ETHERNET INTERNETWORK NODE CONTROLLER

Description

The EINC, Ethernet Internetwork Node Controller, provides the means by which the Building Management System network can incorporate an Ethernet network. The EINC operates at the internetwork level, including the necessary support for WAN’s (e.g. TMN support). It also provides virtual CNCs which allow supervisory or tool software running in PCs connected to the Ethernet network to connect to the BMS system.

It is provided with a 10 BASE-T interface, and an AUI connector which allows an alternative network transceiver to be used.

Features

- Facilitates use of Ethernet network in BMS system
- 10 BASE-T interface and AUI connector for alternative transceivers.
- Four virtual CNCs for PC connection via Ethernet.
- EINCs can span routers
- Ethernet provides faster signalling rate.
- Integration of BMS network into existing Ethernet system.
- Automatic reporting of network population
- Network alarms available in 10 languages
- EEPROM retains configured data during power fail (no battery required).

Physical

- mains ac supply connector
- 24 Vac supply connector
- Ethernet (10BASE-T) connector
- Ethernet transceiver (AUI) connector
- power/watchdog LEDs
- earth busbar
- current loop network connector
- current loop network LEDs
- Ethernet LEDs
- address/baud switch

Dimensions:
- 230 mm (9.06”)
- 70 mm (2.76”)
- 181 mm (7.13”)
- 123 mm (4.84”)

Other components:
- RDS/RS232
- MODEM
- 24V
- /G4C /G41 /G43 /G20 /G41 /G64 /G64 /G72
- /G4F /G2F /G53
- /G4D /G41 /G43 /G20 /G41 /G64 /G64 /G72
- 00.10.70.00.UD.BB
- S/No: Q3B____X73010003
- Location
- Ethernet LEDs address/baud switch
- current loop network
- connector

Note: The image includes a diagram with labels for the physical components and dimensions of the EINC.
FUNCTIONALITY

SYSTEM

The EINC acts as an interface between the BMS current loop network and the Ethernet network. This enables it to be used in a number of applications (a more detailed description of its uses is given in the Ethernet Products Engineering Guide, TE200369):

Virtual CNCs

The EINC firmware incorporates four virtual CNCs each of which can act in either supervisor or alarm mode.

Supervisor Mode

This enables the Ethernet to be used as a connection between a PC running supervisory or tool software and the virtual CNC (rather than normal RS232, device to CNC, interface). The supervisor connects to the CNC by using the EINC’s IP address and the port address as set up in the virtual CNC module. The 945 and 962 make a permanent connection to the virtual CNC which enables both communications from supervisor to EINC and from EINC (such as alarms) to the supervisor. The 962 v3 (or greater) or 963, have TCP dial up, which enables them to make temporary connections to EINCs, treating each connection as a separate site. It can optionally also make a permanent connection as previously described. However, a temporary connection will not allow the virtual CNC to send alarms back to the supervisor, instead a virtual CNC in alarm mode must be used.

Alarm mode

This enables alarms generated from IQs or other devices to transmit alarms to a PC running 962 v3 or greater, or 963, connected to the Ethernet where the connection to the EINC is of a temporary nature using TCP dial up. The 962/963 has an alarm receiver module which will receive alarms from IP addresses and retrieve their site identities, Lan numbers, and device addresses for the 962/963 to process. The virtual CNC is switched from a supervisor mode to alarm mode by setting up an alarm IP address in the virtual CNC module. An IQ can send its alarms to the virtual CNC using normal Lan/device addressing, and the virtual CNC will forward the alarms to the PC using the port address, Cn(P), and the alarm Ip address, Cn(I), as set in the virtual CNC module. The 962/963 alarm receiver must have the port address set up to receive IP alarms.

The virtual CNCs appear to be located on the EINC’s local Lan, and will respond to Lan mapping in this way.

In order for a virtual CNC to operate, its cnc Address must be set up using IP tool or in configuration mode; until this is done the virtual CNC function is switched off.

Initially the EINC should be configured using SET/IP tool. (However, it can be configured from a current loop Lan in configuration mode using Lan/device addressing, either using Lan 0/device address 126 , or own Lan number address switch setting/device address 126 if over the internetwork.) Once a virtual CNC is enabled by setting its cnc Address, further configuration can be done from an Ethernet connected PC using IP addressing via the virtual CNC if required. Note that if used by the 945, the EINC’s IP address, and its appropriate virtual CNC port address must be set up in C:\WINDOWS\ETHCONF.INI (e.g. using ‘945 TCP’ editor).

Ethernet Internetwork

The EINC may also be used to provide an Ethernet internetwork. When used in this way it has similar functionality to an INC i.e. the EINC enables a BMS network system to be expanded by connecting Lans together via an internetwork. However, instead of connecting to a current loop internetwork, it connects to an Ethernet internetwork. It can construct an internetwork with other EINCs or IQ3xcites; a minimum of two such devices are required to construct the internetwork on Ethernet. The EINC identifies this mode of operation (Ethernet INC mode) by an address switch setting <100.

