

IQ5ECO Unitary Controller



Description

The IQ5ECO range of unitary controllers provides a secure and versatile platform for building and energy management systems which seamlessly integrate with the full IQ5 building automation solution.

Available in two enclosure sizes one with 16 IO points and one with 24 IO points each offering distinct I/O capabilities.

- 16 point variants include 8 UIOs, 4 SSRs, 4 Relay Outputs
- 24 point variants include 16 UIOs, 4SSRs, 4 Relay Outputs

A wide variety of communication options are supported. All controllers are equipped with RS-485 (for Modbus integration), Sylk™ and USB ports. Two Ethernet IP backbone communication technologies are offered:

- IP T1L
- IP CAT5/6

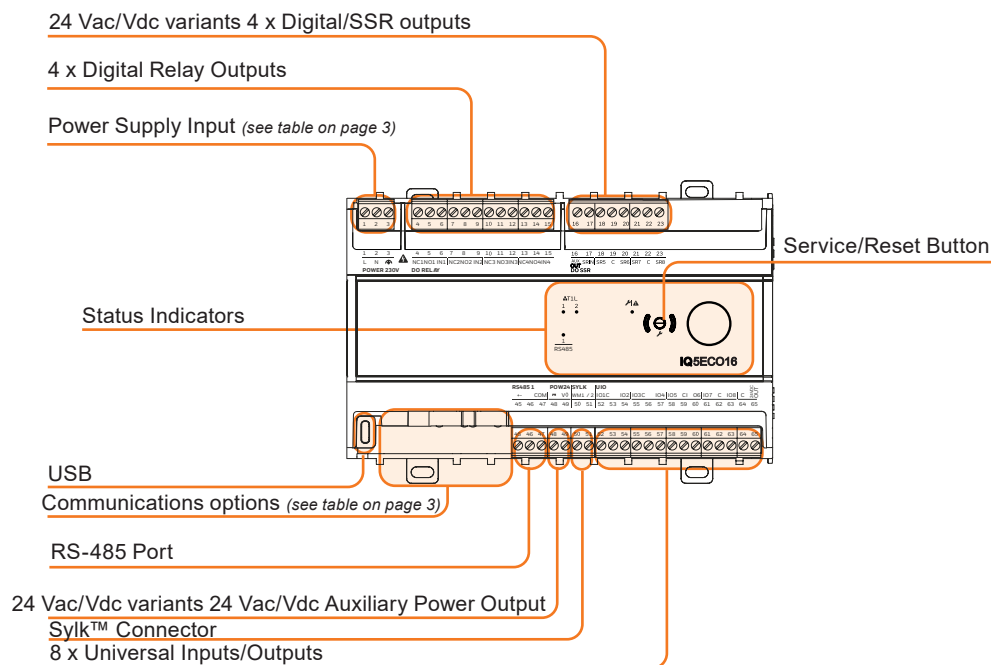
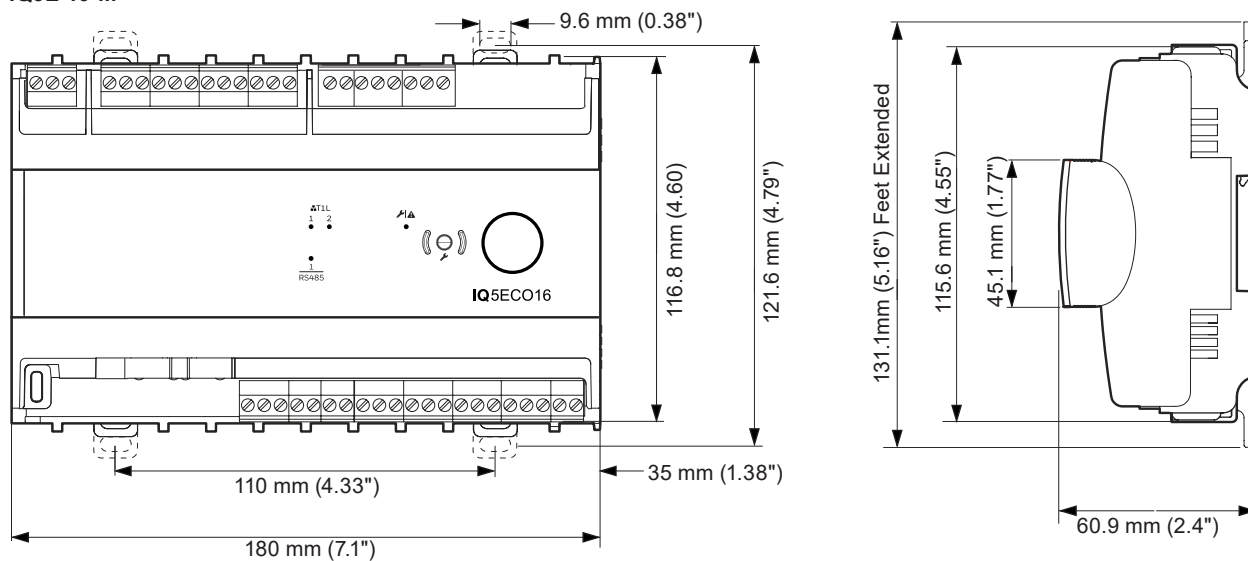
This not only enables the creation of a Trend network but provides the ability to interface with a wide range of third party devices using BACnet IP, or Serial Modbus RTU.

Features

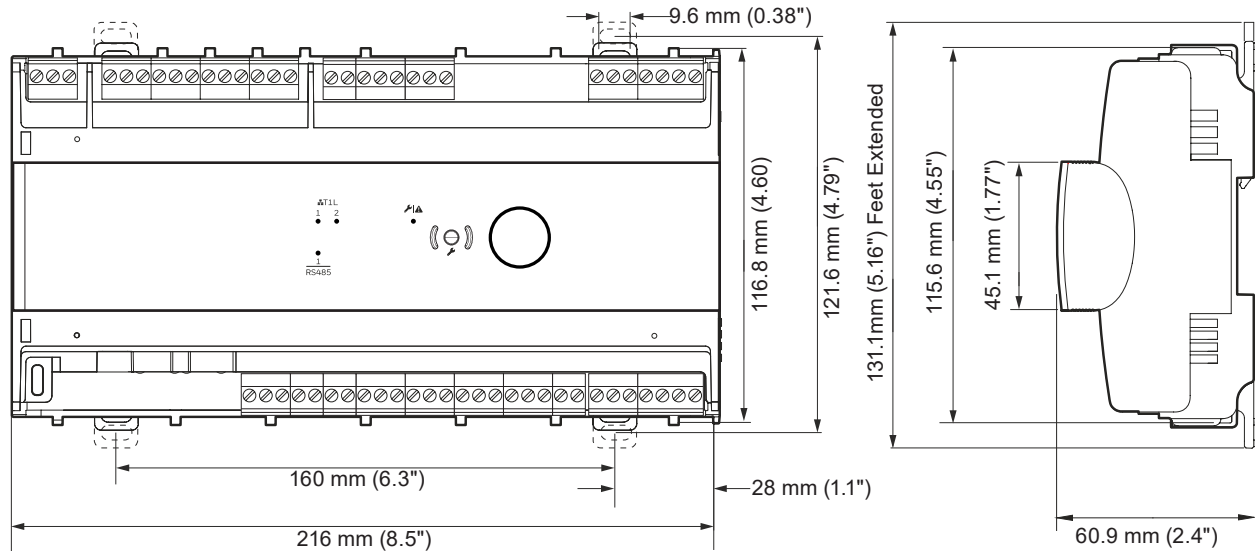
- 1 RS-485 port for Serial Modbus RTU communications
- 1 Sylk™ port for connection of field devices and displays
- 2 ports for communication with other controllers:
 - IP T1L variants - 2 T1L ports for communication with other controllers using T1L media.
 - IP CAT5/6 variants 2 Switched 10/100Mbit Ethernet Ports for communication with other controllers using CAT5/6 Ethernet .
- RSTP support
- 2 enclosure sizes.
- DIN rail mounting, DIN 19 size.
- USB local supervisor/engineering port
- 24 Vac/dc input power supply.

Physical

IQ5E-16-...



IQ5E-24-...



24 Vac/Vdc variants 4 x Digital/SSR outputs

4 x Digital Relay Outputs

Power Supply Input (see table below)

4 x Universal Inputs/Outputs

Status Indicators

Service/Reset Button

USB

Communications options (see table below)

RS-485 Port

24 Vac/Vdc variants 24 Vac/Vdc Auxiliary Power Output

Sylk™ Connector

16 x Universal Inputs/Outputs

Option	Description	
Communication Options	IP CAT5/6 Variants	IP T1L Variants
	IP Ethernet 1 over CAT5/6 cabling IP Ethernet 2 over CAT5/6 cabling	IP Ethernet 1 over T1L cabling IP Ethernet 2 over T1L cabling
Input Power Options	24 Vac Variants 24 Vac/dc input power	

FUNCTIONALITY

IQ5ECO's functionality is different to that of IQ500 and IQ528 controllers - see the table below.

