FAIRBANKS
S C A L E S

X Series
Process Indicator
PR 5410

51207

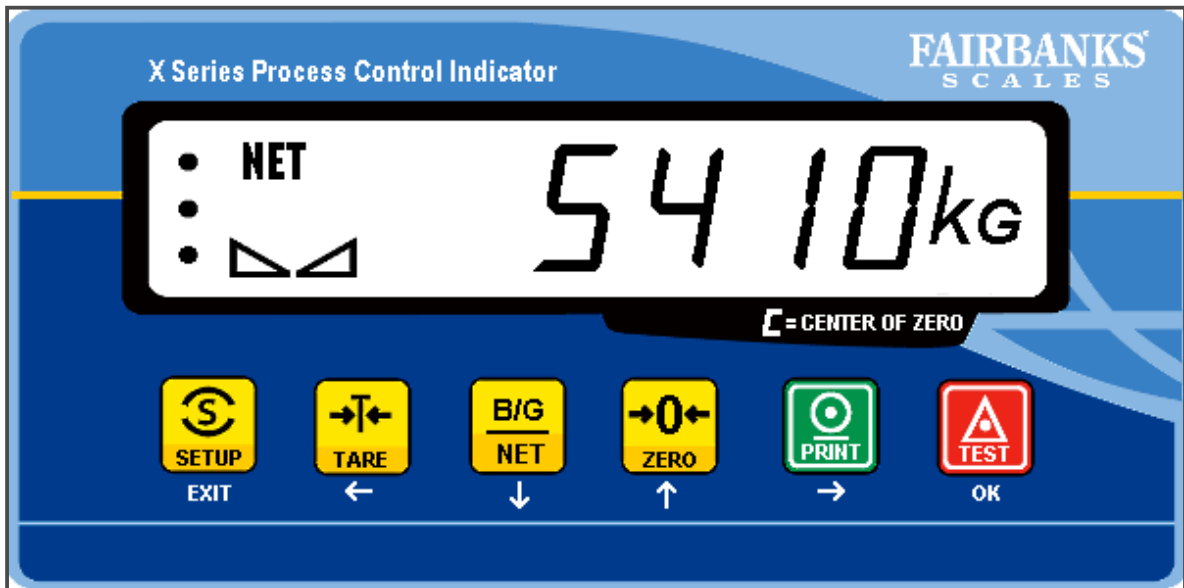Revision 1   10/08

Disclaimer

Every effort has been made to provide complete and accurate information in this manual. However, although this manual may include a specifically identified warranty notice for the product, Fairbanks Scales makes no representations or warranties with respect to the contents of this manual, and reserves the right to make changes to this manual without notice when and as improvements are made.

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Table of Contents

1   Warnings and Safety Precautions

This instrument has been built and tested in compliance with the safety regulations for measuring and control instrumentation for protective class I (protective earth connection) according to IEC 1010/ EN61010 or VDE 0411. The instrument was in perfect condition with regard to safety features when it left the factory. To maintain this condition and to ensure safe operation, the operator must follow the instructions and observe the warnings in this manual.

1.1   INTENDED USE

The instrument is intended for use as an indicator for weighing functions. Product operation, commissioning and maintenance must be performed by trained and qualified personnel who are aware of and able to deal with the related hazards and take suitable measures for self-protection. The instrument reflects the state of the art. The manufacturer does not accept any liability for damage caused by other system components or due to incorrect use of the product.

1.2   INITIAL INSPECTION

Check the content of the consignment for completeness and inspect it visually for signs of damage that may have occurred during transport. If there are grounds for rejection of the goods, a claim must be filed with the carrier immediately and the sales or service organization must be notified.

1.3   BEFORE COMMISSIONING

Visual inspection:
Before commissioning and after and storage or transport, inspect the instrument visually for signs of mechanical damage.

1.3.1   Installation

The front panel of the instrument housing meets IP65. It is suitable for mounting in any position. To ensure proper cooling of the instrument, make sure air circulation around the instrument is not blocked. Avoid exposing the instrument to excessive heat; e.g., from direct sunlight. Ambient conditions must be taken into account at all times. The instrument is suitable for control cabinet/panel mounting.

1.3.2   Opening the Instrument

CAUTION: DANGER OF DEATH

Working on the instrument while it is switched on may have life-threatening consequences.
Disconnect the instrument from the supply voltage. Any time covers or parts are removed, live parts or terminals may be exposed.
Capacitors in the unit may still be charged also after disconnecting the unit from all voltage sources.

This instrument contains electrostatic sensitive components. For this reason, an equipotential bonding conductor must be connected when working on the open instrument (antistatic protection).

1.3.3   Grounding and Shock Prevention PR 5410/00

The instrument must be connected to protective earth via a protective earth conductor (PE) in the power connector. The power cable contains a protective earth conductor which must not be interrupted inside or outside the unit (e.g., by using an extension cable that does not have a protective earth connection). The PE conductor is connected to the back panel of the housing inside the instrument.

1.3.4   Grounding and Shock Prevention PR 5410/01

The back panel of the housing must be connected to protective earth.

1.3.5   Power Connection and Power Supply PR 5410/00

The unit does not have a power switch and is ready for operation immediately after connecting the supply voltage. Safe interruption of both supply voltage conductors must be provided for, either by disconnecting the power connector or using a separate switch. The unit is equipped with a wide range power supply and covers AC systems with a frequency of 50 Hz/60 Hz and a voltage range of 100 VAC to 240 VAC +10%/-15% automatically (without manual selection). The power supply is protected against short circuits and overload, and switches off automatically in the event of failure.

When the electronic protection is triggered:
- Disconnect the unit from all voltage sources and wait at least one minute.
- Determine and eliminate the source of error.
- Re-connect the unit to the supply voltage.

1.3.6   Power Connection 24 VDC PR5410/01

The version PR5410/01 is designed for 24 V direct current.

The supply is done with two screw terminals (- 24V +), the instrument is protected against wrong polarity.

The instrument is protected by a fuse in the + conductor on the back panel of the housing.

1.3.7   Failure and Excessive Stress

If there is any reason to assume that safe operation of the instrument is no longer ensured, shut it down and make sure it cannot be used. Safe operation is no longer ensured if any of the following is true:
- The instrument is physically damaged
- The instrument does not function
- The instrument has been subjected to stresses beyond the tolerance limits (e.g., during storage or transport).

1.3.8   Important Note

Make sure that the construction of the instrument is not altered to the detriment of safety. In particular, leakage paths, air gaps (of live parts) and insulating layers must not be reduced. cannot be held responsible for personal injury or property damage caused by an instrument repaired incorrectly by a user or installer.

2   Process Indicator

The instrument is equipped with a six-digit 7-segment display and additional status indication. Local operation is performed using 6 double-function keys.

2.1   OVERVIEW OF THE INSTRUMENT

- Accuracy 10,000 e (Class III) for the weighing electronics
- High-speed conversion with response times from 10 Msec
- Weight indication with status by transflective 6-digit 7-segment display
- 6 function keys for front-panel operation
- Front panel rated to IP 65, back panel to IP30
- LAN adapter with 10/100 Mbit/sec (built-in)
- RS-232 interface, built-in; for connecting e.g. a printer or a remote indicator
- Expansion possible by addition of plug-in circuit boards (2 slots)
- Galvanically isolated interfaces (except RS-232, analog input and BCD output)
- Wide range power supply for 100 to 240 V AC, protection class I (protective earth)
- Version PR 5410/01 for 24 VDC direct current
- Plug-in connections on the back panel for load cells, inputs/outputs, LAN adaptor
- Suitable for mounting in a panel cut-out or a control cabinet
- Calibration using front keys or PC tool (Browser/VNC)
- Calibration using weights, by entering mV/V values,
  or directly, using load cell data ("smart calibration")
- Software configuration of the interface cards, e.g. for remote display or printer
- Analog test for the weighing electronics

Communication protocols:

For the internal RS-232 or RS-232/-485 (see Accessories):
- Remote display
- Printer, standard or legal for trade
- JBUS/MODBUS (slave)
- SMA
- Asycom

Fieldbus slave with PR 1721/3x (see Accessories):
- Profibus-DP
- Interbus-S
- DeviceNet
- EtherNet/IP

or PR 5510/14 Ethernet for Modbus TCP/IP

2.2 HOUSING

The instrument has aluminium housing and a front panel compliant with IP 65. It is suitable for installation in a control cabinet. Keypad, display and display board form a unit with the front panel. A square cut-out is required for installation. The cable connectors are on the back panel of the housing. A 6-pin plug-in terminal block is provided for connection of the load cells. The built-in serial interface has a 9-contact D-Sub female connector. Network connection is possible via the built-in RJ-45 LAN socket. 3 Optocoupler inputs and 3 Optocoupler outputs can be connected using plug-in terminals.

The cut-outs for up to 2 plug-in cards are covered by dummy plates.

The power cable plugs into the built-in power connector (with fuse socket).

Front view

Side view

View from the back

Panel cut-out

187 + 0.5   X   91 + 0.5
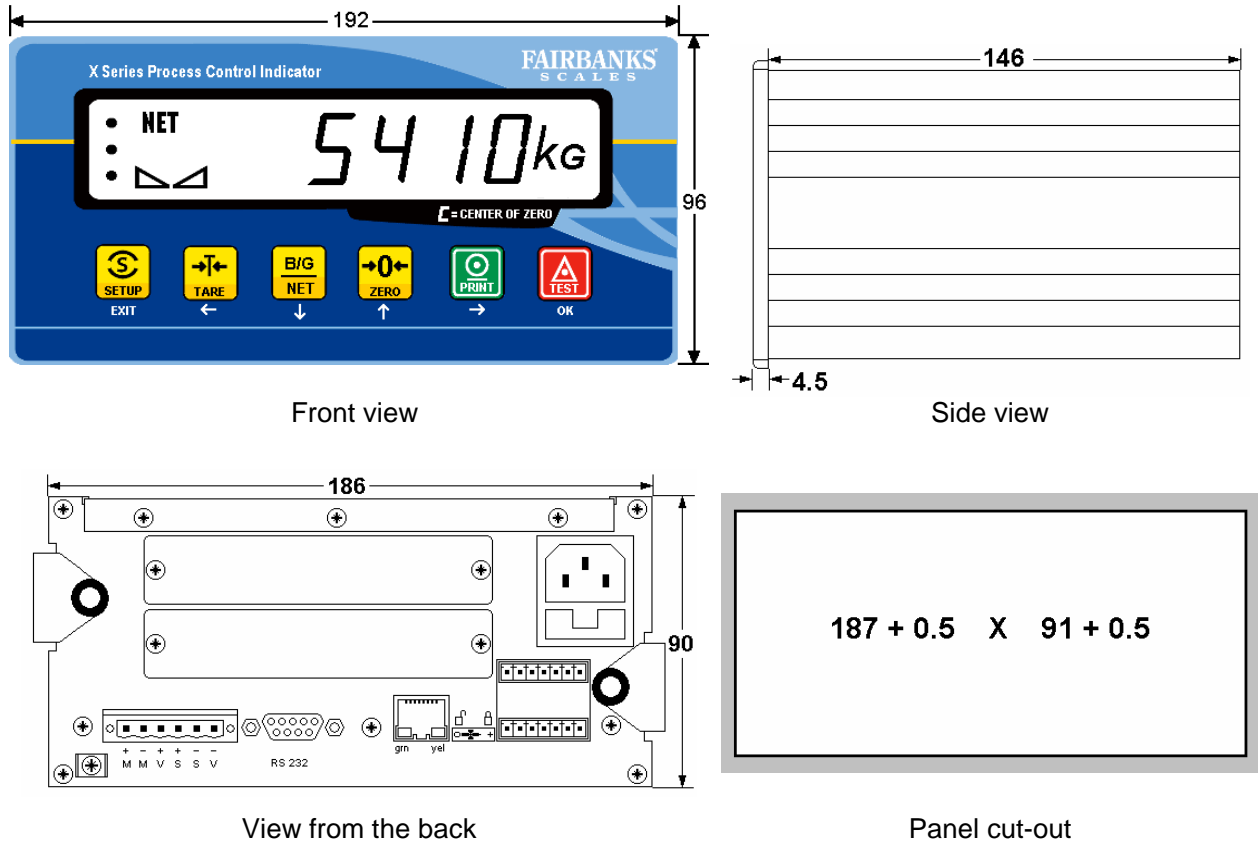
2.3   DISPLAY AND CONTROLS

2.3.1   Display

The display permits indication of 6-digit weight values (digit height 18 mm) with decimal point and polarity sign.
Possible units of mass are **t, kg, g** or **lb**.

Status indication   Weight value   Mass unit
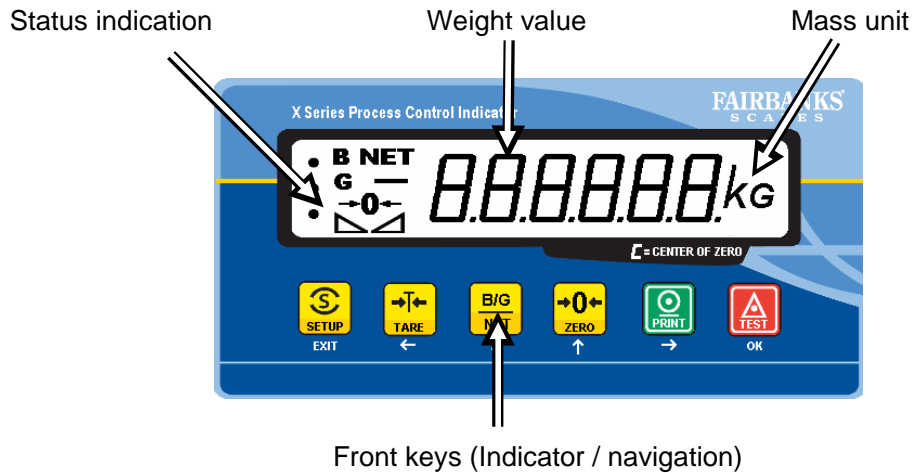
Front keys (Indicator / navigation)

B **G**	Gross weight display (G with NTEP or NSC mode)	–0–	The weight value is within +/- ¼ d of zero
NET	Net weight display	◣◢	Stability of the weight value
T,PT	Tare weight or fixtare display	⋮	Range indication

2.3.2   Front-Panel Keys

Indicator keys

SETUP	Instrument settings, set-up	PRINT	Start printing
TARE	Taring, the current gross weight is stored in the tare memory, provided that: - weight value is stable - indicator not in error status (function dependent on configuration)	ZERO	Set gross weight to zero, provided that: - weight value is stable - weight within zero setting range (function dependent on configuration)
B/G NET	Selection of display mode: gross – net – tare weight	TEST	Analog test, weighing function

Calibration and parameter input using front keys is described in chapter 4.3 .

2.3.3 Selection Using the Navigation Keys (VNC)

Press the down arrow key ↓ to scroll down, or the up arrow key ↑ to scroll up in a menu. Press ᴼᴷ⁾ to select a menu item. To choose the desired setting for the selected menu, press ← or → .

Press the ᴱˣⁱᵗ key to exit a menu and continue the operation on the next higher level.

An arrow ▸ in front of a menu item indicates that there are menu sublevels. The menu item selected by pressing ↑/↓ is shown inversely.

Info
▸ Show version
▸ Show status

Press the ᴼᴷ⁾ key to select an item.

If the list of menu items is long, a vertical bar graph on the left (black and gray) shows which part of the list is displayed.

WP A/Calibration	
Measuretime	⇅ 320 ms
Digital filter	off
Test mode	absolute
W & M	none
Standstill time	0.50 s
Standstill range	1.00 d

Availability of settings options (selectable with ← or →) is indicated by preceding double arrows ⇅ .

WP A/Calibration	
Measuretime	⇅ 640 ms

Press ←/→ to select the measuring time.

2.3.4 Tool Tip (VNC)

The 'tool tip' indicates valid value ranges or important properties in a pop-up window, see example:

Standstill range	1.00 d
Tare timeo	2.5 s
Zeroset ra	50.00 d
Zerotrack range	0.00 d
Zerotrack step	0.25 d
Zerotrack time	1.0 s

Zerotrack disabled as long as Zerotrack range is 0

This is a warning, that the zero tracking is not activated, if the Zerotrack time is set to 0.

2.3.5 System Messages during Input (VNC)

The following types of messages are displayed as confirmation prompts / warnings during input:

Question mark
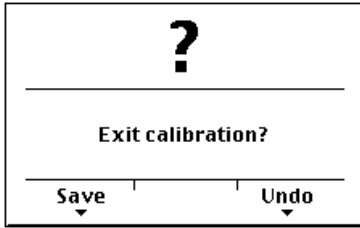
A question mark indicates that a choice of options (e.g. [Save] for saving or [Undo] for cancelling) is available.

"Stop"
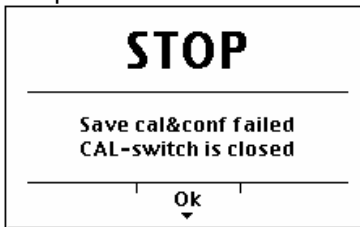
An important indication that an action cannot be executed (e.g., if saving is not possible because the CAL switch is closed). Read the description and press [OK] to continue:

Processing is in progress

If an action takes a long time (e.g., Max for setting the full scale deflection), a clock symbol is shown.

Warning

A warning is marked by three exclamation points.

Informational text
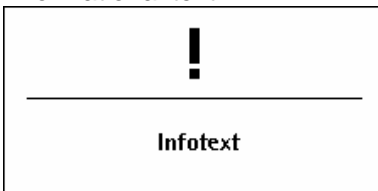
An informational text is marked by one exclamation point.

Execution message
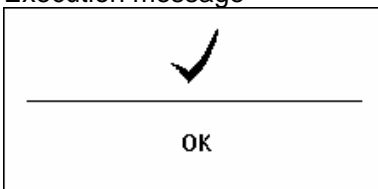
Successful execution of an action is indicated by a checkmark.

The graphics are not always included when system messages are depicted in this manual.

2.3.6   Overview of Accessories
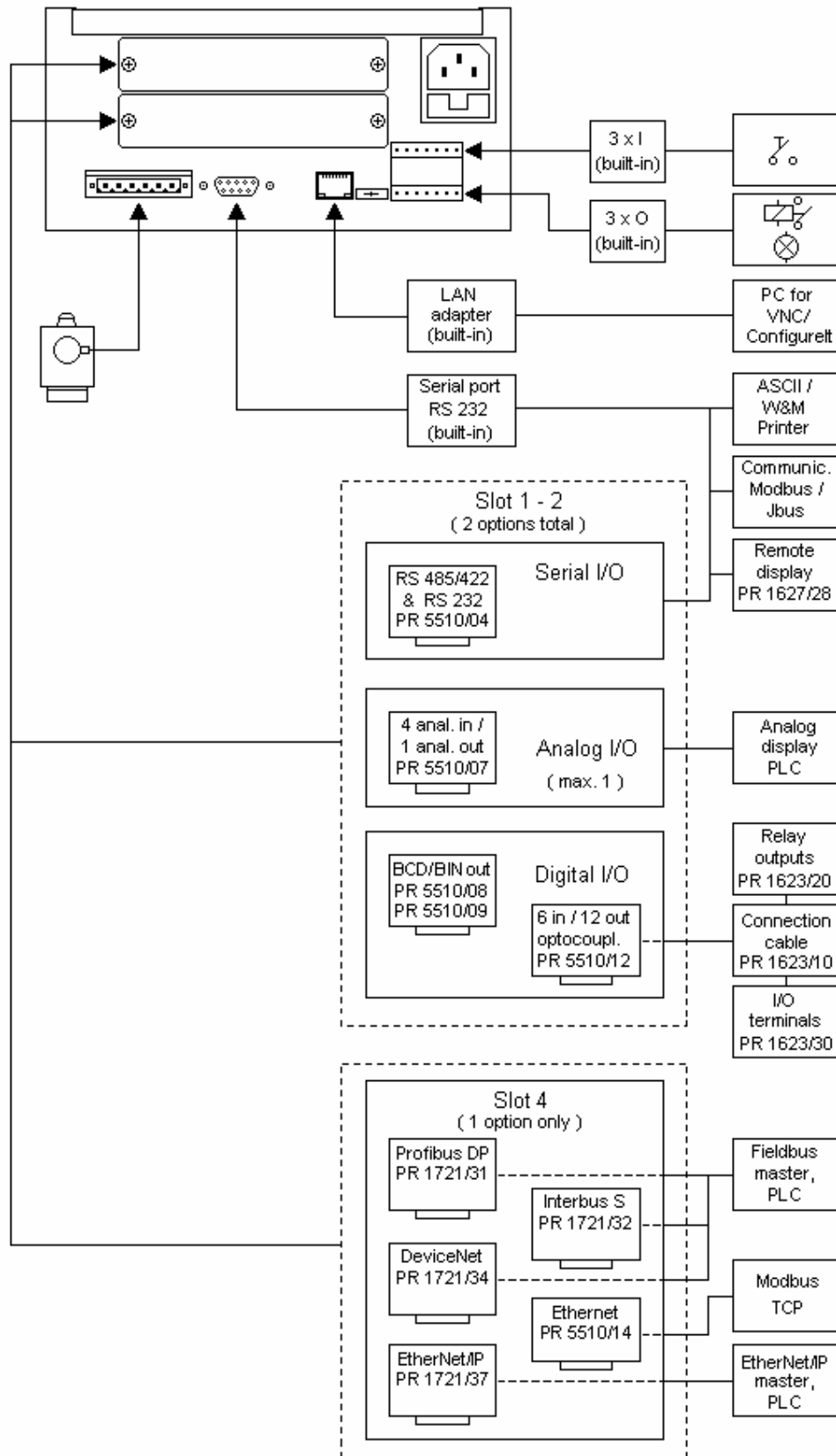
2.3.7 Plug-in Cards

On the main board, the PR 5410 Process Indicator can be fitted with up to 2 plug-in cards. Mounting different types of cards on Slots 1 and 2 is mandatory (exception: PR 5510/04)!
If a card is fitted on Slot 4, only one more card may be mounted on Slots 1 or 2.

Product	Function	Position
PR 5510/02 2 serial RS-232 interfaces	Protocols and parameters are adjustable via software.	Slot 1 or 2
PR 5510/04 1 serial RS-232 interface and 1 serial RS-485/RS-422 interface.	The serial RS-485/-422 interface is configurable using DIL switches on the card. Protocols can be selected via software.	Slot 1 and/or 2
PR 5510/07 1 analog output, 4 analog inputs	16-bit analog output, 0/4 - 20 mA. Input: 4 channels with common ground, 3000 d resolution (max. 1 card)	Slot 1 or 2
PR 5510/08 BCD output	Output: 5 decades + plus or minus sign or 3 bytes binary, open emitter. 1 input	Slot 1 or 2
PR 5510/09 BCD output	Output: 5 decades + plus or minus sign, or 3 bytes binary, open collector. 1 input	Slot 1 or 2
PR 5510/12 6 optocoupler inputs and 12 optocoupler outputs	Digital interfaces electrically isolated via optocouplers. Passive inputs and outputs.	Slot 1 or 2
PR 5510/14 Ethernet	10 / 100 Mbit/s Modbus TCP	Slot 4
PR 1721/31 Profibus-DP slave	Profibus-DP to IEC 61158 with max. 12 Mbit/s	Slot 4
PR 1721/32 Interbus-S slave	Interbus-S slave with up to 2 Mbit/s	Slot 4
PR 1721/34 DeviceNet slave	DeviceNet slave with max. 500 kbit/s	Slot 4
PR 1721/37 EtherNet/IP	10 / 100 Mbit/s EtherNet/IP	Slot 4

For product details, see chapter 3.3.3 .

3 Installing the Instrument and Plug-in Cards

Before starting work, please read Chapter 1 and follow all instructions.
Further procedures:

- Check the consignment: unpack the components specific to the application.
- Safety check: inspect all components for damage.
- Make sure the on-site installation is correct and complete including cables, e.g. power cable fuse protection, load cells, cable junction box, data cable, console/cabinet, etc.
- Follow the instructions for installation of the unit relating to application, safety, ventilation, sealing and environmental influences).
- If necessary, mount the plug-in cards (instrument must be disconnected from all voltage sources).
- Connect the cable from cable junction box or platform/load cell.
- If applicable: connect other data cables, power cable, etc.
- Connect the instrument power cable.
- Check the installation.

3.1 MECHANICAL PREPARATION

For cabinet or panel mounting, a corresponding cut-out for the housing must be provided (see Chapter 2.2).
Have all required parts, technical documents and tools at hand for mounting. Secure the cable at the place of installation; e.g., using cable ties. Remove the insulation from the cable ends, keep the strands short and fit them with ferrules.

3.2 HARDWARE CONSTRUCTION

The electronics are contained on two printed circuit boards: the main board and the display board. The display board is connected to the main board by a plug.

3.3 MAIN BOARD
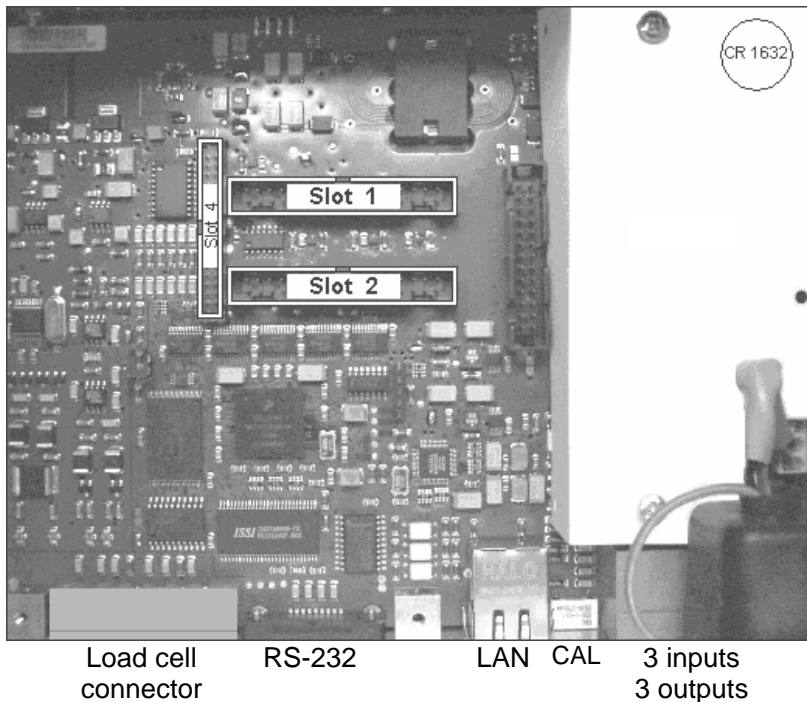
The lithium battery (under the cover for the power supply) is always activated and energizes the calendar/clock module.

The main board holds the power supply and Slots 1, 2 and 4 for additional cards.

Load cell connector, serial interface, LAN adaptor, CAL switch as well as 3 inputs and outputs are accessible on the back panel.

Load cell connector   RS-232   LAN   CAL   3 inputs
3 outputs

3.3.1 Network Port

The network port is built in as standard equipment. The port contains powerful TCP/IP connection circuitry with transfer rates of 10 or 100 Mbit/sec. The LEDs on the connector indicate whether the port is functioning.

Transfer rate:	10 Mbit/s, 100Mbit/s, full / half duplex, auto-detection
Connection method:	Point to point
Cable:	CAT 5 patch cable, shielded twisted pair
Cable impedance:	150 ohms
Electrical isolation:	Yes
Cable length :	Max. 115 m
Connection :	RJ-45 socket on back panel of housing
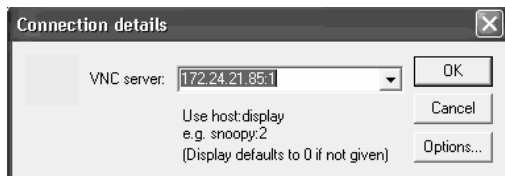
Remote operation of the PR 5410 indicator from the PC is possible; install version 3.3.7 VNC program on the PC. For setting the network address, see Chapter 4.2.4.

3.3.2 Standard RS-232 Interface

The instrument is provided with a built-in RS-232 interface that is accessible on the back panel of the housing. This interface is configurable, and can be used, for example, for data transmission to a remote display or a printer.

Number of channels:	1
Type:	RS-232, full duplex
Transfer rate:	300 to 115K2 bit/s
Parity:	none, odd, even
Data bits:	7 / 8 bits
Input signal level:	logic 1 (high) - 3 ... - 15 V logic 0 (low) + 3 ... + 15 V
Output signal level:	logic 1 (high) - 5 ... - 15 V logic 0 (low) + 5 ... + 15 V
Number of signals:	2 output signals (TXD, RTS) 2 input signals (RXD, CTS)
Electrical isolation:	none
Cable type:	shielded twisted pair (e.g. LifYCY 3x2x0,20), 1 pair of wires for GND

Connection:	9-pin D-Sub socket (female)	Cable length:	max. 15 m

Connecting a Remote Display / Remote Terminal

A PR 1627 remote display or a PR 1628 remote terminal can be connected to the built-in RS-232 interface [Builtin RS232] or to the PR 5510/04 card.
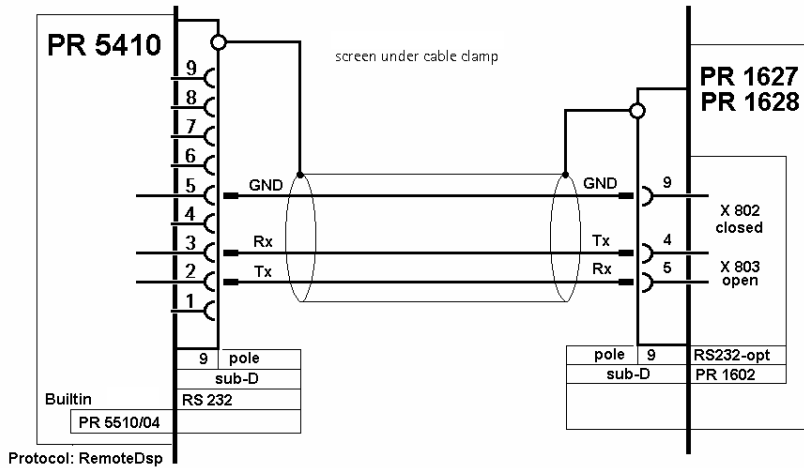
Press [SETUP] -[Serial ports parameters]-[Remote display]-[Builtin RS232]-[Param] and select [Baudrate] 4800. The baud rate now corresponds to the default settings of PR 1627 or PR 1628. The following settings cannot be changed: [Bits] 7, [Parity] even and [Stopbits] 1.
If only one instrument is connected to a PR1627/8, [Mode] must be [single transmitter].
When connecting several instruments to a PR 1628 via an RS-232/RS-485 converter, selection for display on PR 1628 is possible using addresses. For this purpose, select [multiple transmitters] as [Mode] in all instruments, enter the instrument address under [Device Id] and the address of the subsequent instrument under [Next Device Id].

Connecting a YDP12IS or YDP04IS Ticket Printer

The ticket printer YDP12IS-OCEUV or YDP04IS-OCEUV can be connected via [Builtin RS232] interface or the RS-232 on card PR 5510/04.
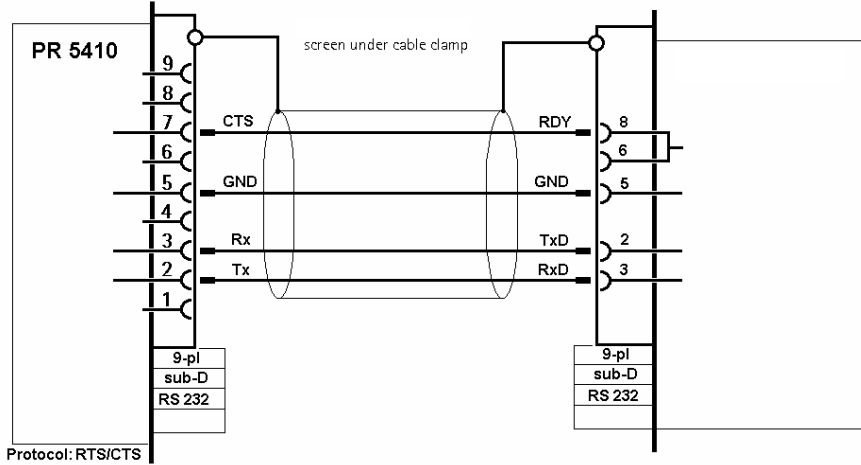
If the printer is connected to the [Builtin RS232] port:

Press [SETUP]-[Serial ports parameter]-[Printer]-[Builtin RS232]-[Param] and configure the following settings under [Protocol]: [RTS/CTS], [Baudrate]: 9600, [Bits]: 8, [Parity]: [none], [Stopbits]: 1 and [Output mode]: [Raw].
The printer must be set to Line Mode (factory setting: Page Mode). Press the 'FEED' button to change modes; please refer to the installation instructions delivered with the printer.

3.3.3   Optocoupler Inputs

The main board has 3 digital inputs for process control, electrically isolated by optocouplers, each bipolar potential-free.

Number of inputs:	3 (CH1, CH2, CH3)
Input signal:	Logic 0: 0 to 5 VDC or open Logic 1: 10 to 31 VDC Passive, external supply required
Input current:	< 7 mA @ 24 V < 3 mA @ 12 V Protected against incorrect polarity
Electrical isolation:	Yes, via optocoupler
Connection:	Plug-in 7-pin screw terminal block, cable shield connected to housing (terminal 14), max. 1.5 mm² cable.
Cable:	Shielded, max. 50 m

Example: connection of a contact input
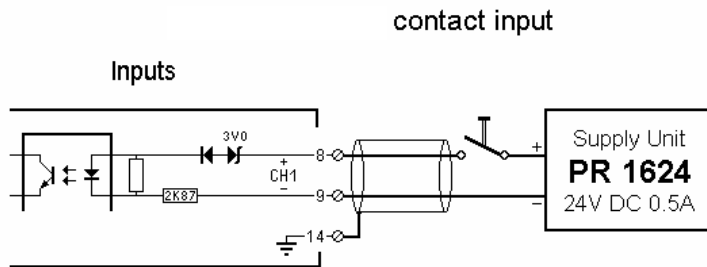
3.3.4   Optocoupler Outputs

The main board has 3 digital outputs for process control, electrically isolated by optocouplers, each bipolar potential-free.

	Number of outputs:	3 (CH1, CH2, CH3)
	Output:	Max. switching voltage: 31 VDC, Protected against incorrect polarity Max. switching current: 25 mA Voltage drop @ 25 mA: 3 V Passive, external supply required
	Electrical isolation:	Yes, via optocouplers
	Connection:	Plug-in 7-pin terminal block, cable shield connected to housing (terminal 7), max 1.5 mm² cable
	Cable:	Shielded, max. 50 m

Example: connection of relay control
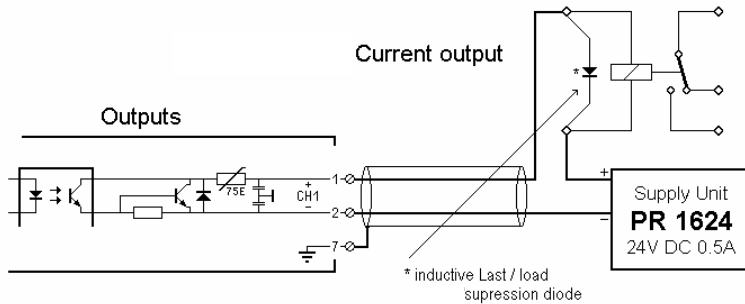
The relay switches, when the output is active (true). For protection of the output circuit, relays with free-wheel diode must be provided.

Example: connection of voltage output
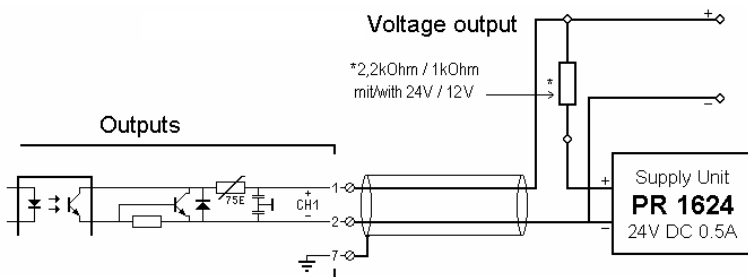
When the output is active (true), the output voltage goes from 24 V / 12 V to < 3 V . The load resistance must be 2.2 kohms / 1 kohm.

3.4   ACCESSORIES

3.4.1   Installing Plug-in Cards

The main board has two slots with identical pin allocation (34 contact pins in two rows of 17) and another slot (34 contact pins in two rows of 17) for plug-in cards. The slot designations are "Slot 1 ... 2" and "Slot 4" (left). Up to 2 cards can be mounted. Accordingly, the back panel is provided with two cut-outs for the retainer plates of the cards.

⚠ Before installing or removing a plug-in card, disconnect the instrument from all voltage sources.
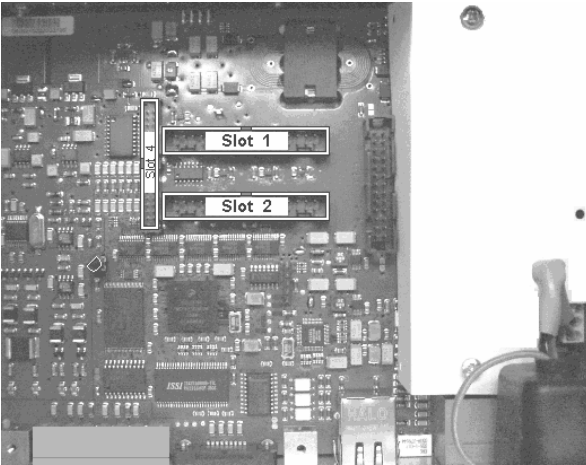
View from above, back panel connectors at the bottom

Installation (Slots 1-2, 4):
The flat cables plug into connectors (Slots 1 ... 2, 4) on the main board. The cables are polarized; i.e. incorrect polarity is precluded.

