Weight Indicator

FT-11(D)

Technical Manual



For FT-11 Firmware Version 2.13 and higher
For FT-11D Firmware Version 2.06 and higher

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1. Safety Instructions



CAUTION READ this manual BEFORE operating or servicing this equipment. FOLLOW these instructions carefully. SAVE this manual for future reference. DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment. ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance. CALL FLINTEC ENGINEERING for parts, information, and service.



WARNING ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.



WARNING FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.



WARNING DISCONNECT ALL POWER TO THIS UNIT BEFORE REMOVING THE FUSE OR SERVICING.



WARNING BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT OR BODILY HARM.



CAUTION OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

2. Declaration of Conformity

FLINTEC

EG-Konformitätserklärung
EC-Declaration of Conformity

Monat/Jahr: *month/year:*	07/2010
Hersteller: *Manufacturer:*	Flintec GmbH
Anschrift: *Address:*	Bemannsbruch 9 D-74909 Meckesheim Deutschland / Germany
Produktbezeichnung: *Product name:*	FT-11 Weight Indicator FT-11D Digital Weight Indicator

Das bezeichnete Produkt stimmt mit folgenden Vorschriften der Europäischen Richtlinien überein:
This product confirms with the following regulations of the Directives of the European Community

Richtlinie 2004/108/EG des Europäischen Parlaments und des Rates vom 15. Dezember 2004 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit und zur Aufhebung der Richtlinie 89/336/EWG	***Directive 2004/108/EC*** *of the European Parliament and of the Council of 15th December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC*
Richtlinie 2006/95/EG Niederspannungs-Richtlinie	***Directive 2006/95/EC*** *Low Voltage Directive*
Die Absicherung aller produktspezifischen Qualitätsmerkmale erfolgt auf Basis eines zertifizierten Qualitätsmanagement-Systems nach DIN ISO 9001.	*All product-related features are assured by a quality system in accordance with ISO 9001.*
Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.	*This declaration certifies the conformity with the listed directives, but it is no promise of characteristics.*

Folgende Normen werden zum Nachweis der Übereinstimmung mit den Richtlinien eingehalten:
As a proof of conformity with the directives following standards are fulfilled:

EN 61326-1	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen (IEC 61326-1:2005) *Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 61326-1:2005)*
EN 60950-1	Einrichtungen der Informationstechnik - Sicherheit - Teil 1: Allgemeine Anforderungen (IEC 60950-1:2005, modifiziert); *Information technology equipment - Safety - Part 1: General requirements (IEC 60950-1:2005 modified)*

Flintec GmbH · Bemannsbruch 9 · FLINTEC · 74909 Meckesheim · Germany

Dr. Jens Achenbach
Geschäftsführer / *General Manager*

i.V. Felix von Hertling
Technischer Leiter / *Technical Director*

3. Overview

The type FT-11(D) weight indicator is an economic and powerful state-of-the-art instrument. The accurate and versatile instrument is available in different housings, meeting the industries demand for various environmental conditions. FT-11(D) is approved by Weights & Measures Authorities for use in Accuracy Class III applications with up to 10 000 intervals according to OIML R76. It has a large 6 digit LED weight display (red, 20 mm or 14 mm high) with weight status information. With a variety of interface options the FT-11(D) weight indicators are the perfect fit to weighing systems and process control systems.

3.1 Key Features

	FT-11D	FT-11
EU Type approved for 10 000 intervals	Yes	Yes
Single or dual range	Yes	Yes
Approved sensitivity 0.4 μV/e		Yes
High internal resolution up to 8 000 000 counts	Yes	Yes
Display resolution up to 60 000 counts	Yes	Yes
Maximum conversion rate of 100/s		Yes
Adaptive digital filter for fast and stable reading	Yes	Yes
High resolution display mode	Yes	Yes
Up to 6 load cells (350 Ω) or 18 load cells (1100 Ω)		Yes
Up to 10 digital load cells (DLC); 16 if externally powered	Yes	
Automatic eccentricity adjustment	Yes	
Realtime clock	No	No
Standard Serial interface RS232C	Yes	Yes
Integrated AC power supply	Yes	Yes
Zeroing with one button & Taring with one button	Yes	Yes
Auto-zero tracking and auto-zero at power-up	Yes	Yes
Motion detection	Yes	Yes
Printout in different formats incl. header and footer	Yes	Yes
Isolated digital inputs / outputs	Option	Option
Setpoint monitoring (3 setpoints, digital I/O required)	Yes	Yes
Key lock option to prevent unauthorized access	Yes	Yes

3.2 Available Options and Accessoires

	FT-11D	FT-11
Alibi memory for up to 149 764 weighing results	Yes	Yes
Additional serial interface RS232C	Yes	Yes
Additional serial interface RS232C / 20 mA TTY CL / RS485	Yes*	Yes*
Modbus RTU	No	Yes
Ethernet TCP/IP and Modbus RTU over Ethernet	No	Yes
Profibus DP-V0 & DP-V1	No	Yes
ProfiNet	No	Yes
CANopen	No	Yes
Analogue output 0 – 10 V and 4 – 20 mA	No	Yes
Binary data output (17-bit code)	No	Yes
Digital inputs / outputs	3x / 3x	3x / 3x
12 V DC (12…17 V DC) power inlet	No	Yes
24 V DC (20…27 V DC) power inlet	No	Yes
Rechargeable battery (for 230 V AC version only)	No	Yes
Flintec IndFace Software	No	Yes

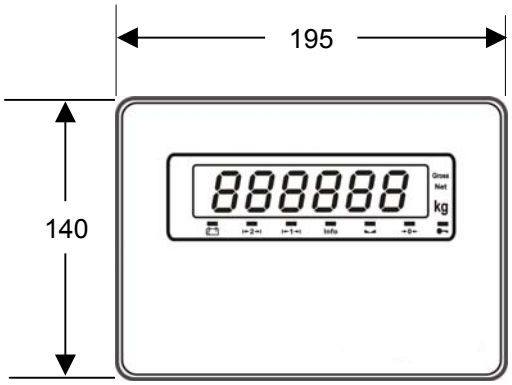
* 20 mA TTY CL not for stainless steel housing

3.3 Technical Specifications

	FT-11D	FT-11
Accuracy		
Accuracy class:	III	
EU Type approved:	10 000 intervals (single range); 2x 6 000 intervals (dual range)	
Display and Keyboard		
Display:	6 digits, 7 segments, LED red, 20 mm high (Panel type 14 mm high)	
Display update rate:	250 ms	
Keyboard:	8-keys; membran with tactile feedback	
A/D Converter		
A/D converter type:		24 bit Delta-Sigma ratiometric with integral analog and digital filters
Conversion rate:		Max. 100 measurement values per second
Input sensitivity:		0.4 µV/e (approved), 0.1 µV/d (non approved)
Analogue input range:		0 to 20 mV
Internal resolution:		Up to 8 000 000 counts
Display resolution:	Up to 60 000 counts	
Scale Calibration and Functions		
Calibration:	By application weights	By application weights or in mV/V (eCal)
Corner adjustment:	Automatic	Only externally
Digital filter:	5 step adjustable	10 step adjustable
Weighing functions:	Tare, zero, auto zero tracking, motion detection, auto zero at power up	
Programmable setpoints:	3 setpoints, (needs digital I/O option)	
Alibi memory:	Optionally available: 74 880 records or 149 760 records	
Linearity:		Within 0.0015% FS, ≤ 2 ppm/°C
Load cells		
Communication & protocol:	RS485, compatible to RC3D	
Excitation:	12 V DC, max. 450 mA	5 V DC at 58...1200 Ω; max. 100 mA
Number of load cells:	Up to 10 (directly powered) or up to 16 (externally powered)	Up to 6 load cells (350 Ω) or 18 load cells (1 100 Ω) connected in parallel
Connection:	4-wire technique, 2 wires for digital interface and 2 wires for power supply	4- or 6-wire technique. Cable length is 274 m/mm² for 6-wire connection
Communication:	Standard serial interface RS232C; 1 200 to 57 600 baud; programmable	
Continuous mode update rate:	100 ms	
Option board update rate:	40 ms	
Power supply:		
200...240 V AC , 50/60 Hz	Yes	Yes
12...17 V DC, max. 12 VA	No	Optionally
20...27 V DC, max. 12 VA	No	Optionally
Battery runtime:		5 h (with 93 Ω LC) to 7 h (with 410 Ω LC)
Battery charging time:		6 h
Environment and Enclosure		
Operation temperature:	-10 °C to +40 °C legal for trade; max. 85% RH, non-condensing	
Enclosure	Aluminium cast desk type (IP30) or stainless steel (IP65)	Aluminium cast desk type (IP30) or panel type (front panel IP65) or stainless steel (IP65)

3.4 Housing Dimensions

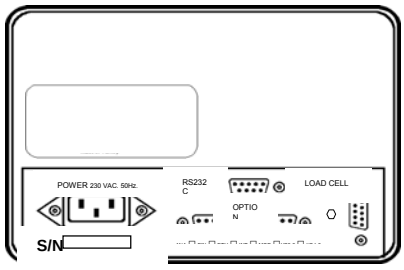
3.4.1 Desk Type Housing



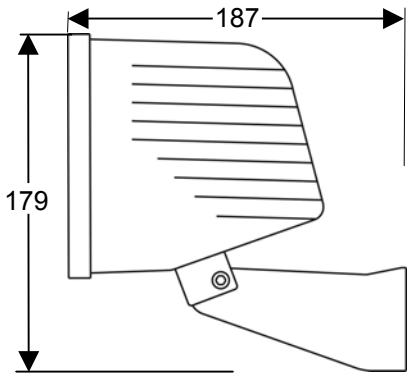
Desk type front view



Desk type side view

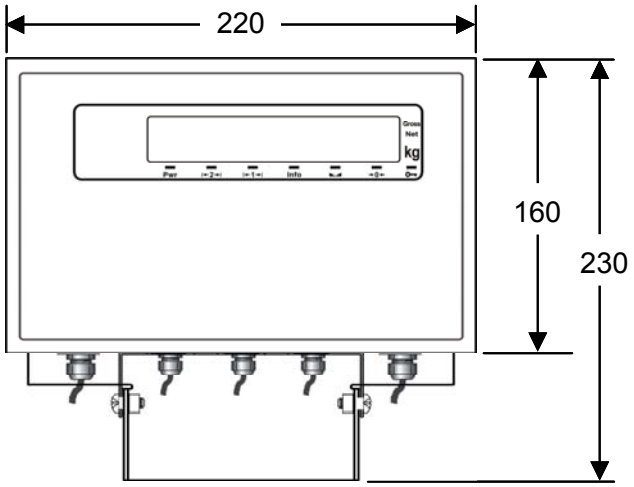


Desk type rear view

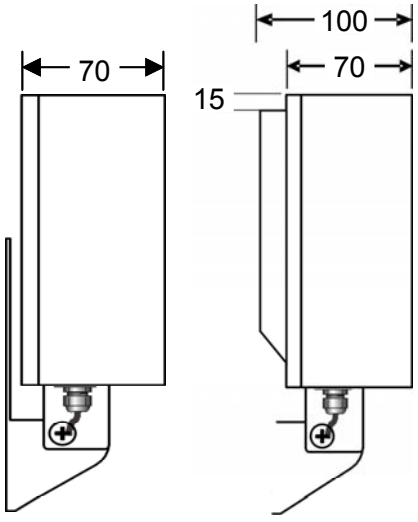


Dimensions of Desk type housing with wall mount kit

3.4.2 Stainless Steel Housing

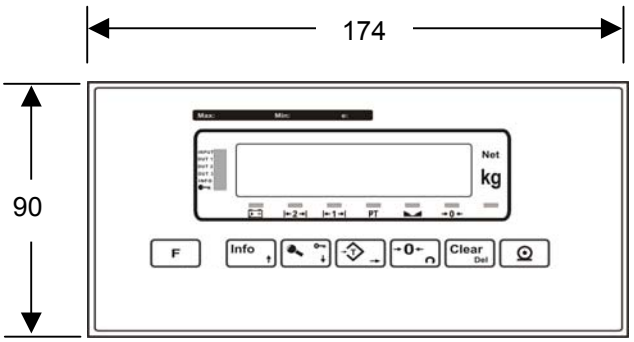


Stainless steel housing front view

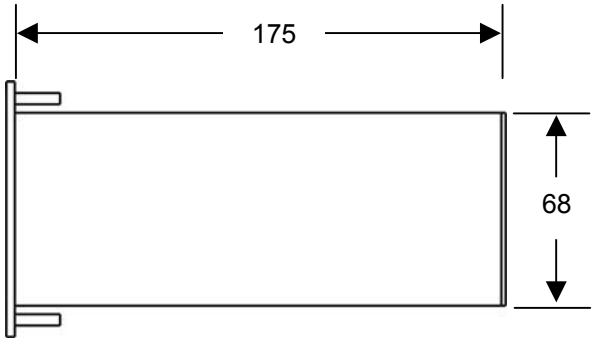


Stainless steel housing side view
100 mm deep with big backplane option

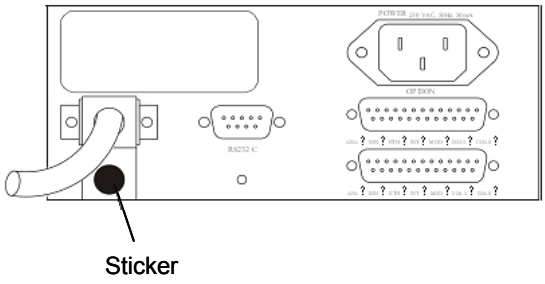
3.4.3 Panel Type Housing (for FT-11 only)



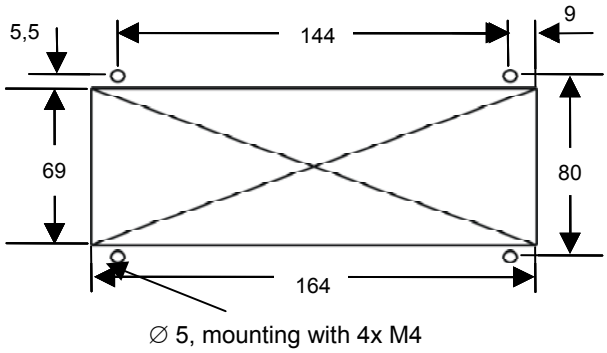
Panel type front view



Panel type side view



Panel type rear view



The hole dimensions for mounting on a panel

4. Installation and Commissioning

PRECAUTION: Please read this manual carefully before energizing the indicator. Perform the commissioning operation according the procedure given here. Use trained personnel for cleaning, commissioning, checking and service of the indicator. The interference of untrained personnel may cause some unwanted damages or injures.
Note: In this manual the term “Digital Load Cell“ will be refered to “DLC“.