The table below provides a comparison:

Feature	IQ5ECO	IQ500	IQ528
Compatibility Mode	x	✓	✓
Local Users	x	✓	✓
System Accounts	✓	✓	✓
Synchronised Account Management	✓	✓	✓
Timemaster	x	✓	✓
Encrypted Trend communications	✓	✓	✓
Web Server	x	✓	✓
IQ5-IO Modules	x	✓	✓
*IQ4/IO/.. I/O Expansion Modules	x	✓	x
XCITE/IO/.. I/O Expansion Modules	x	✓	x
*Use all RS-485 ports for interfacing	✓	✓	✓
*Modbus interfacing	✓	✓	✓
*Mbus interfacing	x	✓	✓
*XNC	x	✓	✓
Wallbus interfacing	✓	x	x
Sylk™ interfacing	✓	x	x
*MS/TP router (NC)	x	✓	✓
BACnet	✓	✓	✓
Password recovery via email	✓	✓	✓
IQVIEW SCD for IQ5	x	✓	✓
802.1x (isolated port only)	x	✓	x
Trend Current Loop (via LAN adapter)	x	✓	✓
Isolated Ethernet port	x	✓	x
T1L for communications with other controllers	✓	x**	x**
Email alarms	x	✓	✓
vCNC functionality	x	✓	✓
sCNC functionality	✓	✓	✓

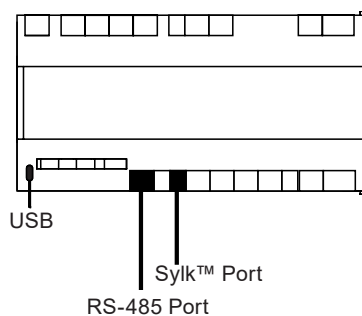
*Requires Licence

**IQ500 and IQ528 controllers can communicate with IQ5ECO controllers on T1L using a T1L Media Adapter.

For more details see the IQ5 Configuration Manual (TE201485).

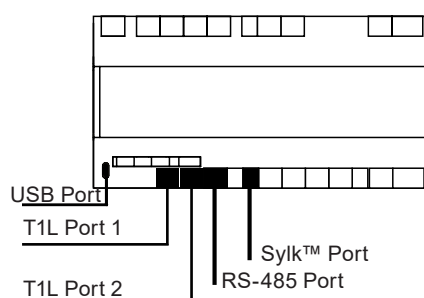
SYSTEM

All IQ5ECO's have communication ports for RS-485, Sylk™ and USB. Other communication ports depend on the variant.



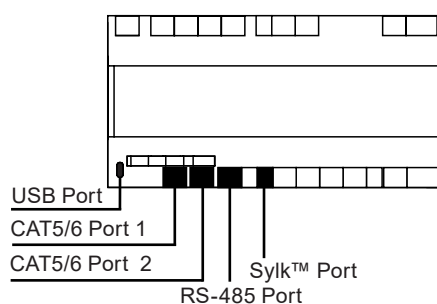
IP T1L Variants

IP T1L variants have two T1L ports plus the RS-485, USB and Sylk™ ports common to all variants.



IP CAT5/6 Variants

IP CAT5/6 variants have two CAT5/6 ports plus the RS-485, USB and Sylk™ ports common to all variants.



RS-485 Port

IQ5ECO's have an single RS-485 port which can be configured to communicate with Modbus devices using Modbus RTU protocol. For further details see 'Modbus Interfacing' on page 8.

USB (Local Engineering Port)

IQ5ECO's have an single USB (Local Engineering Port) which allows direct connection of IQSET enabling IQSET to communicate across the entire Trend network - see 'Building Trend Networks' on page 6.

Note: Firmware upgrade is not supported via the USB port.

Sylk™ Port

IQ5ECO's have an single Sylk™ port which can be configured to communicate with Sylk™ and Wallbus devices.

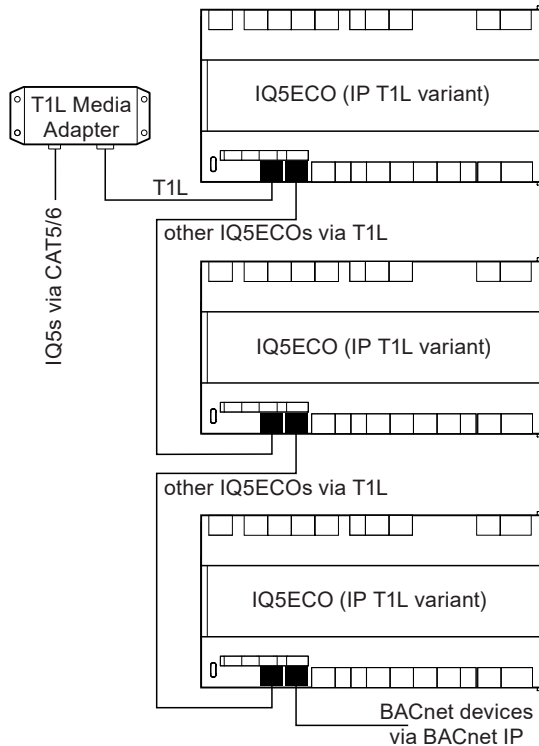
T1L Ports (IP T1L variants)

IP T1L variants have two T1L ports which can be used for:

- IP communication using T1L cabling

For details of building the Trend network - see 'Building Trend Networks' on page 6.

The diagram below shows an example of how a system might be connected using the T1L ports:



*Note The IQ5ECO's T1L port **CANNOT** be used for connection of IQ5-IO modules.*

The IQ5ECO's T1L ports (1, & 2) are connected to a single network adapter. The adapter has a unique MAC address that can be used to help identify the IQ5ECO during configuration. The adapter supports either static or dynamic (DHCP) IP addressing (DHCP by default).

Number of devices: There is no restriction on the number of devices that can be physically connected to the T1L bus other than normal Ethernet/IP constraints. However, the number of devices that can operate on a Virtual LAN is limited. A maximum of 64 devices is supported when an IQ500 or IQ528 controller on the same Virtual LAN is performing the INC routing function. If the Virtual LAN consists solely of IQ5ECO controllers, the maximum supported number of devices is 32.

Port Management

The T1L ports can be individually enabled/disabled.

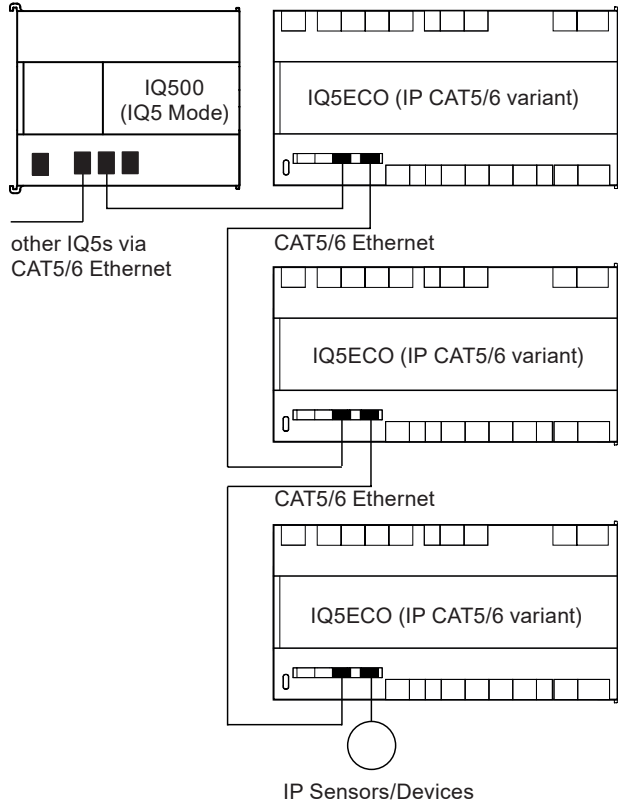
CAT5/6 Ports (IP CAT5/6 variants)

IP CAT5/6 variants have two 10/100 CAT5/6 ports which can be used for:

- IP communication using CAT5/6 cabling,
- IP-based communication with field devices,

For details of building the Trend network - see 'Building Trend Networks' on page 6.

