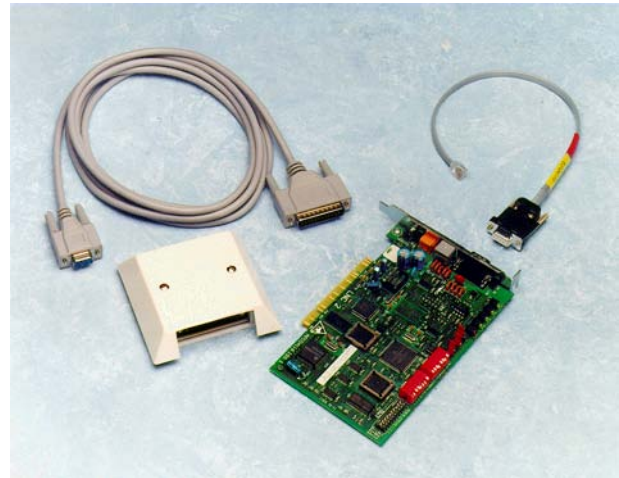


## Lancard Node Controller



LONMARK™  
PARTNER



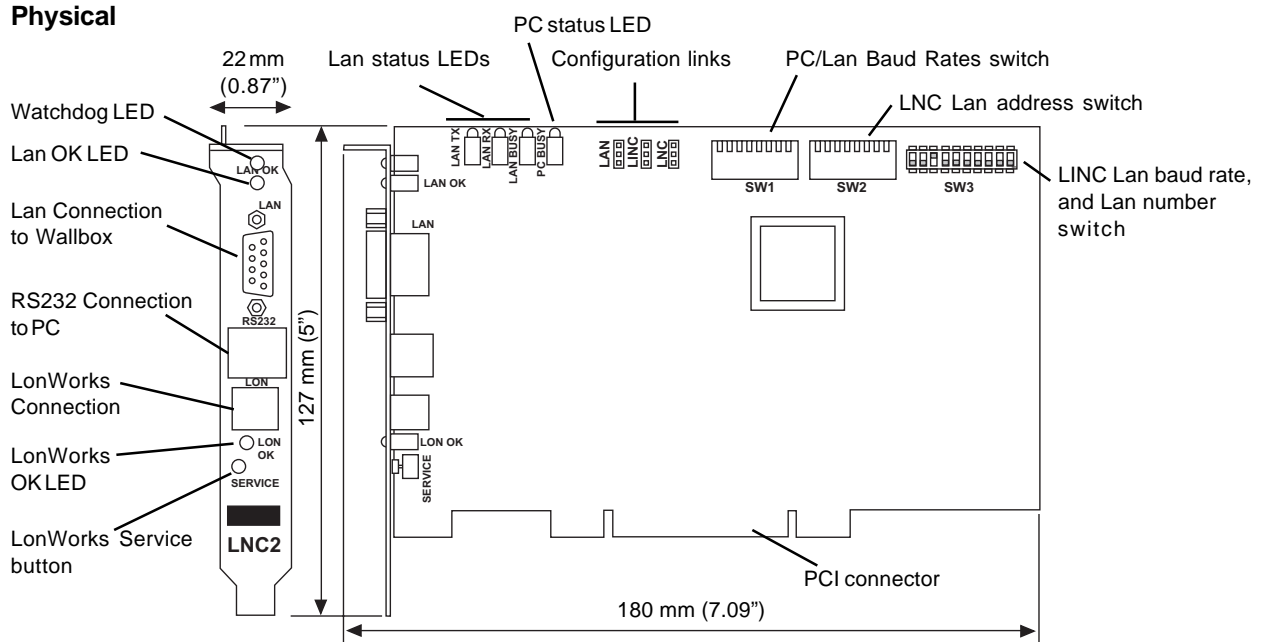
### Description

The LNC2 Lancard Node Controller is a PCI bus card that interfaces between a IQ system Supervisor or Software Tool and the IQ system network. There are two versions: an RS232 to IQ current loop Lan node (traditional LNC), and an RS232 to Lan node and then to LonWorks node by way of the Lan (i.e. LNC to LAN to LINC). The IQ current loop Lan connection comprises two parts: the LNC2 board itself, and the wallbox which ensures network LAN integrity when the PC is disconnected, or powered down. The LonWorks node operates at the internetwork level, including the necessary support for WAN's (e.g. TMN support). IQ system operation is achieved without the need for any LonWorks network management. However, it can be managed and integrated with LonMark products. It is provided with a 78 k baud rate free topology interface.