A description and examples of the various cards and connections are given in Chapter 3.3.3 .
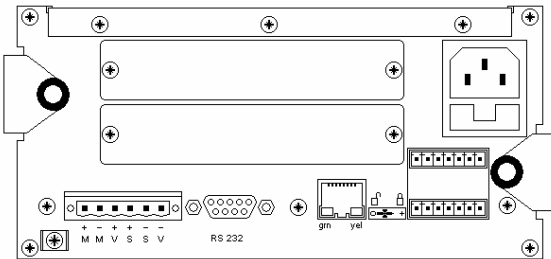
View from the back

Remove the dummies from the back panel (2 screws; M3) and replace them with the retainer plates for the plug-in cards.

The flat-cable connectors must be inserted into the corresponding slots on the main board.

After installation/modification, the plug-in cards are detected automatically.

To view a list of the installed plug-in cards, select ⓘ-[Show HW-slots]:

Info/HW-Slots			
	Builtin	RS 232	Built-in serial interface
▸ Slot 1	PR 5510/04	RS 485/232	Slots (Slot 1 and 2) are identical
▸ Slot 2		-empty-	
▸ Slot 3	Builtin	Digital I/O	Built-in digital I/Os
▸ Slot 4	PR 1721/31	Profibus-DP	Only Fieldbus cards

3.4.2   Cable Connection in the D-Sub Connector Mating Plug

The connections on the back panel are plug-in type. Keep the conductors as short as possible and connect them to the terminals. The connector housings are conductive (metallized), i.e., part of the shield, and must be fastened to the back panel by screws.

Mounting a cable:

cabel coat

cable screen
bended back over coat

cable clamp   grounding tongue
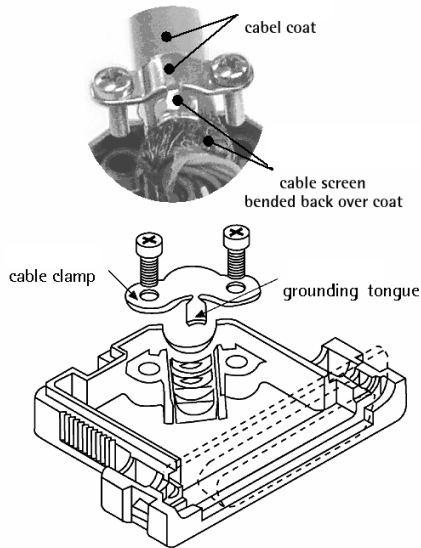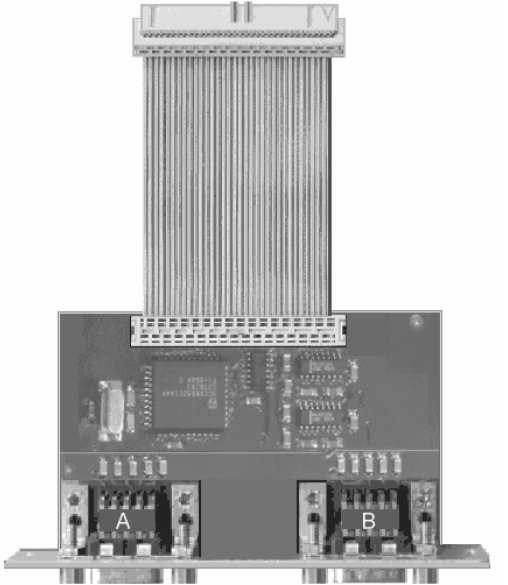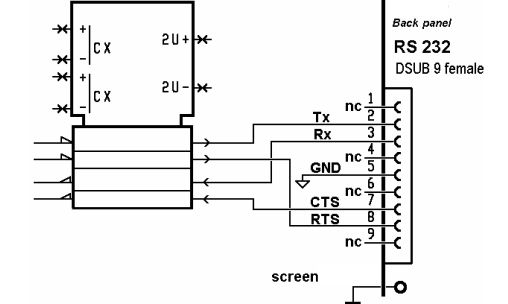
- Open the connector housing (catches)
- Release and open the cable clamp
- Remove approx. 50-60 mm of the cable insulation
- Shorten the shield to 5 mm and bend it over the cable sheath
- Remove 3mm wire insulation and connect it by soldering
- Insert the pin unit
- Put the cable under the cable clamp
  The grounding tongue presses on the shield bent backwards; the clamp presses on the cable sheath
- Close and tighten the cable clamp
- Check the strain relief
- Insert the mounting screws on both sides
- Close the connector housing (catches)

The shields must be connected to the metal housings on both ends of the cable.

3.4.3 PR 5510/02 Serial I/O

The plug-in card contains two RS-232 channels (A and B), which can be used simultaneously and independently. Max. 2 PR 5510/02 cards can be plugged in (Slot 1 ... 2). The relevant interface parameters are adjustable in [SETUP]- [Serial ports parameter], no additional settings on the card are required.

	Internal connection:	34-pole connector socket
	Number of channels:	2
	Type:	RS 232, full duplex
	Transfer rate:	300 to 19k2 bits/sec
	Parity:	No, odd, even
	Data bits:	7 / 8 Bit
	Signals RS 232:	Output: TX, RTS Input: RX, CTS
	Input signal level:	logic 1 (high) - 3 ... - 15 V logic 0 (low) + 3 ... + 15 V
	Output signal level:	logic 1 (high) - 5 ... - 15 V logic 0 (low) + 5 ... + 15 V
	Potential isolation:	No
	Cable length:	max. 15m
	Cable type:	twisted pairs, screened (e.g. LifYCY 3x2x0,20), 1 conductor pair for GND.
	External connection:	2x D-Sub 9-pole socket (female)
	Accessories (delivered with the unit):	2x connector counterpart D-Sub 9-pin (male) incl. screening hoods
	Dimensions: (LxWxH):	86 x 52 x 15 mm
	Weight:	appr. 30 g
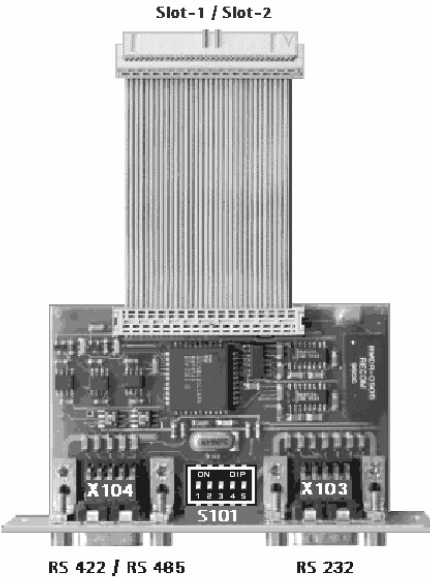
The RS-232 can only be used as point to point connection. A max. cable length of 10-15m must not be exceeded.

The PR5510/02 and the 'Builtin' comply with the standard pin allocation, i.e. they are equal in the connecting diagrams. Accordingly, the RS232 connections are described only for the Builtin Interface in this manual (see chapter 3.3.2).

3.4.4   PR 5510/04 Serial I/O

The plug-in card has two channels (1x RS-232 and 1x RS-422/485), which can be used simultaneously and to a great extent independently. The RS-422/485 interface is electrically isolated. Up to 2 PR 5510/04 cards (Slot 1 and 2) can be plugged in. The relevant interface parameters can be configured under [SETUP]-[Serial ports parameter]; the DIL switch S101 must be set for RS-422/485 additionally.

	Internal connection:	34-contact socket terminal strip
	Number of channels:	1x RS-232, 1x RS-422/485
	Type:	RS-232 full duplex RS-422/485 full duplex (4-wire) * RS-485 half duplex (2-wire) *
	Transfer rate:	300 to 19k2 bit/s
	RS-232C (V24) signals:	Output: TXD, RTS, DTR Input: RXD, CTS, DCD, RI
	RS-422/485 signals:	TxA, RxA, TxB, RxB
	Electrical isolation:	RS-232: no, RS-422 / 485: yes
	Cable length:	Max. 15m with RS-232 Max. 1000 m with RS-422 / 485
	Cable type:	Shielded twisted pair (e.g., LifYCY 3x2x0,20), 1 conductor pair for GND.
	External connection:	2 D-Sub 9-contact female connectors
	Accessories (delivered with the unit):	2 D-Sub 9-pin mating plugs (male) incl. shielded housing
	Dimensions: (LxWxH):	86 x 52 x 15 mm
	Weight:	33 g

PR 5510/04 RS-232

The RS-232 interface is independent of the S101 switch settings.
It can be used only for point-to-point connection.

PR 5510/04 is provided as an equivalent to the [Builtin RS-232] interface in the RS-232 channel with additional signals: DCD, DTR, RI.

The built-in and PR 5510/04 interfaces comply with the standard pin allocation; i.e., they are equivalent in the following connecting diagrams. Thus only the RS-232 connections for the built-in interface are described in this manual (see Chapter 3.3.2).

PR 5510/04
SERIAL I/O
RS 232

U/U CX 2U+
CX 2U-

X103
TXD 2
RTS 8
RXD 3
CTS 7

U/U CX 2U+
CX 2U-

GND 5

DTR 6
DCD 1
RI   9

DSUB 9 female
RS 232

RS 422/485

X104
TxB 2
TxA 3

S101-1
S101-2

S101-3
RxB 7

S101-4
RxA 5
S101-5

DSUB 9 female
RS 422/485

SIG.GND 8

DC
DC
+5Vi
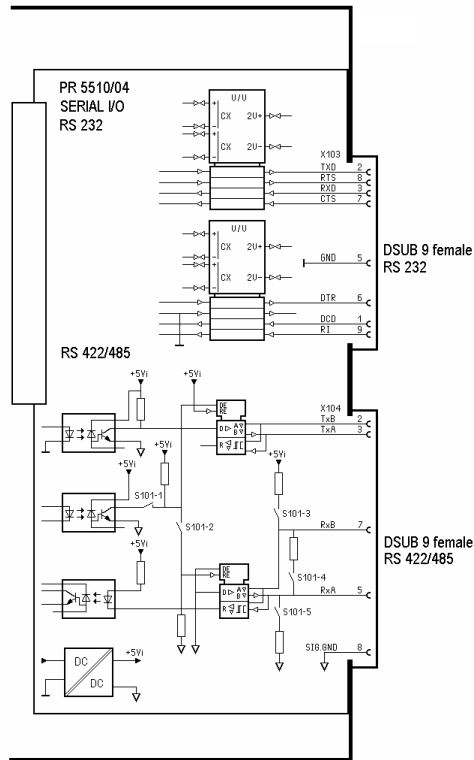
PR 5510/04 RS-422/485

When mounting, the RS-485/422 interface must be configured by DIL switch S101 on the card. Using RS-485 is compulsory with a multi-point connection (tristate status). The RS-485 interface can be used also for point-to-point connection. Like 2-wire or 4-wire connections, this is dependent on the other communicating units.

A 2-wire connection is half-duplex and cannot send and receive simultaneously. It requires corresponding driver programming (see relevant instrument manual).

Factory setting		Switch S101	Settings for RS-422/ 485	
	1:	Tristate enable:	OFF – RS-422	ON – RS-485
	2:	Rx enable	OFF – 4-wire	ON – 2-wire
	3:	Rx pull-up resistor:	OFF – not connected	ON - (RxB 1k54 +V)
	4:	Rx bus termination:	OFF – not connected	ON - (RxA 205E RxB)
	5:	Rx pull-down resistor:	OFF – not connected	ON - (RxA 1k54 -V)
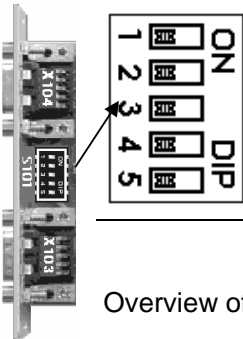
Overview of which switches must be closed (ON) for which mode:

S101	Two-wire system		Four-wire system	
	Point to point	Bus	Point to point	Bus
Master	RS-485 1, 2, 3, 4, 5 = on	RS-485 1, 2, 3, 4, 5 = on	RS-422 4 = on	RS-422 3, 4, 5 = on
Individual slave	RS-485 1, 2 = on	-	RS-422 4 = on	-
Other slaves	-	RS-485 1, 2 = on	-	RS-485 1 = on (default)
Last slave	-	RS-485 1, 2, 3, 4, 5 = on	-	RS-485 1, 3, 4, 5 = on

Connecting a PR 1627 Remote Display over RS-485

Four-wire transmission, point to point, full duplex (simultaneous sending and receiving possible) with PR 1627/00 remote display.
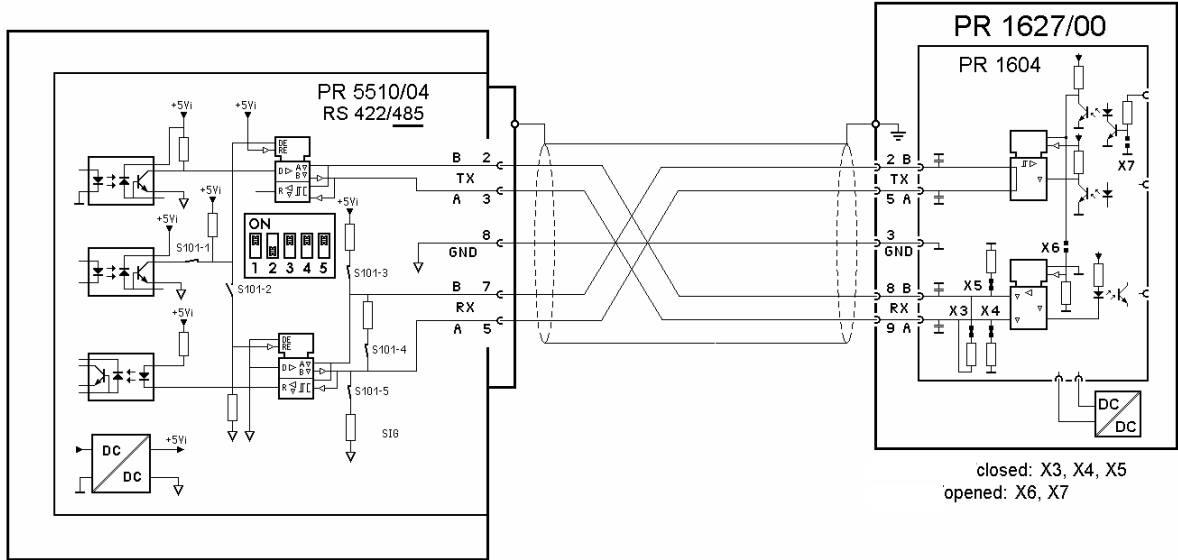
Configuration: [SETUP]-[Serial ports parameter]-[Remote display]-[Slot1/2-RS-485]

RS-422 Point-to-Point Connection (Four-Wire)

Four-wire transmission: full duplex (simultaneous sending and receiving possible)
RS-422 can be used only for point-to-point connection.
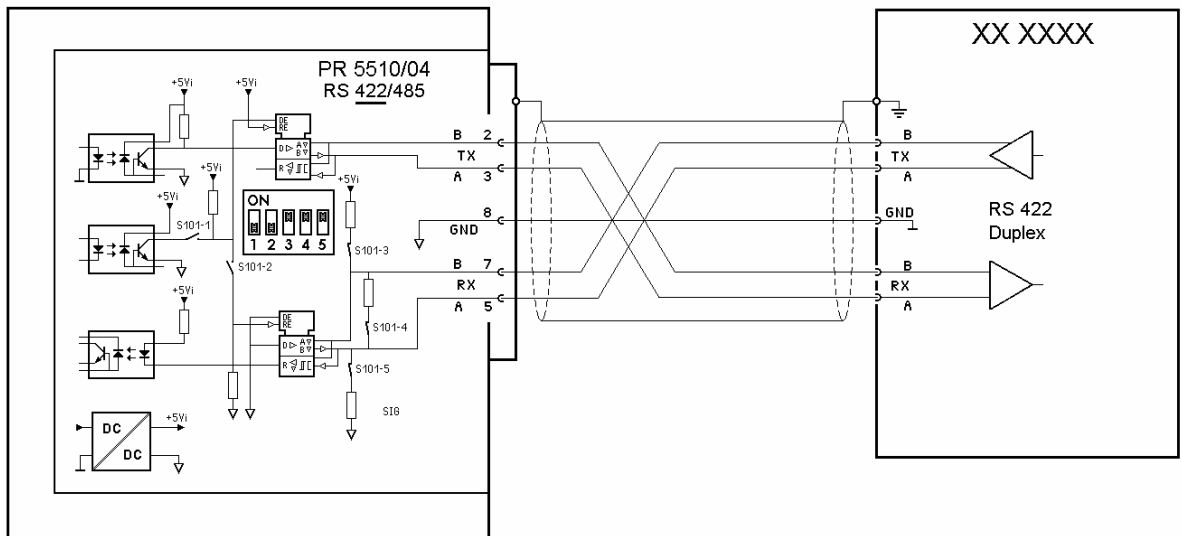
Configuration: [SETUP]-[Serial ports parameter]-[.........]-[Slot1/2-RS-485]

Connecting Several PR 1627 Remote Displays over RS-485

Connection of several PR 1627 remote displays over RS-485, four-wire, full-duplex (simultaneous sending and receiving possible):
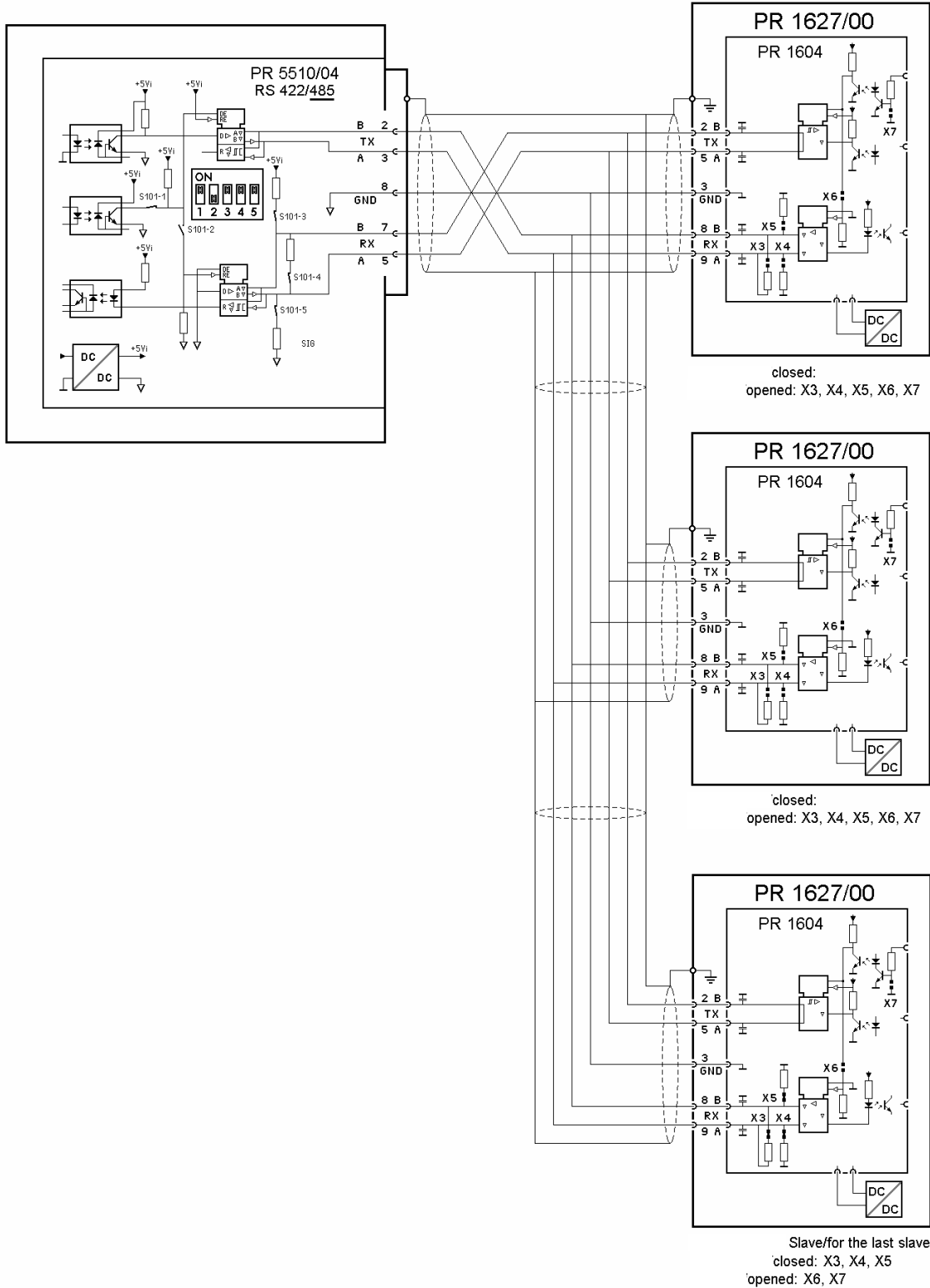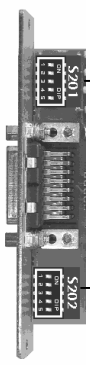
3.4.5   PR 5510/07 Analog Input/Output Card

The plug-in card with 15-contact D-Sub socket for the analog channels is configured as 1 analog output (active) and 4 analog inputs. The analog inputs are not supported by the standard instrument.

	Internal connection:	34-contact connector socket on flat cable for Slot 1, 2
	Number of outputs:	1 active current output: 20mA, 10V output voltage via external 500 ohm resistor
	Output assignment:	Gross / net / display following, configurable
	Output range:	0/4 ... 20mA, configurable
	Output resolution:	16 bits binary, 20,000 internal counts @ 20 mA
	Output linearity error:	@ 0 - 20mA: 0.04 % @ 4 - 20 mA: 0.02 %
	Output temperature effect:	< 100 ppm/K
	Output zero error:	0.05 %
	Max. output error:	< 0.1 %
	Load:	Max. 0 ... 500 ohms
	External connection:	15-contact D-Sub female connector
	Accessories:	15-pin D-Sub male connector
Dimensions: (LxWxH):	86x53x16mm	
Weight:	40g	
	Inputs:	4 channels current or voltage input 0 ... 20 mA, input resistance 250 ohms 0 ... 10 V, input resistance 100 kohms 0 ... 5 V, input resistance >10 Mohms
	Input resolution:	3,000 internal counts corresponding to e.g. 0 - 20 mA / 0 ... 10 V
	Input accuracy:	0.2 %
	Input, linearity error:	< 0.03 %
	Input temperature effect:	< 50 ppm/K
	Input, reserve:	+- 15%, i.e. −1.5V ... +11.5V
	Electrical isolation:	Output: yes, inputs: no
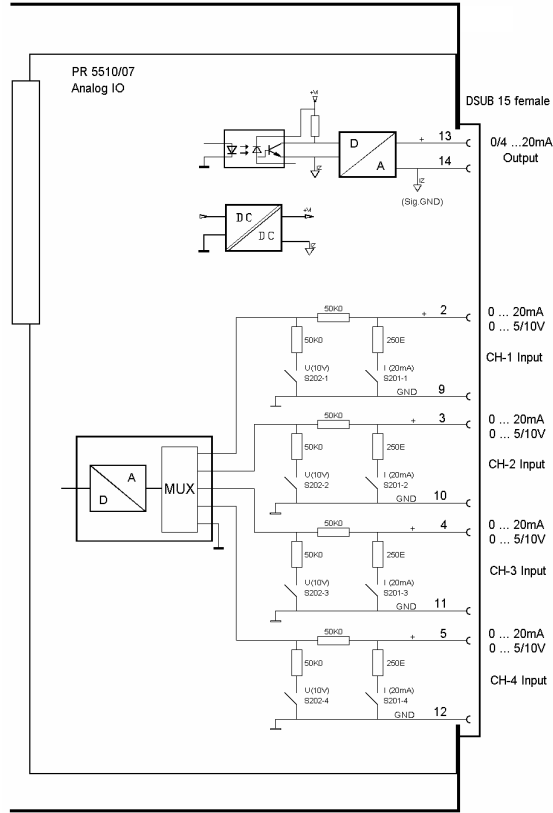
Analog input Signal selection		Channel	Current 0...+ 20mA DC	Voltage 0...+ 10V DC	Voltage 0...+ 5V DC
	S201	CH1	ON	OFF	OFF
		CH2	ON	OFF	OFF
		CH3	ON	OFF	OFF
		CH4	ON	OFF	OFF
		----	----	----	----
	S202	CH1	OFF	ON	OFF
		CH2	OFF	ON	OFF
		CH3	OFF	ON	OFF
		CH4	OFF	ON	OFF
		----	----	----	----
Input resistance			250 ohms	100 kohms	> 10 Mohms

Pin allocation of rear socket (for installation, see Chapter 3.4.1)

D-Sub 15
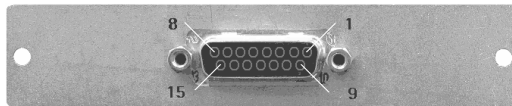
Input (PIN) 4 channels	2 + CH1	9 GND	3 + CH2	10 GND	4 + CH3	11 GND	5 + CH4	12 GND

Output (PIN) 1 channel	13 + 0/4 ... 20 mA	14 Sig GND

3.4.6   PR 5510/08 BCD Output (Open Emitter)

The plug-in card is used for BCD-coded output of a 5-decade weight value.
Cyclical output of the weight value with 4-bit (plus or minus sign, stability, error). The value is intrinsically consistent and can be output continuously or the digital input DATA_IN control can be used to freeze (hold) the value.

	Internal connection:	34-contact female connector on flat cable for Slot 1, 2
	Number of outputs:	5 digits BCD + plus or minus sign
	Number of inputs:	Input: 1 bit (DATA IN)
	Output stage:	Common collector at +Uext., open emitter
	External supply:	+5 V ... +24 VDC
	Voltage drop:	Approx. 1.7 V
	Output current:	Max. 50 mA
	Enable input:	5 V / 24 V adjustable via S101 @ 5 V high > 3.1 V, low < 1.5 V @ 24 V high > 16 V, low < 10V protected against incorrect polarity
	Cable:	Shielded, max. 50 m
	Electrical isolation:	No
	External connection: X102	26-contact D-Sub connector (female)
Dimensions (LxWxH): 60x106x22	Accessories (delivered with the unit):	26-pin D-Sub mating plug (male) incl. shielded housing
Weight: 55 g		

Before installing the card, set switches S101 and S102; see Chapter 0.

PR 5510/08 BCD Output
common Collector, open Emitter

DSUB 26 f

	Uext	1
	$1 * 10^0$	2
	$2 * 10^0$	3
	$4 * 10^0$	4
	$8 * 10^0$	5
	$1 * 10^1$	6
	$2 * 10^1$	7
	$4 * 10^1$	8
	$8 * 10^1$	9
	$1 * 10^2$	10
	$2 * 10^2$	11
	$4 * 10^2$	12
	$8 * 10^2$	13
	$1 * 10^3$	14
	$2 * 10^3$	15
	$4 * 10^3$	16
	$8 * 10^3$	17
	$1 * 10^4$	18
	$2 * 10^4$	19
	$4 * 10^4$	20
	$8 * 10^4$	21
	SIGN	22
	STANDSTILL	23
	WEIGHT VALID	24
outp: TARED		25
S101-1		26
GROUND		

EH CI

S102-1

EH CI

&

=1

V1/V2

inp: DATA IN
S101-2

S102-2   S102-3   S101-4   S101-3

External supply voltage required: pin 1 - Uext, reference potential pin 26 – GND

Outputs

The PR 5510/08 outputs (pins 2 - 24) use common supply voltage at the collector as reference potential and open emitter outputs. A non-activated output has high impedance, and an active output has a voltage by approximately 1.7 V lower than the supply voltage.
The load to be connected is applied between the output (pins 2 … 24, 25*) and GND (pin 26).

Input

When using as DATA_IN, the input (pin 25) can control the 23 outputs. As an output, data is "continuous/hold/tristate" and its signal can be configured (TTL/24V active (high/low). It is applied to pin 25 – DATA_IN of the 26-pin connector and is effective only with DIL switch S101-1 = OFF and S101-2 = ON.
The meaning of switches is given in the table in Chapter 0.

PR 5510/08 connector pin allocation:

DSUB 26-pol.
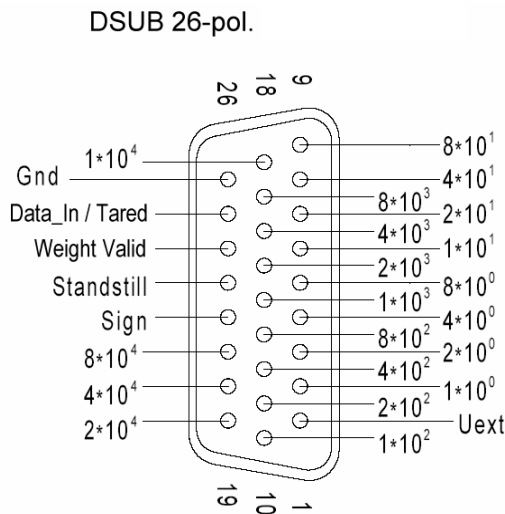
BCD output for the weight value

Output circuitry
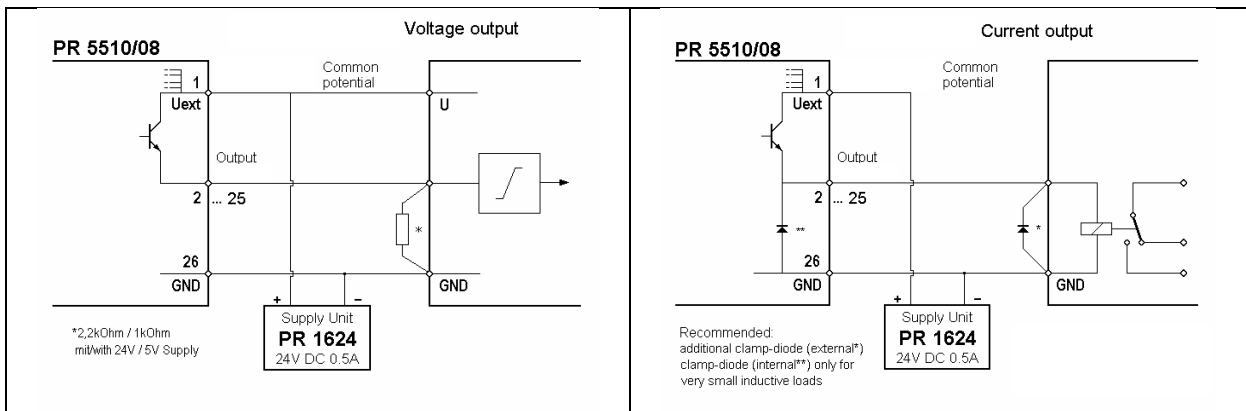
Output Modes

The output modes are identical with the PR 5510/09 card; see Chapter 0

3.4.7   PR 5510/09 BCD Output (Open Collector)

The plug-in card is used for BCD-coded output of a 5-decade weight value.
Cyclical output of the weight value is with 4-bit corresponding status (polarity sign, stability, error).
The value is intrinsically consistent and can be output continuously or the digital input DATA_IN control can be used to freeze (hold) the value.

Internal connection:	34-contact female connector on flat cable for Slot 1, 2
Number of outputs:	5 digits BCD + plus or minus sign
Number of inputs:	Input: 1 bit (DATA IN)
Output stage:	Common emitter at GND, open collector
External supply:	+5 V ... +24 VDC
Voltage drop:	Approx. 0.9 V
Output current:	Max. 50 mA
Enable input:	5 V / 24 V adjustable via S101 @ 5 V high > 3.1 V, low < 1.5 V @ 24 V high > 16 V, low < 10V protected against incorrect polarity
Cable:	Shielded, max. 50 m
Electrical isolation:	No
External connection: X102	26-contact D-Sub connector (female)
Dimensions: (LxWxH): 60x106x22	Accessories (delivered with the unit): 26-pin D-Sub mating connector (male) incl. shielded housing
Weight: 55 g	

Before installation, set the switches S101 and S102 as given in Chapter 0.

PR 5510/09 BCD Output
common Emitter, open Collector

DSUB 26 f
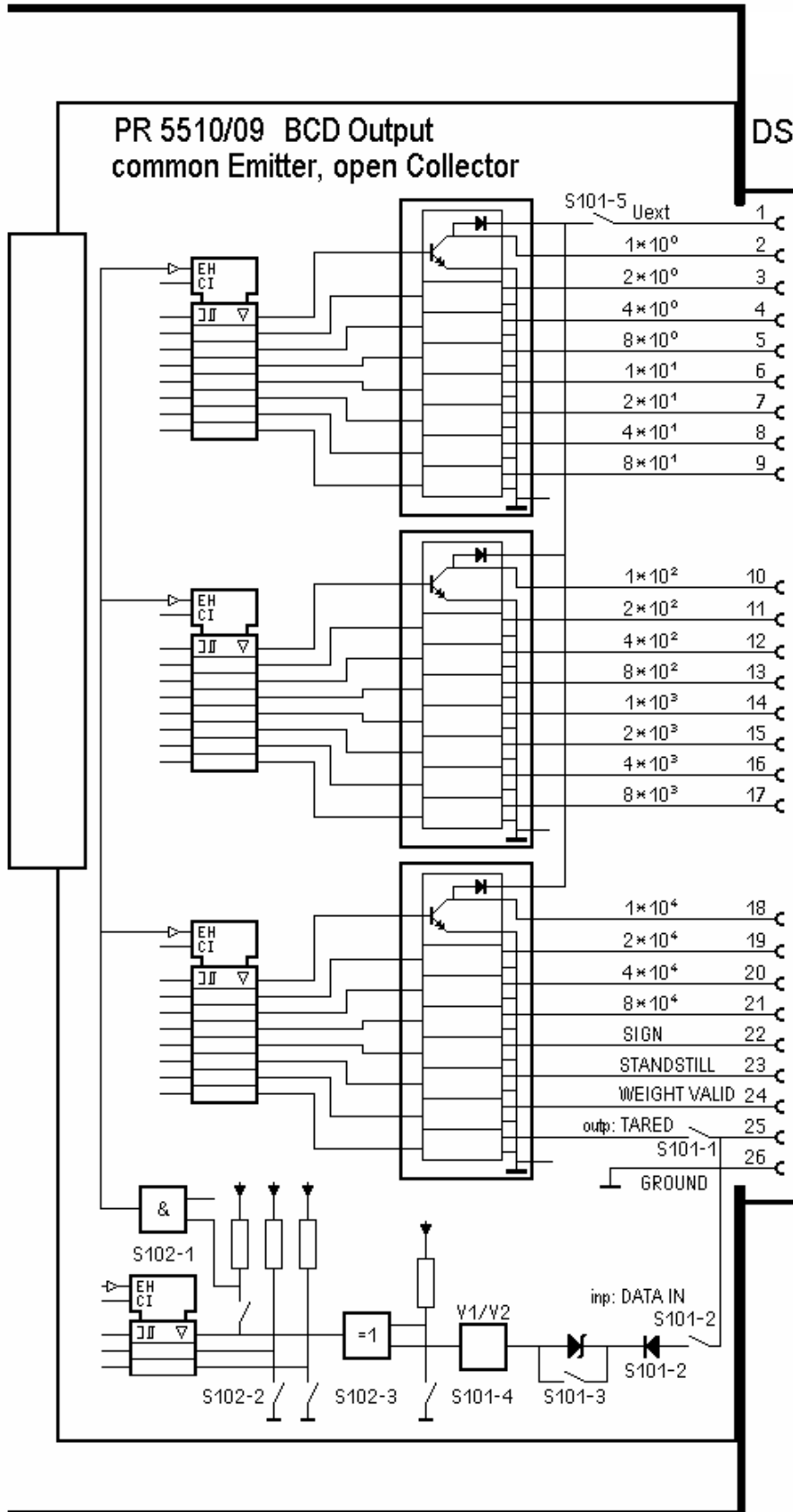
External supply voltage is required : pin 1 - Uext, reference potential pin 26 – GND

Outputs

PR 5510/09 outputs (pins 2 ... 24) use common GND as a reference potential and open collectors.
A non-activated output has high impedance, and an active output has a voltage by approximately 0.9 V higher than GND.
The load to be connected is applied between the collector [pins 2 … 24,(25*)] and Uext [PIN 1].

Input

When using as DATA_IN, the input (pin 25) can control the 23 outputs. As an output, data is "continuous/hold/tristate" and its signal can be configured (TTL/24V active (high/low). It is applied to pin 25 – DATA_IN of the 26-pin connector and is effective only with DIL switch S101-1 = OFF and S101-2 = ON.

