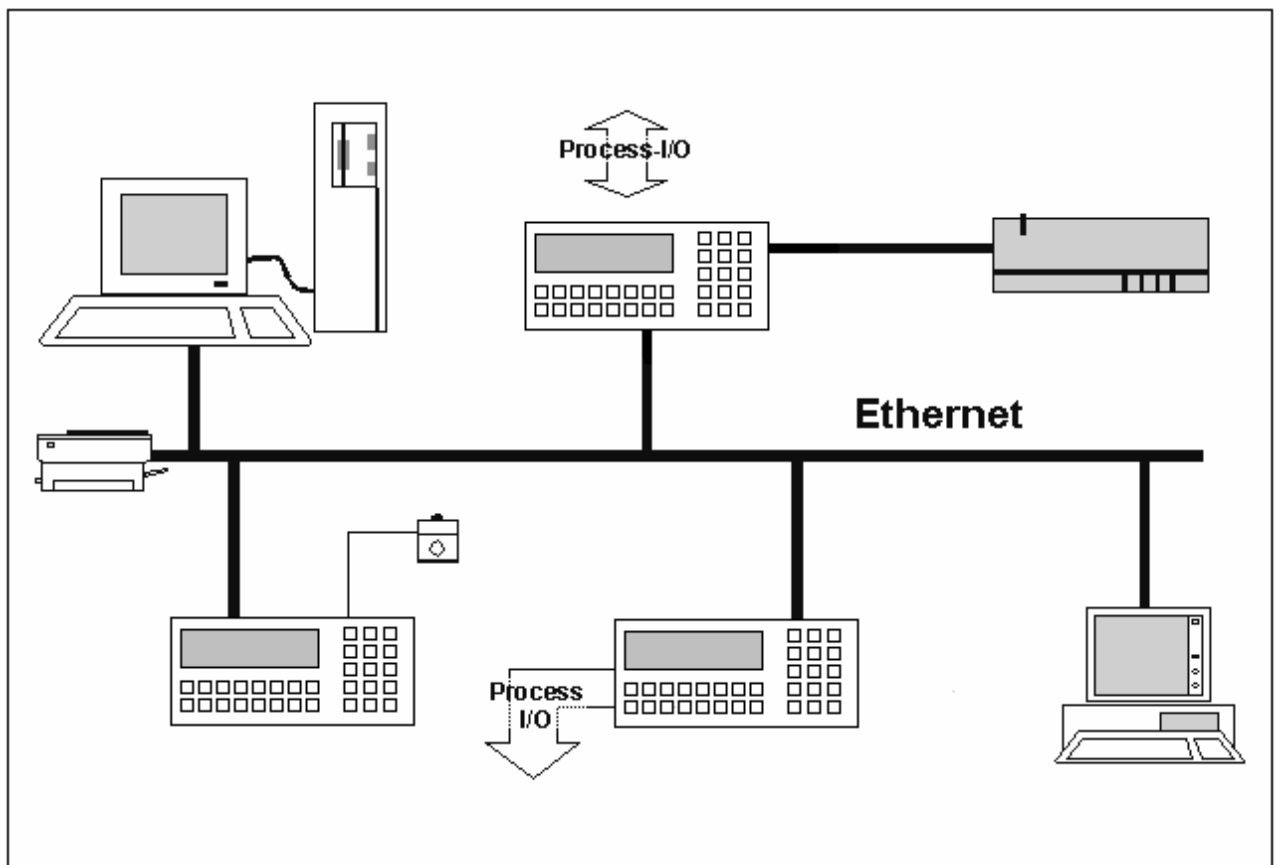


PR1713, X5, X6 - Weighing Controller Ethernet Interface

PR1713/14, PR1713/24

User Manual



User Manual

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For PR 1713, PR 5610/20

Release \geq 1.12

For PR 5710/20

Release \geq 1.12



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1 SAFETY INSTRUCTIONS



CAUTION !!!

Before you begin with any work of replacing or adding cards, components and hardware configuration, it is absolutely important to **disconnect the power supply** and any other source connections, also avoid electrostatic discharge. Otherwise, severe damage will happen to the vulnerable electrical and digital components and may cause the circuit irreparable.

- **Dismantling the instrument**

! Attention: Danger to life !

Note that capacitors may still be charged for a few seconds after the unit is disconnected from all voltage sources.

After finishing the work on the unit, don't forget to take away all the tools and loose parts.

- **Protection class**

The unit PR1713, PR5610 or PR5710 conforms to protection class I (protective earth) according to IEC 1010 and VDE 0411. When connected to a mains, the unit must be provided with a protective earth conductor, which allows no interruption in as well as outside the instrument (e.g. using an extension cable with no protective earth).

When connecting the unit to the mains, **ensure that the protective earth conductor is intact.**

1.1 Visual Inspection

Check the contents of the consignment for completeness and note whether any damage has occurred during transport. If the content is incomplete or damaged, a claim must be filed with the carrier immediately, and the Sartorius sales or service organisation must be informed to permit repair or replacement of the unit. After storage or transport, check the instrument, accessories and eventually, components packed externally for physical damage before commissioning.

1.2 Maintenance and Repair

A repair service is provided for the instruments sold by Sartorius Hamburg GmbH. In case of defect or malfunction, please contact your local Sartorius service organization for more detailed information.

- **Failure and excessive stress**

When safe operation becomes challenged, shut down the unit and protect it against accidental operation. It is the case, if

- the instrument is damaged,
- the instrument does not function any more,
- after a stressing of the instrument (e.g. storage, transport) for a period beyond the permissible limits.