The diagram below shows an example of how a system might be connected using the CAT5/6 ports:



Note: It is recommend that the network is connected in a ring in a daisy chained topology to provide a redundant path if a device is powered off. RSTP root bridge functionality within the IQ5ECO IP CAT5/6 variants must then be enabled if the network is connected in a ring.

Note: Daisy chained looped networks using RSTP are limited to 40 devices.

The CAT5/6 ports (1, & 2) are connected to a single network adapter. The adapter has a unique MAC address that can be used to help identify the IQ5ECO during configuration. The adapter supports either static or dynamic (DHCP) IP addressing (DHCP by default).

Number of devices: RSTP networks are limited to 40 devices apart from this there are no limits other than normal Ethernet/IP constraints. However, the number of devices that can operate on a Virtual LAN is limited. A maximum of 64 devices is supported when an IQ500 or IQ528 controller on the same Virtual LAN is performing the INC routing function. If the Virtual LAN consists solely of IQ5ECO controllers, the maximum supported number of devices is 32.

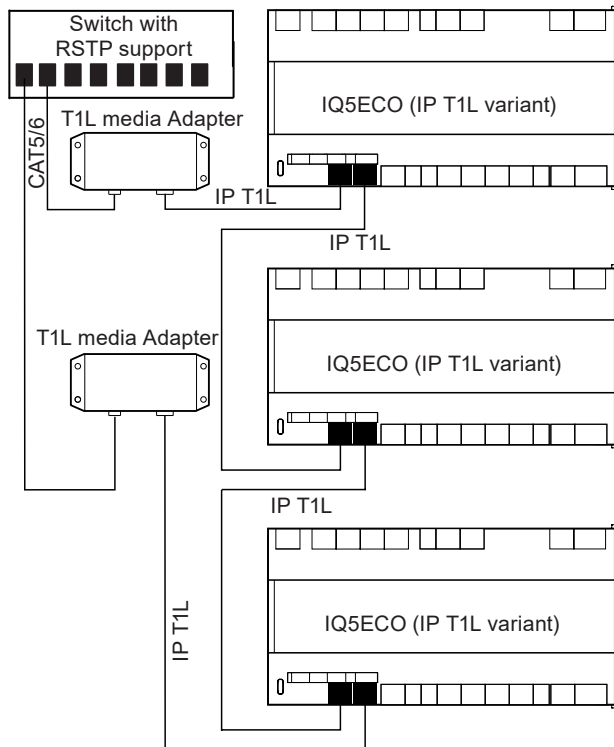
Port Management

The CAT5/6 ports can be individually enabled/disabled.

RSTP

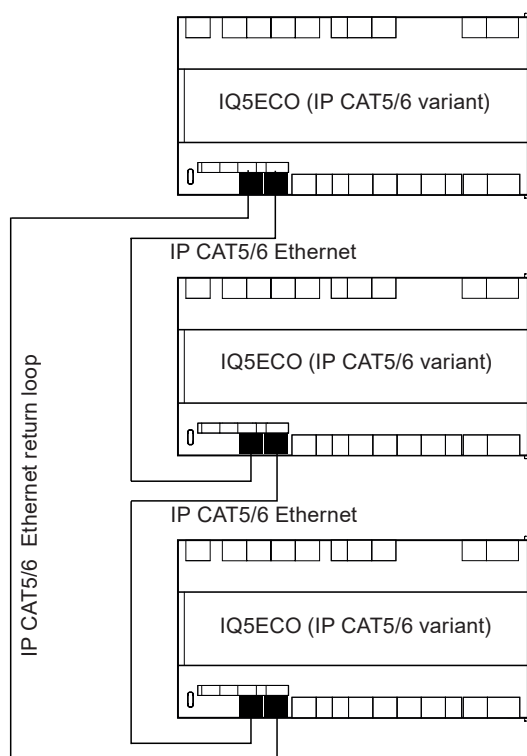
RSTP helps prevent loops on the Ethernet network. When used the maximum number of devices on the bus is 40 apart from this there are no limits other than normal Ethernet/IP constraints.

IP T1L variants: RSTP is supported but the IP T1L variants do not provide RSTP managed switch bridge functionality therefore a router/switch that supports RSTP is required on the network.



IP CAT5/6 variants: RSTP and RSTP managed switch bridge functionality is supported. In the example below the IQ5ECOs are configured for RSTP.

Note: Although a router/switch that supports RSTP is not required on the network it is recommended.

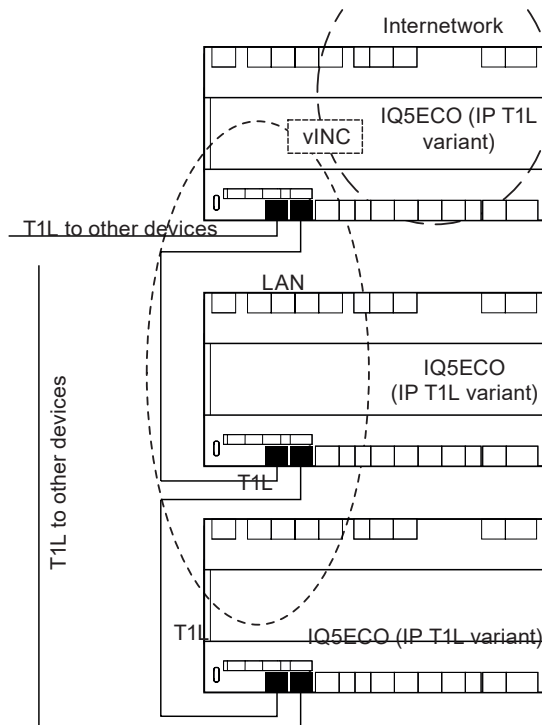


Building Trend Networks

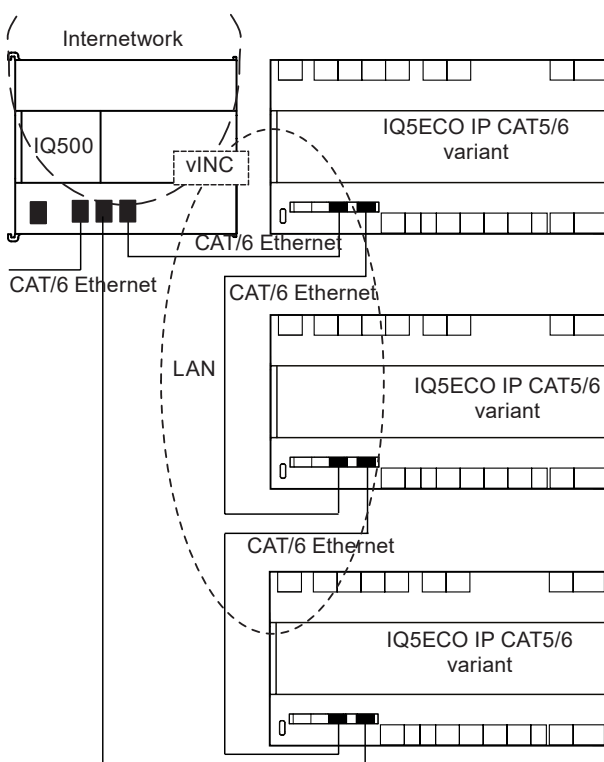
IQ5ECOs are able to coexist on the same Trend network as IQ500 and IQ528 controllers as well as other IQ5ECOs. They can form a Trend LAN with other Trend devices over Ethernet using T1L or CAT5/6 cabling. They can join an internetwork using their vINC. Other devices on the Ethernet network can communicate with the IQ5ECO using IP addressing.

Note: Remote communication with the Trend network by a supervisor, tool or display will require the use of a secure virtual CNC (vCNC) in an IQ500 or IQ528 on the network.