Note that an INC2, or LINC cannot be on the same local Lan as an EINC.
Internetwork Ethernet extension

The EINC may also be used to extend a current loop internetwork into an Ethernet internetwork. In this mode it acts as a router between the current loop internetwork and the Ethernet network (e.g. EINC A in diagram below). A minimum of two EINCs or an EINC and an IQ3xcite are required to construct such an internetwork. The EINC takes a Lan address on the internetwork which is used to identify the EINC for configuration purposes and as a Lan for its virtual CNCs (see below). The EINC identifies this mode of operation (internetwork extension mode) by an address switch =>100.

Stand Alone Mode

An EINC can be set to ‘Stand Alone’ by the IP tool. It will not attempt to build networks with other EINCs or IQ3xcites, but will still communicate as a single EINC as above (with supervisors via virtual CNCs and with its local Lan). An EINC should be set to stand alone mode to reduce Ethernet network traffic (i.e. to disable polling messages trying to ‘find’ other Novar Trend Ethernet devices).

EINC with IQ3xcite

The IQ3xcite is an IQ controller that uses Ethernet and TCP/IP networking technologies. The IQ3xcite contains its own virtual Lan which can include a node for its own controller, a CNC for its local supervisor port, a virtual CNC and a virtual INC (at address 126).

If multiple IQ3xcites with the same Lan number are connected to Ethernet then they form a virtual Lan on Ethernet, and the IQ3xcite with the lowest IP address will assume the INC functionality (the other virtual INCs disappear).

If multiple IQ3xcites have different Lan numbers connected to Ethernet then their INCs will form an internetwork (along with any EINCs on the internetwork).

Note that an IQ3xcite’s Lan number must not be the same as any EINC’s Lan number; IQ3xcites can only build Lans with other IQ3xcites, not with EINCs.

In the above example, the two IQ3xcites form virtual Lan 4 which includes all their internal nodes. IQ3xcite IP 171.192.6.152 assumes the proxy INC role, and forms an internetwork with the INC in the EINC. The EINC’s Lan 5 includes its internal nodes and the external current loop Lan.

The IQ3xcite’s internal nodes are:

Proxy INC: The internetwork INC function assumed by lowest addressed IQ3xcite on its Lan. It addresses 126.

Virtual CNC: Similar to the EINC’s virtual CNC’s, but with only one instance. It does not have the EINC alarm mode capability so is always in supervisor mode. It does not exist until its node address is set up (using SET/IP tool).

Controller node: The actual node of the controller. It’s address is set by SET, SET/IP tool.

Local supervisor CNC: Local supervisor port node, similar to IQ2 functionality. If set to adddress zero it does not exist on the Lan and local supervisor talks only to local IQ3. If set non-zero (by SET) local supervisor talks over network.

Alarm Reporting

Since the IQ3xcite’s virtual CNC cannot be set to alarm mode, the reporting of IQ3xcite alarms to a supervisor connected by temporary dial up has to be done using an EINC. One of the EINC’s virtual CNCs must be set to alarm mode and reserved for this purpose.

Current Loop Lan

Since the IQ3xcite cannot connect to a current loop Lan containing IQ1 or IQ2 series controllers, an EINC must be used to connect together a system of IQ3xcite and earlier IQ controllers. The EINC connects either to a current loop Lan or internetwork as described earlier. This also enables IQL LonWorks controllers to be used via the EINC/LINC connection.
SYSTEM (continued)

IQ3xcite and TMN
The IQ3xcite does not have an integral autodialling facility, but autodialling can be achieved by using a TMN connected to an EINC's current loop network.

The EINC should operate in internetwork extension mode (i.e. device address => 100) which provides a current loop internetwork with an extension on Ethernet. However, this will only give normal text communications, it cannot provide IQ3xcite’s web pages.

Setting up EINCs to span Routers

If the EINCs are not set up to span the router as described below, only one internetwork is allowed on a site, but the Supervisor can treat the internetworks as separate sites, and change the IP address of the EINC virtual CNC it is using as it switches sites.

Note that there cannot be any IC comms between the sites. If alarms are required to be sent to the supervisor (962 v3 or greater, or 963), a virtual CNC in alarm mode must be used as described above. If the EINC’s network alarms are to be sent to this supervisor, the alarm addresses and Lan numbers (i.e. configuration parameters R(A, R, E, T)) must be set up to be sent to the address of the virtual CNC in alarm mode.

Setting up EINCs to span Routers
This is done by setting up a router IP address in the PC (e.g. Control Panel-Network-TCP/IP-Properties-Gateway). In addition the default router IP address must be set up within the EINC in configuration mode, so that TCP/IP messages from the EINC are transferred through the router (to the PC).

