

IQ4NC Controllers



Description

The IQ™4NC enables Trend networks on different media (either Ethernet, Trend current loop, or MS/TP) to be joined together in various configurations. It provides 4 virtual CNCs which allow supervisors or tools on the Ethernet network to connect to the Trend system.

The IQ4NC/00 has no I/O channels, the IQ4NC/12 has 12, the IQ4NC/16/... and IQ4NC/32/... have 16 I/O channels. External I/O modules enable the IQ4NC/32/... to be expanded to 32 I/O channels.

Features

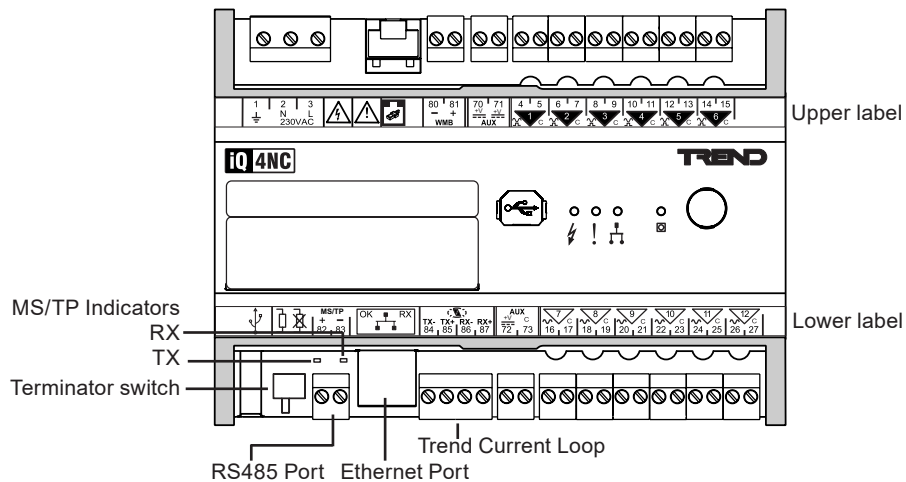
- Trend system interface with MS/TP trunk (e.g. IQecos)
- BACnet over MS/TP
- Extend Trend network from Ethernet to Trend current loop
- BACnet over IP
- Communication mode configuration facilitated by IQ web pages
- Optional interfacing to Serial/IP MODBUS, and M-Bus devices.
- INC alarm forwarding (e.g. enabling IQeco alarms to be forwarded to an IP address)

Physical

This section highlights features relevant to the NC functionality.

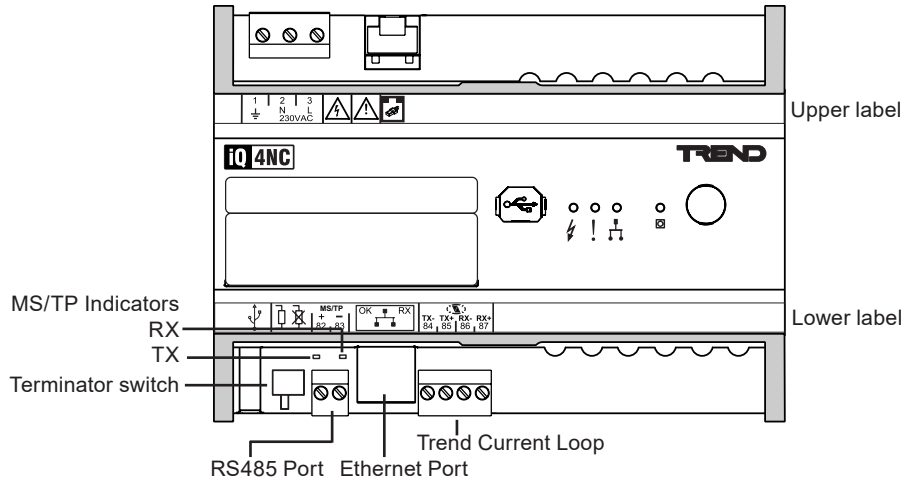
IQ4NC/12/...

For physical dimensions and other details see the IQ422 Data Sheet (TA201260).



