This includes the Hitachi communication settings and the mapping of the IO Slots to the Logix input and output assemblies.

When downloading this configuration into the module it will be saved in non-volatile memory that persists when the module is powered down.

NOTE: When a firmware upgrade is performed, the module will clear all configuration and mappings.

The general configuration consists of the following parameters:

Parameter	Description
Instance Name	User defined name to identify between various HTC Gateways.
Description	User defined description for the module.
IP Address	The IP Address used to connect to the module.
Major Revision	The major revision of the module

Table 3.1 - General configuration parameters

The general configuration is shown in the figure below. The HTC Gateway general configuration window is opened by either double clicking on the module in the tree or right-clicking the module and selecting *Configuration*.

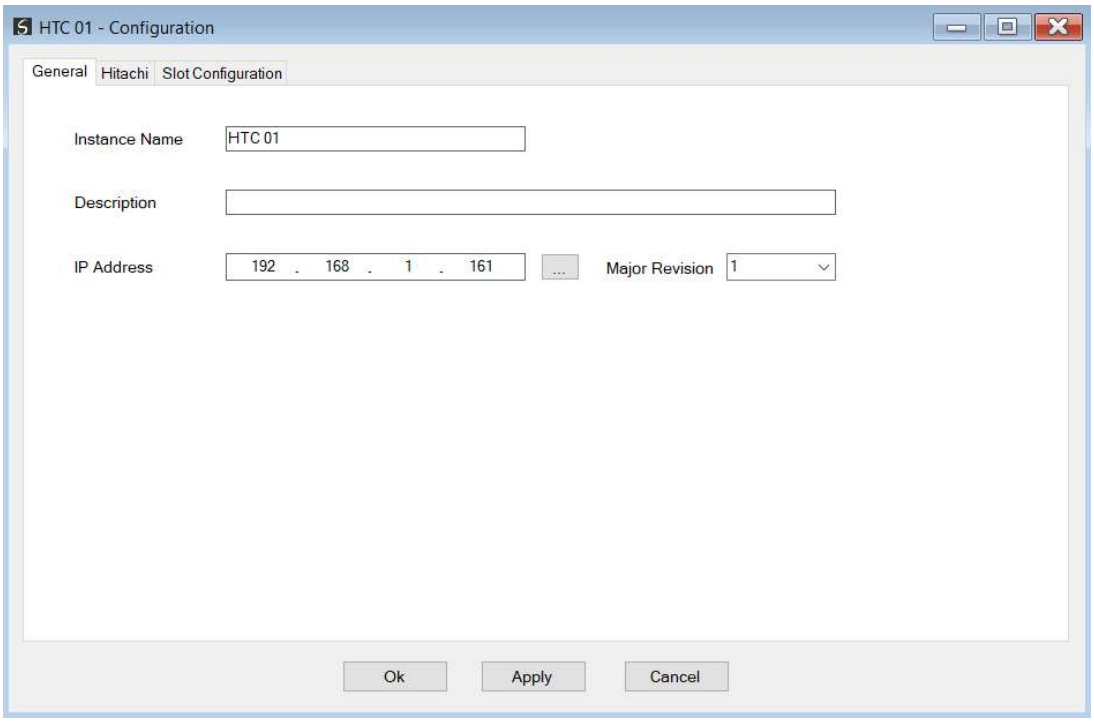


Figure 3.14 - General Configuration

The Hitachi communication configuration consists of the following parameters:

Parameter	Description
Mode	The mode in which the Gateway will operate, either: • **RIOH Master** – The HTC Gateway will operate as a IO Master to the Hitachi IO. • **RIOH Slave** – The HTC Gateway will operate as Hitachi IO to the legacy Hitachi IO Master (Hitachi CPU). • **ROW RIW – Drive** – The HTC Gateway will communicate to a legacy Hitachi Drive.
Comm Failure Retry Limit	The amount of communication failures before reporting a communication failure in the Logix input assembly.
Signal Threshold	The signal level used for the communication signal. **NOTE**: The Signal Threshold will be defaulted when selecting the operation mode and the user should avoid changing this unless communication issues are experienced. See the *Oscilloscope* section for more details regarding the Signal Threshold parameter.

Table 3.2 – Hitachi communication configuration parameters

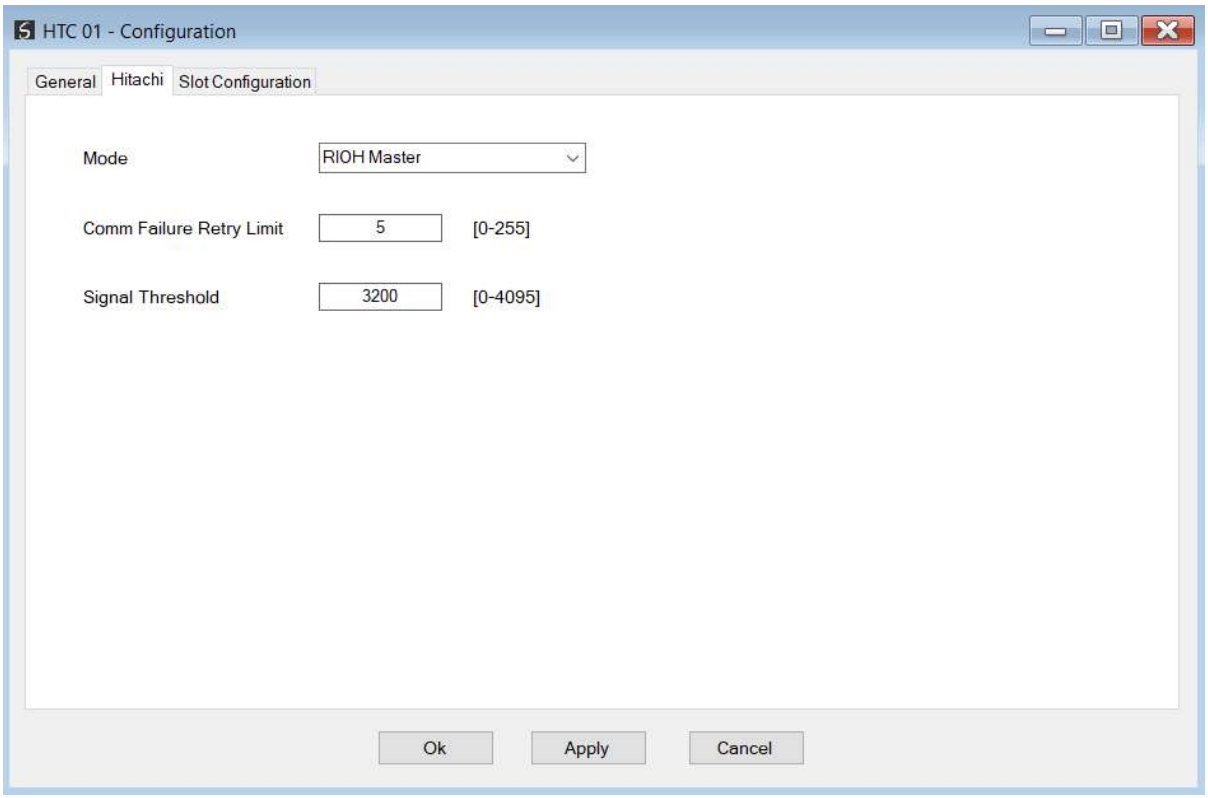


Figure 3.15 – Hitachi communication configuration

3.5. SLOT CONFIGURATION

The third tab is used to configure the IO Slots when operating in IO Master or IO Slave mode.

Each remote IO Slot is entered one row at a time with the corresponding slot number (0 – 127), IO Type, and Timeout (only relevant for IO Slave mode).

The following parameters are associated with each device:

Parameter	Description
Slot	This is the slot number of the IO card being communicated to. This value can range from 0 to 127. The Hitachi IO can be configured as either 16P, 32P, or 64P. **Slots 16P** When the Hitachi IO is configured for 16P, each IO card will use one slot address. **Slots 32P** When the Hitachi IO is configured for 32P, each IO card will use two slot addresses. **Slots 64P** When the Hitachi IO is configured for 64P, each IO card will use four slot address.

<table>
<tr><td>IO Type</td><td>The IO type can be one of the following:
Digital Input
Digital Output
Analog Input
Analog Output
NOTE: When Analog Input or Analog Output is selected, in some instances the top two bits of the 16bit value in Logix will be used to represent the Analog Channel number being used, as the IO Module time-division-multiplexes the different channels into one word. Below is an example where Analog Channel 1 is being used and the value is a 14-bit number (1000) so the 16bit Logix value will be 17384 (0x43E8 hex).

<table><tr><th>Channel Number (Bits 15 & 14)</th><th>Analog Value (Bits 13 – 0)</th></tr><tr><td>01</td><td>00001111101000</td></tr></table>
Additional Logix code is required to demultiplex the analog channel data.</td></tr>
<tr><td>Timeout</td><td>The timeout value is only used in IO Slave mode and is the number of milliseconds since the last communication from the IO Master before the HTC Gateway reports a fault for the specific slot.</td></tr>
<tr><td>Description</td><td>User defined description for the remote slot.</td></tr>
</table>