Maintenance and repair are carried out only by trained and authorized personnel familiar with the implied hazards.

The construction of the unit must not be altered in such a way that the safety of instrument is challenged. Particularly, leakage paths, air gaps and insulation layers are not allowed to be reduced, and only original parts are used for the replacement.

- **Components are sensitive to electrostatic discharge**

The unit contains electrostatically sensitive components. Like all other procedures mentioned above, any changing or replacing work to these sensitive units or components must be performed by professional personnel or the local Sartorius service organization only, and also at such a workstation that provides appropriate protection against electrostatic discharging.

2 GENERAL

2.1 Questions to Ethernet

■ What can be done with Ethernet?

Ethernet has been long widely accepted computer communication network. It takes the job of data exchange, allows the hosts connected with the network to make data query or delivery. Just for the same principles, the Ethernet card enables the weighing controller (PR1713, PR5610, PR5710) to communicate with other nodes, which is designed to make multi-process control possible.

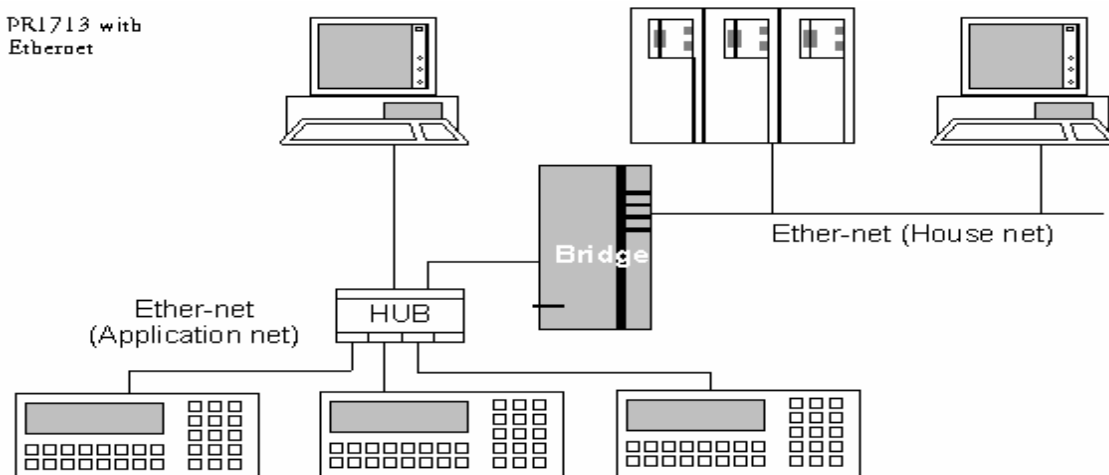
■ Why and when to use the Ethernet card in your unit?


Data exchange is the basis of automation processes. With the Ethernet card, the weighing controller units are enabled to communicate with each other as well as with computers. Once programmed, or in use with PR1740, the multi-tasked weighing controller take their own respective control processes, with other word, synchronize the complicated control processes to achieve optimal production efficiency. Through Ethernet these weighing controller along are fully capable of controlling the largely inter linked processes with or without additional computers.

When the application and control processes become large and complicated, and so far that beyond the capability of a single control unit, so the introduction of Ethernet into your weighing controller will be very necessary and sophisticated. It is a solution to multi-process controls.

■ How does it function?

The Ethernet protocol operates in a Master – Master mode. There is no leading communication master. Telegrams sent by one node or host could be read by any others.



However, the transmitted telegram consists of data frame which concludes the address code of its destination in its head area, and therefore is only accepted by those nodes whose Ethernet card address matches the address code concluded in the head of data frame. Each node sends its data spontaneous onto the bus. An eventually simultaneous bus access causes collision. However, such collision is prohibited by detecting the communication traffics on the bus, waiting for a specific time and trying again. Such actions are taken periodically until no data traffic is detected. There is also a broadcasting address that indicates the telegrams to be received by all hosts on the local network. See  chapter 4.2 'Ethernet configuration'.

A 10 MBit Ethernet is used by the PR1713/14 -/24, and is intentionally isolated from the normal computer network because of the characteristics of Ethernet protocols in order to keep the application free from an eventually heavily occupied network, and thereafter, an application based on data exchange is guaranteed.

For further information, Ethernet is defined in IEEE 802.3.

■ Application

Application: typical for transmission of large quantities of data with high throughput.

