SYNAPSYS
BUILDING INTELLIGENCE

sip2

Installation Guide

Issue 1, Feb. 2020

SYNAPSYS
BUILDING INTELLIGENCE

Printed: Feb. 2020 in England

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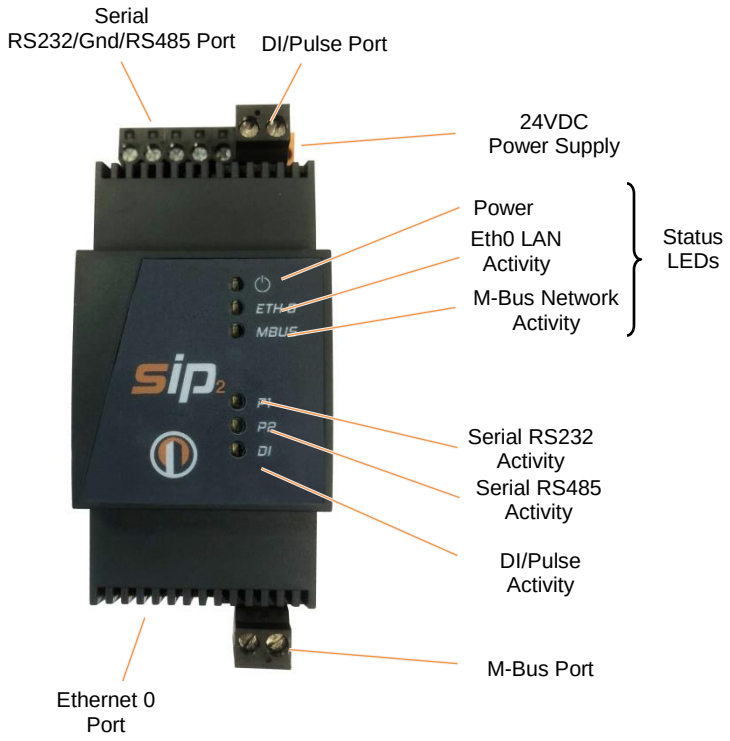
1 INTRODUCTION

This is a miniature computing platform that can be installed as part of the Building energy Management System (BeMS), and includes a dedicated data reporting function. It provides a direct interface between the Building Management services, e.g. ModBus and M-Bus networks, i.e. for metering, UPS (Uninterruptable Power Supply), AHU (Air Handling) units, CRAC (Computer Room Air Conditioning) units, and Chiller Units on a Serial protocol or TCP/IP (Transmission Control Protocol/Internet Protocol) network and a BACnet or Trend BeMS.

Remember **Energy metering is compulsory for buildings of a floor area >500M^2. The owner must be able to account for 90% of the consumed energy from each system, i.e. heat, gas, lighting, water and electricity.**



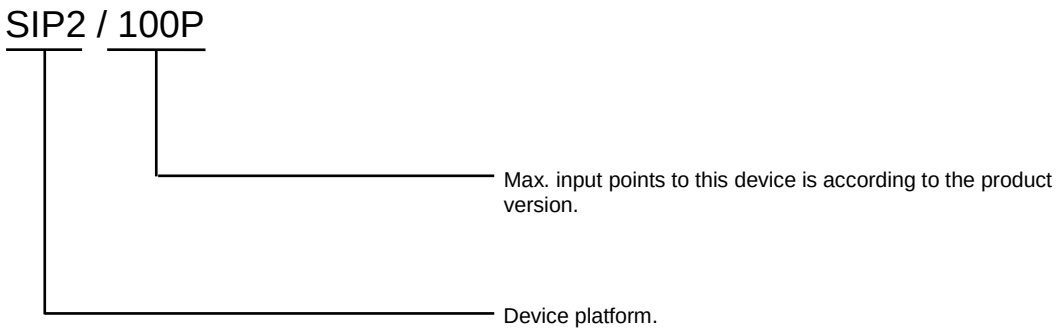
Remember **Typically, individual systems (energy control, lighting, boiler and air conditioning system, etc.) are individually measured for CO2 accountability. So, installing this unit and combining the individual systems can help an effective BeMS be more energy efficient and comply with April 2006 Part L2 Building Regulations.**

