Ethernet Control Network Upgrade, *******, at *******, *******

version 1

Set Up Notes For Eurotherm PC3000, Siemens S7, Lantronix DSTni-XPress-DR IAP and Wizcon SCADA

Our Ref :	Ethernet Control Network Upgrade
Version :	1
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1. BACKGROUND

As part of the ******* project to relocate and re-layout the ******* area, changes need to be made to the control systems comms architecture. The existing RS485 modbus serial comms network (daisy chain) is to be replaced with a modbus TCP/IP Ethernet network.
This will simplify the wiring and improve the connectability for the future.

There are 4 parts to the system that need setting up to work with each other;

- Eurotherm PC3000
- Siemens S7
- Lantronix DSTni-XPress-DR IAP (referred to as XPress from here on) converter
- Wizcon SCADA

The original system employed the following;

RS485 electrical connection between the PC3000s and the 261s comms converters.

RS485 electrical connection between one of the S7s and a 261 comms converters (on the industry line - now relocated and disconnected).

RS232 electrical connection between the 261s and the Wizcon PCs.

Modbus RTU comms protocol (adjusted with an address offset to accommodate the PC3000 which uses Jbus protocol).

Each PC3000 was connected to the Wizcon station via a serial comms daisy chain.

The new system employs the following;

Ethernet electrical connection between the PC and the XPress devices, via unmanaged switches.

RS485 electrical connection between the XPress units and the PC3000s and S7s. Although the PC3000s have the option of using RS232, which is easier to install, the S7s only work with RS485 and therefore RS485 is used as the standard for all devices.

The Wizcon is set to use the Modbus TCP/IP driver, as is the XPress device at their Ethernet ports.

The XPress devices are set up as Modbus RTU on their serial ports/terminals.

Each PC3000 and S7 has its own XPress device to link its serial comms to the Ethernet network on which sits the Wizcon PCs.

2. Network

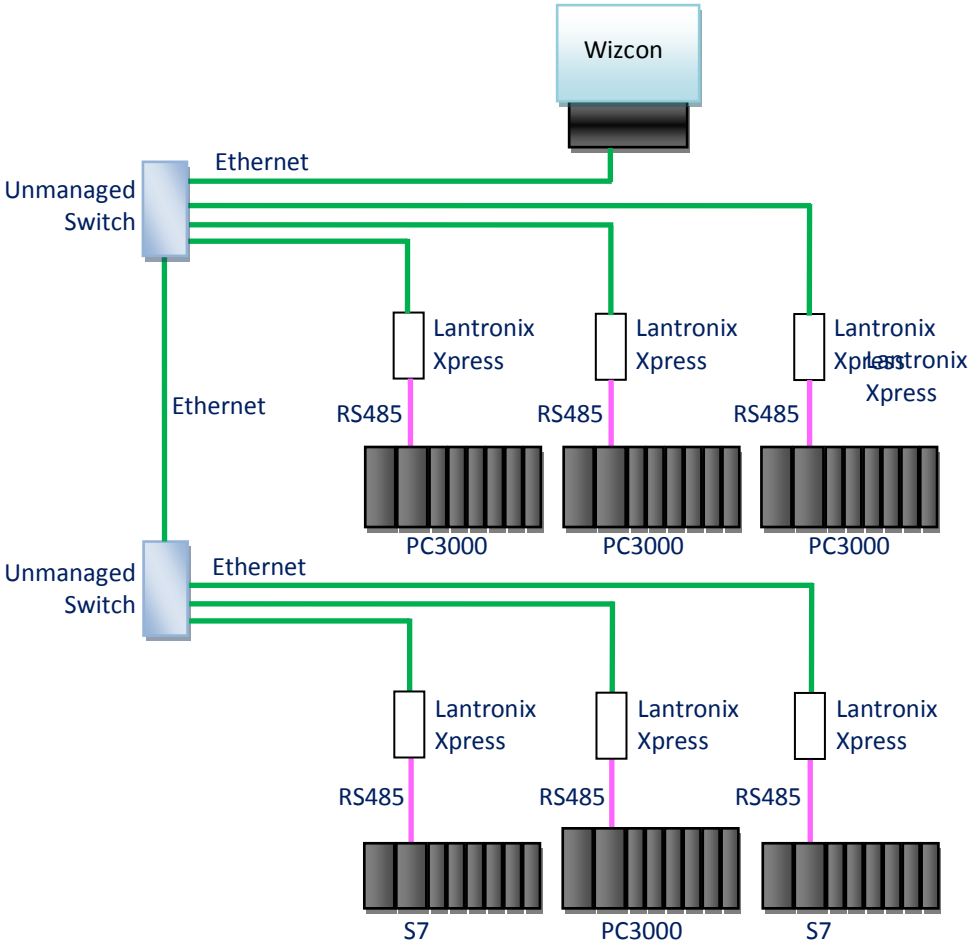
The Control Systems each control a number of ******* and are sited, in their own enclosures, close to where the ******* are situated.