Table 3.3 – Hitachi IO Slot configuration

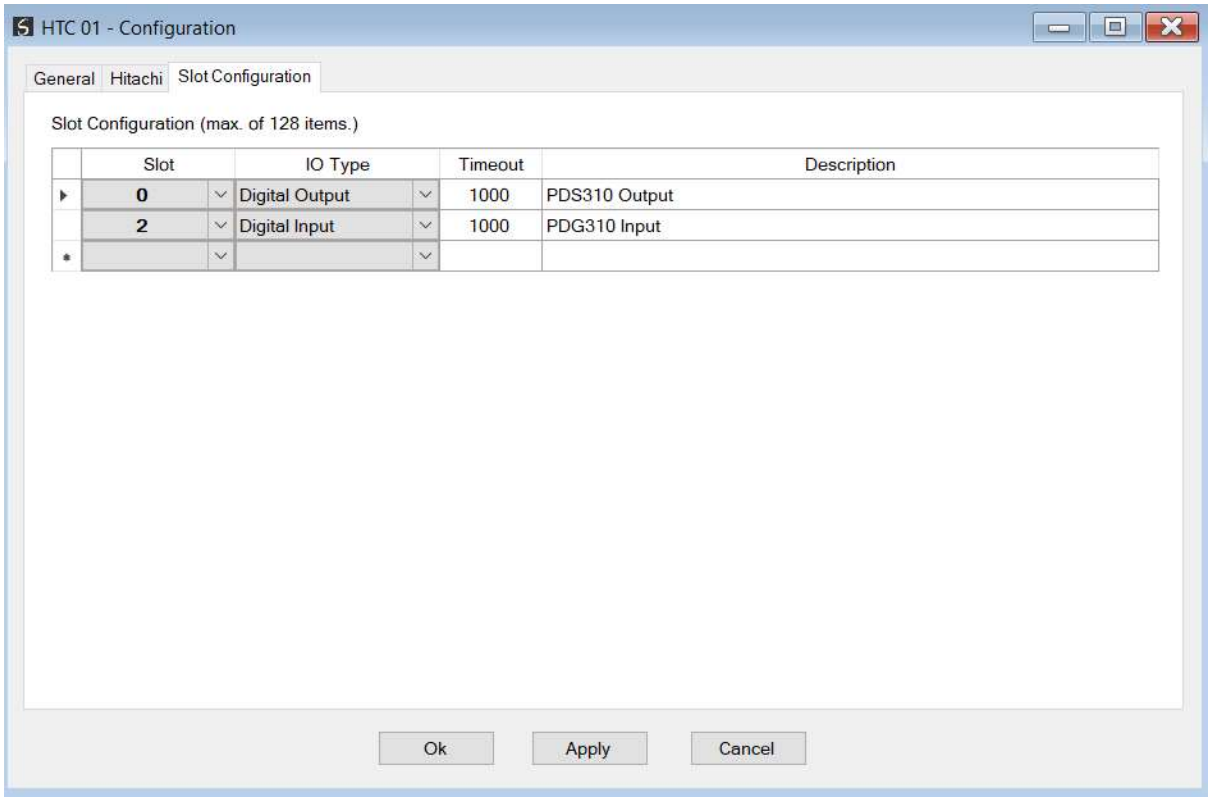


Figure 3.16 – Slot Configuration tab

3.6. MODULE DOWNLOAD

Once the HTC Gateway configuration has been completed, it must be downloaded to the module.

Before downloading the Connection Path of the module should be set. This path will automatically default to the IP address of the module, as set in the module configuration. It can however be modified, if the HTC Gateway is not on a local network.

The Connection path can be set by right-clicking on the module and selecting the Connection Path option.

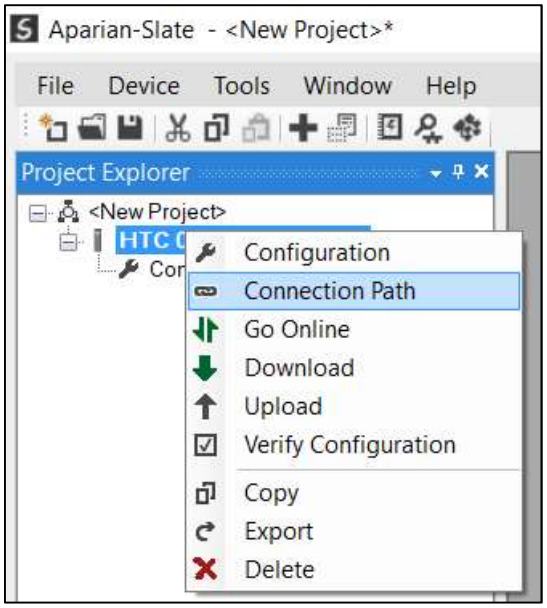


Figure 3.17 - Selecting Connection Path

The new connection path can then be either entered manually or selected by means of the Target Browser.



Figure 3.18 - Connection Path

To initiate the download, right-click on the module and select the Download option.

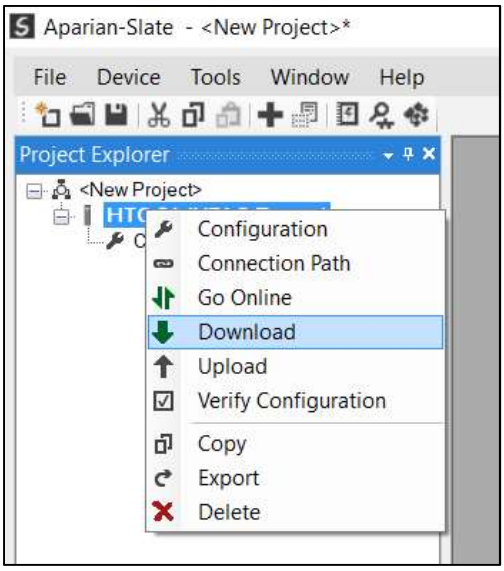


Figure 3.19 - Selecting Download

Once complete, the user will be notified that the download was successful.



Figure 3.20 - Successful download

The module is now configured and will start operating immediately.

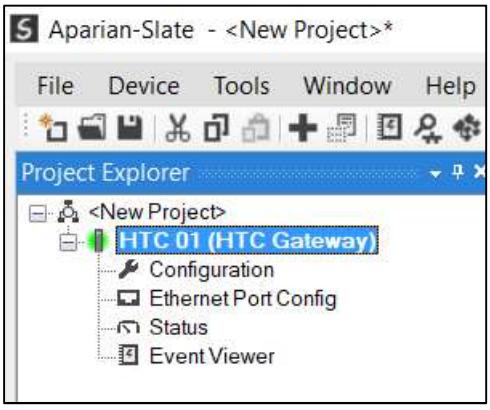


Figure 3.21 - Module online

3.7. RSLOGIX 5000 CONFIGURATION

The HTC Gateway modules can be easily integrated with the Allen-Bradley Logix family of controllers.

3.7.1.1. ADD MODULE TO I/O CONFIGURATION

Adding the module to the Logix IO tree makes use of the generic Ethernet module profile. This is done by right clicking on the Ethernet Bridge in the RSLogix 5000 and selecting *New Module* after which the *ETHERNET-MODULE* is selected to be added as shown in the figure below.

NOTE: See the next section for importing the configuration (L5X).

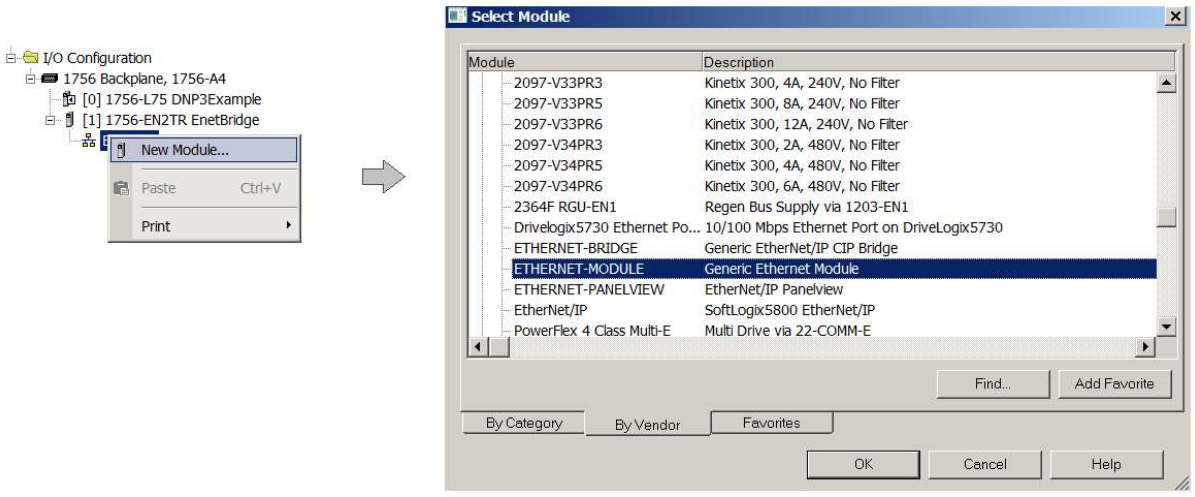


Figure 3.22 - Add a Generic Ethernet Module in RSLogix 5000

The user must enter the IP address of the HTC Gateway that will be used. The assembly instance and size must also be added for the input, output, and configuration in the connection parameters section. Below are the required connection parameters.

Connection Parameter	Assembly Instance	Size
Input	128	81 (32-bit)
Output	129	97 (32-bit)
Configuration	102	0 (8-bit)

Table 3.4 - RSLogix class 1 connection parameters for the HTC Gateway

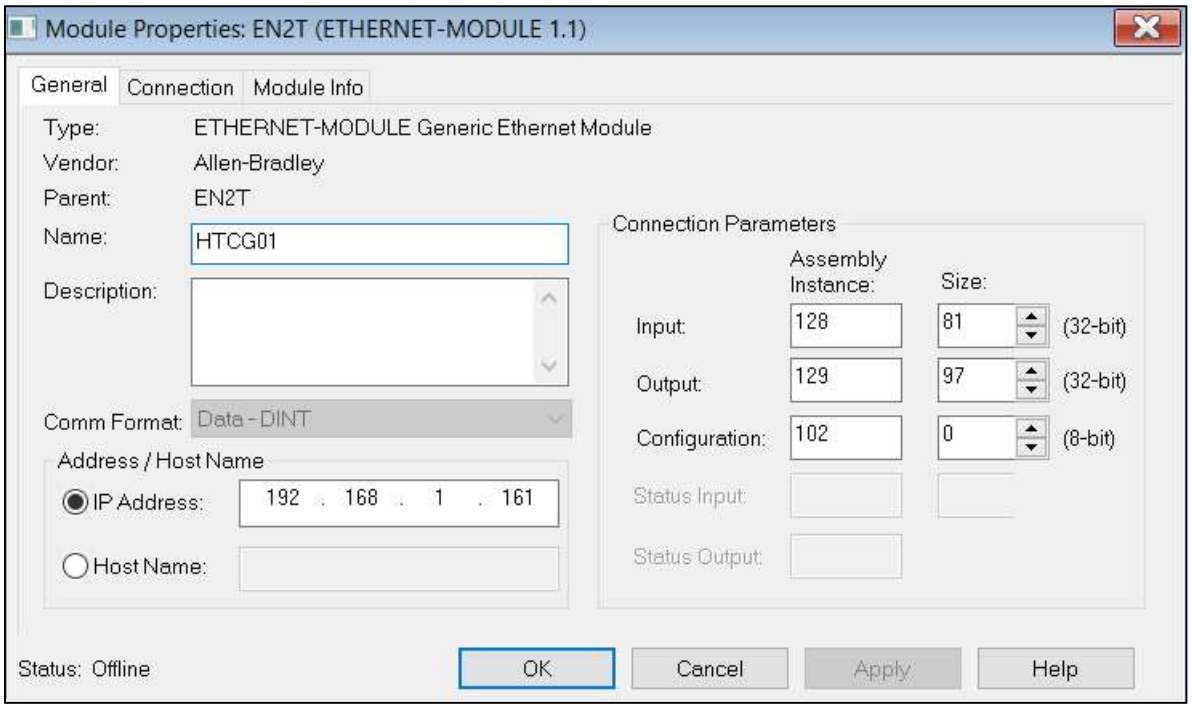


Figure 3.23 . - General module properties in RSLogix 5000

NOTE: The user will need to enter the exact connection parameters before the module will establish a class 1 connection with the Logix controller.