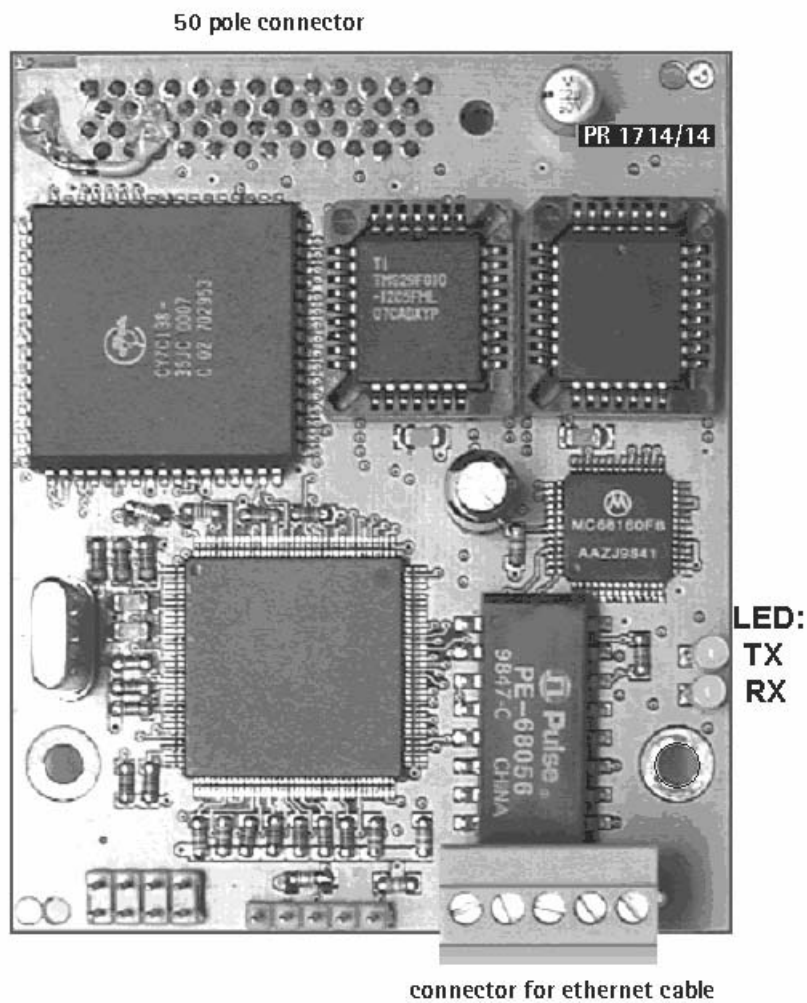
Applicable for the following Sartorius products in specific Sartorius applications :

- PR 1740 recipe manager or PR 8400 ProBatch,
- PR 1750 development tool,
- PR 1791 DDE server, PR 1792 OPC server as "PC communication"
- PR 8001 Powertools (DisplayIt, AccessIt, FlashIt*)
- PR 1713 / 5610 / 5710 instrument cross communication

2.2 Hardware Description of the Ethernet Card

2.2.1 Description

The Ethernet card is a module of I/O interface that is designed and configured to enable communication of the weighing controller among each other. The connection to Ethernet is made via a shielded cable (within the delivery); on one end there is a standard RJ45- connector, the other end has to be mounted via cable- gland to the screw terminals of the weighing controller.



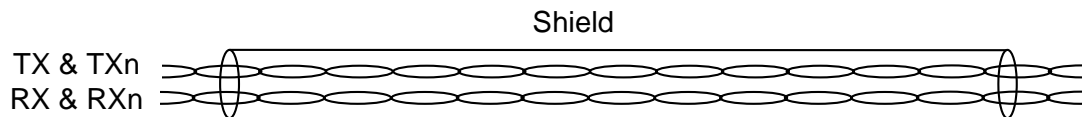
14ETH01

2.2.2 Accessories

■ Ethernet cable

- Specifications

The PR1713/14, -/24 uses a 10 MBit Ethernet. It is recommended to use the conventional Ethernet cable only! For more information about Ethernet cable see table below.



Properties of 10 MBit Ethernet transmission median

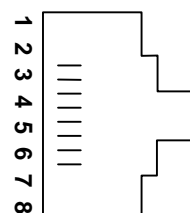
Parameter	STP
Transmission medium	Two shielded twisted pairs
Diameter	
Bending radius	
Shielding	Common
Cable type	
Max. segment length	100 m
Max. number of nodes each segment	2
Distance between two nodes	-
Coupling	Point to point connection
Connection plug	RJ-45
Norm of data rate	10 MBit
Cable impedance	150 Ω
Load	150 Ω
Max. delay of signals	
Link integrity test	yes

- Cable length

From the weighing controller to a HUB the maximum cable length is 30m.

■ Connection

For connection, only the RJ-45 is used. RJ-45



3 INSTALLATION

3.1 Mounting Card and Cable

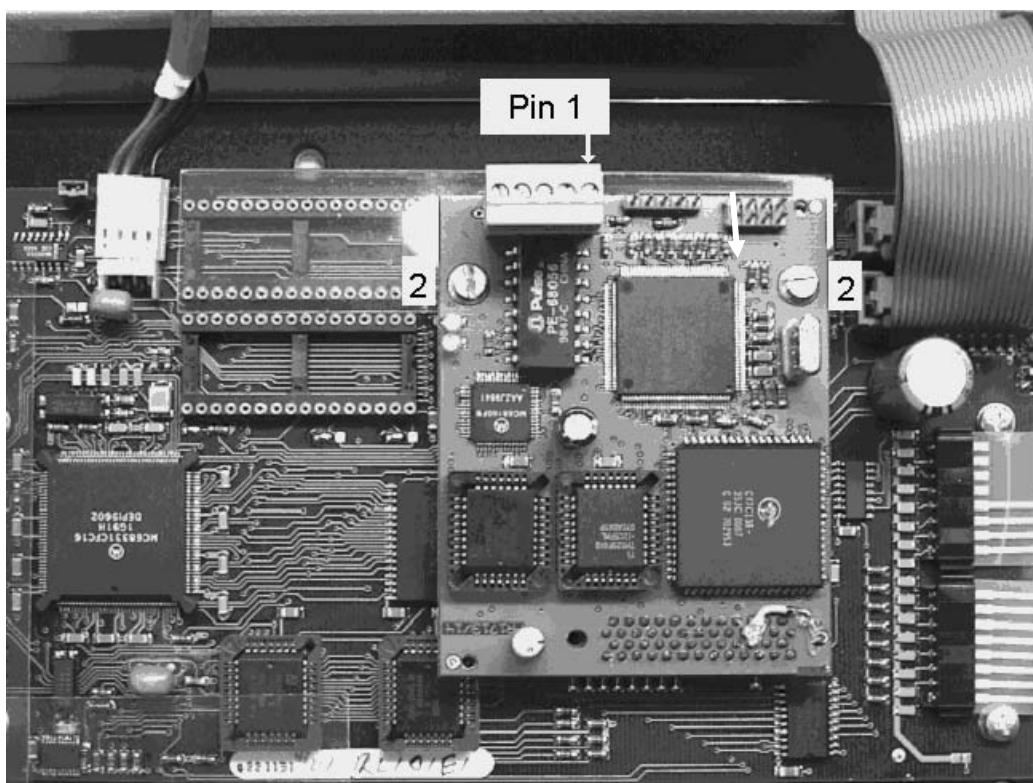
CAUTION!!!

