The UniNET Network

The UniNET Network is a feature of the operator panels that enables them to be connected together in a network and to communicate with each other. It is now possible to connect 2 or more panels (the maximum number is 32) with a simple RS-485 connection, to obtain immediately the possibility of displaying on one panel either the data from the PLC attached to the panel itself, or from other PLCs attached to other panels on the network.

Symbols Used

The table below describes the symbols used in the figures.

Bus Terminal and RS-232 to RS-485 converter without termination resistor

Bus Terminal and RS-232 to RS-485 converter with termination resistor

Bus terminal with termination resistor

Bus terminal without termination resistor

Network cable

Clients and Servers

Note: A -002x series CP UniOP Panel cannot act as a server in a UniNET network.

The operator panels attached to the UniNET Network can be classified in two categories, depending on the type of communication that they can support once they are placed in the network: Server type panels and Client type panels

? A panel is a Server when it is connected directly to a PLC. It makes available to other panels in the network the data in the PLC to which it is attached.
? A panel is a Client when it requests data from a PLC attached to a Server on the network

Obviously a panel can be, in certain cases, both a Server and a Client. This means that the panel both satisfies the requests from other panels that require access to the data in the PLC to which it is attached, and also requests data from the PLCs attached to other Servers.

? The configuration described in Figure 1 allows many panels to access data from a single PLC via a panel acting as the single Server. The client panels can perform all the normal

operations as if connected directly to the PLC: displaying of variables, modifying of variables, handling of recipes, handling of the Reserved Data Area.

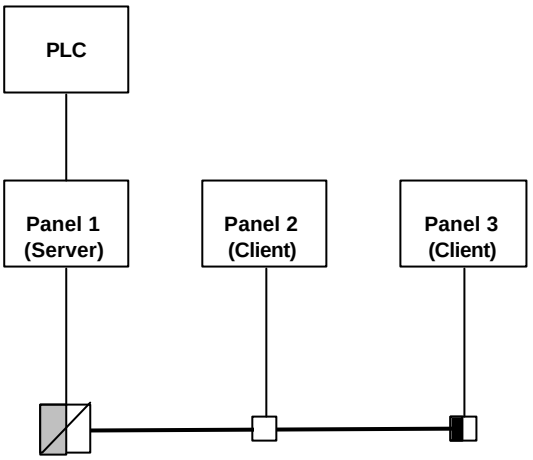

Figure 1

? Figure 2 shows a configuration in which many PLCs are accessed. The panels that are connected to a PLC can function both as Servers and Clients, that is to say they can read data from the PLC to which they are directly attached and also form the PLCs attached to other Servers. The Client panel can also read data from the PLCs attached to the Servers. In this way, every single panel in the network has access to every single PLC attached to the Servers in the network.

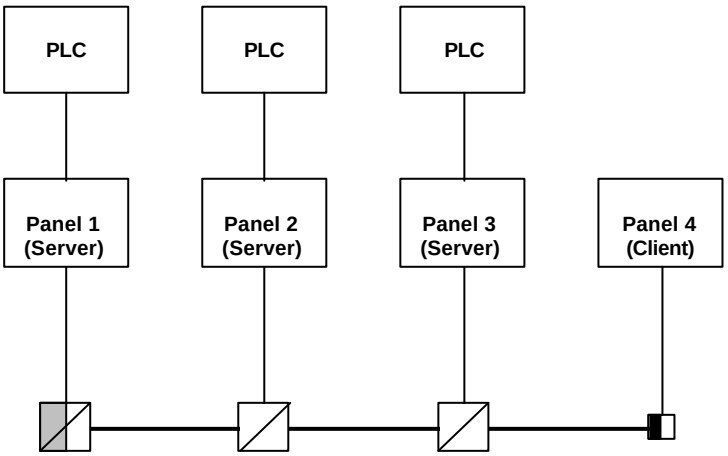

Figure 2

***Note**: An external RS-232 to RS-485 converter is required for each panel used as a **Server**. This is because Servers must be connected to the network using their PC/Printer port which, in*

the current hardware version, only has an RS-232 interface. The Client panels do not need an external converter to be attached to the UniNET network because they

can be attached to the network using their PLC port which has an RS-485 interface as well as an RS-232 interface.