Next the user needs to add the connection requested packet interval (RPI). This is the rate at which the input and output assemblies are exchanged. The recommended value is 10ms. Refer to the technical specification section in this document for further details on the limits of the RPI.

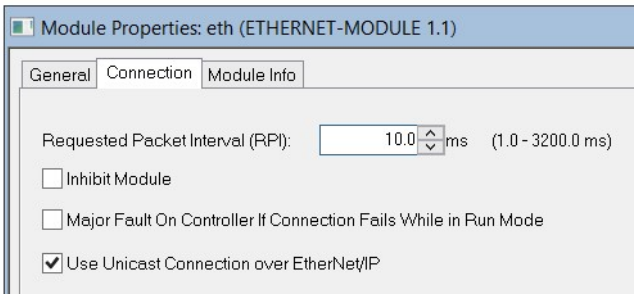


Figure 3.24 - Connection module properties in RSLogix 5000

Once the module has been added to the RSLogix 5000 IO tree the user must assign the User Defined Types (UDTs) to the input and output assemblies. The user can import the required UDTs by right-clicking on *User-Defined* sub-folder in the *Data Types* folder of the IO tree and selecting *Import Data Type*. The assemblies are then assigned to the UDTs with a ladder copy instruction (COP) as shown in the figure below.

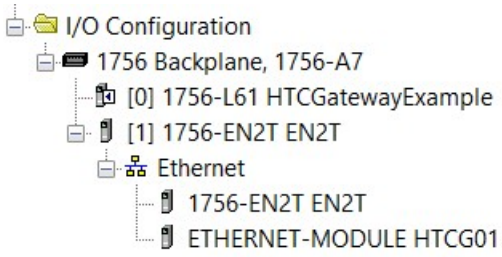


Figure 3.25 – RSLogix 5000 I/O module tree

3.7.1.2. Importing UDTs and Mapping Routines

To simplify the mapping of the input image, an RSLogix 5000 Routine Partial Import (L5X) file is provided. This file can be imported by right-clicking on the required Program and selecting the Import Routine option.

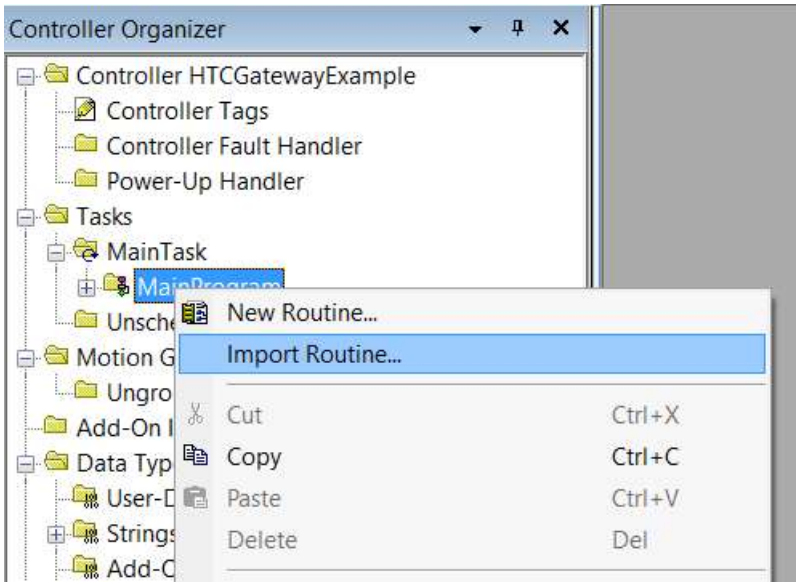


Figure 3.26 – RSLogix 5000 Importing HTC Gateway specific routine and UDTs

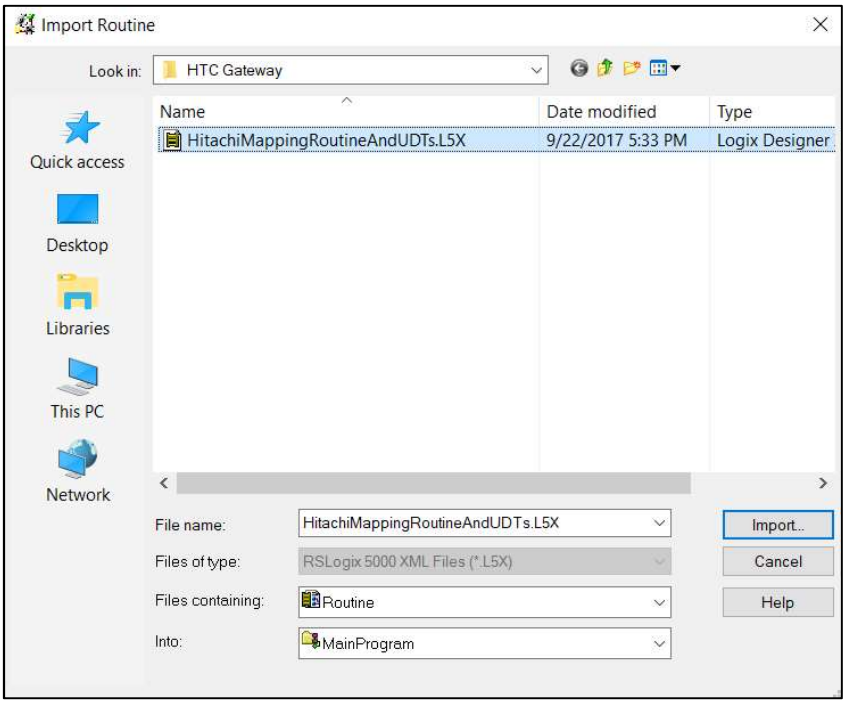


Figure 3.27 - Selecting partial import file

The import will create the following:

- The required UDTs (user defined data types)
- Two controller tags representing the Input and Output assemblies.
- A routine mapping the HTC Gateway module to the aforementioned tags.

The user may need to change the routine to map to the correct HTC Gateway module instance name, and make sure that the mapping routine is called by the Program's Main Routine.

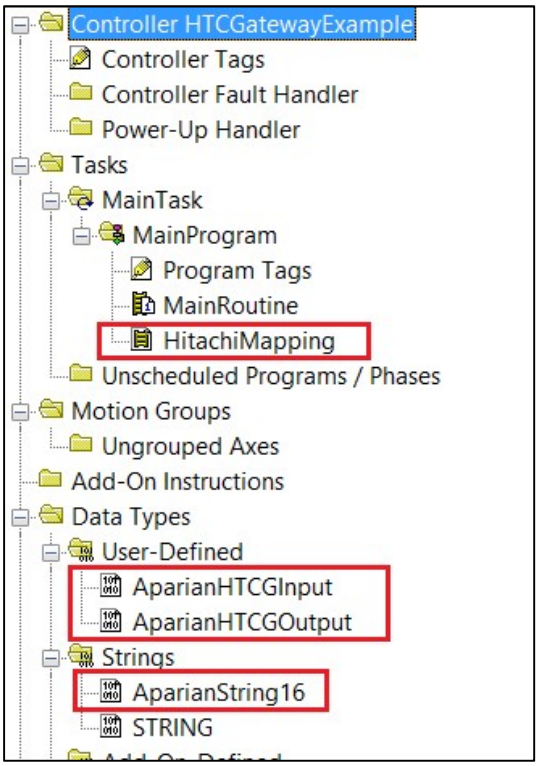


Figure 3.28 - Imported RSLogix 5000 objects

Refer to the additional information section of this document for an example RSLogix 5000 project as well as the required UDTs.

4. OPERATION

When the module is running it will exchange data between each Hitachi IO card or Hitachi Drive (depending on the mode of operation configured) :

4.1. IO MASTER/SLAVE MODE

When the HTC Gateway is in the RIOH Master mode, it will exchange data with all configured slots every RPI (Logix Requested Packet Interval).

IO Master
In this mode, the Input Assembly data represents the Hitachi Input cards (digital or analog). Each Slot data will be in the respective 16-bit Data Input Map index (explained below in the Logix Assemblies) and the Output Assembly data represent the Hitachi Output cards (digital or analog). Each Slot data will be in the respective 16-bit Data Output Map index (explained below in the Logix Assemblies)

IO Slave
In this mode, the Input Assembly data represents the Hitachi Output cards (digital or analog). Each Slot data will be in the respective 16-bit Data Output Map index (explained below in the Logix Assemblies) and the Input Assembly data represent the Hitachi Output cards (digital or analog). Each Slot data will be in the respective 16-bit Data Input Map index (explained below in the Logix Assemblies)

4.2. DRIVE MODE

When the HTC Gateway is in Drive Mode, it will exchange data with one Hitachi Drive. The data from the Hitachi Drive is 32-bit and will be represented in Data Map item 0 and 1 (each 16-bit). The data in the Input Data Map will represent the data **received from** the Hitachi Drive whilst the data in the Output Data Map will represent the data **sent to** the Hitachi Drive (explained below in the Logix Assemblies).

4.3. LOGIX ASSEMBLIES

The Logix controller will establish a class 1 cyclic communication connection with the HTC Gateway and the input and output assemblies are exchanged at the RPI interval. The UDTs provided, will convert the input and output arrays into tag based assemblies. Refer to the additional information section in this document for the input and output UDTs.