This product collects values from devices communicating via the Serial M-Bus and ModBus RTU network and/or M-Bus, ModBus TCP/IP, and/or the Digital Input/Pulse Counter connection. This collected information is then available to

- an internal data reporting functionality, energy, water and gas usage at determined time intervals, and instantaneous power and custom values at determined time intervals
- a BACnet and/or Trend BMS via the Ethernet network to control and monitor energy and environmental conditions, i.e. measuring the consumption of specific services (heat, gas, electricity power, airflow, ambient room temperature, humidity and water) in a building via a controller.

Tip! **Use SIP+ Data, SIP+ EMT or SIP+ EMT-IF to request values from an existing BACnet, and/or Trend BMS.**

The maximum number of points permitted is limited according to the product variant licence (see ***Order Code***), and appropriate hardware (Drivers) where applicable. A maximum of 4 drivers can be added, excluding the Digital Input/Pulse Counter.



It is designed and manufactured to comply with CE Class A, FCC Class A, WEEE (Waste Electrical and Electronic Equipment), RoHS (Restriction of Hazardous Substances) regulations and the identification of a substance as Substance of Very High Concern (REACH).

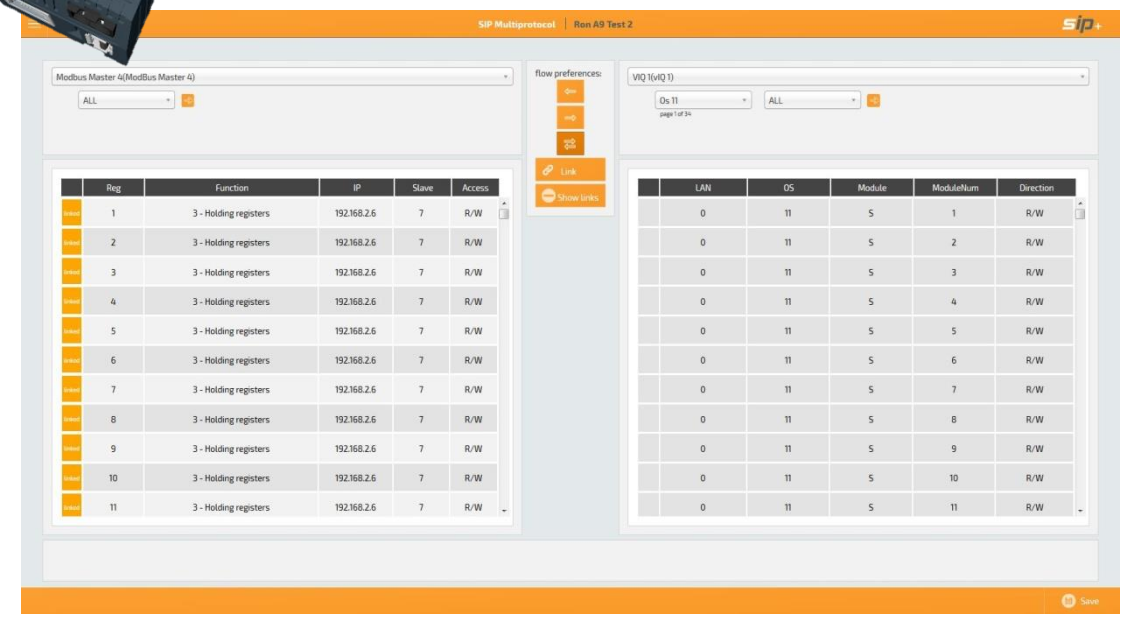
It also complies with the requirements defined in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (89/336/EEC). For the evaluation regarding the electromagnetic compatibility, refer to the Declaration of Conformity certificate (available on request).

