SYNAPSYS
BUILDING INTELLIGENCE

sip+

Installation Guide

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SYNAPSYS
BUILDING INTELLIGENCE

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Contents

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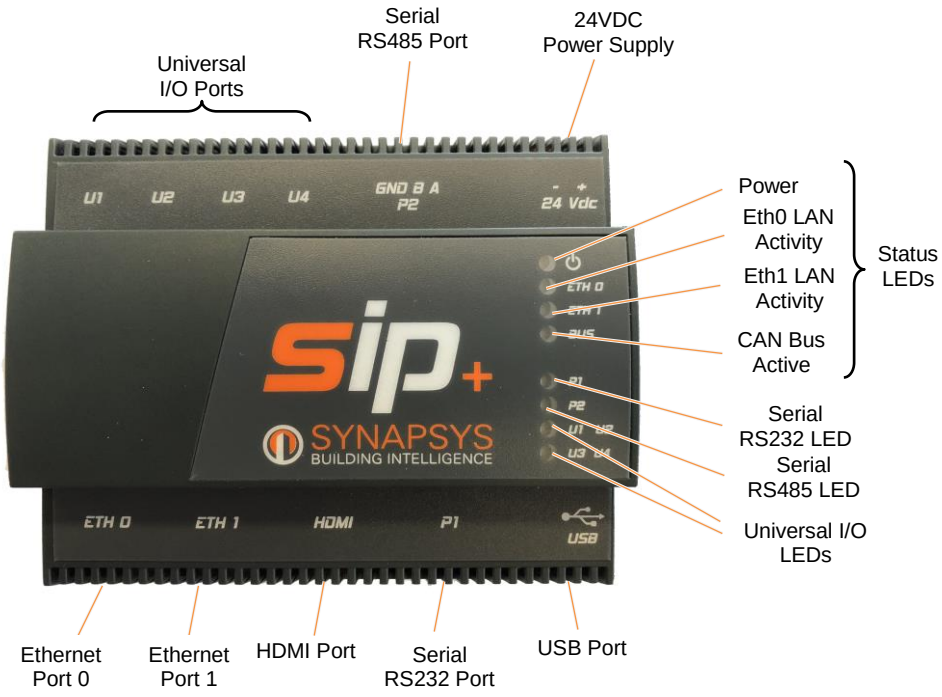
1 INTRODUCTION

This is a miniature computing platform that can be installed as part of the Building energy Management System (BeMS), and includes a dedicated Energy Monitoring and Targeting (EM&T) functionality. It provides a direct interface between the Building Management services, e.g. metering networks, 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 the 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.**



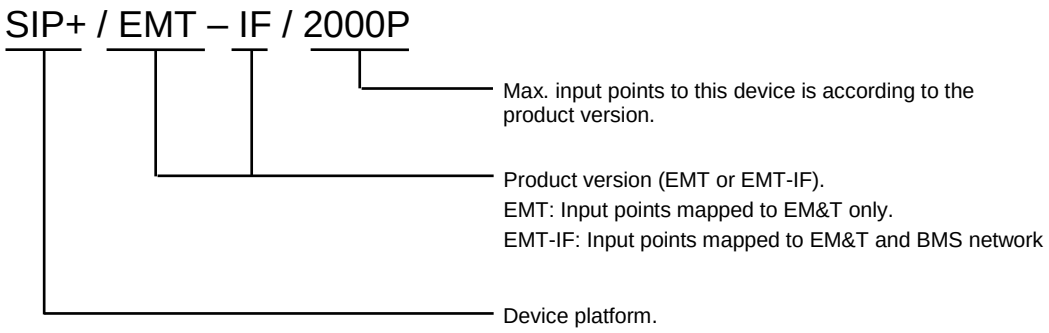
Remember **Typically, individual systems (energy control, lighting, boiler and air conditioning system, etc.) are individually measured for CO2 accountability. So, installing this unit and combining the individual systems can help an effective BeMS be more energy efficient and comply with April 2006 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, BACnetIP or Trend Ethernet network. This collected information is then available to

- our internal EM&T for monitoring energy, water and gas usage at determined time intervals, and instantaneous power and custom values at determined time intervals
- a BACnet 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.