HTCInput	{...}	{...}		AparianHTCGInput
HTCInput.InstanceNameLen	6		Decimal	DINT
HTCInput.InstanceName	{...}	{...}	Decimal	SINT[16]
HTCInput.Status	1		Decimal	DINT
HTCInput.Temperature	51.46352		Float	REAL
HTCInput.TxCount	85417		Decimal	DINT
HTCInput.RxCount	86613		Decimal	DINT
HTCInput.ErrorRetries	8		Decimal	DINT
HTCInput.IOErrors	0		Decimal	DINT
HTCInput.DriveErrors	0		Decimal	DINT
HTCInput.TransactionRate	200		Decimal	DINT
HTCInput.IOStatus	{...}	{...}	Decimal	BOOL[128]
HTCInput.DataInputMap	{...}	{...}	Decimal	INT[128]
HTCInput.DataInputMap[0]	0		Decimal	INT
HTCInput.DataInputMap[1]	0		Decimal	INT
HTCInput.DataInputMap[2]	7		Decimal	INT
HTCInput.DataInputMap[3]	0		Decimal	INT
HTCInput.DataInputMap[4]	0		Decimal	INT
HTCInput.DataInputMap[5]	0		Decimal	INT
HTCInput.DataInputMap[6]	0		Decimal	INT
HTCInput.DataInputMap[7]	0		Decimal	INT
HTCInput.DataInputMap[8]	0		Decimal	INT
HTCInput.DataInputMap[9]	0		Decimal	INT
● ● ●				
HTCInput.DataInputMap[117]	0		Decimal	INT
HTCInput.DataInputMap[118]	0		Decimal	INT
HTCInput.DataInputMap[119]	0		Decimal	INT
HTCInput.DataInputMap[120]	0		Decimal	INT
HTCInput.DataInputMap[121]	0		Decimal	INT
HTCInput.DataInputMap[122]	0		Decimal	INT
HTCInput.DataInputMap[123]	0		Decimal	INT
HTCInput.DataInputMap[124]	0		Decimal	INT
HTCInput.DataInputMap[125]	0		Decimal	INT
HTCInput.DataInputMap[126]	0		Decimal	INT
HTCInput.DataInputMap[127]	0		Decimal	INT

Figure 4.1. - Input assembly UDT structure

4.3.1. INPUT ASSEMBLY

The following parameters are used in the input assembly of the module.

Parameter	Datatype	Description
InstanceName	STRING	This parameter is the instance name of the module that was configured under the general HTC Gateway configuration in Slate.
Status.00	BOOL	Configuration Valid.
Status.01 - .15	BOOL	Reserved

Temperature	REAL	The internal temperature of the module.
TxCount	DINT	The amount of times the data sent to the Hitachi Legacy devices have been updated.
RxCount	DINT	The amount of times the data received from the Hitachi Legacy devices have been updated.
ErrorRetries	DINT	The amount of errors that have occurred.
IOErrors	DINT	The amount of times the sequential error count has reached the retry limit for IO devices (i.e. when in Master or Slave mode).
DriveErrors	DINT	The amount of times the sequential error count has reached the retry limit for a Drive device (i.e. when in Drive mode).
TransactionRate	DINT	The number of successful updates from Hitachi legacy devices have occurred in one second.
IOStatus	BOOL[128]	The status of each legacy Hitachi device. A logical '1' indicates that the data exchange with the legacy device is successful, while a logical '0' indicates that the data exchange is not successful. **RIOH Master/Slave Mode:** Each bit represents an IO Slot. For example if communication with a IO card in slot 5 is exchanging data correctly then IOStatus[5] will be set to 1. **Drive Mode:** The first bit represents (IOStatus[0]) represents the status of the communication with the drive.
DataInputMap[128]	INT	The Data Input map. An array of 16-bit integers containing the input data received from Hitachi IO or the Hitachi Drive. **Hitachi IO – Master Mode** Each index of the Data Input Map represents an IO Card slot (for example the data for IO Slot 3 will be at DataInputMap[3]). In Master mode only input IO Cards will have their data in the DataInputMap (the data being sent from the legacy Hitachi IO). **Hitachi IO – Slave Mode** Each index of the Data Input Map represents an IO Card slot (for example the data for IO Slot 3 will be at DataInputMap[3]). In Slave mode only output IO Cards will have their data in the DataInputMap (the data being sent from the legacy Hitachi Master).

		Drive Data – Drive Mode The first two 16-bit fields of the Data Input Map are used to represent the data received **from** the Drive (32-bits).

Table 4.1 - RSLogix 5000 input assembly parameters

4.3.2. OUTPUT ASSEMBLY

The following parameters are used in the output assembly of the module.

HTCOutput	{...}	{...}		AparianHTCGOutput
HTCOutput.GenCtrl	0		Decimal	DINT
HTCOutput.IOSlotCmd	{...}	{...}	Decimal	SINT[128]
HTCOutput.DataOutputMap	{...}	{...}	Decimal	INT[128]
HTCOutput.DataOutputMap[0]	4		Decimal	INT
HTCOutput.DataOutputMap[1]	3		Decimal	INT
HTCOutput.DataOutputMap[2]	0		Decimal	INT
HTCOutput.DataOutputMap[3]	0		Decimal	INT
HTCOutput.DataOutputMap[4]	0		Decimal	INT
HTCOutput.DataOutputMap[5]	0		Decimal	INT
HTCOutput.DataOutputMap[6]	0		Decimal	INT
HTCOutput.DataOutputMap[7]	0		Decimal	INT
HTCOutput.DataOutputMap[8]	0		Decimal	INT
HTCOutput.DataOutputMap[9]	0		Decimal	INT
● ● ●				
HTCOutput.DataOutputMap[113]	0		Decimal	INT
HTCOutput.DataOutputMap[114]	0		Decimal	INT
HTCOutput.DataOutputMap[115]	0		Decimal	INT
HTCOutput.DataOutputMap[116]	0		Decimal	INT
HTCOutput.DataOutputMap[117]	0		Decimal	INT
HTCOutput.DataOutputMap[118]	0		Decimal	INT
HTCOutput.DataOutputMap[119]	0		Decimal	INT
HTCOutput.DataOutputMap[120]	0		Decimal	INT
HTCOutput.DataOutputMap[121]	0		Decimal	INT
HTCOutput.DataOutputMap[122]	0		Decimal	INT
HTCOutput.DataOutputMap[123]	0		Decimal	INT
HTCOutput.DataOutputMap[124]	0		Decimal	INT
HTCOutput.DataOutputMap[125]	0		Decimal	INT
HTCOutput.DataOutputMap[126]	0		Decimal	INT
HTCOutput.DataOutputMap[127]	0		Decimal	INT

Figure 4.2. - Output assembly UDT structure

Parameter	Datatype	Description
GeneralControl	DINT	Reserved for future use.
IOSlotCmd	SINT[128]	Reserved for future use.

DataOutputMap[128]	INT	The Data Output map. An array of 16-bit integers containing the output data sent to Hitachi IO or the Hitachi Drive. **Hitachi IO – Master Mode** Each index of the Data Output Map represents an IO Card slot (for example the data for IO Slot 3 will be at DataOutputMap[3]). In Master mode only output IO Cards will have their data in the DataOutputMap (the data being sent to the legacy Hitachi IO). **Hitachi IO – Slave Mode** Each index of the Data Output Map represents an IO Card slot (for example the data for IO Slot 3 will be at DataOutputMap [3]). In Slave mode only input IO Cards will have their data in the DataOutputMap (the data being sent to the legacy Hitachi Master). **Drive Data – Drive Mode** The first two 16-bit fields of the Data Output Map are used to represent the data sent **to** the Drive (32-bits).

Table 4.2 - RSLogix 5000 output assembly parameters



NOTE: When the HTC Gateway losses communication to the Logix controller and the Class 1 connection is broken, the HTC Gateway will stop all communication on the Hitachi Interface.

5. DIAGNOSTICS

5.1. LEDS

The module provides three LEDs for diagnostics purposes as shown in the front view figure below. A description of each LED is given in the table below.



Figure 5.1 – HTC Gateway front view

LED	Description
Ok	The module's Ok LED will provide information regarding the system-level operation of the module. If the LED is red then the module is not operating correctly. For example, if the module application firmware has been corrupted or if there is a hardware fault the module will have a red Module LED. If the LED is green then the module has booted and is running correctly.
Eth	The Ethernet LED will light up when an Ethernet link has been detected (by plugging in a connected Ethernet cable). The LED will flash every time traffic was detected.
Act	The Module's Activity LED indicates each time there is a successful or failed transaction. The LED will flash green when there is a successful transaction and flash red when there is a failed transaction.

Table 5.1 - Module LED operation

5.2. MODULE STATUS MONITORING IN SLATE

The HTC Gateway can provide a number of statistics which can assist with module operation, maintenance, and fault finding. The statistics can be accessed in full by Slate or using the web server in the module.

To view the module's status in the Aparian-Slate environment, the module must be online. If the module is not already Online (following a recent configuration download), then right-click on the module and select the ***Go Online*** option.

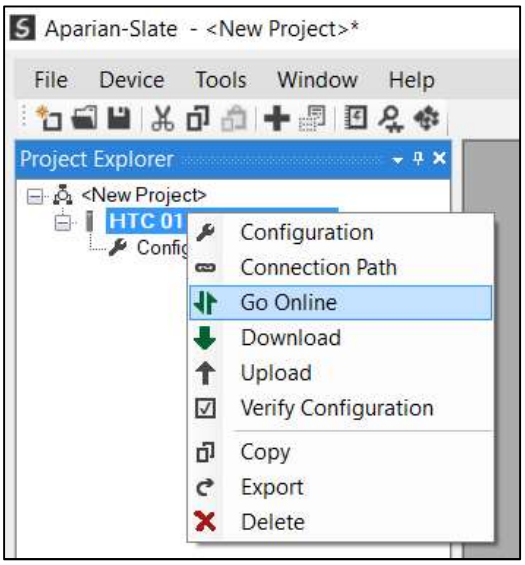


Figure 5.2 - Selecting to Go Online

The Online mode is indicated by the green circle behind the module in the Project Explorer tree.