The TSI01 Bus Terminal and Converter provides additionally optical isolation between the panel and the UniNET network. If you are using a Client panel attached to the network through a simple TSI02 bus terminal, there is no optical isolation. Optical isolation is recommended whenever panels are to be operated in a noisy environment or powered by different power source. A completely optically isolated network can be obtained using a TSI01 Bus Terminal and Converter for each panel attached to the network.

Network with Different PLC Types

The network configuration shown in Figure 2 works even if the PLCs are of different model types or even if they are of different manufacturer brands. Designer allows the user to specify the addresses of the data items added to the project file using the method of addressing specific to that PLC brand or type.

It is also possible to transfer data from one PLC to another using the 'PLC to PLC transfer' feature supported by the operator panels. The transfer of the data can be performed even if the PLCs are of different manufacturer brands; the panels act as bridges connecting different PLC worlds.

Technical Data

The main technical features of the UniNET Network are shown in the table below:

Maximum speed:	19200 baud
Physical interface:	RS-485 Half Duplex
Connection cable:	Shielded twisted pair
Maximum length:	1200 m
Access control:	Token passing
Maximum number of stations:	32

One of the main benefits of the token passing method is that every station on the network gets the chance to communicate, even in conditions of heavy communication load.

3. Network Configuration

The UniNET network can be configured using the Designer. The configuration entails specifying, amongst other things, the number of Clients and the number of Servers on the network. This section describes the steps that need to be taken to configure the UniNET network.

The Configure Network Option

The *Configure Network* option is displayed by first selecting the Options Designer menu item. By selecting *Configure Network* the network configuration required by your application can be initially defined or subsequently modified .

The first time that the Configure Network option is selected, Designer will display the Network Type Selection dialog box (shown in Figure 3) to enable the type of the required network to be selected.

This dialog box allows the choice between the three main network configurations supported by UniNET:

? Single Server, multiple Clients
? Multiple Servers, multiple Clients (same PLC types)
? Multiple Servers, multiple Clients (different PLC types)

In the first case, Designer will ask the user to enter the number of Clients to be included in the network and will then choose the optimal default values for all the network configuration parameters.

In the second case, Designer will ask the user to enter both the number of Servers and the number of Clients to be included in the network and will then choose the optimal default values for all the network configuration parameters.

The third case is the most advanced option. With this type of network the user has complete control over the network to be configured. This allows the user to make full use of the powerful capabilities of the UniNET network such as adding multiple Servers for different PLC manufacturer brands. This complete control over the network is gained at the expense of having to explicitly specify all the configuration parameters for the network

The parameters for the network are automatically configured if it is selected to be of either the Single Server, Multiple Client type or of the Multiple Server, Multiple Client (same PLC types) type. However, Designer allows the user to make slight modifications to the network parameters, by using the Network Configuration dialog shown in Figure 4. This dialog box is invoked by selecting again the Configure Network option from the Options menu. When the network type has already been selected selecting this option again will display the Network Configuration dialog box.

Similarly when the Multiple Servers, Multiple Clients (different PLC types) option is selected, the Designer will automatically display the Network Configuration dialog box to allow the user to explicitly enter all the parameters for the required network.

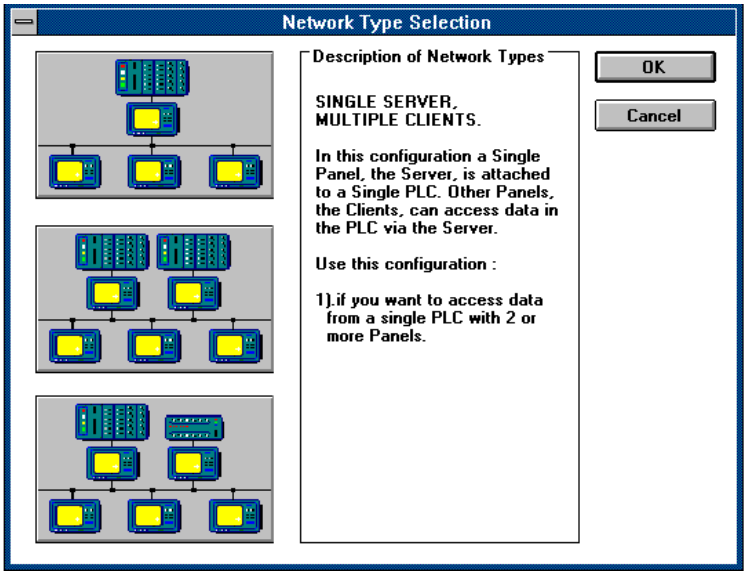

Figure 3

The main elements of the Network Configuration dialog box are as follows:

Maximum Node Number: this specifies the node number of the highest node that will be allowed to receive the network token. Nodes that have a node number higher than this value will not be able to communicate over the network. The Maximum Node Number should be set as low as possible to minimize the amount of time that will be required for the token rotation.