Meaning of Switches S101 and S102

			Fact. sett.	S101	-1	-2	-3	-4	-5
				for:	*OU*	*IN*	*Level*	*Level*	*Diode*
As INPUT	DATA_IN	5V	Active HIGH	Pin 25	OFF	ON	ON	ON	x
As INPUT	DATA_IN	5V	Active LOW	Pin 25	OFF	ON	ON	OFF	x
As INPUT	DATA_IN	24V	Active HIGH	Pin 25	OFF	ON	OFF	ON	x
As INPUT	DATA_IN	24V	Active LOW	Pin 25	OFF	ON	OFF	OFF	x
Free-wheel diode*	internal								ON
Free-wheel diode*	internal								OFF

	Fact. sett.			S102	-1	-2	-3	-4	-5
				for:	*Function*	*Function*	*Function*	-	-
Pin25 INPUT	DATA_IN	follow	hold	Pin 2…24	OFF	OFF	ON	x	x
	DATA_IN	tristate	follow	Pin 2…24	ON	ON	OFF	x	x
	DATA_IN	tristate	hold	Pin 2…24	ON	ON	ON	x	x

Signal level:

DATA IN		Logic level	I input
high	5 V mode	> 3.1 V	0.5 mA
low	5 V mode	< 1.5 V	0.3 mA
high	24 V mode	> 16 V	1.0 mA
low	24 V mode	< 10 V	0.5 mA

PR 5510/09 connector, pin allocation:

DSUB 26-pol.
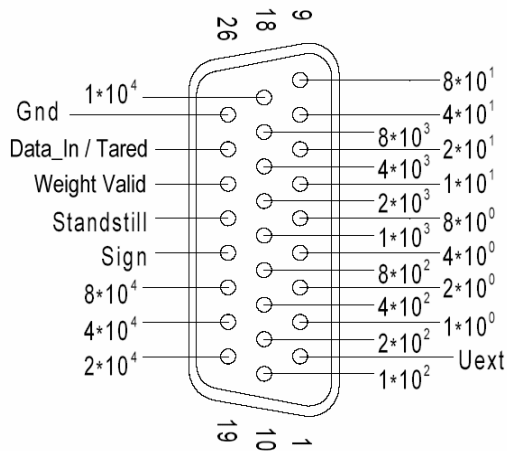
BCD output for weight value

Output circuitry
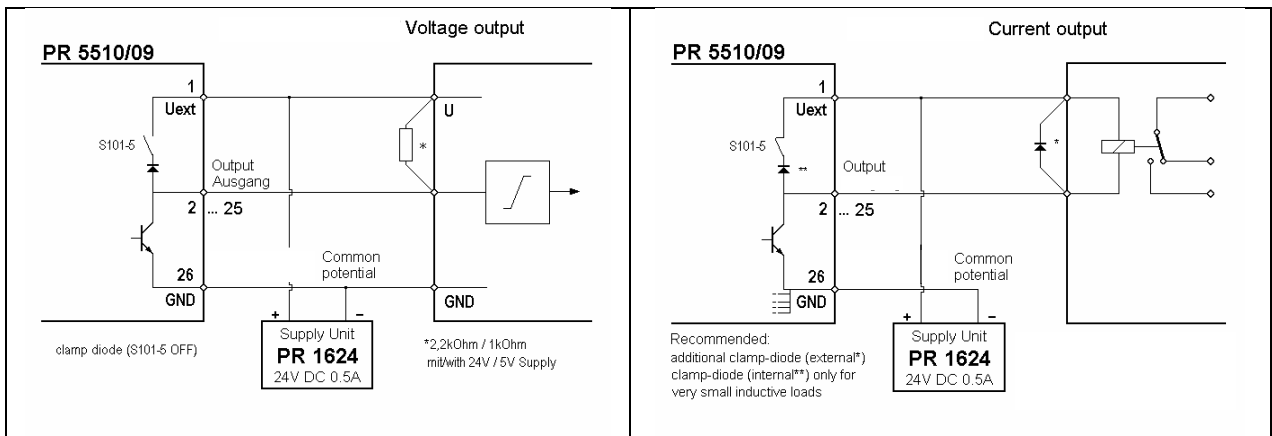
Output Modes

In all modes, data is output with each internal PLC cycle.

Mode 1 : Continuous data output (follow), no DATA_IN:
Continuous output of consistent data without request, e.g. for remote display.

Modus-1

- The driver modules are always enabled.
- PIN25 is output.
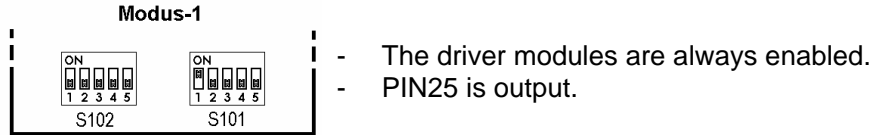
Mode 2: Data output on external request DATA_IN (hold):
Output of consistent data in "held" condition on request, otherwise continuous.

Modus-2

- As long as DATA_IN is active, the last output value remains held.
- The driver modules are always enabled.
- PIN25 DATA_IN is data-hold (level S101-3, polarity S101-4).
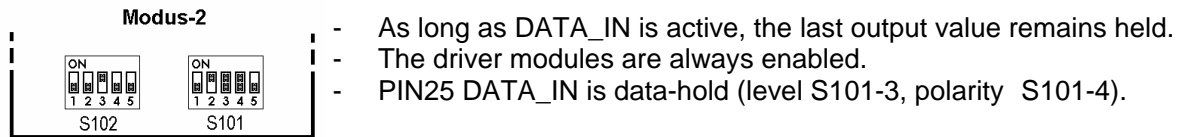
Note:
Data might be transferred internally (data modification) in the output memory at the same time the external request signal changes from "Data hold" to "Data valid". In this case, the reading instrument must wait 100 µs, until the data is considered valid.

Mode 3 : Parallel bus system (tristate), external request DATA_IN (hold):
Parallel connection of n PR 5510/09 cards, controlled via the DATA_IN (tristate/hold) input.
Output of the consistent data in "held" condition on request, otherwise tristate (high-impedance).

Modus-3

- As long as DATA_IN is active, the last output value remains held.
- The driver modules are enabled (not tristate) only, when DATA_In (hold) is active.
- PIN25 DATA_IN is data-enable+hold (level S101-3, polarity S101-4).
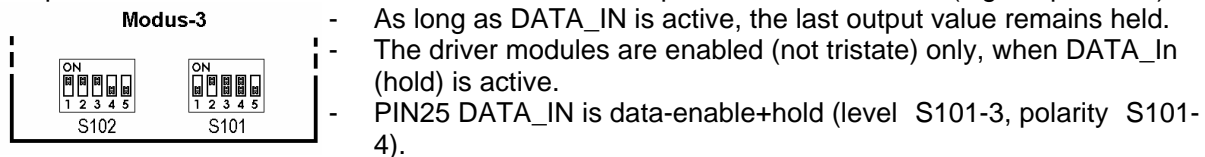
Mode 4 : Continuous single-bit output (23xDA), DATA_IN (1xDE):
Continuous bit output, continuous, without request (1xIN, 23xOUT, configurable).

Modus-4

- The driver modules are always enabled.
- PIN25 is input.
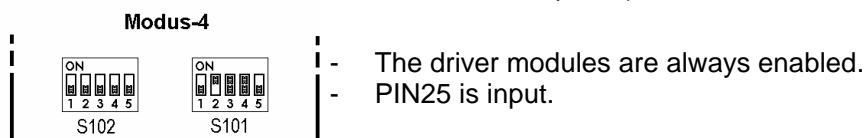
Mode 5 : Continuous single-bit output (24xDA), no DATA_IN:
Continuous bit output without request (24xOUT, configurable).

Modus-5

- The driver modules are always enabled.
- PIN25 is output.
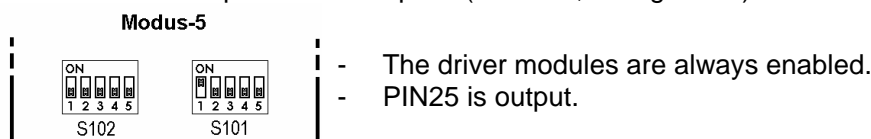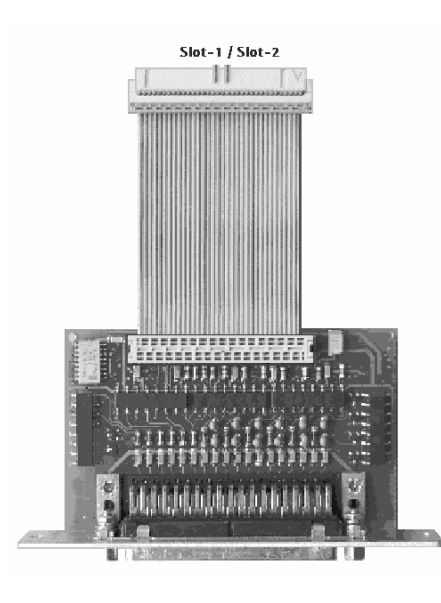
3.4.8   PR 5510/12 6 Optocoupler Inputs / 12 Optocoupler Outputs

The card converts external binary process signals to internal signal levels and vice versa.
12 digital outputs for process control, electrically isolated with passive optocoupler outputs, each bipolar potential-free.
6 digital inputs for process control, electrically isolated via optocouplers, each bipolar potential-free.
The input signal is logical "0" with open input.

	Internal connection:	34-contact female connector for Slot 1, 2
	Number of inputs/outputs:	Inputs: 6 , outputs: 12
	Input signal:	Low: 0 ... 5 VDC or open High: 10 ... 31 VDC Passive, external supply required
	Input current:	< 7 mA @ 24 V < 3 mA @ 12 V Protected against incorrect polarity
	Output:	Max. switching voltage: 32 VDC Max. switching current : 25 mA Voltage drop @ 25 mA: 3 V Protected against wrong polarity Passive, external supply required
	Electrical isolation:	Yes, via optocoupler
	Cable:	Shielded, max. 50 m
	Accessories (delivered with the unit):	1 DB37 mating plug (male) incl. shielded housing
	External connection:	26-contact D-Sub connector (female)
Dimensions (LxWxH): 60 x 106 x 22	Accessories:	PR 1623/10 4m connecting cable PR 1623/20 relay output terminal unit PR 1623/30 terminal I/O module
Weight: 70 g		

The card has independently from the slot position a fixed signal allocation.

Output, bit 1   DIMM (Weight below zero or above Max)
Output, bit 2   Weight within zero set range
Output, bit 3   Output limit 1
Output, bit 4   Output limit 2
Output, bit 5   Weight within 1/4 around zero
Output, bit 6   Scale error (ADC Error)
Output, bit 7 - 12   Not used

Input, bit 1   Set tare / reset tare, positive edge
Input, bit 2   Print command, positive edge
Input, bit 3 - 6   Not used
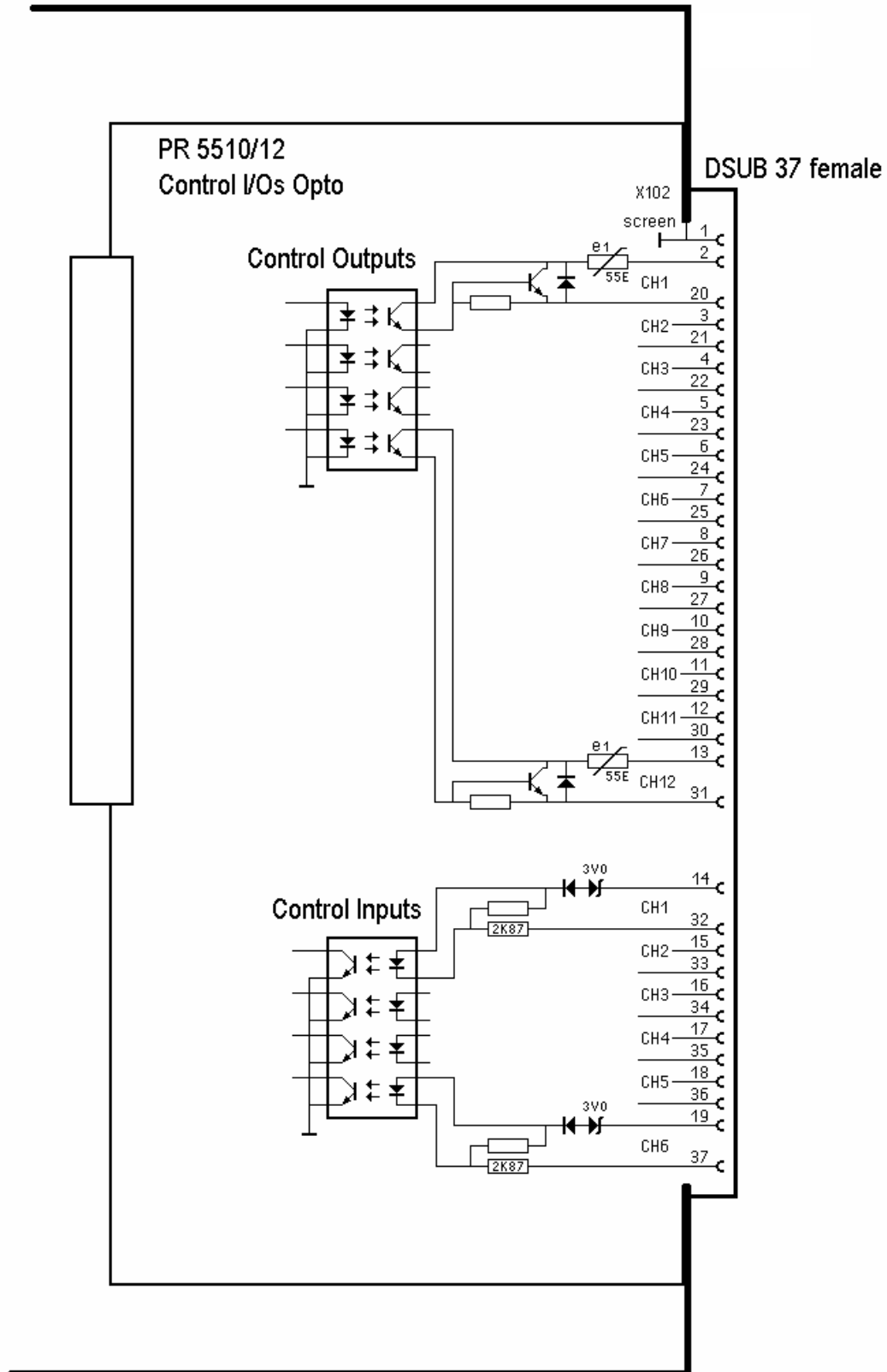
Passive; external supply voltage required (I/O channels potential-free, no common reference)
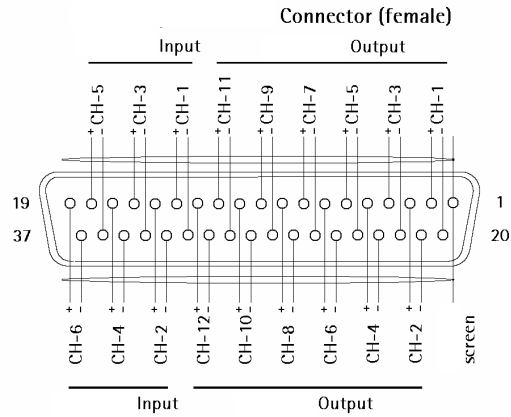
Output circuitry
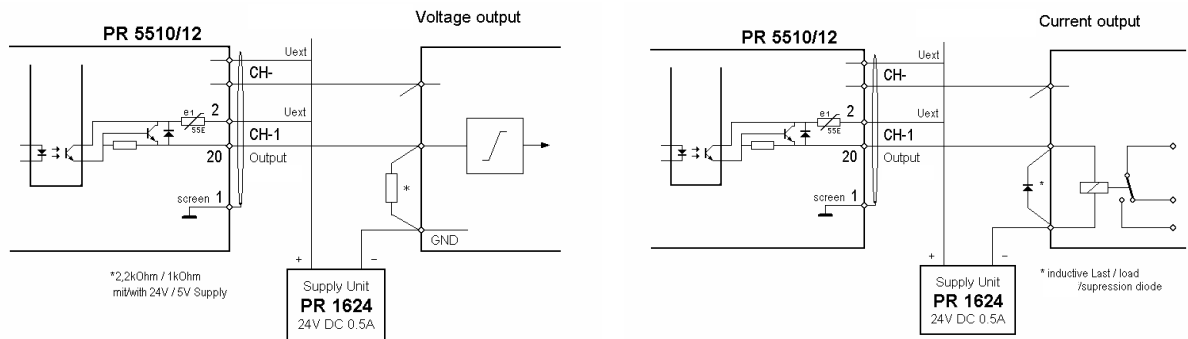
Input circuitry
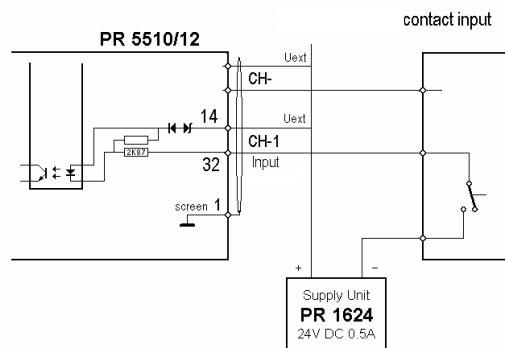
Circuit diagram: PR 5510/12 – PR 1623/10 – PR 1623/20
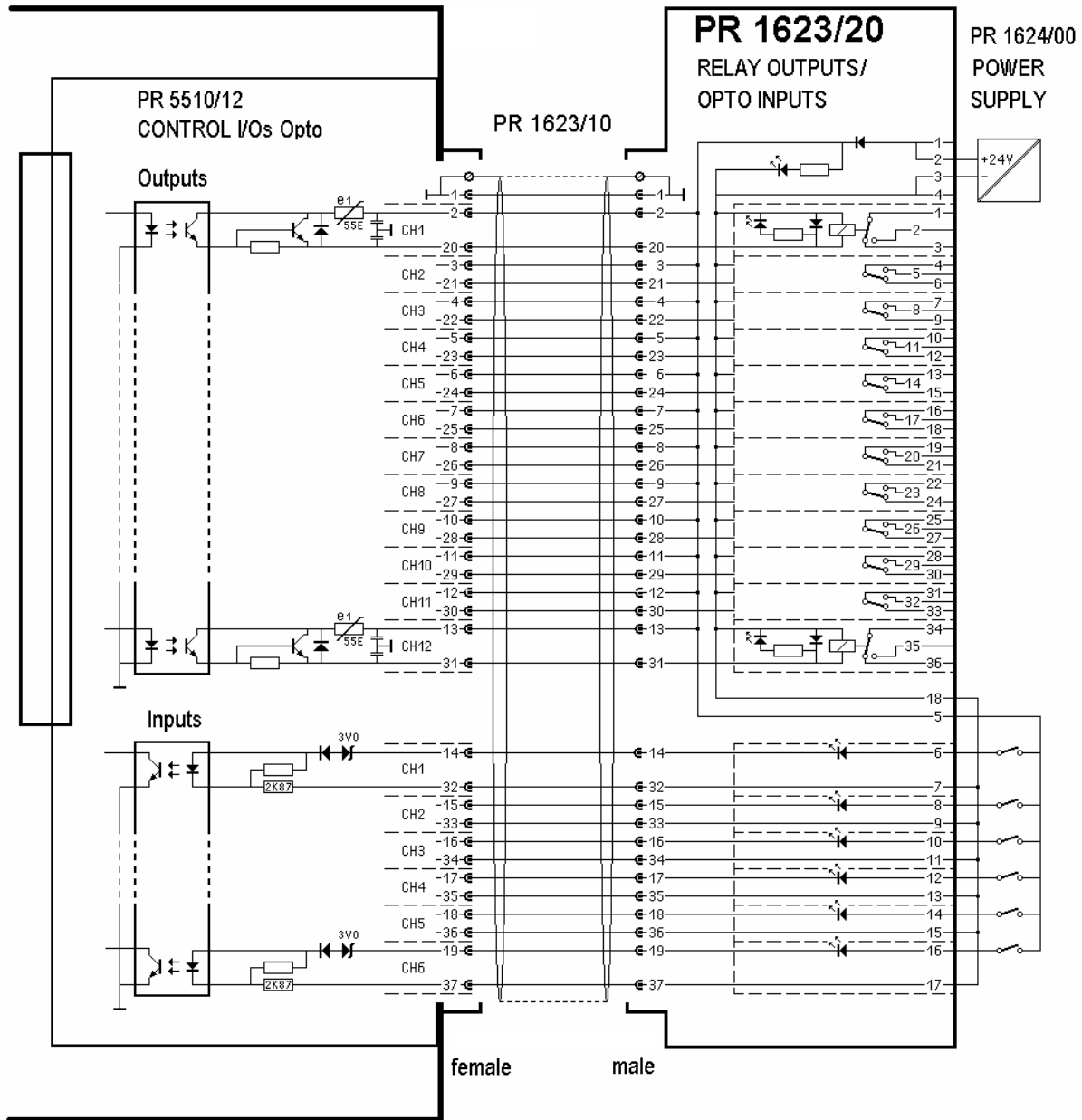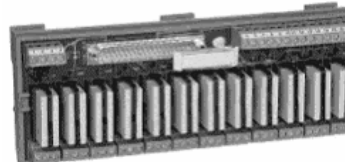
Circuit diagram: PR 5510/12 – PR 1623/10 – PR 1623/30
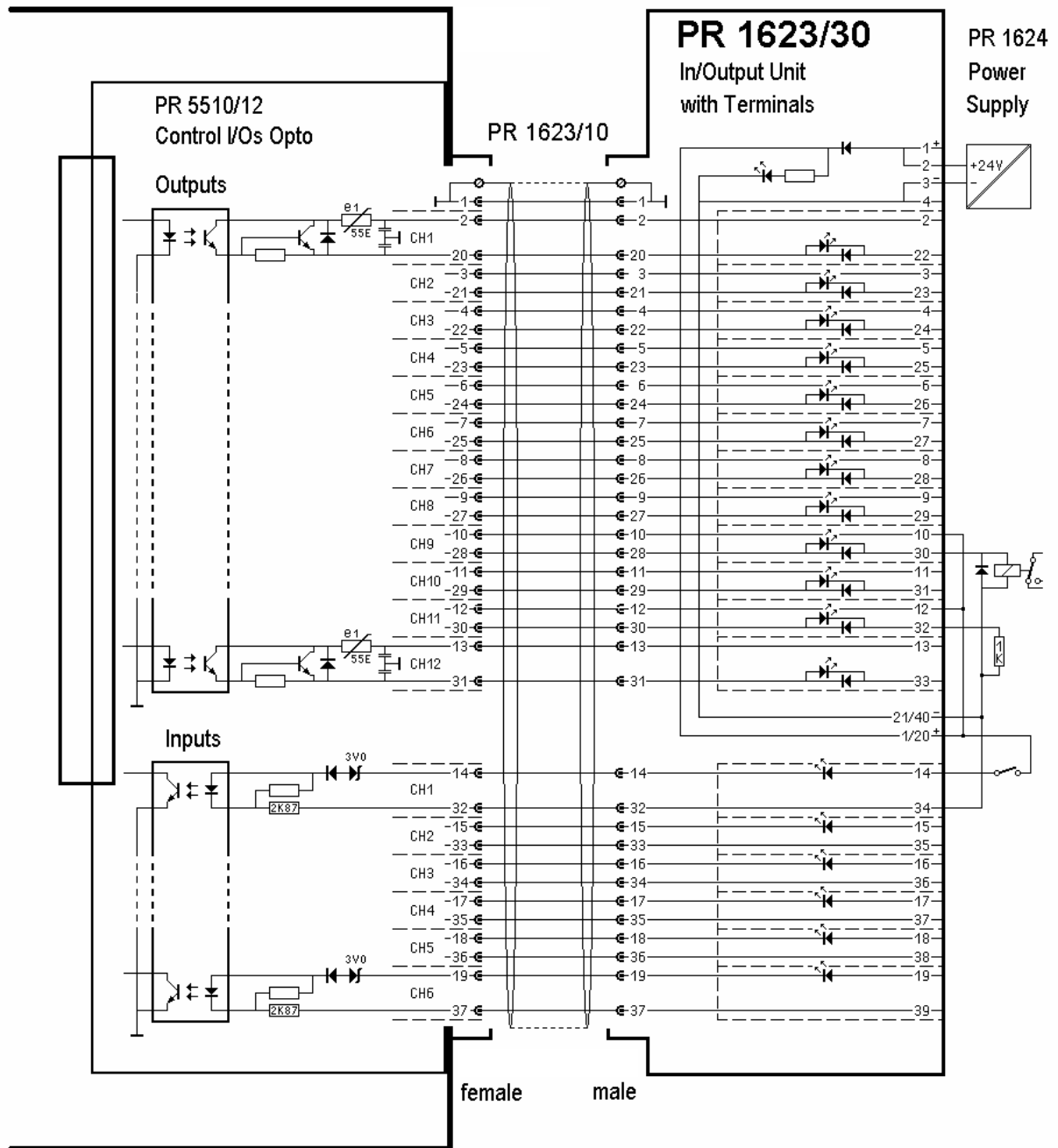
PR 1623/10

PR 1623/30
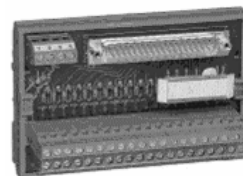
3.4.9   PR 1721/31   Profibus Interface

Profibus interface PR 1721/31 is a plug-in card for mounting in Slot 4; see Chapter 3.4.1. Communication protocols and syntax comply with the Profibus-DP standard to IEC 61158, with transfer rates up to 12 Mbit/s.

Slot-4	Internal connection:	34-pin connector on flat cable for Slot 4	
	External connection:	9-contact D-Sub socket ❷ in retainer plate	
	Transfer rate:	9.6 kbit/s to 12 Mbit/s, baud rate auto-detection	
	Connection mode:	Profibus network, connections can be made/released without affecting other stations	
	Protocol:	PROFIBUS-DP-V0 slave to EN 50 170 (DIN 19245), mono or multi-master systems are supported. Master and slave devices, max. 126 nodes possible. Watchdog timer	
	Transport:	EIA RS-485 , Profibus DIN 19245 Part 1	
	Cable:	Special Profibus color: violet Shielded twisted pair cable	
	Cable impedance:	150 ohms	
	Bus termination	Can be activated externally via DIL-switch	
	Certificates:	Profibus test center Comdec in Germany and PNO (Profibus User Organization). Suitable for industrial applications to CE, UL and cUL	
Dimensions (LxWxH):	87 x 55 x 15 mm	Electrical isolation:	Optocoupler in lines A and B (RS-485)
Weight:	125 g	Cable length:	Max. distances 200m can be extended with 1.5 Mbit/s by means of additional repeater.

⚠ Make sure the two rotary switches ❹ are set to position 0.
The terminating resistors can be switched on and off by pressing switch ❸ .

Connecting diagram for a master with three slaves
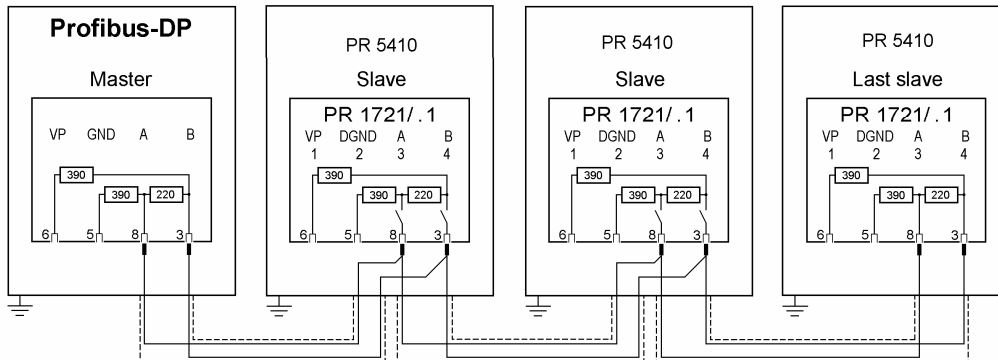
3.4.10 PR 1721/32 Interbus Interface

The Interbus interface PR 1721/32 is a plug-in card for installation in Slot 4; see Chapter 3.4.1.
The interface is based on the Interbus chip technology and enables transfer rates of 500 kbit/s and 2 Mbit/s.

Slot-4	Internal connection:	34-pin connector on flat cable, only for Slot 4	
	External connection:	Standard IBS 9-contact D-Sub socket OUT and D-Sub plug IN in retainer plate	
	Transfer rate:	500 kbit/s or 2 Mbit/s, selectable	
	Topology:	Bus as a closed ring	
	Protocol:	INTERBUS-S master-slave fixed telegram length, deterministic cyclical process data transmission with max. 10 words I/O.	
	Transport:	EIA RS-422, cable-bound	
	Cable:	Interbus, color: green 3x2 twisted pairs, common shield	
	Cable impedance:	150 ohms	
	Lead termination:	Not required, due to active ring topology	
	Certificates:	From Interbus Club e.V.: Compatibility with Interbus standard IEC 61158 (Parts 3 to 6) EN 50254 (DIN 19258) Suitable for industrial applications CE, UL & cUL	
Dimensions (LxWxH):	87 x 55 x 15 mm	Electrical isolation:	Yes, optocoupler and DC/DC converter
Weight:	125 g	Cable length:	400m (between two remote bus sharing units). Overall length: 13 km

> ⚠ With Bus OUT ❸, 5 and 9 must be bridged if another slave follows.
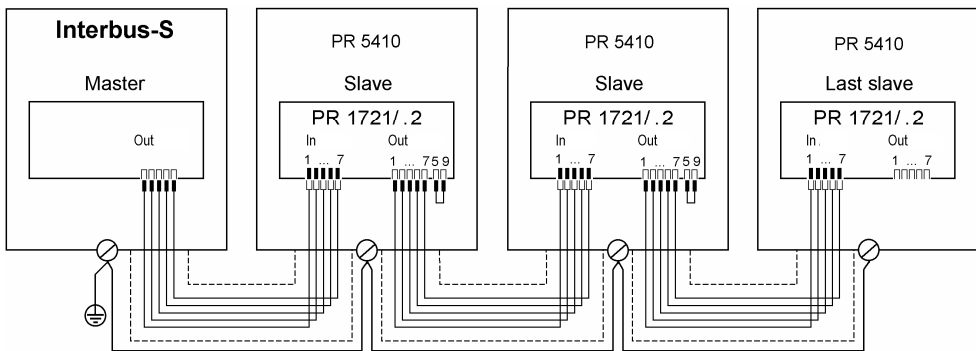
Connecting diagram for a master with three slaves.

3.4.11 PR 1721/34 DeviceNet Interface

DeviceNet interface PR 1721/34 is a plug-in card for installation in Slot 4; see Chapter 3.4.1. It is a complete DeviceNet adaptor (slave) with CAN controller and transfer rates of up to 500 kbit/s.

Slot-4

Internal connection:	34-pin connector on flat cable, only for Slot 4	
External connection:	5-pin screw terminal block ❷ (plug-in) in retainer plate	
Transfer rates:	125, 250 and 500kbit/s	
Topology:	Parallel bus	
Protocol:	DeviceNet master-slave Polling method (polled IO) CRC error detection to IEC 62026 (EN50325) Max. 64 station nodes Max. data width 512 bytes input&output	
Transport:	EIA RS-485	
Configuration:	EDS file (PR 1721/34-specific) MAC-ID (1…62)	
Certificates/ conformity:	Compatible with DeviceNet specification Vol. 1: 2.0, vol. 2: 2.0 ODVA certificate in accordance with conformity test software version A-12 Suitable for industrial applications CE, UL & cUL	
Cable:	DeviceNet, color: petrol-green 2x2 shielded twisted pair	
Cable impedance:	150 ohms	
Bus termination:	120 ohms at the cable ends	
Dimensions (LxWxH):	87 x 55 x 15 mm	Bus load:	33mA
Weight:	125 g	Electrical isolation:	Yes, optocoupler and DC/DC converter

⚠ Make sure DIP switches 1- 8 ❸ are set to ON.

Connecting diagram for a master with three slaves
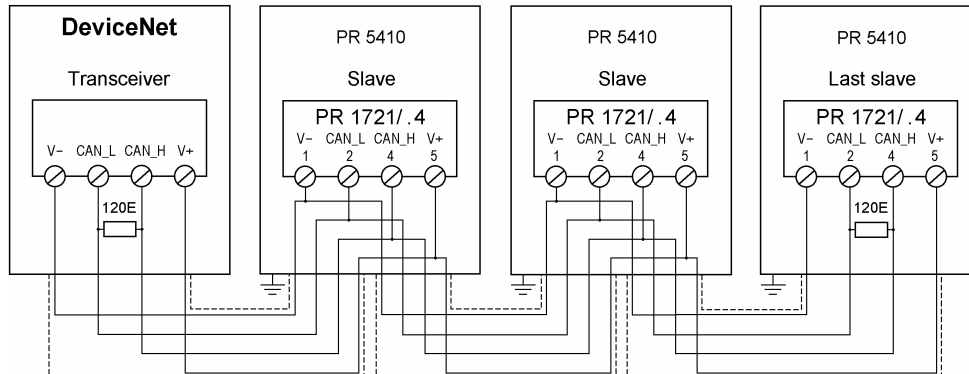
3.4.12 PR 1721/37 EtherNet/IP Schnittstelle

The EtherNet/IP interface is a plug-in card for installation in Slot 4, see chapter 3.4.1. The card is fitted with a standard RJ-45 socket for Ethernet connection and contains a powerful TCP/IP and EtherNet/IP connecting circuitry with transfer rates of 10 and 100Mbits/s.

	Internal connection:	❶ 34-pin connector on flat cable for Slot-4
	External connection:	❷ RJ-45 connecting socket in holding plate
	Transfer rate:	10Mbit/sec and 100Mbit/sec Autodetection (10/100, HalfDX/FullDX)
	Connection mode:	Network
	Protocol:	EtherNet/IP
	Transport:	TCP/IP oder UDP/IP
	Cable:	Twisted pairs, screened e.g. patch cable CAT5 Autolink (straight oder crossover)
	Cable impedance:	150 Ohm
	Cable length to HUB:	Max. 115 m
	Certificates:	EtherNet/IP Specification ODVA File No. 10286 Test Date: 06.09.2005 Vendor ID 90 See also: www.odva.org Tested according to: CE, UL & cUL
	Potential isolation:	Yes
	Dimensions (LxWxH):	87 x 55 x 15mm
	Weight:	125 g

The EtherNet/IP card is supported from PR 5410 Firmware Release 1.30 onwards. The IP-Address and the Subnet-Mask are set at Fieldbus parameter FP 96 und 97 (see chapter 4.7.7 and **Error! Reference source not found.**).

⚠ ❸ Take care, that switches 1 - 8 are set to (OFF)

❺	LED 1	LED 2	LED 3	LED 4
Off	No connection (HW)	No power	No power o. No IP Address	
On green	Connection (HW)	Controlled by a scanner	Online, connection established	
On red		Major unrecoverable fault	IP Address double, fatal error	
Flasching green		Not configured o. scanner in idle state	Online, no connection established	packet is received or transmitted
Flashing red		Minor recoverable fault	Connection timeout	
Alternat. red/green		Self test in progress	Self test in progress	

❹	Watchdog LED
Flashing 1Hz green	Modul initialized and running without problems

Flashing 2Hz green	Modul not initialized
Flashing red	RAM, ROM or ASIC test error

3.4.13 PR 5510/14 ModBus TCP Interface

The Ethernet interface PR 5510/14 is a plug-in card for installation in Slot 4, Chapter 3.4.1. The card is fitted with a standard RJ-45 socket for Ethernet connection.
It contains powerful TCP/IP and ModBus TCP connecting circuitry with transfer rates of 10 and 100Mbits/s.

	Internal connection:	❶ 34-pin connector on flat cable for Slot-4
	External connection:	❷ RJ-45 connecting socket in holding plate
	Transfer rate:	10Mbits/sec (10BaseT , Ethernet) and 100Mbits/sec (100BaseTx, Fast Ethernet) Auto-detection (10/100, HalfDX/FullDX)
	Connection mode:	Network
	Protocol:	ModBus-TCP
	Transport:	TCP/IP or UDP/IP
	Certificates:	Compatible with ModBus-TCP standard of ModBus organization suitable for industrial applications CE, UL, cUL
	Cable:	Twisted pairs, screened e.g. patch cable CAT5 Autolink (straight or crossover)
	Cable impedance:	150 Ohm
	Cable length to HUB:	Max. 115 m
Dimensions (LxWxH):	87 x 55 x 15mm Potential isolation:	Yes
Weight:	125 g	

Application: ModBus TCP as a Fieldbus interface
The IP-Address and the Subnet-Mask are set at Fieldbus parameter FP 96 und 97. (see chapter 4.7.7 and **Error! Reference source not found.**).

⚠	❸ Take care, that switches 1 - 8 are set to (OFF)

3.5 CONNECTING LOAD CELLS

Load cells or analog platforms (e.g., from the CAPP series) can be connected.
The supply voltage is protected from short circuit and overload.
The card is fitted with a solder link (factory setting: closed; see Chapter 3.5.5), which should be opened only when the supply voltage and thus also the sense voltage are reduced to below approx. +/- 4 VDC.
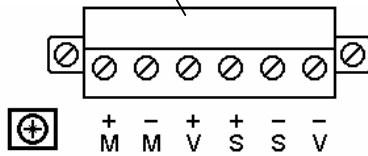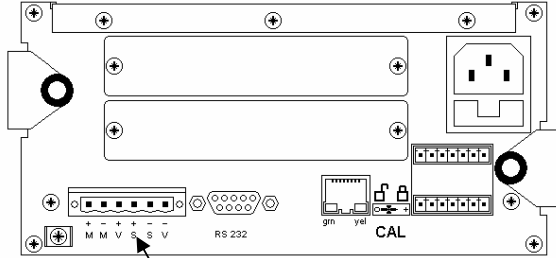
Terminal block	Connection	Description
+M	+ meas.	+ signal/LC output
- M	- meas.	- signal/LC output
+V	+ supply	+ supply/excitation
+S	+ sense	+ sense
- S	- sense	- sense
- V	- supply	- supply/excitation
Housing	GND	shield/ground

3.5.1 Connecting a Load Cell with 4-Wire Cable
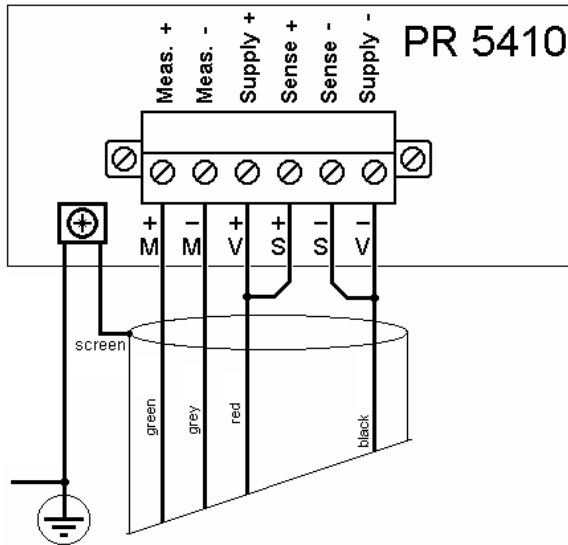
Provide links
between + supply and + sense and
between – supply and - sense
directly at the terminal block.