4.1 Mechanical Installation

First of all please determine the place where your indicator can operate safely. This place should be clean, not getting direct sun light if possible, with a temperature between -10 ºC and +40 ºC, humidity not exceeding 85% non-condensing. Take care to the housing dimensions and the suggested panel hole dimensions given in chapter 3.4. All the cables should be installed safely to avoid mechanical damages.
To avoid electrical noise protect your indicator which has very low input signal level from the equipment that produces electrical noise, especially in panel mounting.

4.1.1. Jumpers

There are three jumpers on the instrument’s main board/weighing board for calibration and for switching on/off. To change the position of this jumpers, open the housing and perform the necessary changes before energizing the indicator.

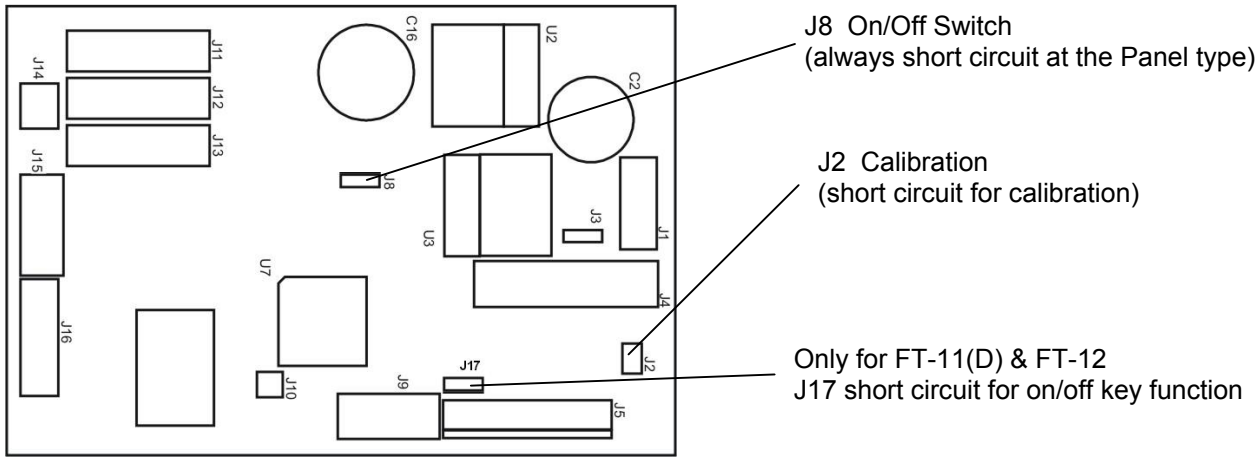


Figure 4.1 FT-11(D) Main board

4.2. Electrical Connections

4.2.1. Power Supply and Grounding

FT-11(D) is available with 230 V AC power supply or 24 V DC or 12 V DC power inlet. The 230 V AC indicators are supplied with a power cable; the DC indicators are supplied with a special connector for the power inlet. Prepare your power voltage according to your instrument’s power inlet. The DC connector pin configuration can be found in Figure 4.2 below.



Desk / Panel

Definition	Pin no. for desk and panel type	Pin no. for stainless steel housing
12 V / 24 V	1	3
0 V	2	2
Housing Gnd	3	1

Figure 4.2 The pin layout of the DC DC connector

The quality of the instrument’s ground will determine the accuracy and the safety of your indicator. A poor ground can result in an unsafe condition if an electrical short cuircuit happens. A good ground connection is needed to minimize extraneous electrical noise pulses. It is important that the instrument does not share power lines with noise-generating equipment such as heavy load switching, motor control equipments, inductive loads, etc. If the condition of the power line in the plant is bad, prepare a special power line and grounding.
If you have to service the indicator, turn off the power and wait at least for 30 seconds before interfering.
All connectors are at the rear side of the housings of desk and panel types. The stainless steel housings must be opened to make the required connections. These connections must be done as described below.

4.2.2. Standard Load Cell Connection (for FT-11 only)

The load cell wiring should be made carefully before energizing to avoid damages to the weight indicator and the load cells. The input resistance of the load cells that you want to connect should be more than 58 Ω.
The sense pins of the instrument should be connected. In 4-wire installations the sense and excitation pins with the same polarity should be short circuited at the connector side.

6-wire Load Cell Connection	4-wire Load Cell Connection	Pin no. for desk type & panel type (D-Sub, 9-pin, female)	Pin no. for stainless steel housing (J12 connector)
+ Excitation	+ Excitation	1	1
+ Sense	+ Excitation	2	2
Shield	Shield	3	4
- Sense	- Excitation	4	6
- Excitation	- Excitation	5	7
+ Signal	+ Signal	7	3
- Signal	- Signal	8	5
Shield	Shield	Connector body	4

4.2.3. Digital Load Cell Connection (for FT-11D only)

The signal cable between the instrument and the junction box must be suitable for high speed RS485. The cable must have a common shield. Please also take care for the correct termination of the RS485 bus (see also manual of type KPFD junction box).

Definition	Pin no. for desk type housing (D-Sub, 9-pin, female)	Pin no. for stainless steel housing (J12 connector)
+ Power	5	5
- Power	3	6
COM A	9	2
COM B	7	3
Shielding	Connector body	4

4.3. Commissioning

After making the required installations and connections to your indicator, turn the power on and perform following steps:

- Get familiar with the instrument's setup mode (see chapter 6.1)
- For FT-11D only: Define the digital load cells (see chapter 6.2)
- Define the configuration parameters (see chapter 6.3)*
- Define the scale parameters (see chapter 6.4)
- Calibrate the scale (see chapter 6.5)

*** Note:** Most of the parameters can be skipped for later setup. Please take care for the parameters which may be locked by the J2 calibration jumper in legal for trade applications (see Appendix 1: Setup and Calibration Menu of the instrument).

If you want to use the Flintec IndFace Software (for FT-11 only) then you have to set up the instrument's standard serial interface to host mode (see chapter 9.2) before you adjust all the configuration parameters.

After checking the performance of your weighing instrument you can begin to use the indicator.

If there are peripheral connections, first you should turn the power off; make the peripheral connections, perform the required safety checks and energize the indicator. Then set the related parameters and check if the peripheral devices are operating properly.

If required perform following additional steps:

- Set up the serial interfaces (see chapter 8.2)
- Printer setup (see chapter 8.2)
- Set up other optional inputs and outputs (see chapter 8.3ff and 9)

5. Front Panel and Keypad

5.1. Weight Display and Status LEDs



Figure 5.1 Front panel view of FT-11(D)

The weight display of FT-11(D) is a 6 digit LED with 14 mm or 20 mm height.

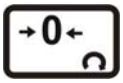
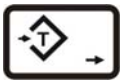
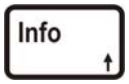
At the right side of the display there are three status LEDs for indicating “Gross”, “Net” and the standard unit “kg”.

Below the weight display there are several status LEDs. The meanings of these are:

Status LEDs related to the weighing process	
LED	**Meaning**
Info	**Info:** The instrument displays information different from the weight
I←1→I I←2→I	**Range:** With multi range scales these LED indicates the current operating range. For single range scales only the first range LED is lit.
	Stable: The weight value on the display is stable
→0←	**Center of zero:** The weight is in the center of zero (see param. [203] in chap.6.4)
	Key lock: is active
Pwr	**Power:** This LED will flash in case of supply voltage decrease. If the voltage decreases too much the indicator will automatically shut off.

5.2. Keypad

The meaning of the front panel keys and the key functions are:

Key	Meaning
	**Power On/Off:** This key is used for turning the instrument on or off. To switch off the key must be pressed and hold at least for 2 seconds. There is no On/Off key on panel type housings.
	**Manual Zero:** In Gross mode, if the scale doesn't show zero while there is no load on the pan, you can zero the scale by pressing this key.
	**Manual Tare:** Pressing this key tares the scale and gets into the Net mode.
	**Clear:** Pressing this key clears the tare and the scale and returns to Gross mode.
	**Print:** By pressing this key weight data and other information depending on the instrument setup are sent to a printer or a PC via serial port.
	Enter: This key is used for confirming an entered value and to get to the next parameter in setup mode.
	**High Resolution:** By pressing this key the weight value will be shown with a higher resolution for a short period.
	**Info:** This key is being used to view Total and CN information. To toggle between these infos you have to press this key repeatedly and finally you will return to weighing mode again. To clear the total weight, you have to press the <Clear> key while the total value is seen on the display. [All C] will appear on the display. You can confirm the deletion by pressing <Enter> or cancel by pressing the <F> key.
	**Function :** This key is used in combination with other keys to enter any function or to quit without saving.
	**Setpoint:** These keys are being used to view or to enter setpoint values.

5.3. Key lock

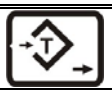
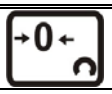
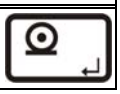
The instrument has the capability to lock the keys to avoid unauthorized person's interference. You can activate or deactivate this function by pressing the <F> and <Key Lock> keys sequentially. The LED with the key sign (below the display) indicates the keys are locked.
For FT-11: The key(s) which would be locked are set in parameter [115].

6. Setup and Calibration

6.1. Basics

6.1.1. Basic Setup Keys on the Frontplate

The symbols located on the lower right corner of each key indicate the function of the keys in the setup menu. The basic meanings of these keys are given in the table below.

Exit without saving	Stepping forwards to the next parameter	Stepping backwards to the previous parameter	Changing the digit	Changing the value or increasing the flashing digit	Clear (delete)	Enter
						

If you use a PC the Flintec IndFace software can be used for the setup and the calibration (for FT-11 only).

6.1.2. Entering the Setup and Calibration Menu

To enter the Setup and Calibration Menu: Press <F> and <Info> keys sequentially

First [FunC] and then [PASSWr] prompts will be displayed sequentially.

Here you can enter the parameter block by using:
the service password: Press **<Zero>** and **<Info>** and **<Enter>**
or the operator password: Press **<Tare>** and **<Enter>**

The calibration jumper (see chapter 4.1) should be short circuit to change the legal metrological parameters in the service mode (there is black box on the top right corner of the grey coloured boxes in the calibration menu flowcharts, see Appendix 1).

The Setup and Calibration menu consists of main blocks which are displayed as [X--] and sub-blocks. By using <↑> and <↓> keys you can reach previous or next main blocks. After reaching the desired main block you can get in by pressing the <Enter> key. As you enter the block you will reach the first sub-block in that main block. The sub-block address will be seen on the display as [X0-].
You can also search between the sub-blocks by using <↑> and <↓> keys and reach the first parameter of the displayed sub-block by pressing the <Enter> key. The number of the parameter is displayed as [XY0]. Again you can search between parameters by <↑> and <↓> keys.
For entering numerical values in the parameters press the <Tare> key to select the digit and press the <Zero> key to change the value.

6.1.3. Exiting the Setup and Calibration Menu

Whatever parameter block you are in – if you press the <F> key, you will get out of the active sub-block and reach the next sub-block. If you press the <F> key again you will get out of the active block and reach the next main block. If you press the <F> key once again, the [SAvE] message appears on the display.
Here you can press

- the <Enter> key to save the changes into the memory or
- you can press the <Tare> key to store the changes temporarily until the power goes off or
- you can press the <F> key to abort any changes.

The [Wait] message will be displayed for a few seconds and afterwards the weighing mode will restart automatically. Especially for legal metrological usage, please don't forget to turn the power off and remove the calibration jumper before you start the operation.

6.2. Defining the Digital Load cells (for FT-11D only)

6.2.1. Digital Load Cell Addressing

The parameter group [22-] is used for defining and addressing the DLCs.

[22-] DLC Configuration Block

In this section the DLCs are introduced to the indicator.

[220 X] DLC Type

0 = RC3D This parameter must be set to “0” for type RC3D digital load cell.

[221 XX] Quantity of DLC

Enter the quantity of DLCs used in the scale. The quantity can be selected between 1 and 16.

[222] DLC Addressing

The following diagram shows the addressing principles of the DLCs in a weighbridge / truck scale. The numbers in the diagram show the DLC addressing principle for easy eccentricity adjustment.



Figure 6.1 The addressing principles of the DLC’s in a weighbridge / truck scale

For addressing of DLCs, press the <Tare> key.
The messages [222 YY] and [XXXXXX] will be displayed alternately.

Here:	“YY”	DLC number /address
	“X”	Last 6 digits of the DLC’s serial number

If you press <Enter> the next load cell will be shown, the <F> key is used to return the parameter group [20-].
You can enter the S/N, by pressing the <Tare> key. The serial numbering system of the indicator is 9 digits. First you will see the first 3 digits of the S/N. Enter this digits by pressing the <Tare> and <Zero> keys. If the serial number of the DLC is less than 9 digits, the unused digits on the left must be set to “0”. For example, if the serial number is “1234567” then “001234567” must be entered. After entering the first 3 digits, the following 6 digits are entered by pressing <Enter>.

Important hint: When addressing the connected Type RC3D load cells, the load cells should always be loaded. If the load cells are unloaded, FT-11D may show a DLC input error.

After entering all serial numbers sequentialy, the display goes to parameter group [20-]. This means all load cells are addressed and ready to work in the scale.
For replacing any load cell, you have to re-address the new load cell in parameter [222]. After installing the new load cell, turn on the indicator. Enter parameter [222] and then access the load cell address of the replaced DLC. Enter the serial number of the new load cell as described in the previous paragraph.

Note: It is always assumed that the RS485 load cell bus system is correctly terminated, please see the manual of the installed junction box.

6.2.2. Eccentricity Adjustment

The eccentricity adjustment must be done in parameter group [32-] before the calibration of the scale. The adjustment can be done for each load cell independently or for sectional pairs. The selection is done by parameter [320]. After selection of the adjustment method , the adjustment is performed automatically as described in parameter [321].

[32-] DLC Eccentricity Adjustment Block

In this parameter group the eccentricity correction is performed automatically or manually. This adjustment must be performed automatically before calibration.

[320 X] Adjustment Method

The scale eccentricity can be adjusted in corners (each DLC individually) or in sectional pairs.

0 = Independent DLC (factory default) 1 = Sectional pair

[321] Auto Adjustment

After entering parameter [321] by pressing the <Tare> key, you will see [Zero CA] on the display. Unload the scale and press the <Enter> key. Do not interfere the scale during the period the [Waıt] message is displayed. Next the instrument will display [321 01]. Place a weight of at least 10% of the DLC capacity as close as possible to the independent load cell or sectional pair 1. Then press <Enter>. After some period [321 02] appears on the display. Apply the same load to the other places in sequence.
After loading all load cells / sections the message [322] will be shown on the display. This means the eccentricity error correction is performed automatically.

[322] Manual Adjustment

If needed the eccentricity error can get modified manually. You can change the error correction coefficients of the DLCs in this parameter. For entering this parameter press the <Tare> key. You can change the load cell number by the <Enter> key. For changing the coefficient of any DLC select the number of the DLC and press the <Tare> key to view and edit the coefficient. Use <Tare> and <Zero> keys for changing the value and then press the <Enter> key.
To exit this parameter press the <F> key and save the changes you applied by pressing <Enter>. The <F> key is used to quit without saving the manual corrections.