1.1 THE UNIT

This product has a smart casing which permits for safe, quick and simple installation on DIN rail in an enclosure. The hardware includes internal web based Configuration pages, designed to simplify the engineering and configuration of the interface, and the reporting functionality. A set of web pages simplify the configuration of communication requirements for each selected driver and allows the value of each defined point to be linked to the BACnet, Trend and/or Data Acquisition output points of the selected driver.

It provides a web page used to

- define the connection to the local IP network
- select/create required drivers (according to the connected slices if appropriate), and define the communication requirements for the selected driver
- create/define the required points from the selected driver
- link selected input point of the selected driver to necessary output point of the selected driver
- define the recipients receiving reports
- perform product service/maintenance tasks



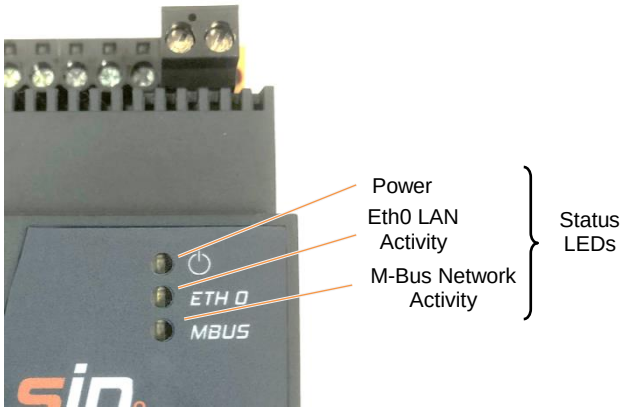
1.1.1 Front Panel Annunciation

The LEDs on the unit are arranged in 2 groups, a group to indicate the general status of this unit, including Power, Ready and LAN communication activity and a group that shows the communications activity with slave devices on the ModBus network.

- Power

  This  LED indicates the current status of the power applied to the unit.

  When continuously illuminated the 24VDC power is supplied. If the LED is off, the power is not supplied or has failed.



- ETH 0 LAN Activity

  This LED shows the communication between this unit and the devices connected via the Ethernet on the compatible IP address range.

  When incoming communications traffic is detected, the LED will illuminate, but will extinguish if outgoing communications traffic is detected.

- MBUS Activity

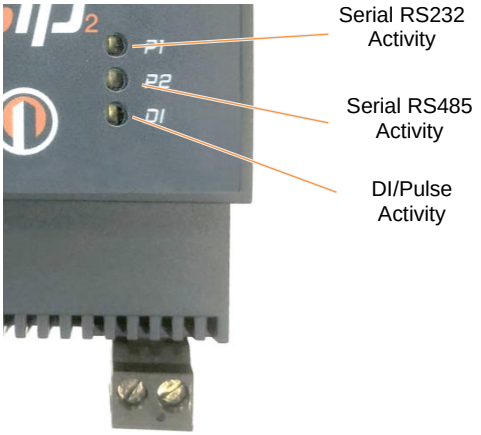
  This LED shows the communication between this unit and the M-Bus devices connected via the M-Bus port.

Tip! **A dedicated Level converter is NOT required for this SIP2 Interface and Data Acquisition product.**

- ***P1*** Activity

  This RS232 (***P1***) LED shows the communication between this unit and the single device connected via the Serial port using the compatible RS232 standard.

  When outgoing communications traffic is detected the LED will illuminate yellow, and illuminates green if incoming communications traffic is detected.



- ***P2*** Activity

  This RS485 (***P2***) LED shows the communication between this unit and the network of devices connected via the Serial port using the compatible RS485 standard.

  When outgoing communications traffic is detected the LED will illuminate yellow, and illuminates green if incoming communications traffic is detected.

