

12.2 Data Communication Via The Ethernet Interface

Due to the connection of the checkweigher to the intranet, several possibilities are now available for transmitting data to the checkweigher via the intranet or for requesting data from the checkweigher via the intranet.

There are some pre-defined applications that use the Ethernet port – above all, Freeweigh. Net, HI-SPEED LogInServer and HI-SPEED CW-ReAcT//. For these applications, certain parameters must be entered at the checkweigher only once. For applications which mean that the delivered data must be further processed, for example weight data or GARECO.Net, the general operation principle of data transmission by means of Ethernet and TCP/IP must have been understood.

12.2.1 Basics of TCP/IP

Already in the 1960s, the American military placed an order to create a protocol that should allow for a standardized communication, irrespective of the hardware and software used, between any number of different networks. From this requirement specification, the protocol TCP/IP arose in the year 1974. Even though TCP and IPS are always mentioned together in one word, they are two protocols one of which works on top of the other. The Internet Protocol IP ensures the right addressing technique and delivery of the data packets while the Transport Control Protocol TCP which is on top of it is responsible for the transfer and protection of the data.

IP addresses

Under IP each network subscriber has an unique internet address, which is often referred to as "IP number". This internet address is a 32-bit value that is always transmitted by four decimal numbers separated by decimal points (8-bit values) for better legibility (dot notation). The internet address consists of Net ID and Host ID, with the Net ID serving for addressing of the network and the Host ID serving for the addressing of the network subscriber within a network.

The network administrator is free to choose the assignment of the Host ID to the network subscriber and thus the resulting IP address. Ensure that an IP address will be assigned only one at a time.

TCP/IP Ethernet

TCP/IP is a purely logical protocol and always requires a physical basis. Today, Ethernet has the biggest popularity among the physical network topologies, and so one finds Ethernet as physical basis in most TCP/IP networks.

TCP – Transport Control Protocol

As IP is an unsecured, connectionless protocol, it normally works together with the TCP on top of it, the latter ensuring the protection and the handling of the useful data. TCP establishes a connection between two Network subscribers for the duration of the data transmission. During the establishing of the connection, conditions will be determined – for example the size of the data packets – which are applied to the connection during the entire connection duration. One can compare TCP with a telephone connection as an example. Subscriber A dials to subscriber B; subscriber B accepts the connection by picking up the handset, the connection then remains until one of the two subscribers finishes it by hanging up.

TCP works according to the client-server principle:

The network subscriber who builds a connection (i. e. the subscriber who takes the initiative) is called "the client". The client makes use of a service offered by the server, with – depending on the service – one server being capable of serving several clients simultaneously. The network subscriber to which the connection is made is called "the server". A server does nothing actively but waits for a client to establish a connection to it. In TCP context, these two are referred to as TCP client and TCP server.

Establishing and cancelling of a TCP connection

TCP has fixed mechanisms for establishing a connection between client and server. Among others, the establishing of a connection is used to synchronize both subscribers in accordance with the data flow to be transferred, and to exchange transfer parameters such as the package length and receive-memory capacity.

Flow controls

TCP has several mechanisms to ensure the certain and efficient transfer of data:

- The sender must maintain all data i.e. keep them available until they are confirmed (acknowledged) by the recipient.
- In case of faulty packages, for example data packages with a wrong checksum, the recipient returns the last acknowledgement number to the sender, whereupon the sender repeats the data package.
- In case of lost packages the sender repeats all packages, after a timeout has ended, after the acknowledgement received last.

Port numbers

TCP also forwards the useful data on the target computer to the right user program, by contacting different user programs – also referred to as "services" – via different port numbers. All port numbers from 0 to 1023 are occupied by standardized services.

The following table shows a selection of the most popular applications.

Port	Name	Application/Service
21	FTP	File Transfer
23	TELNET	Terminal over Network
25	SMTP	Simple Mail Transfer
53	DOMAIN	Domain Name Service
80	HTTP	Hypertext Transfer
115	SFTP	Simple File Transfer

12.3 Configuration Of The Checkweigher

In order to set up the checkweigher as a subscriber in the network, the entry of the IP address is necessary first. The IP address must be, as already explained above, be unambiguous within the intranet. Also the sub-net entry screen must be set to that value which is valid for your network. These two values are of extreme importance for the correct function of the checkweigher in the network. The values should always be determined by the network administrator, the settings shown in the figure below represent only an example!

Network				
IP address	172	27	169	250
Subnet mask	255	255	254	0
Gateway	172	16	0	1
Listening on port:	23			

The checkweigher optionally has the possibilities to send the weight data of the weighed products and to answer instructions from the remote control protocol GARECO. Only if one of these two options is active on the checkweigher, a TCP/IP connection can be made from a TCP client to the checkweigher. If none of these two options is active, the TCP-server is not started on the checkweigher and the network services are not available.

When the TCP server is started, it waits on that port which was entered in "Connect on port:" for connection inquiries/requests from TCP clients. Any desired value can be entered. However, be aware that all values which are less than 1023 may cause conflicts with standard network services. The value 23 is preset and "harmless" since the standard service "Telnet" is based upon this port number. With Telnet you can try out the options without having to write extra, own programs.

Wait 10 seconds – then restarting the checkweigher.