[323 X] Service mode: Set Shift Coefficients manually to 1

This parameter allows you to view the weighbridge's performance with disabled eccentricity correction for service purposes. Using this function does not change any stored coefficient but all coefficients are "temporarily" set to value 1.

0 = Normal operation (factory default) 1 = Service mode

Attention: After the eccentricity adjustment a scale calibration has to be done.

6.3. Configuration Parameters

[1--] Configuration Block

[11-] Start Up

[111 X] Auto Power Off

0 : Auto power off disabled (default) 1 : Power off after 3 minutes of stability or no key function
2 : Power off after 10 minutes of stability or no key function

[112 X] Store Tare at Power Off

0 : Disabled (factory default) 1 : Enabled

[113 X] Auto Clear Tare

0 : Disabled (factory default) 1 : The scale returns to gross mode after unloading

[115] Key lock (for FT-11 only)

[ABCDE] When the key lock function is activated, all key(s) set to “1” in this parameter are locked.

A : On/Off B : Setpoint C : Zeroing D : Taring / Clear E : Print

[12-] Filter

In this block the proper filter values according to the operating conditions can be entered. One of the most important features of the indicator is viewing the filter characteristics on the display and with the help of this option, you can select the most suitable filter without leaving the setup mode.

[120 X] Filter

For FT-11 the filter value can be set from 0 to 9, for FT-11D the value range is from 0 to 4. When you enter this parameter and press the <Enter> key while [120 X] is shown on the display, the weight variation can be seen on the display. The value of the filter can be changed by using the <↑> and <↓> keys and the weight variation for each value is shown on the display. After finalising the filter selection you can go to the next step by pressing the <F> key.

[14-] Entries

In this block you can enter the initial CN (consecutive number).

[142] Label No. (CN)

[XXXXXX] The desired value is entered via <Tare> and <Zero> keys and saved by pressing <Enter>. If the number exceeds 65 535 it will automatically restart at 1.

6.4. Scale Parameters

[2--] Scale Block

The parameters related to the weighing operation are located here.

[20-] Set Up

[200 X] Approved

0 = No 1 = Yes

[201 X] Increased Indication

0 = by pressing key 1 = Always increased indication

[202 X] Power On Zero

This parameter setting controls if after power-on the scale will get automatically zeroed if the weight is in the percentage of the zeroing range. If the weight is not in the zeroing range the display will show [E E E] message until you press the <Enter>.

0 = disable 1 = ± 2% 2 = ± 10%

[203 X] Zeroing Range

0 = disable 1 = ± 2% 2 = ± 20%

[204 X] Auto Zero Tracking

AZT automatically re-adjusts the scale to zero for compensating defined small deviations around the centre of zero.

0 = disable 1 = ± 0,5e 2 = ± 1e 3 = ± 3e

[205 X] Tare

0 = Disabled 1 = Multi tare via key 2 = Tare via key in gross mode

[206 X] Motion Detector

This parameter defines the sensitivity level which will determine what is considered as stable.

0 = ± 0.3e 1= ± 0.5e 2= ± 1e 3= ± 2e 4 = No motion detector

[207 X] Tilt Switch (for FT-11 only)

The tilt switch is being used to prevent wrong weighing results in mobile scales due to the slope of the floor. If this parameter is enabled the digital input 1 must be connected to the tilt switch.

0 = Disabled 1 = Normally Open contact 2 = Normally Closed contact

[208 X] Stability Time

This parameter defines the time period (up to 9.9 s) which will determine what is considered as stable.

[21-] Scale Build

The capacity and the resolution of the scale will be defined here.

[210 X] Scale Type

The capacity and resolution parameters will vary according to the selection here.

0 = Single Range 1 = Dual Range

You will reach the next parameter by pressing <Enter>. Please note that the following parameters will vary according to this selection.

If single range has been selected:

[212] Capacity

Press the <Tare> key to reach this parameter.

[CAP]
[XXXXXX] The capacity of the scale will be entered here by <Tare> and <Zero> keys. The value will be confirmed by pressing <Enter>.

[d]
[XXXXXX] Display resolution of the scale will be selected by <Zero> key. The selection will be confirmed by pressing <Enter>.

If dual range has been selected:

[211] 1. Capacity

Press the <Tare> key to reach this parameter.

[CAP1]
[XXXXXX] The capacity of the first weighing range (Select from Appendix 6) will be entered here by <Tare> and <Zero> keys and confirmed with <Enter>.

[d1]
[XXXXXX] Display resolution of the first weighing range will be selected by <Zero> key and confirmed with <Enter>.

[212] 2. Capacity

Press the <Tare> key to reach this parameter.

[CAP2]
[XXXXXX] The capacity of the second weighing range (Select from Appendix 7) will be entered here by <Tare> and <Zero> keys and confirmed with <Enter>.

[d2]
[XXXXXX] Display resolution of the second weighing range will be selected by <Zero> key and confirmed with <Enter>.

Attention: After the scale parameters have been changed the scale has to be calibrated.

6.5. Scale Calibration

[3--] Calibration Block

The calibration of the scale will be performed here.

[30-] Calibration

[300] Gravity

This parameter should be used in the scale that will be verified in two stages by gravity adjustment (in legal metrologic applications). This parameter **should not be touched** in other applications.
If you enter a value in this parameter before calibration (as six decimal digits, e.g. enter “798564” for “9.798564”), this value will be assumed as the reference gravity acceleration where the initial calibration has been performed. After the initial calibration this parameter will be automatically set to “0”.
If the value of this parameter is “0” this means no gravity adjustment has been performed after the initial calibration.
In the second stage of the verification the gravity acceleration of the place where the weighing indicator will be used should be entered (as six decimal digits, e.g. enter “800065” for “9.800065”).
Exit setup by saving the changes without entering the calibration (parameter [301]).

[301] Calibration with Test Weights

Begin the calibration by pressing <Enter>.
Unload the scale when the displays shows [ZEro.CA] message and press <Enter>.
The display will show the [WAıt] message during the zero calibration. In this period the scale must be unloaded and stable.
Approximately 10 seconds later the display will show [LoAd] and then [XXXXXX].
The value shown on the display is the weight that should be used for the span calibration. If the value of the test weight which will be used is different from the value shown on the display, type the new value by <Tare> and <Zero> keys, place the test weights on the scale and press <Enter>. Any test weight should be at least 10% of the scale capacity or higher.
The display will show the [WAıt] message during the span calibration. Approximately 10 seconds later the display will show the [SAvE] message. You can save the calibration by pressing <Enter> or quit without saving by pressing the <F> key.

[31-] Adjustment

In this sub-block you can only perform zero adjustment or span adjustment without doing a full calibration.

[310] Zero Adjustment

This parameter is only used for refreshing the zero level of the scale to prevent wrong weighings due to zero drifts. Begin the zero adjustment by pressing <Enter>. Unload the scale when the displays shows the [ZEro.CA] message and press <Enter> again.
The display will show the [WAıt] message during the zero adjustment. In this period the scale must be unloaded and stable. Approximately 10 seconds later the display will show the [SAvE] message. You can confirm the “Save zero adjustment” by pressing <Enter> or cancel it by pressing the <F> key.

[311] Span Adjustment

This parameter lets you perform the span adjustment. By pressing the <Enter> key [XXXXXX] appears on the display. The displayed value is the weight that should be used for the span adjustment. If the value of the test weight that will be used is different from the value shown on the display, then type the new value by <Tare> and <Zero> keys, place the test weights on the scale and press <Enter>.
The display will show the [WAıt] message during the span adjustment. Approximately 10 seconds later the display will show the [SAvE] message. You can confirm the “Save span adjustment” by pressing <Enter> or cancel it by pressing the <F> key.

[312] Span Adjustment Under Load (for FT-11 only)

This parameter is being used to perform span adjustment of a scale without lifting the load from it. This operation is especially used for span adjustment of filled tanks. You can make span adjustment without removing the load in the tank.
When you press the <Enter> key the [P.ZEro] message appears on the display. This means the scale will take the current load as a temporary zero. After getting ready for this level, which means temporary zero adjustment, the <Enter> key should be pressed. The display will show the [WAıt] message during the temporary zero adjustment. After this step the display will show [LoAd] for a certain period and then [XXXXXX]. The value shown on the display is the weight that should be used for the span adjustment. If the value of the test weight which will be used is different from the value shown on the display, type the

new value by <Tare> and <Zero> keys, place the test weight on the scale and press <Enter>. The display will show the [WAıt] message during the span adjustment under load. Approximately 10 seconds later the display will show the [SAvE] message. You can confirm the “Save span adjustment under load” by pressing <Enter> or cancel it by pressing the <F> key.

[313] eCal (electronic calibration)

Warning: The scale capacity and the resolution must be entered before performing eCal.

This parameter allows to calibrate the scale without using test weights. Based on scale capacity, total load cell capacity, load cell rated output and estimated preload FT-1x calculates the calibration coefficients. If the conditions are convenient for zero calibration, you may perform automatic zero adjustment instead of entering estimated preload.
For maximized eCal accuracy the A/D coefficients of the instrument are adjusted in the factory.

Press the <Tare> key to enter eCal.

[LC.CAP]
[XXXXXX]
Enter the total load cell capacity in [kg] via <Tare> and <Zero> keys and press <Enter> to go to the next step.
Example : If the scale uses 4 load cells with 1000 kg maximum capacity for each, then enter 4000.

[LC.oUt]
[XXXXXX]
Enter load cell’s rated output in [mV/V] via <Tare> and <Zero> keys. If the scale uses more than one load cell, then calculate the mean value of all load cells’ rated output as indicated in their certificates. Press <Enter> to go to the next step.
Example: If the load cell’s rated outputs are LC1: 2.0010, LC2: 1.9998, LC3:1.9986 and LC4:2.0002, then the mean value will be
Mean LC output = (2.0010 + 1.9998 + 1.9986 + 2.0002) ÷ 4 = 1.9999 mV/V.

[rt.oUt]
Enter load cell’s rated output in [counts] via <Tare> and <Zero> keys (200 000 is default setting). Press <Enter> to go to the next step.

[ZEr.AdJ]
[XXXXXX]
If the scale is empty and you want to make an automatic zero adjustment instead of entering the estimated preload (see next step), press the <Enter> key.
When the message [Zero.CA] appears then press the <Enter> key for starting the zero calibration. The display will show the [WAıt] message during zero adjustment. In this while the scale must be unloaded and stable. Approximately 10 seconds later the display will prompt you to save the calibration by the [SAvE] message (see below). If the scale is not empty or you prefer to enter the estimated preload value, press the the <↑> or <↓> key.

[PrE-Ld]
[XXXXXX]
Enter the scale’s dead load value in [kg] by using <Tare> and <Zero> keys.
Press <Enter> to go to the next step.
Hint: Is the deadload not exactly known, then you should enter „0“ for this parameter. After save and restart of the weighing function the following weighing result is identical to the real deadload value of the scale. Note this value and repeat the eCal procedure with a known deadload value.

[SAvE]
Save this eCal calibration by pressing <Enter> OR
press the <F> key to quit without saving this eCal calibration.

Note: If you want to make a zero adjustment after entering the estimated preload value, empty the scale, change the preload value to (estimated value + display value at zero load) or enter parameter 310 for zero adjustment.

7. Alibi Memory and Legal Metrological Records

If the alibi memory is installed and activated, the indicator keeps the latest 149 764 weighing records in this memory. The recorded data can be viewed on the indicator's display or exported via serial port.
To find a definite record you have to enter parameter [802]. After reaching the desired record, the recorded data can be viewed in the display. If needed you can print this record together with the following 9 records by pressing the <Print> key. If you press the <Print> key in parameter [803], all recorded data will be sent via serial port. The <F> key cancels the print job.
Empty fields will be printed as "------" , corrupted records as "xxxxx" . For the records for which weighing results cannot be given, the message "no rec" will be shown on the display.
If the alibi memory is activated, the alibi record number is also found on the print out data.
After installing the alibi board or changing the main board "Error 41" or "Error 42" will be shown on the display after power on because the activation of the alibi memory is required.
If the calibration jumper is short circuited, you can activate the alibi board by pressing the <Enter> key after power on. Otherwise the alibi errors will disappear by pressing the <Enter> key, but you cannot export any data (Error "43" will be shown after pressing the <Print> key).

[8--] Metrological Data Block

The parameters about Metrological Registry are being entered in this section.

[80-] Legal Metrological Records

In this block edit the parameters with <↑> key and use the <Enter> key according to the parameter's description.

[800] Counter

This counter increases automatically by 1 after starting the setup mode with enabled calibration jumper and service password. This counter cannot be changed manually.

[801] Alibi Memory)

0 = Disabled 1 = Enabled

[802] Finding any record from Alibi Memory

You can call any record from the Alibi Memory by <Tare> and <Zero> keys. If the <Print> key is pressed while an alibi record is on the display, this and the 9 previous records will be printed.

[803] Print all Alibi Memory records

All data from the Alibi Memory can be printed by pressing the <Print> key. You can stop printing with the <F> key.

[804] Alibi Info

You can get some basic information about the alibi memory board and the records by pressing the <Print> key. These data are:

- SN : Pin code of the alibi memory card
- SA : The alibi record start number within this indicator
- LA : The alibi record number of the next weighing with this indicator
- CN : Calibration counter number
- CS : Check sum status
- AS : Capacity of the alibi memory
- LD : Firmware date of the alibi memory

8. Communication

8.1. Overview about Communication

Application	Hardware channel	Operation mode of the interface
Data export to PC (non-approved); Remote display; Remote control with ASCII entries (Z, T, C)*	Standard Serial Interface (RS232C) OR Option Serial Interface 2 (RS232C) OR Option Serial Interface 3 (RS232C, RS485, 20 mA TTY) OR Option Ethernet (for FT-11 only; see Chap. 8.3)	Continuous output mode; see Chap. 8.2.3 and Appendix 2
IndFace-Software (FT-11 only); Process control (PLC, DCS, SCADA...)		Host mode (for FT-11 only); see Chap. 8.2.4 & Appendix 3
Data export to PC (legal for trade with alibi memory); Output to printer; Remote control with ASCII entries (P, Z, T, C)*		Print mode; see Chap. 8.2.5
Process control (PLC, DCS, SCADA...)	Option Serial Interface 2 (RS485) OR Option Ethernet (for FT-11 only; see Chap. 8.3)	Modbus RTU (for FT-11 only); see Appendix 4
	Option Profibus (for FT-11 only; see Chap. 8.4 + Appendix 5)	Profibus DP
	Option ProfiNet (for FT-11 only; see Chap. 8.5 + Appendix 5)	ProfiNet
	Option CANopen (for FT-11 only, see Chap. 8.6 + App. 6)	CANopen

* Z = Zero; T = Tare; C = Clear; P = Print

8.2. Serial Interface and Printer

The instrument has a standard serial port for connecting peripheral equipment.
The serial port is suitable for bi-directional communication. If you transmit ASCII codes of P, Z, T or C letters to the serial port, the indicator will behave like the related keys have been pressed. If optional serial interfaces are installed, only continuous data output can be programmed for more than one interface (see chapter 8.2.7 for setup details).