Panel Node: node number of the node being selected for configuration. It must be a number greater than 0 and smaller or equal to the Maximum Node Number.

Printout Node: node number be used for the network printout function. This feature is currently not available.

Comm Port for Network: selection of the Communications Port to be used for attaching the panel to the UniNET network. The Client panels MUST be configured to use the Printer Port; the Server panels should be configured to use the PLC Port. Currently the hardware does not support the Network Port; so this option is currently disabled.

Num Comm Retries: number of times a network message is retried in case of communication errors.

Comm Time Out: value of the time out interval used in the network communication

Panel Type - Network Client/Server: list of communication protocols available for the network configuration. During the configuration process all the Client panels must be assigned the 'Network Client' protocol, all of the Server panels must be assigned the protocol of the PLC they

are directly attached to. This list becomes active only when a valid node number is entered in the Panel Node field.

Configured Nodes: list of the already configured network nodes. Each node in the list is described by its node number, PLC protocol and version numbers of protocol and Designer DLL. Client panels are identified by the 'Network Client' protocol.

Add/Modify: click this button to add a new node to the list of configured nodes or to modify the parameters of an existing node. To modify an existing node you must first select the required node from the list of already configured nodes. The parameters for the configured node will then be displayed. When the data has been modified as required pressing Add/Modify will make the changes permanent.

Delete: click this button to remove an already configured node from the list of configured nodes. To delete a node from the list you must first select the required node from the list of already configured nodes.

Net Comm: pressing this button displays the dialog box for the configuration of the communication parameters for the UniNET network. In the current version, communication speeds up to 19200 baud are supported. To obtain the best results, the highest baud rate possible should be used.

Import: any UniNET network configuration may be saved to disk for later use or for sharing it between multiple project files designed for the same network. Click on the Import button to load an existing configuration from disk. The UniNET network configuration files have extension .NET.

Export: click on this button to save the existing network configuration to a disk file. The network configuration may the be loaded from disk with the Import button. The UniNET network configuration files have extension .NET.

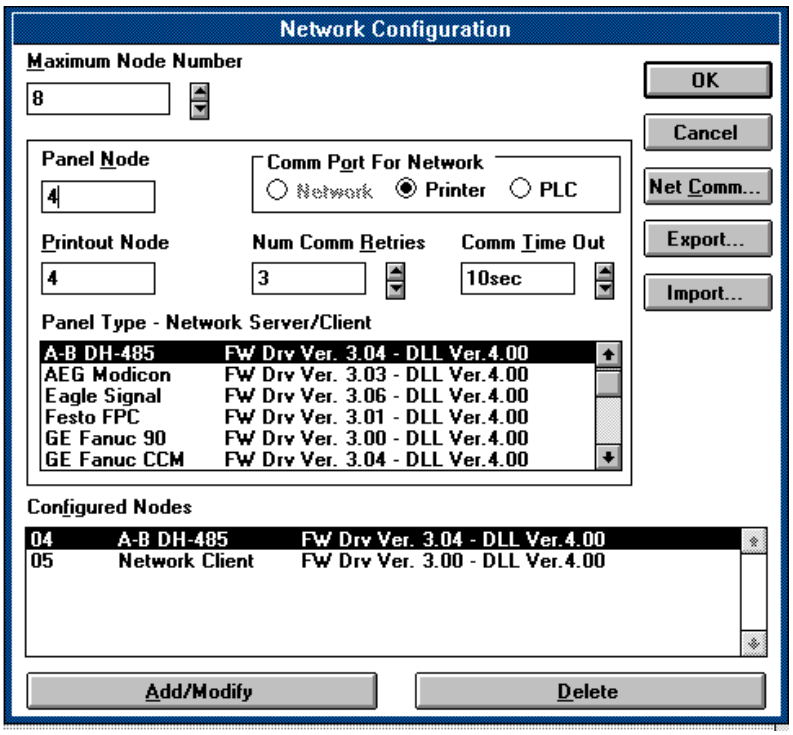
Network Configuration
Maximum Node Number
8
OK
Cancel
Net Comm...
Export...
Import...
Panel Node
4
Comm Port For Network
Network
Printer
PLC
Printout Node
4
Num Comm Retries
3
Comm Time Out
10sec
Panel Type - Network Server/Client
A-B DH-485 FW Drv Ver. 3.04 - DLL Ver.4.00
AEG Modicon FW Drv Ver. 3.03 - DLL Ver.4.00
Eagle Signal FW Drv Ver. 3.06 - DLL Ver.4.00
Festo FPC FW Drv Ver. 3.01 - DLL Ver.4.00
GE Fanuc 90 FW Drv Ver. 3.00 - DLL Ver.4.00
GE Fanuc CCM FW Drv Ver. 3.04 - DLL Ver.4.00
Configured Nodes
04 A-B DH-485 FW Drv Ver. 3.04 - DLL Ver.4.00
05 Network Client FW Drv Ver. 3.00 - DLL Ver.4.00
Add/Modify
Delete