Disconnect all power and source supplies before you begin mounting the card!

Follow the SAFETY INSTRUCTIONS in chapter1.

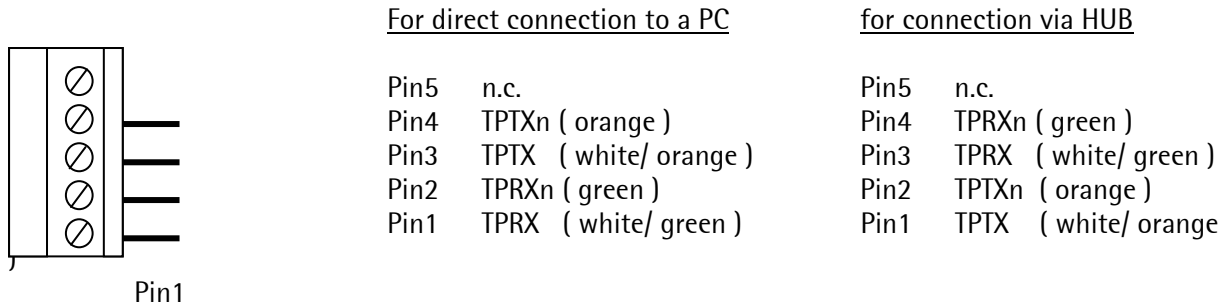
The position for the Ethernetcard PR1713/14, -/24 in the weighing controller is on slot4 (print2).

Therefore remove the two screws (2), plug in the card to the 50pol. connector and fix it together with the plastic cover (1) with the screws.



14ETH02

Then open one of the two 9- blind plates at the rear of the weighing controller and screw in the delivered cable with the open stripes into the housing. Fix the cable gland and connect the 5pol. screw terminal as follows:



Pin allocation according to ISO/IEC 11801
EN 50173
EIA/TIA 568 A and B

"Direct" connection: PR 5610<-1-> PR5610 or PC (=> -1- „crossover" cable type)

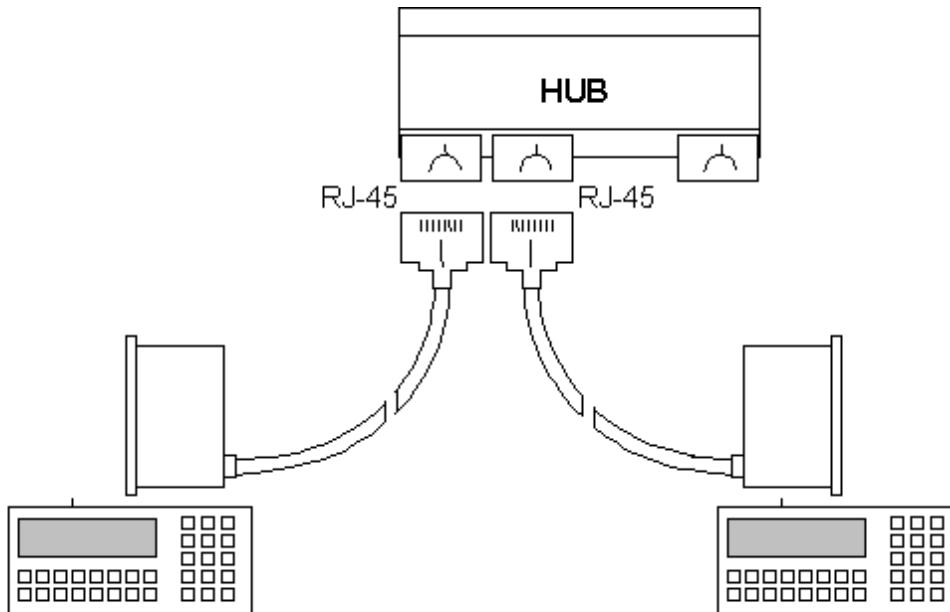
„crossover"	RJ 45	Signal	Pair	Conductor colour	Signal	PR5610
EIA/TIA 568 A	1	1a - TPTX	2	white/orange or red	2a - TPRX	3
	2	1b - TPTXn	2	orange or orange	2b - TPRXn	4
	3	2a - TPRX	3	White/green or black	1a - TPTX	1
	4		1	blue or white		
	5		1	White/blue or blue		
	6	2b - TPRXn	3	green or green	1b - TPTXn	2
	7		4	White/brown or yellow		
	8		4	brown or brown		

"Indirect" connection : PR 5610<-1-> HUB etc. <-2-> PC (=> -1,2- "straight-through" cable type)

"straight-through"	RJ 45	Signal	Pair	Conductor colour	Signal	PR5610
EIA/TIA 568 B	1	1a - TPTX	2	white/orange or red	1a - TPTX	1
	2	1b - TPTXn	2	orange or orange	1b - TPTXn	2
	3	2a - TPRX	3	white/green or black	2a - TPRX	3
	4		1	blue or white		
	5		1	white/blue or blue		
	6	2b - TPRXn	3	green or green	2b - TPRXn	4
	7		4	white/brown or yellow		
	8		4	brown or brown		