Trend Network over T1L Ethernet

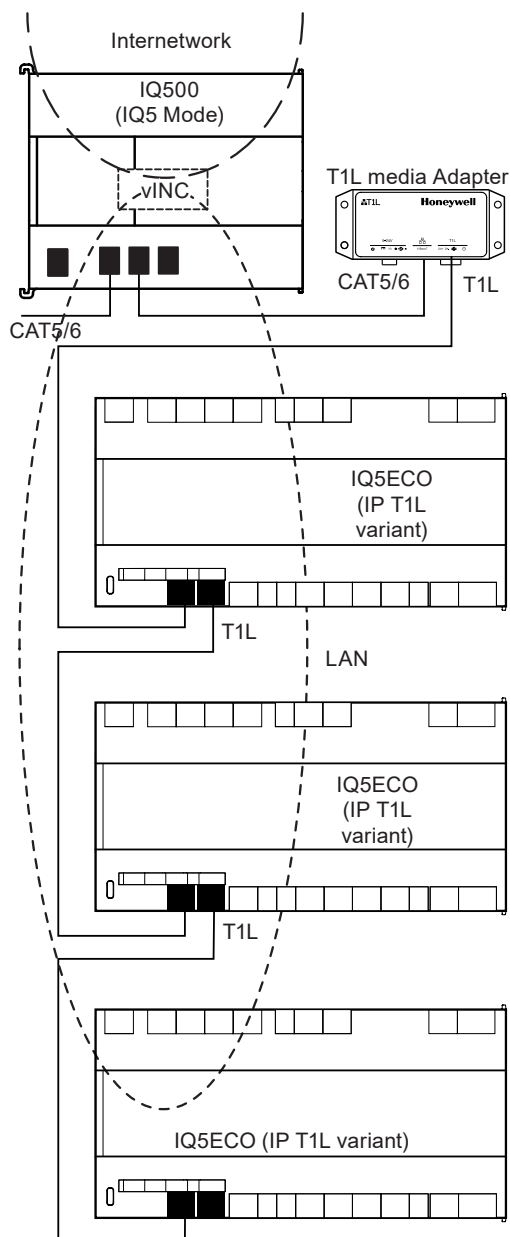


Trend Network over CAT5/6 Ethernet



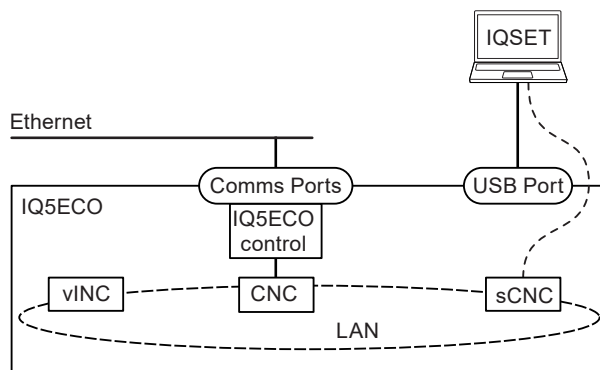
Note: RSTP must be configured in the IQ5ECOs, for this configuration to prevent broadcast storms and a network which cannot be established.

A T1L media adapter can be used to link the CAT5/6 cabling and the T1L cabling enabling the Trend network to be built across both media.



In order to connect to the Trend network the IQ5ECO will create its own internal LAN which includes the following nodes:

- a CNC for its own controller,
- a supervisor CNC (sCNC) for its USB port
- a virtual INC (vINC).



Default CNC Addressing: The IQ5ECO's device (outstation) address is factory-set (in the Address module) as follows:

Local LAN	20
Local Address	20

sCNC Functionality: When a PC running IQSET is connected to the USB port it uses an sCNC. If the USB port address is set to 0 (default), the sCNC is dynamically created at address 125 for the duration of the IQSET session. When the PC is removed the sCNC times out and no longer exists on the network. If the address is configured to be non-zero, the sCNC remains on the network at all times.

vINC Functionality: When the IQ5ECO joins a LAN on Ethernet, if there is an IQ500 or IQ528 controller on the LAN it will assume INC functionality (using its vINC at address 126). If the LAN consists of only IQ5ECO's the IQ5ECO with the lowest IP address assumes INC functionality. Any vINC's in other controllers on that LAN will automatically be disabled.

IC Comms: The IQ5ECO can communicate with other IQ5ECO's IQ500s, IQ528s, using IC Comms and BACnet devices, including Trend devices via BACnet, using BACnet IC Comms.

BACnet Communications

The IQ5ECO is able to communicate over BACnet. BACnet is an open protocol that enables the products of a number of different manufacturers of building automation and control equipment to communicate with each other. It supports communication using BACnet over IP (Ethernet) including:

- Access to IQ5ECO parameters over BACnet,
- Alarm delivery,
- IC comms to a BACnet device.

A full specification of the objects, properties, and BIBBS (BACnet Interoperability Building Blocks) supported by the IQ5ECO are given in the IQ5ECO BACnet Product Implementation Conformance Statement (TP201533). The mapping of BACnet properties to Trend parameters is described in the IQ5 Configuration Manual (TE201486).

Modbus Interfacing

The IQ5ECO can be configured to communicate with Modbus devices using Modbus RTU protocol enabling it to be easily integrated with many third party devices including meters, sensors, and variable speed drives.

Note: Modbus functionality needs to be enabled using an optional -INT licence (see 'Order Codes' on page 16).

Engineering with standard Network and Interface modules allows connection to other Modbus devices. Strategy blocks can be created for favourite devices.

IQ5ECO can be configured to communicate with Modbus devices using RS-485 port.

***Maximum number of inputs/outputs per device:** Each Modbus Interface module can have up to 150 inputs and 150 outputs (150 combined total).

**Note: The total number of inputs/outputs across all is limited by the number of licensed interface points - see Order Codes.*

Maximum number of devices: Although the maximum number of Modbus devices connected to the IQ5ECO is determined by the number of available interface modules in the IQ5ECO (max 1000), in reality, the limit is set by the Modbus rules.

Maximum number of connected Modbus networks: Each connected network requires one Modbus Network module. For Serial Modbus network modules, the number is set by the IQ5ECO's hardware.

Devices from different manufacturers can be connected to the same network providing the network parameters configuration are the same.

Note: IQ5ECO cannot be configured to work as a Modbus slave. It works as a Modbus client.

Water Balancing

The standard strategies for water balancing involve the management of water-side systems for effective balancing and flushing operations. Water balancing can be initiated using a multistate selector module or the service button. If necessary, custom strategies can be developed and linked to the multistate selector module to allow initiation via the service button.

Hardware

Input/Output Channels

The following types of input and output channel are supported:

- Universal Input/Output (UIO)
- Digital/Relay Output (DO RELAY)
- Solid state relay outputs (DO SSR)

The I/O channels available vary with the IQ5ECO Variant as shown in the table below:

	IQ5E-24-...-24	IQ5E-16-...-24
Universal Inputs/Outputs (UIO)	16	8
Digital/Relay Outputs (DO RELAY)	4	4
Solid state relay outputs (DO SSR)	4	4

24 Vdc auxiliary outputs are provided for powering certain types of I/O devices.

Cable Screening

The use of screened cable for input and/or output connections is optional and not generally required unless the cable passes through electrically noisy environments.

If screened cable is used the screen must be connected to the local panel/enclosure ground and left unterminated at the far end.

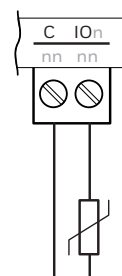
Universal Input/Output (UIO)

These channels will function in one of the following modes:

- thermistor input,
- voltage input,
- digital input,
- current input, or
- analogue output.

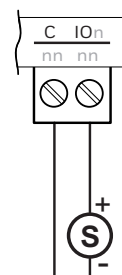
The input/output mode of each channel is set by the strategy configuration in the controller.

Thermistor input: Used for a thermistor (e.g. NTC (2K, 3K, 10K, 20K), PT100, PT1000, NI1000), potentiometer (0 to 300 kΩ) or fan speed control. The thermistor bridge resistor is 12 kΩ with a bridge supply 3.3 V. Example wiring:



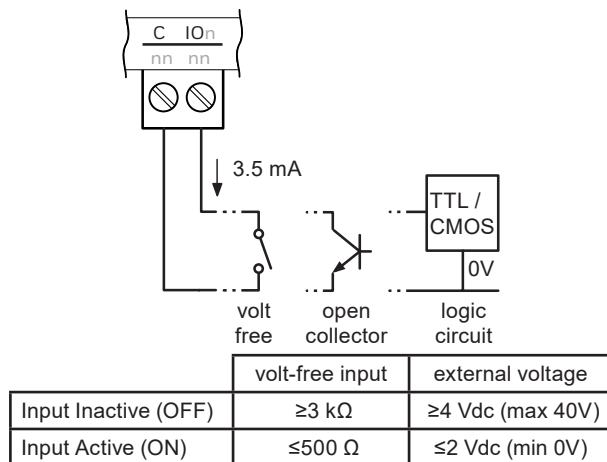
Voltage input: Used with a 0 to 10 Vdc or 2 to 10 Vdc source.

Example wiring



Digital input: Used for a volt free contact, logic circuit (e.g. TTL, CMOS), open collector (transistor), open drain (FET) or external voltage.