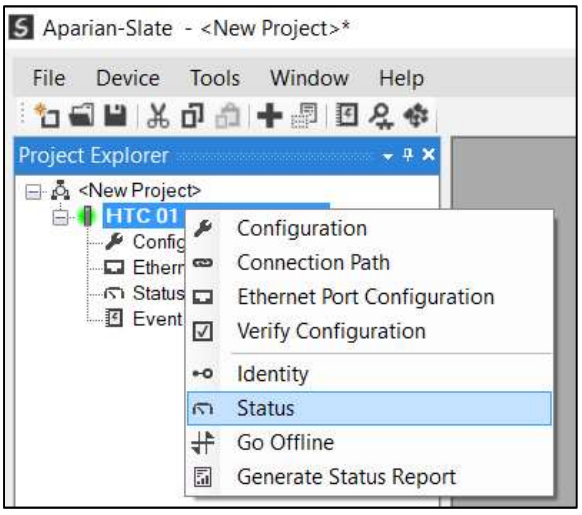


Figure 5.3 - Selecting Online Status

The Status monitoring window can be opened by either double-clicking on the ***Status*** item in the Project Explorer tree, or by right-clicking on the module and selecting ***Status***.

The status window contains multiple tabs to display the current status of the module.

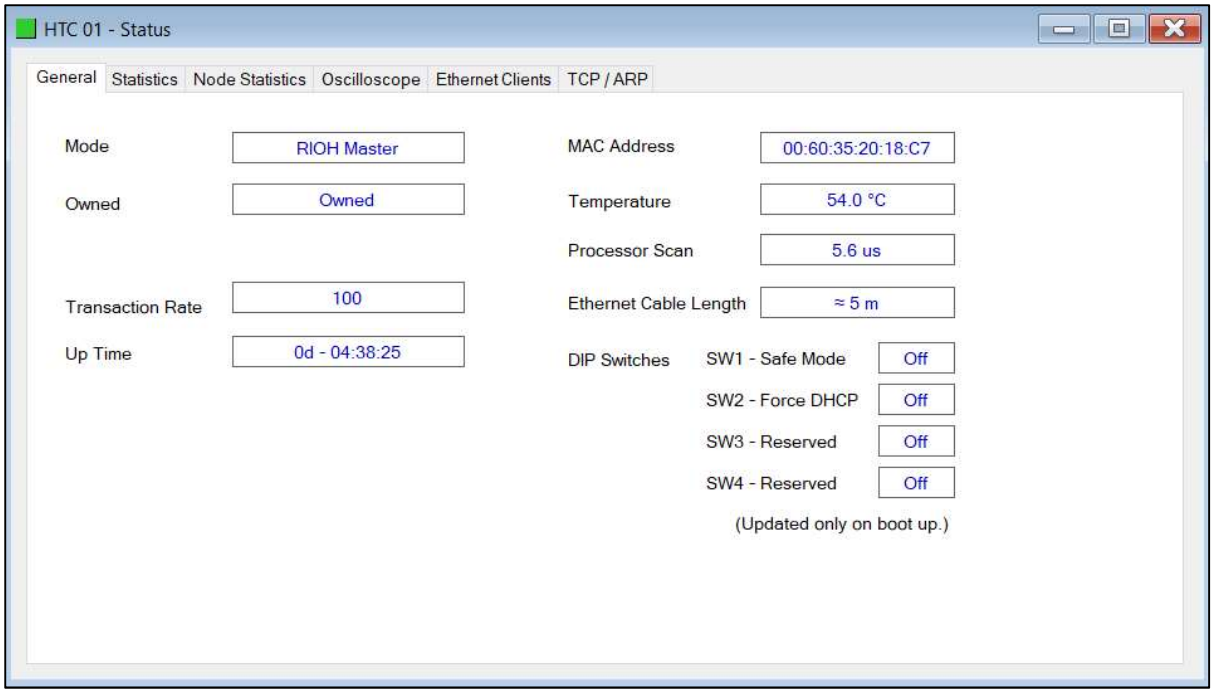


Figure 5.4 - Status Monitoring – General

The General tab displays the following general parameters and can also be used to set the module time to the PC time:

Parameter	Description
Mode	Indicates the current operating mode, either IO Master, IO Slave, or Drive.
Owned	Indicates whether or not the module is currently owned (Class 1) by a Logix controller.
Transaction Rate	The transaction rate is the number of Hitachi messages per second that the module is currently processing.
Up Time	Indicates the elapsed time since the module was powered-up.
MAC Address	Displays the module's unique Ethernet MAC address.
Temperature	The internal temperature of the module.
Processor Scan	The amount of time (microseconds) taken by the module's processor in the last scan.
Ethernet Cable Length	Indicates the estimated length of the Ethernet cable attached to the module. (Accuracy of 5m)
DIP Switch Position	The status of the DIP switches when the module booted. Note that this status will not change if the DIP switches are altered when the module is running.

Table 5.2 - Parameters displayed in the Status Monitoring – General Tab

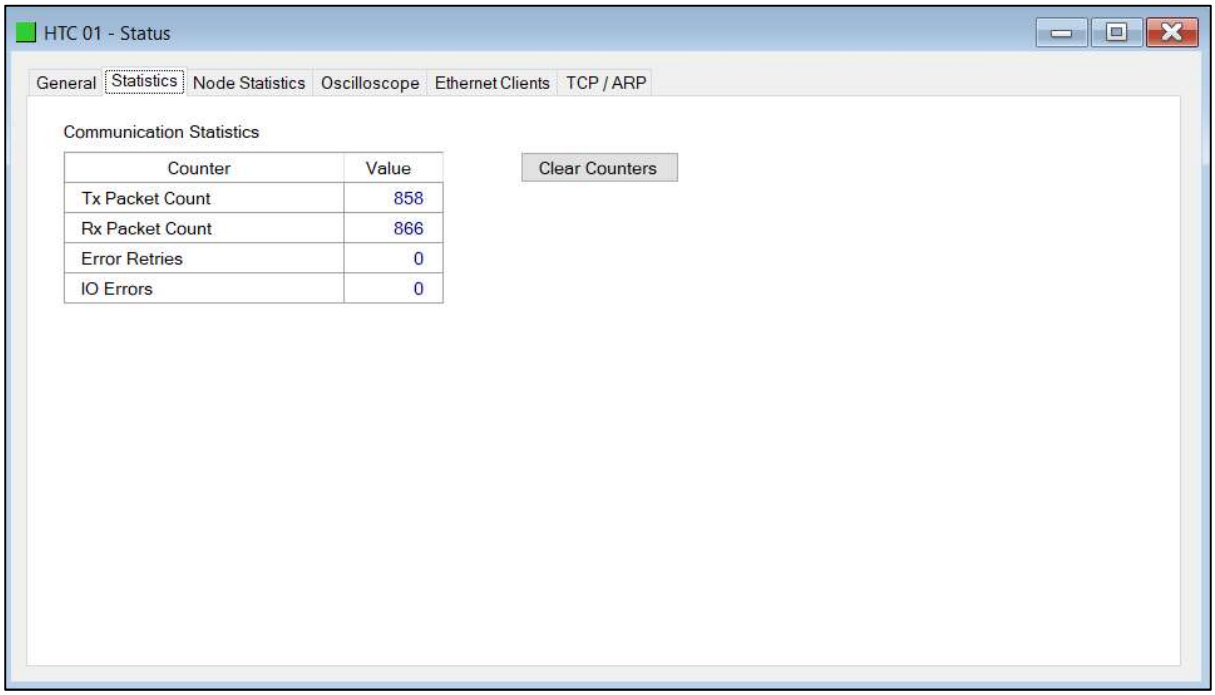


Figure 5.5 - Status monitoring - Hitachi Statistics

The Hitachi Statistics tab displays the statistics associated with the Hitachi communication and mapping.

Statistic	Description
Tx Packet Count	The amount of times the data sent to the Hitachi Legacy devices has been updated.
Rx Packet Count	The amount of times the data received from the Hitachi Legacy devices has been updated.
Error Retries	The amount of errors that have occurred.
IO Errors	The amount of times the sequential error count has reached the retry limit for IO devices (i.e. when in Master or Slave mode).
Drive Errors	The amount of times the sequential error count has reached the retry limit for a Drive device (i.e. when in Drive mode).

Table 5.3 – Hitachi statistics

The IO Slot Statistics tab will display the successful packet counts processed by each mapping item.

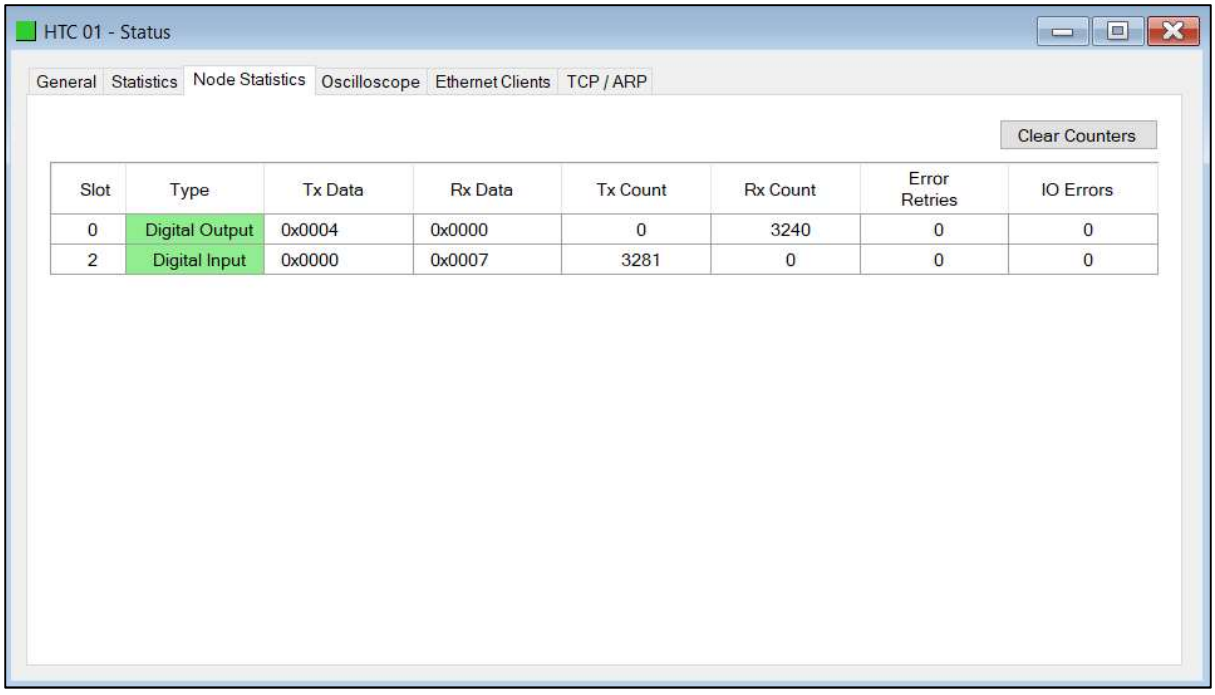


Figure 5.6. - Map Item status

The Hitachi IO Slot Statistics tab displays the statistics associated with each individual Hitachi IO.