8.2.1. Standard Serial Interface Connector (RS232C)

The instrument has a standard serial port for connecting to peripherals.

Standard Serial interface; Parameter group [00-]	
Baudrate	1200, 2400, 4800, 9600, 19 200, 38 400 or 57 600 baud
Data format	8 bit no parity OR 7 bit even parity OR 7 bit odd parity
Start / Stop bit	1 start bit and 1stop bit

The connection of the standard RS232C of the instrument should be made as given in the table below.

Definition	Desk type housing, panel type housing; Pin no. (D-Sub, 9-pin, male)	Stainless steel housing Pin no. (J11 connector)	RS232C; typical PC allocation
TXD	2	3	3
RXD	3	4	2
GND	7	2	5
Shield	Connector body	1	

You have to connect each TXD (output) with RXD (input) at the other end.

8.2.2. Optional Serial Interface Connector (RS232C, RS485, 20 mA TTY)

Additional serial interfaces can be added in addition to the standard RS232C port.

2nd Serial interface	Optional RS232C; Parameter group [01-]
3nd Serial interface	Optional RS232C / RS485 / 20 mA TTY current loop* (field changeable); Parameter group [02-]

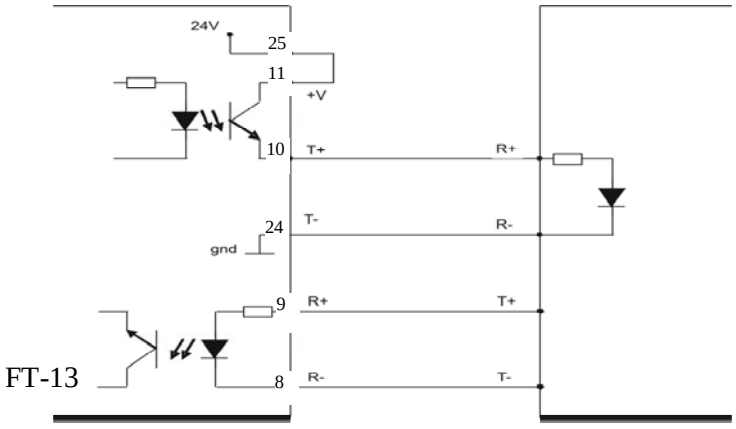
* 20 mA TTY current loop not available with stainless steel housing

If parameter [012] is set to 2 (= hardware handshake), the second serial interface cannot be used as RS232C port. Up to 32 instruments can be connected with enabled RS485 port.

The pin configuration of the optional D-Sub 25-pin female connector is given below.

Parameter [012]		Pin no. for desk and panel types (D-Sub, 25-pin, female)	Pin no. for stainless steel housing	
is set to "0" or "1"	is set to "2"		J10 connector (Option 1)	JR1 / JR2 connector (Option 2 or 3)
TxD1; Par. [01-]		2	8	15
RxD1; Par. [01-]		3	7	14
TxD2; Par. [02-]	RTS1; Par. [01-]	4	3	10
RxD2; Par. [02-]	CTS1; Par. [01-]	5	2	9
GND (RS 232C)		7	6-9	13
R-; Par. [02-]		8	Not used	
R+; Par. [02-]		9	Not used	
T+; Par. [02-]		10	Not used	
+V; Par. [02-]		11	Not used	
Termination (RS 485)		19	Not used	
Termination (RS 485)		20	Not used	
A; Par. [02-]		21	5	12
B; Par. [02-]		22	4	11
T-; Par. [02-]		24	Not used	
+24V; 20 mA CL		25	Not used	
Shield		D25 body	1	1

The RS485 interface termination can be done by short circuiting pin no. 19 and 20 at the desk and panel type enclosures or by jumper JP4 on the interface board within the stainless steel housing . These short circuits terminate the line with an internal termination resistor of 100 Ω.



20 mA CL ASCII interface connection:

The 20mA CL ASCII output is disabled by default. For enabling this output the connections should be made as given in figure shown on the left.
(Enabled output is not available for 12 V DC instruments and stainless steel housings).

8.2.3. Continuous Output Mode

The continuous output mode allows for a fast and continuous data export to connected peripheral devices. The output data structure is described in Appendix 2.

8.2.4. Host Mode (for FT-11 only)

The indicator can communicate with a PC in host mode. You can upload or download data to the indicator by adjusting the related interface parameters within the FLINTEC IndFace software (for FT-11 only) or using the command sets described in Appendix 3. This mode is convenient for process control applications which need not only the weight data, but also require some uploads / downloads and status control.

8.2.5. Print Mode

In the print mode you can select the print formats (parameter group [04-], see chapter 8.2.6). This format – preferably the single line – is convenient to use as weight data interface in legal for trade applications which require recording to the Alibi memory. The print mode is not available for more than one interface (see also overview in chapter 8.1).

1. Single Line

You can send the data in single lines as shown below by pressing the <Print> key.

Example from FT-11(D):

```
CN:    21   G:    3.000kg   T:    1.000kg   N:    2.000kg
```

CN				GROSS				TARE				NET				
MSD		LSD	SP	MSD		LSD	SP	MSD		LSD	SP	MSD		LSD	LF	CR
9			3	13			3	13			3	13			1	1

2. Multi Line



By pressing the <Print> key you can send the data in multiple lines as shown in the labels at the left.

3 lines of header and 1 line of footer can be downloaded to the instrument (in host mode).

The data output structure is defined by the printer parameters.

3. Title and Footnote (for FT-11 only)

It is possible to load 3 lines of header and 1 line of footer to FT-11 and print a label with title and footnote in print mode.
Title and footnote can be loaded to the indicator from a PC via the serial port in host mode. The FLINTEC IndFace software can be used for this. The free of charge interface software can be downloaded from the FLINTEC web site www.flintec.com.

8.2.6. Setup

[0--] Interface Block

You can access the parameters of the instruments's serial interface(s) in parameter section [0--].
The data output modes can be used only once per instrument except for continuous data output.

[00-] Serial Interface 1 (Standard serial interface)

[000 X] Data Format

0 : No data transfer
1 : Continuous data output
2 : Print mode (refer to parameter [040])
3 : Host mode

[001 X] Baud Rate

0 : 1 200 Baud
1 : 2 400 Baud
2 : 4 800 Baud
3 : 9 600 Baud
4 : 19 200 Baud
5 : 38 400 Baud
6 : 57 600 Baud

[002 X] Handshake

0 : No Handshake
1 : Xon/Xoff

[003 XX] Address

The address range is 1 to 99. If you enter 0, the indicator will operate without an address.

[004 X] Data Length and Parity

0 : 8 bit, no parity
1 : 7 bit, odd parity
2 : 7 bit, even parity

[005 X] Checksum

0 : Checksum byte disabled
1 : Checksum byte enabled

[01-] Serial Interface 2 (Optional serial interface)

[010 X] Data Format

0 : No data transfer
1 : Continuous data output
2 : Print mode (refer to parameter [040])
3 : Host mode

[011 X] Baud Rate

0 : 1 200 Baud
1 : 2 400 Baud
2 : 4 800 Baud
3 : 9 600 Baud
4 : 19 200 Baud
5 : 38 400 Baud
6 : 57 600 Baud

[012 X] Handshake

0 : No Handshake
1 : Xon/Xoff
2 : Hardware

Warning: If you choose hardware as handshake, the serial interface 3 can not be used as RS232C.

[013 XX] Address

The address range is 1 to 99. If you enter 0, the indicator will operate without an address.

[014 X] Data Length and Parity

0 : 8 bit, no parity 1 : 7 bit, odd parity 2 : 7 bit, even parity

[015 X] Checksum

0 : Checksum byte disabled 1 : Checksum byte enabled

[02-] Serial Interface 3

The parameters of the 3rd serial interface.

[020 X] Data Format

0 : No output 1 : Continuous data output 2 : Print mode (refer to parameter [040])
3 : Host mode 4 : Modbus RTU High-Low 5 : Modbus RTU Low-High

[021 X] Baud Rate

0 : 1 200 Baud 1 : 2 400 Baud 2 : 4 800 Baud 0 : 1 200 Baud
4 : 19 200 Baud 5 : 38 400 Baud 6 : 57 600 Baud

[022 X] Handshake

0 : No Handshake 1 : Xon/Xoff

[023 XX] Address

The address range is 1 to 99. If you enter 0, the indicator will operate without an address.

[024 X] Serial Mode

0 : Interface operates as RS232C (param. [012] ≠ 2) 1 : Interface operates as RS485
2 : Interface operates as 20 mA TTY Current Loop (not for 12 V DC powered instruments)

[025 X] Data Length and Parity

0 : 8 bit, no parity 1 : 7 bit, odd parity 2 : 7 bit, even parity

Note: The parameter **[**025] must be set to "0" for Modbus RTU output.

[026 X] Checksum

0 : Checksum byte disabled 1 : Checksum byte enabled

[04-] Printer

If one of the serial interfaces is selected as printer, the label settings will be made in this sub-block.

[040 X] Print Out Format

1 : Single line 2 : Multi line

[042 X] Transfer of CN (Consecutive no.) via serial interface

0 : no 1 : yes

[045] Minimum Print

[XXXXXX] If the weight is less than the value entered here, the data will not be printed

[046 X] Print Control

0 : Printing with key 1 : Auto print 2 : Print interlock

Explanation: If set to "Auto print", the data will automatically be printed when the value is stable and higher than the minimum print value. The weight value should fall below the minimum print value to reprint. If this parameter is set to "Print interlock", after printing the weight must change for reprint.

[047 XY] Line Feed

X = 0, 1, 2…9 Number of empty lines at the top of the label (numerical key entry)
Y = 0, 1, 2…9 Number of empty lines at the bottom of the label (numerical key entry)

[048 X] Form Feed

0 : No FF 1 : After printing the printer will go to the next page automatically

[049 X] Quantity of Copies

X = 0, 1, 2…9 Number of labels to print for each weighing

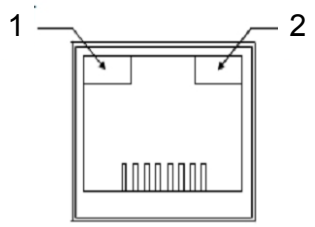
Note: This function is only valid for parameter [040] = 2.

8.3. Ethernet Option (for FT-11 only)

FT-1x series indicators which are equipped with an Ethernet option can be connected to Ethernet TCP/IP or Modbus RTU over Ethernet networks as described below.

8.3.1. Electrical Connections

The pin configuration of the RJ45 Ethernet connector is described below:

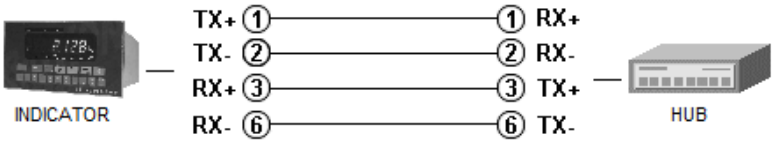


1: Link LED
2 Activity LED

Pin no.	Signal	Description
1	TX+	Differential Ethernet transmit data +
2	TX–	Differential Ethernet transmit data –
3	RX+	Differential Ethernet receive data +
4		Not used, terminated
5		Not used, terminated
6	RX–	Differential Ethernet receive data –
7		Not used, terminated
8		Not used, terminated
	Shield	Chassis ground

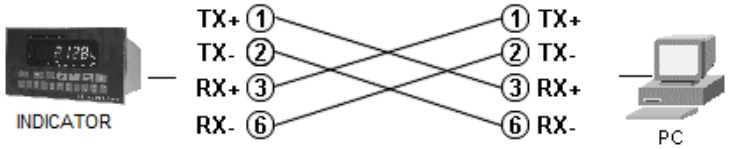
State	Link LED	Activity LED
Off	No link	No Activity
Amber	10 Mbit/s	Half Duplex
Green	100 Mbit/s	Full Duplex

Connection to an Ethernet hub



Cabling is done using a standard RJ-45 patch cable.

Direct connection to a PC



Cabling is done using a RJ-45 cross over cable.

8.3.2. Setup

There are several setup parameters for the Ethernet network as described below:

Host Name	Device name on the network. Default is " "
IP Address	The numeric code that identifies all computers that are connected to the internet. Default is "92.168.16.250"
Local Port	Ethernet connection point of the device. Default is "10001"
Gateway	Network point that acts as an entrance to other networks. Default is "192.168.16.254"
Subnet Mask	Defines a range of IP addresses in a network. Default is "255.255.255.0"
Primary DNS	Primary DNS server IP address
Secondary DNS	Secondary DNS server IP address
DHCP	The Dynamic Host Configuration Protocol provides dynamically allocated IP addresses to computers on a network, if it is enabled.
Remote Connection	Automatic connection to any device on the network
Remote IP	IP address of the PC or device which should be connected automatically
Remote Port	Ethernet connection point of the PC or device which should be connected automatically

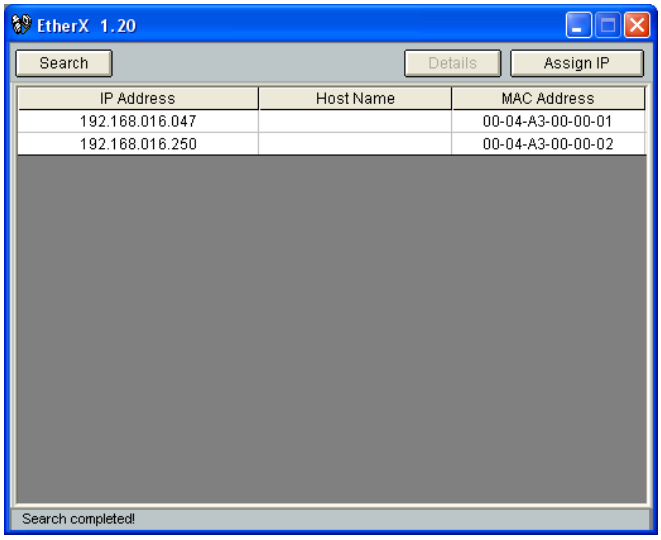
Important hint: During the setup the Ethernet output (weight value and status bits) will not be updated.