### Features

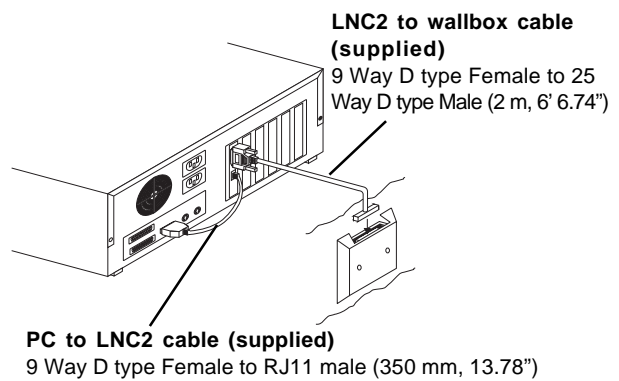
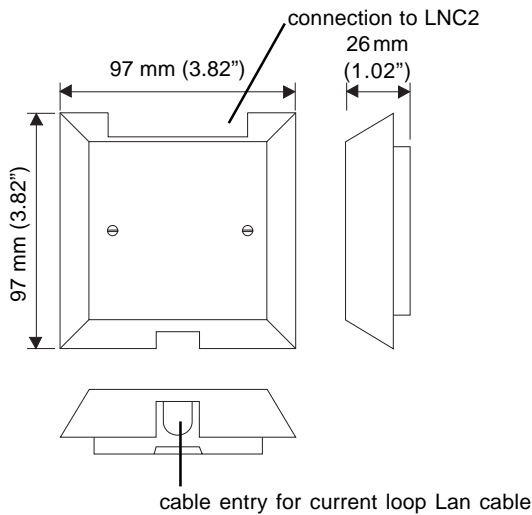
- PCI Bus node
- IQ system Lan and LonWorks versions
- Lan identification by text label (LINC)
- Facilitates use of LonWorks network in BMS system
- LonWorks provides flexibility of two wire free topology.
- LonWorks provides faster signalling rate.
- Integration of IQ system network into existing LonWorks system.
- EEPROM retains configured data during power fail (no battery required).
- IQ system alarms available in 10 languages

### Physical



**PHYSICAL** (Continued)

**Wallbox**

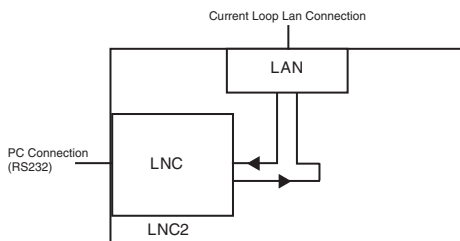


**FUNCTIONALITY**

**LNC2 VERSIONS**

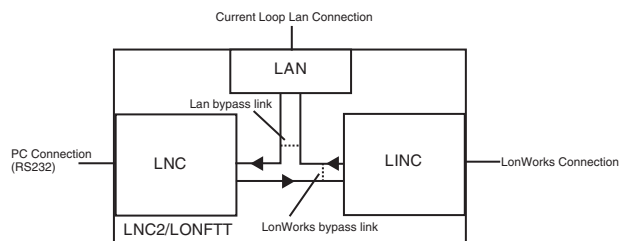
The LNC2 consists of an LNC2 PCI board, a wallbox, and two adaptor cables. The product is provided in two versions, the LNC2 and the LNC2/LONFTT.

**LNC2**



In this version the board is equipped to carry an LNC module connected to the LAN and so provides just the traditional LNC functionality (i.e. the RS232 to IQ current loop Lan interface).

**LNC2/LONFTT**



In this version the LNC2 board is equipped to carry both the traditional LNC module and a LINC module. Links are provided so that the Lan connection, or the LonWorks connection can be bypassed resulting in three configurations:

**LNC/LAN:** The LINC is bypassed, so the board functions as the basic LNC2 described above.

**LNC/LAN/LINC:** There are no bypass links so the LNC2 has both an RS232 to current loop Lan interface, and a current loop Lan to LonWorks internetwork interface.

**LNC/LINC:** The current loop Lan connection is bypassed, so the LNC communicates directly with the LINC thus effectively providing a RS232 to LonWorks internetwork interface. However, the board contains a Lan so the Lan addresses of the LNC and LINC must be set up. *Note that the LNC2 to wallbox cable should be disconnected in this mode.*

*Note that in the rest of the data sheet, references to the LINC module can be ignored if the LNC2, or the LNC2/LONFTT set to LNC/LAN mode are being used.*

**LNC MODULE**

The LNC module interfaces between a PC running a supervisor or a software tool (RS232 port) and the IQ current loop Lan; it also provides certain network maintenance operations. The LNC continually monitors the current loop Lan; if it receives data that is addressed to a different node, it passes it on around the current loop Lan using its transmit port; if it receives data for its own address, it will transmit it to the RS232 port. When data arrives from the RS232 port, it transmits the data onto the current loop Lan using the transmit port.