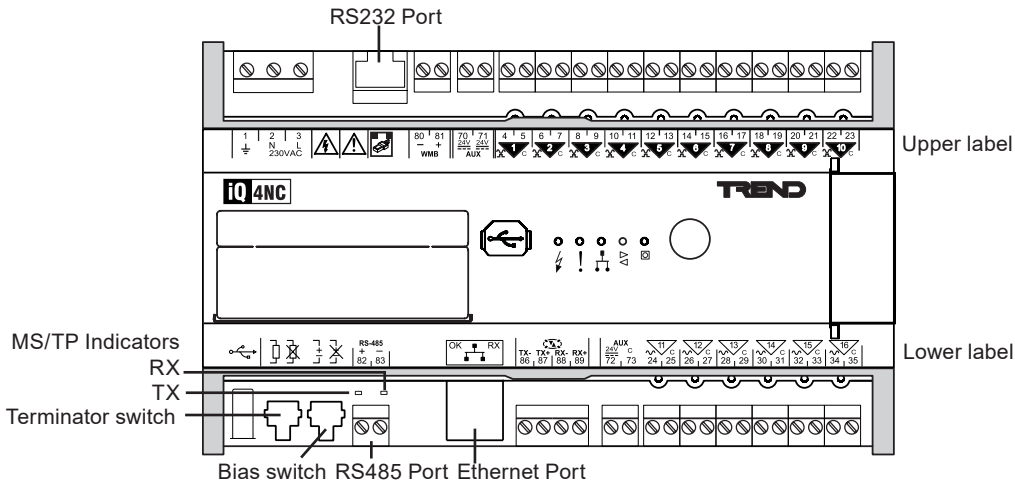
IQ4NC/00/...

For physical dimensions and other details see the IQ422 Data Sheet (TA201260).



IQ4NC/16/.. and IQ4NC/32/..

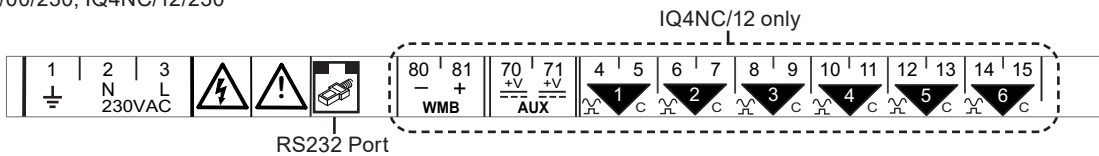
For physical dimensions and other details see the IQ4E/.. Controller Data Sheet (TA210340).