Using a Supervisor with Multiple Sites

Only one internetwork is allowed on a site, but the Supervisor can treat the internetworks as separate sites, and change the IP address of the EINC virtual CNC it is using as it switches sites. Note that there cannot be any IC comms between the sites.

Connecting a PC to an EINC via a Router
An Ethernet connected PC running supervisor or tool software (e.g. 963) may use an EINC virtual CNC via a router.

Routers
On EINCs pre version 4.1, although EINCs enabled Ethernet to be used as an internetwork, the internetwork could not span a router. On version 4.1 or greater EINCs can construct an internetwork across a router.

However, using all versions of EINC, it is possible for PCs to connect to EINCs via routers, and to treat EINCs separated by routers as separate sites.

IQ3xcites also have the ability to span routers and EINCs or IQ3xcites are interchangeable in the description below, with the following exceptions in IQ3xcite: no configuration mode, no broadcast/directed option, no updatelist feature.

This requires the PC running SET, with the facility to make parameter changes via Ethernet using a browser and the IQ3xcite’s own server (webpages).

IQ3xcite has to have its IP address, subnet mask, UDP port, set up using SET/IP tool prior to it being accessible via its IP address. IP tool is recommended to be used to set up both IQ3xcites and EINCs. The device is initially identified by its unique MAC address (printed on the front panel label).

This requires the PC running SET and the IP tool to be connected to Ethernet. The IP tool can automatically fetch the details of all the Novar Trend IP devices (EINCs and IQ3xcites) on its own segment of Ethernet; it can also fetch details from devices the other side of a router by reading the ‘remote Trend devices’ information (see below) from an IQ3xcite or EINC if the user enters the remote device’s IP address (alternatively the user can enter the details by hand).

The IP tool also enables the current loop Lan and outstation address, the default router, the Virtual CNCs, and the remote Trend devices (see below) to be configured, and for the device to be set stand alone if required.

The IP, Lan, and outstation addresses should be written on the label; a tear off adhesive label strip with the unit’s IP, Lan, and outstation addresses can be used for a paper record e.g. log book.

Addressing
As explained above an EINC can be configured from a current loop Lan using its configuration mode. However, IQ3xcite does not have traditional configuration mode; it is intended to be configured using SET, with the facility to make parameter changes via Ethernet using a browser and the IQ3xcite’s own server (webpages).

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The IP tool also enables the current loop Lan and outstation address, the default router, the Virtual CNCs, and the remote Trend devices (see below) to be configured, and for the device to be set stand alone if required.

The IP, Lan, and outstation addresses should be written on the label; a tear off adhesive label strip with the unit’s IP, Lan, and outstation addresses can be used for a paper record e.g. log book.
Multiple routers: The default router can be any router on the same subnet as the device using it. It will pass the message to a router on the remote EINC’s subnet.

If the EINC one side of the router is set up with the details of an EINC the other side, they will construct an internetwork across the router. The EINC with the lowest IP address (master) is responsible for creating the internetwork across the router. In the diagram above, EINCA has the lowest IP address and should be set up with the information for an EINC the other side, e.g. EINCB. The two internetworks will combine.

If EINCC were to be switched off, the message initiated by EINCA would still reach the remaining EINC on the far subnet (EINCD) if it were to be sent as a broadcast message. Broadcast messages are sent to all devices on the subnet (i.e. EINCC and EINCD). All EINCs on the same channel (i.e. between routers) must be on the same subnet. By default the EINC will operate in broadcast mode, but most users disable their routers from sending broadcast messages for security reasons, and only directed messages are permitted.

Without broadcasting, if EINCC were to be switched off, the internetwork across the router will be broken from both directions. To prevent this happening EINCA should have details of both EINC and EINCD. In the above system it would be recommended that both EINCA and EINCB have details of EINCC and EINCD and vice versa, this gives a reasonable level of redundancy in case of failure.

In a more general system each EINC on one side of a router should have details of as many EINCs as possible on each subnet the other side of the router. With reasonable risk two devices from each subnet could be used. It is recommended that the two lowest IP addresses one side of a router have details of the two lowest IP addresses on each subnet of the system the other side of the router.

**UPDATE LIST**

The setting up of several EINCs across routers is facilitated by the `uPdatelist` configuration module (EINC only, not IQ3xcites). This enables one EINC’s `remoteEincs` list to be set up, and then for it to be copied across to all the other EINCs on the system including those on the local subnet, and those across routers. It uses the remoteEincs list to discover the remote subnets, so details of at least one EINC from every subnet must be set up on the list. When update list is initiated the list is sent to each known EINC, and then each one of them will pass it on to every other EINC on its subnet. A remote EINC will then have the same list set up and will use it to create the internetwork from its perspective, so the list must also contain the details of the original EINC.