2.1 Node numbers

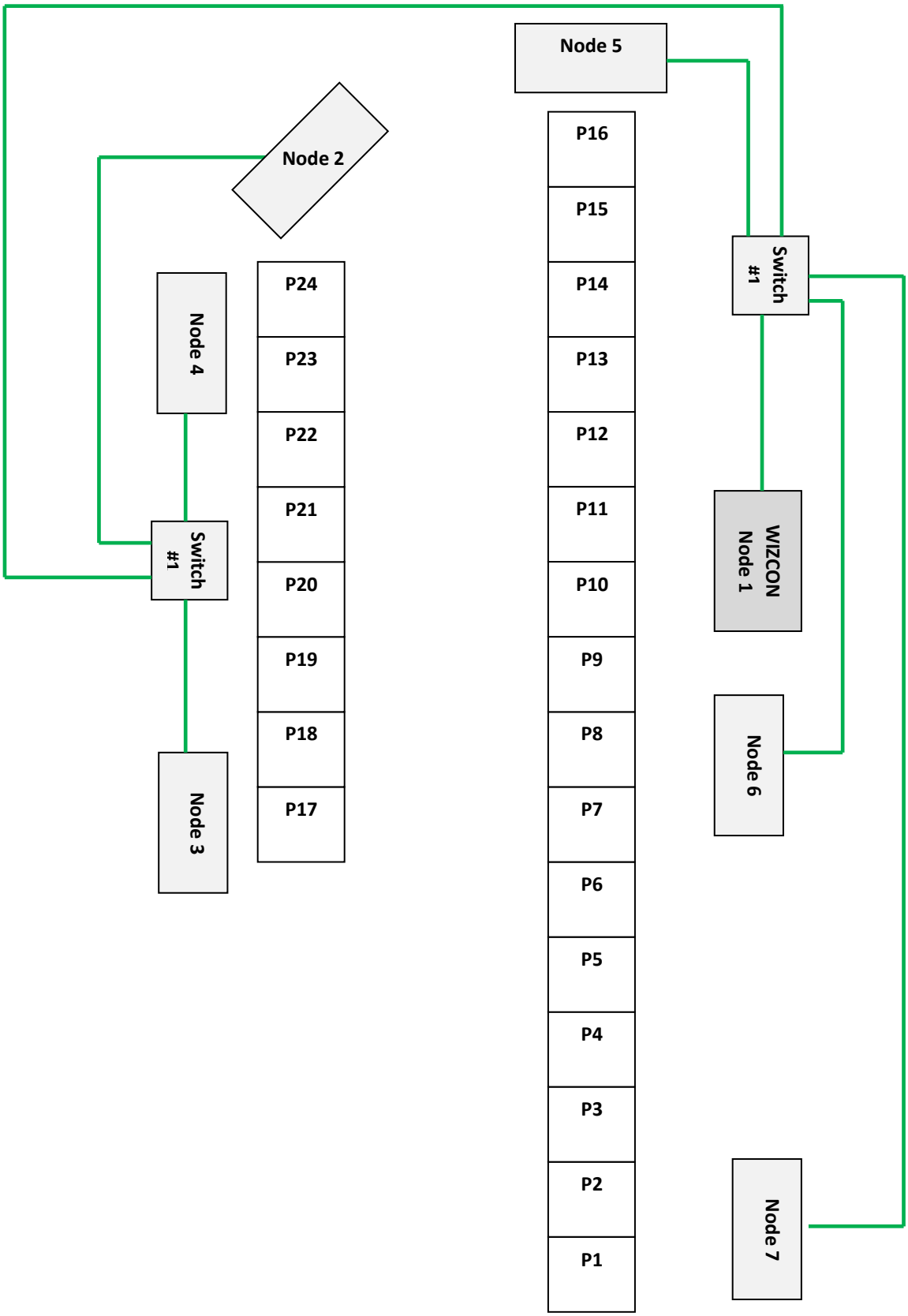
Each Control System enclosure will be installed with an XPress Ethernet converter.