Example wiring



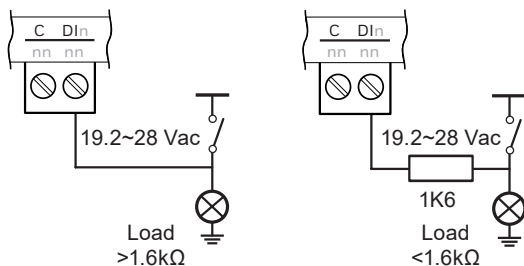
The input has a nominal wetting current of 3.5 mA.

Note: Voltage levels or resistances outside the values above may cause indeterminate operation.

The input can be configured for pulse count operation maximum 100 Hz max. Min pulse width 5 ms (both logic high and logic low).

Digital inputs can also be used to monitor the state of a 24 Vac circuit (e.g. to determine if a relay or actuator is on or off).

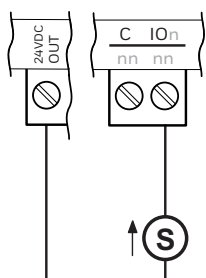
Example wiring



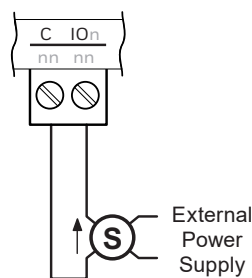
In the above example the input will be ON when the load is powered. If the load impedance is less than 1.6 k Ω (e.g. a filament lamp or relay coil) then a 1.6 k Ω resistor must be fitted in series with the input.

Current input: Used for 0 to 20 mA or 4 to 20 mA sources. May be either loop powered (from onboard 24 Vdc OUT terminal) or externally powered.

Example wiring - loop



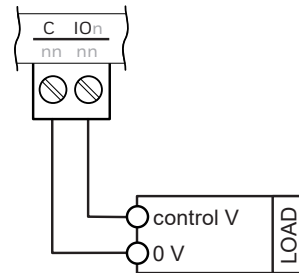
Example wiring - external



Note: The 24 Vdc OUT terminal can source up to 75 mA.

Analogue output: Provides a variable voltage output (0 to 10 Vdc, 1 to 10 Vdc, 2 to 10 Vdc, 0 to 20mA and 4 to 20mA).

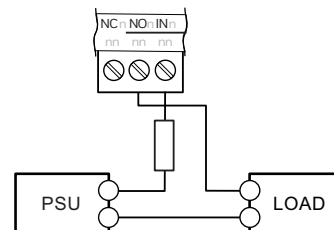
Example wiring



Digital/Relay Output (DO)

These channels provide a single pole dry contact relay.

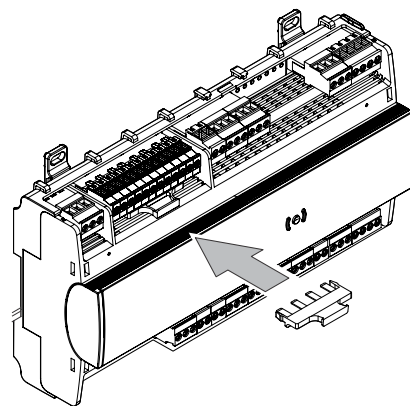
Example wiring for normally open connection



Ensure that external circuits are suitably protected against fault currents that would exceed the ratings for the switching circuits provided in this product.

The relay contacts close (i.e. NO makes with IN) when the output channel is ON.

An optional jumper (IO-JUMPER-4) can be inserted adjacent to the connectors which will link the IN terminals, enabling a common supply to be used on the DO channels.



Jumpers are supplied and are also available as spares.

Note: If required, pins can be removed from the 4-way jumper to prevent a certain channel from being linked. For example, remove the pin from channel 4 position to only have channels 1, 2 and 3 linked.

Caution: Mains and low voltage must not be mixed. If switching mains, all relays must switch the same phase and polarity. Arc suppression circuit (RC) recommended for inductive loads (see TG200208).

Solid State Relay Outputs (DO SSR) (-24 variants only)

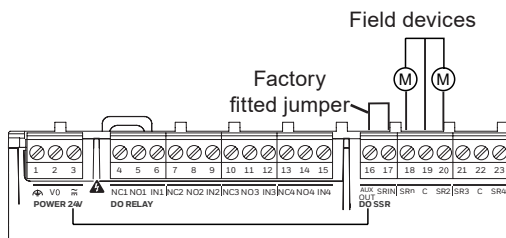
These channels provide switched 24 Vac or 24 Vdc control for thermic (thermoelectric) actuators, relays and synchronous motors.

The controller has an 'AUX OUT' terminal linked to the power supply terminal of the controller. This voltage can be 24 Vac or 24 Vdc depending on the connected input power. The AUX OUT and SRIN terminals have a factory jumper allowing it to feed power to the SR1 to SR4 terminals. When the factory jumper is removed between the 'AUX OUT' and 'SRIN', a separate power supply can be used to feed power to the SR1 to SR4 terminals.

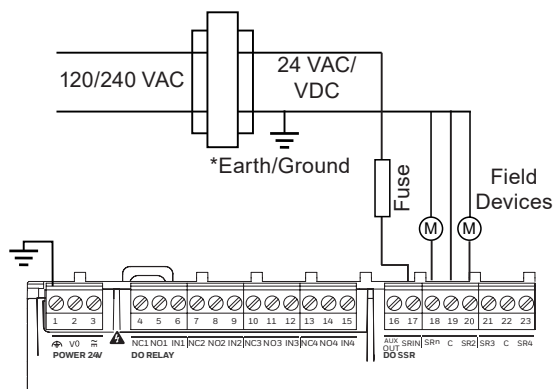
Note: If the combined load of the controller and the DO SSR outputs is greater than the power provided by the controller's supply (Class 2 supply) it is necessary to power the outputs from an external supply. The link between auxiliary output and the SR input should be removed to allow an external power supply to be used.

Note: The SRIN input is connected internally to terminal 3 of the input power supply, and has no protection.

Example wiring (internally powered)



Example wiring (externally powered)



*Connect the 0V (common) of the transformer's secondary circuit to a known earth/ground.

Auxiliary Outputs (PWR OUT & 24VDC OUT)

These outputs can be used to supply 24 Vac/dc to I/O devices (e.g. sensors) with the return through any 'C' terminal. The number and specification of the auxiliary outputs is dependent on variant - see 'Auxiliary Power Output (PWR OUT & 24VDC OUT)' on page 18.

Enclosure

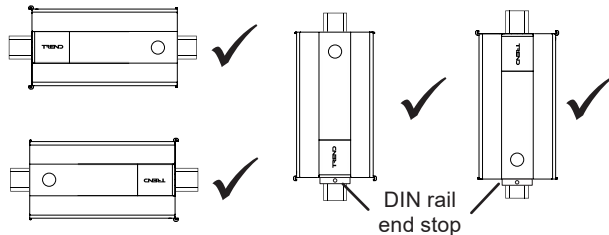
The IQ5ECO is housed in a polycarbonate enclosure compatible with the DIN43880 and DIN 19 size 2 standard. Integral clips on the back of the enclosure enable the unit to be clipped on to (and quickly released from) a standard TS35 DIN rail. If required the IQ5ECO can be surface mounted.

It must be installed in a secondary enclosure with a minimum protective rating of IP20 (or equivalent).

The unit may be mounted as shown:

-24 Variants:

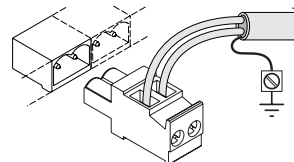
5 to 95% Rh, -40 to +65 °C (-40 to +149 °F)

**-24 Variants:**

5 to 95% Rh, -40 to +55 °C (-40 to +131 °F)

**Terminal Connectors**

Connection for power RS-485 is via two-part pluggable screw terminal connectors which are supplied as standard with the controller and available in packs for spares.- see 'Order Codes' on page 16).



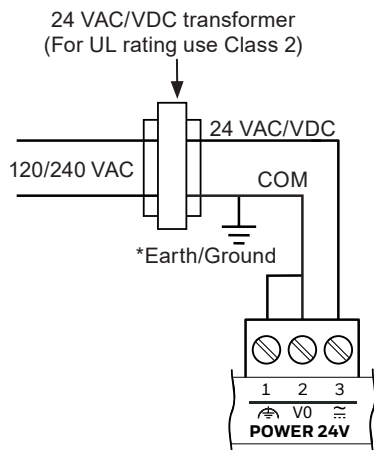
Function	Connector Type
Power	3-way
T1L	3-way
MS/TP	3-way
RS-485	3-way
Sylk™	2-way
Universal Input/Output (UIO)	3-way
Digital/Relay Output (DO)	3-way
Digital Chopper Output (DO CHP)	2-way
PWR OUT	3-way
24 Vdc Output	2-way

Input Power Supply

The IQ5ECO requires a 24 Vac/dc power supply rated as follows depending on the variant see 'Electrical' on page 17.