Statistic	Description
Slot	IO Slot number
Type	IO Type – Digital Input, Digital Output, Analog Input, Analog Output
Tx Data	Data being sent to the Legacy Hitachi IO (in Master mode) or Legacy Hitachi Master (in Slave mode).
Rx Data	Data being received from the Legacy Hitachi IO (in Master mode) or Legacy Hitachi Master (in Slave mode).
Tx Count	The amount of times the data sent to the Hitachi Legacy device has been updated.
Rx Count	The amount of times the data received from the Hitachi Legacy device has been updated.
Error Retries	The amount of errors that have occurred.
IO Errors	The amount of times the sequential error count has reached the retry limit for IO devices (i.e. when in Master or Slave mode).

Table 5.4 – Hitachi Slot Statistics

5.3. OSCILLOSCOPE

The module provides the capability to capture the Hitachi Signal for analysis. This will allow the user and the support team to resolve any possible issue on site.

To invoke the capture of the Hitachi signal, click on the ***Refresh Trace*** button in the Oscilloscope window.

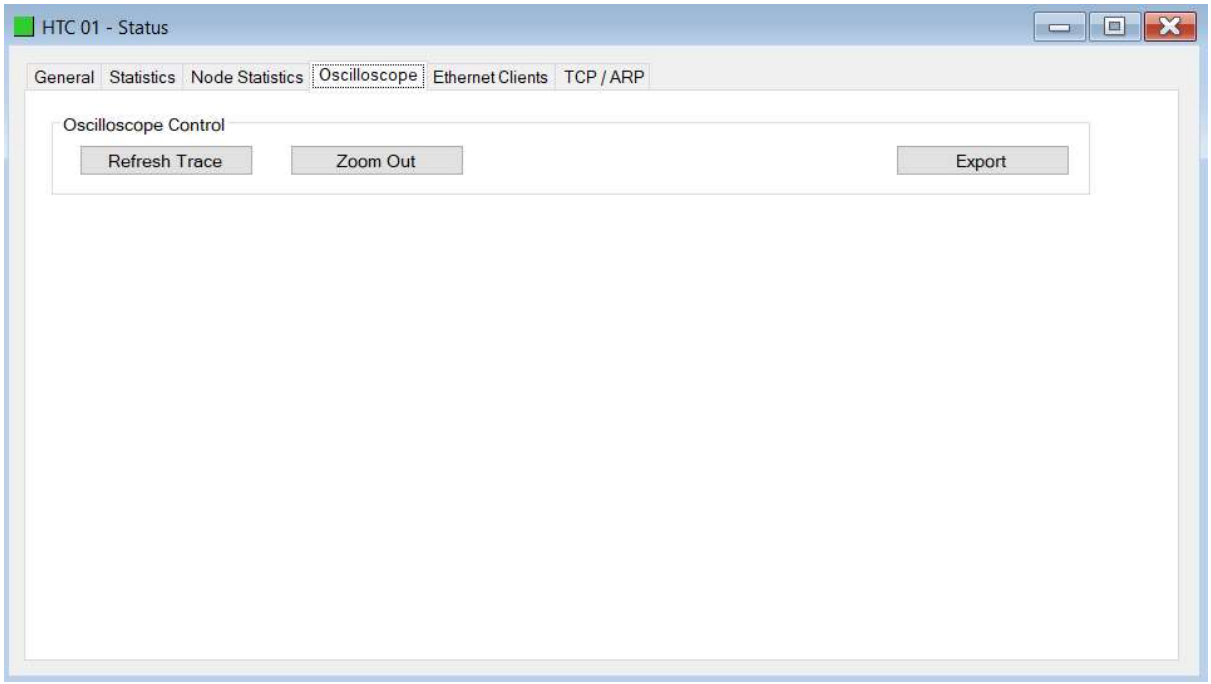


Figure 5.7. - Selecting Hitachi Signal Capture

The Hitachi Signal Capture window will automatically start capturing the Hitachi Signal and stop once the capture has been done.

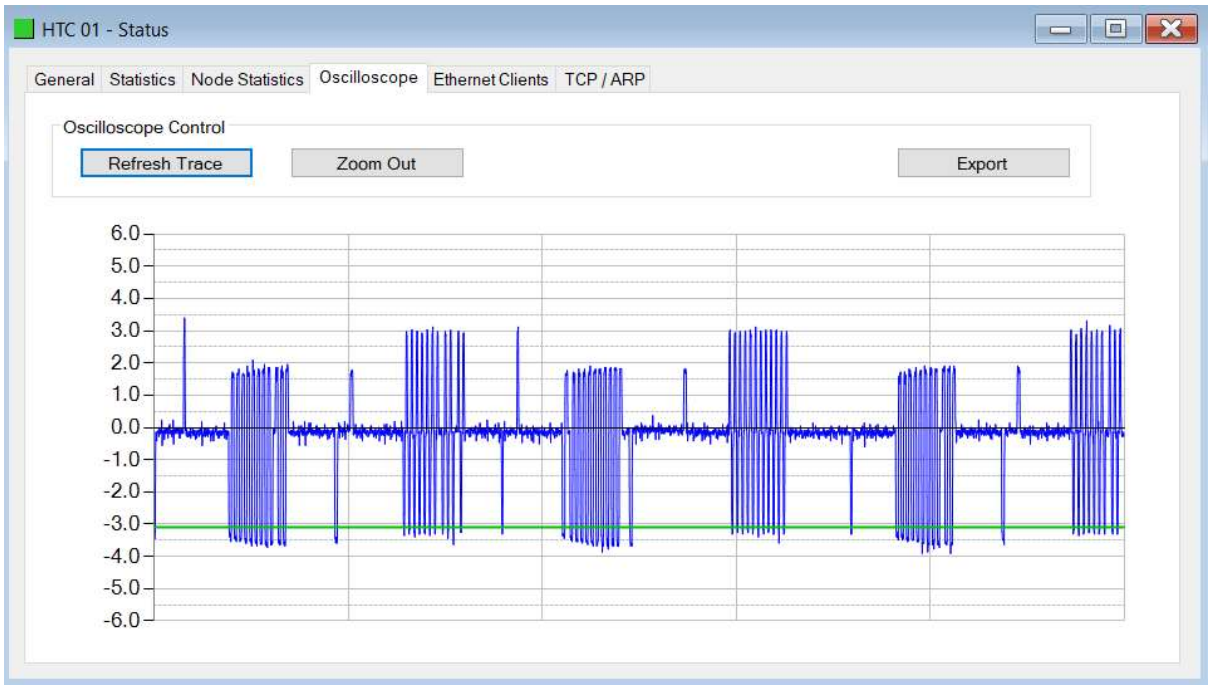


Figure 5.8. – Hitachi Signal capture

The user can zoom into the signal by left-clicking on the trace and dragging the area the user wants to zoom into.

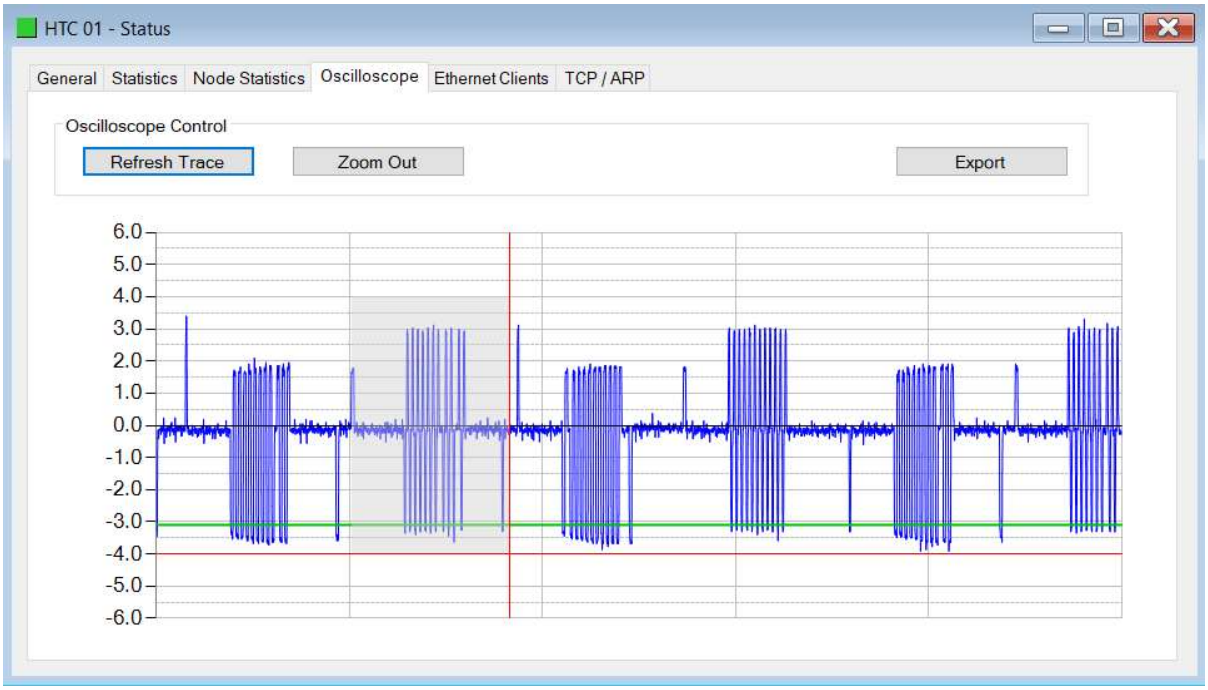


Figure 5.9. – Hitachi Signal /Capture complete

The signal will then be displayed as a zoomed in version.