3.2 Connection Diagram

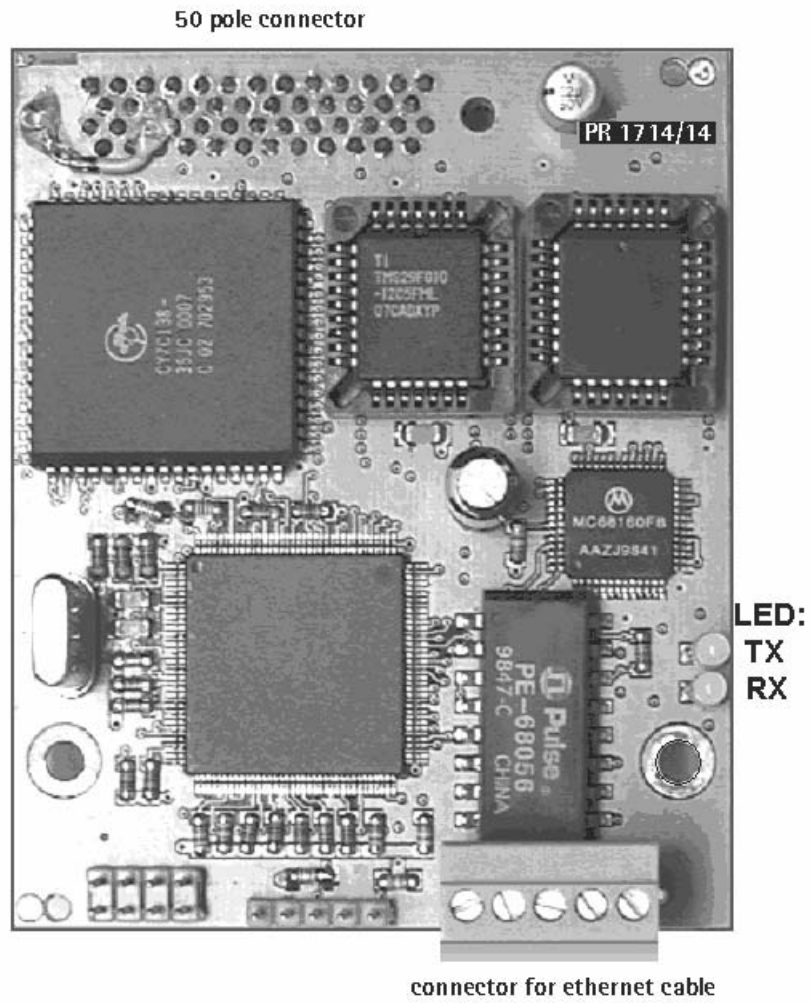
Connecting two or more weighing controller and PCs over Ethernet is via an HUB. It is recommended that the length of cable from the weighing controller to the HUB be not beyond 30m.



3.3 LED Indicators

On the upside of the Ethernet card are two LEDs as shown in the photo. They have the following meanings.

- **Ethernet RX indicator**
Receiving indicator. This LED blinks whenever the PR 1713/14, /24 is receiving data from the Ethernet.
- **Ethernet TX indicator**
Transmission indicator. This LED blinks whenever the PR 1713/14, /24 is transmitting data onto the Ethernet.



14ETH01

4 SOFTWARE CONFIGURATION

4.1 Compatible Software Version

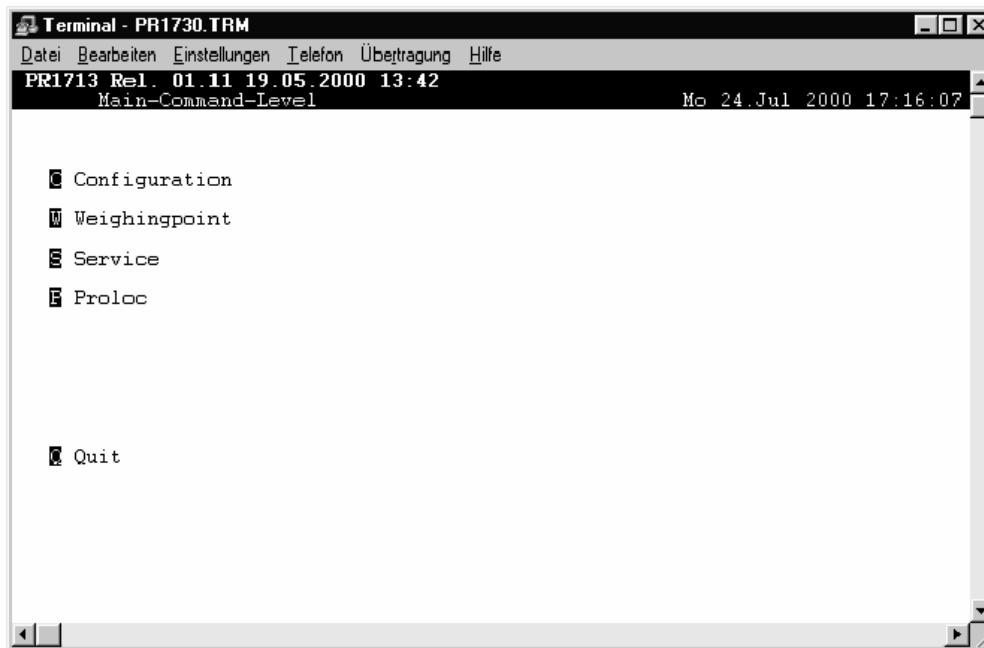
A weighing controller with Ethernet card goes with the following software version