- ***DI*** Activity

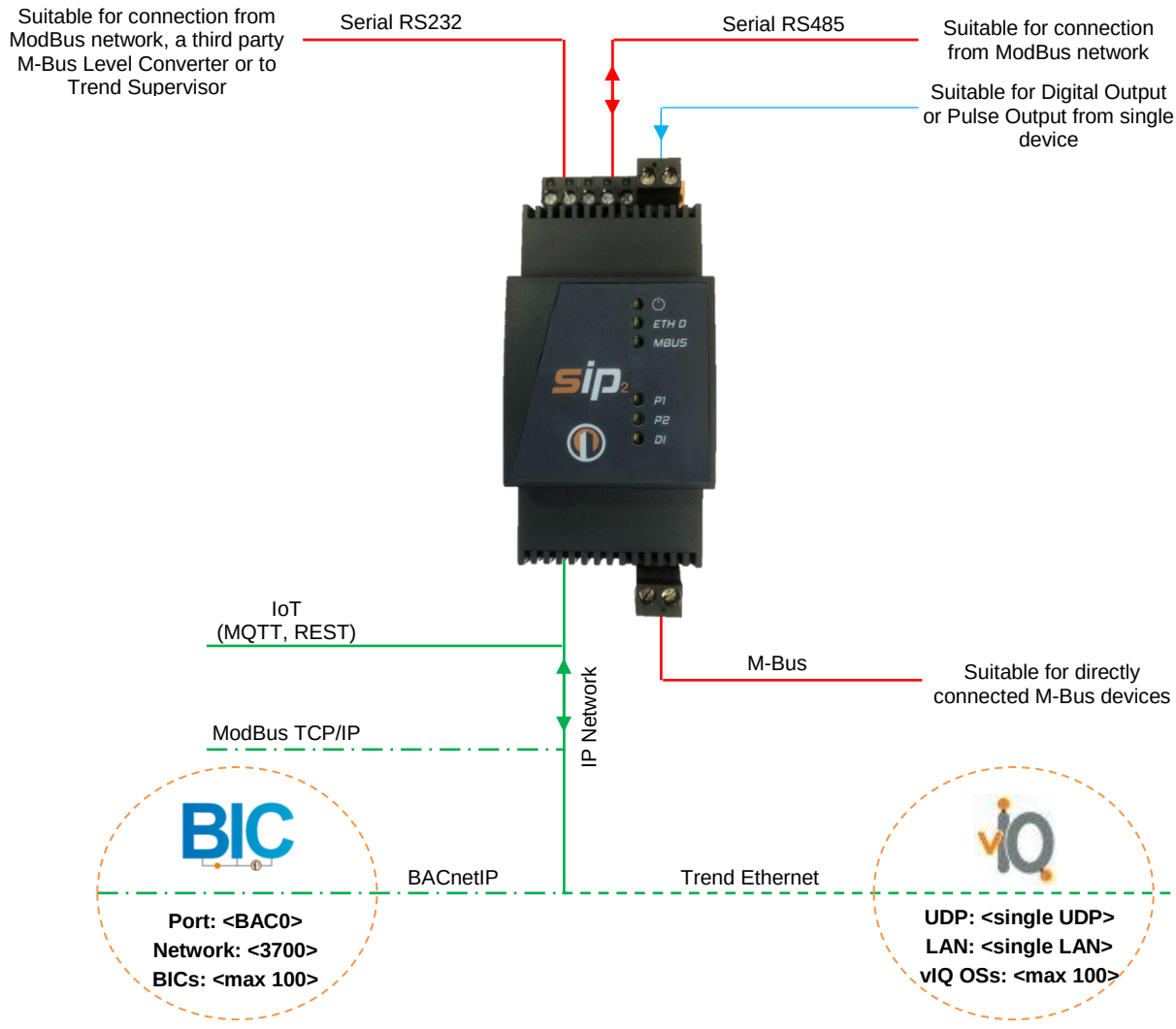
  This Digital Input/Pulse Counter (***DI***) LED shows the communication between this unit and the single device connected via the DI port.

  DI will illuminate green when the input is active, and illuminate orange when the input is not active.

1.2 SYSTEM OVERVIEW

The unit provides a hardware and software connection between devices communicating via an Input protocol and an Output protocol.