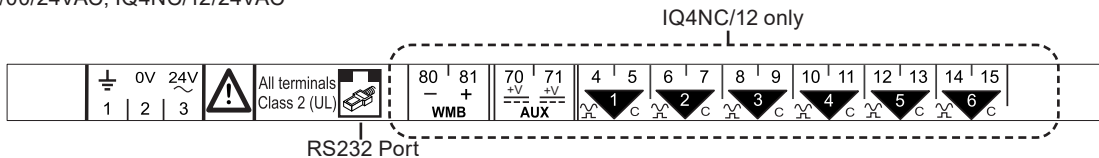
Terminal Labels

Upper Label

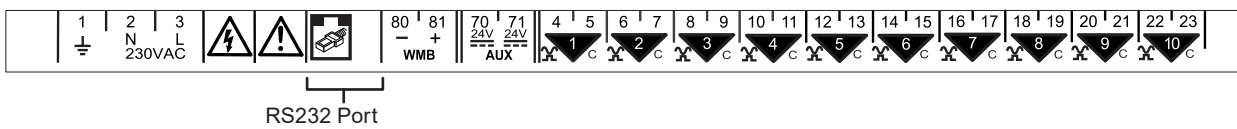
IQ4NC/00/230, IQ4NC/12/230



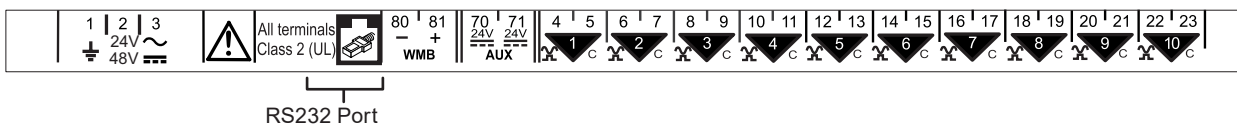
IQ4NC/00/24VAC, IQ4NC/12/24VAC



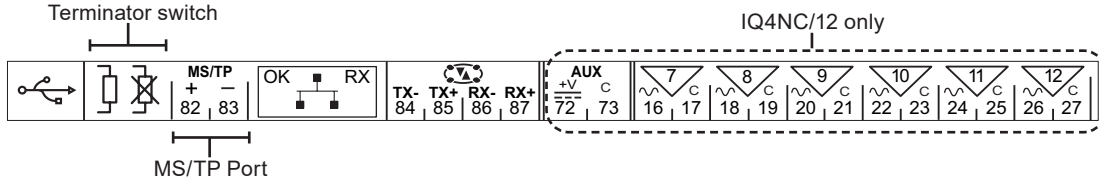
IQ4NC/16/.../230, IQ4NC/32/.../230



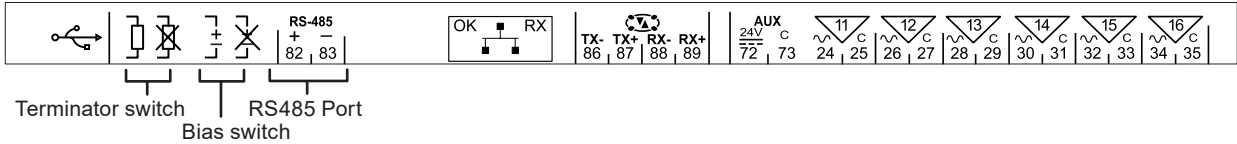
IQ4E../XNC../24VAC, IQ4NC../XNC/24VAC



Lower Label
IQ4NC/00/..., IQ4NC/12/...



IQ4NC/16/..., IQ4NC/32/...



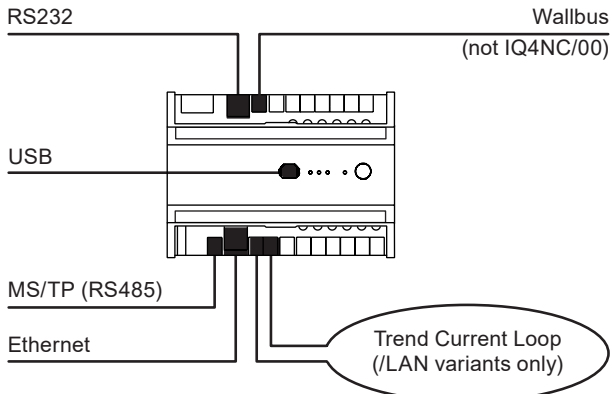
FUNCTIONALITY

Note: This data sheet describes the additional functionality of IQ4NCs variants. For standard functionality of the IQ4NC/00/... and IQ4NC/12/... see the IQ422 Controller Data Sheet (TA201260). For standard functionality of the IQ4NC/16/..., and IQ4NC/32/... see the IQ4E/... Controller Data Sheet (TA210340), details of the XNC functionality are described in the IQ4/.../XNC/... Data Sheet (TA201346).

The IQ4NC's functionality can be divided into four sections: System, Hardware, Firmware, and Strategy.

SYSTEM

The IQ4NC has communication ports for Ethernet, MS/TP (RS485), USB (Local Engineering), RS232 (Local Supervisor) and a Trend Current Loop. The IQ4NC/12, IQ4NC/16/.. and IQ4NC/32/.. variants also have a Wallbus port:



All IQ4NC variants provide support for BACnet communications.

MS/TP (RS485) Port

Used to connect to a Trend System on the MS/TP trunk.

On /XNC variants it is labelled 'RS-485' and can be used to connect to a 3rd party system that communicates over RS485.

Note: If the /XNC variant is connecting to a 3rd party system the port cannot be used to interface to the MS/TP trunk.

On INT variants the RS485 connector can be used to communicate with serial MODBUS devices and in conjunction with a RS485 to M-bus converter to M-bus devices (e.g. meters and VSDs). For ore details on INT variants see the appropriate IQ422 or IQ4E Data Sheet.

Note: The connection can only be used for one type of connection.

Network Modes

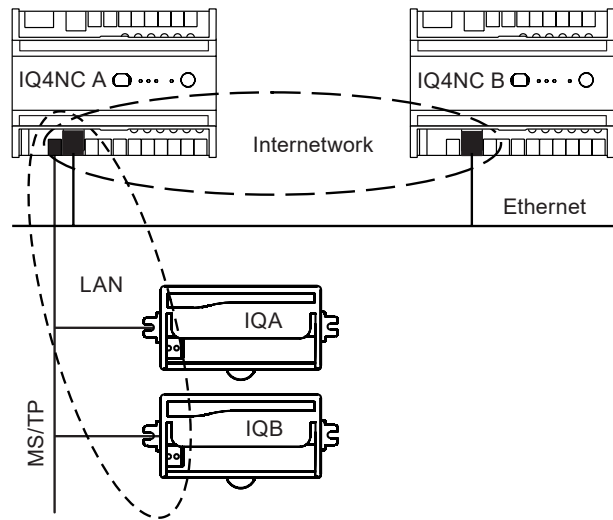
The IQ4NC can be configured to operate in one of four modes:

- Ethernet to MS/TP (default)
- Trend Internetwork to MS/TP
- Ethernet Trend LAN
- Ethernet Trend Internetwork

It also supports a manual configuration mode where the above standard modes are not suitable.