Note: After changing the values of "IP address", "Sub-net entry screen" and "Connect on port" you must restart the checkweigher!

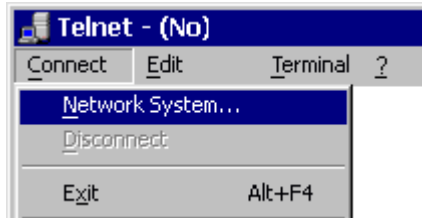
	CAUTION
	<p>Wait 10 seconds before switching ON again.</p> <p>Possible damage to sensitive electronic components if the waiting time of 10 seconds is not observed.</p>

You can try out the options "weight data" and "GARECO" with the service program Telnet without having to write your own programs.

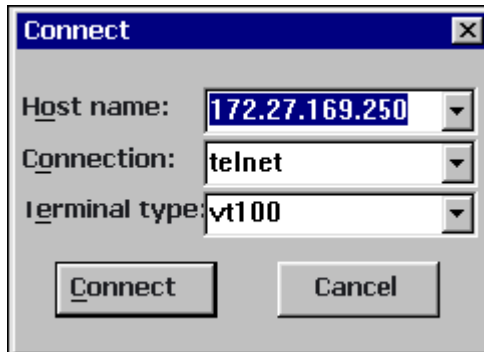
12.4 Test With TelNet

Telnet is a kind of text window i.e. text-oriented program, by use of which it is possible for a user to remote-control another processor (host computer) in the network. All modern operating systems incorporate a Telnet client program nowadays. The Telnet client establishes a TCP connection to a Telnet server, accepts keyboard entries from the user, forwards them to the Telnet server and visualizes the characters sent by the server on the screen.

Start Telnet (usually: C:\WINDOWS\TELNET.EXE) and select the menu item "network system".



You first require the IP address of the checkweigher. Enter the address in the field "host name" in the connection dialog of Telnet. Since the application Telnet uses an internationally standardized connection port, you must enter the value 23 at the checkweigher in "Connect on port".



The action "Connect" now tries to establish a connection via the network to the checkweigher. If this is successful, the message "Accept: xxx. xxx. xxx. xxx " appears on the checkweigher, with the indication of the IP address of the PC. Furthermore Telnet opens an entry window where you can enter character strings now. Telnet immediately transfers each character entered to the server (i.e. the checkweigher), so that there is no correction possibility in the case of typing errors. Use the Telnet help function, for example, in order to activate the local echo. Now you have the required conditions which enable you to test GARECO.NET instructions or to start the transmission of weight data.

12.5 Receiving Weight Data Via TCP

Procedure

1. Establishing the connection.
2. Determining the protocol type – if deviating from the standard setting.
3. Determining the protocol format – if deviating from the standard setting.
4. Starting the transmission.
5. Stopping the transmission.
6. Testing the connection.

(SPACE) = Blanks, ASCII-HEX 20h

(CR)(LF) = Carriage Return, LineFeed (ASCII-HEX 0Dh 0Ah); with Telnet: "Enter" key

Establishing The Connection

1. Establish the connection.

Determining The Protocol Type

The protocol type determines which kind of weight value from the checkweigher shall be transferred. There are 4 different protocol types at your choice.

2. Transmit the string "WD_SET_PROT(SPACE)X(CR)(LF)", with X being a value from the following list:

X	Type of Protocol
2	Transmission of the current weight value (standard)
3	Transmission of the current weight value, with a transmission taking place only for "not rejected" products
4	Transmission of the gliding "mean value" after each weighing. This is the value that is also shown in the left speedometer (tacho gauge) of the basic screen.
5	Transmission of the mean value of the last "n" products, with "n" being user-entered at the weighing terminal of the checkweigher. A transmission will take place only every "n" product.



Note: You need to determine the protocol type only in cases where it deviates from the standard setting X=2!

Determining The Protocol Format

Moreover, four different protocol formats are at your choice. After having determined the "what" now here is the determination of "how", with regard to the transmission. The protocol format determines the pattern of the character string in which the weight data will be sent.

3. Transmit the string "**WD_SET_FORMAT**(SPACE)**X**(CR)(LF)", with X being a value from the following list:

X	Protocol Format	Total number of characters
1	(STX); 10 characters package name; 7 characters weight value; 3 characters weight unit; (ETX)	22
2	(STX); 7 characters weight value; 3 characters weight unit; (ETX)	12
3	10 characters package name; 7 characters weight value; 3 characters weight unit; (CR)(LF)	22
4	7 characters weight value; 3 characters weight unit; (CR)(LF) (standard)	12

Note: You need to determine the protocol format only in cases where it deviates from the standard setting X=4!

Starting the transmission

4. Transmit the string "**WD_START**(CR)(LF)".

From now on, for each product that follows now, the transmission will be performed based upon the set (entered) type and format.

Stopping the transmission

5. Transmit the string "**WD_STOP**(CR)(LF)".

The transmission is stopped.

Testing the transmission

A peculiarity of a TCP connection between TCP server and TCP client is the fact that the client cannot determine automatically whether the server has perhaps cancelled the connection. For this reason the client can test by use of an instruction whether the connection still exists.

6. Transmit the string "**WD_TEST**(CR)(LF)".

In cases where the connection exists, the scales immediately send "**WD_OK**(CR)(LF)" as reply.