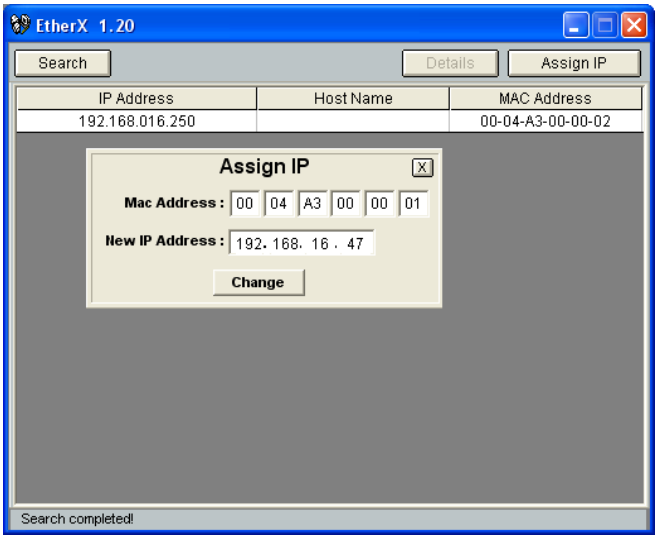
The Ethernet setup can be done using the Ether X PC software.

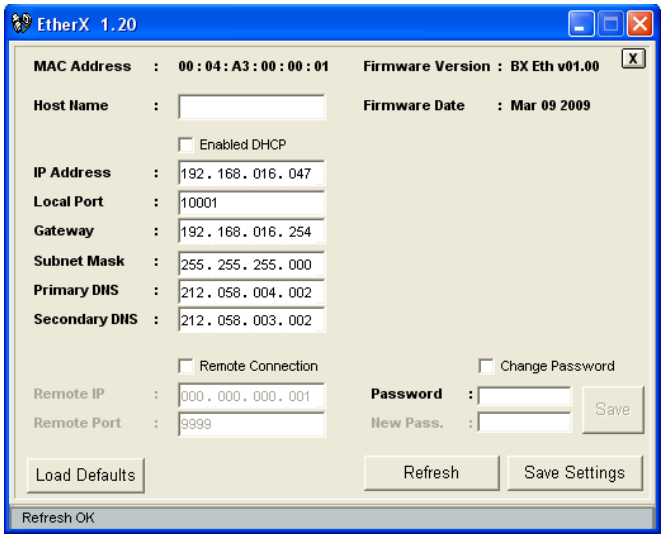
Note: For older instruments the configuration will be done by the Ethernet Device Installer PC software, see separate document on the Flintec Product-CD.

Setup by Ether X Software:

Step 1: Install the Ether X software from the Flintec Product-CD to any PC on the network
Step 2: Start the Ether X software
Step 3: After pressing the “Search” button the software lists the FT-1x devices on the network as shown in the figure below
Step 4: The IP address of any device may be changed after clicking the “Assign IP” button
Step 5: Click the “Details“ button to open the parameter window as shown below.







The parameter window presents information like Firmware Version of Ethernet option board and it helps to edit resources like Host Name, Gateway, DNS server etc.

After changing any parameter, enter the password and click the “Save Settings” button.
The default Password is “123456”.

The “Load Defaults” button resets the device to the default settings.

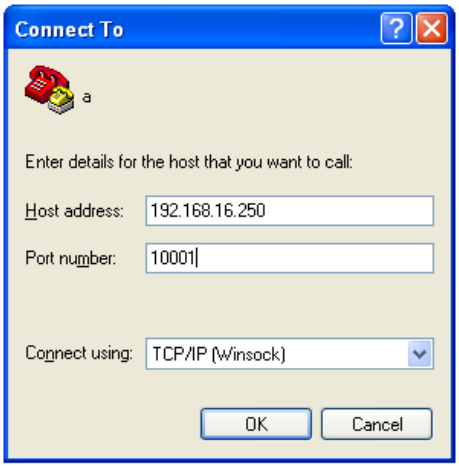
Frequently Asked Questions (FAQ)

Question: The Ether X could not reach the FT-1x instrument.
Answer: 1. Check the local network connection
2. Check if the IP address of the indicator is convenient for your network
3. Check the PC Ethernet output with other network instruments
4. Check the existence of the Ethernet related parameters in the instrument setup (see chapter 8.3.3). If you cannot not see these parameters in the setup, please check the proper installation of the Ethernet board.
5. Change the Ethernet option board.

Question: The Ether X software could reach the FT-1x instrument, but you can't communicate with the instrument.
Answer: The port number of the indicator is not convenient for port numbers of your application software. Check the port number of the indicator by using the Ether X software.

Question: How can I check the communication?
Answer: You can use any communication program like HyperTerminal which is supplied with your Windows operating system (Microsoft).

Example: HyperTerminal



1. Open the HyperTerminal and choose a name for the connection. Press OK.

2. Then enter the Ethernet address of the indicator and the port number as shown at the left. Also you need to set the connection type to "TCP/IP (WinSock)".

3. To test the connection now, you can set the Ethernet output of the indicator to "continuous" (refer to chapter 8.3.3).

With an active HyperTerminal you should now be able to follow the data stream.

8.3.3. Data Structure

[0--] Interface Block

[03-] Ethernet

This sub-block includes the parameters of the Ethernet port.

[030 X] Data Format

0 : No Ethernet output 1 : Continuous data 2 : Print mode (refer to parameter [040])
3 : Host mode 4 : Modbus RTU High-Low* 5 : Modbus RTU Low-High**

* High word before low word at address 40001 and 40002
** Low word before high word at address 40001 and 40002

Note: In continuous data format of the Ethernet interface, the checksum byte is disabled.

The data structure depends on the selected data format (see parameter [030]):

Data format	Data structure
Continuous output mode	See Appendix 2
Print mode	See Chapter 8.2.5 and 8.2.6 parameter [040]
Host mode	See Appendix 3
Modbus RTU	See Appendix 4

[031 XX] Address

The address of the instrument will be entered via numerical keypad in the range 01 to 99.

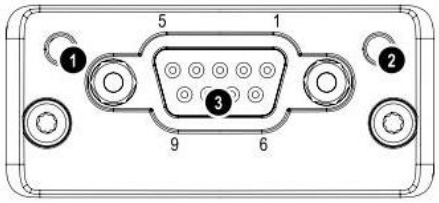
8.4. Profibus Option (for FT-11 only)

FT-11 indicators which are equipped with the Profibus option can be connected to a PLC bus as described below.

Profibus DP V0 & V1	Automatic (96 kbit/s to 12 Mbit/s)
Update rate	Weight data will be updated each 40 ms
Response time on entries	5 ms to 25 ms

8.4.1. Electrical Connections

The pin configuration of the female 9-pol D-Sub Profibus connector (DB9F) is described in the table below:



1 Operation mode LED
2 Status LED
3 Profibus Connector

Pin no.	Signal	Description
1		
2		
3	B-Line	Positive RxD / TxD, RS485 level
4	RTS	Request to send
5	GND	Isolated GND
6	+5 V DC	Isolated +5V output for bus termination
7		
8	A-Line	Negative RxD / TxD, RS485 level
9		
Housing	Shield	Bus cable shield, connected to Ground

Operation mode LED		
State	Indication	Action / Comment
Off	Not on-line /No power	Check power and cable
Green	On-line, data exchange	
Flashing Green	On-line, clear	
Flashing Red (1 flash)	Setup error	Not supported
Flashing Red (2 flash)	PROFIBUS configuration error	Check GSD file

Status LED	
State	Meaning
Off	No power or Profibus module is initialising
Green	Initialized
Flashing Green	Initialized and diagnostic event is present
Red	There is an exception error

8.4.2. Setup

[0--] Interface Block

[03-] Profibus

This sub-block includes the parameters of the Profibus port.

[032 X] Data Format

0 : Signed 32 bit integer 1 : Signed 32 bit floating point

[033 XX] Address

The address of the instrument will be entered via numerical keypad. Value range is 1 to 126. After editing the address it is required to restart the instrument.

The GDS file is available on a CD which is supplied together with the instrument.

After the setup of these parameters and the hardware connection as described above, the data interface can be used as described in Appendix 5.

Important hint: During the setup the Profibus output (weight value and status bits) will not be updated.

8.4.3. Data Structure

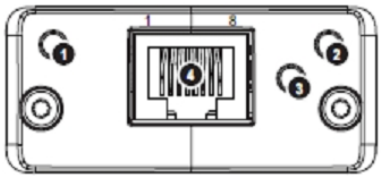
See Appendix 5.

8.5. ProfiNet Option (for FT-11 only)

Indicators which are equipped with the ProfiNet option can be connected to a PLC bus as described below.

Weight data update rate: 40 ms Response time on entries: 5 ms to 25 ms

8.5.1. Electrical Connections



ProfiNet Interface:
1. Network Status LED
2. Module Status LED
3. Link/Activity LED
4. Ethernet Connector (100 Mbit/s, full-duplex)

MS Module Status LED		
LED State	**Description**	**Comment**
Off	No power or not initialized	No power or ProfiNet module is in initialization state
Green	Initialized	
Green, 1 flash	Initialized, diagnostic event(s) present	Diagnostic is active
Green, 2 flashes	Blink	Used by engineering tools to identify the node on the network
Red	Exception error	There is an exception error
Red, 1 flash	Configuration error	Check EDS configuration
Red, 2 flashes	IP address error	IP address not set
Red, 3 flashes	Station name error	Station name not set
Red, 4 flashes	Internal module error	Re-energize the instrument. If seen again, change module

LINK/Activity LED		
LED State	**Description**	**Comment**
Off	No Link	No link, no communication present
Green	Link	Ethernet link established, no communication present
Green, flickering	Activity	Ethernet link established, communication present

NS Network Status LED		
LED State	**Description**	**Comment**
Off	Not online /No power	Check power and cable
Green	On-line (RUN)	-
Green, flashing	On-line (STOP)	-

8.5.2. Setup

[0--] Interface Block

[03-] ProfiNet

[036 X] Data Format

0 : Signed 32 bit integer 1 : Signed 32 bit floating point

There are 7 setup parameters for ProfiNet network:

DHCP	Dynamic Host Configuration Protocol automates network parameters if it is enabled. Default is 'Disable'.
IP Address	If DHCP is disabled, define IP address manually. Default is '192.168.16.250'
Subnet Mask	If DHCP is disabled, define subnet mask manually. Default is '255.255.255.0'.
Gateway	If DHCP is disabled, define default gateway manually. Default is '192.168.16.254'.
Primary DNS	If DHCP is disabled, define primary DNS manually. Default is '208.67.222.222'.
Secondary DNS	If DHCP is disabled, define secondary DNS manually. Default is '208.67.220.220'.
Host Name	Enter a unique host name to the instrument. Default is ' '

The ProfiNet communication will be configured by the EtherX PC software. EtherX can be installed from the Flintec Product CD-ROM. The EDS file is available on a CD which is supplied together with the instrument. After the setup of these parameters and the hardware connection as described above, the data interface can be used as described in Appendix 5.

Important hint: During the setup the ProfiNet output (weight value and status bits) will not be updated.

8.5.3. Data Structure

See Appendix 5.

8.6. CANopen Option (for FT-11 only)

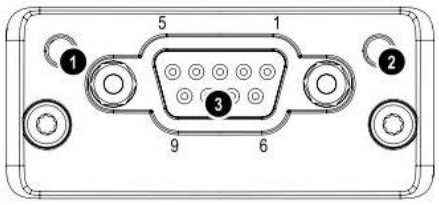
FT-11 indicators which are equipped with the CANopen option can be connected to a PLC bus as described below.

Baud rate	Automatic (10 kbps to 12 Mbps)
Update rate	Weight data will be updated each 40 ms
Response time on entries	5 ms to 25 ms

8.6.1. Electrical Connections

The pin configuration of the male 9-pol D-Sub ProfiNet connector (DB9M) is described in the table below:

Connector



1. Run LED
2. Error LED
3. CANopen Connector

Pin no.	Signal	Description
1		
2	CAN_L	
3	CAN_GROUND	
4		
5	CAN_SHIELD	
6		
7	CAN_H	
8		
9		
Housing	Shield	

Run LED		
State	**Indication**	**Action / Comment**
Off	No power or not initialized	No power or cable broken
Green	On-line, data exchange	
Green, flashing	On-line, initializing	
Green, single flash	Stopped	Check for hardware damages
Green, flickering	Auto baud rate detection in progress	
Red	Exception error	Check EDS file

Error LED		
State	**Indication**	**Action / Comment**
Off	No error	No power or CANopen module is inizializing
Red, single flash	Warning limit reached	Bus error counter reached or exceeded its warning limit
Red, flickering	LSS	LSS services in progress
Red, double flash	Error count event	A guard (NMT slave or master) or heartbeat event has occured
Red	Bus off (fatal event)	Bus off

8.6.2. Setup

[0--] Interface Block

[03-] CANopen

This sub-block includes the parameters of the CANopen.

[034 X] Data Format

0 : Signed 32 bit integer 1 : Signed 32 bit floating point

[035 XX] Address

The address of the instrument will be entered via numerical keypad. Value range is 1 to 127. After editing the address it is required to restart the instrument.

After the setup of these parameters and the hardware connection as described above, the data interface can be used as described in Appendix 6.

Important hint: During the setup the CANopen output (weight value and status bits) will not be updated.

8.6.3. Data Structure

See Appendix 6.

9. Other I/O Options

9.1. Analogue Output Option (for FT-11 only)

FT-11 can be equipped with 4 – 20 mA or 0 – 10 V analogue output option. The value of the analogue output changes in linear relationship to the displayed value. But if there is no numerical value on the display, the value of the analogue output will be given as stated below:

Condition (On Display)	0 – 10 V output	4-20 mA output	Alarm output
The weight value is higher than the weighing range (Over)	13 V	24 mA	High
The weight value is lower than the zero range (Under)	-1.4 V	0 mA	High
Error [Err XX]	13 V	24 mA	High
ADC is out of operating range [Adc Out]	13 V	24 mA	High

As shown in the table above the linear range of the analogue output is limited between -1.4 V and 13 V respective 0 mA and 24 mA.

9.1.1. Electrical Connections

There is an optically isolated input on the analogue card for zeroing the scale via an analogue output option connector. The connections of the analogue output connector is given in the table below.

Description	Pin no. for Desk and panel types (DB25 Female)	Pin no. for stainless steel housing	
		J10 connector (Option 1)	JR1 / JR2 connector (Option 2 or 3)
+ Zeroing input (+24V)	8	6	13
- Zeroing input (0V)	9	5	12
Alarm output	18	8	7
GND (Current / Voltage)	19 & 22	4 & 9	6 & 11
Iout (Current)	23	3	10
Vout (Voltage)	24	2	9
Shield	D25 body	1	1

9.1.2. Setup

The analogue output is being adjusted digitally from the parameter group [4--].

[4--] Analogue Output Block

The calibration of the optional analogue output is performed in this sub-block.

[40-] Signal Selection

[400] Signal type*

0 = 4 – 20 mA 1 = 0 – 10 V DC *activated after saving the settings

[41-] Zero Adjustment (Signal level at load = 0 kg)

[410] Coarse Zero Adjustment

The coarse zero adjustment is being performed by pressing the <Zero> key continuously to increase the analogue signal level or the <Clear> key to decrease the analogue signal level. The true load will be ignored while adjusting.