Ethernet to MS/TP

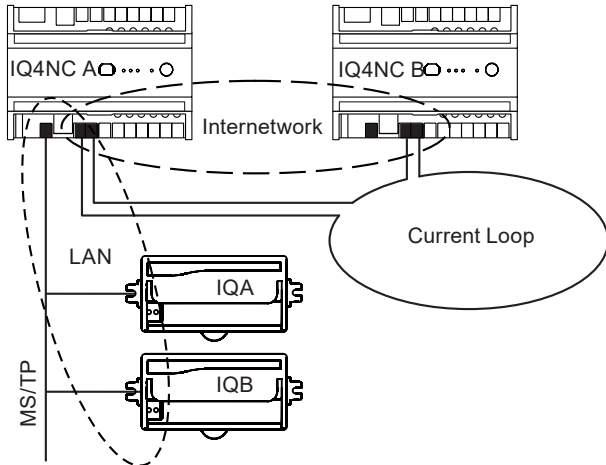
When in this mode the IQ4NC acts as an interface between an internetwork on Ethernet and a LAN on an MS/TP network. This is the default mode of operation.



In the above example IQ4NC A and IQ4NC B form an internetwork on Ethernet. IQ4NC A forms a LAN on the MS/TP trunk with IQA and IQB and connects it to the internetwork. The LAN incorporates the IQ4NC A internal LAN.

Trend Internetwork to MS/TP

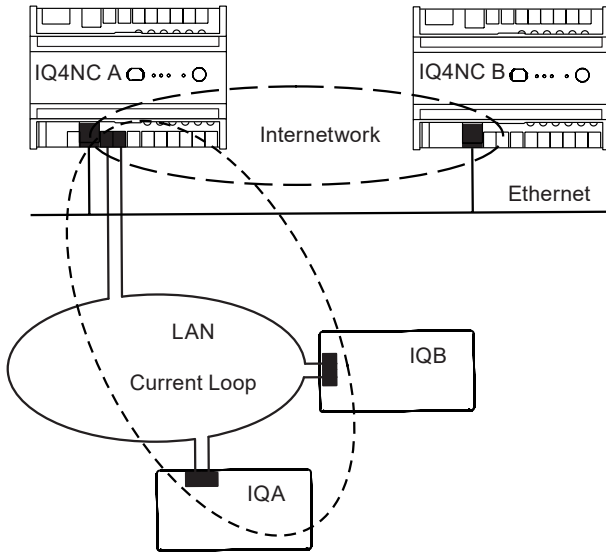
In this mode the IQ4NC acts as an interface between an internetwork on a Trend current loop network and a LAN on the MS/TP trunk.



In the above example IQ4NC A and IQ4NC B form an internetwork on the Trend current loop. IQ4NC A forms a LAN on the MS/TP trunk with IQA and IQB and connects it to the internetwork. The LAN incorporates the IQ4NC A internal LAN.

Ethernet to Trend LAN

In this mode the IQ4NC acts as an interface between an internetwork on Ethernet and a LAN on the Trend current loop.

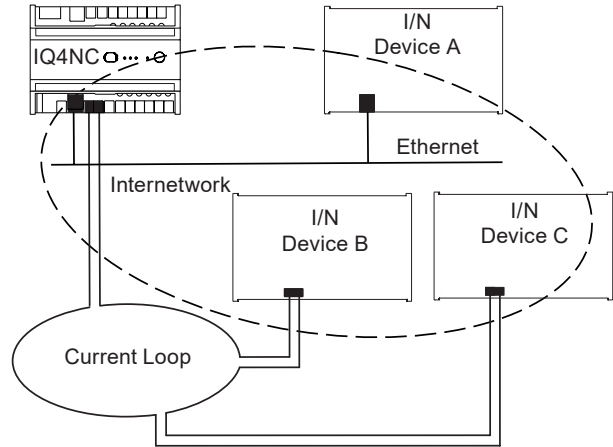


In the above example IQ4NC A and IQ4NC B have built an internetwork on Ethernet. IQ4NC A forms a LAN on the Trend current loop with IQA and IQB and connects it to the internetwork. The LAN incorporates the IQ4NC A internal LAN.