Note **BACnet, and Trend input point Drivers and other protocol input and output point Drivers will be available at future releases, according to customer demand.**

The maximum number of points permitted is limited according to the product variant licence (see ***Order Code***), and appropriate hardware (Drivers) where applicable, e.g. M-Bus networks require an appropriate Level Converter. A maximum of 16 slices can be connected, via the DIN Rail connectors on the CAN bus, where 1 (one) slice is equal to 1 (one) driver.



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 an internal web based Configuration pages, designed to simplify the engineering and configuration of the interface, displaying values and reporting alarms. This set of pages simplifies the configuration of communication requirements for each selected driver and allows the value of each input point to be linked to the 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
- display EM&T information, i.e. Energy usage graph
- perform product service/maintenance tasks

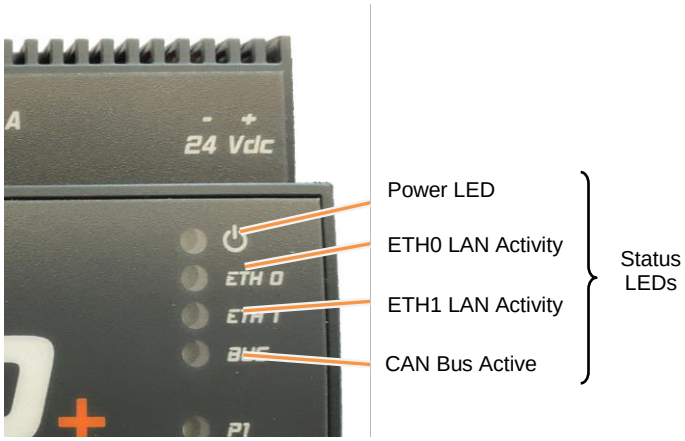
1.1.1 Front Panel Annunciation

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 LED

  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.



- ETH0 LAN Activity LED

  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.

- ETH1 LAN Activity LED

  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.

- BUS

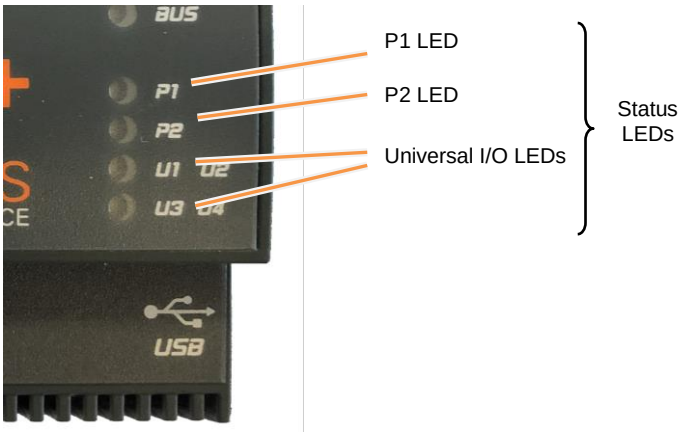
  This LED shows it has detected a SIP Slice connected to the CAN bus via the DIN Rail connector.

  When a slice is NOT detected, the LED will illuminate, but will extinguish when a slice is detected.

- ***P1*** LED

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

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



- ***P2*** LED

  This LED shows the communication between this unit and the device connected via the Serial ***P2*** port using the compatible RS485 standard.

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

- ***U1***, ***U2*** LED and ***U3***, ***U4*** LED (Future Development)

  These dual colour LEDs show a connection to ***U1***, ***U2***, ***U3*** and/or ***U4*** has been detected.