Figure 4

The Panel Setup Dialog Box

Once a network configuration has been defined, you must assign a valid network node to the current project file. The Panel Setup dialog box includes the checkbox Enable UniNET Network. If the network is enabled by checking this checkbox the dialog will unfold to show the current list of all configured UniNET nodes. To assign a node number to the current project just select one item from the list.

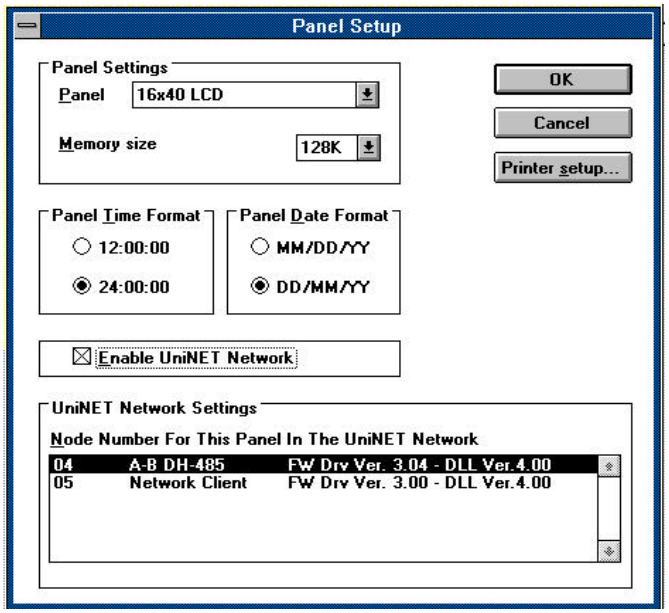

Figure 5

The Data Field Definition Dialog Box

When designing a project for a network application, the Data Field Definition dialog box is used to specify the addresses of the required data items in the same way as for non-network projects. The only difference is that if the network contains more than one Server then it is necessary not only to specify the address of the PLC data item but also to specify which PLC the data item is to be read from. This is specified by first selecting the node number of the panel that is attached to the PLC that contains the required data item. Then the Data Field Definition dialog box, specific to the PLC type, is used to specify the actual address of the data item within the PLC.

Depending on the type of network configuration selected, the Designer will operate as described below:

? Single Server, Multiple Clients

In this configuration, data can only be read from a single PLC, that attached to the single Server. In this case there is no need for Designer to prompt the user for the node number of the Server, as there is only one, and so there is no need to specify any additional addressing information.

? Multiple Servers, Multiple Clients (same PLC type):

In this configuration, data can be read from more than one PLC. Therefore it is necessary for Designer to prompt the user for the node number of the required panel before allowing the user to enter the address of the data item. Therefore, before showing the Data Field dialog, Designer will display the Node Selection dialog box which will display the list of available Servers. The user can select the required panel from this list. Doing so will then cause the Data Field Definition dialog box for that node to be displayed. Since the PLCs connected to the servers are all of the same type, the same Data Field Definition dialog will be shown regardless of the panel selected in the Node Selection dialog box.