Note: That when operating in this mode it is not possible to have another internetworking device (e.g. XTEND) on the Trend current loop.

Ethernet to Trend Internetwork

In this mode the IQ4NC acts as an interface between an internetwork on Ethernet, and an internetwork on the Trend current loop network.



In the above example the IQ4NC and internetwork type (I/N) device A form an internetwork on Ethernet. The I/N devices B and C form an internetwork on the Trend current loop. The IQ4NC joins all the devices together to form a single internetwork.

Manual Communication Mode

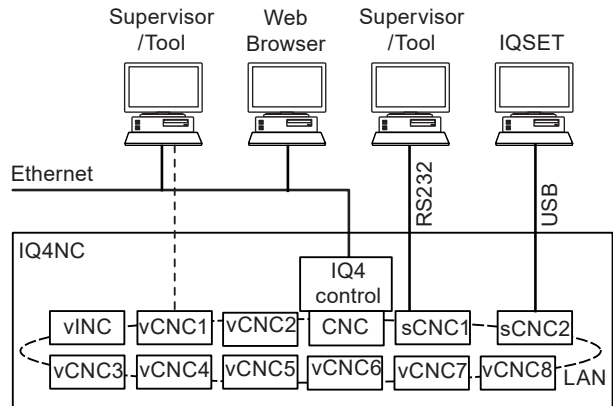
In addition to the four standard modes described above, the IQ4NC can be manually configured to allow other communication modes. For example, Ethernet to Trend current loop Internetwork with an MS/TP LAN.

Caution should be taken when using this mode as, although the interface will prevent invalid combinations being configured, it is easy to make an error and incorrectly configure the IQ4NC.

Networking

In order to connect to the Trend network the IQ4NC will create its own internal LAN which includes the following nodes:

- a CNC for its own controller,
 - a supervisor CNC (sCNC1) for its RS232 port,
 - a supervisor CNC (sCNC2) for its USB port,
 - Eight virtual CNCs (vCNC1, vCNC2, vCNC3, vCNC4, vCNC5, vCNC6, vCNC7 & vCNC8).
- Note: By default vCNCs 1, 2, 3, and 4 are enabled. vCNCs 5, 6, 7, 8 are disabled and can be enabled if required.*
- a virtual INC (vINC).



vINC Functionality: The IQ4NC has a permanent virtual INC (internetwork node controller) unlike the basic IQ4 which only has a vINC if its CNC is the lowest address on its LAN. The vINC always has a LAN to connect to the internetwork so the IQ4NC cannot join another Trend LAN on Ethernet. The vINC has the standard INC address of 126 on its local LAN.

Trend LAN Network Alarms

The IQ4NC will forward its local LAN network alarms to the specified alarm group set up in the appropriate network strategy module. In the special case of Ethernet to Trend Internetwork mode the local virtual LAN cannot produce reportable alarms.

INC Alarm Forwarding

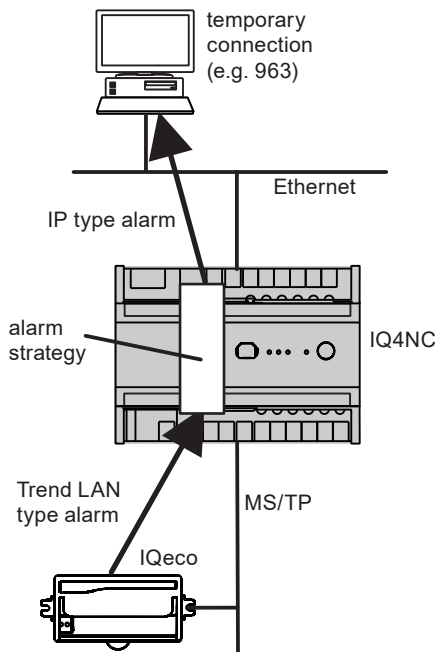
INC Alarm Forwarding enables the IQ4NC to forward IQ controller alarms either to the IP address of a remote Trend supervisor making temporary connection to the site (TCP/IP dial up) or to an email address.

INC alarm forwarding is a feature of a permanent vINC which is present in IQ4NC. It satisfies a similar requirement to that provided by the XTEND when the vCNC is set up in alarm mode.

This feature can be used by any Trend IQ controller but is particularly useful for controllers which do not have direct Ethernet access or do not have IP Address or Email alarm destination types, such as IQ1, IQ2, IQL, IQeco, IQ3/LAN, IQ4/LAN.