If using the `uPdatelist` facility described above, EINCA should have its own details plus those of EINCB, C, and D set up in its list so that it can be copied across to the other EINCs.

As a general rule, before using `uPdatelist`, if ‘send remote broadcasts’ is ‘yes’ details of only one EINC from each subnet and of this EINC should be set up in the `remoteEincs` list (remote Trend devices); if ‘send remote broadcasts’ is ‘no’ (or broadcasting is disabled for security reasons) details of as many EINCs as possible from each subnet and from this EINC’s subnet should be set up in the `remoteEincs` list (remote Trend devices). Note that `uPdatelist` facility also transmits the broadcast/directed flag status to the other EINCs.

**Internet Access**

Because the Internet uses TCP/IP addressing, the 962v3 or 963 communication with the EINC can operate over the Internet. Company Internet access is normally protected by a firewall which is usually the responsibility of the company’s IT department. The firewall will need to be set up to allow messages through the port addresses being used for sending and receiving BMS system messages. Additionally the firewall may be set up either to pass messages through or to redirect them. If redirection is used, then the messages are sent to the firewall IP address and the firewall must be set up with the BMS system IP address so it can pass them on. If using an imperative ISP connection (e.g. via a dial up modem) at either 962/963 or EINC end, the ISP must support reverse dial up.

Note that EINC to EINC networking communications will not operate across a firewall (i.e. virtual networks cannot be built across firewalls).

**IQ3xcite and EINC with routers**

As explained above IQ3xcites also have the capability to span routers and EINCs or IQ3xcites are almost completely interchangeable. However, since IQ3xcites do not have configuration mode, they have to be set up using SET/IP tool. Also IQ3xcites do not have the update list feature, but IP tool has functionality to facilitate the setting up of remote Trend devices by copying the settings from one device to another. On a combined IQ3xcite/EINC site the remote Trend devices should be set up using IP tool rather than using the update list feature.

**SYSTEM**

T(D) = Default Router IP address
En(P) = Remote EINC IP address
EN(S) = Remote EINC Subnet mask
Because the IQ3xcites communicate across the router only using directed messages, details of as many EINCs/IQ3xcites as possible from each subnet across routers should be set up as remote Trend devices.

Again the general rule applies: It is recommended that the two lowest IP addresses one side of a router have details of the two lowest IP addresses on each subnet of the system the other side of the router.

### UDP Port:

The UDP (User Datagram Protocol) port number defines the Ethernet port used by the EINCs to send messages to each other. To construct an internetwork, the EINCs must be on the same subnet (unless set up to span routers), and must use the same UDP port. If the user is restricted to using one subnet, but wishes to have separate sites on that subnet (i.e. more than one internetwork), then he can set different UDP port numbers for the groups of EINCs in the different internetworks.

The above diagram is equivalent to two independent internetworks, but without using a router.

#### EINC Data Sheet

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#### EINC Data Sheet
**HARDWARE** (continued)

**Reset:** Setting both the address and baud rate switches to zero for more than 3 seconds with power applied will reset the configuration parameters to default values.

Defaults are:
- Address module (see list in firmware section)
- User module (clear)
- Router (clear)
- Virtual CNCs (clear)
- Remote EINCs (clear)

**Transceivers:** The EINC has two Ethernet connections, the 10 BASE-T connector and the AUI connector, but only one connector may be used at a time. The unit will automatically detect which connector is in use.

10 BASE-T: The 10 BASE-T network uses twisted pair cable (to IEEE 802.3) and the EINC can run up to 10 Mbps. The maximum distance between the node and the hub is 100 m. The EINC should be connected to the hub using Cat 5e unshielded or shielded (UTP or FTP) cable and RJ45 plugs (shielded or unshielded appropriate to the cable). The following are available from Novar Trend:
- CAT5 UTP LSZH 305M: 305 m Cat 5e UTP (unshielded) cable
- CAT5 FTP LSZH 305M: 305 m Cat 5e FTP (shielded) cable
- RJ45 PLUG FTP/10: Pack of 10 unshielded RJ45 connectors
- RJ45 PLUG FTP/10: Pack of 10 shielded RJ45 connectors

**AUI:** The Attachment Unit Interface (AUI) connector is a 15 way D type. It is a standard connector for connection either directly, or indirectly by a drop cable, to a transceiver module. This enables use of other Ethernet media such as 10 BASE-2 (co-axial thin net) or FOR/RL (fibre-optic cable). The interface can supply 12 Vdc at a maximum of 400 mA to the transceiver module.

**Indicators:** The EINC has nine LED indicators.

**Current Loop Network**
- **TX** (yellow) Indicates current flowing from the EINC current loop network transmitter (normally ON). If OFF indicates open circuit.
- **RX** (yellow) Indicates current flowing into the EINC current loop network receiver (normally ON). If OFF indicates open circuit or short circuit.
- **OK** (green) Indicates that the EINC is able to send and receive messages on the current loop network (normally ON). Flashes when prohibited address switch setting (0, 2, 3, >119). When OFF it indicates a LAN BROKEN condition exists on the network (e.g. baud rate fault).