Caution **Existing SIP Easy files MUST be converted to suit this product.**



Tip **Additional protocols may be available in future release.**

1.2.1 BACnet/IP Network

The BACnet/IP protocol has been specifically designed for building automation and control networks providing a standard way of representing the functions from third-party devices to exchange of data over a computer network. It operates on a client/server principle, where this unit is the server and a BACnet device or BACnet explorer is the client. The network uses standard cat 5e cabling to transfer 'service' requests from a client to the server that performs the service and reports the result to the client. Local IP network policy is used to address BACnet devices.

Each 'service' request includes a default set of 'Objects'. These may represent single physical point, or logical groupings of points that perform a specific function. An 'Object' is simply a collection of properties, including 'object_name', 'object_type', 'present_value', etc. that describe the behaviour and operation of the BACnet device.

Caution **This device does NOT collect data from a BACnetIP network. Please use the SIP+ Data, SIP+ EMT, and/or SIP+ EMT-IF.**

1.2.2 IoT: MQTT

The IoT Message Queuing Telemetry Transport (MQTT) protocol has been specifically designed for wireless networks that experience varying levels of latency due to occasional bandwidth constraints or unreliable connections. It is a simple and lightweight messaging protocol, enabling resource-constrained IoT devices to Publish and Subscribe data about a given 'Topic', e.g. Temperature, Motion or Moisture sensors. Values related to 'Topics' in MQTT devices are Published (sent) to an MQTT message broker, allowing compatible MQTT devices to Subscribe (request) the values as available.

A minimal MQTT control message can be two bytes of data, but can carry nearly 256 megabytes of data of plain text or JSON if needed. There are 14 defined message types used to connect and disconnect a client from a broker, to publish data, to acknowledge receipt of data, and to supervise the connection between client and server.

Tip! **Sometimes the MQTT Broker is inherent in the Cloud based platform, i.e. Microsoft Azure. Check with the cloud based platform to confirm.**

1.2.3 IoT: REST

The IoT REST protocol has been developed as an extension to HTTP and is a web service. It is a client/server based messaging protocol exposing REST client POST, PUT, GET and DELETE commands to the REST server with one-way connection via HTTP.

A REST client connects to the REST server when needing to get read and/or write values to the REST server. Generally, an edge server or gateway will not allow a connection quicker than every 1 minute to avoid overloading, e.g. activating a light from a mobile app will transfer a plain text or JSON messages to the server instantly, but the message from the server to the client needs to wait for the client to connect.

1.2.4 M-Bus Network

The M-Bus protocol has been specifically designed for remote reading of electronic utility meters and operates on a master/slave principle, where the master is this interface product and the slaves are meters. The network uses 2-wire, typically, non-polarised bus (M-Bus protocol states JYStY N*2*0.8 mm cable) to transfer values via data telegrams at a Baudrate between 300 and 9600 bit/s. Meters can be identified by the Primary address or the Secondary Id. The Primary address supports the range 1 to 250 (Meters may be supplied with address 0 (zero) or derived from the last 3 (three) digits of the serial number). The Secondary Id is the meter Serial number, typically according to the label on the meter, or the Fabrication number held as a parameter in the telegram. Most meters can automatically detect and respond at a 300 or 2400 Baudrate.

Caution **Some battery powered meters limit the number of telegram requests to preserve the life of the battery.**

TRANSMISSION CHARACTERISTICS

M-Bus meters are designed to be synchronised with two different currents (Mark and Space) that must not vary by more than 0.2% for 1 V voltage change on the bus. To transmit a Mark, a Unit Load of a current at 1.5mA maximum is specified. If the meter requires more current, an appropriate number of additional Unit Loads are used. When sending a Space, the meter increases its current consumption by 11-20mA. To receive data, the meter detects the maximum value (Vmax) of the bus voltage, which can be between 21V and 42V. A Mark is registered if the bus voltage is more than 'Vmax - 5.5V', and a Space is registered if the bus voltage is less than 'Vmax - 8.2V', should be registered.