- PR1740 Recipe and production control \geq software version 4.3
- PR1791 DDE Server for PC \geq software version 8,1,0,4
- PR1750 Programming tool \geq software version 1.62 SP1

4.2 Ethernet Configuration via Terminal

To get the Ethernet configuration menu page, take the following steps:

- Run the terminal emulation program (HyperTerminal) on a PC that is connected to the weighing controller via an ordinary SERIAL I/O interface, normally the built in. The main menu page '*Main-Command-Level*' is shown as following:



14ETH03

- To select the submenu '*Configuration*', simply press the key [C] during the main menu screen session of terminal program. The menu of Configuration is shown as following:

```

Terminal - PR1730.TRM
Datei Bearbeiten Einstellungen Telefon Übertragung Hilfe
PR1713 Rel. 01.11.19.05.2000 13:42
Configuration Mo 24. Jul 2000 17:18:02

[ ] Set date
[ ] Set time
[ ] Change serial I/O parameter
[ ] Add, delete, show license
[ ] Set software configuration
[ ] Set units
[ ] Configure the Networkparameter

[ ] Print all configuration data
[ ] Exit

```

14ETH04

- To call up the menu page of '*Network Configuration*', simply press the key [N] on submenu page '*Configuration*'. The menu page relating to the Ethernet configuration has the following features:

```

Terminal - PR1730.TRM
Datei Bearbeiten Einstellungen Telefon Übertragung Hilfe
PR1713 Rel. 01.11.19.05.2000 13:42
Network Configuration

IP address      : 10.10.2.228
Subnet mask     : 255.255.254.0
Default gateway : 0.0.0.0
Multicast address : 224.3.0.9
Device address  : 0

+ next parameter Return change parameter
- prev parameter [E] exit

```

14ETH05

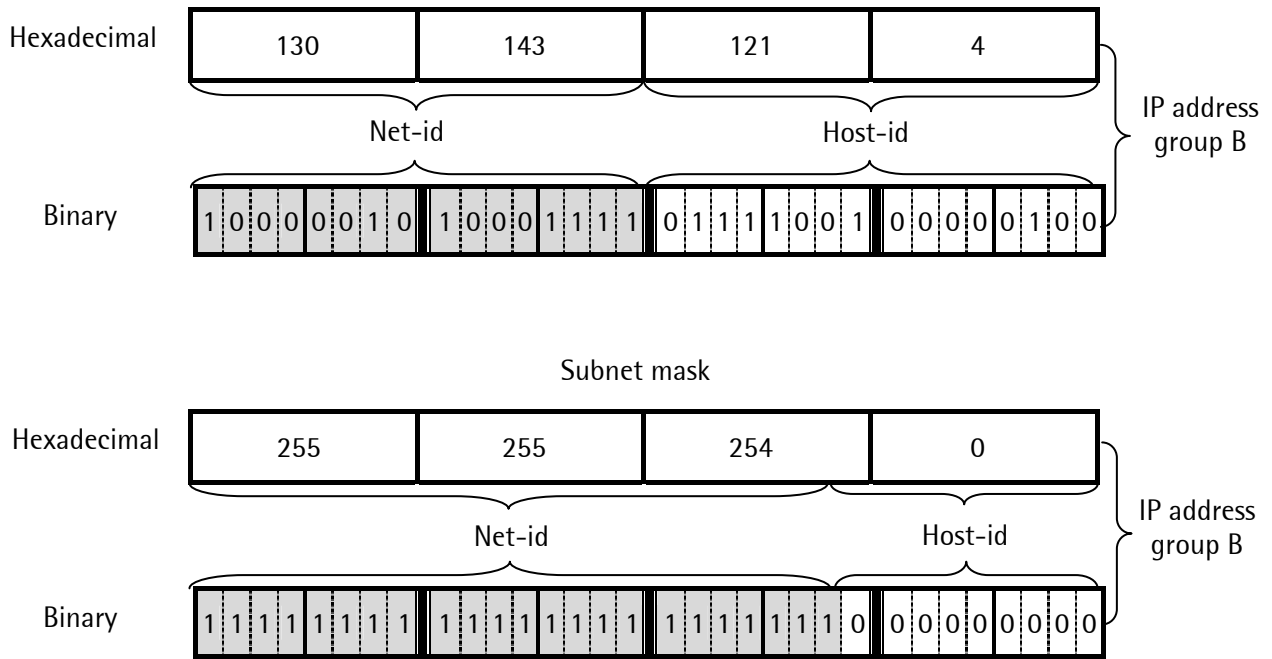
To return to the main menu, select '*Exit*' by pressing key [E].

To change parameter, select with cursor keys and press '*Enter*' to edit.