**Ethernet**
- **TX** (yellow) Packet of data is being transmitted across Ethernet (normally flashes ~6s). If continuously OFF indicates fault.
- **RX** (yellow) Packet of data is being received across Ethernet (normally flashes ~6s). If continuously OFF indicates fault.
- **OK** (green) The EINC has successfully communicated with at least one other EINC on the Ethernet. ON if internetwork on Ethernet has been constructed, OFF if EINC alone (e.g. using virtual CNCs only)
- **REMOTE EINCS** (yellow) Indicates Fault (Link Integrity): (yellow) On when connection to Ethernet system has been constructed (voltage present on network). Normally ON; if OFF indicates faulty Ethernet connection. Only applies to 10BASE-T use; OFF for AUI use.
- **POWER** (green) On when power supply is connected.
- **WATCHDOG** (red) Flashes when EINC has internal fault.

**COMPATIBILITY**

An ANC+, AND, or XN28 on the internetwork must be firmware version 2.5 or later and an MNC on the internetwork must be firmware version 2.54 or later (any TMN is OK). Any IQ25 is on the system must be firmware version 1.2U or later and an IQ241 must be firmware version 1.2M or later.

In order to receive alarms from virtual CNCs to which it is not currently connected, a 962 supervisor must be at version 3 or greater. The 38k4 baud rate is only compatible with other node 2 devices (e.g. INC2).

For compatibility with old software, when configuring on the local Lan, an INC2 can be addressed as device 126 on either Lan 0 or Lan 126. EINC version 4.2 is recommended for use with IQ3xcite as it has improved support for IP tool.

**FIRMWARE**

**Configuration**

The EINC uses a configuration mode similar to that used by IQ controllers (see IQ Configuration Manual); this is a built-in feature enabling configuration via the network (including across the internetwork), using any configuration utility. The EINC can be addressed from its local Lan by device address 126 on Lan 0, and from the internetwork by device address 126 on its Lan number. It can be accessed by an PC connected to the Ethernet by setting up the EINC IP address, and the CNC port (see virtual CNC port address below). The default IP address is 128.1.1.1. <address switch setting>, with a subnet mask of 255.255.255.1. A local PC may be connected via the Ethernet either by using an adjacent hub, or by direct connection using a standard Ethernet cable in conjunction with a crossover adapter (XOITE/XA).

If using the EINC with IQ3xcite the initial configuration is best done using IP tool; this will facilitate the configuration of IP address, subnet mask, UDP port, Lan and outstation address, the default router, the Virtual CNCs, and the remote Trend devices on a system wide basis ensuring that the Ethernet devices work together.

The EINC is initially uniquely identified using its MAC address printed in the front panel label. The IP, Lan, and outstation addresses should be written on the label; a tear off adhesive label strip with the unit’s IP, Lan, and outstation addresses can be used for a paper record e.g. log book.

**Configuration Mode**

The top level configuration mode menu is as follows:

```
User address router virtualCncs remoteEincs updateList
=?
```

Note that if Ethernet is not connected, the following warning is given:

```text
*** WARNING - NO ETHERNET SIGNAL DETECTED ***
```

**User - PIN**

The EINC has a single programmable PIN number which will protect the EINC from unauthorised configuration mode changes. Once a PIN is set up, until the valid PIN is entered, the User module display will show a blank PIN and random generator number.

```
User

PIN
generator 1060
```

If the PIN is forgotten, the user should contact Technical Support quoting the generator number, and the Ethernet MAC address (see below); Technical Support will supply a default PIN.
IP address and subnet mask details.

**addRes**

**Addresses**

- **lan number 119 (address switch set)**
- **iDentifier EINC**
- **trend alarm Addr 1 on Remote lan 1**
- **Ethernet alarm addr 1 on remoTe lan 1**
- **alarm language type 0 English**
- **ethernet mac address 00:10:70:00:00:06**
- **Ip address (auto) 128.1.1.119**
- **Subnet mask 255.255.255.0**
- **Udp port 57612**
- **EINC V4.2 21/3/03**

**iDentifier**: A label up to 15 characters long which is used to identify the Lan.

**trend alarm Addr**: The alarm target device address for the current loop network (i.e. Lan or internetwork) alarms. Address or Lan zero stops alarms being transmitted.

- **on Remote lan**: The alarm target Lan number for the current loop network (i.e. Lan or internetwork) alarms. Address or Lan zero stops alarms being transmitted.

**Ethernet alarm addr**: The alarm target device address for Ethernet (i.e. always internetwork) alarms. Address or Lan zero stop alarms being transmitted.