*******	Control device	Node
01 - 04	PC3000	7
05 - 10	PC3000	6
11 - 16	PC3000	5
17, 18	S7	3
19-22	PC3000	2
23, 24	S7	4

2.2 Architecture



2.3 Geographical Layout



2.4 IP Addresses

The Wizcon PC has an additional Ethernet card fitted, so to allow the control network to be kept separate from the plant network.

Each XPress and the Wizcon PC control network port has an IP address.

Wizcon PC (Node 1)	192.168.100.120
Node 2	192.168.100.102
Node 3	192.168.100.103
Node 4	192.168.100.104
Node 5	192.168.100.105
Node 6	192.168.100.106
Node 7	192.168.100.107

3. Device Details

3.1 Eurotherm PC3000

3.1.1 Comms configuration

The PC3000s were already communicating via a serial comms network to the Wizcon. This means that the comms port and comms driver were already set up with the correct protocol and UID (Unit Identification number). They therefore required no reconfiguration to prepare them for the new Ethernet network.
The PC3000s remain configured for Modbus RTU. Allocating the Wizcon comms to Port C of the LCM and with specific cables, the PC3000 will communicate via RS485.

*******	UID Address	Baud
1 - 5	7	19200
6-10	6	19200
11-16	5	19200
19-22	2	19200

3.1.2 PC3000 cables

The cable connected to the comms port is a proprietary cable from Eurotherm.

There are different versions, based on age and supplier, with different colour coded wires.

Nodes 5, 6 & 7

PC3000 Plug Pin	Wire Colour		Function	Standard
1		Brown	RXD	RS232
2		Orange	TXD	
3		Red	TX-	RS485
4		Black	TX+	
5		Green	RX-	
6		Blue	RX+	
7		White	Common	RS232 / RS485
8		Grey	Common	

Node 2

PC3000 Plug Pin	Wire Colour		Function	Standard
3		Red	TX-	RS485
4		Brown	TX+	
5		White	RX-	
6		Blue	RX+	
7		Yellow	Common	RS232 / RS485
8		Black	Common	

3.2 Siemens S7

3.2.1 Comms Configuration

The S7s were configured as Modbus slaves as part of the original scope of the supply. The one formerly used at ******* 9 & 10, was set up to communicate with the "*******" Wizcon system. However, the UID needed to be changed for the relocation, after renumbering, to talk to the ******* Wizcon.
The S7 comms module (CP341) is only capable of RS422 / 485. The ports were set as;

*******	UID Address	Baud
17 & 18	3	19200
23 & 24	4	19200

The 15 way D socket is wired to marshalling terminals in the control panel.

Function	Terminal number	RJ45 (from XPress) Wire Colour	
TX+	2202		Orange / White
RX+	2204		Blue
Common	2208		Blue / White
TX-	2209		Orange
RX-	2211		Brown / White

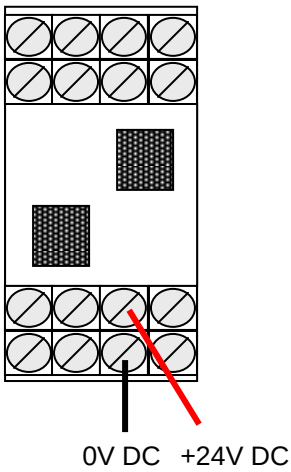
3.3 Lantronix Dsni-XPress-DR IAP

Referred to as XPress.