The cable colors shown above are applicable to the PR 62.. series load cells.
Before connecting, check the assignment of cable colors in the load cell manual.

3.5.2 Connecting PR 6221 Load Cells

See PR 6021/08, -/68 operating manual.

3.5.3   Connecting up to 8 Load Cells (650 Ohms) Using 6-Wire Connecting Cable

Via cable junction box PR6130/.. using PR 6135 or PR6136 connecting cable:
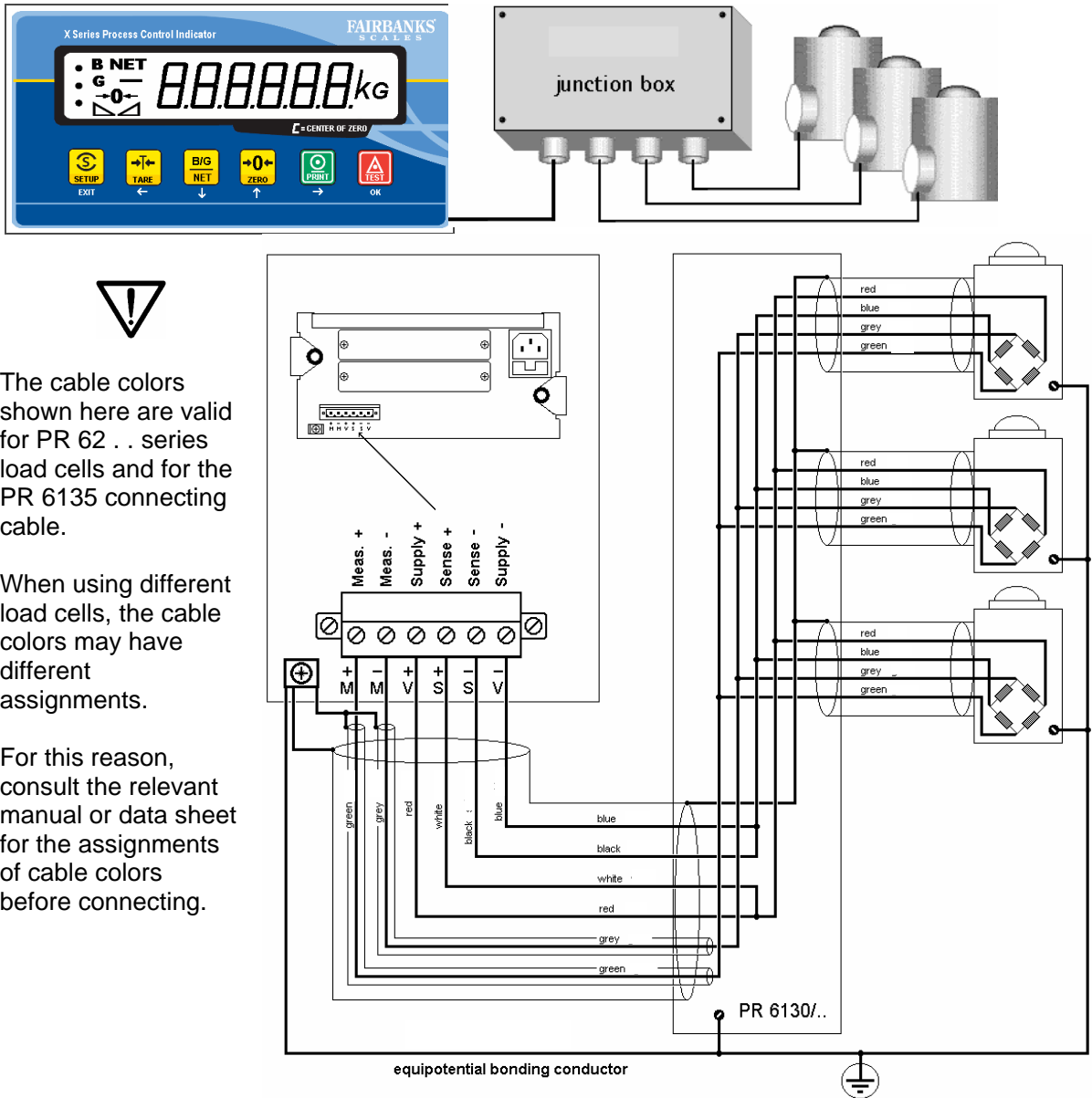
The cable colors
shown here are valid
for PR 62 . . series
load cells and for the
PR 6135 connecting
cable.

When using different
load cells, the cable
colors may have
different
assignments.

For this reason,
consult the relevant
manual or data sheet
for the assignments
of cable colors
before connecting.

Recommendations: - Install cable in steel pipe connected to earth potential.
 - Min. distance to high-voltage cables: 1m

Load cell supply circuit:
Load resistance of load cell circuit $\geq$ 75 ohms, e.g. 8 load cells of 650 ohms each,
supply voltage is 12 V DC; for further data, see Chapter 12.4.

3.5.4   Connecting Load Cells with External Supply

When the load of the load cells is < 75 ohms (e.g. more than 4 load cells with 350 ohms), external load cell supply is required. In this case, the internal supply is replaced by a potential-free external supply. The neutral wire of the external supply voltage (0 ext. supply) must be connected to the instrument housing to ensure that the voltage is symmetrical to 0. The internal supply is not connected.
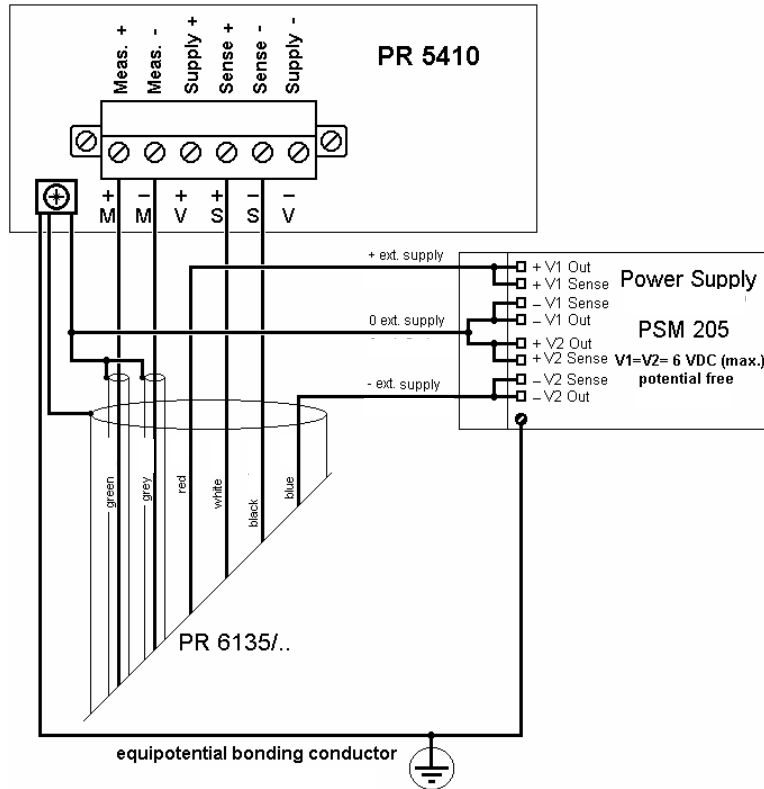
The cable colors indicated above are valid for connecting cable PR 6135.
When using other load cells/cables, the assignment of colors may differ.
For this reason, the relevant manual or data sheet should be consulted for assignments of cable colors before connecting.

3.5.5 Connecting Load Cells via Intrinsically Safe Load Cell Interface PR 1626/60
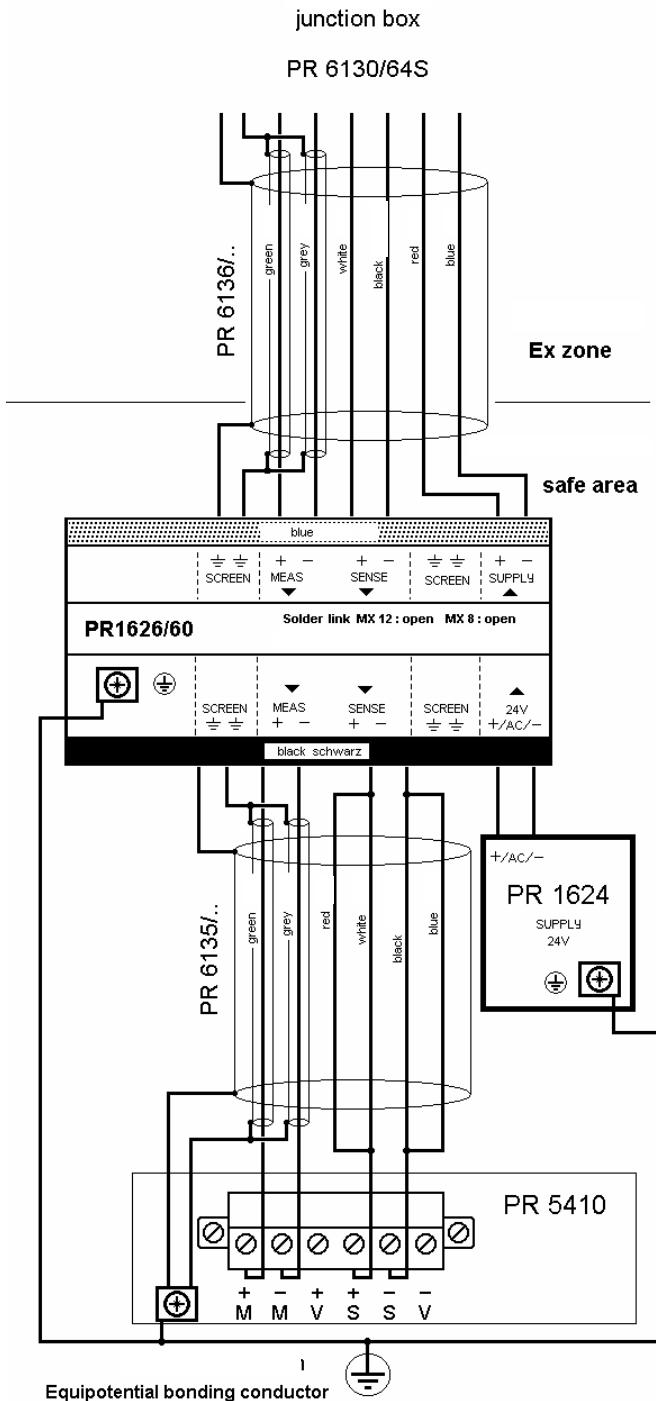
The cable colors shown here are valid for the PR 62.. series load cells and for PR 6135 and PR 6136 connecting cables.

When using other load cells, the assignments of cable colors may differ.

For this reason, the relevant manual or data sheet should be consulted for assignments of cable colors before connecting.

When using the PR 1626/60 intrinsically safe load cell interface with 7.5 VDC (MX 8 closed), open the solder link on the main board of PR5410 to switch the sense voltage detection.
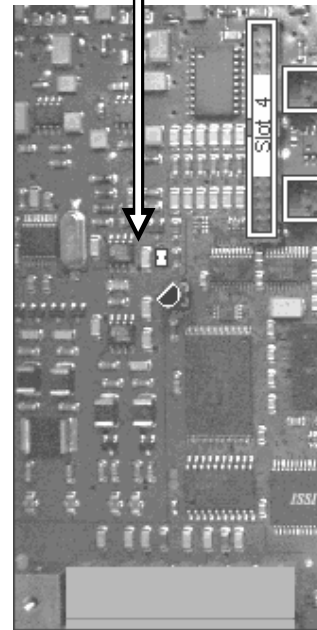
The PR5410 load cell supply must not be connected.

3.5.6   Connecting Platforms (CAP...)

One Combics analog platform (CAP... series) can be connected to the instrument.
The following example shows a platform with 6-wire connection and another one with 4-wire connection.

Platforms with
4-wire connection require
links between +V and +S and
between –V and –S.
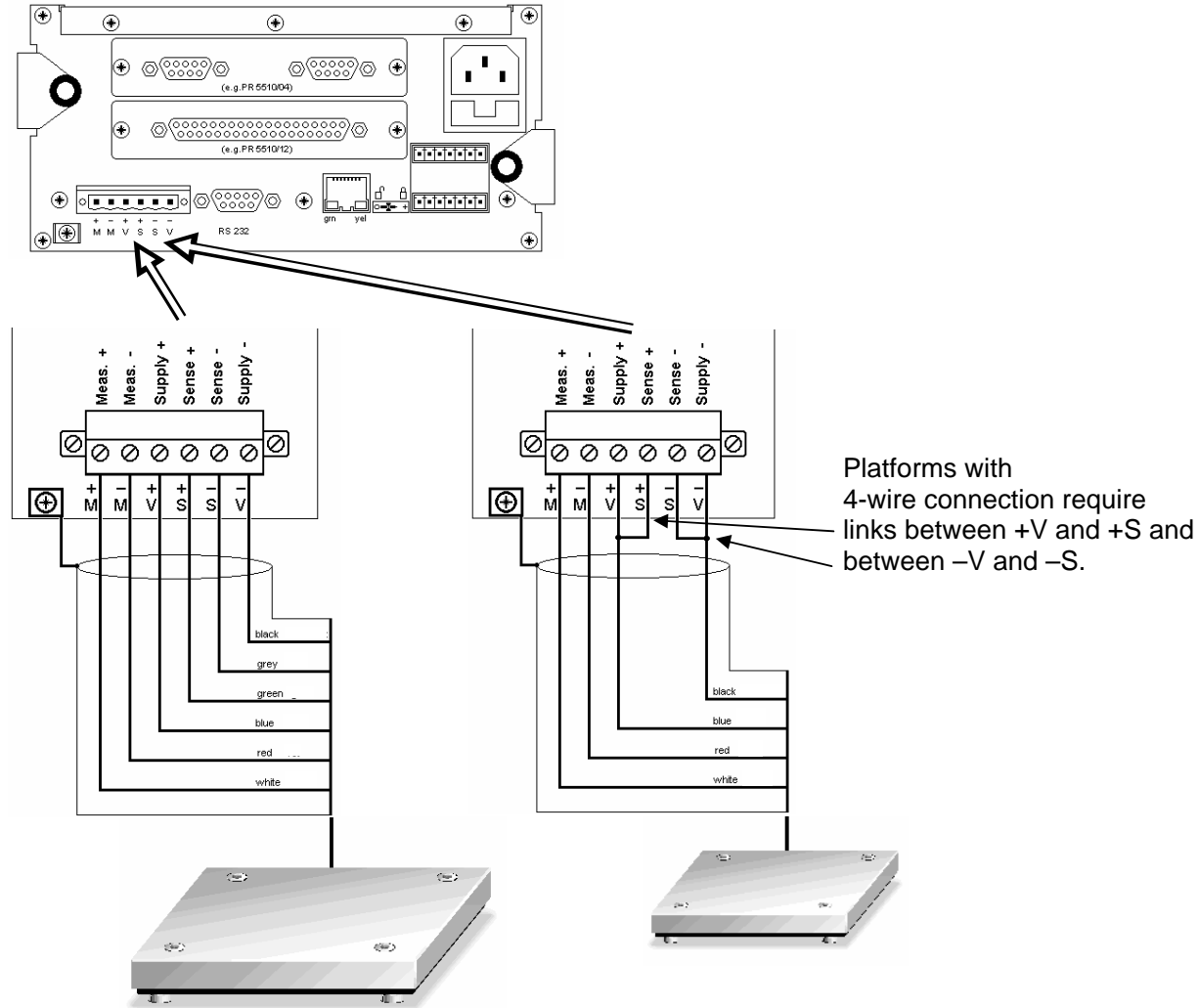
⚠ The cable colors shown above are valid for a CAPP4 500 x 400 and a CAPP1 320 x 420, as an example.
The assignments of cable colors are given in the platform operating manual.

The cable shields must be connected to the GND terminal of the instrument. If the measuring lines (+M, -M) are shielded individually, these shields must be connected to the GND terminal as well.

4 Commissioning

Front panel key assignment and operating concept are described in Chapter 2.3.

4.1 DATA PROTECTION/POWER FAILURE

The calibration data and parameters as well as all configuration and interface data are stored in non-volatile (EAROM) memory. Unauthorized data changing can be prevented by an access code; the front panel keys can be disabled. Additional write protection is provided for calibration data and parameters (CAL switch, see Chapter 4.1.1). Clock and calendar continue running in the event of a power failure.

4.1.1 CAL Switch

The CAL switch is located on the instrument back panel. Generally, we recommend setting the switch into the closed position after calibration to prevent accidental overwriting/data loss.
The built-in alibi memory is protected against erasure, as long as the CAL switch is closed.
With legal-for-trade applications, the CAL switch must be sealed in the closed position.
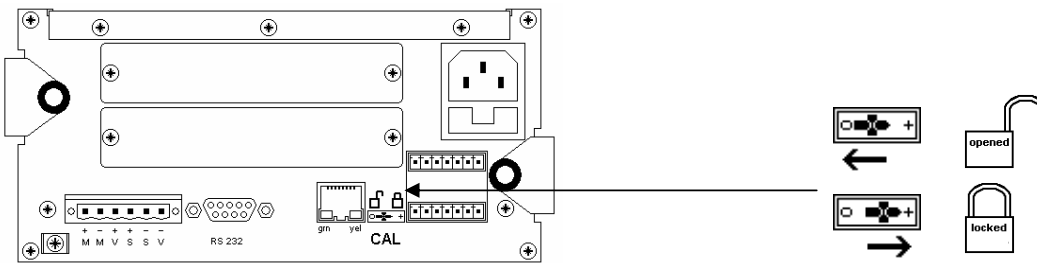
With operation via front keys with [SETUP] under Cd 000 'CAL.CLS' is shown if the CAL switch is closed, the calibration data and - parameter can be viewed but not altered.
To view the position of the CAL switch with VNC, select (Info)-[Show status]:

Info/Status	
Free system RAM	1904 of 13136 kb
Clock battery	ok
Cal-Switch	opened

[opened] = opened; no write protection
[closed] = closed; write protection is active.

4.2 SWITCHING ON THE INSTRUMENT

The instrument can be put into operation and calibrated using a PC with the VNC program (on the enclosed CD), an Internet browser or the ConfigureIt program.

On initial start-up, the date and time must be set.

When the supply voltage is applied to the instrument, the following information is displayed:

`Pr5410`	Instrument type: PR5410 = X3
`b 1.00.00.`	BIOS release
`F 1.00.00.`	Firmware release
`8.8.8.8.8.8.kg`	Automatic display test
`1350.50 kg`	Weight display

`Error6☐`	Error message if no load cells are connected, see Chapter 4.6.1.

4.2.1 Display Test

Press 🔲 to access the front panel key menu: `dSP.tSt.` .

`8.8.8.8.8.8.kg`   Press OK) to activate all display items. After approx.   5 s, the menu is closed automatically.

4.2.2 Front-Panel Key Test

Press and hold `B/G NET`, then press `A TEST` as well.

`0.0.0.0.0.0.`	One digit per key is displayed. Each time a key is pressed, the corresponding digit is incremented by 1
`0.0.0. 1.0.0.`	Display, if `→0← ZERO` is pressed once
`-8023-`	Display, if several keys (2 and 3) are triggered simultaneously
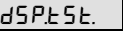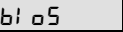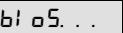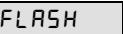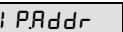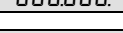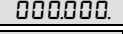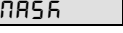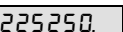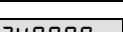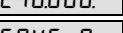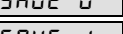
If no key is pressed for 5 s, the test is finished automatically and the weight is displayed again.
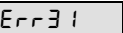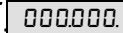
4.2.3 Resetting the Instrument to the Factory Settings

Reset to the factory settings is possible only, when the CAL switch is open.
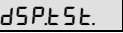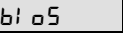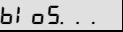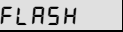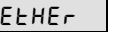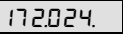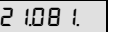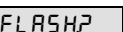
🔲 SETUP	Press Setup at the instrument
`dSP.tSt.`	Press ↓ to reach the BIOS menu
`bIoS`	Press OK
`bIoS. . .`	Is displayed, followed by
`FLASH`	Press ↓ ↓ to go to menu
`dEL.EAr.`	Press OK
`ErAS. 0`	It is asked, whether resetting should be done
`ErAS. 1`	Alter with ↓ the '0' to '1' for resetting and confirm with OK
`donE`	Is displayed to indicate the execution

4.2.4 Setting the Network Address Using Front-Panel Keys

[SETUP]	Press Setup at the instrument
dSPtSt.	Press ↓ to reach the BIOS menu
bioS	Press OK
bioS...	Is displayed, followed by
FLASH	Press ↑ to reach the menu
nEt	Press OK
iPAddr	Instrument will display the IP-address next
000.000.	The most significant part of the address* is displayed, with ← the position is selected (the current digit blinks) and press ↑ / ↓ to select the digit
000.000.	By → the least significant part of the address* can be set, continue with OK
MASK	Instrument will display the mask next
225.250.	The most significant part of the mask* is displayed, with ← the position is selected (the current digit blinks) and press ↑ / ↓ to select the digit
240.000.	By → the least significant part of the address* can be set, continue with OK
SAUE 0	It is asked, whether address and mask should be stored
SAUE 1	Alter with ↓ the '0' to '1' for storing and confirm with OK
donE	Is displayed to indicate the execution

Err31   * Error message, if digit group for IP-address / mask is not within 0 - 255

For DHCP (Assignment by server) the address has to be set to ˜ 000.000. ˜ 000.000.   .

4.2.5 Viewing the Network Address via Front-Panel Keys

[SETUP]	Press Setup at the instrument
dSPtSt.	Press ↓ to reach the BIOS menu
bioS	Press OK
bioS...	Is displayed, followed by
FLASH	Press OK
EtHEr	Press OK
dHCP...	Instrument is waiting for address assignment by the server
172.024.	The most significant part of the Ethernet address is displayed
21.081.	Subsequently the least significant part of the Ethernet address is displayed
FLASH?	Terminate with [SETUP] [SETUP]

Caution: In case of restart, a new address may be assigned by the server.

4.2.6 Searching the Instrument in the Network Using 'IndicatorBrowser'

The address can be determined using the 'IndicatorBrowser' program (stored in a directory on the enclosed CD-ROM).
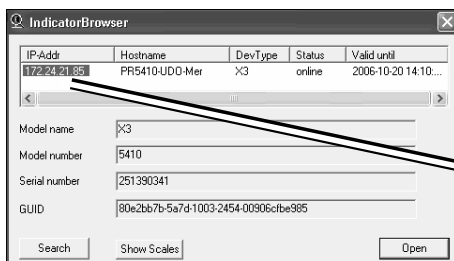
When connecting the instrument to a network, it is "default" in the DHCP mode; i.e., an address is assigned to it by the server. This address, e.g., 172.24.21.85, can be determined using the 'IndicatorBrowser' program.

4.2.7 Loading New Software

[SETUP]	Press Setup at the instrument
dSP.tSt.	Press ↓ to reach the BIOS menu
bi oS	Press OK
bi oS. . .	Is displayed, followed by
FLASH	Press OK
EtHEr	For flashing over the network, you can press OK
SEri AL	Alternatively, you can press ↓ to select the built-in serial interface
dHCP. . .	Now, the instrument indicates: Waiting for address assignment by the server
172.024.	The most significant part of the Ethernet address is displayed
21.08 1.	Subsequently the least significant part of the Ethernet address is displayed
FLASH?	The instrument is waiting for the start of the FlashIt program.
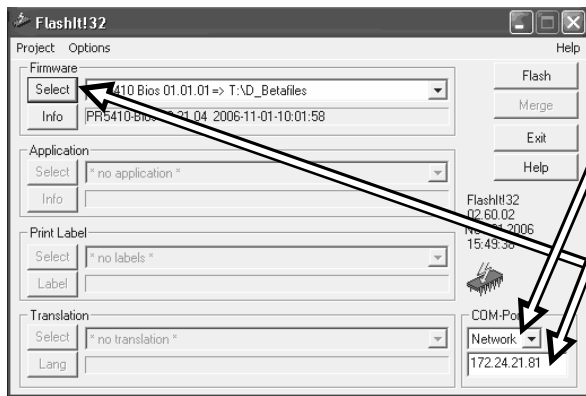
Run FlashIt!32 Rel. 02.60.02, Nov 21 2006

Select the network

Enter the instrument IP address

Select the module to be flashed

Click [Flash] to start the procedure

In case BIOS, firmware and application must be updated, the procedure must be executed sequentially.

4.3 CONFIGURATION AND CALIBRATION USING FRONT KEYS

4.3.1 Meaning of Front Keys

The instrument can be set directly via front keys:

SETUP	TARE	B/G NET	ZERO	PRINT	TEST
EXIT	←	↓	↑	→	OK

SETUP	Press Setup
`SEtuP`	Setup-Menu, press OK
`Cd 000`	Calibration menu, 'Cd' is flashing

With ↑ the next parameter group (Cp) is selected, with → switch to the parameter number ('000' is flashing), the parameter table is described in chapter 4.3.3 .

If a selection has to be performed, ↑ / ↓ have to be used.
The digit position is selected by ← / → , with ↑ the digit is increased, with ↓ decreased.
Inputs are completed by OK , a menu is left with Exit.

All parameters / data are clearly characterized by a max. 3-digit number, additionally two letters are preceded for the parameter group for easy allocation.

If data have to be overwritten, a safety prompt appears:
`SAVE` if the data should not be saved, then 'YES' has the be changed with ↑ to 'no'.

4.3.2 Entering Date and Time

1. Press SETUP, SEtuP is shown
2. Press OK , Cd 000 (Cd is flashing),
   with ↑ (9 x) change to dt 086
3. Press OK , YEAr is shown
4. Press OK , 2007 (YYYY) is shown, alter with ← / → and ↑ / ↓
5. Press OK , dAtE is shown
6. Press OK , 05.15 (MM.DD) is shown, alter with ← / → and ↑ / ↓
7. Press OK , tIME is shown
8. Press OK , 17.35 (HH.MM) is shown, alter with ← / → and ↑ / ↓
9. Press OK , dt 086 is shown
10. Press Exit to leave the menu

4.3.3 Parameter Table

- SEtuP

```
- Cd     Calibration data
    - 000     CALIb      nEW new calibration, VIEW view data, Mod modify calibration
    - 001     MAX.FSd    Decimal point position, Max (Scale range) and weight unit
    - 002     StEP       Scale interval
    - 003     dEAdLo     Deadload setting  by weight (LoAd) or mV/V (MVoLt)
    - 004     SPAn       Calibration weighing range by weight (LoAd) or mV/V (MVoLt)
    - 005     0-rnG      Show used zeroset range
    - 006     uVolt.d    Show µV/d
    - 007     WEIGHt     Show current gross weight, with      10-fold multiplier is activated
- CP     Calibration parameter
    - 010     MEAtIM     Measure time
    - 011     FILtEr     Digital filter
    - 012     FCut       Cut-off frequency
    - 013     tStMod     Test mode
    - 014     WAM        W&M, legal for trade
    - 015     StStIM     Standstill time
    - 016     StSrnG     Sandstill range
    - 017     TArtIM     Time out for taring / zeroset
    - 018     ZESrnG     Zeroset range
    - 019     ZEtrnG     Zerotrack range
    - 020     ZEtStP     Zerotrack step
    - 021     ZEttIM     Zerotrack time
    - 022     oVrLd      Overload
    - 023     MIn        Min weight
    - 024     MuLrnG     Multi range mode
    - 025     rAnG  1    Range 1
    - 026     rAnG  2    Range 2
- LI     Limits
    - 030     LIM.1on, LIM.1oF   Limit 1 'On', Limit 1 'Off'
    - 031     LIM.2on, LIM.2oF   Limit 2 'On', Limit 2 'Off'
    - 032     LIM.3on, LIM.3oF   Limit 3 'On', Limit 3 'Off'
- LA     Limits, action / condition
    - 033     LIM.1on    Action / Condition
    - 034     LIM.1oF    Action / Condition
    - 035     LIM.2on    Action / Condition
    - 036     LIM.2oF    Action / Condition
    - 037     LIM.3on    Action / Condition
    - 038     LIM.3oF    Action / Condition
- do     Digital outputs
    - 040     bCd.out    BCD-Mode: GroSS = gross, NEtIt = net if tared, else gross, SELECt,
                         trnSP
    - 041     outP. 1    Output 1
    - 042     outP. 2    Output 2
    - 043     outP. 3    Output 3
- dI     Digital inputs
    - 044     InP.1on    Input 1, condition
    - 045     InP.1oF    Input 1, condition
    - 046     InP.2on    Input 2, condition
    - 047     InP.2oF    Input 2, condition
    - 048     InP.3on    Input 3, condition
    - 049     InP.3oF    Input 3, condition
- Ao     Analog outputs
    - 050     AnA.Mod    Mode: GroSS = Brutto, NEtIt = Netto wenn tariert, sonst Brutto, SELECt,
                         trnSP
    - 051     AnA.rnG    Range 0/4 - 20 mA
    - 052     out.Err    Output at error
    - 053     out.< 0    Output at  < 0
    - 054     out.>20    Output at > Max
    - 055     WGt.0/4    Weight at 0/4 mA
```

```
    |  |- 056      WGt. 20      Weight at 20 mA
    - oP    Operating parameter
    |  |- 060      Addr         Instrument address
    |  |- 061      PIn          Access Code
    |  |- 062      ALIbI        Alibi storage, nonE, GroSS, nEt , Gr.nE.tA., Gr.nE. oder Gr.tA
    |  |- 063      SEqnr        Next free sequence number
    |  |- 064      tArKEY       Tare-Key, Function, Disable
    |  |- 065      ZErKEY       Zeroset-Key, Function, Disable
    |  |- 066      nbtKEY       N.B.T -Key, Disable
    |  |- 067      PrtKEY       Print-Key, Disable
    |  |- 068      tStKEY       Test-Key, Disable
    - PP    Print parameter
    |  |- 073      PrtMod       LAYout (direct) /  nICELb (Nice Label)
    |  |- 074      LAYou1       Select item 1
    |  |- 075      LAYou2       Select item 2
    |  |- 076      LAYou3       Select item 3
    |  |- 077      LAYou4       Select item 4
    |  |- 078      LAYou5       Select item 5
    |  |- 079      LAYou6       Select item 6
    - nP    Network parameter
    |  |- 080      dHCP         DHCP
    |  |- 081      IP.Addr      IP-Address
    |  |- 082      SubnEt       Subnet
    |  |- 083      Gt.Addr      Gateway
    |  |- 084      CLIEnt       VNC-Client
    |  |- 085      Et.Addr      Ethernet Chip Address (12 HEX Characters)
    - dt    Date, Time
    |  |- 086      YEAr         YYYY, dAtE: MM.DD,  tIME: HH.MM
    - VS    Program Version
    |  |- 087      FIrM         Firmware Version
    |  |- 088      bIoS         Bios Version
    |  |- 089      boArd        Board number
    - FP    Fieldbus Parameter
    |  |- 090      Prot         Protocol
    |  |- 091      PdPAdr       PDP-Address
    |  |- 092      dVnbdr       Devicenet Baudrate
    |  |- 093      dVnAdr       Devicenet Address
    |  |- 094      CCLbdr       CC-link Baudrate
    |  |- 095      CCLAdr       CC-link Address
    |  |- 096      ModbIP       Modbus TCP  / EtherNet/IP  IP-Address
    |  |- 097      ModbSu       Modbus TCP  / EtherNet/IP  Subnet Mask
    - AL    Alibi Storage
    |  |- 100      SEqnr        Input sequence number for alibi view / print
    |  |- 101      ErASE        Erase alibi storage contents YES / no
    - SI    Serial Interfaces
    - SI  110      Print        Printer
    - SI  111      rEMdSP       Remote Display
    - SI  112      ModbuS       Modbus RTU
    - SI  113      SMA          SMA
    - SI  114      ASYCoM       Asycom
    - HS    Hardware Status
    |  |- 120      Slot 1       EMPtY = empty or PR 5510 card type
    |  |- 121      Slot 2       EMPtY = empty or PR 5510 card type
    |  |- 122      Slot 4       EMPtY = empty or PR 1721 card type
    |  |- 123      bAt          bAt oK   Battery Status
```

The meaning of the data and parameters as well as the value ranges have to be taken from the VNC operating description (see chapter 4.4 to 4.9).

4.3.4   New Calibration using Front Keys

Example: Max (Maximum load) 600 kg, scale interval 200 g, setting deadload with empty scale.
At start of a new calibration the instrument has got the following default values: Max 3000 kg, scale interval 1 kg.

START
1. Warm-up the instrument (minimum 0,5 hours), open CAL switch

2. Press [SETUP], SEtuP is shown

NEW CALIBRATION (Cd 000)
3. Press OK , Cd 000 (Cd is flashing)
4. Press OK , CALIb is shown (with CAL switch closed CAL.CLS is shown, calibration is not possible, but data can be shown)
5. Press OK , nEW (for new calibration) is shown

DEFINING SCALE RANGE and WEIGHT UNIT (Cd 001)
6. Press OK , Cd 001
7. Press OK , MAX.FSd for Max (Maximum load for weight display = Full scale deflection) is shown
8. Press OK , - - - - - -.kg is shown
9. With ← the decimal point is shifted left for 1 digit behind the decimal point - - - - -.- kg
10. Press OK 00300.0 kg is shown (the 3 is flashing) , with ↑ (3 x) change to 6 für 600.0 kg
11. With → (4 x) switch to weight unit (kg is flashing) and if required change to t, Lb or g with ↑

DEFINING SCALE INTERVAL (Cd 002)
12. Press OK , Cd 002
13. Press OK , StEP is shown
14. Press OK , 1 is shown, change with ↑ to 2 for 200 g scale interval

SETTING DEADLOAD (Cd 003)
15. Press OK , Cd 003
16. Press OK , dEAdLo is shown
17. Press OK , LoAd is shown (Deadload with empty scale, else with ↑ MUoLt for mV/V input)
18. Press OK , unLoAd is shown, unload scale
19. Press OK , a weight value for deadload is shown
20. Press OK , deadload is set, the display must show 00000.0 kg

SETTING SPAN (Cd 004)
21. Press OK , Cd 004
22. Press OK , SPAn is shown
23. Press OK , LoAd is shown (Range with test weights, else with ↑ MUoLt for mV/V input)
24. Press OK and apply test weights, instrument displays a weight value (still not calibrated)
25. Press OK , WEIGHt is shown
26. Press OK , 00600.0 kg is shown (Maximum test weight),
    alter with ← / → und ↑ / ↓ the value for the test weight
27. Press OK , Cd 005

STORING and EXIT
28. Press Exit , SAVE is shown
29. Press OK , YES is shown, (if values must not be saved, alter with ↑ to no)
30. Press OK , during storage time SAVE. . . is shown, when finished Cd 000,
    leave the setup menu with Exit
31. If the calibration parameters CP 010 - CP 026 have not to be / are already set,
    close the CAL switch now, see chapter 4.1.1 .

4.3.5   Subsequent Change of Deadload using Front Keys

If due to mechanical modifications the deadload (weight of empty scale / hopper) has changed, the procedure is as follows:

START
1. Warm-up the instrument (minimum 0,5 hours), open CAL switch

2. Press 🔲, SEtuP is shown
3. Press OK , Cd 000 (Cd is flashing), switch to parameter number with ➜ , (000 is flashing),
   change with ✚ to Cd 003

MODIFY DEADLOAD (Cd 003)
4. Press OK , dEAdLo is shown
5. Press OK , Press OK , LoAd is shown (Deadload with empty scale)
6. Press OK , unLoAd is shown, unload scale
7. Press OK , a weight value for deadload is shown
8. Press OK , deadload is set, the display must show 00000.0 kg
9. Press OK , Cd 004

STORING and EXIT
10. Press Exit , SAVE is shown
11. Press OK , Press OK , YES is shown, (if values must not be saved, alter with ✚ to no)
12. Press OK , during storage time SAVE. . . is shown, when finished Cd 000,
     mit Exit wird das Setup-Menü verlassen.
13. If no further calibration data or parameters have to be entered,
     close the CAL switch now, see chapter 4.1.1 .

4.3.6   View Calibration Data

START

1. Press 🔲, SEtuP is shown
2. Press OK , Cd 000 (Cd is flashing)
3. Press OK , CALIb is shown (with CAL switch closed CAL.CLS is shown, calibration is not possible,
   but data can be shown, continue with 6.)
4. Press OK , nEW is shown, with ✚ switch to VIEW
5. Press OK , CAL.oPn is shown for CAL switch open
6. Press OK , MAX.FSd is shown (Maximum load = Full scale deflection)
7. Press OK , the entered maximum load is shown
8. Press OK , Cd 002
9. Press OK , StEP is shown
10. Press OK , the entered scale interval is shown
11. Press OK , Cd 003
12. Press OK , dEAdLo is shown
13. Press OK , the deadload in weight is shown
14. Press OK , dEAdLo is shown
15. Press OK , the equivalent for deadload in mV/V is shown
16. Press OK , Cd 004
17. Press OK , SPAn is shown
18. Press OK , the equivalent for maximum load in mV/V is shown
19. Press OK , Cd 005
20. Press OK , 0-rnG is shown
21. Press OK , the already used zeroset range is shown
22. Press OK , Cd 006
23. Press OK , uVoLt.d is shown
24. Press OK , the measuring signal in µV/d is shown.

The other parameters can be displayed in the same way.

4.3.7 View Calibration Data for Deadload and Maximum Load

Normally all settings of the instrument should be documented or printed out during commissioning. If an instrument has to be replaced by another one due to breakdown and no new calibration can / should be done, the values for deadload and maximum load in mV/V are absolutely required. Therefore the following has to be done:

1. Press [SETUP], SEtuP is shown
2. Press OK , Cd 000 (Cd is flashing), with → switch to parameter number, (000 is flashing), with ↑ (3 x) change to Cd 003
3. Press OK , dEAdLo is shown
4. Press OK , LoAd is shown, with ↑ change to MVoLt
5. Press OK , the deadload is shown in mV/V
6. Note the value for deadload in mV/V
7. Press OK , Cd 004 is shown
8. Press OK , SPAn is shown
9. Press OK , MVoLt is shown
10. Press OK , the maximum load is shown in mV/V
11. Note the value for maximum load in mV/V
12. Leave Setup menu

4.3.8 PIN Code

The Setup-program can be protected against unauthorized access by a PIN-code defined by the user.