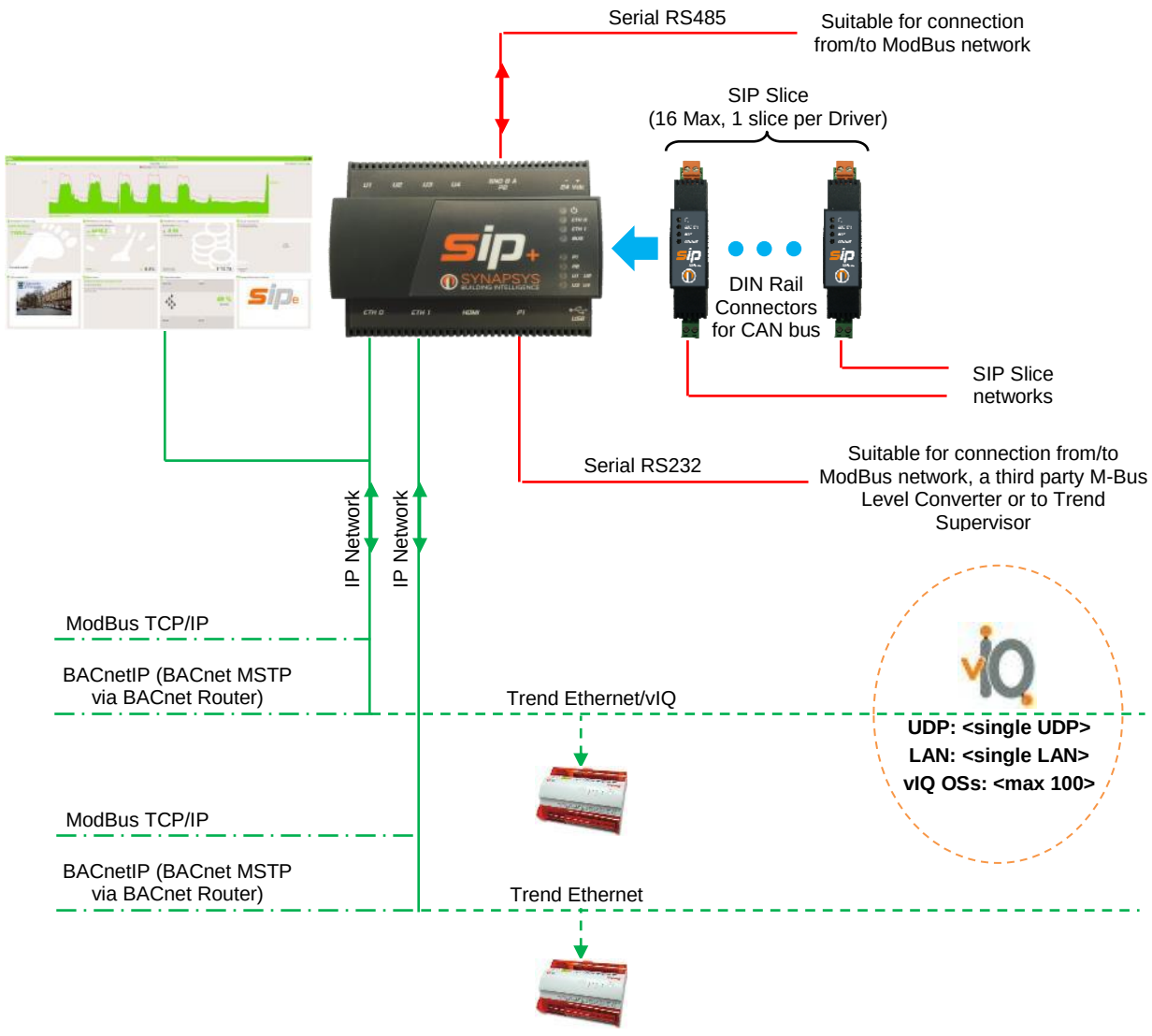
  U1, ***U2***, ***U3*** and/or ***U4*** will illuminate green when the input is active, and illuminate orange when the input is not active.