- **on remoTe lan**: The alarm target Lan number for Ethernet (i.e. always internetwork) alarms. Address or Lan zero stop alarms being transmitted.

**alarm language type**: This enables the alarm language used for the network alarms generated by the EINC to be changed.

- **0=English, 1=Spanish, 2=Finnish, 3=Swedish, 4=Norwegian, 5=Danish, 6=German, 7=Italian, 8=Portuguese, 9=French.**

**ethernet mac address**: Unique number identifies Ethernet chip; also used in default PIN generation process.

**Ip address (auto)**: The IP address used by the EINC automatically defaults to 128.1.1.<address switch setting> (i.e. the last section is set the same as the address switch setting). The user can override the default setting by entering a new IP address to suit the addresses used on his system.

**Subnet mask**: The mask is used to mask the IP address to give the subnet (e.g. with above settings subnet would be 128.1.0.0).

To create an internetwork, all EINCs on the same channel (i.e. not separated by routers) must be on same subnet, and hence must have same mask setting. Defaults to 255.255.255.0.

**Note that the company's IT department should be contacted for IP address and subnet mask details.**

**Udp port**: The UDP (User Datagram Protocol) Port defines the Ethernet port used by EINCs. All EINCs used to create an internetwork must use same port (see UDP port section above). Defaults to 57612.

**rouTer**: Default router: This can be set to the IP address of a router (e.g. of format 171.192.22.25) on the same subnet as the EINC if EINCs are to span routers, or if one of the virtual CNCs is to be used by a PC connected to an Ethernet subnet the other side of a router (see example above in 'Routers' section).

**virtualCncs**: Virtual CNC Ports

- **NUMBER CNC ADDR PORT ADDR ALARM IP ADDR**
- 1 5 10005 Unused
- 2 6 10006 Unused
- 3 7 10007 Unused
- 4 Unused Unused Unused

For each of the 4 virtual CNCs this lists the CNC address on the EINCs Lan, its port address, and alarm IP address.

**send remote Broadcasts**: Yes

This is the remoteEincs list (remote Trend devices in IP tool). For each EINC it shows the IP address and the subnet mask. It enables the address details to be set up for up to 20 EINCs.

**Note that if the default router is not set up, the following warning is given:**

*** WARNING - NO DEFAULT ROUTER ENTRY ***

**send remote Broadcasts**: This can be set by B1 or BY (Y=yes).

It can be set to stop remote broadcast messages being sent (i.e. directed only) by B0 or BN (N=no). It is set to allow remote broadcast messaging by default. Only set to non-broadcast if the routers have remote broadcast messaging disabled (see Broadcast/Directed above).
FIRMWARE (continued)

From the list, 1 selects EINC1, 2 selects EINC2 etc. Alternatively E1 will select EINC1 from the top menu.

REMOTE EINC 1
IP address: 171.171.10.12
Subnet mask: 255.255.255.0

= ? ;

iP address: This is the IP address of the EINC on Ethernet.
Subnet mask: This is the subnet mask for the EINC.

Using the subnet mask 255.255.255.0 on the IP address 171.171.10.2 gives the subnet address 171.171.10.0 which is used as the destination address for the broadcast messages to the EINC subnet. See explanation in 'Routers' section.

uPdatelist

Overwrite remote EINC list in all EINC(s) (Y/N) = ?
If Y is entered, the EINC list (including Broadcast/Directed flag status) will be copied to all the other EINCs on subnets which have at least one of their EINC’s details in the list. The EINCs will then be able to create the internetwork across the routers. The list should contain the EINC’s own details as well as details of at least one EINC from every subnet (and hence virtual Lan) to be linked by the internetwork. If broadcasting is not enabled, details of as many EINCs as possible from each subnet should be entered (see Broadcast/Directed above). Entering Y will cause the copying to start and the screen will show the progress of the updatelist process. Any EINC with a User PIN set up will require that PIN to be entered for its update to proceed.

Note that on a mixed EINC/IQ3xcite system IP tool is recommended to keep the remote Trend devices list updated, so the update list function should not be used

Text Communications

Text communications use the configuration mode letters as defined above e.g. U(P) Pin number, R(D) Identifier. In addition there are: R(C) version number, R(g) default PIN generator, R(s) serial number.

Identification

The EINC replies to ‘w’ comms with Internetwork Node Controller (INC) v4.00 or greater. The virtual CNCs reply with Communications Node Controller (CNC) v4.xx when they are not in use; when in use they will pass the ‘w’ comms request on to the connected device.