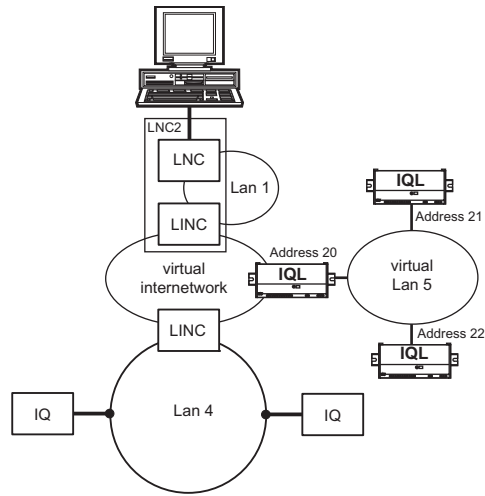
The LNC also monitors network integrity by performing continuous checking of network messages. It will generate alarm messages whenever a problem occurs (see 'Alarms', firmware section).

**LINC MODULE**

The LINC module acts as an interface between the IQ current loop network (Lan) and the LonWorks bus (Lon).

It may be used to provide an internetwork on LonWorks. When used in this way it has similar functionality to an INC i.e. it enables an IQ system network system to be expanded by connecting Lans together using an internetwork. However, instead of connecting to an IQ system current loop internetwork it forms an internetwork on LonWorks. The LINC identifies this mode of operation by an address switch setting <100.

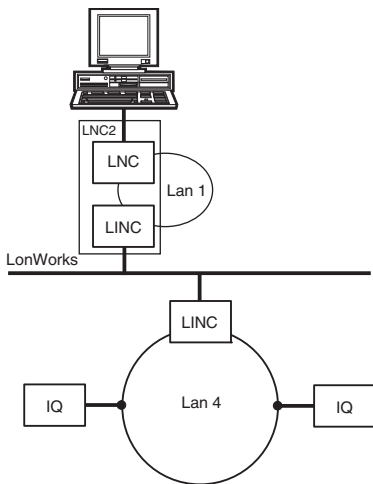
The LINC also gives access to IQLs. These controllers can form an IQ current loop Lan with the lowest addressed IQL performing the INC network management functions (proxy INC). The internetwork on the LonWorks now consists of LINC and the lowest addressed IQL, and the IQLs form a Lan on LonWorks.



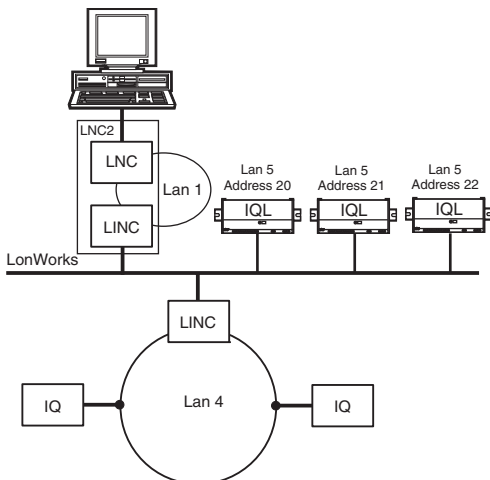
In the above diagram the three IQLs are set up for Lan 5.

The above diagram shows how the networks are formed on LonWorks. The two LINC and the lowest addressed IQL (address 20 is proxy INC) have formed an internetwork, and the three IQLs have formed a Lan (Lan 5).

As explained in the Configuration Section, the LonWorks system has a subnet address parameter which corresponds to the Lan number on the IQ system network. Subnets and hence IQ system Lans cannot cross routers. However, each LINC takes a different subnet number (255 minus Lan number) but is able to find other LINC and IQL Lans and create the internetwork. Thus the IQ system internetwork uses several subnets and is able to span routers.



The LNC2 LINC module is not able to provide an internetwork extension on LonWorks, unlike the normal LINC. Since this is set by a Lan number (LINC address switch setting) of =>100, the LNC2 LINC module Lan number must be <100.



## HARDWARE

**Board:** The LNC2 board is a standard short PCI card that must always be mounted inside a PC. Power is provided by the PC; all other connections are external to the PC.

*Note that the old version LNC was an ISA card, so the new version must be plugged into a different expansion socket.*

**Wallbox:** The wallbox is fitted outside the PC (normally wall mounted) to facilitate connection to the IQ network. It also provides a node bypass relay to ensure network integrity when the PC is disconnected.

**Fusing:** The LNC2 has no replaceable fuses. Protection is provided by a self-resetting solid state multifuse.

**Cables:** The unit is supplied with two cables. The PC to LNC2 cable consists of a 350 mm cable between 9 Way D type Female and RJ11 Male connectors. The LNC2 to Wallbox cable consists of a 2 m cable between 9 Way D type Female and 25 Way D type Male connectors. (See diagram in physical section).

**Network bypass relay:** In order that the network continues to operate if the LNC2 fails, or the PC is switched off, a node bypass relay is fitted to the wallbox to maintain network integrity. The bypassing of a node will be recognised by the downstream node, and reported as a 'Lan Changed' alarm.