Note **The Master unit is fitted with connections that support power, communications, and hardware expansion. Power and communications between this Master unit and the SIP slices are supplied via the dedicated DIN Rail connector available with each SIP slice.**

1.2 SYSTEM OVERVIEW

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

Note **Any protocols not supplied at start, will be available in future release.**



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

1.2.1 BACnet/IP Network

The BACnet/IP protocol has been specifically designed for building automation and control networks provides 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.

Note **For BACnet support refer to the BACnet PICS (Protocol Implementation Conformance Statement).**

1.2.2 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 the interface product (connected via the M-Bus Level Converter, i.e. SIP M-Bus Slice) and the slaves are meters. The network uses 2-wire 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 from meters addressed in 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). 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.

1.2.3 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, RS422 requires multi-drop daisy-chained 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.**

1.2.4 Trend Network

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 hardware.**

Trend IQ3/IQ4 controllers (including all Trend compatible SIP(d/e/p) and interface products via the software) 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.**

1.2.5 Virtual IQs (Out-stations)

The vIQ (Virtual IQ) software enables connectivity (SIPd) to a Trend Ethernet network and allows any Trend compatible SIP(e/p) product to present each third party device as a 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.

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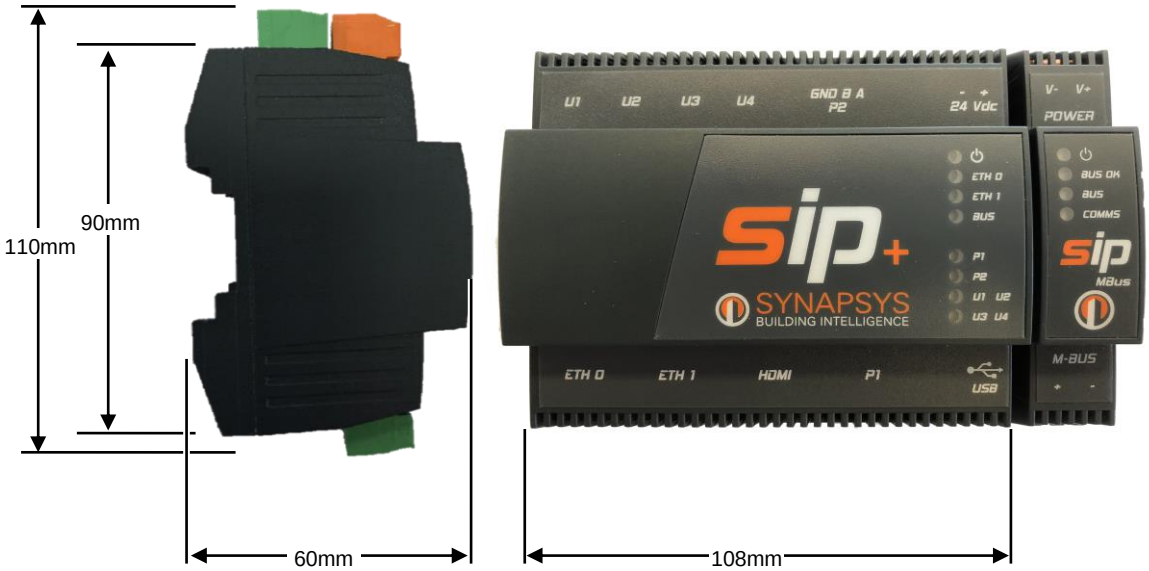
2 HARDWARE GUIDE

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



General

Dimensions:	108mm x 90mm (110mm with connectors) x 60mm:(WxHxD)
Weight:	160g per master unit
Default User name:	Admin (case-sensitive)
Default Password:	password (case-sensitive)

Power Input

Input Voltage Range:	24VDC
Power Consumption:	0.3A

Caution **An appropriate PSU is required according to the number of SIP Slices installed on the DIN Rail.**