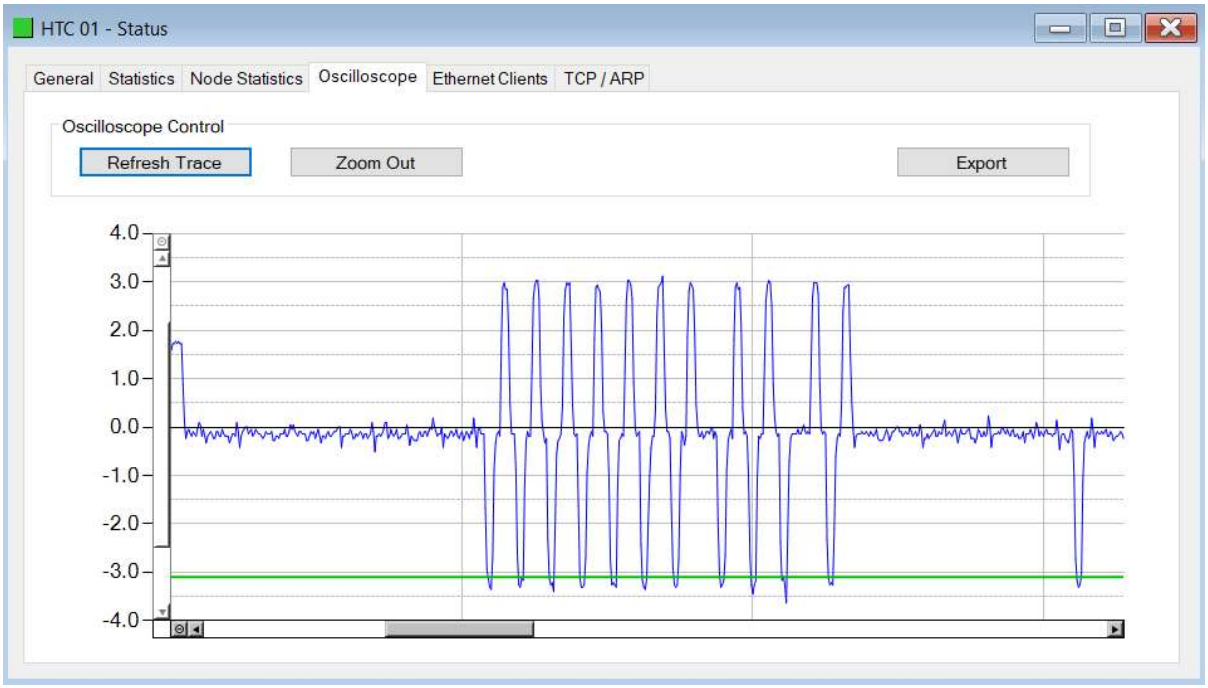


Figure 5.10. - Selecting the Hitachi Signal Viewer

5.4. MODULE EVENT LOG

The HTC Gateway module logs various diagnostic records to an internal event log. These logs are stored in non-volatile memory and can be displayed using Slate or via the web interface. To view them in Slate, select the ***Event Viewer*** option in the Project Explorer tree.

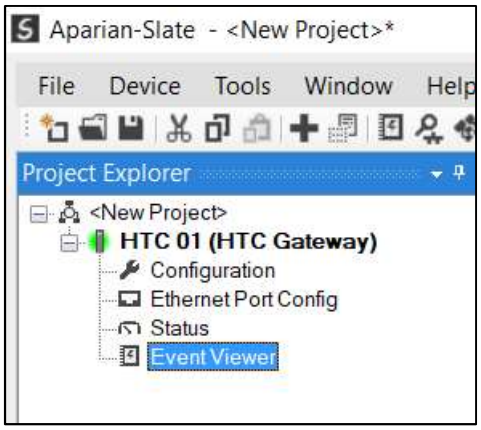
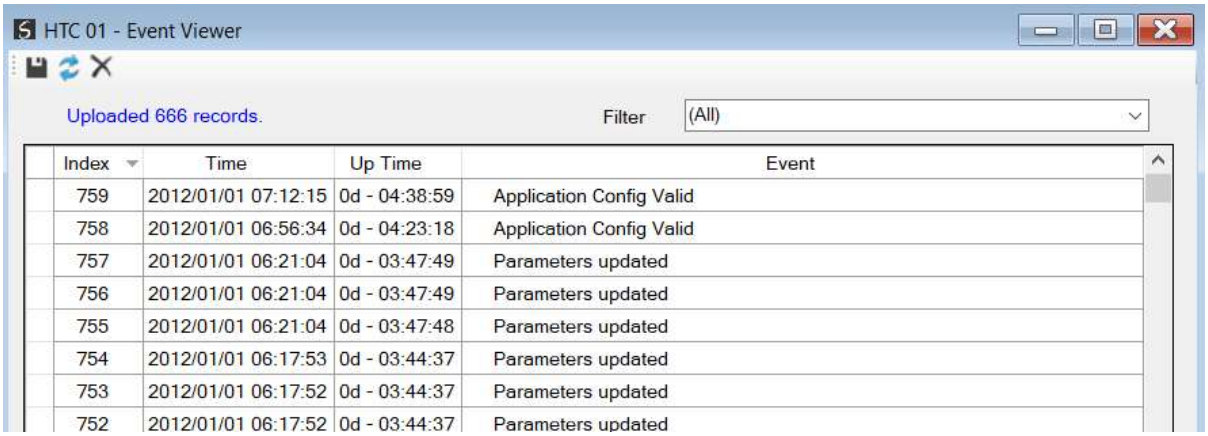


Figure 5.11. - Selecting the module Event Log

The Event Log window will open and automatically read all the events from the module. The log entries are sorted so as to have the latest record at the top. Custom sorting is achieved by double-clicking on the column headings.



Index	Time	Up Time	Event
759	2012/01/01 07:12:15	0d - 04:38:59	Application Config Valid
758	2012/01/01 06:56:34	0d - 04:23:18	Application Config Valid
757	2012/01/01 06:21:04	0d - 03:47:49	Parameters updated
756	2012/01/01 06:21:04	0d - 03:47:49	Parameters updated
755	2012/01/01 06:21:04	0d - 03:47:48	Parameters updated
754	2012/01/01 06:17:53	0d - 03:44:37	Parameters updated
753	2012/01/01 06:17:52	0d - 03:44:37	Parameters updated
752	2012/01/01 06:17:52	0d - 03:44:37	Parameters updated

Figure 5.12. – Module Event Log

The log can also be stored to a file for future analysis, by selecting the ***Save*** button in the tool menu.

To view previously saved files, use the ***Event Log Viewer*** option under the tools menu.

5.5. STATUS REPORT

A Status Report can be generated which describes the configuration and current status of the module in a rich-text formatted document. Generating this document and emailing it to Aparian support can drastically speed-up the remote support process.

To generate the Status Report, the module must first be online. Right-click on the HTC Gateway and select the ***Generate Status Report*** option.

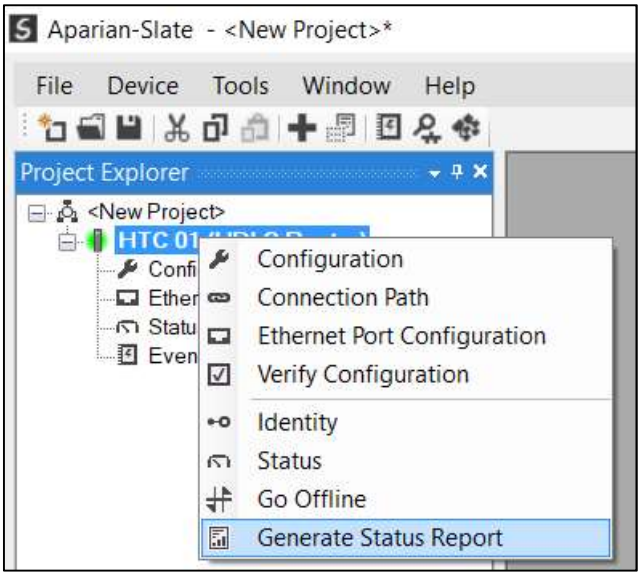
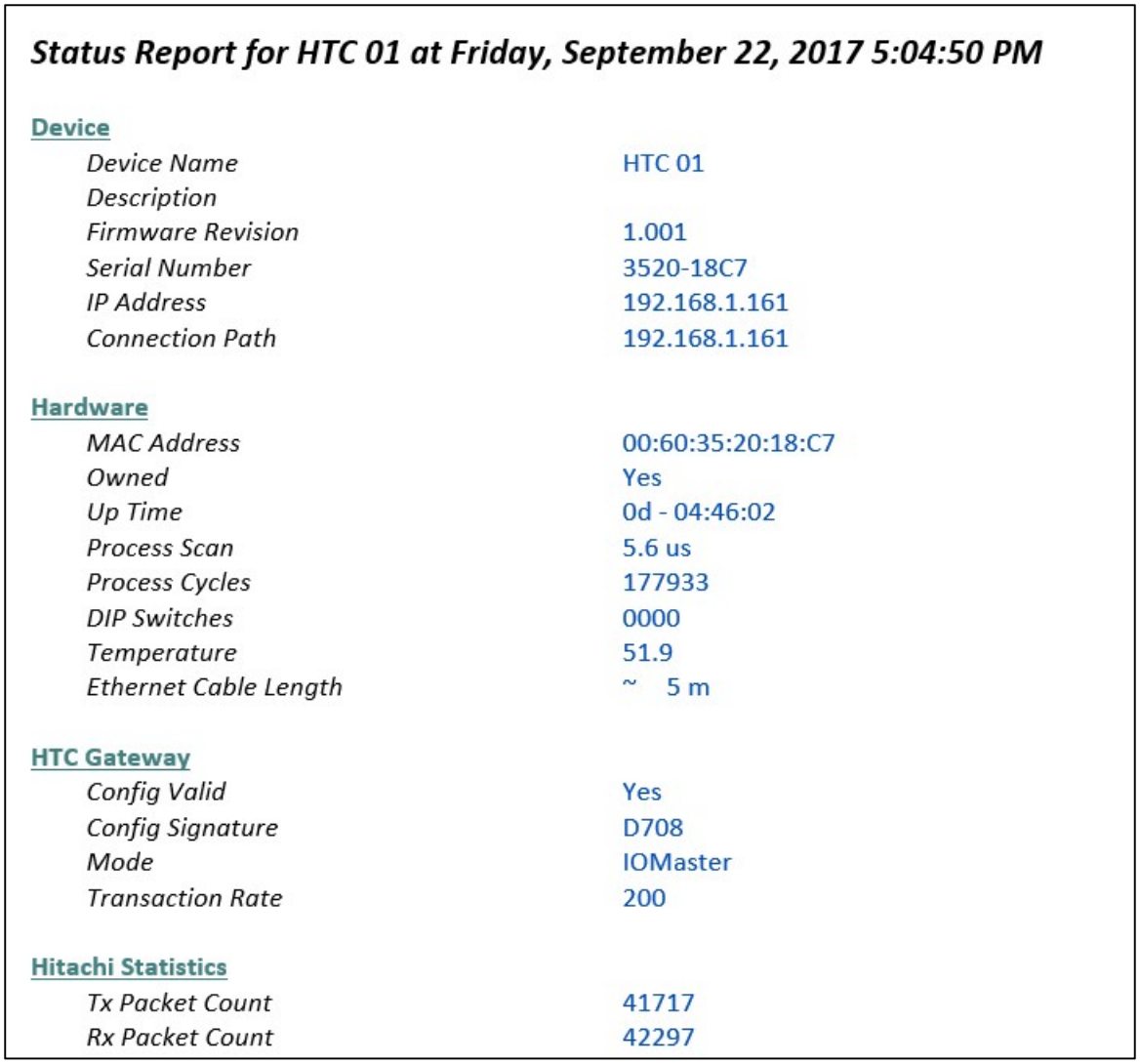


Figure 5.13 - Generate Status Report option

Then, using the file save dialog, select a suitable path for the resulting RTF file.