**Network:** The network connectors facilitate connection of 2 or 4 wire cables.

**Addresses and Baud Rates:** These are set by on-board switches. The RS232 (PC to LNC2) baud rate is set by SW1 poles 5 to 8 (19k2, 9k6, 4k8, or 1k2), the LNC Lan baud rate is set by SW1 poles 1 to 4 (19k2, 9k6, 4k8, or 1k2), and the LINC Lan baud rate is set on SW3 poles 8 to 10 (19k6, 9k6, or 1k2). The LNC Lan and LINC Lan baud rates must be set the same as each other, and to match other nodes on the Lan. The RS232 baud rate must match the PC baud rate.

*Note that the LNC Lan baud rate on SW1 should not be set to 4k8 if using the LINC module.*

The LNC address on Lan is set by SW2 poles 1 to 7; it may be set in the range 1 to 119 excluding addresses 2, 3, 10. The address must be unique on the Lan. The LINC always uses address 126 on the Lan and there must not be another INC type node (e.g. LINC) on the same Lan.

When the LINC is being used, the Lan number on the internetwork must be set up; this is done by setting SW3 poles 1 to 7 in the range 1 to 99 excluding addresses 2, 3, 10 (addresses >99 change the LINC mode to internetwork on LonWorks extension which isn't suitable for the LNC2). The Lan number must be unique on the internetwork, and the Lan numbers set up in other devices on the Lan must match this.

**Dumb/Normal Operation.** The dumb/normal switch setting (SW2, pole 8) is ignored by the LNC2. The LNC2 will only operate on a network+, post 1985 Lan.

**Power:** The LNC2 board requires  $\pm 12$  Vdc for correct operation. This is provided by the PC.

**Indicators:** The LNC2 has seven LED indicators of which two are visible without removing the PC cover.

Normally visible:

**W DOG** (red): On if there is a processor or software fault.

**LAN OK** (green): When ON, the network is operating correctly (i.e. the LNC is able to send and receive messages). When OFF, it indicates that a LAN broken, or fault condition exists. If it is flashing the address set on the LNC Lan address switch is invalid (set to 0, 2, 3, >119).

**LON OK** (green): This indicates that the LINC has successfully communicated with at least one other IQ system device on the LonWorks (LINC, LONC, IQL).

Located under the cover:

**LAN TX** (yellow): Indicates current flowing from the LNC2 Trend network transmitter. If Off indicates open circuit.

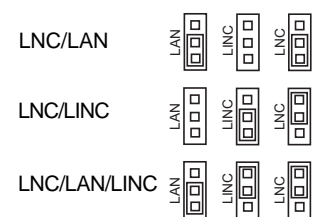
**LAN RX** (yellow): Indicates current flowing in the LNC2 IQ system network receiver. If Off indicates open circuit or short circuit.

**LAN BUSY** (yellow): When on, the LNC is unable to receive data. It will normally light for short periods due to messages on the network.

**PC BUSY** (yellow): When on, the PC is unable to receive data. It will normally light for short periods due to messages on the network.

**Configuration Links:** (LNC2/LON/FTT only)

There are three link headers (LAN, LINC, and LNC), which are used to select the three operating modes as detailed on the on-board label.



### Service Button:

This button is used by the LNC2 LINC module but is not normally needed as IQ system LonWorks products self-install onto LonWorks.

If it is required to bind LonMark devices to IQL or LONC modules, or if pre-version 2.23 LINC's straddle a router, then the IQ system LonWorks devices need to be installed onto a LonWorks network management tool. During the installation process, the tool will request to be informed of the presence of the LINC; this is done by pressing the 'service' button.

*Note that the LINC module within the LNC2 is post-version 3.23 and thus will self install even if other post-version 3.23 LINC's are installed the other side of a router.*

**Internetwork:** The LNC2 LINC module provides connection to a LonWorks internetwork. An internetwork provides the following advantages:

- **Increased addressing** - 116 Lans may be connected using an internetwork each Lan having 116 devices networked.
- **Each Lan may have different baud rates** - this is relevant to older IQ systems where an area may be limited to low baud rates (1k2).
- **Immunity to Lan failure** - if one Lan fails the others will still operate.

**Transceiver:** The LNC2 LINC module includes an FTT10 transceiver (free topology) which has the following features:-

- (1) Use of free bus topology enabling star, bus, or loop wiring simplifies installation and facilitates network expansion.
- (2) The bus uses two wires (twisted pair) which are polarity independent with no need for screen.
- (3) The FTT10 runs at 78 k baud.
- (4) The FTT10 LonWorks may already be present in a building. This use of the LINC enables the Trend system to make use of an existing building bus and hence reduce installation cost.