The IQ controller will send the alarms to be forwarded to the IQ4NC which will receive the alarms using the receiving network module (i.e. BACnet MSTP, IQ LAN, or Ethernet IP). The IQ4NC controller must have the alarm group parameter set up in this network module. The network module will then place the alarm in the specified alarm group for processing to the required IP or email address in the normal manner by the Alarm Group, Route, and Destination modules.

Care should be taken in the configuration of the alarm format in the sending IQ controller as only certain formats are supported for different destinations; full details of the forwarded alarm type and format are given in the IQ4 Configuration Manual (TE201263).



The diagram above shows an IQeco sending an alarm to the IQ4NC on its local LAN which is forwarding it to a 963.

Using a Remote IQ4NC: The ability to send the alarms to a remote IQ4NC enables remote IQ controllers to make use of the IQ4NC's alarm strategy to forward alarms (or it could be in order to send alarms to a different destination than that set up on its local IQ4NC).

Alarm from Current Loop LAN being forwarded: Alarms from a current loop LAN will be initiated by IQ1, IQ2, IQ3/LAN or IQ4/LAN; they will be of Trend Alarm type and so need to be forwarded as Email, or IP (if to be received by a device making a temporary Ethernet connection).

EINC replacement by IQ4NC: A specific example of alarms from a current loop LAN being forwarded by an IQ4NC is where an EINC is being replaced by an IQ4NC. The EINC can have a vCNC set to alarm mode for alarm forwarding; the IQ4NC controller address should be set to the address of this vCNC so that the alarms will be received for forwarding by the IQ4NC without having to change destination addresses in the initiating IQs.

Network Alarms and Alarms for forwarding: A network module alarm group is also used to handle network type alarms from that particular network, so both alarms for forwarding and appropriate network alarms will be forwarded through the IQ4NC's alarm strategy.

Alarm forwarding to a vCNC: Alarm forwarding as Trend LAN type alarm is not supported. If this is required the alarms can be targeted directly to that vCNC rather than using alarm forwarding.

Target Address for Alarms to be forwarded: Two alarm address options are available for sending alarms to an IQ4NC:

- For all IQ1, 2, 3, and 4 (pre v3.2) controllers this will be the IQ4NC's controller address on its own LAN number. This option provides benefits to existing sites e.g. replacing an EINC with an IQ4NC.
- For all future projects using IQeco, IQ2, IQ3, IQ4 (v3.2 or greater) controllers, this will be the IQ4NC's controller address or address 126 both on its own LAN number. This enables 126 to be used as standard without knowing the IQ4NC's specific address.

Note: There are various ways of addressing the LAN number of a local IQ4NC depending on the controller type, and also that although address 126 can be set up in IQ®SET, it is not always configurable using web pages, configuration mode, or text comms. These concerns are covered by the recommended address settings given in the table below.

IQ	IQ4NC on Local LAN		IQ4NC on Remote LAN	
	Outstation	LAN	Outstation	LAN
IQeco (Pre v2.2)	126	IQ4NC's LAN Number	126	IQ4NC's LAN Number
IQeco (v2.2 or greater)	126	0 or IQ4NC's LAN Number		
IQ4 - (v3.2 or greater)	126	0		
IQ1/2/3, IQ4 (pre v3.2)	IQ4NC's Controller address	0	IQ4NC's Controller address	

For example, an IQ2 sending its alarm to an IQ4NC on its local LAN will send it to the IQ4NC controller address on LAN 0.

HARDWARE

IQ4NC/00/230, IQ4NC/12/230's use the same hardware as the IQ422 - see IQ422 Data Sheet (TA201260). The IQ4NC/16/... and IQ4NC/32/... use the same hardware as the IQ4E - see IQ4E Data Sheet (TA210340). However the MS/TP (RS485) port, MS/TP (RS485) indicators, MS/TP (RS485) terminator switch and bias switch are operational.

MS/TP (RS485) Indicators

Indicator	Colour	Function
TX	Yellow	Status of MS/TP data transmission
RX	Yellow	Status of MS/TP data reception

MS/TP (RS485) Terminator Switch

Used to switch the integral 120 ohm terminating resistor in or out of circuit.

RS485 Bias Switch (the IQ4NC/16/..., IQ4NC/32/... only)

IQ4NC/16/... and IQ4NC/32/... have a bias switch which determines whether bias is applied.

Note: For IQ4NC/00/..., IQ4NC/12/... bias is permanently applied and cannot be disabled. There shouldn't be any more than two devices on the bus that add bias.