The XPress has to be configured, out of the box, to ;

a. change the default IP address to the one nominated for the node
b. upgrade the driver firmware with a Modbus driver
c. set up the serial comms

3.3.1 Wiring power supply



Supply voltage;

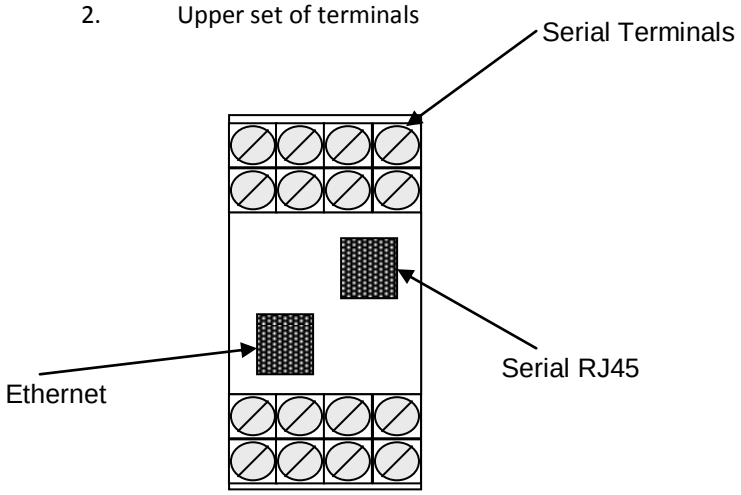
Max 30V DC

Max 24V AC

3.3.2 Wiring the Comms

There are two serial comms options;

1. RJ45
2. Upper set of terminals

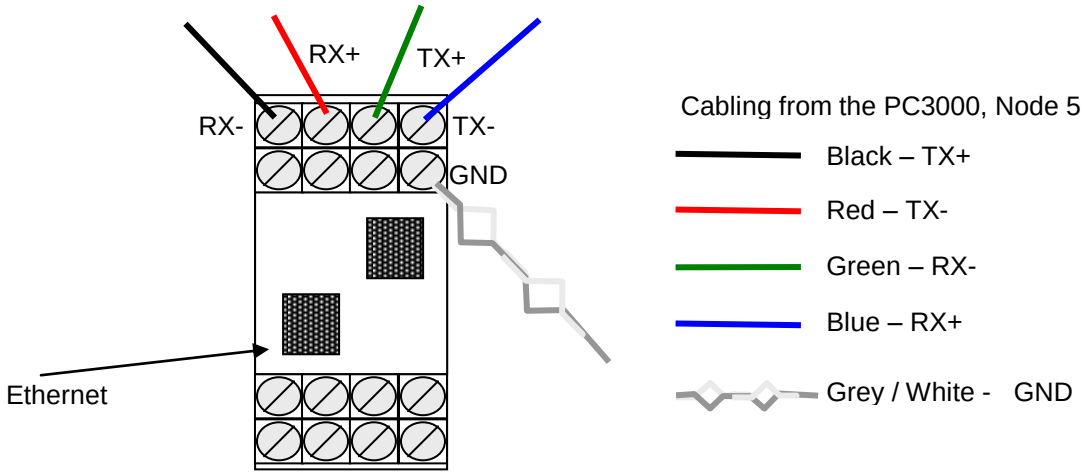


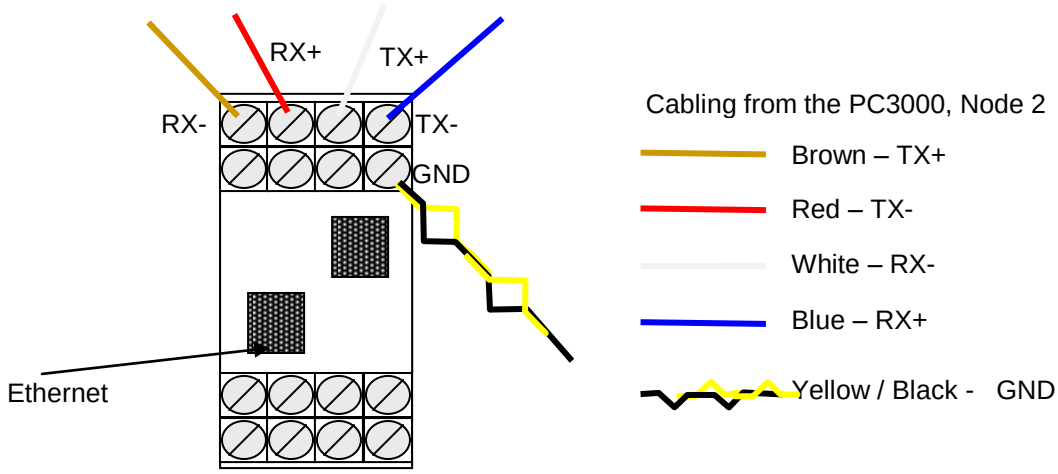
3.3.2.1 RJ45

The connections are as follows;