Alarms

The EINC also helps to maintain a high level of network integrity by performing continuous checking of network messages. The following text alarms are generated when faults are found:

"Remote LAN From EINC on Lan xxx -
Lan Broken NKBK" - a break in communications in the Lan
Lan OK NKOK" - Lan communications are restored
Lan Changed NKCH" - a node has gone from or been added to the Lan
Caused Re-Map NKCH" - EINC has started mapping its Lan after a Lan broken or Lan changed condition.
All Maps Built NKCH" - Lanmapping finished
Duplicate address NKDA" - The EINC’s address is duplicated on the Lan (i.e. another address 126: another EINC, INC2, or LINC).
Only generated after the Lan has been mapped.

"Internetwork From EINC on Lan xxx -
Internetwork Broken NKBK" - a break in communications in the current loop internetwork
INSTALLATION

The NBOX/EINC must be mounted on a flat surface via 3 off 6 mm (0.24") holes using screws and rawl plugs. For NBOX/EINC/24 only, the unit is rated as 'UL916, accessory to enclosed energy management equipment'. The EINC installation involves the following procedure:

- Fix the unit in position
- Route cables
- Connect current loop network
- Set current loop network address
- Set current loop network baud rate
- Connect power supply
- Connect earth (if not part of supply)
- Connect Ethernet network
- Set Address/Baud rate switch
- Power up unit
- Commission current loop network
- Configure EINC
- Configure remote end of Ethernet
- Test system

This is covered in detail in NBOX/EINC Installation Instructions TG200152. Details for fixing the metal box are included in the ENCLS/MBOX installation instructions TG200203.

CONNECTIONS

**Mains Supply (option)**

- 2 part screw terminals
- 230 Vac

**24 Vac Supply (option)**

- Mat-N-Loc to terminal adaptor (supplied)
- 2 part Mat-N-Loc connector (supplied)
- 24 Vac: 24 Vac

**10BASE-T Ethernet Port**

- RJ45 e.g.
- RJ45 PLUG UTP/10 (UTP)
- RJ45 PLUG FTP/10 (FTP)
- (packs of 10)
- Cat 5e twisted pair e.g.
- CAT5E UTP LSZH 305 M (UTP)
- CAT5E FTP LSZH 305 M (FTP)
- 305 m cable
- Ethernet hub e.g.
- FL HUB 10BASET

A local supervisor (Ethernet) can be connected to an adjacent port on the hub or directly via a standard Ethernet cable and an XCITE/XA adapter

**AUI Ethernet Port**

- 15 Way D socket
- For connection of transceiver or drop cable.

**Current Loop Network**

- 2 wire
- polarity independent
- 4 wire

**Earth Bus**

Connect bus to earth separately
MAINTENANCE

Replacement of the fuse is described in the NBOX/EINC Installation Instructions TG200152 sheet 1.

DISPOSAL

COSHH ASSESSMENT FOR DISPOSAL OF NODE CONTROLLER. No parts affected.

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.

ORDER CODE

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBOX/EINC/230</td>
<td>EINC for 230 VAC supply in NBOX plastic enclosure, including busbar and screws</td>
</tr>
<tr>
<td>NBOX/EINC/24</td>
<td>EINC for 24 Vac supply in NBOX plastic enclosure, including busbar and screws</td>
</tr>
<tr>
<td>ENCLS/MBOX</td>
<td>Metal box with hinged front panel for NBOX device including busbar, screws, and cable glanding knockouts</td>
</tr>
<tr>
<td>FL HUB 10BASET</td>
<td>4 port Ethernet hub.</td>
</tr>
<tr>
<td>FL SWITCH 5TX</td>
<td>5 port Ethernet switch</td>
</tr>
<tr>
<td>FL HUB AGENT</td>
<td>4 port Ethernet managed hub</td>
</tr>
<tr>
<td>CAT5 UTP LSZH 305M</td>
<td>305 m of Cat 5e UTP (unshielded) cable for wiring Ethernet connections.</td>
</tr>
<tr>
<td>CAT5 FTP LSZH 305M</td>
<td>305 m of Cat 5e FTP (shielded) cable for wiring Ethernet connections.</td>
</tr>
<tr>
<td>RJ45 PLUG UTP/10</td>
<td>Pack of 10 unshielded RJ45 connectors for wiring Ethernet connections.</td>
</tr>
<tr>
<td>RJ45 PLUG FTP/10</td>
<td>Pack of 10 shielded RJ45 connectors for wiring Ethernet connections.</td>
</tr>
<tr>
<td>XCITE/XA/5</td>
<td>Pack of 5 Ethernet connector adapters for direct connection of PC to EINC using standard Ethernet cable.</td>
</tr>
</tbody>
</table>
**SPECIFICATION**

### Electrical

**Supply**
- /230: 230 Vac -15%, +10%, 50 or 60 Hz, 18 VA.
- /24: 24 Vac, ±10%, 50 or 60 Hz, 24 VA.

**Fusing**
- /230: 125 mA (T), 250 V, 20 mm mains fuse
- /24: 1.6 A (T), 20 mm mains fuse

**Data Backup**
- No battery needed, configuration data stored in non-volatile memory.

**Current Loop Network**
- 20mA two wire current loop, opto-isolated polarity independent, receiver, balanced transmitter
- Current loop network distance: Between units dependent on cable type (see table).