[411] Fine Zero Adjustment

The fine zero adjustment is being performed by pressing the <Zero> key repeatedly to increase the analogue signal level or the <Clear> key to decrease the analogue signal level. The true load will be ignored while adjusting.

[42-] Span Adjustment (Signal level at maximum load)

[420] Coarse Span Adjustment

The coarse span adjustment is being performed by pressing the <Zero> key continuously to increase the analogue signal level or the <Clear> key to decrease the analogue signal level. The full capacity value is taken as the reference without loading any weight.

[421] Fine Span Adjustment

The fine span adjustment is being performed by pressing the <Zero> key repeatedly to increase the analogue signal level or the <Clear> key to decrease the analogue signal level. The full capacity value is taken as the reference without loading any weight.

9.2. Digital I/O Option

9.2.1. Electrical Connections

It is possible to use control inputs and setpoint outputs if you add an optional digital I/O board (3 inputs and 3 outputs) to the instrument. The electrical connection of the inputs and outputs should be made as shown in Fig. 9.1.

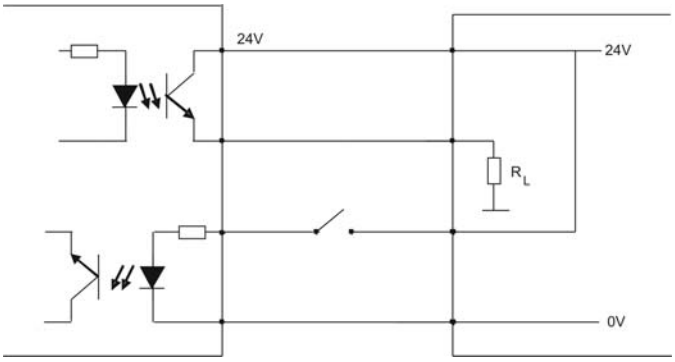


Figure 9.1 Digital I/O ports connection diagram

	Voltage	Current
Digital input	20 to 28 V DC	Max. 30 mA
Digital output	20 to 28 V DC	Max. 300 mA (sum of all 3 outputs)

The power for the digital I/O has to be supplied from an external power supply module.

The pin layout of the parallel Input/Output connector is given below.

Definition	Pin no. for desk and panel types (DB-Sub, 25-pin, female)	Pin no. for stainless steel housing	
		J10 connector (Option 1)	JR1 / JR2 (Option 2 or 3)
0 V	13	1	1
+24V	12 - 24 - 25	2	2
Output 1	1	7	8
Output 2	3	8	7
Output 3	5	9	6
Input 1	11	3	10
Input 2	10	4	11
Input 3	9	5	12
Shield	Connector Body	Not Used	Not Used

9.2.2. Setup

[1--] Configuration Block

In this block the parameters are located which are being used to set up the digital inputs and outputs.

[13-] Digital Inputs / Outputs

FT-11(D) has optionally 3 digital inputs and 3 digital outputs.

[130 X] Outputs

The outputs operate with respect to the displayed weight value. In the 3rd selection the Output 3 operates as Error and Alarm output.

0 = Disabled (factory default)
1 = (Output1 = Sp1), (Output2 = Sp2), (Output3 = Sp3)
2 = (Output1 = Sp1), (Output2 = Sp2), (Output3 = Stable)
3 = (Output1 = Sp1), (Output2 = Sp2), (Output3 = Error and Alarm)

[131 X] Input 1

0 = Disabled (factory default) 1 = Zero 2 = Tare
3 = Clear 4 = Print 5 = Key lock

Warning: This input will be used as tilt switch input for tilting applications (parameter [207] > 0)

[132 X] Input 2

0 = Disabled (factory default) 1 = Zero 2 = Tare
3 = Clear 4 = Print 5 = Key lock

[133 X] Input 3

0 = Disabled (factory default) 1 = Zero 2 = Tare
3 = Clear 4 = Print 5 = Key lock

9.2.3. Entering Setpoints

Press the <SP> key to enter the setpoint memory. The setpoint values will be defined by the <Zero> and <Tare> keys and confirmed with the <Enter> key. You will advance to the next setpoint. Here you can select between setpoints via the <↑> and <↓> keys. Quit without saving by pressing the <F> key.

9.3. Binary Output Option

This option adds a 17-bit binary output to the instrument which changes in the value range between “0” and “131 071” depending on the displayed value and the zeroing input status.
The value of the binary output will change related to the display value as stated in the table below.

	BINARY OUTPUT		
Condition (On Displayed)	**Data**	**Negative**	**Error**
Over	High	Low	High
Under	High	High	High
ADC Out	High	Low	High
Weight indication	Binary	X	Low

The pin configuration of the D25 female binary connector is given below.

Pin no.	Connection	Definition
1	24V DC	POWER SUPPLY
14-2	GND	POWER SUPPLY
15	TEST	INPUT
3	D0	2^0
16	D1	2^1
4	D2	2^2
17	D3	2^3
5	D4	2^4
18	D5	2^5
6	D6	2^6
19	D7	2^7
7	D8	2^8
20	D9	2^9
8	D10	2^{10}
21	D11	2^{11}
9	D12	2^{12}
22	D13	2^{13}
10	D14	2^{14}
23	D15	2^{15}
11	D16	2^{16}
24	Strobe	1 = Data Ready
12	Zero	Input
25	Error	Output
13	negative	Output
D25 body	Schirm	

“Data Ready” means that the weight data can be read from the output.
If the output value is low, a wrong reading of the weight value is probable.
If you apply a test input, the weight data output will be interrupted and all outputs will be activated sequentially during the test input is active.
Outputs are PNP open collector and common is ground.
The binary output card has to be supplied with 24 V DC (max. 28 V DC), maximum current consumption can be up to 200 mA.

10. Diagnostics

The parameter block [9--] contains certain functions for checking and testing.

[9--] Diagnostics

The operations about checking and testing the instrument can be made here.

[90-] Tests

[900] Key Pad test

In this step each key's ASCII code will be shown on the display as you press the related key. By this way you can test if all the keys are functioning or not. Pressing "↑" key will take you to the next parameter.

[901] Serial Interface-1 test

The characters in the alphabet will sequentially be transferred from serial interface-1 by pressing the "Zero" key repeatedly. Received numerical data is shown on display.

[902] Digital Input test

[ı X YY]
To perform a digital input test, enter the number of the input to YY digits via "Tare" and "Zero" keys and press the "Enter" key. "X" shows the logical condition of this input.

[904] mV Indication (for FT-11 only)

When pressing the <Enter> key the output voltage of the load cell will be shown on the display. This uncalibrated value is only for test- and service purposes.

[905] DLC Internal Count (for FT-11D only)

When pressing the <Enter> key the message [905 1] is shown. The number of the load cell can be selected by up and down keys and internal counts can be seen by pressing the <Enter> key.
Press the <F> key to quit this parameter.

[91-] Serial Numbers

[910] Instrument Serial No.

[911] Option 1 Serial No.

[912] Option 2 Serial No.

[913] Option 3 Serial No

When pressing the <Enter> key the serial number of the instrument or the option will be shown.

[97-] Calibration Coefficients

The parameters located in this section are the calibration parameters of the instrument. If these values have been noted this can help when a calibration problem occurs. You can refresh the calibration by entering the correct values printed before (see parameter [990]).

[99-] Printing Parameter Values

[990] Print All Parameters

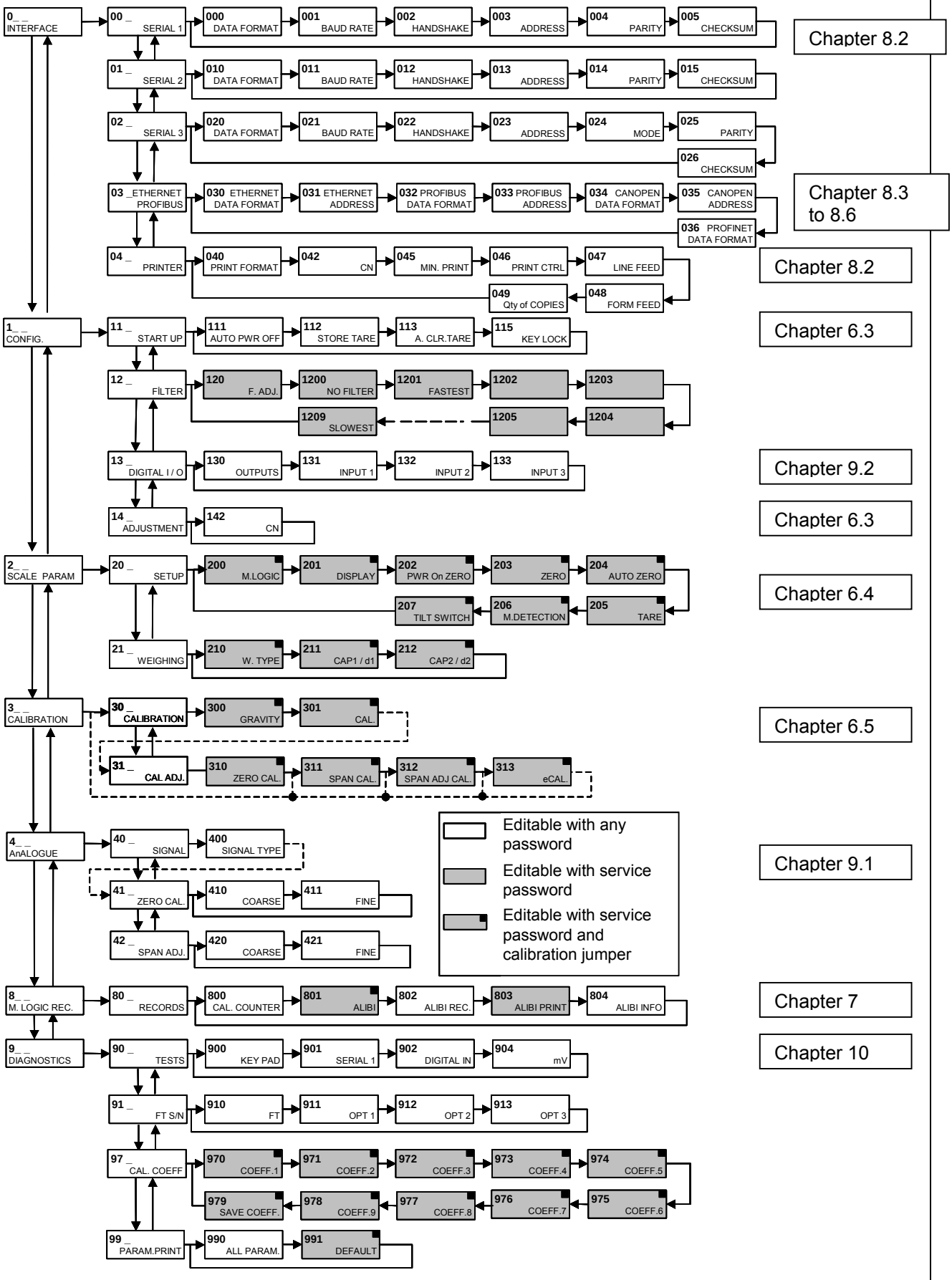
By pressing the <Print> key all parameters can be printed.

[991] Loading Default Parameters

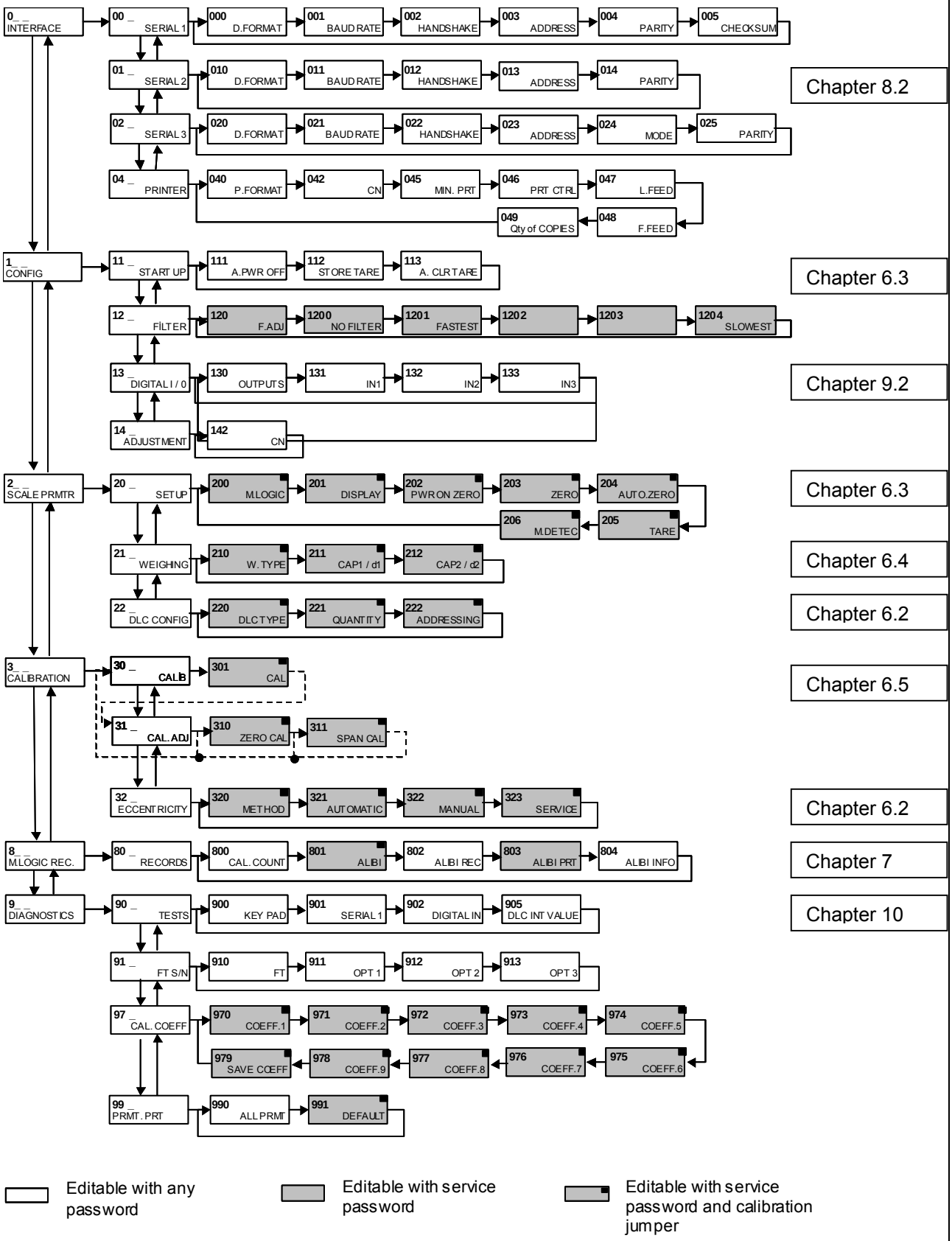
When pressing the <Enter> key the [Ld dEf] message appears on the display. Press the <Tare> key for loading the default values or press the <F> key to go to "9-" sub block.