ACTIVATING PIN

1. Press [SETUP], SEtuP is shown
2. Press OK , Cd 000 (Cd is flashing)
3. Select oP with ↑ (6 x), oP 060 is shown
4. With → switch to parameter number and with ↑ switch to oP 061
5. Press OK , PIn is shown
6. Press OK , the default PIN (000000 = no request) is shown, it can be changed with ← / → and ↑ / ↓
7. Press OK , PIn is stored and oP 062 is shown
8. The menu can be left with Exit and Exit.

ENTERING PIN

1. Press [SETUP], SEtuP is shown
2. Press OK , PIn is shown
3. Press OK , 000000 is shown, enter PIN with ← / → and ↑ / ↓
4. Press OK , with wrong PIN PInWro is shown, back to 3.
   with correct PIN Cd 000 (Cd is flashing) is shown.

SUPER-PIN
If the PIN-Code is lost, the Setup can be unlocked with Super-PIN '212223'.

4.4 OPERATION USING A PC

4.4.1 Operation Using the VNC Program

VNC stands for 'virtual network computing' and is a program for remote operation of computers. The program distinguishes between the VNC server and VNC client (viewer). The server program is part of the instrument software. The client program (viewer) must be installed and executed on the PC to be used for operating the instrument.
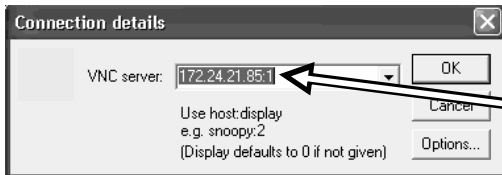
For direct operation using the VNC program, the IP address (extended by : 1) must be specified when you run the program; e.g. 172.24.21.85:1 .
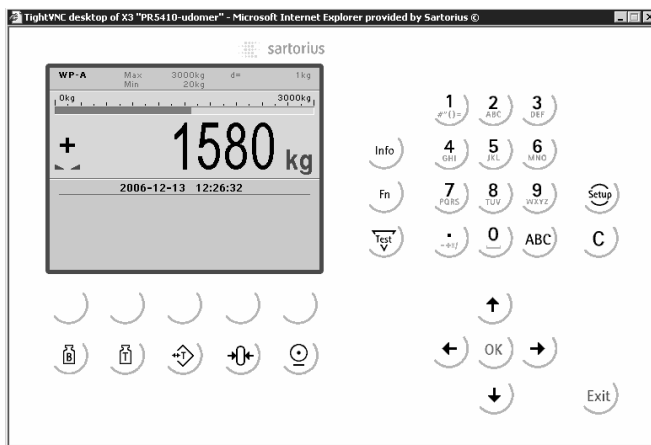
The address range of the controlling PC can be limited in the instrument; see Chapter 4.7.8 .
The operator interface of the VNC program appears:

4.4.2 Operation Using Internet Browser

With the Internet browser, the [IP address] must be entered.

Example: http://172.24.21.146/
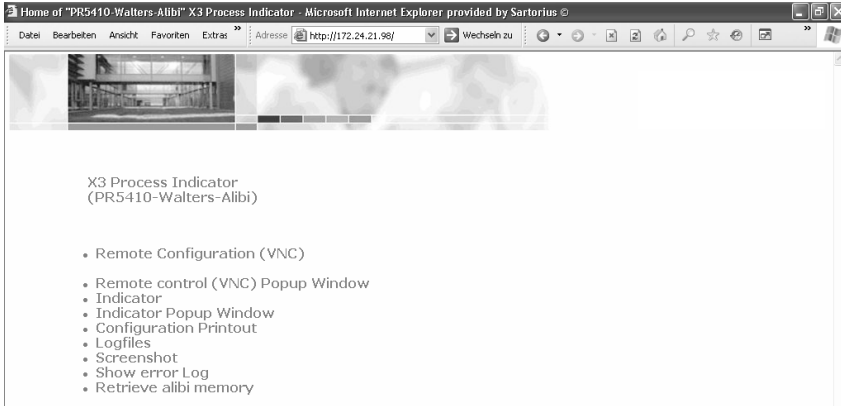
The menu appears on the monitor. The line in brackets below the header corresponds to the device name specified in [Hostname].

[Remote Configuration (VNC)], [Remote Configuration (VNC) Pop up Window]
For instrument operation using the VNC program without additional installation of VNC, see Chapter 4.4.1

[Indicator], [Indicator Pop up Window]
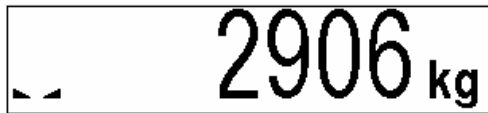
The weight value is displayed with the unit and status symbols

[Configuration Printout]
Can be used for printing the configuration data as a text file, see chapter 9

[Logfiles]

[Screenshot]
Device display for saving the display

[Show error Log]
Display of the error messages

[Retrieve alibi memory]
Transfer of alibi memory datasets as CSV file

4.4.3 INFO Function

When you press ⓘ, the program releases and status messages are displayed. The ⓘ key also has other functions; see Chapters 0 and 0.

Info
▸ Show version
▸ Show status
▸ Show HW-slots
▸ Show alibi memory

When you select [Show version], the installed program releases and the board number are displayed:

Info/Version		
Firmware	Rel. 01.00.00	Firmware release and creation date
	2006-12-02 10:50	
Appl-DEFAULT	Rel. 01.00.00	Application release and creation date
	2006-12-02 10:50	
Bios	Rel. 01.00.00	BIOS release and creation date
	2006-12-02 10:50	
Boardnumber	251398426	Main board identification number
		(different from the device serial number)

When you select [Show status], instrument status information is displayed:

Info/Status		
Free system RAM	5052 of 15196 kb	
Clock battery	ok	(Low if voltage too low)
CAL-Switch	closed	(opened if CAL switch is open)

When you select [Show HW-slots], the installed plug-in cards are displayed:

Info/HW-Slots			
▸	Builtin	RS 232	Standard serial interface
▸ Slot 1	PR 5510/04	RS 485/232	
▸ Slot 2		-empty-	
▸ Slot 3	Builtin	Digital I/O	Standard interface, digital I/Os
▸ Slot 4	PR 1721/31	Profibus-DP	

When you select [Show alibi memory], you can display the selected dataset.

Info/Show alibi memory			
Sequencenumber		52	Last entry, can be overwritten
Date		2007-06-01	
Time		10:21:45	
Grossweight	A	<751 kg>	
Netweight	A	<1150 kg>	
+	-		Increase, decrease sequencenumber

Selection is done on the sequence number. For more information please refer to chapter 4.10 .

4.4.4 Setup Function (VNC)

Press ![SETUP] to configure the main operating parameters. The configuration depends on the application licenses registered and the plug-in cards installed.
Calibration is in a simple dialogue. Compliance with the relevant (verification) standards must be checked by the person commissioning the instrument or the verification officer. To protect the calibration data from overwriting, close the corresponding CAL switch on the back panel of the instrument. On legal-for trade instruments, the CAL switch must be sealed in the closed (write-protected) position; see Chapter 4.1.1.

4.4.5 Setup Menu (VNC): Overview

![SETUP]

- Serial ports parameter

- Printer	<none>, Builtin RS 232, Slot 1 .. 2 RS 485, Slot 1 ... 2 RS 232
- Remote display	<none>, Builtin RS 232, Slot 1 .. 2 RS 485, Slot 1 ... 2 RS 232
- JBUS/MOD-Bus	<none>, Builtin RS 232, Slot 1 .. 2 RS 485, Slot 1 ... 2 RS 232
- SMA	<none>, Builtin RS 232, Slot 1 .. 2 RS 485, Slot 1 ... 2 RS 232
- Asycom	<none>, Builtin RS 232, Slot 1 .. 2 RS 485, Slot 1 ... 2 RS 232
- Param	Assigned to, Protocol, Baud rate, Bits, Parity, Stop bits,

- Date & Time   Change date and time

- Operating parameter

- Address	Address of the instrument
- PIN	Access code for setup
- Use Alibimemory	None, Gross, Net, Tare combinations
- Sequencenumber	Sequence number
- SetTareKey	Tare& reset tare, tare&tare again, disabled
- SetZeroKey	Only when not tared, reset tare on zeroset, disabled
- N-B-T-Key	enabled, disabled
- PrintKey	enabled, disabled

- Printing parameter

- Print mode	Print selected items, via Nice Label
- 1 ... 6 Item	Select: Gross weight, net weight, tare weight, date & time, sequence number

- Fieldbus parameter   Only if PR 1721/XX is installed in Slot 4; see Chapter 4.7.7

- Network parameter   Hardware address (read only), Host name, IP address, Subnet mask, Default gateway, VNC-Client (access restriction)

- Calibration   New, Modify, Param; see Chapter 4.4.6

- Limit parameter

- Limit 1/2/3 on/off	Limit 1/2/3 'on'/ 'off', Action, Condition; see Chapter 4.8.5

- Digital I/O parameter

- Output 1/2/3	Configuring outputs; see Chapter 4.8.3
- Input 1/2/3 on/off 3	Inputs, Action, Condition; see Chapter 4.8.4
- BCD	Gross, Net if tared, selected, transparent; see Chapter 4.8.6

- Analog output parameter   Gross, Net if tared, selected, transparent; see Chapter 4.9

4.4.6   Calibration Menu

- Calibration		Calibration of weighing electronics
	- New	
	Reset Span and deadload	Contin, Cancel
	- Max	0.00001 ...<3000>... 999999 <kg>, t, lb, g
	- Scale interval	<1>, 2, 5, 10, 20, 50
	- Deadload at	<0.000000 mV/V> or [by load]
	- Max at	<1.000000mV/V> or [by load]
	by load	0.00001 ... 999999 <kg>, t, lb, g
	- Calibrated at	(Display only)
	- Sensitivity (µV/d)	(Display only)
	- Test	Determine test value
	Exit calibration	Save or cancel changes
	- Modify	Only for minor modifications/ setting new dead load, otherwise [New]
	see New	
	- Param	
	- Measuretime	5 ms, 10, 20, 40, 80, 160, <320>, 640, 960, 1280, 1600ms
	- Digital filter	<off>, Bessel, aperiod., butterw., tscheby.
	- Fcut	Cut off frequency, only unless filter 'off', 0.1 - 80.0 Hz
	- Test mode	<Absolute>, relative
	- W & M	<none>, OIML, NSC, NTEP
	- Standstill time	0.01 s…<0.50 s> ... 2.0 s (range is dependent on response time)
	- Standstill range	0.00 d ... <1.00 d> ... 10.00 d
	- Tare timeout	0.1 s ... <2.5 s> ... 25 s, timeout due to instability
	- Zeroset range	0.00 d ... <50.00 d> ... 10000.00 d
	- Zerotrack range	0.00 d ... <0.25 d> ... 10000.00 d
	- Zerotrack step	0.00 d ... <0.25 d> ... 10.00 d
	- Zerotrack time	<0.0 s> ... 25 s
	- Overload	0 d ... <9 d> ... 999999 d
	- Min	0 d ... <50 d> ... 999999 d, minimum weight
	- Range mode	<Single range>, multiple range, multi-interval
	- * Range limit 1	In weight, unit same as Max, transition from small to medium scale interval, *only for multiple range or multi-interval
	- * Range limit 2	In weight, unit same as Max, transition from medium to high scale interval, *only for multiple range or multi-interval
	- View(when CAL switch closed)	
	- Max	(Display only)
	- Scale interval	(Display only)
	- Deadload at	(Display only)
	- Max at	(Display only)
	- Calibrated at	(Display only)
	- Sensitivity (µV/d)	(Display only)
	- Param	Items as for Param. (display only)

4.5 CALIBRATION

Calibration using weights, mV/V or load cell data can be done using the VNC program. During calibration, the instrument must be set to gross weight display (reset tare, if necessary).

For a 'legal-for-trade' application, set the mode under [SETUP]-[Calibration]-[Param] to [W&M] before starting calibration; see Chapter 0. Select [New] to go to the maximum capacity [Max] (see Chapter 4.5.3); select the scale interval and determine the dead load. Now calibrate the maximum capacity by applying a calibration weight, in mV/V or with load cell data.
After determining the test value, the menu can be closed as described in Chapter 4.5.12, in order to save the new settings. Calibration data can be protected by the CAL switch (see Chapter 4.1.1), which must be sealed in the closed (write-protected) position for 'legal-for-trade' applications.

4.5.1 Displaying Calibration Data

| Cannot calibrate!
CAL_switch is closed | When the CAL switch is closed, the following message is displayed, only data display possible with [Param]: |

| Cannot calibrate!
Scale is tared | If the scale was tared, the following message is displayed, data display with [View], reset tare with [Res.tar.], return with [Cancel]: |

With [View], the calibration data can be displayed, but not changed.

WP A/View Calibration			
Max	3000 d	3000 kg	Number of scale intervals and max. capacity
Scale interval	3000 d	1 kg	Scale interval
Deadload at	0.00 kg	0.000000	Dead load in weight and mV/V
Max at	3000.00 kg	1.000000	Weight and mV/V for maximum capacity
Calibrated at	3000.00 kg	1.000000	Test load* and corresponding mV/V
Sensitivity	833.33	4.000000	Number of internal counts and voltage per scale interval
Param			

The calibration data and parameters (press [Param]) are displayed in the format entered/determined during calibration.
* After input with mV/V, the maximum capacity and the mV/V value entered are displayed.

Increased Resolution (10-Fold)

In the [SETUP]-[Calibration] menu, the weight is displayed with 10-fold resolution (also with the CAL switch closed) when you press the key (Info), and marked as an invalid weight with ⚠ above the weight unit. The display on the instrument remains unchanged. After 5 s, the VNC display returns to normal resolution, or you can press the key [↓] to return to normal display immediately.

4.5.2 Selecting the Calibration Mode

You can choose between [New] and [Modify] with the softkeys:

New	Modify	Param			

New Calibration

Open the menu via [SETUP]-[Calibration].
When you press [New], the data is set to default first and calibration is started.

SPAN and deadload will be reset	You are prompted to confirm: Press [Continue] for the default settings, or [Cancel] to cancel the selection.

Default settings with [New]:

WP A/Calibration		
Max	3000 d	3000 kg
Scale interval	3000 d	1 kg
Deadload at		0.000000 mV/V
Max at		1.000000 mV/V
Not calibrated		
Sensitivity	833.33	4.000000
		Test

Changing the Calibration

⚠ [Modify] may be used only for minor changes (e.g. changing the dead load, adapting mV/V values for dead load and/or Max); otherwise, always use [New].

Open the menu via [SETUP]-[Calibration]-[Modify].

WP A/Calibration		
Max	3000 d	3000 kg
Scale interval	3000 d	1 kg
Deadload at	1.07 kg	0.000358 mV/V
Max at	3000.00 kg	1.000000 mV/V
Calibrated at	3000.00 kg	1.000000 mV/V
Sensitivity	833.33	4.000000
by load by mV/V		Test

For setting a new value for Dead load, press ↑/↓ to select [Deadload] and either enter a new $\overset{mV}{V}$ value with [by mV/V] or discharge the scale/hopper and press [by load].

Exit calibration without CalcTest?	When closing the menu with (Exit) you are prompted whether the menu should be closed without calculation of the test value: Reply [Yes] to close the menu.

4.5.3   Determining the Maximum Capacity (Max)

The maximum capacity (Max) determines the maximum weight without dead load of the weight to be measured and the displayed number of digits behind the decimal point. Normally, Max is less than the load cell capacity (nominal capacity * number of load cells).
Permissible values are:

  [Max] from 0.00010 to 999999, with [ABC] in kg, t, g or lb
Max must be an integer multiple of the scale interval. It may have up to 6 digits and is entered as a numeric value with or without decimal point.

WP A/Calibration		
Max	3000 d	3000 kg

The weight unit can be changed from kg into t, g or lb by pressing [ABC].

After pressing (OK) or [↓] confirmation of the change is displayed with:

Setting Max

Error messages

STOP
Set span failed above physmax
OK

The maximum capacity is too high (the calculated input voltage for the specified maximum capacity exceeds 36 mV).

Set Max failed below calibration

Subsequent changing of the maximum capacity is possible; if you decrease the capacity, a message is displayed if the new maximum capacity is lower than the test load ([Calibrated at]):

Set Max failed too many digits

The selected resolution is so high that less than 0.8 internal counts per scale interval (d) or 0.5 µV/e for legal-for-trade acc. to OIML/NSC are available.

Set Max failed Max not multiple of scale interval

The maximum capacity is not an integer multiple of the scale interval.

Set Max failed incompatible units

Weight units do not match, e.g. subsequent change of [Max] from **kg** to **lb.**

After you press [OK], the input value for the maximum capacity is cancelled.

4.5.4   Determining the Scale Interval

WP A/Calibration		
Max	3000 d	3000 kg
Scale interval	3000 d ⇅	1kg

The scale interval
1, 2, 5 10, 20 or 50 can be set by pressing
←/→ .

The weight unit is taken from [Max] and cannot be changed here.
The number of digits behind the decimal point must be determined already when entering [Max] as well.

Set Scale interval

After ⓞⓚ or ↓ confirmation of the change is displayed with:

Set scale interval failed
Max not multiple of scale interval

The maximum capacity is not an integer multiple of the scale interval.

4.5.5   Determining the Dead Load

WP A/Calibration			
Max	3000 d	3000 kg	
Scale interval	3000 d	1 kg	
Deadload at	0.00 kg	0.000000	mV̯v
Max at	3000.00 kg	1.000000	mV̯v
Not calibrated			
Sensitivity	833.33	4.000000	
by load by mV/V		Test	

To use the empty scale/hopper as dead load (normal case):
- discharge the scale/hopper
- press [by load]

Set deadload

After ⓞⓚ or ↓ confirmation of the change is displayed:

If the mV/V value of the dead load was calculated, or if it is known from the previous calibration, the value can be overwritten by pressing [by mV/V].

WP A/Calibration			
Max	3000 d	3000 kg	
Scale interval	3000 d	1 kg	
Deadload at	0.00 kg	0.000000	mV̯v
Max at	3000.00 kg	1.000000	mV̯v
Calibrated at	3000.00 kg	1.000000	mV̯v
Sensitivity	833.33	4.000000	
by load by mV/V		Test	

Possible error messages:

Set deadload failed above physmax	The dead load entered in mV/V plus maximum capacity in mV/V is higher than 3 mV/V (= 36 mV).
Set deadload failed no standstill	The scale is not stable. Remedial action: Check the mechanical function of the scale; adapt the filter setting; reduce the resolution; if necessary, adapt the stability conditions.
Set deadload failed deadload < -0.1mV/V	Measuretime signal is negative (load cells connected with wrong polarity or defective) when determining the dead load with [by load].
Set deadload failed overflow in arithmetics	The dead load entered in mV/V is higher than 5mV/V.

4.5.6   Calibration with Weight (by Load)

Select [by load] for calibration using weight.

Place CAL weight on the scale and enter value 2000 kg	The weight value for the calibration weight must be entered in a separate window.

After applying the weight, enter the weight value and confirm with $\boxed{\text{OK}}$. The weight unit for the calibration weight (press $\boxed{\text{ABC}}$ to change) may differ from the unit in the instrument; conversion is automatic.
Afterward, the following message is displayed:

Setting SPAN by load

Weight value, weight unit and measuring signal in mV/V corresponding to this value are displayed in the [Calibrated at] line.

WP A/Calibration			
Max	3000 d	3000 kg	
Scale interval	3000 d	1 kg	
Deadload at	165.11 kg	0.057920	mV/V
Max at	3000.00 kg	1.052369	mV/V
Calibrated at	2000 kg	0.701579	mV/V
Sensitivity	876.97	4.209600	

by load	by mV/V	by data	Linear.	Test

Set SPAN failed No stability	The scale is not stable. Remedial action: Check the mechanical function of the scale; adapt the filter setting; reduce the resolution; if necessary, adapt the stability conditions.

Set SPAN failed Load below deadload	The weight on the scale is less than the dead load after input of the weight value.

The next step is calculation of the test value with [Test] (see Chapter 0), and calibration is completed with ⊞ (see Chapter 4.5.12).

Determining span without weight

WP A/Calibration			
Max	3000 d	3000	kg
Scale interval	3000 d	1	kg
Deadload at	3.00 kg	0.001000	mV/V
Max at	3000.00 kg	0.000000	mV/V
Not calibrated			
Sensitivity	833.33	4.000000	

by load	by mV/V	by data	Linear.	Test

4.5.7   Calibration with mV/V Value

The scale can be calibrated without weights. During input of the load cell mV/V value, the acceleration of gravity at the place of installation can be taken into account. The STAR load cell data is based on the acceleration of gravity effective at Hamburg, Germany: 9.81379 m/s².
Calculation of the average load cell sensitivity:
With D1 specification load cells, the use of sensitivity C given in the data sheet is sufficient.
The average load cell sensitivity C_{Avr} is calculated as follows:

$$C_{Avr} = \frac{\dfrac{C1}{Ra1} + \dfrac{C2}{Ra2} + ... + \dfrac{Cn}{Ran}}{\dfrac{1}{Ra1} + \dfrac{1}{Ra2} + ... + \dfrac{1}{Ran}}$$

The formula is simplified when the output resistance Ra for the load cells is almost equal:

$$C_{Avr} = \frac{1}{n}\sum C$$

Span: Calculation of the equivalent input voltage in mV/V
Span indicates the equivalent input voltage in mV/V related to the maximum capacity (Max) of the scale. It is calculated as follows:

$$\text{Span [mV/V]} = \frac{\text{maximum capacity } * \text{ load cell sensitivity } C_{Avr} \text{ [mV/V]}}{\text{load cell capacity (nominal load } * \text{ number of load cells)}}$$

Dead load: Calculation of the equivalent input voltage in mV/V
The input voltage in mV/V equivalent to the dead load can be calculated by using the dead load rather than the maximum capacity in the formula specified above.
Normally, calculation of the dead load (scale without load/empty hopper) is not necessary.
Subsequent dead load correction (as described in Chapter 0) can be used for later re-determination of the dead load, when the scale/hopper is empty.

Example: Load cell(s) with rated output of 2mV/V at nominal load of 2000 kg, dead load 500 kg, load cell supply voltage 12 VDC
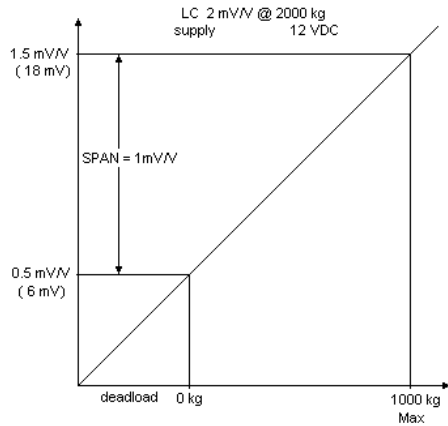
The calibration dialog provides an overview of all settings:

WP A/Calibration		
Max	1000 d	1000 kg
Scale interval	1000 d	1 kg
Deadload at	500.00 kg	0.500000 mV/V
Max at	1000.00 kg	1.000000 mV/V
Calibrated at	1000.00 kg	1.000000 mV/V
Sensitivity	2500.00 cnt/d	12.000000 µV/d

After selecting [mV/V], the values for the Max and for the dead load (if necessary) can be entered.

The next step is calculation of the test value with [Test] (see Chapter 0), and calibration is completed by pressing ⌐x⌐ (see Chapter 4.5.12).

4.5.8   Calibration with Load Cell Data ("Smart Calibration")

This is the simplest method for 'calibration without weights', as no calculation is necessary.

WP A/Calibration		
Max	3000 d	3000 kg
Scale interval	3000 d	1 kg
Deadload at	3.00 kg	0.001000 mV/V
Max at	3000.00 kg	0.000000 mV/V
Not calibrated		
Sensitivity	833.33 cnt/d	4.000000 µV/d
by load	by mV/V	by data	Linear.	Test

Start by pressing [by data].

WP A/Calibration/Loadcell configuration	
Number of loadcells	⇅ 4
Nominal load	3000 kg
Gravity	9.81379 m/s²
Hysteresis error	not specified
Certified data	all LC same
LC sensitivity	1.000000 mV/V
Enter	Calc

WP A/Calibration/Loadcell configuration	
LC resistance	⇅ 600.000 ¥
Enter	Calc

[Number of load cells]
Number of load cells connected in parallel (1, 2...<4>...9, 10)

[Nominal load]
Nominal load E_{max} of a load cell (not the overall nominal weight of the scale).

[Gravity]
Acceleration of gravity at the place of installation; default is the value for Hamburg, Germany, 9.81379 m/s².

[Hysteresis error]
When switching from [Not specified] to [Specified], values for [Correction A/B] must be filled in. The data is given on the load cell certificate.

[Certified data], [LC sensitivity], [LC resistance]
With [all LC same] only 1 value for the sensitivity [LC sensitivity] and the output resistance [LC resistance] must be filled in. With [each LC specific] individual values for each load cell are requested.

[Calc]
The mV/V value is calculated and after confirmation with [OK], the calculated mV/V value is stored in the calibration data.

4.5.9   Subsequent Dead Load Correction

If the hopper/platform weight changes by an amount that is higher than the zero-setting range; e.g., due to dead load reduction, dead load increase or mechanical changes, the functions for automatic zero tracking and manual zero setting no longer work. To view the range which is already utilized by zero tracking or zero setting, in [Calibration] press the ⓘ key; this also activates 10-fold increased resolution of the weight value. Press ⓘ again to return to the previous state:

> Current zero setting: 0.123 kg

If the entire zero-setting range is already utilized, you can still correct the dead load (CAL switch must be open) without affecting other calibration data/parameters.

To do this, select 🟨-[Calibration]-[Modify] and determine the dead load with [Deadload at]-[by load] (see Chapter 0).

4.5.10 Linearization

After selecting [SETUP]-[Calibration]-[New]/[Modify] and after completing calibration, select the linearization menu with softkey [Linear.]:

by load	by mV/V	by data	Linear.	Test

When you press [Linear.] the menu shown below appears:

WP A/Calibration/Linearisation		
Max at 3000.00 kg 1.000000 mV/V		
Add	by mV/V	by load

To add a new linearization point, press [Add], fill in the weight value, apply the weight and press [by load]. Then fill in the corresponding value in mV/V for the weight. After pressing [mV/V], the value can be entered directly.
Up to 3 linearization points can be determined.
A linearization point can be added with [Add], removed with [Delete] and changed with [Change].

WP A/Calibration/Linearisation				
1. Lin. point	750 kg	0.250010 mV/V		
2. Lin. point	1500 kg	0.500020 mV/V		
3. Lin. point	2250 kg	0.750040 mV/V		
Max at	3000.00 kg	1.000000 mV/V		
Add	Change	Delete	by mV/V	by load

A linearization point can be selected with ↑/↓, changed with [Change] and deleted with [Delete].

4.5.11 Test Value Determination / Display

Press [Test] to activate test value calculation. The maximum capacity (Max) is displayed with the designation **TST** without a weight unit.

WP A/Calibration			
			Test

Depending on the settings under [SETUP]-[Calibration]-[Param]-[Test mode], either is shown when you press (Fn) to view the test data.

TST
+ **3000** ⚠

- the maximum capacity with [Absolute], or
- the deviation from the test value with [Relative]

4.5.12 Finishing / Saving the Calibration

Finish the calibration with ⏏.
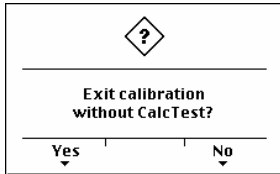
You are prompted to confirm whether calibration should be closed without determining the test value.
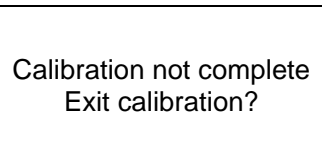
| Calibration not complete
Exit calibration? | If not all data was determined when calibrating with [New] (e.g. dead load not set/entered), this message is shown:

Press [Yes] to confirm and then press ⏏ again; another prompt is displayed: |

| Exit calibration ? | Press [Save] to save changes in calibration data. If you press [Undo], changes are not saved and the display returns to the selection menu for the weighing points. |

| Saving calibration | Confirm, or |

| Exit calibration | close the menu. |
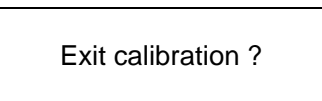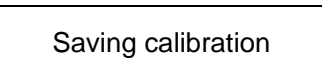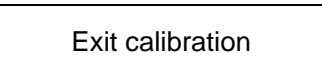
After finishing the calibration, set the CAL switch to the closed position; see also Chapter 4.1.1.

4.5.13 Parameter Input

Open the menu via 🔧-[Calibration]-[Param]

WP A/Calibration		
Measuretime	⇳	160 ms
Digital filter		bessel
Fcut		3.00 Hz
Test mode		absolute
W & M		none
Standstill time		0.50 s
Standstill range		1.00 d

This line is shown only, if the filter is on.

[Measuretime]
Select the measuretime; possible values: 5, 10, 20, 40, 80, 160, 320, 640, 960, 1280, 1600 ms. In 'legal-for-trade' mode select <= 1 s.

[Digital filter]
The digital filter can be switched on only with the measuretime set to <= 160 ms.
Select the filter characteristic: [off], [bessel], [aperiod.], [butterw.], [tscheby.].

[Fcut]
Enter the cut-off frequency for the low-pass filter (0.1 – 80 Hz); the setting is dependent on the measuretime.

[Test mode]
With [Absolute], the test value is determined when the test is called. With [Relative], the deviation from the initially stored test value is displayed; see Chapter 0.

[W & M]
Setting for 'legal-for-trade' mode; select [None], [OIML], [NTEP] (for USA) or [NSC] (for Australia); see Chapter 0.

[Standstill time]
Parameters [Standstill range] and [Standstill time] are required for determining the mechanical stability of the scale. Input in seconds; permissible range: 0.01 to 2 sec. If 0 is set, stability is not checked. The stability time must not be less than the measurement time.

[Standstill range]
The mechanical stability of the scale can be detected as long as any changes in the weight value are within this range; permissible range 0.01d to 10.00d. In 'legal-for-trade' mode, select <= 1 d.

WP A/Calibration		
Tare timeout	2.5	s
Zeroset range	50.00	d
Zerotrack range	0.25	d
Zerotrack step	0.25	d
Zerotrack time	0.0	s
Overload	9	d

[Tare timeout]
Enter a timeout value between 0.1 and 25 s for a taring/zero set command that cannot be executed (e.g., if scale mechanically unstable, filter settings faulty, resolution too high, stability condition too narrow).

[Zeroset range]
Determine a +/- range around the zero point determined by the dead load during calibration; within this range:
- the displayed gross weight can be set to zero by pressing the zero-setting key (or by a corresponding external command), and
- automatic zero tracking is active
  Available range: 0.00 d to 10000.00d
In 'legal-for-trade' mode a value <= 2 % of Max. must be entered. Example: 60 d for 3000e, class III.

[Zerotrack range]
Range within which automatic zero tracking compensates deviations; 0.25 to 10000.00d.
In 'legal-for-trade' mode a value of 0.25 d has to be entered.

[Zerotrack step]
Step for automatic tracking; 0.25 to 10d. In 'legal-for-trade' mode a value of 0.25 d has to be entered.

[Zerotrack time]
Enter a time interval for automatic zero tracking within 0.0 (tracking switched off) and 25 s.
In 'legal-for-trade' mode a value of 1 s has to be entered.

[Overload]
Weighing range above the maximum capacity (Max), without error message. Available range: 0 to 999900 d. In 'legal-for-trade' mode max. 9 d=e has to be entered.

WP A/Calibration		
Min	50	d
Range mode	Single range	

[Min]
Minimum weight at which a print command can still be executed. Range is 0 to 999900 d.
In 'legal-for-trade' mode min. 20 d has to be entered.

Legal-for-Trade Operation

Under [SETUP]-[Calibration]-[Param]-[W&M] you can choose between [none] and a legal-for-trade mode: [OIML], [NTEP] or [NSC].

	[none]	[OIML]	[NTEP]	[NSC]
Gross weight display	**B**	**B**	**G**	**G**
Min. meas. signal	0.125 mV/V at 30000 d	0.125 mV/V at 3000 e	0.125 mV/V at 3000 e	0.125 mV/V at 3000 e
	0.25 mV/V at 60000 d	0.25 mV/V at 6000 e	0.25 mV/V at 6000 e	0.25 mV/V at 6000 e
		0.42 mV/V at 10000 e	0.42 mV/V at 10000 e	0.42 mV/V at 10000 e

If legal-for-trade operation is selected, the parameters (zero tracking etc.) must be set accordingly; they are not checked. The relevant CAL switches (see Chapter 4.1.1) must be sealed in the closed position.

Multiple Range Scale/Multi-Interval Scale

Range selection is controlled by three parameters under [SETUP]-[Calibration]-[Param].

WP A/Calibration			
Range mode	⇅	Multiple range	Select [Multiple range] or [Multi-interval]
Range limit 1		1000 kg	Switch point from range 1 to 2
Range limit 2		2000 kg	Switch point from range 2 to 3

Multiple range scale
With [Range mode] = [Multiple range], the scale has up to 3 ranges with different resolutions. The switch points [Range limit 1] and [Range limit 2] are the range limits. As soon as the gross weight exceeds range 1, the next higher range with the next higher interval becomes valid (1->2->5->10->20->50->100->200). When reducing the weight, the interval of the previous range is kept. When the gross weight is <= 0.25 d of range 1 and the scale is stable and not tared, the scale returns to range 1 with the corresponding interval.

Multi-interval scale
With [Range mode] = [Multi-interval], the scale has up to three ranges with different resolution. Each range has the corresponding interval. Unlike [Multiple range], switching the interval is also triggered by weight reduction; i.e., when the weight drops below the range limits.

During calibration, the multiple range/multi-interval function is always switched off.
The weight display header (VNC) includes the current range (R1, R2, R3), Max, Min and d (or e with legal-for-trade instruments) (Example: multiple range scale in range 2):

```
WP-A   R2   Max      2000kg
             Min        40kg     e=        2kg
```

The ranges are marked by points on the left side of the display.

Range 1

```
 .▭    09 10 kg
```

Range 2

```
 ::▭    19 15 kg
```

Range 3

```
 :::▭    2945 kg
```

4.6 ERROR MESSAGES
4.6.1 Measuring Circuit Error Messages

The weighing electronics can generate error messages, which are output on the weight display.

Display	VNC text	Cause
EPPOP1	Arith err	Internal arithmetic overflow (faulty calibration values)
EPPOP2	Overload	Input voltage is higher than Max + (x d)
EPPOP3	No EOC	Input signal is higher than the permissible range of 36 mV. However, the trouble cause can also be due to an error in the analog section, to a defective load cell or to a cable break
EPPOP6	No sense voltage	Load cells not connected. Sense line or supply line is interrupted or connected with wrong polarity or sense voltage is low
EPPOP7	Negative Input	Input voltage is negative (e.g. wrong polarity of load cell signal or supply voltage)
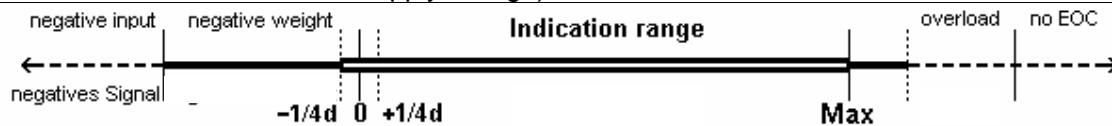
Testing the Measuring Circuit
A simple test with the load cells connected can be carried out with a multimeter
(not with external supply or intrinsically safe load cell interface):
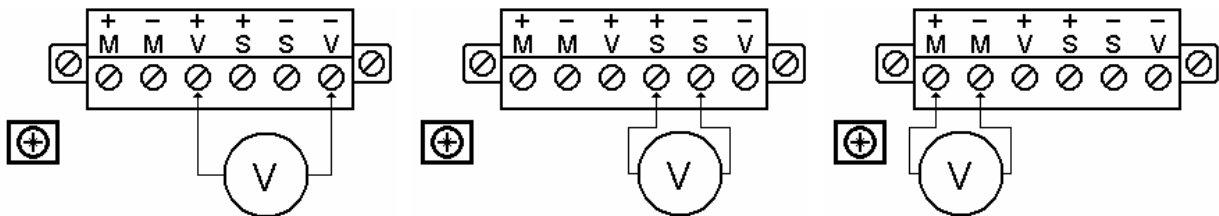
12 VDC +/- 0.8 V (symmetrical to housing GND)	12 VDC +/- 0.8 V (symmetrical to housing GND)	0 - 12 mVDC @ LC with 1.0 mV/V 0 - 24 mVDC @ LC with 2.0 mV/V
Supply voltage	Sense voltage	Measuring voltage

4.6.2 General Error Messages

Display	Cause
EPP 21	The BIOS is too old for the firmware
EPP 22	The firmware is too old for the BIOS
EPP 23	Starting is not possible; ROM error
EPP 25	The plug-in card combination is not permissible
EPP 29	Flashing failed
EPP 31	The IP address is faulty, e.g. item > 255
EPP 32	The IP address is already used
EPP 33	Wrong parameter
EPP 41	Fatal system error
EPP 42	Fatal control system error

4.7   CONFIGURING GENERAL PARAMETERS

The configuration of parameters which are not related to the weighing electronics is divided into several sections (see Chapter 4.4.5).

4.7.1   Date and Time

Select 🔆-[Date & Time] to set date and time.

Setup/Clock	
Date	2005-08-17
Time	16:21:52

Date and time can be overwritten

4.7.2   Serial Ports

To configure the serial interfaces, press 🔆 and select [Serial ports parameter].