? Multiple Servers, Multiple Clients (mixed PLC types):

In this configuration, data can be read from more than one PLC. Therefore it is necessary for Designer to prompt the user for the node number of the required panel before allowing the user to enter the address of the data item. Therefore, before showing the Data Field dialog, Designer will display the Node Selection dialog box which will display the list of available Servers. The user can select the required panel from this list. Doing so will then cause the Data Field Definition dialog box for that node to be displayed. Since the PLCs connected to the servers are of different types, the Data Field Definition dialog specific to the PLC type of the selected Server will be shown.

The Node Selection dialog box in the case of a mixed PLC network configuration is shown in Figure 6.

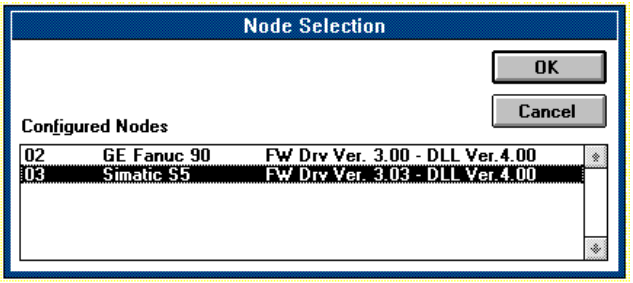

Figure 6

4. Setting-up the UniNET Network: A Quick Start Example

Most of the features of the UniNET Network can be tried by using a very simple configuration. This section will describe the steps required to set-up a UniNET network composed of a single Server operator panel connected to a PLC and two Client operator panels which will access the PLC data via the Server through the network services. The network configuration is shown in Figure 1.

***Note**: the complete system is composed of three operator panels; you will have to create an individual project file for each of them. All three project files must include the same network configuration information in order to enable the three panels to exchange*

information. To ensure that the project files contain the same network configuration information, you can define the network configuration once, in the first project file, and save the network configuration to disk by exporting the network configuration by selecting Export in the Network Configuration dialog box. When creating the other two project files you can then import the network configuration from disk by selecting Import in the Network Configuration dialog box.

? **Setting Up the Network Configuration**

i) Select 'New' from the File menu to clean up you workspace
ii) Select the Change Controller Driver option from the Project menu and choose the PLC type required for the Server
iii) Select the option Configure network from the Options menu
iv) Choose the first option 'Single Server, Multiple Clients' clicking on the topmost button and then selecting OK.
v) When the dialog 'Number of Clients/Servers' is shown enter 2 for the number of clients and click on OK to select a configuration with one Server and two Clients.

The network configuration is now completed. The Designer will automatically assign default values to Node Numbers and to all the other network parameters.

? **Creating the Project File for the Server**

vi) Select 'Panel Setup' from the Project menu
vii) Click on the 'Enable UniNET Network' checkbox, the dialog will unfold and show the network configuration with the list of existing nodes
viii) Choose the Node number 1 corresponding to the Server panel
ix) Create the first page of your application with some text and one data field with the Read/Write option enabled
x) Connect the Designer to the operator panel you have designated as the Server and download the project. When the transfer is complete, detach the cable from the PC/Printer port of the panel and connect the RS-232/RS-485 converter

? **Creating the Project File for the First Client**

xi) Repeat all the steps from i) to v)
xii) Select 'Panel Setup' from the Project menu
xiii) Click on the 'Enable UniNET Network' checkbox, the dialog will unfold and show the network configuration with the list of existing nodes
xiv) Choose the Node number 2 corresponding to the first client panel
xv) Create the first page of your application with some text and one data field with the Read/Write option enabled
xvi) Connect the Designer to the operator panel you have designated as the first Client and download the project. The panel must be attached to the network through its PLC port.

? **Creating the Project File for the Second Client**

xvii) Repeat all the steps from i) to v)

xviii) Select 'Panel Setup' from the Project menu

xix) Click on the 'Enable UniNET Network' checkbox, the dialog will unfold and show the network configuration with the list of existing nodes
xx) Choose the Node number 3 corresponding to the second Client panel
xxi) Create the first page of your application with some text and one data field with the Read/Write option enabled
xxii) Connect the Designer to the operator panel you have designated as the second Client and download the project. The panel must be attached to the network through its PLC port.