1.2.5 ModBus Network

The ModBus protocol is a widely accepted fieldbus standard for reading of electronic devices and operates on a master/slave principle, where the master is this unit and the slaves are devices connected to this unit. This unit supports ModBus RTU (Remote Terminal Unit) transmission mode via an RS485, RS232 or RS422 bus at 300 to 115200 (bps) Baudrate.

ModBus is a request/reply protocol offering services specified by function codes. The ModBus function codes are elements of request/reply PDUs (protocol Data Unit) sent by the ModBus master to a slave which performs the required action and responds to the message. Each ModBus message are divided into a sequence of four basic elements, '**Device address**' (slave address), '**Function code**' (message type and the type of action required by the slave, as per '**Function**' on 'Map points' page), '**Data**' (values from register address) and '**Error check**' (Numeric check value to test for communication errors).

Remember **RS232 topology requires point to point wiring, and RS485 topology requires multi-point daisy-chained wiring. All ModBus serial communications permit only a single ModBus Master. However, ModBus TCP/IP communications permit multiple ModBus Master via the IP network.**

1.2.6 Trend Networks & vIQ

The Trend BMS uses a proprietary protocol. Trend controllers communicate via IQ System Current Loop or Ethernet networks.

Trend IQ2 (including SXNC) and IQ1 controllers are Building energy Management System controllers that are physically wired together in a (IQ System Current) loop allowing data to pass from one device to the next until the right device is found. When connected, the controllers can be combined to create a LAN and/or internetwork.

Note **A Trend IQ System Current loop can be connected to an IQ3/IQ4 network using appropriate Trend hardware.**

Trend IQ3/IQ4 controllers (including all Trend compatible Synapsys Solutions products) are Building energy Management System controllers that use Ethernet and TCP/IP networking technologies. They incorporate a web server that can serve information to a PC or mobile device running a web browser. Generally, these controllers are also compatible with the traditional IQ System protocol.

Note **An appropriate Trend IQ3/IQ4 (LAN) controller can be connected to an IQ System Current loop via the Supervisor port.**

The vIQ (Virtual IQ) software enables connectivity to a Trend Ethernet network. The vIQ software allows any Trend compatible SIP(+/d/e/p) product to present each third party fieldbus device as a virtual Trend controller (OS (out-station)), directly onto the Trend network via a defined VCNC Node and Port. The defined VCNC Node also represents a Node (OS) on the network.

Remember **OSs are subject to the constraints imposed by the Trend network, e.g. Node 2, Node 3 and Node 10 are reserved.**

Each transferred value held in the configured vIQ OS is provided as a standard Trend module (sensor, digital Input, knob, and switch) and has the full complement of functionality such as labels, alarms and plots.

Remember **v1.13 and later support Trend IQVision.**

Caution **This device does NOT collect data from a Trend Ethernet network. Please use the SIP+ Data, SIP+ EMT, and/or SIP+ EMT-IF.**

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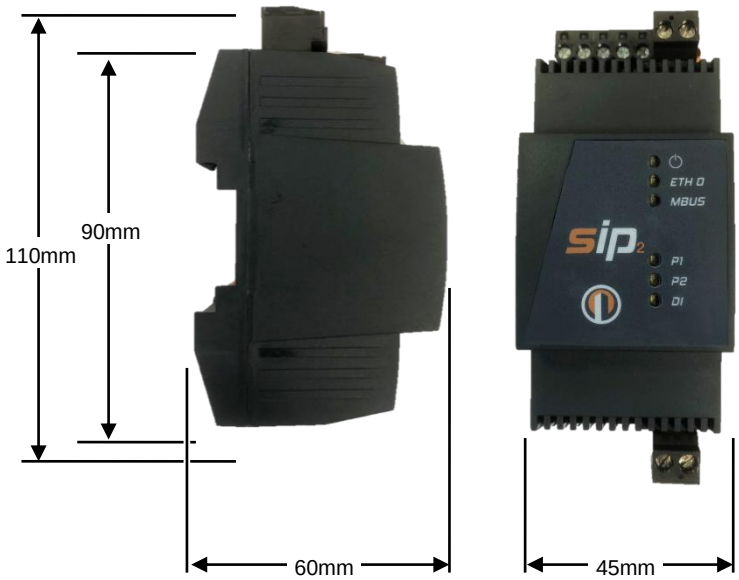
2 HARDWARE GUIDE

This hardware simply clips to standard DIN rail mounted in an enclosure.