The local earth terminal must be earthed (grounded) at the controller. The supply must include a suitably rated switch in close proximity and be clearly marked as the disconnecting device for the unit. Do not position the equipment so that the disconnecting device is difficult to operate. Wiring example:

-24 Variants - Example for one controller per transformer



*Connect the 0V (common) of the transformer's secondary circuit to a known earth/ground.

Service Button 🔧

The service button is located on the front of the IQ5ECO. It has the following functions:

- To identify the IQ5ECO to IQSET during commissioning,
- To return the IQ5ECO to its factory default settings.
- To initiate water balancing

Indicators

Various indicators are provided on the IQ5ECO giving feedback on its operational status.

General (located on the front panel):

Indicator	Colour	Function
	Green Yellow Red	Device operational status and network status.
	Green Yellow	Service button status.
	Green Yellow Red	RS-485 port status.
	Green Red	T1L bus status.

RJ45 Ethernet: (located adjacent to each Ethernet connector):

Indicators	Colours	Description
	Left - Green Right - Yellow	100 Mbps link detected Solid = connected Blinking = activity on network
	Left - Off Right - Yellow	10 Mbps link detected Solid = connected Blinking = activity on network

Backup

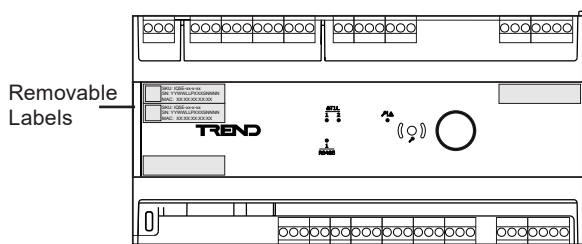
In the event of interruption to the power supply, the IQ5ECO uses the following mechanisms to retain data until power is restored.

Critical data changes (e.g. strategy values), are stored on power failure or other similar fault conditions

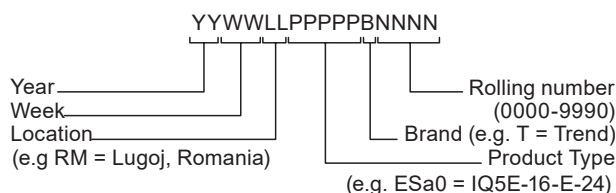
A supercap is used to maintain the real time clock (RTC). In the event of power failure this will typically maintain time and date function for up to 24 hours.

Labelling

Removable self-adhesive labels detailing the serial number (SN) and Ethernet MAC address (MAC) of the IQ5ECO controller are supplied which can be adhered to plant room panels, cabinets or schematic plans as required:



The serial number comprises the following manufacturing and product information:



The QR codes provide Serial number, MAC ID, model name and vendor ID, each separated by a \$ (dollar sign).

FIRMWARE

The firmware in the IQ5ECO controls its functionality and provides a range of modules that can be configured to produce a control strategy.

Strategy

In order to run sequences of operation for equipment and building control, the modules provided by the firmware must be configured to define the way the controller is to control the connected equipment. This configuration is known as the strategy. Strategies are configured using the System Engineering Tool (IQSET).

This produces a strategy file (filename.IQ5E) that can be downloaded to the controller to define its operation. This file consists of all the strategy module instances, their parameters, and links. When this is downloaded it is stored in the controller and then run using the controller firmware.

For details of using IQSET see the System Engineering Tool Manual (TE200147).

Strategy Modules

The range of strategy modules provided in the IQ5ECO firmware are listed in the table below. Full details of each module can be found in the IQ5 Configuration Manual (TE201486).

Module	brlQs	Max. number of Modules	Note
Address	24	1 (fixed)	
Alarm Destination	14	8	
Alarm Group	9	500	
Alarm Route	9	500	
Alarm Log	0	1 (fixed) 2000 records	
Analog Node	16	4000	
Calendar	566	100	
Digital Byte	16	4000	
Digital Input	28	4000	①
Directory	13	1000	
Display	19	4000	
Driver	57	1000	①
Function	19	4000	①
IC Comms	19	50	① ③
Interface	130	1000	①
Knob	13	4000	
Logic	19	4000	①
Loop	55	1000	
Network Service/Network	0	-	
NTD	30	4000	
Option	0		
OSS	34	500	
Page	4	500	
Plot	12	4000	
Program	0	1 (fixed)	
Schedule Offset	21	4000	
Sensor	76	4000	① ④
Sensor type	12	99	
Sequence	106	1 (fixed) - see separate table for maximum steps	
Security	0	1 (fixed)	
States Category	0	100	
Switch	10	4000	
Time	38	1 (fixed)	
Time Schedule	566	100	②

① The number of brlQs used on these modules varies with the module type. The largest size is shown here.
 ② Includes a maximum of 50 exceptions per module.
 ③ A maximum of 50 IC comms/COV subscriptions can be configured.
 ④ Max 30 sensors logging at 1 second intervals
 For more details see the IQ5 Configuration Manual (TE201486).

The quantity of each type of module may be adjusted to match the requirements of the application subject to the following:

- a maximum of 4000 modules in total,
- the maximum for each type of module, and
- the IQ5ECO's memory capacity (measured in 'brlQs').

The maximum number of modules for each type, and number of brlQs required per module are shown in the table above.

The total available memory capacity varies according to the number of I/O channels:

Number of I/O channels	Max. brlQs available
16	15,000
24	20,000

Note: If the INT50 or INT150 licence is applied these values are increased by 5,000.

Plot Modules

The IQ5ECO's Plot modules can plot the value of any connectable module output (analogue or digital) at a specific interval of between 1 second and 24 hours. There are four types of Plot module: Synchronised, Triggered, Periodic and COV (change of value). Although all four types are BACnet interoperable, only periodic plots can be compliant with the BACnet standard. All Plot modules can generate a buffer ready alarm when the number of records equals a notification threshold.

The maximum number of records per plot is 1000. The maximum total number of records (for all plots) depends on the available plot memory (measured in log points) and the type of plots used:

Maximum plot memory (log points)		1,000,000
Maximum number of records	Synchronised plots	
	single precision (5 log points per record)	200,000
	double precision (10 log points per record)	100,000
	Triggered, COV or periodic plots	
	single precision (10 log points per record)	100,000
	double precision (15 log points per record)	67,666

Note: A maximum of 30 plots can be serviced in a 1 s period (e.g. 30 x 1 s plots only). This is calculated on the average plots serviced in 1 s, so a 1 minute plot would contribute a 1/60. For example, 90 x 1 s plots plus 360 x 1 min plots would give 96 (90+6) plots per second on average. The periodic and triggered plots must also be counted, and it is up to the engineer to make their best estimate.

Sequence Table Module

The IQ5ECO has a maximum of 400 steps in the sequence table.

BACnet COV Reporting and Receiving

The IQ5ECO's BACnet Change Of Value (COV) services allow a COV client to receive reports from a COV server when the value of a referenced property changes. IQ5ECO provides both COV reporting (limited to 1000 COV subscriptions - see page 12 for limitations) and COV receiving facilities.

Firmware Upgrades

New versions of firmware may be made available from time to time to change or add functionality or to provide support for new products.

Firmware can be upgraded using a PC running the IQTool Firmware Upgrade Applet, and to the IQ5ECO connected over Ethernet.

Alarms

The IQ5ECO will generate Network, General, and Item alarms. Network alarms are generated by the Trend Network nodes, General alarms are generated when the IQ5ECO detects a problem within its own hardware or program, and Item alarms are generated by the strategy, and are normally due to a faulty plant condition.

Network alarms are sent to supervisors or tools connected to the USB local engineering port

General and Item alarms can be sent either to a designated Trend LAN address, or to an IP address. Alternatively, certain Item alarms (e.g. sensor, digital input, digital driver readback, and plot), can be sent to a BACnet device.

Alarms sent to a Trend LAN address, or to an IP address can either be sent in text, or attribute format. Network alarms are sent in text format only.

All alarms (except Network alarms) are also stored locally in the Alarm Log. The alarm log can record up to 300 alarms. Once this limit is reached each new alarm will overwrite the oldest record.

Identification

The IQ5ECO will identify itself as an IQ5ECO to system clients, i.e. IQVISION or IQSET.

SECURITY

IQ5ECO is designed to meet ISA ISA/IEC 62443-4-2-SL2, and has been developed using processes that are fully certified to ISA/IEC 62443-4-1. To meet these requirements IQ5ECO provides:

- Secure Boot
- Authenticated and Encrypted Network
- Encrypted at Rest
- Synchronised Account Management
- Audit logging

In the event of a forgotten password, an engineer can initiate an unlock code to be sent to a pre-defined email address from an IQ500 or IQ528 in the same Trend network.