MS/TP Trunk

The IQ4NC in Ethernet to MS/TP or Trend Internetwork to MS/TP modes behaves as a master on the MS/TP trunk. MS/TP (master-slave token passing) is based on the two wire RS485 network. It can operate at speeds from 9.6 to 76.8 kbps. 76k8 baud is recommended for best performance. The baud rate is set in the IQ4NC's BACnet MSTP network module and the IQecos automatically set their baud rates to match. The baud rates of all devices on the trunk must be the same.

The MS/TP trunk should be wired as a straight bus (not loop or star). Use tinned copper, screened, twisted-pair cable with characteristic impedance between 100 and 130 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot). Distributed capacitance between conductors and screen shall be less than 200 pF per meter (60 pF per foot). Foil or braided screens are acceptable. The maximum recommended length of an MS/TP segment is 1200 meters (4000 feet) with AWG 18 (0.82 mm² cross sectional area) cable.

The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485. Details of recommended cable are given in the Trend TP Cable Data Sheet (TA200541).

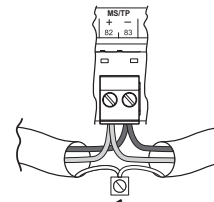
All MS/TP devices must have their power supply neutral or ground terminal connected to earth, in conjunction with normal safety wiring.

The IQ4NC provides network biasing (470 ohms); a maximum of two devices on the network can provide network biasing.

Matched terminating resistors ($\pm 1\%$, ¼ Watt, range 100 to 130 ohms) are required as shown above.

Up to 3 repeaters may be used. Each MS/TP segment must have a single point screen ground. Do not ground the MS/TP screen using a controller terminal. Do not ground both ends of the screen.

Screen should be continuous; at connecting points, tie the screen through an additional terminal (not supplied).



Additional terminal (not supplied)

Failure to comply with these practices will result in significant impairment of the communication performance.

For detailed information about wiring the MS/TP trunk see the IQ422, IQ4NC/00/..., IQ4NC/12/... Installation Instructions - Mounting (TG201264) or the IQ4E/..., IQ4NC/16/..., IQ4NC/32/... Installation Instructions - Mounting (TG201338).

There may be the IQ4NC with up to 64 IQecos or other manufacturer's devices on the MS/TP trunk.

A separate limitation is that the MS/TP segment supports up to 32 'unit' loads. The IQ4NC presents a ¼ BACnet 'unit' load (ref. EIA-485), as does the IQeco; other manufacturer's devices may have different unit loads.

FIRMWARE / STRATEGY

The descriptions of the firmware and strategy for the IQ4NC are covered in the IQ422 Data Sheet (TA201260) or IQ4E Data Sheet (TA210340), other than it having a BACnet MSTP Network module.

Modules

The number and type of modules available in the firmware of an IQ4NC is the same as is in a standard IQ4 - see the IQ422 Controller Data Sheet (TA201260), or IQ4E/.. Controller Data Sheet (TA210340).

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,
- A maximum for each type of module, and
- The IQ4's memory capacity (measured in briQs).

The total available memory capacity varies with the IQ4 variant:

IQ4NC Variant	Maximum briQs available.
IQ4NC/00/..	16,000
IQ4NC/00/INT	30,000
IQ4NC/12	16,000
IQ4NC/12/INT	30,000
IQ4NC/16/XNC	30,000
IQ4NC/32/XNC	30,000

The maximum number of sequence steps varies with the IQ4NC variant:

IQ4NC Variant	Maximum Sequence Steps.
IQ4NC/00/..	600
IQ4NC/12	600
IQ4NC/16/XNC	600
IQ4NC/32/XNC	640

COMPATIBILITY

See the IQ422 Data Sheet (TA201260) or IQ4E Data Sheet (TA210340), for general compatibility. Any differences are shown below.

Utility software: IQ SET v7.06 or greater is required to configure IQ4NC specific parameters.

FIELD MAINTENANCE

The IQ4NC controller 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 IQ4NC controllers.

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.

INSTALLATION

The IQ4NC installation follows the same process as that described in the IQ422 Data Sheet or IQ4E Data Sheet except for the additional steps required for the MS/TP interface and for configuring the communication mode.

A full description of installing the unit is given in the IQ422, IQ4NC/00/..., IQ4NC/12/... Installation Instructions - Mounting (TG201264), IQ422, IQ4NC/00/..., IQ4NC/12/... Installation Instructions - Configuring (TG201265), IQ4E/..., IQ4NC/16/...,IQ4NC/32/... Installation Instructions – Mounting (TG201338), IQ4E/..., IQ4NC/16/...,IQ4NC/32/... Installation Instructions - Configuring (TG201339).