Xpress		Connect to	
Tx/Rx	Wire Colour	Node 6, 7 PC3000 wires	Node 3, 4 terminals
TX+	Brown / White	Green	2211
TX-	Blue	Blue	2204
RX+	Orange	Red	2209
RX-	Orange / White	Black	2202
Common / Ground	Blue / White	Grey / White	2208

3.3.2.2 Terminals





3.3.2.3 Cross Over

A cross-over is needed between the PC3000 / S7 and the Lantronix Xpress.

The PC3000 / S7 TX+ is connected to the XPress RX-.

The PC3000 / S7 TX- is connected to the XPress RX+.

The PC3000 / S7 RX- is connected to the XPress TX+.

The PC3000 / S7 RX+ is connected to the XPress TX-.

3.3.3 Configuration

There are three stages to configuring the XPress Ethernet / serial comms converter;

a. Setting an appropriate IP address
b. Loading the Modbus comms driver
c. Setting the serial comms parameters

3.3.3.1 Set The IP Address

Each XPress must be modified to have its default IP address changed to the one allocated.

Node	IP Address	Subnet Mask
Node 2	192.168.100.102	255.255.255.0
Node 3	192.168.100.103	255.255.255.0
Node 4	192.168.100.104	255.255.255.0
Node 5	192.168.100.105	255.255.255.0
Node 6	192.168.100.106	255.255.255.0
Node 7	192.168.100.107	255.255.255.0

This done using the Lantronix **DeviceInstaller** software tool.

3.3.3.2 Load The Modbus Driver

XPress is dispatched with 'Standard Tunnelling' firmware (5.2). This does not work with Modbus as it produces non-standard message packages. it is necessary to upload the Modbus firmware to the Xpress.
The current Modbus firmware available from Lantronix website is V2.5.0.0 and is a file called **amdx25.rom**.
This file is referenced during the XPress device upgrade routine within the **DeviceInstaller** software tool.

3.3.3.3 Setting Serial Comms Parameters

Using the Telnet config utility, within the **DeviceInstaller** software tool, configure serial comms for Modbus RTU ;

1) Network/IP Settings :
   Leave as set

2) Serial & Mode Settings :
   Protocol : Modbus/RTU, Slave (s) attached *(serial protocol set 1)*
   Serial Interface : 19200, 8, N, 1, RS485 *(interface type set 2 for RS485 4-wire)*
   (Enter serial parameters….set 19200,8,N,1)

3) Modem Control Settings :
   Leave as set

4) Advanced Modbus Settings :
   Slave Addr / Unit Id Source: Modbus TCP Header *(set 0 for Auto)*
   Modbus Serial Broadcasts : Disabled *(Use MB/TCP ….set to 2 = No)*
   (Disable Modbus/TCP pipeline …set to 1 = No)
   MB / TCP Exception Codes : YES *(set to 2 = Yes)*
   Char, Message Timeout : 00050msec, 05000msec *(Character timeout set 50)*
   (Message timeout set 5000)
   (serial TX delay…… set 0)
   (swap 4x…… set N)

3.4 WIZCON

The Modbus TCP/IP driver VPIWNMRP was installed and named "Ethernet".

The format for the address is identical as the existing Modbus RTU addresses and does not need modifying. Each tag requires the Driver to be changed from referencing the "PC3000" (serial comms Modbus RTU) to "Ethernet" (ethernet Modbus TCP/IP)

The INIT file must be modified to include a line for each XPress device. The line must include the IP address to initialise it and the Modbus TCP code 502.

The INIT file for the Wizcon now reads;

```
02 = 192.168.100.102,  502
03 = 192.168.100.103,  502
04 = 192.168.100.104,  502
05 = 192.168.100.105,  502
06 = 192.168.100.106,  502
07 = 192.168.100.107,  502
BUS = J, D
```

The 02 refers to the address ID for the XPress device. This will be included in the Wizcon address (eg 0240123). This should be confused with the PC3000 UID which would have previously taken the same position in the address.