## FIRMWARE

**Reset:** The LNC2 LNC module will reset itself on power up, or on change of address or baud rate. This will reset its alarm language to English.

### Network Alarms:

The LNC2 LNC module generates the following alarms to its PC and its local Lan whenever it detects a problem on its Lan:

#### “Local LAN reported by xxx-

**LAN Broken NKBK**” - a break in communications over the local Lan

**LAN OK NKOK**” - local Lan communications are restored

**LAN Changed NKCH**” - a node has gone from or been added to the local Lan.

**Duplicate Address NKDA**” - another node on the local Lan has the same address as this LNC2. Checked after a reset or any network build caused by another device on the network.

**Device Dead DVDD**” - The Device Dead alarm indicates that the PC is no longer communicating with the LNC Module. All configuration settings are reset to default.

**Device OK DVOK**” - The Device OK alarm indicates that the PC has recommenced communication.

*Note that the Device Dead and OK alarms are only sent to the local Lan (not to the PC).*

*Note that if the software using the LNC2 (e.g. 962 Supervisor) is closed the LNC2 will generate a ‘Device Dead’ alarm.*

The LNC2 LINC module generates the following own Lan alarms if both **local alarms Addr** and **Remote lan** (both in the address module) are set up and sends them to the address defined by these parameters.

#### “LINC - Rem LAN From LINC on Lan xxx -

**LAN Broken NKBK**” as above.

**LAN OK NKOK**” as above

**LAN Changed NKCH**” as above

**Duplicate Address NKDA**” as above. In this case the duplicated address will be 126, the address of the LINC on the Lan.

The LNC2 LINC module generates the following LonWorks internetwork alarms if both **int/net alarms node** and **remoTe lan** (both in the address module) are set up and sends them to the address defined by these parameters.

#### “LINC - Int’wrk From LINC on Lan xxx-

**LON Iwrk Broken NKBK**” - a break in internetwork communications

**LON Iwrk Changed NKCH**” - a node has gone from or been added to the internetwork

**LON Iwrk OK NKOK**” - internetwork communications are restored

**Duplicate Lan NKDA**” - The LINC’s Lan number is duplicated on the internetwork; only generated when the internetwork is mapped

**NID=xxxxxxxxxxxxx NKSv**” - The LINC has received a service pin message from any LonWorks device on it LonWorks. The NID number is the neuron ID or unique identification number.

#### “LINC - Int’wrk Node xxx Subnet yyy

**This node is deaf NKDF**” - The LINC has received a ‘deaf IQL’ message from an IQL (which can send but not receive). It will be repeated every 25 s until the fault is corrected.

**Identification:** The LNC2 will reply to a request for LNC details sent to address 10 from the supervisor or software tool running in the PC connected using RS232. The LNC2 LINC module identifies itself to ‘w’ comms as INC v3.xx.

**Alarm language:** Some IQ system supervisors or software tools are able to set the LNC module to report its network alarms in foreign languages (English, Spanish, Finnish, Swedish, Norwegian, Danish, German, Italian, Portuguese, French).

## Configuration Mode (LNC2 LINC module only)

The LNC2 LINC module is configured by way of the IQ system network or internetwork (including from the local PC through the LNC). It is addressed as address 126 on Lan 126 if configured over local Lan, and address 126 on its Lan number (Lan number as set by the LINC address switch) if configured over the internetwork. Configuration mode has the following modules:

### User Module

The LINC has a single programmable **PIN** number which will protect the LINC 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. If the PIN is forgotten, the user should contact Trend Technical Support quoting the generator number, and the neuron chip id (see below); Technical Support will supply a default PIN.

### Address Module

**addr switch on local lan, iDentifier:** These are the same as the INC, the local Lan number follows the address switch setting, and the identifier is up to 15 characters long.

**Trend iwrk alm Addr/Remote lan:** This defines the destination details for alarms about the local Lan. The Lan number (either local or remote) and node address may be entered.

**lon iwrk alm node/remoTe lan:** This defines the destination details for alarms about the LonWorks bus. The Lan number (either local or remote) and node address may be entered.

*Note Alarm destination node addresses must be in valid range (1 to 119 excluding 2,3,10). If set to zero, alarm is not transmitted.*

**lonworks domain, subnet, node:** These define the LonWorks address. The LonWorks system has number of domains of which the LonWorks chip (neuron) can use two. The LINC defaults to the second domain, domain 1, (and this second domain is itself initialised to be of single byte length, and value 255, however domain value and byte length are not visible in configuration mode). Within each domain are a number of subnets. The LINC defaults to subnet 255 minus Lan number (as set on LINC address switch); the LonWorks node address is 126.