All of this is managed by an admin account which should be provided to the site owner.

IQ5ECOs MUST NOT be directly connected to the Internet.

Synchronised Account Management: IQ5ECO features an account management system which provides the engineer with a single logon for the site, and synchronizes any password changes across the whole site.

Audit logging: The IQ5ECO provides audit logging which can be viewed from IQSET as part of diagnostics collected from IQ5ECO for:

- Access control
- Request errors
- Operating system events
- Control system events
- Backup and restore events
- Configuration changes
- Reconnaissance activities
- Audit logging events

LICENSING

All IQ5ECOs have the same base level capacity/functionality.

Additional capacity/functionality can be added to an IQ5ECO by applying a licence to the controller. There are two types of licence Base and Upgrade:

Base Licences

Base licences are used for the initial licensing of the controller i.e. during installation/commissioning. Base licenses can be applied to the controller during the grace period after this an upgrade licence must be used to add to the controller's capacity/functionality.

Grace period: The grace period is 60 days of power-on time following the application of the initial base license. Within this timeframe, additional base licenses may be added. The initial base license is applied by IQSET. The grace period is visible in IQSET's IQ5 feature licensor and the IQ5's web pages in the address module.

Upgrade Licences

Upgrade licenses are used allow for system expansion after the grace period.

See 'Order Codes' on page 16 for the available order codes.

FIELD MAINTENANCE

The IQ5ECO requires no routine maintenance.



WARNING: Contains no serviceable parts. Do not attempt to open the unit. Failure to comply may cause damage to the unit.

DISPOSAL

COSHH (Control of Substances Hazardous to Health - UK Government Regulations 2002) ASSESSMENT FOR DISPOSAL OF IQ5ECO.

RECYCLING

All plastic and metal parts are recyclable. The printed circuit board may be sent to any PCB recovery contractor to recover some of the components for any metals such as gold and silver.



WEEE Directive:

At the end of their useful life the packaging, and product should be disposed of by a suitable recycling centre.

Do not dispose of with normal household waste.
Do not burn.

COMPATIBILITY

Supervisors and Displays: IQVISION V4.15u4 (or later).

Note: A supervisor connected to the USB Local Engineering Port of an IQECO cannot see IQ5ECO devices.

Utility Software: IQSET V9.0 (or later).

T1L Devices: Other IQ5ECO IP T1L variants, T1L Media Adapter.

*Note: IQ5ECO is **NOT** compatible with IQ5-IO Modules.*

To ensure compatibility and follow cyber security best practices, when installing an IQ5ECO controller or adding / replacing IQ5ECO an existing controller, always ensure that the IQ5ECO is running the latest version of firmware available from PNet. (<https://partners.trendcontrols.com>).

Controllers: IQ5ECOs, IQ500s and IQ528s in IQ5 Mode (via Ethernet).

Strategies: IQ1, IQ2, IQ3, IQ4, and IQECO can be imported into IQSET, converted into IQ5ECO strategies, and then downloaded into an IQ5ECO.

IQ5 hardware types can be changed in the strategy i.e. IQ500 or IQ528 strategies can be changed to IQ5ECO strategies and IQ5ECO strategies can be changed to IQ500 or IQ528 strategies

Note: IQ5ECO strategies cannot be converted to pre V2.0 IQ500 and IQ528 strategies.

IC Comms: The IQ5ECO can communicate with other IQ5ECOs IQ500s, IQ528s, using IC Comms and BACnet devices, including Trend devices via BACnet, using BACnet IC Comms.

INSTALLATION

The IQ5ECO is designed to be surface mounted or clipped on to a TH35x7.5 or TH35x15 DIN rail. The IQ5ECO must be installed in a secondary enclosure with a minimum protective rating of IP20 (or equivalent).

The installation procedure involves:

- Mounting the controller in position
- Connecting Ethernet network
- Connecting power
- Connecting RS-485 network (if required)
- Connecting Sylk™ network (if required)
- Connecting inputs/Outputs
- Powering up

- Setting up Ethernet connectivity
- Creating a strategy
- Connecting to the controller
- Downloading strategy and other configuration files
- Checking communications
- Connecting inputs and checking operation
- Connecting outputs and checking operation

A full description of installing the unit is given in the IQ5ECO Installation Instructions - Mounting (TG201521) and IQ5ECO Installation Instructions - Configuring (TG201522).

ORDER CODES

IP T1L VARIANTS

IQ5E-16-T-24	IQ5ECO IP T1L Unitary controller in medium enclosure with 8UIOs, 4SSRs, 4 Relay Outputs, 24V ac/dc
IQ5E-24-T-24	IQ5ECO IP T1L Unitary controller in large enclosure with 16UIOs, 4SSRs, 4 Relay Outputs, 24V ac/dc

IP CAT5/6 VARIANTS

IQ5E-16-E-24	IQ5ECO IP CAT5/6 Unitary controller in medium enclosure with 8UIOs, 4SSRs, 4 Relay Outputs, 24V ac/dc
IQ5E-24-E-24	IQ5ECO IP CAT5/6 Unitary in large enclosure controller with 16UIOs, 4SSRs, 4 Relay Outputs, 24V ac/dc

LICENCES

Base Licences

Base licences are used for the initial licensing of the controller i.e. during installation/commissioning.

IQ5ECO-INT50-BASE	IQ5 base license for Modbus with 50 points
IQ5ECO-INT150-BASE	IQ5 base license for Modbus with 150 points

Upgrade Licences

Upgrade licenses are used allow for system expansion after the grace period (60 days of power-on time following the application of the initial base license). The following upgrade licences are available:

IQ5ECO-INT50-UP	IQ5 upgrade license for Modbus with 50 points
IQ5ECO-INT150-UP	IQ5 upgrade license for Modbus with 150 points

ACCESSORIES

CW-COV-L-UNITARY	Terminal cover for the IQ5E-24-... variants (pack of 10)
CW-COV-S-UNITARY	Terminal cover for the IQ5E-16-... variants (pack of 10)
10BASE-T1L-ADAPT-0	T1L Media Adapter - IP-T1L single pair media adapter that allows conversion between 10BASE-T traffic to 10BASE-T1L
SCRW-TB-UNI-L	Spare set of removable terminal blocks
IO-JUMPER-4-10	Spare 4 pin relay Output Jumper Bars to connect 4 relay commons (pack of 10)

SPECIFICATIONS

ELECTRICAL

Rated Input Voltage
-24 variants 20 to 30 VAC / 24 to 30 VDC

Nominal Power Consumption
IQ5E-16-...-24 10 VA
IQ5E-24-...-24 13 VA

Full Load Power Consumption
Maximum load including external loads, Sylk™, Communication,
Universal IO output, and 24 Vdc output.

Note: These figures exclude the load on the SSRs and relays).

IP CAT5/6 variants
IQ5E-16-...-24 36 VA
IQ5E-24-...-24 60 VA
IP T1L variants
IQ5E-16-...-24 38 VA
IQ5E-24-...-24 59 VA
Frequency Range 50/60 Hz
CPU Crossover processor NXP I.MRT,
Cortex M7
Memory Capacity 64 MB QSPI Flash, 64 MB SDRAM.
Operating System LINUX/RTOS.
Real Time Clock
Accuracy (typical) ±0.3 s per day (±2 minutes per year).
Retention 24 hours, the time will reset to factory
default time.
Type of loads Resistive or inductive
Impulse Voltage
-24 variants 330 Vac
Material Group IIIb
Period of electric stress across insulating parts Long
Classes of control function Class A control
Type of Output Waveform
-24 variants Sine wave or DC voltage
Cycle Time Sequence table 1s.

CAT5/6 Ports

Number of Ports 2.
Protocol supported Ethernet IP, BACnet IP
IP Addressing Modes
Dynamic DHCP and Link-local
Static Assigned
Transmission 10/100 BASE-T (IEEE 802.3).
Connection RJ45, auto MDI-X.
Cable Type Cat 5e, UTP (unshielded twisted pair).
Distance (to hub) 100 m (328 ft) maximum.

USB Local Engineering Port

Connector USB type C.
Transmission USB 2.0.
Supported cable
-24 variants USB type C to USB type A
Data Rate 480 Mbits/s. (limited to 19k2 by IQSET)
Distance 5 m (16 ft) maximum.
Address (sCNC) 1 to 119, (2, 3 and 10 not permitted)
settable in software.