#### Current Loop Network Distance (Table)

<table>
<thead>
<tr>
<th>Cable</th>
<th>1k2 baud</th>
<th>4k8 baud</th>
<th>9k6 baud</th>
<th>19k2 baud</th>
<th>38k4 baud</th>
<th>No. of Wires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belden 9182</td>
<td>1000 m</td>
<td>1000 m</td>
<td>1000 m</td>
<td>1000 m</td>
<td>700 m</td>
<td>500 m</td>
</tr>
<tr>
<td></td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(765 yds)</td>
<td>(545 yds)</td>
</tr>
<tr>
<td>Belden 9207</td>
<td>1000 m</td>
<td>1000 m</td>
<td>1000 m</td>
<td>1000 m</td>
<td>700 m</td>
<td>500 m</td>
</tr>
<tr>
<td></td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(765 yds)</td>
<td>(545 yds)</td>
</tr>
<tr>
<td>Trend TP1/1/22/HF/500 (Belden 8761)</td>
<td>1000 m</td>
<td>1000 m</td>
<td>1000 m</td>
<td>500 m</td>
<td>250 m</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(545 yds)</td>
<td>(270 yds)</td>
<td></td>
</tr>
<tr>
<td>Trend TP2/2/22/HF/500 (Belden 8723)</td>
<td>1000 m</td>
<td>1000 m</td>
<td>1000 m</td>
<td>500 m</td>
<td>250 m</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(1090 yds)</td>
<td>(545 yds)</td>
<td>(270 yds)</td>
<td></td>
</tr>
</tbody>
</table>

**Current Loop Baud Rate**: Selectable by board switches 1k2, 9k6, 19k2, 38k4 baud - set to be same as other nodes on Lan.

**Lan Number**: Selectable by board switches - Lan number set to be unique on internetwork; 116 nodes addressable (1 to 119, excluded addresses 2, 3, and 10).

**Device Address**: The address of the EINC on the Lan is preset at 126. The four virtual CNC addresses set in configuration mode, to be unique on Lan; 116 nodes addressable (1 to 119, excluded addresses 2, 3, and 10) per Lan.

**Ethernet**
- IEEE 802.3
- Attachment Unit Interface for attachment to alternative Ethernet media (e.g. 10 BASE-2).

**Connectors**
- RJ45 connector, unshielded twisted pair (UTP) cable, 10 Mbps, 100 m.
- :15 way D type connector for attachment of AUI transceiver to convert to other Ethernet media (e.g. fibre optic, co-axial). Either direct connection or via drop cable. The interface supplies 12 Vdc at 400 mA maximum to transceiver.
- Lan/Internetwork: 2 part connector screw terminals 0.5 to 2.5 mm² cross section area (14 to 20 AWG) cables.
- Power: 2 part connector screw terminals 0.5 to 2.5 mm² cross section area (14 to 20 AWG) cables.

### Mechanical

**Dimensions**: 230 mm (9.06") x 181 mm (7.13") x 70 mm (2.76")

**Material**
- Box: ABS
- Terminal Cover: Clear Styrolux

**Protection**: IP30

**Weight**: 1.4 kg (3.08 lbs)

### Environmental

**EMC**
- Emissions: EN50081-1
- Immunity: EN50082

**Electrical Safety**: IEC 730-1

**UL**: (NBOX/EINC/24 only) The unit is rated as 'UL916, accessory to enclosed energy management equipment.'

**Ambient Limits**
- Storage: -10 °C (14 °F) to 50 °C (122 °F)
- Operating: 0 °C (32 °F) to 45 °C (113 °F)
- Humidity: 0 to 95 %RH non-condensing

### Indicators

**Current Loop**
- TX: (yellow) ON if current is flowing from the current loop network transmitter
- RX: (yellow) ON if current is entering the current loop network receiver
- OK: (green) ON if EINC successfully communicating over current loop network.

**Ethernet**
- TX: (yellow) EINC transmitting Ethernet data packets.
- RX: (yellow) EINC receiving Ethernet data packets.
- (Link Integrity): (yellow) On when Ethernet 10 BASE-T connected properly.
- (Power): (green) On when supply is on.
- (Watchdog): (red) Flashes when internal fault detected.

### Version

This document applies to the following version:
- firmware: v4.2
- board: AP103428 issue 1/D

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Trend Control Systems Ltd reserves the right to revise this publication from time to time and make changes to the content hereof without obligation to notify any person of such revisions or changes.

Trend Control Systems Ltd P.O. Box 34 Horsham Sussex RH12 2YF England Tel:+44 (0)1403 211888 Fax:+44 (0)1403 241608 www.trend-controls.com