Appendix 1: Setup and Calibration Menus

FT-11 Setup and Calibration Menu



FT-11D Setup and Calibration Menu



Appendix 2: Continues Output Mode Data Structure

The format and the definition of the continuous data output is given below.

	Status			Indicated						Tare							
STX	STA	STB	STC	D5	D4	D3	D2	D1	D0	D5	D4	D3	D2	D1	D0	CR	CHK

The definition of the status bytes STA, STB and STC is given below.

Definition Table for Status Byte A									
Bits 0, 1 and 2				Bits 3 and 4			Bit 5	Bit 6	Bit 7
0	1	2	Decimal point	3	4	Increment size			
0	0	0	XXXXOO	1	0	X 1			
1	0	0	XXXXXO	0	1	X 2			
0	1	0	XXXXXX	1	1	X 5			
1	1	0	XXXXX.X				Always 1	Always 1	X
0	0	1	XXXX.XX						
1	0	1	XXX.XXX						
0	1	1	XX.XXXX						
1	1	1	X.XXXXX						

Definition Table for Status Byte B		
Bit 0	Gross = 0	Net=1
Bit 1	Weight positive = 0	Weight negative=1
Bit 2	Overload = 1	
Bit 3	Stable = 0	Unstable =1
Bit 4	Always = 1	
Bit 5	Always = 1	
Bit 6	Always = 0	
Bit 7	x	

Definition Table for Status Byte C	
Bit 0	Always 0
Bit 1	Always 0
Bit 2	Always 0
Bit 3	Always 0
Bit 4	Always 1
Bit 5	Always 1
Bit 6	Always 0
Bit 7	x

CR = (D7,D6,D5,D4,D3,D2,D1,D0) = (X, 0, 0, 0, 1, 1, 0, 1)
CSUM = 0 – (STX + STATUS A + ... + CR)

Appendix 3: Host Mode Data Structure

If related parameters are adjusted for host communication, the weight indicator will be connected to your system in Host Mode. Functions “0x03” and “0x10” are supported.

Read Hold Registers (0x03)

This function code is being used to read the information in the register addresses which have been permitted to be read from holding registers. The reading operation will be performed by transmitting the information about the registry to be read as given in the “Request Table”. The indicator will evaluate the received data and will respond the info in the format as stated in the “Reply Table” or “Error Table”.

Request:

Field Name	Host-Bus	ASCII Code
STX	@	64
Slave address	X X	X,X
Function	0 3	48,51
Address registers high	X X	X,X
Address registers low	X X	X,X
No. of addr. registers high	X X	X,X
No. of addr. registers low	X X	X,X
Error check	X X (csum)	X,X
EOP	Cr	13

Reply:

Field Name	Host-Bus	ASCII Code
STX	@	64
Slave address	X X	X,X
Function	0 3	48,51
No. of data registers	X X	X,X
Data high	X X	X,X
…	X X	X,X
Data low	X X	X,X
Error check	X X (csum)	X,X
EOP	Cr	13

Error:

Field Name	Host-Bus	ASCII Code
STX	@	64
Slave address	X X	X,X
Function	8 3	56,51
Exception code	X X	X,X
Error check	X X (csum)	X,X
EOP	Cr	13

Exception codes:

1 : Function code is not supported
2 : Out of starting and ending address range
3 : Invalid value entry
4 : Operation error

Preset Multiple Registers (0x10)

This function code is used to edit the information in the register addresses of the holding registers which are allowed to be overwritten. The write operation will be performed by transmitting the information about the registry to be changed as stated in the “Request Table”. The indicator will evaluate the received data and will respond the info in the format as stated in the “Reply Table” or “Error Table”.

Request:

Field Name	Host-Bus	ASCII Code
STX	@	64
Slave address	X X	X, X
Function	1 0	49, 48
Address registers high	X X	X, X
Address registers low	X X	X, X
No. of addr. registers high	X X	X, X
No. of addr. registers low	X X	X, X
No. of data registers	X X	X, X
Data high	X X	X, X
Data low	X X	X, X
Error check	X X (csum)	X, X
EOP	Cr	13

Reply :

Field Name	Host-Bus	ASCII Code
STX	@	64
Slave address	X X	X, X
Function	1 0	49, 48
Address registers high	X X	X, X
Address registers low	X X	X, X
No. of addr. registers high	X X	X, X
No. of addr. registers low	X X	X, X
Error check	X X (csum)	X, X
EOP	Cr	13

Error :

Field Name	Host-Bus	ASCII Code
STX	@	64
Slave Add	X X	X, X
Function	9 0	57, 48
Exception code	X X	X, X
Error Check	X X (csum)	X, X
EOP	Cr	13

Exception codes:

1 : Function code is not supported
2 : Out of starting and ending address range
3 : Invalid value entry or wrong byte number
4 : Operation error

Error Check Calculating:

CSUM = 0 – (Slave_Add + Function + … + Last_data)
(STX and CSUM are neglected while calculating CSUM)

Tool for counting:

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

Example:
@|01|10|0008|0001|02||0006|DE|<Cr>

To get the check sum (here FA) you have to sum following numbers first:
01+10+00+08+00+01+02+00+06 = 22

Now you have to subtracte 22 from 00:
00 - 22 = DE

(Calculation examples: 00 – 10 = F0 ; 00 – 11 = EF)

Command	Function (Read / Write)	Address register	Quantity Address register	Quantity Data register	Data	Definition			
Display value	03 (R)	0000	0002	--	-----	Current display value; gross or net			
Status	03 (R)	0002	0001	--	-----	Transfer the replied status data (hex, 4 digits) into binary (up to 16 digits) and compare the binary digits with the following table.			
						Digit	**Definition**		
						D0	Busy	1 – System Busy	
						D1	Data ok	1 – Data ok // 0 – Error	
						D2	Motion	1 – Weight is not stable	
						D3	Net Mode	1 – Net mode	
						D4	0	NA	
						D5	Output 1	1 – Output active	
						D6	Output 2		
						D7	Output 3		
						D8	Input 1	1 – Input active	
						D9	Input 2		
						D10	Input 3		
						D11	0	NA	
						D12	0	NA	
						D13 D14 D15	Error Code; transfer D13, D14, D15 (binary) to decimal and compare to code	0	No Errors
								1	ADC out of range
								2	ADC over range
								3	ADC under range
								4	System fault
								5	FT is not in weighing mode
Tare weight	03 (R)	0003	0002	--	----	Current tare weight			
Gross Weight	03 (R)	0005	0002	--	----	Current gross weight			
Control	10 (W)	0008	0001	02	----	None			
					0001	Zero			
					0002	Tare			
					0003	Clear			
					0004	Print			
					0005	Use Preset Tare (Buffer: Adr. Reg. 0009)*			
					0006	Download setpoints to indicator (Buffer Add. Reg. 000B, 000D, 000F)			
					0007	Upload setpoints to buffer (Buffer Add. Reg. 000B, 000D, 000F)			
					0008	Start			
					0009	Reset			
Set Point 1	03(R) / 10(W)	000B	0002	04	xxxx xxxx	Buffer memory; Data = used value in hex			
Set Point 2	03(R) / 10(W)	000D	0002	04	xxxx xxxx	Buffer memory; Data = used value in hex			
Set Point 3	03(R) / 10(W)	000F	0002	04	xxxx xxxx	Buffer memory; Data = used value in hex			

Examples: The commands will be used for an indicator which instrument address is set to 1.

Reading weight data: @010300000002FA<Cr>
Reading status data: @010300020001F9<Cr>
Reading Tare data: @010300030002F7<Cr>
Taring: @011000080001020002E2<Cr>

Loading 1500 value to Setpoint 1:
1.step: @0110000B000204000005DCFD<Cr>
2.step: @011000080001020006DE<Cr>

Reading Setpoint 1 (SP1=1500):
1. step: @011000080001020007DD<Cr>
2. step: @0103000B0002EF<Cr>

Break down an example:
Setpoint 1: Write value 1500 into buffer

@	01	10	000B	0002	04	000005DC	FD	<Cr>
STX	Device-Adresse	Write	Add. Reg. for Setpoint 1	No. of Addr. Reg.	No. of Data Reg.	Value 1500 (dec.), shown in hex	Checksum	EOP

NOTE: The points you should paid attention to while loading and reading setpoints are:

- To write any value to FT-1x the value should be loaded into the buffer **(address 000B).** Afterwards send command "**6"** to address **0008** to make FT-1x to use the value at address 000B.
- To read a value from FT-1x you should send command "**7"** to address **0008** to make FT-1x to load the value into the buffer. Afterwards you can read the value at address **000B.**
- The commands "**6"** and "**7"** which are sent to address **0008** let you write or read all setpoints

Appendix 4: Modbus RTU Data Structure

If the instrument is programmed for Modbus RTU, it can be used as a Modbus RTU slave on a RS485 communication line or on the Ethernet communication line. The Modbus slave adress is defined in the parameter [Address]. Function code “0x03” and function code “0x10” are supported.

Read command	Modbus register	Function code	Register address	No. of registers	Definition			
Display value	40 001	03	00,00	00,02	Current display value; Gross or Net			
Status	40 003	03	00,02	00,01	D0	Busy	1 – System Busy	
					D1	Data ok	1 – Data ok 0 – Error (See D13…D15)	
					D2	Motion	1 – Weight is not stable	
					D3	Net Mode	1 – Net mode	
					D4	N/A		
					D5	Output 1	1 – Output active	
					D6	Output 2		
					D7	Output 3		
					D8	Input 1	1 – Input active	
					D9	Input 2		
					D10	Input 3		
					D11	N/A		
					D12			
					D13 D14 D15	Transfer binary (D13 to D15) to decimal and compare to error code	0	No Errors
							1	ADC out of range
							2	ADC overrange
							3	ADC underrange
							4	System fault
							5	FT not in weighing mode
Tare weight	40 004	03	00,03	00,02	Current tare weight			
Gross Weight	40 006	03	00,05	00,02	Current gross weight			
Setpoint 1	40 012	03	00,0B	00,02	Setpoint 1 buffer memory; replied value in hex			
Setpoint 2	40 014	03	00,0D	00,02	Setpoint 2 buffer memory; replied value in hex			
Setpoint 3	40 016	03	00,0F	00,02	Setpoint 3 buffer memory; replied value in hex			
Calibration Status	40 033	03		00,01	D0…D7 Calibration Process Status	1	Ready for calibration	
						3	Zero calibration in process	
						4	Span calibration in process	
						9	Error (Refer to D8 ... D15)	
						1	Calibration Timeout – Restart calibration	
					D8…D15 Calibration Errors	2	ADC Error – Re-energize the instrument – If seen again, change board.	
						3	Instrument cannot be calibrated – Check load cell cable – Re-energize the instrument	
						34	Instrument cannot be calibrated – Load cell signal is too low or too high	
						35	Calibration Error – Calibration test weight is too small, increase calibration weight value (40031-32) – Check load cell connections	
						37	Scale unstable – Wait until scale becomes stable – Check grounding wiring	
						38	Calibration Jumper is not installed- Check Calibration jumper	
						1	Ready for calibration	

Write command	Modbus register	Function code	Register address	No. of registers	Data byte count	Data bytes	Definition
Control	40 009	10	00,08	00,01	02	00,01	Zero
						00,02	Tare
						00,03	Clear
						00,04	Print
						00,05	Reserved
						00,06	Use setpoints from buffer (40 012, 40 014, 40 016)
						00,07	Load actual setpoint from indicator to buffer (40 012, 40 014, 40 016)
	40 010						Reserved
Setpoint 1	40 012	10	00,0B	00,02	04	Designated value [hex]	Setpoint 1 buffer memory
Setpoint 2	40 014	10	00,0D	00,02	04		Setpoint 2 buffer memory
Setpoint 3	40 016	10	00,0F	00,02	04		Setpoint 3 buffer memory
Calibration	40 030	10		00,01	02	0	None
						188	Zero calibration
						220	Span calibration (first define the calibration weight value in 40031)
	40 031	10		00,02	04		Calibration weight value

Modbus exception codes

1 : Function code is not supported
2 : Address is out of range (start and end)
3 : Invalid value feed or wrong byte number
4 : Operation error

Explanation (Setpoint):
The reading and writing of the setpoints is done in two steps.

Read operation (Setpoints):
1. Step : Load the actual setpoint values to the buffer.
Sending the control command 0007 to address [0008] (40 009) stores the actual setpoint values in the buffer address [000B], [000D] and [000F] (Register 40 012, 40 014, 40 016).
2. Step : Read the buffer memory. Reading address [000B], [000D], [000F] (Register 40 012, 40 014, 40 016) replies the actual corresponding setpoint value.

Write Operation:
1. Step : Load the value to the assigned buffer memory. Sending the designated value to address [000B], [000D] or [000F] (Register 40 012, 40 014 or 40 016) loads the value into the selected buffer memory.

2. Step : Apply the values from the buffer memory. Sending the control command 0006 (setpoints) to address 0008 (Register 40 009) activates the value(s) from the buffer memory.

Attention: Step 2 activates all 3 setpoint buffer values → All 3 setpoint values have to be loaded to their buffer memory (step 1) before they can be applied (Step 2).

Terminal [hex] - Examples:
Performing direct read and write operations (Modbus High-Low) with the instrument address set to "01". Empty spaces in the example commands are only for a good pattern recognition; Use the commands without spaces.

Reading weight data : 01, 03, 00,00, 00,02, C4,0B
Reading status data : 01, 03, 00,02, 00,01, 25,CA
Reading tare data : 01, 03, 00,03, 00,02, 34,0B
Activating tare : 01, 10, 00,08, 00,01, 02, 00,02, 26,D9

Reading setpoint 1
1.step (load active setpoint 1 to buffer memory) : 01, 10, 00,08, 00,01, 02, 00,07, E6,DA
2.step (read the buffer memory) : 01, 03, 00,0B, 00,02, B5,C9

Loading values “500”, “1000” and “1500” to setpoint 1, 2 and 3

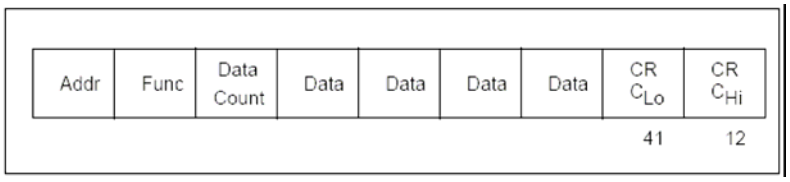
1. step (load designated values to buffer memories) : 01, 10, 00,0B, 00,02, 04, 00,00,01,F4, B2,0B
   01, 10, 00,0D, 00,02, 04, 00,00,03,E8, 32,88
   01, 10, 00,0F, 00,02, 04, 00,00,05,DC, B1,26
2. step (activate buffer memories as setpoints) : 01, 10, 00,08, 00,01, 02, 00,06, 27,1A

- Details of an example: Loading setpoint 1 with value “1500”; STEP1: loading value to buffer memory

01	10	00,0F	00,02	04	00,00,05,DC	B1,26
FT address	Write function	Register address	No. of registers	Data byte count	Data bytes: Value 1500 in hex	CRC checksum

Calculate check sums:

1. Load a 16–bit register with FFFF hex (all 1’s). Call this the CRC register.
2. Exclusive OR the first 8–bit byte of the message with the low–order byte of the 16–bit CRC register, putting the result in the CRC register.
3. Shift the CRC register one bit to the right (toward the LSB), fill a zero into the MSB. Extract and examine the LSB.
4. (If the LSB was 0): Repeat Step 3 (another shift). (If the LSB was 1): Exclusive OR the CRC register with the polynominal value A001 hex (1010 0000 0000 0001).
5. Repeat Steps 3 and 4 until 8 shifts have been performed. When this is done, a complete 8–bit byte will have been processed.
6. Repeat Steps 2 through 5 for the next 8–bit byte of the message. Continue doing this until all bytes have been processed.
7. The final contents of the CRC register is the CRC value.
8. When the CRC is placed into the message, its upper and lower bytes must be swapped as described below.