The Status Report (RTF) file can be opened in Microsoft Word, WordPad or any other suitable rich-text editor.



Status Report for HTC 01 at Friday, September 22, 2017 5:04:50 PM

Device

Device Name	HTC 01
Description	
Firmware Revision	1.001
Serial Number	3520-18C7
IP Address	192.168.1.161
Connection Path	192.168.1.161

Hardware

MAC Address	00:60:35:20:18:C7
Owned	Yes
Up Time	0d - 04:46:02
Process Scan	5.6 us
Process Cycles	177933
DIP Switches	0000
Temperature	51.9
Ethernet Cable Length	~ 5 m

HTC Gateway

Config Valid	Yes
Config Signature	D708
Mode	IOMaster
Transaction Rate	200

Hitachi Statistics

Tx Packet Count	41717
Rx Packet Count	42297

Figure 5.14 - Status Report example

5.6. WEB SERVER

The HTC Gateway provides a web server allowing a user without Slate or RSLogix 5000 to view various diagnostics of the module. This includes Ethernet parameters, system event log, advanced diagnostics, and application diagnostics (Hitachi diagnostics).

NOTE: The web server is view **only** and thus no parameters or configuration can be altered from the web interface.

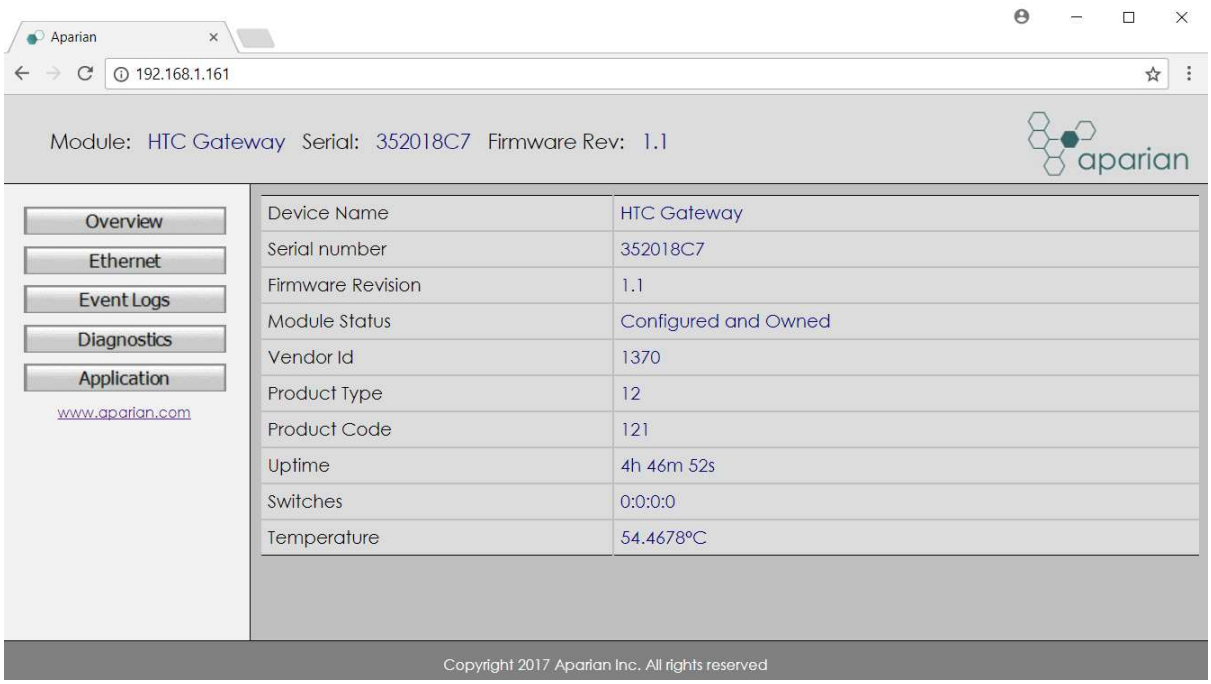


Figure 5.15. - Web interface

6. TECHNICAL SPECIFICATIONS

6.1. DIMENSIONS

Below are the enclosure dimensions as well as the required DIN rail dimensions. All dimensions are in millimetres.

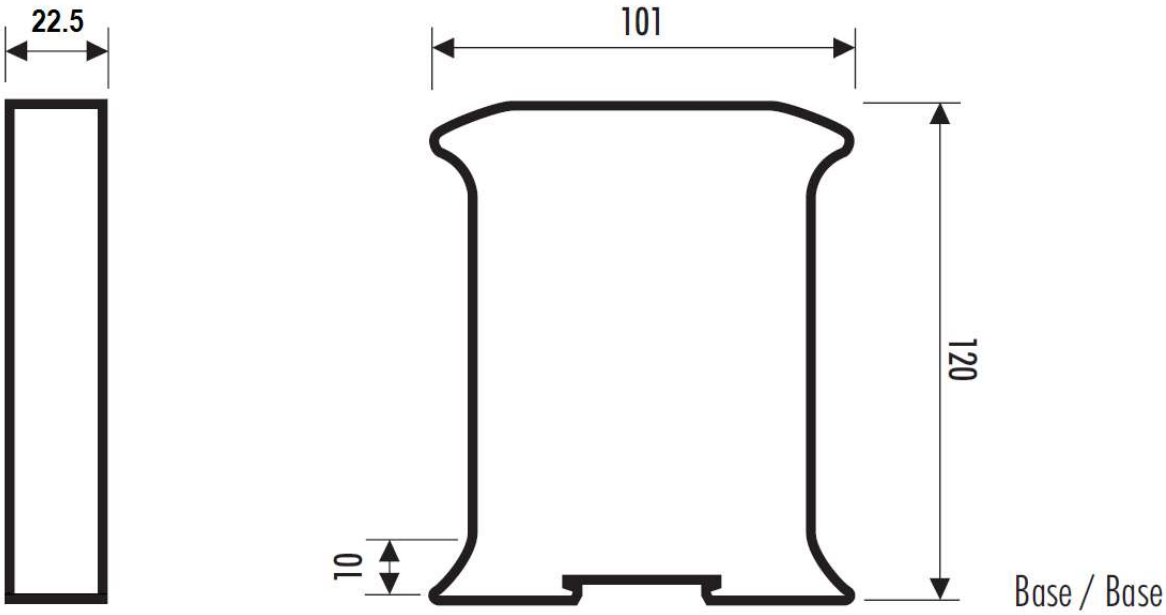


Figure 6.1 – HTC Gateway enclosure dimensions

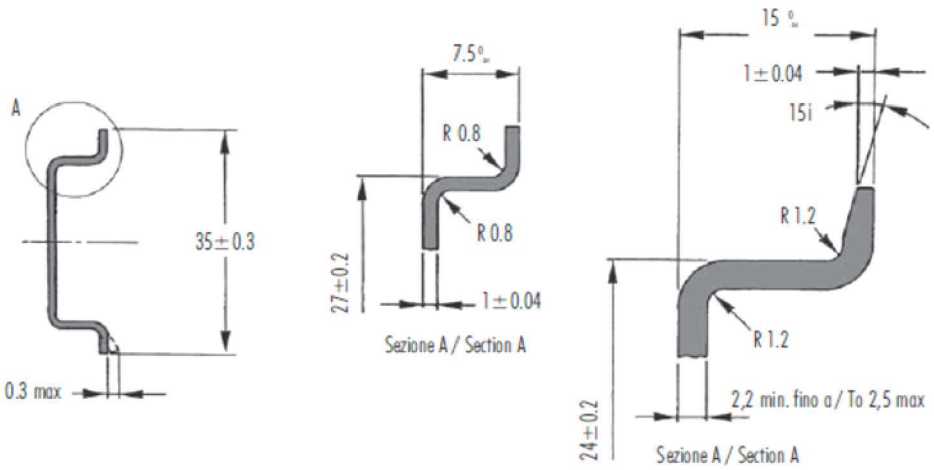


Figure 6.2 - Required DIN rail dimensions

6.2. ELECTRICAL

Specification	Rating
Power requirements	Input: 18 – 28V DC, (70 mA @ 24 VDC)
Power consumption	1.7 W
Connector	3-way terminal
Conductors	24 – 18 AWG
Enclosure rating	IP20, NEMA/UL Open Type
Temperature	-20 – 70 °C
Earth connection	Yes, terminal based

Table 6.1 - Electrical specification

6.3. ETHERNET

Specification	Rating
Connector	RJ45
Conductors	CAT5 STP/UTP
ARP connections	Max 20
TCP connections	Max 20
CIP connections	Max 10
Communication rate	10/100Mbps
Duplex mode	Full/Half
Auto-MDIX support	Yes

Table 6.2 - Ethernet specification

6.4. HITACHI PORT

Specification	Rating
Conductor	RIOH – 22 AWG Drive – 18 AWG (distance dependent)
IO Protocol Support (RIOH)	Yes
Drive Protocol Support (RIW/ROW)	Yes
IO Slot Range	0 – 127

Table 6.3 - Hitachi Port specifications

6.5. CERTIFICATIONS

Certification	Mark
RoHS2 Compliant	RoHS2

Table 6.4 - Certifications

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