**Message code,** defines the code used by the IQ system LonWorks devices (default is 64); *all the IQ system LonWorks devices (LINC/LONCs/IQLs) must use the same code.*

**lonworks domain wide:** Specifies whether inter-LINC communications are restricted to local subnet, or to entire lonworks domain (default is “Yes”, whole domain). All IQ system devices on LonWorks must have the same domain wide setting, either all domain wide, or all restricted to local subnet.

**lonworks managed:** The LonWorks addressing (domain, subnet, node), domain wide flag, and Message code can be determined by the LINC or by a LonWorks network management tool. Lonworks managed is read-only in configuration mode, and defaults to “No” (LINC in control). When the LINC is in control the Message code number can be viewed and changed using configuration mode.

**router Buffer size:** If the IQ system devices on LonWorks are separated by routers, which have internal buffer sizes less than 146 bytes, the router buffer size parameter must be changed in all Trend devices on LonWorks to be equal to the smallest buffer size of any router used (this is normally 66 bytes).

**lonworks transeiVer:** This number will default to the FTT10 interface, and should not be changed; changing this will cause the LNC2 LINC to cease communications on LonWorks.

**neuron chip id:** Unique number identifies neuron chip; also used in default PIN generation process.

### COMPATIBILITY

The LNC2 can only be installed in a PC with PCI expansion sockets. The LNC2 is compatible with all IQ system networks post-network+ (1985 onwards). The LNC2 LINC module requires that an ANC+ or XN28 on the internetwork must be firmware version 2.5 or later and an MNC on the internetwork must be firmware version 2.53 or later. Any IQ251 on the system must be firmware version 1.2V or later and an IQ241 must be firmware version 1.2M or later.

### INSTALLATION

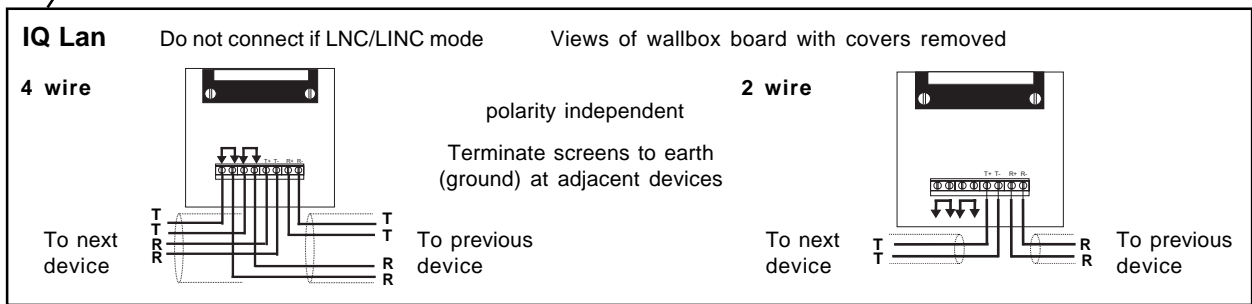
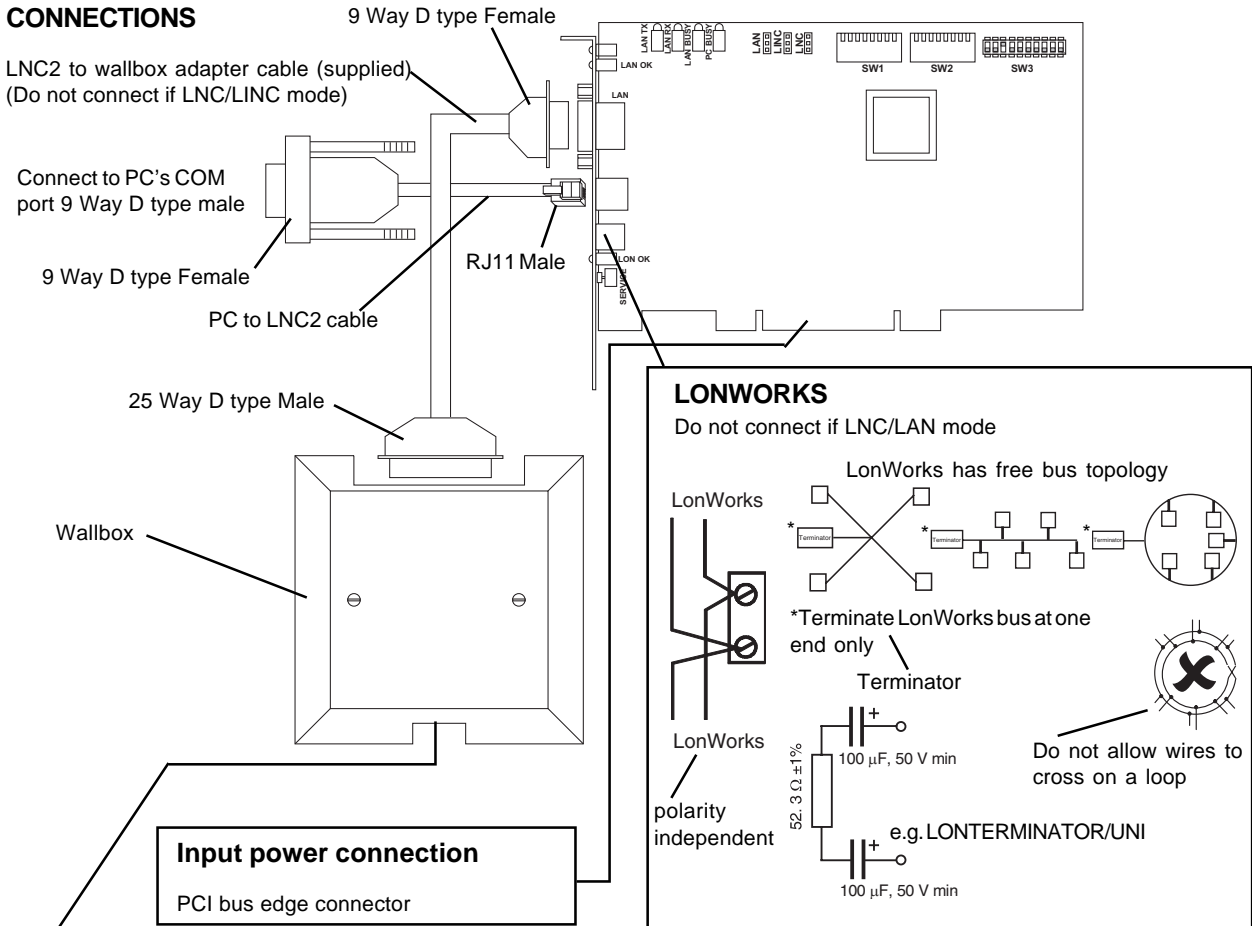
The LNC2 installation involves the following procedure. For LNC2/STD/USA the unit is UL rated as 'UL916, accessory to open energy management equipment'. *Note that the procedure is written for LNC2/LONFTT; the LNC2 product is equivalent to a LNC2/LONFTT set to LNC/LAN mode.*