Setup
▸ Serial ports parameter
▸ Date **&** Time
▸ Operating parameter
▸ Printing parameter

Select [Serial ports parameter] with ↑/↓ and
OK

Setup/Serial ports		
Printer	⇅	Standard RS232
Remote display		Slot1 RS232
JBUS/MOD-Bus		Slot2 RS485
SMA		
Param		

[Printer]
Select the serial interface to which the printer is connected. Select [Param] to define the transfer characteristics:

Setup/Serial ports/Builtin RS232			
Assigned to		Printer	Press ←/→ to select the following:
Protocol	⇅	XON/XOFF	XON/XOFF, RTS/CTS, W&M Printer, no printer
Baudrate		9600 bd	300, 600, ... 19200, 38400
Bits		7	7, 8
Parity		even	no, odd, even
Stopbits		1	1, 2
Output mode		raw	raw, CR/LF translation

[Remote display]

Select the serial interface to which the remote display is connected and then select [Param] to define the [Baudrate] and the remote display type [Mode] connected.

Setup/Serial ports/Builtin RS232		
Assigned to		Remote display
Protocol		Remote display
Baudrate	⇵	9600 bd
Bits		7
Parity		even
Stopbits		1
Mode		single transmitter

Select [Baudrate] with ↑/↓ and set the baud rate with ←/→

The available baud rates are 300, 600, 1200, 2400, 4800 or 9600. The parameters (displayed in light-gray) cannot be changed.
If only 1 instrument is connected to a PR1627/8 (normal case), [Mode] must be set to [single transmitter].
Foe a PR1577 remote display [PR 1577 mode] has to be set.
If more than 1 instrument are connected to 1 remote display, [Mode] must be set to [multiple transmitters].
At [Device Id] the own instrument address (A, B, C ...) has to be entered, at [Next Device Id] the address of the subsequent instrument has to be entered.

[JBUS/MOD-Bus]

Setup/Serial ports/Builtin RS232		
Assigned to		JBUS/MOD-Bus
Protocol		JBUS/MOD-Bus
Baudrate	⇵	9600 bd
Bits		8
Parity		even
Stopbits		1
Slave		1

Select [Baudrate] with ↑/↓ and set the baud rate with ←/→
None, odd or even

Select an address; 1 to 255

Press ⏎ to return to the [Serial ports parameter] setup menu. When you close this menu, the following messages are displayed if at least one setting was changed:

Save settings

Start JBUS/MOD-Bus

The JBUS/MOD bus protocol is described in Chapter 4.9.

4.7.3 SMA Protocol

Select an RS-485 interface under [SETUP]-[Serial ports parameter].

Setup/Serial ports		
Printer		- none -
Remote display		Slot1 RS232
JBUS/MOD-Bus		Slot2 RS485
SMA	⇵	Slot1 RS485
Param		

Only the baud rate is adjustable; the other parameters are fixed.

Setup/Serial ports/Slot1 RS485		
Assigned to		SMA
Protocol		SMA
Baudrate	⇵	9600 bd
Bits		8
Parity		none
Stopbits		1

Press [↑]/[↓] to select [Baudrate] and set the baud rate with [←]/[→]

The SMA protocol is described in Chapter 4.8.

4.7.4 EW Protocol

At configuration of serial ports [SETUP]-[Serial ports parameter] a serial port for [Asycom] has to be selected and the protocol and communication parameters have to be set.

Setup/Serial ports		
Printer		- none -
Remote display		Slot1 RS232
JBUS/MOD-Bus		none
SMA		none
Asycom	⇵	Slot1 RS485
Param		

Setup/Serial ports/Slot1 RS485		
Assigned to		Asycom
Protocol		Asycom V1
Baudrate	⇵	9600 bd
Bits		8
Parity		even
Stopbits		1
Slave		A

Select V1, V2 or V3

Select e.g. [Baudrate] with [↑]/[↓] and with [←]/[→] the transfer parameter
Fixed setting
Fixed setting
Select A - Z

The PR 1612 Instructions for the EW-Protocol are described in chapter 6 .

4.7.5 Operating Parameters

Define the basic operating parameters under [SETUP]-[Operating parameter].

Setup/Operating parameter	
Address	A
PIN	******
Use alibimemory	none
Sequencenumber	0
SetTareKey	tare **&** reset tare
SetZeroKey	only when not tared
ShowGrossTarekey	enabled
PrintKey	enabled
Testkey	enabled

[Address]
Device address; e.g. for print-out.

[PIN]
The access code can be used to protect the [Setup] from unauthorized operation. Enter a number with up to 6 digits. As long as you are in this menu, the value can be overwritten as required.

[Use alibimemory]
The dataset to be stored in the alibi memory can be defined:
[none] - nothing, [Gross] - Gross weight, [Net] - Net weight, [Gross,Net,Tare],
[Gross,Net], [Gross,Tare].

[Sequencenumber]
Number may appear (selectable) on the print-out too, is incremented automatically (max. 999999) and can be set here.

[SetTareKey]
The function of the tare key on the keypad can be configured:
[tare & reset tare]: the scale is tared if it was not tared previously; otherwise, tare is reset.
[tare & tare again]: when you press the [Tare] key, the current value is stored in the tare memory and a net weight of 0 is displayed. [disabled]: The key has no function.

[SetZeroKey]
[only when not tared]: The function of the zero-setting key on the keypad can be limited to gross mode. [reset tare on zeroset]: The zero-setting key switches the scale to gross mode automatically. If the zero-setting key with these settings has no effect, the configured zero-setting range (around the zero-point set with the dead load) is already utilized due to a previous zero-setting operation and/or automatic zero setting. [disabled]: The key has no function.

[ShowGrossTarekey], [PrintKey], [Testkey]
The front panel keys for selecting between gross, net and tare, for starting a print command and for starting the analog test can be de-activated by [disabled]. With [enabled], operation is possible.

☐☐☐☐☐☐ Answer on the instrument display, if disabled keys are pressed.

Save changes?	To close the menu, press ⟨exit⟩. Press [Yes] to save the data, or [No] to close the menu without changing data.

4.7.6   Printing Parameters

Setup
‣ Serial ports parameter
‣ Date **&** Time
‣ Operating parameter
‣ Printing parameter

Press ↑/↓ and
OK) to select [Printing parameter]

Setup/Printing parameter		
Print mode	⇵	Print selected items
1. Item		Sequencenumber
2. Item		Grossweight
3. Item		CR/LF
4. Item		-none-
5. Item		-none-
6. Item		-none-

Select [Print selected items]
or [via NiceLabel]

When selecting item [via Nice Label] under [Print mode], printing with Nice Label Express (NLE) is configured. The NLE program is available commercially.
When you select item [Print selected items] under [Print mode], you can compose a printout of 6 positions from the following list.

[Sequencenumber]
Current sequence number, max. 6 digits, after #999999 the #000001 is following.

[CR/LF], [Formfeed]
Carriage return and line feed, form feed.

[Deviceaddress]
Address of the instrument (A, B ... Z).

[-none-]
Nothing is printed. The function can be used for printing less than 6 data items.

[displayedweight], [Grossweight], [Netweight], [Tareweight]
The displayed gross, net or tare weight is printed. If [OIML], [NTEP] or [NSC] has been selected, printing is done only, if the stability criteria is fulfilled, the weight is shown in '< >'. For [NTEP] or [NSC] the grossweight is indicated with G (else B).

[Date & Time]
The date and time are printed as DD.MM.YYYY HH:MM:SS .

Example for printing:

1. Item	Date **&** Time
2. Item	Sequencenumber
3. Item	Grossweight
4. Item	Netweight
5. Item	CR/LF
6. Item	-none-

```
17.01.2007 11:18:56 #009140        <436 kg> B        <291 kg> N
```

4.7.7   Fieldbus Parameters

Setup
▶ Serial ports parameter
▶ Date **&** Time
▶ Operating parameter
▶ Printing parameter
▶ Fieldbus parameter

Select [Fieldbus parameter] with ⬆/⬇ and ⓄⓀ

This menu item can only be selected if a Fieldbus card is installed in Slot 4.

Fieldbus Protocols

Which protocol is displayed automatically depends on the Fieldbus card installed:
[Interbus-S] for PR 1721/32, [Profibus-DP] for PR 1721/31, [DeviceNet] for PR 1721/34,
[EtherNet/IP] for PR 1721/37 and [ModBus TCP] for PR 5510/14.

Setup/Fieldbus	
Fieldbus protocol	Profibus-DP

Which additional parameters are required, depends on the interface type:

[Interbus-S]

Setup/Fieldbus	
Fieldbus protocol	Interbus-S

[Profibus-DP]

Setup/Fieldbusparameter	
Fieldbus protocol	Profibus-DP
Profibus-DP Address	1

Enter address

[DeviceNet]

Setup/Fieldbus	
Fieldbus protocol	DeviceNet
DeviceNet baudrate	500k
DeviceNet MAC-ID	1

Press ⬅/➡ to select 500, 250 or 125 k
Select address 1 ... 62

[ModBus TCP] or [EtherNet/IP]

Setup/Fieldbus	
Fieldbus protocol	ModBus TCP 100 MB/s
IP address	192.168.1.1
Subnet mask	255.255.255.0

Enter IP-address
Enter Subnet mask

Closing the menu

Save changes?

To close the menu, press ⒺⓍⒾⓉ. Reply [YES] to save the data, or [NO] to close the menu without changing data.

4.7.8 Network Parameters

You can configure settings for the network connections (built-in LAN adapter) under [SETUP]-[Network parameter].

Setup/Network parameter		
HW address	00:90:6C:FB:E9:85	Fixed address determined by the instrument
Hostname	PR5410-UDOWEIGH	Device name; user-definable*
Use DHCP	☑	Address is assigned by the server
IP Address	172.24.21.82	Address assigned by the server
Subnetmask	255.255.240.0	Mask for permissible IP address range
Standardgateway	0.0.0.0	IP number for gateway
Remote access		
VNC-Client	255.255.255.255	Permissible client for operation of the instrument

*The [Hostname] is subject to the following restrictions:
Minimum number of characters: 2, maximum number of characters: 24
The first character must be a letter. Spaces are not permitted.
0-9, A-Z (upper and lower case letters are not distinguished) are permitted.
- or . may be included, but neither at the end nor in succession.

When setting [IP address], [Subnet mask] and [Standardgateway], please consult with your network administrator.

You can configure access permissions for the address specified under [VNC client]:

VNC client	0.0.0.0.	Access over VNC not permitted
VNC client	172.24.21.101	Access only from client machine with this address
VNC client	172.24.21.255	Access from any client with address within range 172.24.21.1 to 254
VNC client	255.255.255.255	Access from client with any address

4.8   LIMIT VALUES, DIGITAL INPUTS AND OUTPUTS

4.8.1   Conditions for Limit Values and Digital Inputs, States for Outputs

The limit values and digital inputs can be combined with conditions that must be met before an action is executed. With outputs, these conditions can be output as states directly. Selection is from the following list:

Selection list for [condition] Function	SPM bit (dec)	Explanation Condition is met, if not true (=0) or if true (=1)
no condition	-----	No condition
actual diginp1	X00=0/1	Digital input 1
actual diginp2	X01=0/1	Digital input 2
actual diginp3	X02=0/1	Digital input 3
actual limit 1	X16=0/1	Limit signal 1
actual limit 2	X17=0/1	Limit signal 2
actual limit 3	X18=0/1	Limit signal 3
ADC error	X32=0/1	Error in load cell/ ADC area, negative/ far outside scale
above Max	X33=0/1	Weight above Max
overload	X34=0/1	Weight above (Max plus the range which is still permissible)
below zero	X35=0/1	Weight below zero
center zero	X36=0/1	Within 1/4 d of zero
inside ZSR	X37=0/1	Within zero-setting range
standstill	X38=0/1	Mechanical stability of the scale
dimmed	X39=0/1	Weight below zero or above Max
command error	X48=0/1	Command was no executed; e.g. zero-setting command, but the weight is out of the zero-setting range
command busy	X49=0/1	Command is being executed
power fail	X50=0/1	Set after power-on (=power failure)
test active	X56=0/1	Analog test was started
cal active	X57=0/1	Calibration was started
tare active	X58=0/1	Tare step is active
marker bit 1	X64=0/1	Marker bit 1; after power-on, the markers are set to '0'
marker bit 2	X65=0/1	Marker bit 2,
marker bit 3	X66=0/1	Marker bit 3

4.8.2 Configuring Digital Inputs and Outputs

Press ⟨SETUP⟩ and select [Digital I/O parameter] to open the configuration menu for outputs and inputs:

Setup/Digital I/O parameter		
Output 1	marker bit 1	X64=1
Output 2	marker bit 2	X65=1
Output 3	marker bit 3	X66=1
Input 1 on	-no action-	
Input 1 off	-no action-	
Input 2 on	-no action-	
Input 2 off	-no action-	
Input 3 on	-no action-	
Input 3 off	-no action-	
BCD out		Gross

4.8.3 Configuring Outputs

Configure the required function for [Output 1] to [Output 3] by selecting a signal from the list; see Chapter 4.8.1. The output goes to the corresponding state.

Example:

Setup/Digital I/O parameter		
Output 1	below zero	X35=1
Output 2	above Max	X33=0
Output 3	center zero	X36=1
Input 1 on	-no action-	

[Output 1] is true (active), when the weight value drops below zero (X35=1).
[Output 2] remains (active), as long as the weight is not above Max (X33=0).
[Output 3] is true (active), when the weight is zero +/- 1/4 d (X36=1).

4.8.4 Configuring Inputs

An action both for signal change from 0 to 1 (on) and from 1 to 0 (off) can be determined for each of the three inputs. The action may be dependent on another condition which must be met.

Setup/Digital I/O parameter		
Output 1	marker bit 1	X64=1
Output 2	marker bit 2	X65=1
Output 3	marker bit 3	X66=1
Input 1 on	⇅ set tare	X113=1
Condition	no condition	-----
Input 1 off	-no action-	
Input 2 on	-no action-	
Input 2 off	-no action-	
Input 3 on	-no action-	
Input 3 off	-no action-	
BCD out		Gross

1. Determining an action

Determine the action for the rising edge of input 1 under [Input 1 on] from the following list (here: When the input signal changes from 0 to 1, a tare command is generated).
Accordingly, an action for the falling edge can be determined.

Selection list for actions of the inputs [Input 1/2/3 on/off]

Function	SPM bit	
-no action-	-----	No function
set marker 1	X64=1	Set marker 1
set marker 2	X65=1	Set marker 2
set marker 3	X66=1	Set marker 3
select net	X72=1	Select net
set zero	X112=1	Set zero
set tare	X113=1	Set tare
reset tare	X114=1	Reset tare
set test	X115=1	Activate the analog test
reset test	X116=1	Finish the analog test
reset PWF	X117=1	Reset power fail
set fixtare	X118=1	Set fixtare (use the value in address D31 as a tare value)
get fixtare	X119=1	Save gross value as fixtare in address D31
set print	X120=1	Activate a print order
clr marker 1	X64=0	Clear marker 1
clr marker 2	X65=0	Clear marker 2
clr marker 3	X66=0	Clear marker 3
select gross	X72=0	Save the gross weight in address D11

2. Determining a condition

The selected action of each digital input can be combined with a condition that must be met for signal change from 0 to 1 (on) or for signal change from 1 to 0 (off). Select the condition from the list; see Chapter 4.8.1. No condition is defined when selecting [no condition]; the action is executed directly.

Example: Taring via digital input, only if the instrument is set to gross:

Setup/Digital I/O parameter		
Output 1	marker bit 1	X64=1
Output 2	marker bit 2	X65=1
Output 3	marker bit 3	X66=1
Input 1 on	set tare	X113=1
Condition	↕tare active	X58=0
Input 1 off	-no action-	
Input 2 on	-no action-	
Input 2 off	-no action-	
Input 3 on	-no action-	
Input 3 off	-no action-	
BCD out		Gross

When input 1 changes from 0 to 1 [Input 1 on], a taring signal is activated only, if the condition under [Condition] is met (here: the scale was not tared previously; this is determined by [tare active X58=0]).

4.8.5   Configuring Limit Values

Each limit value consists of a switch-on and a switch-off point for definition of a hysteresis. The three pairs of values must be entered according to the same principle. The limit values always refer to the gross weight. Values between -0.01 x Max and 1.01 x Max of the relevant scale are permissible.

Setup
▸ Serial ports parameter
▸ Date **&** Time
▸ Operating parameter
▸ Printing parameter
▸ Fieldbus parameter
▸ Network parameter
▸ Calibration
▸ Limit parameter
▸ Digital I/O parameter

Press ⬆/⬇ and OK
to select [Limit parameter]

Setup/Limit parameter		
Limit 1 on		890 kg
	Action	-no action-
Limit 1 off		900 kg
	Action	-no action-
Limit 2 on		300 kg
	Action	-no action-
Limit 2 off		290 kg
	Action	-no action-

Determine the limit values

Setup/Digital I/O parameter		
Output 1	limit 1 out	X16= 1
Output 2	limit 2 out	X17= 1

Assign the outputs

Example:
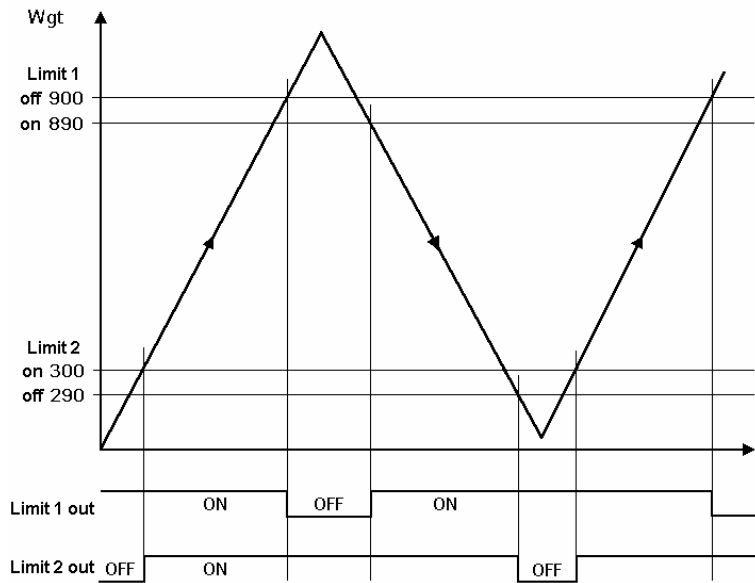
The output signal (Limit 1 out) of limit 1 switches OFF above a weight of 900 kg. The output signal (Limit 2 out) of limit 2 switches OFF below a weight of 290 kg. Both limit values have a hysteresis of 10 kg.

In the event of a power failure, the two outputs go to OFF, thus indicating underfill and overfill at the same time.
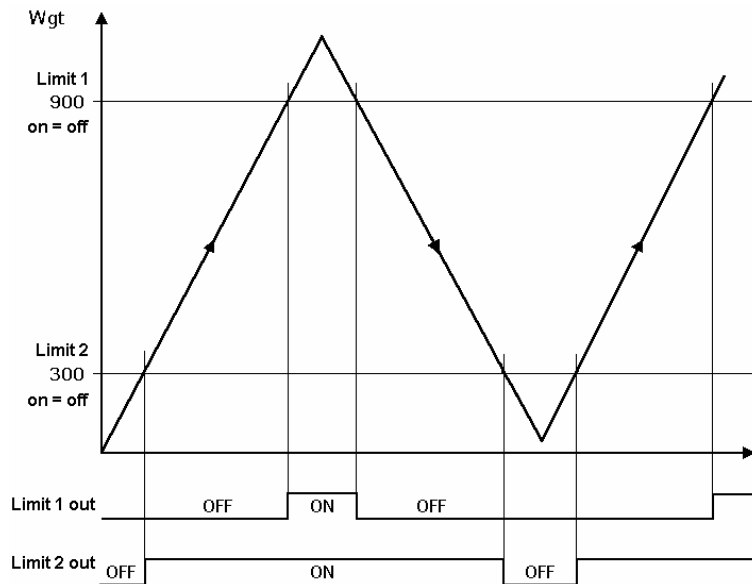
If the limits (Limit 1 and Limit 2) for 'On' and 'Off' are equal (on = off), output 1 (Limit 1 out) switches ON, when the weight (Wgt) exceeds the value and output 2 (Limit 2 out) switches OFF, when the weight drops below the value.

Setup/Limit parameter		
Limit 1 on		900 kg
Action	↕set marker 1	X64=1
Condition	no condition	-----

1. Determining an action

Determine the action for the rising edge of the reference signal under [Limit 1 on] from the following list (here: Marker 1 is set when 900 kg are exceeded).
Accordingly, an action for [Limit 1 off] can be determined.

Function	SPM bit	
-no action-	-----	No function
set marker 1	X64=1	Set marker 1
set marker 2	X65=1	Set marker 2
set marker 3	X66=1	Set marker 3
select net	X72=1	Select net
set zero	X112=1	Set zero
set tare	X113=1	Set tare
reset tare	X114=1	Reset tare
set test	X115=1	Activate the analog test
reset test	X116=1	Finish the analog test
reset PWF	X117=1	Reset power fail
set fixtare	X118=1	Set fixtare (use the value in address D31 as a tare value)
get fixtare	X119=1	Save gross value as fixtare in address D31
set print	X120=1	Activate print order ?
clr marker 1	X64=0	Clear marker 1
clr marker 2	X65=0	Clear marker 2
clr marker 3	X66=0	Clear marker 3
select gross	X72=0	Save the gross weight in address D11

2. Determining a condition

Additionally, a condition [Condition] can be assigned to the signal; see Chapter 4.8.4.

4.8.6   BCD Output

As a prerequisite for using the BCD output, a BCD card must be installed; see Chapter 3.4.6 and Chapter 3.4.7.

Setup/Digital I/O parameter		
Output 1	marker bit 1	X64=1
Output 2	marker bit 2	X65=1
Output 3	marker bit 3	X66=1
Input 1 on	-no action-	
Input 1 off	-no action-	
Input 2 on	-no action-	
Input 2 off	-no action-	
Input 3 on	-no action-	
Input 3 off	-no action-	
BCD out	⇵	Gross

[BCD out]		Output as BCD with max. 5 decades with minus or plus sign and status:
	[Gross]	Gross weight
	[Net if tared]	Net weight if tared, else gross weight
	[Selected]	Gross or Net, depending on SPM-Bit X72
	[Transparent]	The value in D20 is output as BCD

4.9   ANALOG OUTPUT
Max. 1 PR5510/07 card can be mounted in Slot 1/2.

Determine the analog output under [SETUP]-[Analog output parameter].

Setup
▸ Serial ports parameter
▸ Date **&** Time
▸ Operating parameter
▸ Printing parameter
▸ Fieldbus parameter
▸ Network paramter
▸ Calibration
▸ Limit parameter
▸ Digital I/O parameter
▸ Analog output parameter

Press [↑]/[↓] and
(OK) to select [Analog output parameter]

Setup/Analog output parameter	
Analog mode ⇅	no output
Analog range	0 ... 20 mA
Output on error	0 mA
Output if < 0	0 mA
Output if > Max	20 mA
Weight at 0/4 mA	0 kg
Weight at 20 mA	3000 kg

[Analog mode]	[no output]	The analog output is not used
	[Gross D08]	Output of the gross weight
	[Net if tared D09]	Output of the net weight
	[Select D11]	Output Gross or Net, depending on SPM-Bit X72
	[Transparent D30]	Output of the value in D30
[Analog range]	[0...20 mA]	Output of 0... 20 mA
	[4...20 mA]	Output of 4... 20 mA
[Output on error]	[0 mA]	Set the output to 0 mA
	[4 mA]	Set the output to 4 mA
	[20 mA]	Set the output to 20 mA
	[hold]	The last output value is held
[Output if < 0]	[0 mA]	Set the output to 0 mA
	[4 mA]	Set the output to 4 mA
	[20 mA]	Set the output to 20 mA
	[linear]	The output drops below 4 mA up to the limitation (at 4 .. 20 mA)
[Output if > Max]	[0 mA]	Set the output to 0 mA
	[4 mA]	Set the output to 4 mA
	[20 mA]	Set the output to 20 mA
	[linear]	The output exceeds 20 mA up to the limitation
[Weight at 0/4 mA]		Weight value for 0/4 mA output

[Weight at 20 mA]   Weight value for 20 mA output
Press ⏏) to return to the previous menu [Configuration].

4.9.1   Adapting the Analog Output

The output current can be adapted in small ranges. This is required, if small deviations from the nominal value occur in a connected PLC.
Press ℹ) and select [Show HW-slots]-[Slot 1/2 PR5510/07 analog I/O] to open the menu:

Info/HW-Slots		
▸	Builtin	RS 232
▸ Slot 1	PR 5510/07	analog I/O
▸ Slot 2		-empty-
▸ Slot 3	Builtin	Digital I/O
▸ Slot 4	PR 1721/31	Profibus-DP

PR 5510/07 is fitted in Slot 1

Select [PR 5510/07 analog I/O] and confirm with ☺).

Info/HW-Slots	
PR5510/07 on slot	1
In use by PLC task	2
Analog output	0.0000 mA
Stop PLC Stop I/O Adjust Reset	

Select with ↑/↓

Press [Adjust]

Adapt analog output ?

Safety prompt: Reply [Yes] to start adapting.

Info/HW-Slots/Adjust Analog Output Slot 1	
Output	4.000 mA
Measured	4.004 mA

Enter e.g. the value for 4 mA measured by the connected PLC under [Measured].
After pressing ☺), the 2nd value (20 mA) is displayed:

Info/HW-Slots/Adjust Analog Output Slot 1	
Output	20.000 mA
Measured	20.010 mA

Enter e.g. the value for 20 mA measured by the connected PLC under [Measured].

Save settings ?

Reply [Yes] to validate the changes, or
[No] to keep the previous values.

If you want to return to the factory settings (4 mA and 20 mA):
Press [Reset]: A safety prompt is displayed:

Reset to default ?

Reply [Yes] for reset to the factory settings, or
[No], if you want to keep the entered values unchanged.

4.10 ALIBI MEMORY

The instrument is equipped with an alibi memory for approx. 80000 items. If the number is exceeded, the eldest items are overwritten. No license is required for using the alibi memory. At each print command a dataset with a sequence number is filed. The dataset can comprise of up to 3 items (Gross, Net and Tare).

Each item consists of :

- Sequence number   1 - 999999
- Date   YYYY-MM-DD
- Time   hh:mm:ss
- Scale address   Always A
- Weight type   B = Gross, N = Net, T = Tare, PT = Preset tare
- Weight with unit   Separation of decimals is done by the decimal point

Depending on the configuration (Using front keys: oP 063) Gross- and/or Net- and/or Tare weight is filed, see chapter 4.3.3 . Display of the datasets using VNC see chapter 4.4.3 .
The alibi memory can be completely erased, if the CAL switch is open, using front keys (AL 101).
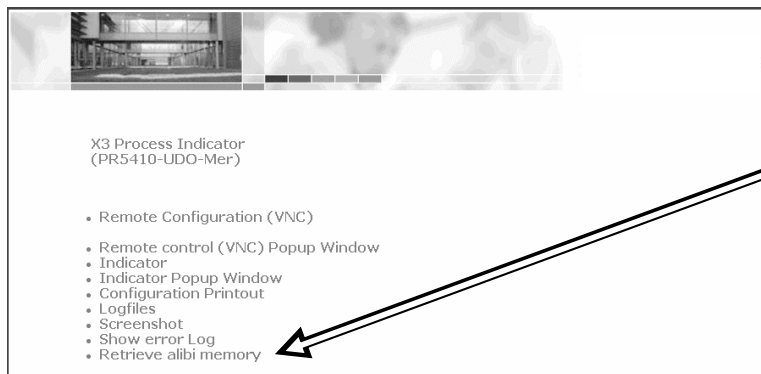
With the Browser the datasets can be exported as CSV file for later evaluation as EXCEL file.

The CSV file uses the 'comma' as separator between the different elements of an item.
Consequently in the EXCEL program a conversion has to be activated to receive only one element per column.
The sequence number is preceded by an additional line number.

Example (Dataset as CSV-file):

```
Line,Seq.No.,Date,Time,WP,Type,Weight
55,13,2007-05-22,16:26:05,A,B,"12.450 kg"
56,13,2007-05-22,16:26:05,A,N,"10.400 kg"
57,13,2007-05-22,16:26:05,A,T,"2.050 kg"
```

After conversion in EXCEL:

	A	B	C	D	E	F	G
1	Line	Seq. No.	Date	Time	WP	Type	Weight
2	55	13	22.05.2007	16:26:05	A	B	12.450 kg
3	56	13	22.05.2007	16:26:05	A	N	10.400 kg
4	57	13	22.05.2007	16:26:05	A	T	2.050 kg

Take care: EXCEL can import at maximum 65536 lines, if these are exceeded, the CSV-file has to be divided previously.

4.11 CONFIGUREIT PROFESSIONAL

The program ConfigureIt Professional has got the following features:

- Searching for an instrument in a network
- Creating and modifying of an instrument configuration
- Entering the parameters of an instrument
- Calibration of an instrument using the following methods:
  - with test weights
  - with mV/V
  - with load cell data ('smart calibration')
- Loading an instrument configuration from an instrument
- Storing an instrument configuration in an instrument or in a file
- Copying instrument configurations (cloning)
- Creating a document (PDF, XLS, etc.) with the instrument configuration

4.11.1 Installation

The installation is done from the CD-ROM, delivered with the instrument. It is recommended to close further application programs running on the PC. For installation approx. 150 MByte is required on the hard disk. For RAM 256 MB is necessary, with a 2GHz processor approx. 5 minutes installation time have to be considered.

Start the program   ConfigureIt Professional ... Setup.exe:

| ConfigureIt Professional 1.1.19 Setup.exe | 70.383 KB | Anwendung | 26.01.2007 09:39 |
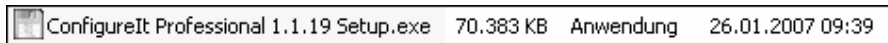
Next >	Next step for installation
< Back	Return to previous step
Cancel	Cancel the installation process

Instruction for closing of further application programs.
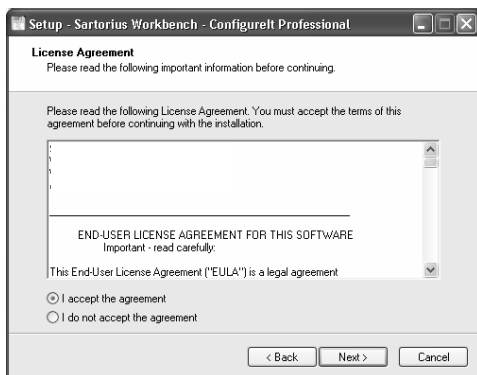
Read the license agreement and confirm the acceptance with clicking on [I accept the agreement].
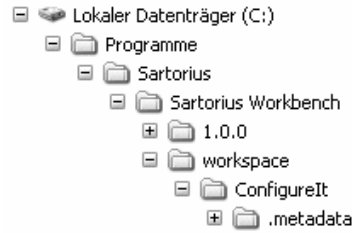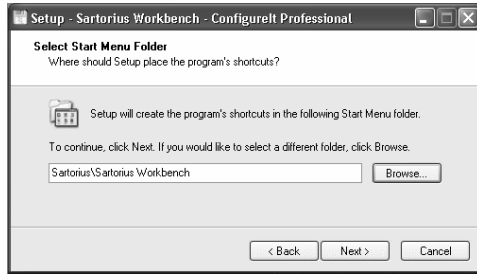
The folder where the programs and configurations are placed is shown. With [Browse] a different folder can be searched and defined.
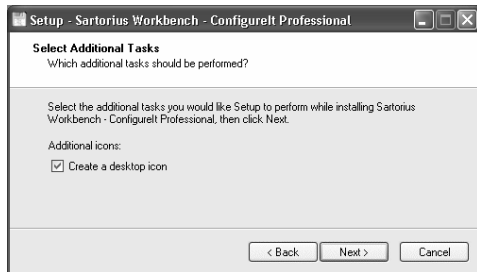
To create an icon on the PC desktop for easy starting of the program the box has to be activated.
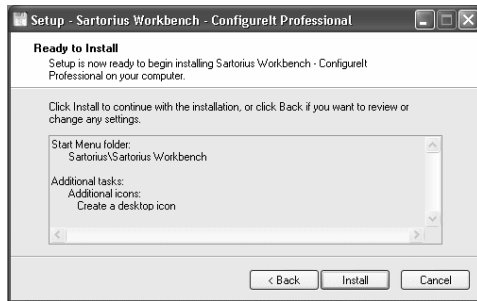
Continue the installation with [Install].
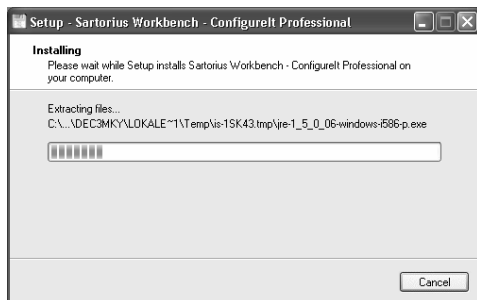
The progress of installation is displayed, the installation may last some minutes depending on the performance of the PC.

If the start box is activated, the ConfigureIt Professional is directly started if [Finish] is pressed.

4.11.2 Program Start

If the program has already been installed previously (see chapter 4.11.1), it can be started with the icon on the desktop:

Define a New Project
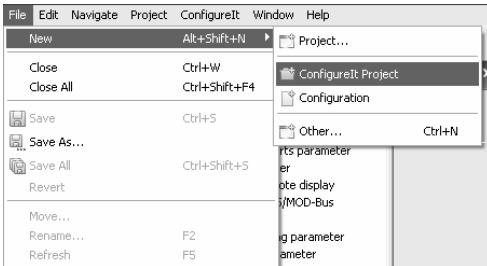
Select [File]-[New]-[ConfigureIt Project].
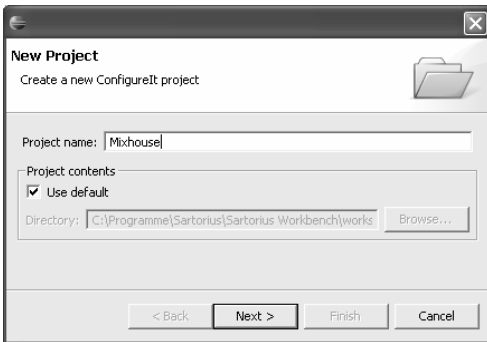
Enter the project name, this is the name of the folder and press [Next >].
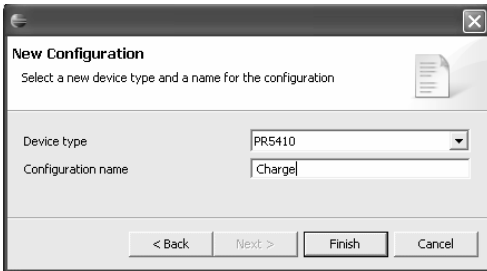
The device type [X3 (PR5410)] has to be selected and a configuration name (file) has to be defined, continue with [Finish].

Define a New Configuration
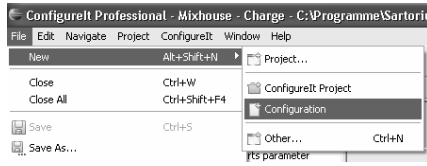
A new configuration is defined with [File]-[New]-[Configuration].
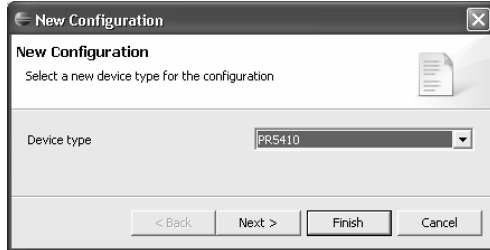
Select the instrument Type [X3 (PR5410)] and continue with   [Next >].
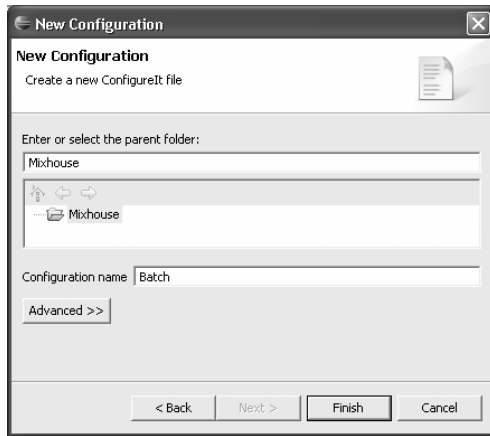
Enter or select the folder, where the configuration has to be placed and enter the name for the configuration. Continue with [Finish].
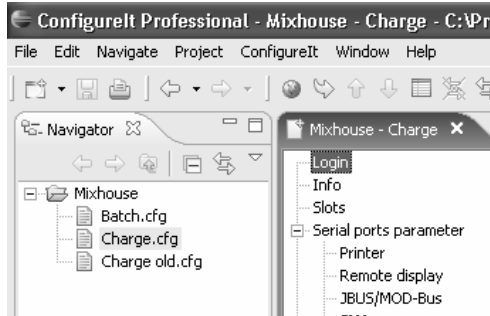
In the Navigator the new configuration [Batch.cfg] is shown in the folder [Mixhouse].