IP address Set IP address

This address is assigned by the local network administrator

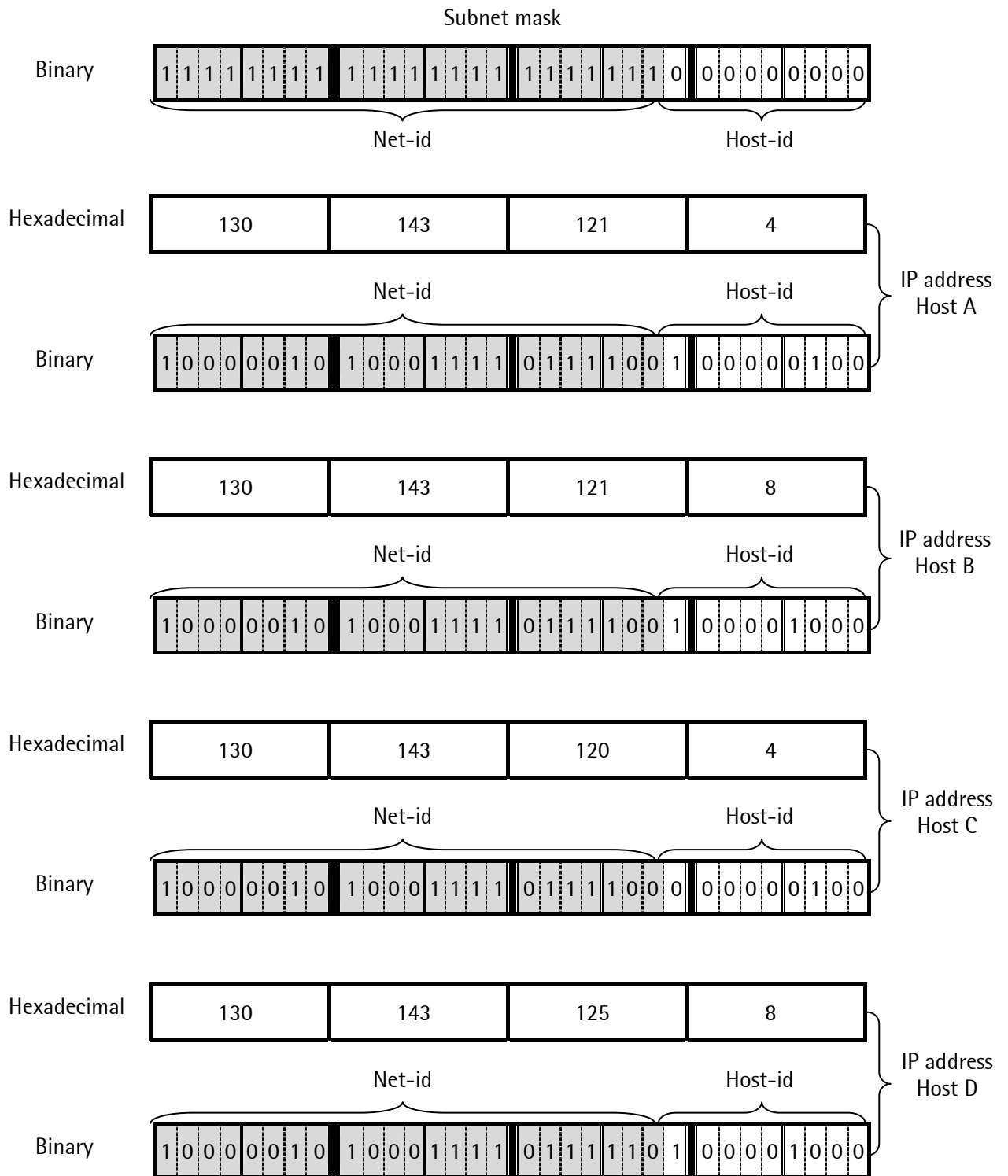
IP (Internet Protocol) address is an address of a host or a station on the network. Only this host or station whose address matches the destination address of a telegram accepts the data, therefore, this address must be unique on the local net, as well as unique to the world wide net if this local net is routed to internet. For purpose of the weighing controller application, the net that the controller are connected to should not open to the public net. It is kept local. The address consists of net-id and host-id. Only the hosts with the same net-id extended with a subnet mask, if there is one, can communicate each other without routing. Note: Subnet is introduced intentionally to turn a part of host-id bits into net-id bits for a local network management.



For the example above, the IP address belongs to group B with the subnet mask '255.255.254.0', so the host with the IP address '130.143.121.4' can communicate with the one that has the address '130.143.121.8', but not with '130.143.125.8', because they are not visible to each other. This IP address is to be assigned by your local network administrator. A general principle should simplify the explanation, that the bits pattern of IP address must be over all identical on that area where the subnet mask is presented with '1' in order to make the correspondent hosts capable of communicating among each other without routing.

If the IP address starts with the Net-id '192.168.aaa.bbb', it is reserved for local networks and will never be routed to global addresses. The Host-id is defined with 0 ... 254 for 'aaa' and 1 ... 254 for 'bbb'.

It is easier to recognize the identity of the IP addresses if we write them in binary form, see following demonstration:



Host A, Host B, and Host C can communicate each other but not Host D without routing.

Note:

The subnet mask is organized by the local network, while the IP address is managed by the international organization.

Subnet mask Set the subnet mask

To get this id mask, ask your administrator if you are not sure what subnet mask your local network has.

Default gateway Set the address of the routing host 0.0.0.0

The routing host houses more than one cards, and consequently more than one IP addresses. The one that is visible in the local network is the address called default gateway. If no host matches the destination address of the telegram, it will go to the routing host. The router delivers telegrams to the public net as well as from the public net to the local net.

Here, the default gateway must be '0.0.0.0', because there is no need to make the weighing controller capable of communication with the public net, at least up to now.

Multicast address Set the address for multicasting

This is the address identical for all hosts on the local net. Telegrams with multicast address can be received by all hosts on the local net.

To get this address, ask your network administrator if you are not sure what a multicast address your local net is using.

Device address Assign the weighing controller a device number

(Use these parameter, if application needs data exchange between two or more devices.)

There are maximum 9 addresses incremented from 0 to 8 available for assigning.

- '0' is the device address indicating that this unit is incapable of transmitting telegram, it can only receive.
- '1' to '8' are the device addresses indicating that these units can both transmit and receive.