- Mount wallbox in position (if not LNC/LINC mode)
- Connect wallbox to network (if not LNC/LINC mode)
- Set RS232 (PC to LNC2) baud rate
- Set LNC Lan baud rate
- Set LINC Lan baud rate (if not LNC/LAN mode)
- Set LNC network address
- Set LINC Lan number address (if not LNC/LAN mode)
- Set LNC2 mode links
- Install LNC2 in PC
- Connect PC COM port to LNC2

- Connect LNC2 to wallbox ((if not LNC/LINC mode)
- Connect LonWorks network (if not LNC/LAN mode)
- Switch on PC
- Commission LNC and Trend network (on-board mini-network for LNC/LINC)
- Configure LINC (if not LNC/LAN mode)
- If required, install in LonWorks management tool
- Configure remote end of LonWorks (if not LNC/LAN mode)
- Test system

A full description of installing the LNC2 is provided in the PACK/LNC2/STD Installation Instructions (TG200240) and PACL/LNC2/LONFTT/STD Installation Instructions (TG200267).

### CONNECTIONS

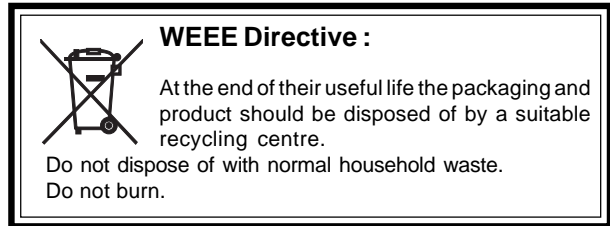


## DISPOSAL

COSHH (Control of Substances Hazardous to Health - UK Government Regulation 2002) 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 CODES

Non USA Order Code	USA Order Code	
<b>PACK/LNC2/STD</b>	<b>882000300</b>	:LNC2 for use as 'traditional' LNC (LNC/LAN mode only), complete with wallbox and two adapter cables.
<b>PACK/LNC2/LONFTT/STD</b>	<b>882000310</b>	:LNC2 including LonWorks FTT10 interface capable of LNC/LAN/LINC configurations, complete with wallbox and two adapter cables.

*Note that codes LNC2 and LNC2/LONFTT are for replacement boards only.*

## SPECIFICATIONS

### Electrical

Input Power (LNC2) :±12 Vdc ±15 % at 250 mA (from PCI bus)  
 Fusing (LNC2) :No replaceable fuses. Protection is provided by a self-resetting solid state multifuse.

LNC2 to PC connection :EIA RS232, EIA/TIA232E, V28

LNC2 to PC distance :350 mm (13.78") cable supplied

LNC2 to wallbox distance:15m (16 yds) max (2 m, 6' 6.74" cable supplied)

Current loop network :20 mA two wire current loop, opto-isolated polarity independent, receiver, bipolar transmitter, balanced transmitter

Current loop network distance :Between units dependent on cable type (see table below).