Hardware connections

DIN Rail Connector:	1 (max 8A) for up to 16 additional SIP Slices, powered directly across the CAN bus
Power Connector:	0-36VDC
RS232 Connector:	RJ45 Connector
RS485 Connector:	3 pin Terminal, Half duplex
Input Connector:	4 x Digital Inputs (>100k impedance), typ. Relay contact less than 1m cable length
Eth0 & Eth1:	RJ45 connector supports 10BASE-T/100BASE-TX with auto-negotiation and auto-crossover
HDMI/USB:	For future use
LEDs:	Power, Eth0, Eth1, Bus, P1 (RS232), P2 (RS485), User LED 1 & User LED 2, and User 3 & User 4

Environmental

Operating Temperature:	0 - 55°C
Storage Temperature:	-25°C - 85°C

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

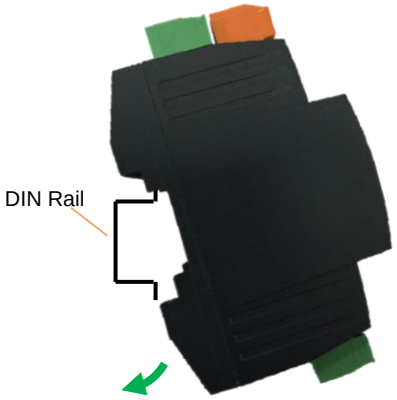
The unit usually forms part of a larger assembly, and mounted to a DIN Rail in an enclosure.

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

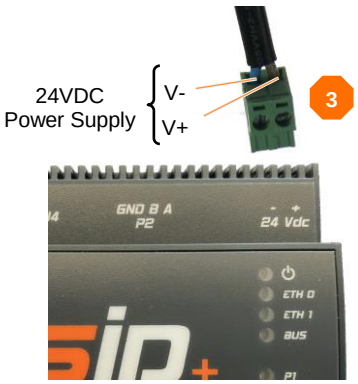
1. Ensure the DIN Rail connector is fitted to the rear of the Master unit.
2. Rest the Master unit including DIN Rail connector to the top of the DIN Rail mounted in the enclosure.

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



3. Connect the power supply to this unit.

   Each Master 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.**
An appropriate PSU is required according to the number of SIP Slices installed on the DIN Rail.

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

Tip! **A DIN Rail connector, fitted to the rear of this unit provides power and communications to connected SIP Slices.**

4. Connect this unit to the local IP network using an appropriate Cat5e cable.

Note

Default ETH0 IP address: 192.168.1.128. Typically used for BMS connectivity. ETH1 can be used to connect to a different IP address range, e.g. the local IP network.

Each unit contains 2 (two) x 10/100base T port for Ethernet communications via a standard RJ45 type connector., and includes auto-negotiation and auto-crossover functionality.

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.
Pin 1	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.

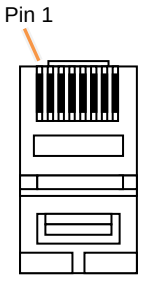
5. Connect required serial networks for requesting values via the appropriate open protocol.

Use ***P1*** for RS232 connection.

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.

Tip! **Use the Synapsys Solutions grey RS232 cable, supplied with the SIP Slice, to connect directly to a SIP Slice. A specific cable can be made, according to the required protocol.**

FROM RJ45 PIN NO. SIGNAL	TO RS232 SIGNAL
1	1
2 RTS	2
3 GND	3
4 TXD	4 GND
5 RXD	5 RXD
6	6 CTS
7 CTS	7 TXD
8	8 RTS

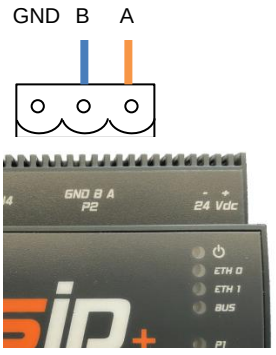


The image shows the flat side of RJ45 plug.

Use ***P2*** with 3-pin 2-part terminal connector for Serial RS485 (2-wire+Gnd).