4.11.3 Establish Communication to the Instrument
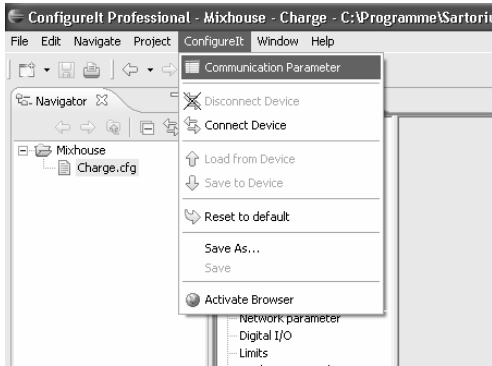
In the Navigator area the folder 'Mixhouse' with the configuration 'Charge.cfg' is present. After double click on the [Charge.cfg] and click on [Login] with [ConfigureIt] - [Communication Parameter] the interface to the instrument can be set.
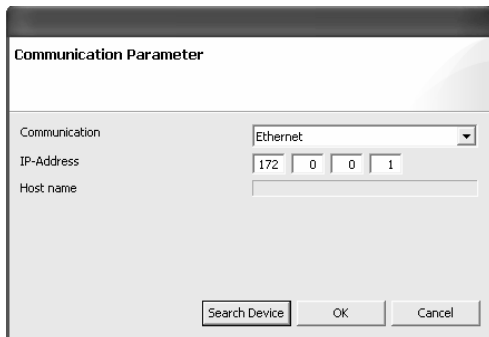
With [Search Device] all instruments of the selected identical type can be found in the network. If the address of the instrument is known, it can be directly entered in [IP-Address].
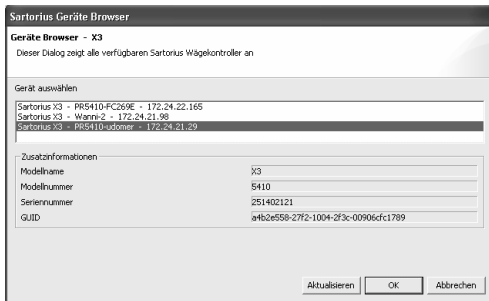
The instruments of the selected type found in the network are shown, the instrument to be configured can be selected, continue with [OK].
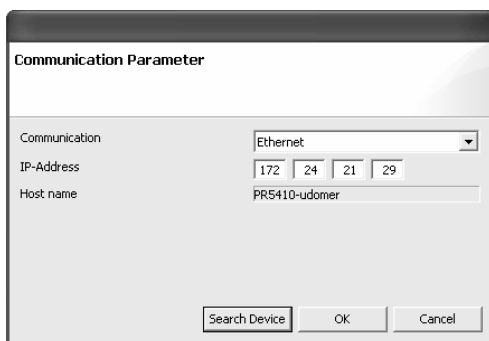
The IP-Address of the selected instrument is taken.
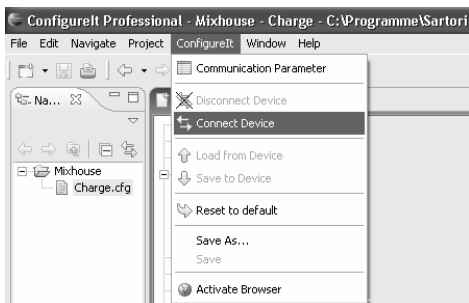
With [ConfigureIt]-[Connect Device] the communication to the instrument is started.

4.11.4 Transfer Dataset from Instrument to PC
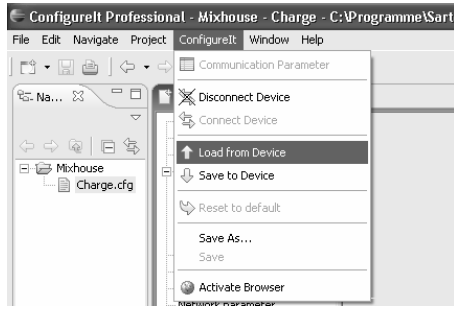
With [ConfigureIt]-[Load from Device] the complete dataset (including the calibration data and parameters) is transferred from the instrument to the PC.

4.11.5 Store Current Dataset on PC
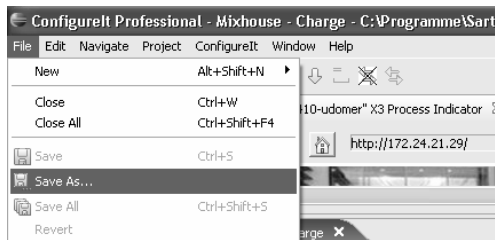
With [File]-[Save as] the complete dataset (including the calibration data and parameters) can be stored in a file.
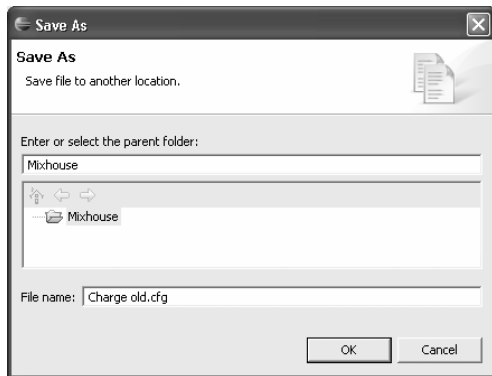
The folder can be selected and a new name for the file can be given.
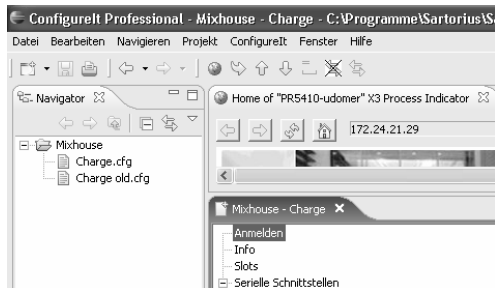
The file [Charge old.cfg] is added at [Mixhouse].

The configuration can be found on the PC with the Explorer in the following folder:

C:\Programs\Sartorius\Sartorius Workbench\workspace\ConfigureIt\Mixhouse
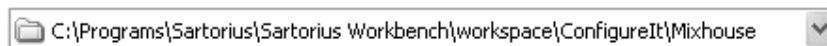
Modification of Dataset
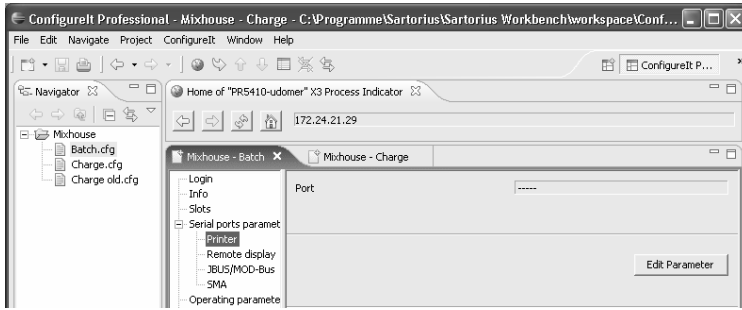
The configuration is selected in the Navigator, then select e.g. [Printer]. Modifications are started by selecting [Edit parameter].
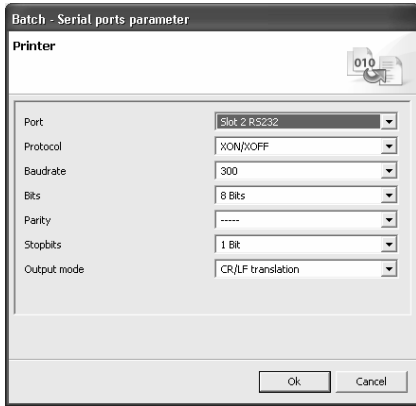
After selection of the port, where the printer of the instrument is connected, the transmission parameters can be altered. Continue with [OK].
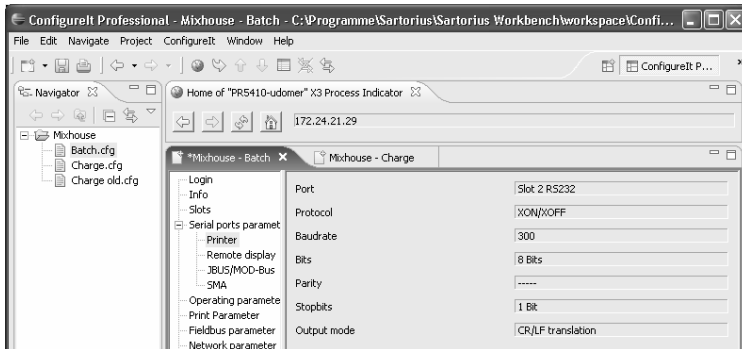
The new parameters are shown.
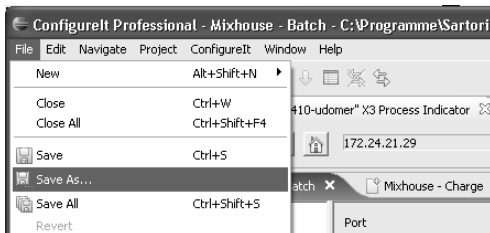
With [File]-[Save As] the modified dataset can be stored in a file.
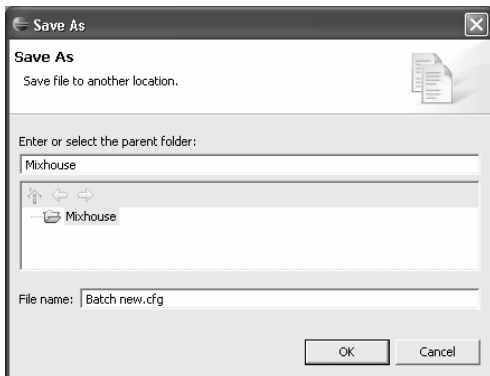
The folder can be selected and a new name for the file can be given, continue with [OK].

4.11.6 Store Current Dataset or Selected Parameters in the Instrument
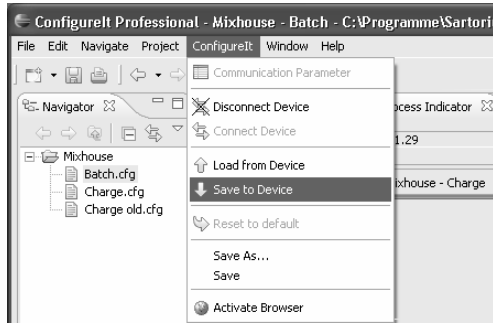
With [ConfigureIT]-[Save to device] parts or the total configuration can be transferred to the instrument.
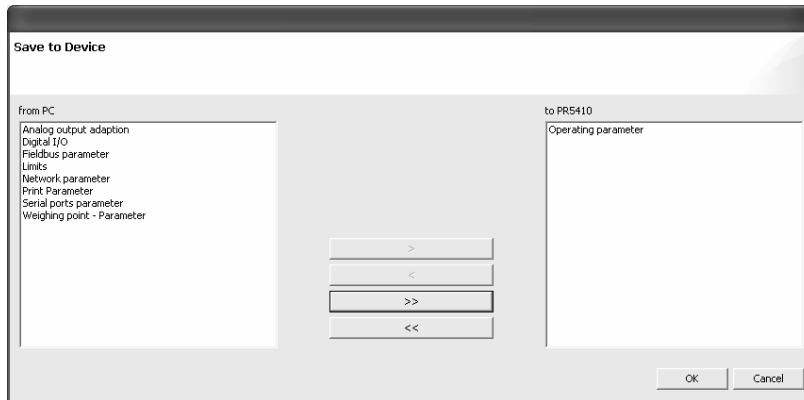
Select with [>] the parameters to be transferred or with [>>] for all parameters.
The transfer is started with [OK].

4.11.7 Reset the Instrument to Factory Default
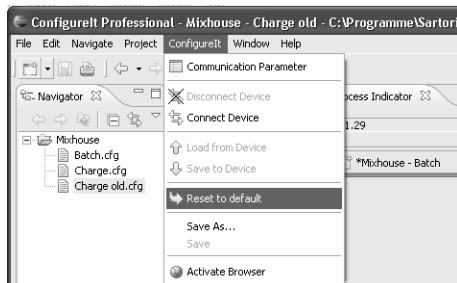
With [ConfigureIt]-[Reset to default] the default data (data in the instrument when leaving the factory) are taken. For transfer to the instrument continue with chapter 4.11.6 .

4.11.8 Exporting a Dataset as Printable File
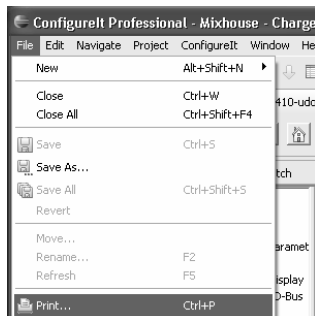
With [File]-[Print] the dataset can be sent to a printer or stored in a file.
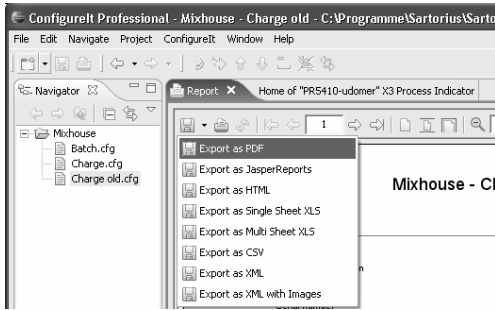
Sending the print file to a printer or selecting the data format of the dataset for storing.

4.11.9 Operation of the Instrument via Browser (VNC)
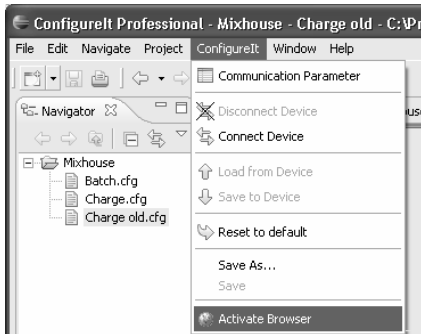
Start the browser with [ConfigureIt]-[Activate Browser].
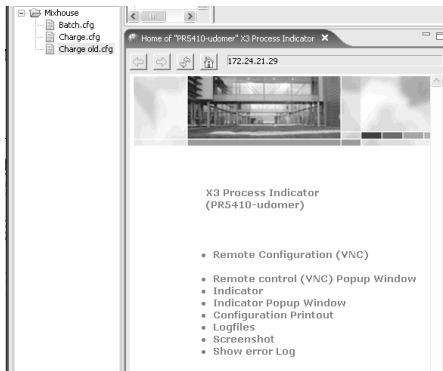
The program can be operated in the same manner as if it had been started directly, see chapter 4.3.

4.11.10 Closing the Program

Before closing the program, it has to be ensured that:
- The correct configuration has been stored in the instrument
- The configuration of the instrument has been stored as .CFG file
- The configuration data has been filed as print out (e.g. PDF) or printed
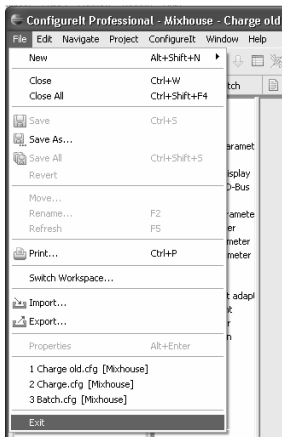
Closing the program with [File]-[Exit] or with: ☒

4.12 MODBUS / J-BUS PROTOCOL

4.12.1 Communication

The MODBUS/J-BUS protocol implemented in the instrument permits fast, simple and reliable communication between a PC or a PLC and up to 127 instruments. PR 5410 fully supports Modbus-RTU including functions 1, 2, 3, 4, 5, 6, 8 (sub-function 0), 15 and 16.

J-bus is a French 'clone' of the Modbus. There is a small difference: J-bus addresses count from 0 (instead of 1) to hex FFFF (instead of dec. 9999). Some Modbus masters automatically subtract 1 before sending a message, and some Modbus slaves subtract 1 to get the requested address. Thus it may happen that access to an address shifted by 1 is made; this is the only point which must be taken into account. In everyday practice, no other problems when connecting J-bus and Modbus instruments should appear.

Binary data from and to the SPM of PR 5410 are transmitted using this protocol. Any data exchange includes two telegrams: a command from the PC to PR 5410 and a reply from PR 5410 to the PC.
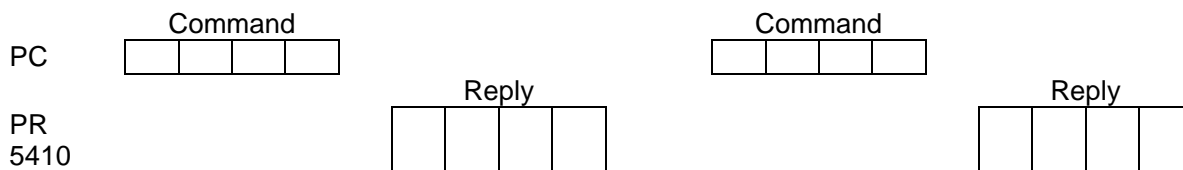
Each telegram consists of four blocks:
1. Device address
2. Functional code
3. Data (addresses and values)
4. Control word (CRC)

Note: All 2-byte values (16-bit values/word) have the Motorola notation. Consequence: MSB - LSB

A reply to every correct command is sent. At 9600 bauds, the reply time is typical 4 ms and maximal 8 ms.

A faulty command received by PR 5410 (e.g., parity error in the data, or CRC error) is ignored and no reply is sent.

The pauses between the individual characters and a command must not exceed the 3.5-fold value of a character length; otherwise PR 5410 detects a premature end of the command.

If the received command is correct but cannot be executed nevertheless (e.g. due to a faulty address or faulty data), reply is with an error telegram.

⚠ A telegram sent to Slave 0 is executed by all PR 5410 units, but not replied by anyone.

4.12.2 Function 1 or 2: Reading n Bits

Command	Device address	Function number	Address of 1st bit	Number of bits	CRC 16
	1 byte	1 byte	2 bytes	2 bytes	2 bytes
Range	1...127	1, 2	0,8,16...	8,16,24. ..	

The bit address must always be the 1st bit of a byte. The number of bits to be read may not be smaller than 8 and must be a multiple of 8.

Reply	Device address	Function number	Number of read bytes	Value of 1st byte	Value of 2nd byte	..	Value of last byte	CRC 16
	1 byte	1 byte	1 byte	1 byte 8th ... 1st bit	1 byte		1 byte last bit	2 bytes

If the address of a bit to be read is out of the permissible range (0...127), an error message is sent as a reply (the address plus the number of bits must not exceed 128).
Example of function 1 for reading the status bits of the scale.

Command	1	1	2	32	0	8	CRC	CRC

Reply	1	1	1	X	CRC	CRC

The read byte X
is interpreted as follows:

Bit 0 = bit 32 of SPM = ADC error
Bit 1 = bit 33 of SPM = above Max (maximum capacity)
:
Bit 6 = bit 38 of SPM = weight is stable
Bit 7 = bit 39 of SPM = weight is below zero or above Max

4.12.3 Function 3 or 4: Reading n Successive Words

Command	Device address	Function number	Address of 1st word	Number of words	CRC 16
	1 byte	1 byte	2 bytes	2 bytes	2 bytes
Range	1...127	3,4	0...63	1...64	

Reply	Device address	Function number	Number of bytes	Number of words	CRC 16
	1 byte	1 byte	1 byte	n bytes	2 bytes

MSB	LSB	MSB	- - - - - -	MSB	LSB
1st word				last word	
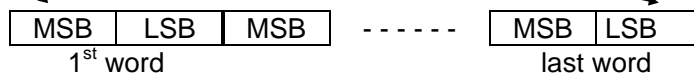
If the address of one of the words to be read is out of the permissible range (0...63), an error message is sent as a reply (the address plus the number of bytes must not exceed 64).

Example of function 3 for reading a gross weight (D8 = W16) of 893 kg

Command	1	3	0	16	0	2	CRC	CRC

Reply	1	3	4	0	0	3	125	CRC	CRC

The individual bytes are shown.

4.12.4 Function 5: Writing a Bit

Command	Device address	Function number	Address of the bit	Value of the bit	Always 0	CRC 16
	1 byte	1 byte	2 bytes	1 byte	1 byte	2 bytes
Range	0...127	5	0...127	0 or 255	0	

Reply	Device address	Function number	Address of the bit	Value of the bit	Always 0	CRC 16
	1 byte	1 byte	2 bytes	1 byte	1 byte	2 bytes

If the address of the bit is out of the permissible range (0...127), an error message is sent as a reply.

Example of function 5 for setting bit 113 (taring)

Command	1	5	0	113	255	0	CRC	CRC

Reply	1	5	0	113	255	0	CRC	CRC

The individual bytes are shown.

4.12.5 Function 6: Writing a Word

Command	Device address	Function number	Word address	Value of the word	CRC 16
	1 byte	1 byte	2 bytes	2 bytes	2 bytes
Range	0...127	6	0...63		

Reply	Device address	Function number	Word address	Value of the word	CRC 16
	1 byte	1 byte	2 bytes	2 bytes	2 bytes

If the address is out of the permissible range (0...63), an error message is sent as a reply.

4.12.6 Function 8: Diagnosis

Command	Device address	Function number	Sub-function	Any value	CRC 16
	1 byte	1 byte	2 bytes	2 bytes	2 bytes
Range	1...127	8	0		

This function is intended for testing the communication.
Only sub-function 0 is supported.
The received command is sent as a reply.

Command	Device address	Function number	Sub-function	Value of the command	CRC 16
	1 byte	1 byte	2 bytes	2 bytes	2 bytes

4.12.7 Function 15: Writing n Successive Bits

Command	Device address	Function number	Address of the 1st bit	Number of bits	Number of bytes	Value of bits	CRC 16
	1 byte	1 byte	2 bytes	2 bytes	1 byte	n bytes	2 bytes
Range	0...127	15	0...127	8,16, 24	1,2,3...		

1st byte	2nd byte	3rd byte	- - - - - - - - - - -	Last byte
8th ... 1st bit				last bit
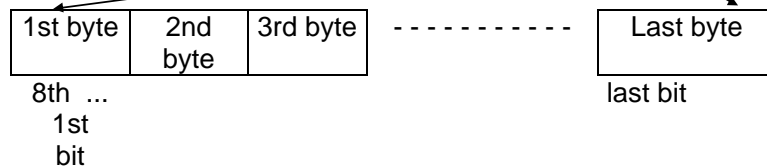
The bit address must always be the 1st bit of a byte. The number of bits to be read must not be smaller than 8 and must be a multiple of 8. The address plus the number of bits must not exceed 128.

Example of function 15

Command	1	15	0	64	0	8	1	3	CRC	CRC

Reply	1	15	0	64	0	8	CRC	CRC

The individual bytes are shown.

4.12.8 Function 16: Writing n Successive Words

Command	Device address	Function number	Address of 1st word	Number of words	Number of bytes	Value of words	CRC 16
	1 byte	1 byte	2 bytes	2 bytes	1 byte	n bytes	2 bytes
Range	0...127	16	0...63	1...64	2...128	/	\

	MSB	LSB	MSB	- - - - - - -	MSB	LSB
		1st word				last

Reply	Device address	Function number	Address of 1st word	Number of words	CRC 16
	1 byte	1 byte	2 bytes	2 bytes	2 bytes

If the address is out of the permissible range (0...63), an error message is sent as a reply (the address plus the number of bytes must not exceed 64).

Example of function 16 for writing the limit_1 switch-on point using value 893:

Command	1	16	0	48	0	2	4	0	0	3	125	CRC	CRC

Reply	1	16	0	48	0	2	CRC	CRC

The individual bytes are shown.

4.12.9 MODBUS / J-BUS Error Messages

If a command was transmitted correctly, but cannot be executed because e.g. the address is too high, an error message is sent as a reply to the command.

The error message has the following format:

Device address	Function number +128	Error number	CRC 16
1 byte	1 byte	1 byte	2 bytes

The 2nd byte contains the received function number; the most significant bit is set additionally. Meaning of the error number:

1	The function number is unknown
2	The address is out of the permissible range
3	The data format is faulty (e.g. more data than specified in the number were written)

Example of an error message which was generated by an invalid function number.

Command	1	9	0	0	0	0	CRC	CRC

Reply	1	137	1	CRC	CRC

The individual bytes are shown.

4.12.10 MODBUS / J-BUS Word Addresses

16	Gross weight, 1st byte (MSB)	Gross weight, 2nd byte

17	Gross weight, 3rd byte	Gross weight, 4th byte (LSB)

2	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

7	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127

Address   Meaning

Read bits:
32   ADC error
33   Above Max (full scale deflection)
34   Above Max + n d
35   Below zero (minus sign)
36   Zero within ¼ d
37   Within zero setting range
38   The weight is stable
39   The weight is below zero or
                   above Max

Write bits:
112   Set zero
1130   Set tare
114   Reset tare

For further bits, see Chapter 8 .

5 SMA Protocol

5.1 General

The protocol of the 'Scale Manufacturers Association' (SMA) provides a simple access to the scale. It can be used for reading data, or for executing functions.

The RS-485 interface is used as an interface. Fixed interface settings are 8 bits, no parity and 1 stop bit.

The commands to the instrument are printable ASCII characters starting with <LF> = 0A hex and ending with <CR> = 0D hex.
The instrument sends a reply on each received command after approx. 100 μs. With commands that wait for stability of the weight value, the reply can be delayed by the waiting time.

5.2 Description of Used Symbols

All characters used in this protocol are printable ASCII characters. Characters <CR> <LF> <SPACE> and <ESC> are excepted.

< >	The symbols < and > are used to put communication fields and non-printable ASCII characters into brackets. These symbols are never part of any communication message.
<LF>	A data set starts with a line feed character (line feed = 0A hex).
<CR>	A data set ends with the carriage return character (carriage return = 0D hex).
'_' <space>	The underscore or space character is used to mark an ASCII space character (20 hex).
<ESC>	The 'escape' character (1B hex) is used to cancel a command.
'!'	An ASCII exclamation mark (21 hex) is used for communication errors.
':'	An ASCII colon is used as a field delimiter.
'-'	ASCII minus sign (2D hex)
'?'	An ASCII question mark (3F hex) is used for unknown or non-supported commands.
'c'	Command character. All printable ASCII characters are permitted.
<s><r><n>	Scale status indicator characters; ASCII letters or spaces
<m><f>	For details, see Chapter 5.4.1.
<r><e>	Scale diagnostics indicator characters; upper case ASCII letters or spaces.
<c><m>	For details, see Chapter 5.4.4 .
<xxxxxx.xxx>	Weight data including minus sign (right-adjusted) and a decimal point (if any). If necessary, leading spaces are introduced with a leading zero before the decimal point. The entire field is always 10 characters long. With some error states, the field is filled up with minus signs '-'. Examples: <_ _ _ _ _0.000>; <_ _ _ _11.120>; <_ _ _ _ -1.000>; <- - - - - - - - - ->
<yyyyyy>	Text field of printable ASCII characters; for transporting scale information. The field has max. 25 characters.
<uuu>	Abbreviation of the used unit. The field is always 3 characters long; it is left-adjusted and filled up with spaces.

5.3   SMA Command Set

The SMA command set is intended for requesting weight values and status information as well as for control of the scale. The commands start with <LF> and end with <CR>.
Format: <LF>c<CR>

5.3.1   Requesting a Weight

Requesting a Weight
Command: <LF>W<CR>
Reply: The scale immediately returns the weight and status: gross weight if not tared, net weight if tared.
               <LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
               For details, see Chapter 5.4.1 .

Requesting the Weight with Stability

Command: <LF>P<CR>
Reply: The scale returns the weight and the status only, when the stability condition is met: Gross weight if not tared, net weight if tared.
               For this function, the stability condition must be met. The maximum waiting time for stability is set under [Tare timeout]; see Chapter 4.5.13.
               <LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
               After elapse of the waiting time without reaching stability, the following reply is sent:
               <LF><_><1><n><_><f><----------><___><CR>
               For details, see Chapter 5.4.1 .

Requesting Weight Continuously

This is a command which generates non-requested replies, because it does not function according to the strict pattern of command and reply. After the command, the scale repeats the reply continuously.

Command: <LF>R<CR>
Reply: The scale repeats the weight and status information continuously until another command is received.
               <LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
               For details, see Chapter 5.4.1 .

Dependent on the used baud rate, the repetition rate of reply telegrams is roughly as follows:
19200 bd   ⇨   100ms
9600 bd   ⇨   110ms
4800 bd   ⇨   170ms

Requesting the High-Resolution Weight

Command   <LF>H<CR>
Reply: The scale immediately returns the high-resolution (10x) weight and status: Gross weight if not tared, net weight if tared.
               Note: The <n> gross/net status is shown in lower-case letters while the high-resolution weight is sent.
               <LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
               For details, see Chapter 5.4.1 .

Requesting the High-Resolution Weight with Stability

Command: <LF>Q<CR>
Reply: The scale returns the weight and status only, when the stability condition is met: Gross weight if not tared, net weight if tared.
The stability condition must be met for this function. The maximum waiting time for stability is set under [Tare timeout]; see Chapter 4.5.13.
<LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
After elapse of the waiting time without reaching stability, the following reply is sent:
<LF><_><1><n><_><f><---------><___><CR>
For details, see Chapter 5.4.1 .

Requesting the High-Resolution Weight Continuously

This is a command which generates non-requested replies, because it does not function according to the strict command-and-reply pattern. After the command, the scale repeats the reply continuously.

Command: <LF>S<CR>
Reply: The scale repeats the high-resolution weight and status information continuously, until another command is received.
<LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
For details, see Chapter 5.4.1 .

Dependent on the used baud rate, the repetition rate of reply telegrams is roughly as follows:
19200 bd   ⇨   100ms
 9600 bd   ⇨   110ms
 4800 bd   ⇨   170ms

Requesting the Tare Weight

Command: <LF>M<CR>
Reply: The scale returns the tare weight and signals the 'tared' status in the <n> status character.
<LF><s><r><T><m><f><xxxxxx.xxx><uuu><CR>
For details, see Chapter 5.4.1 .

5.3.2   Controlling the Scale

Request for Taring of the Scale

Command: <LF>T<CR>
Reply: The scale makes a taring attempt and signals the tared status in the <s> and <n> characters.
For this function, the stability condition must be met. The maximum waiting time for stability is set under [Tare timeout]; see Chapter 4.5.13
<LF><s><r><N><m><f><xxxxxx.xxx><uuu><CR>
For details, see Chapter 5.4.1 .

Request for Taring with Fixtare Value

Command: <LF>T<xxxxxx.xxx><CR>
Reply: The scale makes a taring attempt using the fixtare value <xxxxxx.xxx> and signals the
tared status in the <s> and <n> characters.
<LF><s><r><N><m><f><xxxxxx.xxx><uuu><CR>
For details, see Chapter 5.4.1 .

Request for Zero Setting of the Scale

Command: <LF>Z<CR>
Reply: The scale makes a zero setting attempt and signals the zero status in the <s>
character.
For this function, the stability condition must be met. The maximum waiting time for
stability is set under [Tare timeout]; see Chapter 4.5.13 .
<LF><Z><r><n><m><f><xxxxxx.xxx><uuu><CR>
For details, see Chapter 5.4.1 .
Unless the scale is in the zero setting range, an error reply is generated.

Request for Tare Resetting

Command: <LF>C<CR>
Reply: The scale deletes the tare weight and signals the tare reset status in the <n> status
character. The scale tare is reset.
<LF><s><r><G><m><f><xxxxxx.xxx><uuu><CR>
For details, see Chapter 5.4.1 .

5.3.3 Scale Diagnosis

Command: <LF>D<CR>
Reply: The scale starts the diagnosis and returns a diagnosis reply.
<LF><r><e><c><m><CR>
For details, see Chapter 5.4.1 .

5.3.4   Scale Data
Scale Data – First Line

Command: <LF>A<CR>
Reply: The scale sends the first line of its scale data.
                   <LF><SMA>:<yyyyyy><CR>
                   For details, see Chapter 5.4.1 .

Scale Data – Other Lines

Command: <LF>B<CR>
Reply: The scale sends further lines of its scale data.
                   <LF><MFG>:<yyyyyy><CR>
                   For details, see Chapter 5.4.1 .

5.3.5   Scale Information
Scale Information - First Line

Command: <LF>I<CR>
Reply: The scale sends the first line of its scale information.
                   <LF><SMA>:<yyyyyy><CR>
                   For details, see Chapter 5.4.1 .

Scale Information – Other Lines

Command: <LF>N<CR>
Reply: The scale sends further lines of its scale information.
                   <LF><TYP>:<yyyyyy><CR>
                   For details, see Chapter 5.4.1 .

5.3.6   Escape Command

Command: <ESC>
Reply: This is the only command which does not work according to the protocol principle. It
                   does not have a reply. The <ESC> character is detected at any time and cancels any
                   current command.

5.4   SMA Reply Messages

In this section, the replies are described in detail. The data format of each reply has a fixed length. The communication error is the only exception from this pre-definable format. Thus the controlling computer can check each reply according to fixed rules, because each data field is in a fixed position.

5.4.1   Standard Reply

With most commands, the reply format is as described below:
Exceptions are the commands: 'D', 'A'/'B' and 'I'/'N'.

<LF> <s> <r> <n> <m> <f> <xxxxxx.xxx> <uuu> <CR>

Reply format and meaning:

<LF>		Start of reply message
<s>	Scale status	Definition / example
	'Z'	Zero within 1/4d <xxxxxx.xxx>= 0.000
	'O'	Above Max <xxxxxx.xxx>= +weight
	'U'	Below zero <xxxxxx.xxx>= - weight
	'E'	Zero setting error
	'T'	Taring error
	<space>	None of the above conditions
		Note: For 'E', 'I', 'T' error conditions
		<xxxxxx.xxx>= ——————— (minus sign)
		and 'Z', 'O', 'U' are overwritten.
<r>	Range	('1', '2', '3', etc.) always '1' for single range scales
<n>	Gross/net	Status
	'G'	Gross weight
	'T'	Tare weight (as reply from 'M' command)
	'N'	Net weight
	'g'	High-resolution gross weight
	'n'	High-resolution net weight
<m>	Stability status	
	'M'	The scale is not stable
	<space>	The stability-of-scale condition is met
<f>	Reserved for future extensions	
<xxxxxx.xxx>	Weight value; the field has always 10 characters	
<uuu>	Unit of the weight value	
<CR>	End of the reply message	

Examples:
Command   Reply
<LF>W<CR>   <LF> <_> <1> <G> <_> <_> <_ _ _ _ 5.025> <lb_> <CR>

<LF>W<CR>   <LF> <_> <1> <N> <_> <_> <_ _ _ _ 100000> <lb_> <CR>

<LF>H<CR>   <LF> <_> <1> <g> <_> <_> <_ _ _ _5.0025> <lb_> <CR>

<LF>Z<CR>   <LF> <Z> <1> <G> <_> <_> <_ _ _ _ _0.000> <lb_> <CR>

<LF>R<CR>   <LF> <_> <1> <G> <_> <_> <_ _ _ _ 7.025> <kg_> <CR>
             <LF> <_> <1> <G> <M> <_> <_ _ _ _ 7.650> <kg_> <CR>
             ... repeat...
             <LF> <_> <1> <G> <_> <_> <_ _ _ _ 7.650> <kg_> <CR>
             The scale repeats the weight, until another command is received.

5.4.2   Reply with Unknown Command

<LF> ? <CR>   A command from the controlling computer that is not implemented, or invalid, is
               replied with an ASCII '?'.

5.4.3   Reply in Case of Communication Error

<LF> ! <CR>   A command from the controlling computer that is unknown to the scale due to a
               communication error is replied with an ASCII '!'. This includes parity error or frame
               error (if any).

5.4.4   Reply with Diagnosis Command
When a diagnosis command is given, the scale makes a test and gives a status reply.
<LF> <r> <e> <c> <m> <CR>
Reply format and meaning:
<LF>   Start of diagnosis reply
<r>   'R' = RAM or ROM error; '_' = OK,
<e>   'E' = EEPROM error; '_' = OK
<c>   'C' = calibration error; '_' = OK
<m>   Always: '_' = OK
<CR>   End of the diagnosis reply

Reply: without error status
Command   Reply
<LF>D<CR>   <LF> <_> <_> <_> <_> <CR>

5.4.5   Reply with 'A' and 'B' Command

Reply format with 'A' and 'B' commands (variable length):
<LF><xxx>:<yyyyyy><CR>
The reply format and meaning are:

<LF>	Start of reply from 'A'/'B' command
<xxx>	The field name is three characters long, left-adjusted and filled up with spaces on the right, if necessary.

The following fields are sent:
"SMA" level/revision
(reply from 'A' command)
"MFG" manufacturer marking
(reply from the 1st 'B' command)
"MOD" product / model identification
(reply from the 2nd 'B' command)
"REV" software version
(reply from the 3rd 'B' command)
"SN_" serial number
(reply from the 4th 'B' command)
"END": This is always the last inscription field
(reply from the last 'B' command)

':'	Separator between field name and field content.
<yyyyyy>	The data field contains up to 25 character. The SMA field contains <level/revision> with the following meaning: level = (1, 2, etc.); revision = (1.0; 1.1; etc.)
<CR>	End of reply from 'A'/'B' command

Example:

Command	Reply
<LF> A <CR>	<LF>SMA:1/1.0 <CR>
<LF> B <CR>	<LF>MFG:Sartorius <CR>
<LF> B <CR>	<LF>MOD:PR5410 <CR>
<LF> B <CR>	<LF>REV:01.01.9 <CR>
<LF> B <CR>	<LF>SN_:148388723 <CR>
<LF> B <CR>	<LF>END: <CR>

Note: If the controlling computer sends another 'B' command:
<LF> B <CR> <LF> ? <CR>

5.4.6   Scale Reply with 'I' and 'N' Commands

Reply format with 'I' and 'N' commands (variable length):
<LF><xxx>:<yyyyyy><CR>
Reply format and meaning:
<LF>   Start of reply from 'I'/'N' command

<xxx>   The field name is three characters long, left-adjusted and filled up with spaces, if
            necessary.
            The following fields are sent:
            "SMA"   level/revision
                       (reply from 'I' command)
            "TYP"   Scale type: 'S'= scale
                       (reply from the 1st 'N" command)
            "CAP"   Max, unit, scale interval and decimal position, separated by ':'
                       Meaning: yyyyyy= uuu:c..c:n:d
                                 uuu= unit
                                 n= scale interval (e.g. 1, 2, 5,10,20…) without decimal point
                                 d= decimal point position
                                 '0'= without, '1'= xxxx.x, '2'= xxx.xx, '3'= xx.xxx , ... etc.
                       (reply from the 2nd 'N' command)
            "CMD"   Supported SMA commands
                       (reply from the 3rd 'N' command)
            "END"   This is always the last inscription field
                       (reply from the last 'N' command)
':'   Separator between field name and field content.

<yyyyyy>   The data field contains up to 25 characters.
            The SMA field contains <level/revision>
            Meaning: level = (1, 2, etc.); revision = (1.0, 1.1, etc.)