? **Running the Network**

Once all three panels are in Operation Mode, they should display the variable on the screen. In the case of the Client panels, the variable is read from the PLC after the Server receives a request from the Client to read the data.

xxiii) Verify that all three panels do not report any communication error.
xxiv) You may modify the variable itself using the Data Entry Mode. A change in the value of the data entered from any operator panel, will quickly be shown also by the other panels.

5. Advanced Network Programming

This chapter will introduce some more advanced network programming concepts.

Handling the Reserved Data Areas

The UniNET network fully supports the use of all the panel Reserved Data Areas (RDA) including Alarms and Mailboxes. These panel Reserved Data Areas can be placed in any PLC attached to any Server on the network. This is specially interesting since the RDA concepts offers a simple and efficient method to have the PLC program interact with the operator panel.
Note, however, that since most RDA activities are carried out on cyclical basis, even with a small number of nodes in the network, the result may be that most of the network traffic will be for the RDA updates. This may cause an excessively slow update time for the displayed variables.

Network and Recipes

Recipes may also be used in a UniNET network system. A single recipe may contain data items for different PLCs attached to different Servers on the network.

The following considerations should, however, be taken into account:

? recipe transfers may be considerably slower when they contain data items for PLCs attached to other Servers in the network than when they only contain data items for the PLC attached directly to the operator panel.

? the panels in the network can be configured so that they each store copies of the same recipe parameter set. In this case special care must be taken to ensure the consistency of the

parameter sets stored in the different nodes. It is recommended that in a network configuration only one node be assigned the storage of the recipe data.

6. Connecting Operator Panels to the Network

This chapter contains the information necessary for the installation of the UniNET network.

Pinout for the PLC Communications Port

Use the PLC Communications Port to connect Client panels to the network using a bus terminal unit.

***Note**: Panels to be used as Clients **must** have a PLC port with an RS-232/RS-485 interface*

Pin #	Description	Pin #	Description
1	Frame Ground	9	
2	RXD	10	RTS
3	TXD	11	CTS
4	+5V	12	
5	Signal Ground	13	
6	CHA-	14	CHA+
7	CHB-	15	CHB+
8			

Table 1

Pinout for the PC/Printer Communications Port

Use the PC/Printer Communications Port to connect Server panels to the network using a bus terminal unit with RS-232 to RS-485 converter.

Pin #	Description	Pin #	Description
1	Frame Ground	9	
2	RXD	10	RTS
3	TXD	11	CTS
4	+5V	12	
5	Signal Ground	13	
6		14	
7		15	
8			

Table 2

The TSI01 Bus Terminal with RS-232 to RS-485 Converter

The TSI01 Bus Terminal is a special module specially designed for use in the UniNET network. It is an optically isolated RS-232 to RS-485 converter that can be directly connected to the Printer port of an operator panel. The power supply is derived from the panel connector; an on-board isolated DC/DC converter provides the power for the RS-485 section of the converter.
The converter additionally provides the possibility of properly terminating the line with a simple switch.

The pinout of the RS-232 connector of the converter is shown in Table 3; the connector type is D-type 15 pin male.

Pin #	Description	Pin #	Description
1	Frame Ground	9	
2 3	RXD TXD	10 11	RTS
4	+5V external	12	
5	Signal Ground	13	
6		14	
7		15	
8			

Table 3

The pinout of the RS-485 terminal block of the converter is shown in Table 4.

Pin #	Description
1	Frame Ground
2	A (-)
3	B (+)
4	Shield

Table 4

The TSI02 Bus Terminal

The TSI02 Bus Terminal is a special module specially designed for use in the UniNET network. The use of the TSI02 Bus terminal makes it easier to wire a panel to the network and additionally provides the possibility of properly terminating the line by means of a switch.
The TSI02 has been designed for connection to the PLC port of an operator panel equipped with RS-485 interface.

The pinout of the RS-485 connector of the converter is shown in Table 5; the connector type is D-type 15 pin female.

Pin #	Description	Pin #	Description
1	Frame Ground	9	
2		10	
3		11	
4		12	
5	Signal Ground	13	
6	CHA-	14	CHA+
7		15	
8			

Table 5

The pinout of the RS-485 terminal block of the converter is shown in Table 6

Pin #	Description
1	Frame Ground
2	A (-)
3	B (+)
4	Shield

Table 6

RS-232 Cable to TSI01 Bus Terminal with Converter (Printer port)

Use the cable CA74 to connect the Printer port of a Server panel to the TSI01 Bus Terminal with converter.