Cable	1k2 baud	4k8 baud	9k6 baud	19k2 baud	No. of Wires
Belden 9182	1000 m (1090 yds)	1000 m (1090 yds)	1000 m (1090 yds)	700 m (765 yds)	2
Belden 9207	1000 m (1090 yds)	1000 m (1090 yds)	1000 m (1090 yds)	500 m (545 yds)	2
Trend TP/1/1/22/HF/200 (Belden 8761)	1000 m (1090 yds)	1000 m (1090 yds)	700 m (765 yds)	350 m (380 yds)	2
Trend TP/2/2/22/HF/200 (Belden 8723)	1000 m (1090 yds)	1000 m (1090 yds)	500 m (545 yds)	250 m (270 yds)	4

Lon FTT10 :(LNC2/LONFTT only) Free topology (FTT), 78k baud, transformer isolated. Single termination (RC network).

Lon FTT distance :(LNC2/LONFTT only) Maximum bus length and node to node distance depends on cable type (see table below).

Cable	Max bus length	Max node to node
Belden 85102	500 m (545 yds)	500 m (545 yds)
Trend TP/1/0/16/HF/200 (Belden 8471)	500 m (545 yds)	400 m (430 yds)
UL Level IV, 22 AWG	500 m (545 yds)	400 m (430 yds)
JY(St) Y2 x 2 x 0.8	500 m (545 yds)	320 m (350 yds)
TIA568A Cat.5, 24 AWG	450 m (490 yds)	250 m (220 yds)

### Baud rates

LNC2 to PC :Selectable by on-board switch 1k2, 4k8, 9k6, 19k2 baud. Set same as PC.

Network :LNC to Lan, selectable by on-board switch, 1k2, 4k8, 9k6, 19k2 baud. *Note, if LINC is used, 4k8 cannot be selected. Set same as other nodes on Lan.*

LINC to Lan, selectable by on-board switch 1k2, 9k6, 19k2 baud. Set same as LNC.  
 Network address :Selectable by on-board switches, 116 nodes addressable per Lan (1 to 119, excluding addresses 2, 3, and 10). Set to be unique on Lan.

Lan number :(LNC2/LONFTT only) Selectable by on-board switches, 96 Lans addressable on the internetwork (1 to 99, excluding addresses 2, 3, and 10). Set to be unique on internetwork.

### Mechanical

#### Dimensions

LNC :180 mm (7.09") x 127 mm (5") x 22 mm (0.87") (standard short PCI card).

Wallbox :97 mm (3.82") x 97 mm (3.82") x 26 mm (1.02").

### Weight

Board :136 g (4.8 ozs)

Wallbox :106 g (3.7 ozs)

### Connectors

Power (LNC2) :Industry standard PCI system bus edge connector.

Lan (wallbox) :8 way single part connector screw terminals 0.5 to 2.5 mm<sup>2</sup> cross section area (14 to 20 AWG) cables.

LNC2 to PC :RJ11 male on LNC2, 9 way D type male on PC.

LNC2 to wallbox :9 way D type male on LNC2, 25 way D type female on wallbox.

LonWorks :2 way two part connector screw terminals 0.5 to 2.5 mm<sup>2</sup> cross section area (14 to 20 AWG) cables.

### Environmental

EMC emissions :EN50081-1

EMC immunity :EN50082

Electrical safety :IEC 730-1

UL :(LNC2/STD/USA only). The unit is rated as 'UL916, accessory to open energy management equipment'.

### Ambient limits

Storage :-10 °C (14 °F) to 70 °C (158 °F)

Operating :0 °C (32 °F) to 45 °C (113 °F)

Humidity :0 to 95 %RH non-condensing

### Indicators

The W DOG, LAN OK, and LON OK LEDs are visible externally, the others are only visible if PC cover is removed.

W DOG (red) :Watchdog. ON if there is a processor or software fault. OFF if OK.

LAN OK (green) :When ON, network operating correctly. When OFF, indicates LAN fault condition exists. If flashing, LNC Lan address switch setting is invalid.

LON OK (green) :When ON indicates LINC successfully communicated with another Trend device on LonWorks (LINC, LONC, IQL). When OFF, communications unsuccessful.

LAN TX (yellow) :When ON current flowing from the LNC2 Trend network transmitter. If OFF indicates open circuit.

LAN RX (yellow) :When ON indicates current flowing in the LNC2 Trend network receiver. If OFF indicates open circuit or short circuit.

LAN BUSY (yellow) :When ON, LNC unable to receive data. Normally flickers due to messages on the network.

PC BUSY (yellow) :When ON, PC unable to receive data. Normally flickers due to messages on the network.

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