RS-485 Port

Number of ports 1.
Protocol supported Modbus RTU
Termination 120 Ω

Protocol	Device Count	Cable Type	Max Length* metres (feet)
Modbus	32 unit loads	120 Ω twisted pair	900 (2953)

**Dependent on cable specification and baud rate.*

T1L Ports

Transmission 10BASE-T1L 802.3cg-2019
Connection Screw terminal, auto MDI-X
Transmission speed 10 Mbps
Cable Type Single twisted pair, 18AWG, shielded or unshielded. Belden 74040NH or equivalent.
Distance Max distance between Power devices is defined by the cable used. T1L cable allows 900M. Network design should accommodative for devices switching off. Max 10 devices can be off between active nodes. Therefore to allow for two devices to be switched off between devices, the recommended max distance between devices with T1L cable is 300m.

Note: This maximum distance is defined by the cable used, see the T1L Network Specification Guide (TE201517) for maximum cable distances for specific cables.

Sylk™ Port

2-wire, polarity-insensitive

Inputs/Outputs

Universal Input/Output (UIO)

Function Measuring voltage, current, or digital input, or provide analogue control output (function set by strategy).
Input Noise Rejection Minimum 60 dB series mode rejection at input power supply frequency.
Type Action 1
Analogue Resolution 16 bit (65,536 steps) A/D resolution
Analogue Input
Voltage
Input range 0 to 10 Vdc, 2 to 10 Vdc direct/reverse.
Input resistance 9.4 kΩ.
Accuracy ±0.5% of full scale range (50 mV).
Current
Input range 0 to 20 mA, 4 to 20 mA.
Current source Onboard 24 Vdc or external PSU.
Input resistance 75 Ω.
Accuracy ±0.5% of full scale range (100 µA).
Digital Input
Dry contact binary input with direct/reverse
AC voltage
ON state 0 to 28 Vac
19.2 ~ 28 Vac with frequency 50 to 60Hz.
OFF state 0 ~ 1.4 Vac.
DC voltage
ON state 0 to 40 Vdc,
0 to 2 Vdc.
OFF state 4 to 40 Vdc.
Pulse rate 100 Hz max. Min pulse width 5 ms (both logic high and logic low).
Analogue Output
Voltage
Range 0(2)...11 V direct/reverse with -3 mA ...+20 mA.
Accuracy ±0.5% of span (50 mV).
Current
Range 0(4)...20 mA direct/reverse.
Accuracy ±0.5% of span (50 mV).

Digital/Relay Outputs (DO)

Function	Single pole normally open control from strategy for general purpose use.
Contact Rating (current)	10 A constant current on normally open (NO) contact and 80A inrush for 20 ms.
Maximum Total Load	12 A (across all channels) if all commons are connected via a relay jumper.
Output	250/277 VAC, 50/60 Hz, or 24 VDC, 12A Max. total common (10 A Max. per Relay)
Type Action	1.C
AC voltage	19 Vac to 250 Vac
DC voltage	5 Vdc to 30 Vdc
AC Minimum Load	100 mA
DC Minimum Load	10 mA
Minimum Cable Size	18 - 14 AWG.
Resistive	10A, 250V, 65DegC
Resistive	10A, 277V, 65DegC
Inductive load	10A, 250V, 65DegC
Inductive load	10A, 277V, 65DegC

Note:

Relay outputs can be used as dry contact output.

The type of disconnection or interruption is provided by each circuit.

Digital/SSR Outputs (DO DSSR)

Function	Switched 24 Vac or 24 Vdc control for thermic (thermoelectric) actuators, relays and synchronous motors.
Type Action	1
Maximum Total Load	1.5A across all 4 outputs; 3.5A inrush for 0.1s per output
Total current	
Controller powered	Power provided by controller's power supply is shared between controller and the DOSSR outputs.
Externally powered	6 A shared across all 4 channels, 1.5A maximum per channel.

Note: If the combined load of the controller, and the DOSSR outputs is greater than the power provided by the controller's supply it is necessary to power the outputs from an external supply. The link between auxiliary output and the SR input should be removed to allow an external power supply to be used.

Fuse	The fuse should be 5 A, for example, 0AGC005.V, 0AGW005.VP or BK/AGW-5, and the fuse holder, for example, 150603 or BK/HRK-R.
Type	1
Wire Gauge	
SSR output	22-18 AWG
SRIN output	22-18 AWG

24 Vdc Output

Voltage	24 Vdc $\pm 5\%$
Current (maximum)	75 mA

Auxiliary Power Output (PWR OUT & 24VDC OUT)

Voltage	
IQ5E-24-...-24	:1 x 24 Vac/Vdc at 300 mA :3 x 24 Vdc at 75 mA.
IQ5E-16-...-24	:1 x 24 Vac/Vdc at 300 mA :1 x 24 Vdc at 75 mA

Note: The voltage type AC or DC depends on the controller supply voltage, e.g, a controller supplied with 24VAC will provide 24VAC out of those two terminals

Current (maximum)	:6 A also limited by per input power
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AUX Output

The AUX is connected internally to terminal 3 of the input power supply, and has no protection.

Note: Terminal 16 AUX OUT provides output power that is dependent on the input power supply and is connected to the SRIN input using a removable factory fitted jumper.

Voltage	:24 Vac/Vdc $\pm 20\%$.
Current (maximum*)	:Depends on the power available from the transformer.
Wire Gauge Range	22 to 18 AWG

SRN Input

Note: Terminal 17 SRN Input provides output power that is dependent on the controller's input power supply when the removable factory fitted jumper is in place. If the jumper is removed it provides power dependent on the power supply that is connected to the input.

Voltage	:24 Vac/Vdc $\pm 20\%$.
Current (maximum*)	:Depends on the power available from the transformer.
Wire Gauge Range	22 to 18 AWG

T1L

Wire Gauge Range	18-23 AWG
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INDICATORS

General Status	
Device 'ring'	Multicolor LED
Service	Multicolor LED
RS-485	Multicolor LED
T1L	Multicolor LED
Ethernet Ports	
LED	Green or Yellow

MECHANICAL

Construction of control	Independently mounted for panel mounting
Dimensions (WxHxD)	
IQ5E-16-...	180 x 121.6 x 53 mm (7.1 x 4.79 x 2.1")
IQ5E-24-...	216 x 121.6 x 53 mm (8.5 x 4.79 x 2.1")
Material (enclosure)	Flame Retardant Polycarbonate.
Weight	
IQ5E-16-...-24	0.483 kg (1.064 lb)
IQ5E-24-...-24	0.57 kg (1.256 lb)
Mounting	In fuse boxes (DIN43880), on DIN rails or surface mounted with optional protection covers.

Connectors

Power, RS-485, DO, DO CHP, PWR OUT, UIO, Sylk™	
-24 variants	Connector type 2 part connector (5 mm pitch) with rising cage clamp screw terminals.
RJ45 Ethernet Ports	RJ45 connector.

APPROVALS AND CERTIFICATIONS

- EN60730-1/UL60730-1/CSA E60730-1, Standard for Automatic Electrical Controls - Part 1: General Requirements
- UL916
- UL/ULC 60730-1
- FCC/IC Product Class B
- CE-approved
- Plenum tested (according to UL 2043)
- BACnet™ BTL®-Listed as BACnet™ Building Controller (B-BC)
- RoHS compliant
- FCC part 15b / ICES -003 ; Class B.

Action type 1.B.
 Rated impulse voltage 24 V circuits: 500 V.
 Relay outputs: 2500 Vac.
 Protection against shock Class 0;
 Class II (installed in an enclosure).
 Software class A.

ENVIRONMENTAL

Ambient Environmental Limits

Humidity 5 % to 95 % RH, non-condensing.
 Temperature
 Storage -40 °C to 65 °C (-40 °F to 149 °F)
 Operating
 -24 variants -40 °C to 65 °C (-40 °F to 149 °F)

Note: Operating temperature is reduced when mounted in certain orientations - see 'Enclosure' on page 10.

Note: Restrictions apply at higher operational temperatures and altitudes.

Note: For temperatures below 0°C (32°F) special care must be taken that there is no condensation on or within the unit.

Use Indoor use only
 Altitude ≤4000 m (13124 ft).
 Pollution Degree 2 (only non-conducting pollution occurs).
 Protection IP20 if mounted in an enclosure rated at IP20 or equivalent. NEMA 1.
 Additional tests Ball Pressure and Glow wire test.

SAFETY

CAUTION: To Reduce the Risk of Fire or Electric Shock, Do Not Interconnect the Outputs of Different Class 2 Circuits.

CAUTION: Risk of Electric Shock – More than one disconnect switch may be required to de-energize the equipment before servicing.

Please send any comments about this or any other Trend technical publication to techpubs@trendcontrols.com



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