ORDER CODES

IQ4NC/00/230	IQ4NC with 0 I/O channels and 230 Vac supply
IQ4NC/00/24VAC	IQ4NC with 0 I/O channels and 24 Vac supply
IQ4NC/00/INT/230	IQ4NC with without inputs or outputs with IQ interfacing and 230 Vac supply
IQ4NC/00/INT/24VAC	IQ4NC with without inputs or outputs with IQ interfacing and 24 Vac supply
IQ4NC/12/230	IQ4NC with 12 I/O channels and 230 Vac supply
IQ4NC/12/24VAC	IQ4NC with 12 I/O channels and 24 Vac supply
IQ4NC/12/INT/230	IQ4NC with 12 I/O channels, IQ interfacing and 230 Vac supply
IQ4NC/12/INT/24VAC	IQ4NC with 12 I/O channels, IQ interfacing and 24 Vac supply
IQ4NC/16/XNC/230	IQ4NC with 16 I/O channels, XNC functionality and 230 Vac supply.
IQ4NC/16/XNC/24VAC	IQ4NC with 16 I/O channels, XNC functionality and 24 Vac supply
IQ4NC/32/XNC/230	IQ4NC with 16 I/O channels, (expandable to 32), XNC functionality and 230 Vac supply.
IQ4NC/32/XNC/24VAC	IQ4NC with 16 I/O channels, (expandable to 32), XNC functionality and 24 Vac supply

SPECIFICATIONS

See the IQ422 Data Sheet (TA201260) or IQ4E Data Sheet (TA210340), for general compatibility. Differences are described below.

ELECTRICAL

Input power supply voltage	
IQ4NC/00/230	:230 Vac ±10% 50/60 Hz, 20 VA max.
IQ4NC/00/INT/230	:230 Vac ±10% 50/60 Hz, 20 VA max.
IQ4NC/00/24VAC	:24 Vac ±10% 50/60 Hz, 20 VA max.
IQ4NC/00/INT/24VAC	:24 Vac ±10% 50/60 Hz, 20 VA max.
IQ4NC/12/230	:230 Vac ±10% 50/60 Hz, 44 VA max.
IQ4NC/12/INT/230	:230 Vac ±10% 50/60 Hz, 44 VA max.
IQ4NC/12/24VAC	:24Vac ±10% 50/60 Hz, 28 VA max.
IQ4NC/12/INT/24VAC	:24Vac ±10% 50/60 Hz, 28 VA max.
IQ4NC/16/XNC/230	:230 Vac ±10% 50/60 Hz, 70 VA max.
IQ4NC/32/XNC/230	:230 Vac ±10% 50/60 Hz, 70 VA max.
IQ4NC/16/XNC/24VAC	:24 Vac ±10% 50/60 Hz, 44 VA max. or 48 Vdc ±15% 0.67A, 32 W
IQ4NC/32/XNC/24VAC	:24 Vac ±10% 50/60 Hz, 44 VA max. or 48 Vdc ±15% 0.67A, 32 W
MS/TP Bus	
Distance	:Dependent on cable type and wire gauge as specified in EIA-485.
Load	:¼ BACnet 'unit' load
Signalling	:RS-485 signalling transceiver standard
Baud rate	:9k6 to 76k8 baud.
Termination	:100 to 130 ohms matched each end
Terminator	:Integral terminator 120 ohms. Can be switched on or out.
Connectors	
RS485	:2 wide 2 part screw terminals for 0.5 to 2.5 mm ² cross section area (14 to 20 AWG) cables.
LEDs	
TX	:Yellow LED
RX	:Yellow LED

ENVIRONMENTAL

Safety	
CB certificates	
IQ4NC/00/230	:NO80026/M1
IQ4NC/00/INT/230	:TBD
IQ4NC/00/24VAC	:NO80025/M1
IQ4NC/00/INT/24VAC	:TBD
IQ4NC/12/230	:NO80026/M1
IQ4NC/12/INT/230	:TBD
IQ4NC/12/24VAC	:NO80025/M1
IQ4NC/12/INT/24VAC	:TBD
IQ4NC/16/./230	:TBD
IQ4NC/32/./230	:TBD
IQ4NC/./XNC/24VAC	:TBD

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Trend Control Systems Limited

St. Mark's Court, North Street, Horsham, West Sussex, RH12 1BW, UK. Tel: +44 (0)1403 211888, www.trendcontrols.com