<CR>   End of reply from 'I'/'N' command

Example: 6000kg x 1kg platform scale
Command   Reply
<LF> I <CR>   <LF>SMA:2/1.0 <CR>
<LF>N<CR>   <LF>TYP:S <CR>
<LF>N<CR>   <LF>CAP:kg_:6000:1:0 <CR>
<LF>N<CR>   <LF>CMD:HPTMCR <CR>
<LF>N<CR>   <LF>END: <CR>

Example: 5000g x 1g, 10000g x 2, 25000g x 5 multiple range / multi-interval
Command   Reply
<LF> I <CR>   <LF>SMA:2/1.0 <CR>
<LF>N<CR>   <LF>TYP:S <CR>
<LF>N<CR>   <LF>CAP:g__:5000:1:0 <CR>
                 <LF>CAP:g__:10000:2:0 <CR>
                 <LF>CAP:g__:25000:5:0 <CR>
<LF>N<CR>   <LF>CMD:HPTMCRQ <CR>
<LF>N<CR>   <LF>END: <CR>

5.4.7   Communication Error

When a communication error due to a parity error or a frame error (if used) was detected, the scale
sends an ASCII '!' character. The only other error is the detection of an unknown or non-supported
command. In this case, an ASCII '?' character is sent as a reply. Dependent on the error messages,
the controlling computer must decide how to continue the scale operation.

6 PR 1612 Commands

This function enables the use of the following commands of the PR 1612 command set.
No license is required for using.

6.1 MAIN COMMANDS FOR INDICATOR FUNCTION

Command	Reaction	Description
WGA	QGAwwwwwwemz	Read gross weight
WNA	QNAwwwwwwemz	Read net weight
WTA	QTAwwwwwwemz	Read tare weight
WDA	QDAwwwwwwemz	Read difference weight
		wwwwwwe = Weight with sign and exponent (e.g. '002340' = 002.34g; 001005 = 100kg) m = no motion / Stand still, z = 1: Tared, z = 2: Test, z = 4: Zero, 1/4d
WZA	Q	Set indicator to zero
WSA	Q	Set tare
WFA	Q	Reset tare
ZSC	QZSC	Reset communication
V	QV5410-1.00	Version request

Command	Reaction	Description
I	QIaaaaaa ddssnnnnn	xxxx/xx-x.xx = instrument version
LV	QLVxxxx/xx-x.xxaaaaaa ddssnnnnnttttt	aaaaaa = Max in 5 digits with dec. point, dd = Unit, ss = Scale interval, nnnnn = Span in mV/V ttttt = deadload in mV/V

Befehl	Antwort	Beschreibung
WSAwwwwwwe	Q	Set fixtare
ZS1Awwwwwwewwwwwwe	QZS1A	Set Limit 1
ZS2Awwwwwwewwwwwwe	QZS2A	Set Limit 2
ZS3Awwwwwwewwwwwwe	QZS3A	Set Limit 3
ZSDDDMMYYYYhhmm	QZSD	Set date and time

6.2 ERROR MESSAGES FOR PR 1612 COMMANDS

Error	Description	Error	Description
E20000	Command unknown / failure	E10010	Arithmetic overflow
E30000	BCC error	E10020	Input > Max + Ovl
E50000	Analog test active	E10030	Input > 36 mV or ADU failure
E60000	Wrong address / weighing point	E10040	Weight exceeds display digits
E63000	Limit, fixtare > Max	E10050	Weight not available
E70000	Scale tared / in motion	E10060	No sense voltage
		E10070	Negative measuring signal

7 Fieldbus Interface

7.1 FIELDBUS INTERFACE PROTOCOL

The interface works with an 8-byte write window and an 8-byte read window. The fieldbus exchanges its data cyclically with each slave. This means: In each cycle, 8 bytes are written and 8 bytes are read, also if the data content is unchanged.
The fieldbus protocol ensures the data transport between the fieldbus master and the 2 x 8-byte data windows.
The interface protocol runs under the fieldbus and manages the access to a multitude of different data.

Fieldbus Interface

8-Byte Write Window	8-Byte Read Window

Interface Protocol

Data and Functions with PR 5410

- Weight data
- Weight status
- Limit values
- Digital inputs
- Digital outputs
- Analog output
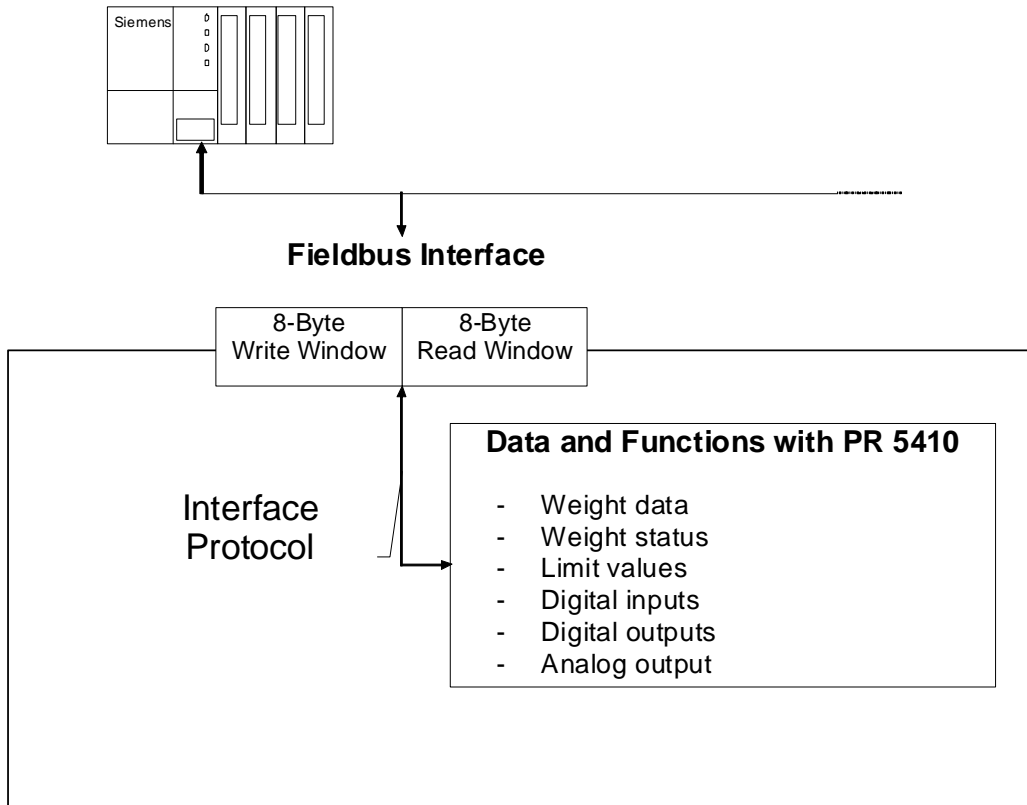
7.1.1   Write Window (Input Area)

Data transmission from the master to the slave (PR 5410) is in this window.

The first four bytes are used only for writing a data value.

The register number is in byte 5.

Bytes 6 and 7 contain bits in direct access independent of the write data.

The command is executed after a 0-1 transition of the corresponding bit.

Byte 0	Write data: MSB
Byte 1	"
Byte 2	"
Byte 3	Write data: LSB
Byte 4	Read_Value _Select
Byte 5	Write_Value _Select
Byte 6	Direct control bits
Byte 7	Direct control bits

7.1.2   Read Window (Output Area)

Data transmission from the slave (PR 5410) to the master is in this window.

The first four bytes are used for reading a data value.

The register number of data is mirrored in byte 4 by the write window, when data is available.

Bytes 5, 6 and 7 contain status bits independent of the read data.

Byte 0	Read data: MSB
Byte 1	"
Byte 2	"
Byte 3	Read data: LSB
Byte 4	Read_Value _Selected
Byte 5	General system bits: - Write_Active - power_fail - analog error...
Byte 6	Status bits
Byte 7	Status bits

7.1.3   Reading and Writing Data

The number of data exceeds the size of the read/write window by far. For this reason, data is addressed with Write_Value_Select and Read_Value_Select. To do this, the first six bytes of the write window and the first five bytes of the read window are required. These can be used by the master to write data in PR 5410: e.g., a limit value is set to 100kg. The master can also read out weight values or other data from the PR 5410. For this purpose, the write and the read window are always required. Safe data exchange is ensured by a write and a read procedure.

For reading status bits, and for writing direct control bits, however, no procedure is required. The general system bits and the status bits are always provided and need not be requested. The direct control bits are also available continuously.

Procedure for reading data:
1. Writing the register number as Read_Value _Select in byte 4 of the write window (e.g. net weight).
2. Waiting, until the Read_Value _Selected in byte 4 of the read window is equal to the Read_Value
   _Select in byte 4 of the write window.
3. Now the value is available in bytes 0 to 3.

Procedure for writing data:
1. Waiting, until Write_Active = 0 in the read window (ready to receive new data).
2. Writing the value in bytes 0 to 3.
3. Writing the register number in byte 5 (Write_Value_Select).
4. Waiting, until Write_Active = 1 (acknowledges data reception)
5. Writing 0 in byte 5 (Write_Value_Select) -> Write_Active goes to 0.

7.2   Description of the I/O Area (Read / Write Window)

7.2.1   Input Area

Data transmission from the master to the PR 5410 (slave) is via the input area.
Weight or data requests are transmitted to the slave by the master.
The master has write access; the slave has read access.

Byte	Name								Description
0	Write_Value (MSB)								e.g. limit value
1	:::								"
2	:::								"
3	Write_Value (LSB)								"
4	Read_Value_Select								e.g. gross weight
5	Write_Value_Select								Write: Limit 1 On
6	free	free	free	free	free	outp. 3	outp. 2	outp. 1	Free / digital outputs
7	Get FixTare	Set FixTare	Res Power	Res Test	Set Test	Res Tare	Set Tare	Set Zero	Control byte, response to 0->1 transition
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 3	Bit 1	Bit 0	

The control byte activates the corresponding action in the instrument with a set bit.
After execution of the operation, the bit should be reset.

Variable	Function
Write_Value	The weight value is transmitted as a binary 32-bit value with plus or minus sign Data type: DINT
Read_Value_Select	For selecting the value sent by the instrument
Write_Value_Select	For selecting the function to be executed by the instrument
GetFixTare	The gross weight is copied into the fixtare memory.
SetFixTare	Taring is performed using the value stored in the fixtare memory.
ResPower	The Power_Fail bit in the output area is deleted.
ResTest	The test operating mode is finished.
SetTest	The test operating mode is started. Now the test value can be read out by reading out the gross weight.
ResTare	Tare is reset.
SetTare	The instrument is tared.
SetZero	The instrument is set to zero.

7.2.2 Output Area

Data transmission from the PR 5410 to the master is via the output area.
The weight or data information requested by the master is transmitted to the master by PR 5410.
The PR 5410 has write access, the master has read access.

Byte	Name								Description
0	Read_Value (MSB)								e.g. gross value
1	:::								"
2	:::								"
3	Read_Value (LSB)								"
4	Read_Value _Selected								e.g. gross
5	Write Active	Power Fail	Out 3	Out 2	Out 1	Limit 3	Limit 2	Limit 1	Status
6	Cmd Busy	Cmd Error	Inp.3	Inp.2	Inp.1	Tare Active	Cal Active	Test Active	Command status
7	Dimmed	Stand-still	Inside ZSR	Center Zero	Below Zero	Over-load	Above Max	Adc Error	Device status
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 3	Bit 1	Bit 0	

Variable	Function
Read_Value	The weight value is transmitted as a binary 32-bit number with plus or minus sign. Data type: DINT
Read_Value_Selected	Acknowledgement of the transmitted value.
Write_Active	The function selected with Write_Value_Select is executed once. This bit is deleted, when Write_Value_Select is set to 0.
Power_Fail	Is set when switching on the instrument. Is reset by ResPower with transition from 0$\rightarrow$1.
Cmd_Busy	The instrument is busy executing a command (e.g. the instrument has received a taring command and waits for stability.
Cmd_Error	The instrument has interrupted the execution of a command (e.g. StandStill could not be reached within the defined standstill time). The error number can be read at Lasterror. It is set only, if an action is executed.
Tare_Active	The instrument was tared.
Cal_Active	The instrument is / was configured. When this bit is 1, the scale parameters (Expo/Unit/Step) must be read again. Set after power On and reset after reading the Max. capacity.
Test_Active	The instrument executes the ADC test. The read weight value is not the gross value, but the test value.
Dimmed	Above Max. capacity or below zero
Standstill	The instrument is stable.
InsideZSR	The weight value is within the zero setting range.
CenterZero	The weight value is within center zero (0 +/- 0.25 d)
BelowZero	The weight value is negative (gross< -0.25d)
Overload	The weight value has exceeded the measuring range; no valid weight data is specified (gross>max. capacity+overload)
AboveMax	The weight value has exceeded the Max. capacity, but is still within Max + permissible overload (gross <= max. capacity+overload)
AdcError	A/D conversion error. (Details are given in register 1, Read_Value_Select = 1)

7.2.3 Reading and Writing Register via Fieldbus

Reading Data: Read_Value, Read_Value_Select, Read_Value_Selected
When the master has to read from the instrument, the register number is transmitted in Read_Value_Select in the input area. The result is specified with Read_Value_Selected in the output area.

Action of the master	Response of PR 5410
Writing register no. in Read_Value_Select	
	Writing the selected register in Read_Value
	Copying Read_Value_Select into Read_Value_Selected
Waiting, until Read_Value_Selected = Read_Value_Select	
Reading Read_Value	

Writing data: Write_Value, Write_Value_Select, Write_Active
When the master has to write into the instrument, the required action is transmitted into the input area with Write_Value_Select together with the data. Execution is indicated by bit Write_Active in the output area.

Action of the master	Response of PR 5410
Writing value in Write_Value	
Writing the register number in Write_Value_Select	
	Writing Write_Value in the selected register
	Setting bit Write_Active
Waiting, until Write_Active was set	
Writing 0 in Write_Value_Select	
	Resetting bit Write_Active

Setting Bit: Action_Select, Write_Active
Single bits can be set or reset directly with Write_Value_Select.
For setting, the bit number (80.. 127) is written in Write_Value_Select.
For resetting, the bit number + 128 (208..255) is written in Write_Value_Select.

Action of the master	Response of PR 5410
Writing register number in Write_Value_Select	
	Writing Write_Value in the selected register
	Setting the Write_Active bit
Waiting, until Write_Active was set.	
Writing 0 in Write_Value_Select	
	Resetting the Write_Active bit

Reading Bit
Single bits can be read only by reading a register. The procedure is described in Chapter 0.

Control Byte

Some instrument functions can be executed by setting bits in the input area directly.

Action of the master	Response of PR 5410
Setting bits in the control byte	
	The operation is handled
Resetting bits in the control byte	

Waiting for the Result of the Action

When an action taking a longer time was started, the end of execution can be waited for after starting (see Chapter 0 and Chapter 0).

Action of the master	Response of PR 5410
Setting bits as in Chapters 0 or 0	
	Acknowledging the set bit as in Chapter 0
	Setting the CmdBusy bit
	The operation is handled
	In the event of an error: Setting the CmdError bit and the LastError byte
	Resetting the CmdBusy bit
Waiting, until CmdBusy was reset	
Checking the CmdError bit	
When set, reading LastError (see Chapter 0)	

This is applicable to taring, zero setting etc. over the fieldbus.

7.2.4   Example: Reading the Gross Weight

The master writes value 8 in Read_Value_Select (byte 4) of the input area.

Input area

Byte	Value	Description
0		
1		
2		
3		
4	**8**	Gross
5		
6		
7		

The master waits, until value 8 was reflected in Read_Value_Selected (byte 4) of the output area.

Output area

Byte	Value								Description
0	**00**								Gross value
1	**00**								"
2	**4**								"
3	**D2**								"
4	**8**								Gross weight request was detected
5									Status
6								**Test active**	Command status
7		Stand-still	Inside ZSR	Center zero	Below zero	**Over-load**	Above Max	**ADC error**	Device status
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 3	Bit 1	Bit 0	

The gross value (hex:000004D2 <=> 1234) can be read from bytes 0...3. When the 'Overload', 'Test Active' or 'ADC error' bits are set, the read value is invalid.
Negative values are output in two's complement.

7.3   Fieldbus Register

7.3.1   Register 0: IO Status Bits for Reading

(Dynamic status), only reading is permitted

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0						Input 3	Input 2	Input 1
Byte 1						Output 3	Output 2	Output 1
Byte 2						Limit 3	Limit 2	Limit 1
Byte 3								

7.3.2   Register 1: Scale Status

(Dynamic status), only reading is permitted

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	DIM	STND	INZSR	CZERO	BELOW0	OVL	>Max	ADCERR
Byte 1					E6	E1	E3	E7
Byte 2						PowerFail	ActionActive	CmdError
Byte 3						TareActive	CalChanged	TestActive

Byte 0 corresponds to byte 7 in the output area; for weight error, see also the table in Chapter 4.6.1.

ADCERR	Error of analog conversion/ load cell circuit (OR function of the E1,E3,E7 bits)
>Max	Gross value is higher than Max (maximum capacity); the full scale deflection was exceeded.
OVL	Scale overload; Gross > Max + overload, Error 2
BELOW0	Gross weight is negative (< 0-1/4 d)
CZERO	Center of zero; weight within 0 +/- 1/4 d
INZSR	The gross weight is within the zero setting range
STND	The scale is stable
DIM	The gross weight has exceeded the full scale deflection (0-1/4 d > weight value > Max+overload), (OR function of bits BELOW0, OVL).
E7	The input signal is negative (inverse conversion), Error 7
E6	No sense voltage, or Sense voltage is low, Error 6
E3	The input signal is > 36mV (no end of conversion), Error 3
E1	Arithmetic error (overflow), Error 1
CmdError	Error during execution (cmdError); e.g. the 'taring' operation is not handled, because the scale is not stable. The error is stored in LastError (register 4). The bit is reset with the ResetError bit (register 2).
ActionActive	The operation is handled; handling is busy
PowerFail	Power failure; is always set after power on. The PowerFail bit is reset with the ResetPWF bit (register 2) 'Reset power failure'.
TestActive	The analog test is busy
TareActive	The instrument was tared.

7.3.3   Register 2: State of State-Controlled Action Bits

Only reading is permitted; the signal state is shown.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								
Byte 1								
Byte 2	87: GetFixTare	86: SetFixTare	85: ResetPWF	84: ResetTest	83: SetTest	82: ResetTare	81: SetTare	80: SetZero
Byte 3							89: ResetError	88: Print

7.3.4   Register 3: State of Edge-Controlled Action Bits

Only reading is permitted; it is always 0.

7.3.5   Register 4: Calibration Information, Error Byte

Only reading is permitted.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	EXPO							
Byte 1	UNIT							
Byte 2	STEP							
Byte 3	LASTERROR							

EXPO   One byte for the position of the decimal point; content in decimal form 0 ... 255
             0 = 000000
             1 = 00000.0
             2 = 0000.00
             3 = 000.000
             4 = 00.0000
             5 = 0.00000
UNIT   One byte for the weight unit; content in decimal form: 0 ... 255
             2 = g, grams 3 = kg, kilograms
             4 = t, tons 5 = lb, pound
STEP   One byte for scale interval; content in decimal form: 0 ...255
             1 = scale interval '1', 2 = scale interval '2', 5 = scale interval '5'
             10 = scale interval '10', 20 = scale interval '20', 50 = scale interval '50'
LASTERROR Last error byte; see also CmdError bit, number of 'last error':
             31 = no stability was reached (e.g. when taring)
             33 = negative weight value when taring and 'legal-for-trade' mode on
             47 = no zero setting; weight not within zero setting range
             107 = no stability with   Getfixtare

7.3.6   Register 5: Device Type and Software Release

Only reading is permitted.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	TYPE MSB							
Byte 1	TYPE LSB							
Byte 2	MAINVERSION							
Byte 3	SUBVERSION							

E.g. 5410 Rel 1.23 = 54100123$_{hex}$

7.3.7   Register 6: Board Number

Only reading is permitted.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Board number MSB							
Byte 1	""							
Byte 2	""							
Byte 3	Board number LSB							

E.g. 148388723 = 08D83B73$_{hex}$

7.3.8   Register 7: (Reserved)

7.3.9   Register 8 ...15: Weight Data

Only reading is permitted.
The gross, net and tare weight are stored as DINT fixpoint.
The real data value is derived from DINT and EXPO as follows :

$$Value_{Real}=reading_{DINT}*10^{(-EXPO}$$

Register 8	Current gross value
Register 9	Current net value, if tared; otherwise gross
Register10	Current tare value, if tared, otherwise 0
Register11	Value on the front-panel display
Register12	Reserved
Register13	Reserved
Register14	Max
Register15	Reserved

7.3.10 Register 20: Weight Data

Register 20	BCD output value

7.3.11 Register 22 ... 27: Limit Values (Read/Write)

Register 22	Limit 1 on
Register 23	Limit 1 off
Register 24	Limit 2 on
Register 25	Limit 2 off
Register 26	Limit 3 on
Register 27	Limit 3 off

7.3.12 Register 30, 31: Fixed Values (Read/Write)

Register 30	Fixed value for analog output; value (num) 0... 20000 corresponds to 20mA
Register 31	Fixed value for fixtare; see also SetFixTare, GetFixTare (see Chapter 7.3.3)

7.3.13 Register 80 ... 89: State-Controlled Action Bits (Write)

For setting bits, see Chapter 0.
Only setting and resetting of single bits is possible.
When changing a bit from 0 to 1, the corresponding action starts. After handling the command, the bit must be reset. Application: the master writes cyclically.
The bit is set as Write_Value_Select with the specified number (see Chapter 0); the bit is reset at the specified number +128.

Register 80	SetZero	Set the gross weight to zero
Register 81	SetTare	Execute taring
Register 82	ResetTare	Reset tare
Register 83	SetTest	Start the ADC test
Register 84	ResetTest	Finish the ADC test
Register 85	ResetPwf	Reset the PowerFail bit (Register 1; the bit was set after power on)
Register 86	SetFixTare	Taring with weight in numerical address D31 'Fixtare'
Register 87	GetFixTare	The current gross weight is copied into numerical address D31.
Register 89	ResetError	The CmdError error bit is reset

7.3.14 Register 112 ... 121: Transition-Controlled Action Bits (Write)

For setting bits, see Chapter 0.
As soon as the bit was set, it is reset internally and the operation is handled; this is transition-controlled (for writing once).
The bit is set as Write_Value_Select with the specified number (see Chapter 0).

Register 112	SetZero
Register 113	SetTare
Register 114	ResetTare
Register 115	SetTest
Register 116	ResetTest
Register 117	ResetPwf
Register 118	SetFixTare
Register 119	GetFixTare
Register 121	ResetError

To prevent excessively frequent writing in the EAROM memory, the write interval should not be less than 15 seconds.

8   Global SPM Variables

For communication via OPC, the following variables are available

BOOL	R	Digital output 1	X8
BOOL	R	Digital output 2	X9
BOOL	R	Digital output 3	X10
BOOL	R	Digital input 1	X0
BOOL	R	Digital input 2	X1
BOOL	R	Digital input 3	X2
BOOL	R	Output limit 1	X16
BOOL	R	Output limit 2	X17
BOOL	R	Output limit 3	X18
BOOL	R	ADC error	X32
BOOL	R	Above Max	X33
BOOL	R	Overload, above (Max + plus the range that is still permissible)	X34
BOOL	R	Below zero	X35
BOOL	R	Zero +/- 1/4 d	X36
BOOL	R	Within the zero setting range	X37
BOOL	R	The weight is stable	X38
BOOL	R	Below zero or above Max	X39
BOOL	R	Load cell measuring signal negative	X40
BOOL	R	Load cell measuring signal > 36 mV	X41
BOOL	R	Internal arithmetic error; CAL data are perhaps faulty	X42
BOOL	R	ADC error, overload	X43
BOOL	R	Command error	X48
BOOL	R	Command active	X49
BOOL	R	Power fail signal	X50
BOOL	R	ADC test active	X56
BOOL	R	Calibration active	X57
BOOL	R	Instrument is tared	X58
BOOL	R/W	Read / write marker bit 1	X64
BOOL	R/W	Read / write marker bit 2	X65
BOOL	R/W	Read / write marker bit 3	X66
BOOL	W	Switch D11 to net weight	X72
BOOL	W	Set the instrument to zero	X112
BOOL	W	Set tare of the instrument	X113
BOOL	W	Reset the tare of the instrument	X114
BOOL	W	Start the ADC test	X115
BOOL	W	Finish the ADC test	X116
BOOL	W	Reset the power fail signal	X117
BOOL	W	Set the fixtare value as tare	X118
BOOL	W	Store the current gross weight in the fixtare memory (D31)	X119
BOOL	W	Start printing	X120
BOOL	W	Reset error	X121

Global SPM Variables, Continued

BYTE	R	Indicator status	B4
BYTE	R	ADC status	B5
BYTE	R	Command status	B6
BYTE	R	Exponent (digits behind the decimal point)	B16
BYTE	R	Weight unit 2:g, 3:kg, 4:t, 5:lb	B17
BYTE	R	Scale interval (multi-interval / multiple range: d1 or e1)	B18
USINT	R	Last error	B19
DINT	R	Current gross weight	D8
DINT	R	Current net weight	D9
DINT	R	Current tare weight	D10
DINT	R	Current gross / net weight selected with X72	D11
DINT	R	Max weight (full scale deflection)	D14
DINT	W	Weight limit 1 on	D24
DINT	W	Weight limit 1 off	D25
DINT	W	Weight limit 2 on	D26
DINT	W	Weight limit 2 off	D27
DINT	W	Weight limit 3 on	D28
DINT	W	Weight limit 3 off	D29
UDINT	W	Analog output for 'transparent' mode	D30
DINT	W	Write the value in the fixtare memory	D31
DWORD	W	BCD value for 'transparent' mode	D20
UDINT	R	Serial number	D6

9 Configuration print-out

The print-out can be started by using front keys ⊙ and ⊙ too.

```
Configuration of PR5410
======================================
Printed          :2007-05-17 17:24:47
Firmware         : Rel. 01.20.00.1024
                 2007-05-15 08:15
Appl-DEFAULT  :      Rel. 01.20
                 2007-05-08 15:52
Bios          : Rel. 01.20.00.1024
                 2007-05-13 12:10
Boardnumber   :      251390341


HW-Options
======================================
Slot 1                   -empty-
Slot 2    PR5510/12      digital I/O
Slot 3    Builtin        digital I/O
Slot 4                   -empty-

Operating parameter
======================================
Address        :          A
PIN            :          0
Use alibimemory  :        Gross
Sequencenumber    :         0
Set Tare Key   : tare & reset tare
SetZeroKey      :only when not tared
N-B-T-Key      :        enabled
PrintKey       :        enabled
TestKey        :        enabled


Printing parameter
======================================
Print mode        :print selected item
1. Item     :     Sequencenumber
2. Item     :     Grossweight
3. Item     :        CR/LF
4. Item     :        disabled
5. Item     :        disabled
6  Item     :        disabled

Limit's
======================================
Limit 1 on    :          0 kg
       Action :     -no action-
Limit 1 off   :          0 kg
       Action :     -no action-
Limit 2 on    :          0 kg
       Action :     -no action-
Limit 2 off   :          0 kg
       Action :     -no action-
Limit 3 on    :          0 kg
       Action :     -no action-
Limit 3 off   :          0 kg
       Action :     -no action-
Digital I/O
======================================
Output 1       :limit 1 out   X16=
Output 2       :limit 2 out   X17=
Output 3       :limit 3 out   X18=
Input 1 on     :set zero      X112=1
    Condition :no condition  -----
Input 1 off        :     -no action-
```

```
Input 2 on       :set tare    X113=1
       Condition :no condition  -----
Input 2 off      :    -no action-
Input 3 on       :reset tare   X114=1
       Condition :no condition  -----
Input 3 off      :    -no action-

Serial assignment
======================================
Printer          :     - none -
Remote display   :     - none -
JBUS/MOD-Bus     :     - none -
SMA              :     - none -
Asycom           :     - none -

Serial port Builtin RS232
======================================
Protocol         :       XON/XOFF
Baudrate    :         9600 bd
Bits        :           8
Parity      :          none
Stopbits    :           1
Output mode      : CR/LF translation

Network settings
======================================
HW-address       : 00:90:6C:FB:E9:85
Hostname    :     PR5410-UDO-Mer
Use DHCP    :           YES
VNC-Client  :   255.255.255.255

Calibration
======================================
Max         :        3000 kg
                     3000 d
Scale interval          1 kg
Deadload  at    :  +0.000000 mV/V
Max at      :   +1.000000 mV/V
Not calibrated
Sensitivity  :    833.33 cnt/d
             :   4.000000 uV/d

Parameters
---------------------------------------
Measuretime    :       160 ms
Digital filter  :     aperiod.
Fcut        :       2.00 Hz
Test mode       :     Absolute
W & M       :         none

Standstill time  :       0.50 s
Standstill range  :       1.00 d
Tare timeout     :       2.5 s
Zeroset range    :      50.00 d
Zerotrack range  :       0.25 d
Zerotrack step   :       0.25 d
Zerotrack time   :       1.0 s
Overload        :         9 d
Min         :         20 d
Range mode      :    Single range
```

10   Repairs and Maintenance

Repairs are subject to inspection and must be carried out at. In case of defect or malfunction, please contact your local dealer or service center for repair. When returning the instrument for repair, please include a precise and complete description of the problem. Maintenance work may be carried out only by a trained technician with expert knowledge of the hazards involved and the required precautions.

10.1 BATTERY FOR DATE/TIME
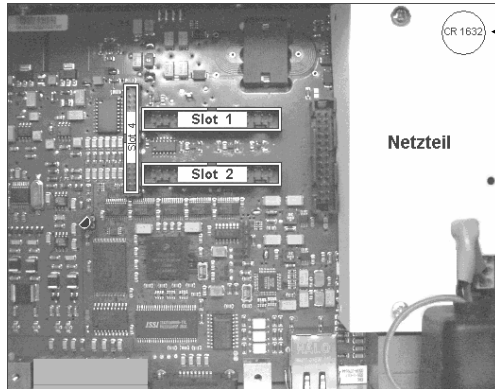
The lithium battery for back-up of the calendar/time chip is located below the cover for the power supply on the main board.
The battery is activated before the instrument leaves the factory.

After initial start-up, the clock must be set (date and time).

10.1.1 Battery Replacement

The instrument is equipped with a lithium battery for back-up of the time/calendar chip. If the voltage drops below the specified minimum, or in case of defect, the battery must be replaced by the customer service or by an equivalent trained technician. For details on disposal, see Chapter 11.
The battery voltage is monitored; see Chapter 4.4.3.
For details on battery lifetime, see Chapter 12.2.1.

10.1.2 Solder Work

Soldering work on the instrument is neither required nor permitted.

10.1.3 Cleaning

✓   Disconnect the instrument from the supply voltage and remove connected data cables.

✓   Prevent moisture from penetrating the instrument.

✓   Do not use aggressive cleaning agents or solvents.

✓   Clean the indicator using a piece of cloth which has been wet with a mild detergent or soap.

✓   If the instrument is used in the food industry, make sure permissible cleaning agents are used.

✓   Dry the instrument using a soft cloth.

✓   Do not wash down the equipment with water or dry it with compressed air; this is not permitted.

11 Disposal

If you no longer need the packaging after successful installation of the equipment, you should discard it by the local facilities for waste disposal. The packaging is made of environmentally friendly materials and is a valuable source of secondary raw material.
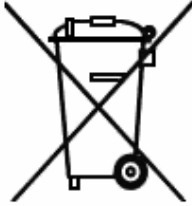
Place discharged batteries in local collection boxes (not in the household waste).
For scrapping of the instrument, please contact your local authorities. Prior to scrapping, any batteries should be removed.

12 Specifications

12.1 INSTRUCTIONS FOR USE OF 'FREE SOFTWARE'

The firmware in the PR 5410 / X3 instrument contains free software that is licensed under:
GNU General Public License (GPL) Version 2, June 1991, and
GNU Lesser General Public License (LGPL) Version 2.1, February 1999.
This software, developed by third parties, is protected by copyright and is supplied free of charge.

The license terms and conditions of Free Software Foundation, Inc in English are enclosed in the delivery of the instrument.

The source text written under the above conditions is contained on the CD-ROM delivered with the instrument.

12.2 GENERAL DATA

The following characteristics are valid after a warm-up time of at least 60 minutes (reference temperature: 23℃).

12.2.1 Backup Battery for Time/Date

The lithium battery for back-up of the time/calendar chip is activated before the instrument leaves the factory.

Battery lifetime:	Instrument connected continuously to the supply voltage	typical 10 years
	Instrument not connected (e.g., in storage)/temporarily connected to supply voltage	typical 7 years

12.2.2 Power Supply PR 5410/00

Supply voltage	100 V - 240 V AC	+10% / -15%	50 / 60 Hz
Max. power consumption	11 W/ 13 VA		
Primary fuse	500mAT 5x20 mm		

12.2.3 Power Supply PR 5410/01

Supply voltage	24 V DC	+ / -20%
Max. power consumption	11 W	
Primary fuse	1.6 AT 5x20 mm	

12.3 EFFECT OF AMBIENT CONDITIONS

12.3.1 Environmental Conditions

Temperature range
    Ambient temperature for operation   -10... +40 ℃
    Ambient temperature 'not legal for trade'   -10... +50 ℃
    Power-on temperature   0... +40 ℃
    Storage/transport   -20... +70 ℃
Humidity   < 95 %, no condensation, (acc. to IEC 68-2)
Protection type   IP 65: front panel, otherwise IP30 (housing)

12.3.2 Electromagnetic Compatibility (EMC)

All data in compliance with NAMUR NE 21, EN 45501 and EN 61326

Housing	Radio frequency electromagnetic fields (80 – 1000 MHz)	EN 61000-4-3	10 V/m
	Electrostatic discharge (ESD)	EN 61000-4-2	6 / 8 kV
Signal and control lines	Fast transients (burst)	EN 61000-4-4	1 kV
	Peak voltages (surge) 1.2/50 µs	EN 61000-4-5	1 / 2 kV
	Conducted disturbances by radio frequency (0.15 – 80 MHz)	EN 61000-4-6	10 V
Mains inputs	Fast transients (burst)	EN 61000-4-4	2 kV
	Peak voltages (surge) 1.2/50 µs	EN 61000-4-5	1 / 2 kV
	Conducted disturbances by radio frequency (0.15 – 80 MHz)	EN 61000-4-6	10 V
	Voltage fluctuation	EN 61000-4-11	40% / 0%
	Voltage dips	EN 61000-4-11	20 msec

12.3.3 RF Interference Suppression

Electromagnetic emission   In acc. with EN 61326, limit value class A

12.4 WEIGHING ELECTRONICS

The weighing electronics are suitable for connection of strain-gauge load cells.

12.4.1 Load Cells

Load cell type   Strain gauge, 6 or 4-wire connection possible
Supply voltage   U= 12V DC   for I_{max}= 160 mA
    for up to 8 load cells of 650 □ each or 4 load cells of 350 □each
Sense voltage monitoring   Sense voltage below + 4VDC -- -4VDC is detected; can be switched off
Max. load   > 75 □
Cable length   Max. 500 m

12.4.2 Principle

Principle	DC voltage, delta-sigma converter, ratiometric to the load cell supply voltage
Conversion / measuretime	5, 10, 20, 40, 80, 160, 320, 640, 960, 1200, 1600 ms
Digital filter	Selectable, 4th order (low-pass), Characteristic: Bessel, aperiodic, Butterworth, Tschebyscheff Configurable cut-off frequency

12.4.3 Accuracy and Stability

Accuracy class	$\leq$ 10000 e (Cl. III) acc. to OIML R76 / EN 45501
Min. measuring signal (OIML)	=/> 0.42mV/V = 5mV corr. to 0.5µV/e for 10000 e
Min. measuring signal (OIML)	=/> 0.25mV/V = 3mV corr. to 0.5µV/e for 6000 e
Linearity error	< 0.003 %
Zero stability error (TK_0)	< 0.05 µV/K RTI <= 0,004%/10K at 1mV/V
Span stability error (TK_{Spn})	< +/- 2.5 ppm/K

12.4.4 Sensitivity

Sensitivity	0.5 µV/e @ 10000e (Cl. III) OIML R76; 0.5 µV/e @ 3000e OIML R76
Resolution	7.5 million counts at 3mV/V, not legal for trade
Input voltage (input signal + dead load)	0 ... max. 36 mV DC, symmetrical to 0
Dead load range	36 mV DC (max. input signal); input/ calibration via software

12.5 MECHANICAL DATA

12.5.1 Construction

Metal housing of aluminium with steel lid and steel back panel. Protection class IP 65 (front panel).

12.5.2 Dimensions

Housing:	Dimensions
Width	192 mm
Height	96 mm
Depth	150 mm

12.5.3 Weight

Net weight	1.45 kg
Shipping weight	2.0 kg

12.6 USE IN LEGAL-FOR-TRADE MODE

The Guide to Verification and further documents can be found on the Internet at:

12.6.1 Documentation for Verification on the Enclosed CD

The enclosed CD has a directory containing the following PDF documents (in preparation):

- EC Declaration of Conformity to Council Directive 90/384/EEC
- Plates and markings (sealing and labels)
- Test certificate for the instrument
- EC type approval

12.6.2 Additional Instructions

Information on the meaning of the CAL switch to be sealed can be found in Chapter 4.1.1 .
Make sure when configuring the instrument (see Chapter 4.5.13) that the settings are in compliance with the legal requirements and the requirements of the EC Type Approval and the EC Test Certificate. Furthermore, the settings and functions described under Item 7 of the EC Test Certificate (Orders and Conditions) must be checked. The person performing installation is responsible for selecting the legally permitted settings. The settings must be checked.
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FAIRBANKS SCALES

X Series

Process Indicator – PR5410

Operation Manual – 51207

Manufactured by **Fairbanks Scale, Inc.**
821 Locust Street
Kansas City, MO 64106

www.fairbanks.com