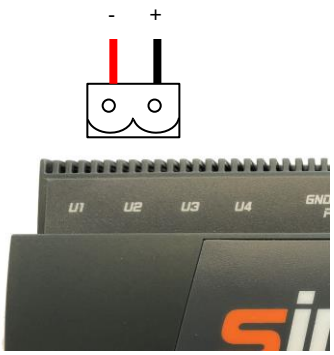
This is typically a multidrop network, with the max devices according to the specific protocol.

	RS485 SIGNAL
GND	GND
Data- (B)	TXD
Data+(A)	RXD



Use the ***U1***, ***U2***, ***U3*** and ***U4*** with 3-pin 2-part terminal connector for the Universal I/O (Future development).

Each Universal Input can be used for a Relay contact with more than 100k high impedance.



Caution **Max 1m cable length.**

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.

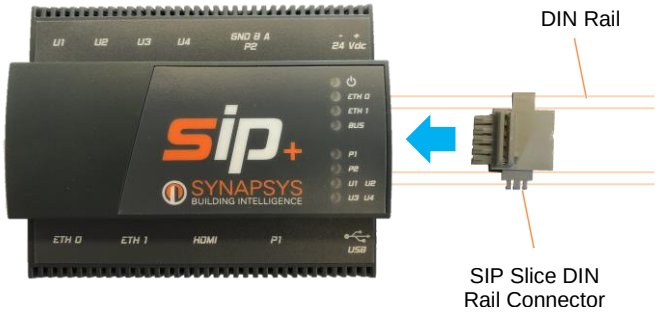
3.2 HARDWARE EXPANSION

The Master unit includes a DIN Rail connector port at the rear to allow power and communications with connected SIP Slices via the DIN Rail connector on the CAN bus network.

The unit is fitted with connections that support additional hardware to be connected to the unit.

To connect SIP Slices

1. Rest the SIP Slice DIN Rail connector to the top of the DIN Rail mounted in the enclosure.



Caution **The SIP+ DIN Rail Connector pack MUST be requested when ordering.**

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

2. Slide the DIN Rail connector until it fits securely in to the DIN Rail connector mounted to the rear of the Master units.

Attach SIP Slice according to the instructions provided.

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4 ORDER CODE

ORDER CODE	DESCRIPTION
SIP+/EMT	
SIP+/EMT/25P **SIP+/EMT/50P** **SIP+/EMT/100P** **SIP+/EMT/250P**	Up to 25, 50, 75, 100, or 250 input points from multiple protocols mapped directly to max 250 internal EM&T (Energy Monitoring and Targeting) points.
SIP+/EMT-IF	
SIP+/EMT-IF/100P **SIP+/EMT-IF /250P** **SIP+/EMT-IF /500P** **SIP+/EMT-IF /1000P** **SIP+/EMT-IF /1500P** **SIP+/EMT-IF /2000P**	Up to 100, 250, 500, 1000, 1500, or 2000 input points from multiple protocols mapped directly to max 250 internal EM&T (Energy Monitoring and Targeting), but also available to BeMS (Building energy Management System).
SIP+/Vision	
SIP+/Vision FW	Firmware upgrade to add EM&T (Energy Monitoring and Targeting) Dashboard functionality to existing SIP+/EMT or SIP+/EMT-IF
SIP+/Vision HW	Dedicated hardware for EM&T (Energy Monitoring and Targeting) Dashboard

4.1 ACCESSORIES

ORDER CODE	DESCRIPTION
PSU/24VDC/nA	24V DC nA Power Supply
SIP/CONV/…	Protocol specific slice with RS232 connector
SIP/CON/SIP+	Includes a DIN rail connector for communications and power via the CAN bus from a SIP+ device
SYN/ESW5(8)	Unmanaged Ethernet switch with 5 (or 8) 10/100BaseT(X) ports

Caution **An appropriate PSU is required according to the number of SIP Slices installed on the DIN Rail.**

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