Note:

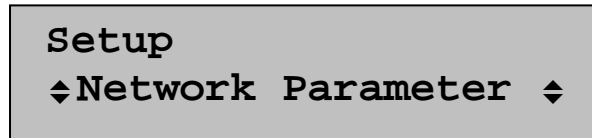
This address must be kept unique on the communication group. If an address is used by 2 or more unit's, an error message appears on the display showing `<nEtConf>`. So be sure that no identical address has been entered for the weighing controller on the network.

Exit Terminate the configuration program and quit

The parameters are stored into the internal EAROM.

4.3 Ethernet Configuration via Frontpanel

The same settings for ethernet as described in 4.2 can also be made directly at the weighing controller. In the setup menu you will find the following:



With " ENTER" you can specify all relevant parameters, as they are

- IP- Address
- Subnet- mask
- Default gateway
- Multicast address and
- Device address.

4.4 Test

After the Ethernet card has been installed into a PR1713, PR 5610 or PR 5710, and assigned an IP address, a correct connection of the weighing controller to the Ethernet can be tested via a PC. This PC, however, must have an Ethernet card and is linked to the net. To test, take the following steps:

- Open a DOS window
- Enter the 'Ping' command followed by the IP address of the weighing controller. For more information about IP addressing, see previous chapter 'Ethernet configuration'
- If the weighing controller answers, the PC will get information replied. It means that the Ethernet of controller works, see following example:

```
C:> Ping 130.143.121.4
Pinging 130.143.121.4 with 32 bytes of data:
Reply from 130.143.121.4: bytes=32 time=9mS TTL=250
```

4.5 Configuration in PR1740 – Recipe and Production Control

An appropriate change of configuration must be made in 'Batching Device' of PR1740-Recipe and production control in order to make the PR1740 capable of using the Ethernet in the weighing controller.

Make following changes on page 'Batching Device' as shown below:

The screenshot shows the 'Batching Device' configuration interface. The 'ComPort' is set to 'Network'. The 'Select Device' table is as follows:

ID	Device Name
1	PR1713-A
2	PR1730-B

The 'Edit Parameter' section shows the following values:

- Name: PR1713
- Type: PR1713
- IP Address: 130, 141, 121, 4

14ETH06

- In Combo Box 'ComPort', select 'Network'.
- Type the IP address of the selected weighing controller that is to be used by the PR1740 in the application, into the edit box of 'IP Address'.

Note:

For each weighing controller used by the PR1740 in the application, a correspondent IP address has to be typed into that edit box. **This address is assigned by the local network administrator.**

4.6 Configuration in PR1791 – DDE Server

An appropriate change of configuration must be made in 'Topic Configuration' of PR1791 DDE Server in order to make the PR1791 capable of using the Ethernet in the weighing controller. Overtyping the field 'Port:' with the IP address for the device of which you need DDE data. **This address is assigned by the local network administrator.**

Make following changes on page 'Topic Configuration' as shown below:

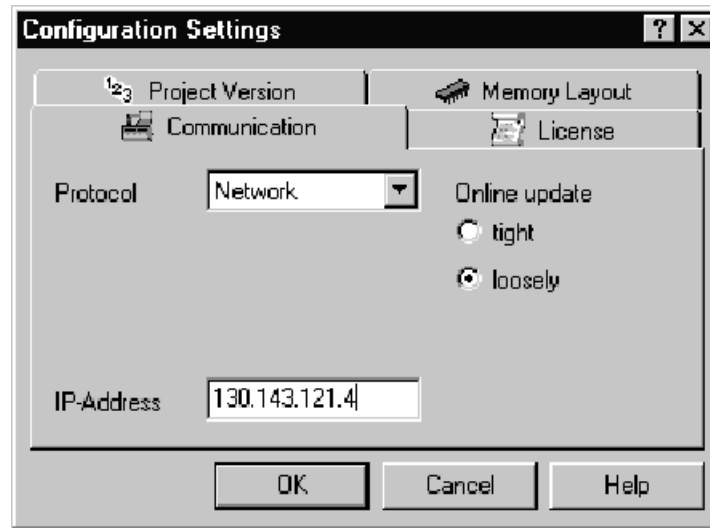
14ETH07

The above shown screenshot is only an example, please fill out the fields as required. The information in 'Slave address' and 'Baud Rate' is not relevant for Ethernet and can be ignored. In your DDE application you can access data as described in the PR1791 documentation.

4.7 Configuration in PR1750 – Programming Tool

An appropriate change of configuration must be made in the Configuration setup of PR1750 in order to make the PR1750 capable of using the Ethernet in the weighing controller.

Make following changes on page Configuration settings as shown below:



5 APPLICATION REFERENCE

5.1 Read Weight from Ethernet Stations (Hosts)

Variables and SPM bit fields could be defined for continuous data exchange over the Ethernet. The maximum length defined in the weighing controller is 64 bytes. The maximum number of devices involved in data exchange is limited of 8 for one group. The multicast address must be assigned identical to all the stations (hosts) on this net, but different device address. **The device number must be kept unique** – see 'Ethernet configuration'.

The weighing controller exchange their data every internal PLC cycle.

The minimum cycle time for a PLC-Task must be 50 msec.

A device who wants to write data to the network, must use his own device number as output address:

4. <dev>. X : 4= fixed slot number, <dev>= device address, X= 0...n (address of datatype)

Declaring network variables

Output:

```
Weight_aAT %QD 4.1.0 : DINT;
```

=> Device1 writes a DINT to the network.

```
Input_count AT %IW 4.2.2 : WORD;
```

⇒ Read the 3. word from the 2. device.

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