The maximum length of the cable is 12m.

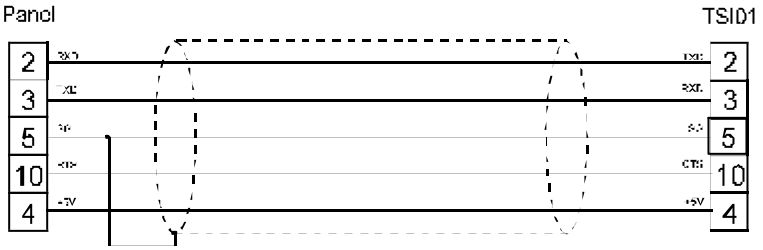

Figure 7

Panel connector: D-type 15P

TSI02 connector: D-type 15S

RS-232 Cable to TSI01 Bus Terminal with Converter (PLC port)

Use the cable CA73 to connect the PLC port of a Client panel to the TSI01 Bus Terminal with converter.

The maximum length of the cable is 12m.

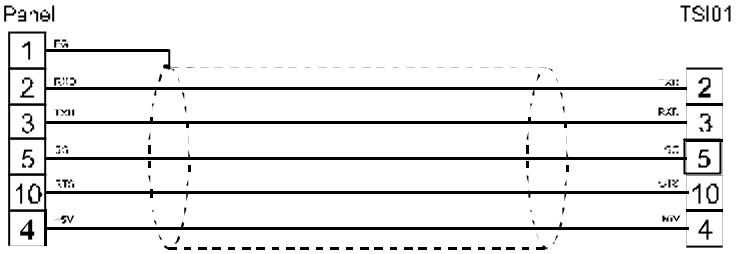

Figure 8

Panel connector: D-type 15S
TSI01 connector: D-type 15S

RS-485 Cable to TSI02 Bus Terminal

Use the cable CA75 to connect the PLC port of a Client panel to the TSI02 Bus Terminal.

The maximum length of the cable is 1 m.

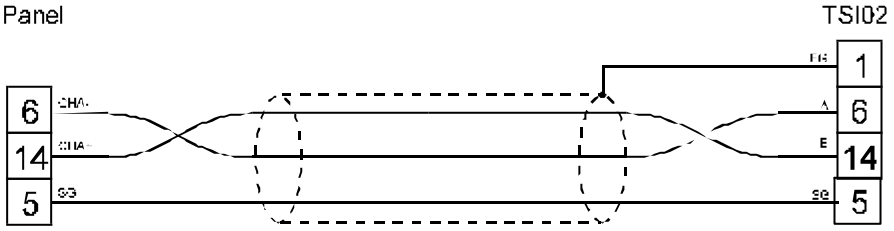

Figure 9

Panel connector: D-type 15S
TSI02 connector: D-type 15P

Installing the Network Cable

The UniNET communication cable consists of a number of cable segments daisy chained together connecting all the network nodes.

The total length of the cable segments cannot exceed 1200 m.

It is recommended to use a shielded cable with one twisted pair.

Note: *Only a daisy-chained network is recommended. For example a star-like connection is not recommended.*

The Bus Terminals at both ends of the networks must have the termination resistance connected with the switch. This connects the termination impedance (120 ohm) that is built in each Bus Terminal. Intermediate Bus Terminals must not have the termination connected.

Appendix A. UniNET Technical Description

The information in this appendix will help you understand the principles of operation of the UniNET network.

The UniNET network has been designed to pass information between UniOP panels operating on the plant floor.
The UniNET network features are the following:

? interconnection of up to 32 operator panels
? multi-master capability
? token-passing capability
? maximum network length of 1200 m

All operator panels connected to the network may initiate a message transfer. The network protocol uses a token passing algorithm to determine which initiator has the right to transmit. A node holding the token is allowed only one transmission each time it receives the token. After a node sends one message packet, it attempts to give the token to its successor by sending a 'token pass' message to its successor. If no network activity occurs the initiator will attempt to find a new successor.

The maximum node address that the initiator will search before wrapping to zero is the value of the configurable parameter 'Maximum Node Number' (see Network Configuration dialog box).

Technical assistance may be obtained :
In North America EXOR at 1-513-874-4665.
In Europe EXOR Italy at +39 045 - 8779068