General

Dimensions:	45mm x 90mm (110mm with connectors) x 60mm:(WxHxD)
Weight:	120g per master unit
Default User name:	Admin (case-sensitive)
Default Password:	password (case-sensitive)

Power Input

Input Voltage Range:	24VDC
Power Consumption:	0.4A

Caution **Use an appropriate PSU as necessary. Alternatively, use an appropriate PoE IEEE switch.**

Hardware connections

Power Connector:	0-36VDC
RS232/RS486 Connector:	5 pin Terminal, Half duplex
Input Connector:	1 x Digital Input/Pulse Counter, typ. less than 200m cable length, 25Hz, 20ms
Eth0:	RJ45 connector supports standard PoE IEEE 802.3af, max 8.5W with 10BASE-T/100BASE-TX auto-negotiation and auto-crossover
LEDs:	Power, Eth0, Bus, P1 (RS232), P2 (RS485), DI

Environmental

Storage Temperature:	-25°C - 80°C (-4 to 176°F)
Operating Temperature:	0 - 70°C (32 to 158°F)
Relative Humidity:	0 to 90%

3 INSTALLATION

This section explains the process of fitting this product in the required location, and connecting the cables to ensure it can communicate as required. It will explain specific wiring conventions used by the connected communications protocols and the hardware fitted to the unit.

Note **The CE marking on a product indicates the product complies with all the applicable European directives and applicable standards.**

3.1 INSTALLING THE UNIT

The unit usually forms part of a larger assembly, and mounted to a DIN Rail in an enclosure.

Note **When fitting this unit as part of a system with other third party equipment, refer to the documentation accompanying the other equipment for details.**

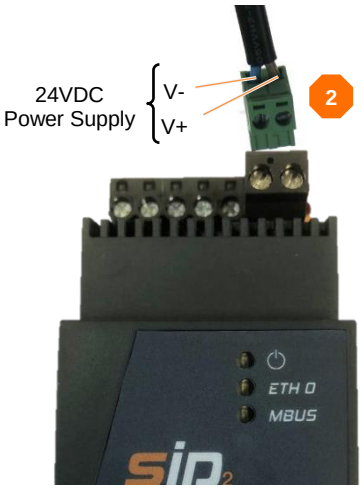
To install the unit on an enclosure DIN Rail

1. Rest the Master unit including DIN Rail connector to the top of the DIN Rail mounted in the enclosure.

   Push the lower half back until the retaining spring clicks on to the bottom of the DIN Rail mounted in the enclosure.

2. Connect the power supply to this unit.

   Each unit requires a 24VDC power supply attached to the connector. If the power is correctly supplied the Power LED is illuminated and the real-time clock (RTC) will be maintained.



Caution **Before connecting power, ensure all connections have been verified.**

Note **A 'beep' indicates the unit has started to boot up.**

3. Connect this unit to the local IP network using an appropriate Ethernet cable.

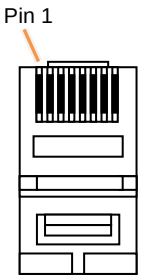
Note **Default IP address: 192.168.1.128.**

Each unit contains a single 10/100base PoE port for Ethernet communications via a standard RJ45 type connector, and includes auto-negotiation and auto-crossover functionality.

Tip! **An appropriate PoE power source is required to support the standard PoE IEEE 802.3af, max 8.5W.**

This is typically used for the BMS interface connection and the local IP network for reporting purposes.

Tip! **Connection to an Ethernet hub/switch requires a Category 5 RJ45-to-RJ45 'straight-through' cable assembly, or a 'crossover' cable if connecting directly to another device supporting 10/100base T Ethernet communications protocol, i.e. a laptop or computer.**

RJ45 MALE	FROM RJ45 PIN NO.	SIGNAL	COLOUR CODE (EIA/TIA 568B)	STRAIGHT THROUGH PIN NO.	CROSSOVER PIN NO.
	1	Transmit+	White/Orange	1	3
	2	Transmit-	Orange	2	6
	3	Receive+	White/Green	3	1
	4	N/A	Blue	4	4
	5	N/A	White/Blue	5	5
	6	Receive-	Green	6	2
	7	N/A	White/Brown	7	7
	8	N/A	Brown	8	8

The image shows the flat side of RJ45 plug.

4. Connect required serial networks for requesting values via the appropriate open protocol.

For RS232 connection, use the first 3 (three) pins of the 5-pin 2-part connector.

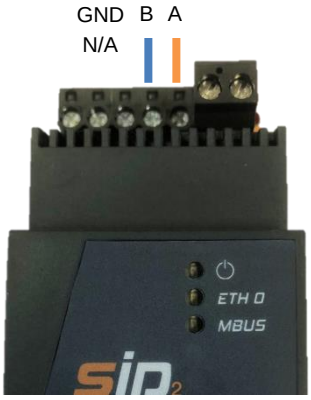
This is typically a single point-to-point connection between 2 (two) end points. It permits a max. 15 mtrs cable length and ±5V min and ±25V max output voltage.

	RS232 SIGNAL
1	TXD
2	RXD
3	GND
4	
5	

Remember ***P1*** **LED show RS232 activity.**

For RS2485 connection, use pins B and A of the 5-pin 2-part connector.

This is typically a multidrop network, with the max 32 devices.



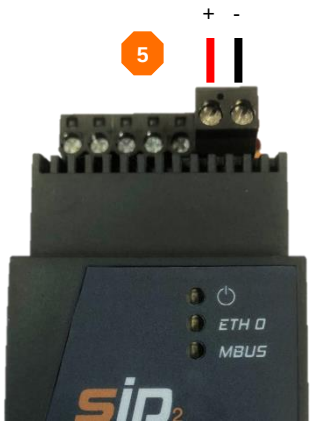
	RS485 SIGNAL
1	
2	
3	GND (N/A)
4	Data- (B)
5	Data+(A)

Remember ***P2*** **shows RS485 activity.**

5. Use the ***DI*** with 2-pin 2-part terminal connector for a Digital Input or Pulse Counter connection.

   The ***DI*** can be used for a Relay contact with more than 100k high impedance.

Caution **Max 200m cable length.**



6. Use the ***MBUS*** with 2-pin 2-part terminal connector for a direct M-Bus metering network connection.

   The ***MBUS*** can be used for a network of up to 60 unit loads.

Remember **A dedicated Level Converter is NOT required.**

CONNECTOR TYPES AND CABLES

Shielded RJ45 connectors and screened Category 5 cables are widely available, however, specifications vary. In view of the problems that can arise with inadequate cabling, it is strongly recommended that ready-made interconnecting cables are used.

4 ORDER CODE

ORDER CODE	DESCRIPTION
SIP2/100P **SIP2/300P** **SIP2/600P**	Up to 100, 300 or 600 input points from multiple protocols mapped directly to internal BICs (virtual BACnet Integrated Controller), and/or vIQs (virtual Trend IQs) BMS protocols and/or the data reporting driver.

4.1 ACCESSORIES

ORDER CODE	DESCRIPTION
PSU/24VDC/nA	24V DC 1A Power Supply
SYN/ESWn	Unmanaged Ethernet switch with ‘n’ 10/100BaseT(X) ports

Caution **Ensure an appropriate PSU is installed.**

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