Attention:

- For hardware connection details please refer to the related hardware descriptions within this manual
- For more Modbus information please refer to the web site http://www.modbus.org

Appendix 5: Profibus DP / ProfiNet Data Structure (FT-11 only)

The output from FT-11 on PLC requests is in **four words** and according to the table below.

FT-11 Output

Bit no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1st Word	W31 MSB	W30	W29	W28	W27	W26	W25	W24	W23	W22	W21	W20	W19	W18	W17	W16
2nd Word	W15	W14	W13	W12	W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	W1	W0 LSB
3rd Word	Error			0	MR	In3	In2	In1	Out3	Out2	Out1	0	Net	MT	Data Ok	Data Integrity
4th Word	Not in use															

Here the first and the second word provide the weight information (32-bit signed integer or 32-bit signed floating point, see chapter 8.4.2 respective 8.5.2; WXX = Weight bit XX; W31 = MSD; W0 = LSD) and the third word is the status as indicated below.

Bit no.	3rd Word	Description in normal operation
15 14 13	Error	000 No error 001 ADC out 010 ADC over 011 ADC under 100 System error 101 FT-11 not in weighing mode
12	Not Used	Always 0
11	MR	Single Range: always 0 | Multi Range: 1. Range = 0 2. Range = 1
10	Digital Input 3	Input bit status (Active = 1)
9	Digital Input 2	
8	Digital Input 1	
7	Digital Output 3	Output bit status (Active = 1)
6	Digital Output 2	
5	Digital Output 1	
4	Not Used	Always 0
3	Net	0: Gross Mode; 1: Net Mode
2	Motion	0: Motion ; 1: No Motion
1	Data Ok	0: Check the error bits; 1: Scale is operating properly
0	Data update in progress	0: PLC should not use the data; 1: use the data (if 0, the instrument was updating the PLC interface shared memory while data was read. The PLC interface should ignore this data and rescan.)

Bit no.	3rd Word	Description during the calibration	
15 … 8	Calibration error	0000 0001	Calibration Timeout – Restart calibration
		0000 0010	ADC Error – Re-energize the instrument – If seen again, change board.
		0000 0011	Instrument cannot be calibrated – Check load cell cable – Re-energize the instrument
		0010 0010	Instrument cannot be calibrated – Load cell signal is too low or too high
		0010 0011	Calibration Error – Calibration test weight is too small, increase calibration weight – Check load cell connections
		0010 0101	Scale unstable – Wait until scale becomes stable – Check grounding wiring
		0010 0110	Calibration Jumper is not installed- Check Calibration jumper
7...0	Calibration status	0000 0001	Ready for calibration
		0000 0011	Zero calibration in process
		0000 0100	Span calibration in process
		0000 1001	Calibration error (see bit 15...8)

Any input to FT-11 is in **four words** and according to the table below.

FT-11 Input

Bit no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1st Word	W31 MSB	W30	W29	W28	W27	W26	W25	W24	W23	W22	W21	W20	W19	W18	W17	W16
2nd Word	W15	W14	W13	W12	W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	W1	W0 LSB
3rd Word	0	0	0	0	SP3	SP2	SP1	0	Zero	Tare	Print	CLR	Select			
4th Word	Not in use															

Here the first and the second word describe the value received from the PLC and the third word the meaning of the first two words as indicated below.

Bit no.	3rd Word	Description
12-15	Not Used	Always 0
11	Setpoint 3	A transition from 0 to 1 activates the command. The value of the first and second word is loaded to the corresponding setpoint.
10	Setpoint 2	
9	Setpoint 1	
8	Not used	Always 0
7	Zero	A transition from 0 to 1 activates the command.
6	Tare	
5	Print	
4	Clear	
3 2 1 0	Select	0000 Gross Weight 0001 Displayed Weight 0010 Net Weight 0011 Tare Weight 0100 Setpoint 1 (not continuous) 0101 Setpoint 2 (not continuous) 0110 Setpoint 3 (not continuous) 0111 Latest alibi record no. (always 32-bit integer) 1000 Latest alibi gross weight 1001 Latest alibi tare weight 1010 Zero calibration and calibration status (see table above) 1011 Calibrate span and and calibration status (see table above) First write the calibration weight value in 1st and 2nd Word 1100 Only calibration status (see table above) 1010 Zero calibration and calibration status (see table above) 1011 Calibrate span and and calibration status (see table above)First write the calibration weight value in 1st and 2nd Word 1100 Only calibration status (see table above)

Appendix 6: CANopen Data Structure (for FT-11 only)

The output from FT-11 on PLC requests is in **two double words** and according to the table below.

FT-11 Output

Bit no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
TxPDO 1 (T_DW1)	W31 MSB	W30	W29	W28	W27	W26	W25	W24	W23	W22	W21	W20	W19	W18	W17	W16
	W15	W14	W13	W12	W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	W1	W0 LSB
TxPDO 2 (T_DW2)	Error			0	MR	In3	In2	In1	Out3	Out2	Out1	0	Net	MT	Data Ok	Data Integrity
	Not in use															

Here T_DW1 provides the weight information (32-bit signed integer or 32-bit signed floating point, see chapter 8.6.2; WXX = Weight bit XX; W31 = MSD; W0 = LSD) and T_DW2 provides the status as indicated below.

Bit no.	TxPDO 2 (T_DW2)	Description
31...29	Error	000 No error 001 ADC out 010 ADC over 011 ADC under 100 System error 101 FT-11 not in weighing mode
28	Not used	Always 0
27	Multi range (MR)	Single range: always 0 | Multi range: 0 = 1. Range / 1 = 2. Range
26	Digital input 3	Status input bit (1 = active)
25	Digital input 2	
24	Digital input 1	
23	Digital output 3	Status output bit (1 = active)
22	Digital output 2	
21	Digital output 1	
20	Not used	Always 0
19	Net	0: Gros mode; 1: Net mode
18	Motion	0: No motion; 1: Motion
17	Data Ok	0: Check the error bits; 1: Scale is operating properly
16	Data update in progress	0: PLC should not use the data; 1: use the data (if 0, the instrument was updating the PLC interface shared memory while data was read. The PLC interface should ignore this data and rescan.)
15...0	Not used	Always 0

Bit no.	T_DW2	Description during the calibration	
15 … 8	Calibration error	0000 0001	Calibration Timeout – Restart calibration
		0000 0010	ADC Error – Re-energize the instrument – If seen again, change board.
		0000 0011	Instrument cannot be calibrated – Check load cell cable – Re-energize the instrument
		0010 0010	Instrument cannot be calibrated – Load cell signal is too low or too high
		0010 0011	Calibration Error – Calibration test weight is too small, increase calibration weight – Check load cell connections
		0010 0101	Scale unstable – Wait until scale becomes stable – Check grounding wiring
		0010 0110	Calibration Jumper is not installed- Check Calibration jumper
7...0	Calibration status	0000 0001	Ready for calibration
		0000 0011	Zero calibration in process
		0000 0100	Span calibration in process
		0000 1001	Calibration error (see bit 15...8)

Any input to FT-11 is in **two double words** and according to the table below.

FT-11 Input

Bit no.	D31 MSB	D30	D29	D28	D27	D26	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0 LSB
RxPDO 1 (R_DW1)	W31 MSB	W30	W29	W28	W27	W26	W25	W24	W23	W22	W21	W20	W19	W18	W17	W16
	W15	W14	W13	W12	W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	W01	W00 LSB
RxPDO 2 (R_DW2)	0	0	0	0	SP3	SP2	SP1	0	Zero	Tare	Print	CLR	Select			
	Not used															

Here R_DW1 provides the value received from the PLC and R_DW2 describes the meaning of this value as indicated below.

Bit Nr.	RxPDO2 (R_DW2)	Description
31...28	Not used	Always 0
27	Setpoint 3	A transition from 0 to1 activates the command. The value of the first and second word is loaded to the corresponding setpoint.
26	Setpoint 2	
25	Setpoint 1	
24	Not used	Always 0
23	Zero	A transition from 0 to1 activates the command.
22	Tare	
21	Print	
20	Clear	
19...16	Select	0000 Gros weight 0001 Displayed weight 0010 Net weight 0011 Tara weight 0100 Setpoint 1 (not continuous) 0101 Setpoint 2 (not continuous) 0110 Setpoint 3 (not continuous) 0111 Latest alibi record no. (always 32-bit integer) 1000 Latest alibi gross weight 1001 Latest alibi tare weight 1010 Zero calibration + Calibration status (see table above) 1011 Span calibration + Calibration status (see table above); First write the calibration weight value in R_DW1 1100 Calibration status (see table on page 50)
15...0	Not used	Always 0

Appendix 7: Error Table

The FT-11 and FT-11D weight indicators have been designed as very reliable and virtually error free instruments. However if an error occurs do not attempt to repair the equipment before you understand what caused the error. Note the problems you have with your instrument and the error messages shown on the display. Then try to solve the problem according to the error table given below.

Error Code	Description	Actions to take / Possible cause	FT-11	FT-11D
Under	Weight is too low	Check the load;	x	x
Over	Over Load	Load cell or instrument could be defective	x	x
Adc Out	Input signal outside the input range	Check the load; Check the calibration; Load cell or instrument could be defective	x	
E E E	Load not within zero range	See parameter [202] in chapter 6.4	x	x
Err 1	ADC error respective	Re-energize indicator; Contact FLINTEC	x	
Err 2	Calibration error	Adjust DLC eccentricity; Parameter [320]		x
Err 3	Indicator cannot get calibrated	Check load cell and load; Repeat the calibration	x	x
Err 10	EEPROM error	Configure the instrument; EEPROM defective	x	x
Err 20	Calibration error	Calibrate the indicator	x	x
Err 21	Configuration error	Configure the indicator	x	x
Err 22	Tare, CN, Total weight and the SP, PT and ID in use error	Check SP, PT and ID entries; Check Tare, CN and Total weight	x	x
Err 23	Header Error	Reload the header	x	x
Err 24	Footer Error	Reload the footer	x	x
Err 26	Setpoint error	Reload setpoints	x	x
Err 27	Indicator is not calibrated	Calibrate the indicator	x	x
Err 30	Processor Error	Contact FLINTEC	x	x
Err 34	Indicator cannot get calibrated	Load cell signal is negative , very low or too high	x	x
Err 35	Calibration Error	Calibration test weight is too small; Check load cell connections	x	x
Err 37	Scale unstable	Wait until scale becomes stable; Check ground connection	x	x
Err 39	Corner coefficient error	Check DLC addressing (chapter 6.2) and check the mechanical installation of the load cells		x
Err 40	Alibi memory error	Correct parameter [801]; Alibi memory card broken	x	x
Err 41	New alibi card installed	Appears when new alibi memory card is installed	x	x
Err 42	Alibi card serial no. is not identical	(*)	x	x
Err 43	Alibi card serial no. is not identical, no print operation will be performed	Identify the alibi memory card to the indicator (*)	x	x
Err 44	Alibi card info error	Contact FLINTEC	x	x
Err 46	Alibi recording capacity error		x	x
Err 47	Info error from weighing board		x	x
Err 50	DLC board not detected	Re-energize indicator; Replace DLC board		x
Err 61	U10 (eeprom) is not installed	Contact FLINTEC	x	x
E XXXX	Hardware error	Contact FLINTEC	x	x
Ed1 yy **	Communication time out	Check DLC (RS-485) hardware; Check DLC cables;		x
Ed2 yy **	Checksum error	Check DLCs and serial number; Contact FLINTEC		x
Ed3 yy **	DLC error	Check ambient temperature; Replace DLC		x
Ed4 yy **	DLC is under	Check mechanical installation and DLC		x
Ed5 yy **	DLC is over			x
Ed6 yy **	DLC communication error	Check DLC (RS-485) hardware; Re-energize indicator; Re-define DLC address		x
Ed7 yy **	DLC address and SN matching error	Check serial number; Re-define DLC address; Replace DLC		x
Ed0 yy **	DLC status error	Replace DLC		x

* see chapter 6

** yy = number of DLC

Appendix 8: Parameter's Default Table

Parameter		Factory defaults	FT-11	FT-11D
0--	**Interface**		x	x
00-	**Serial Interface 1**		x	x
0	Data format	2 = Printer	x	x
1	Baud rate	3 = 9600	x	x
2	Handshake	0 = Disable	x	x
3	Address	0	x	x
4	Data length and parity	0 = 8 bit, no parity	x	x
5	Checksum	1 = Enable	x	x
01-	**Serial Interface 2**		x	x
10	Data format	0 = Disable	x	x
11	Baud rate	3 = 9600	x	x
12	Handshake	0 = No	x	x
13	Address	0	x	x
14	Data length and parity	0 = 8 bit, no parity	x	x
15	Checksum	1 = Enable	x	x
02-	**Serial Interface 3**		x	x
20	Data format	0 = Disable	x	x
21	Baud rate	3 = 9600	x	x
22	Handshake	0 = Disable	x	x
23	Address	0	x	x
24	Mode	0 = RS232C	x	x
25	Data length and parity	0 = 8 bit, no parity	x	x
26	Checksum	1 = Enable	x	x
03-	**Ethernet / Profibus / ProfiNet / CANopen**		x	
30	Ethernet data format	0 = Disable	x	
31	Ethernet address	0	x	
32	Profibus data format	0 = 32-bit integer	x	
33	Profibus adress	0	x	
34	CANopen data format	0 = 32-bit integer	x	
35	CANopen Adresse	0	x	
36	ProfiNet data format	0 = 32-bit integer	x	
04-	**Printer**		x	x
40	Print out format	2 = Multi line	x	x
42	CN (Consecutive number)	1 = Will be printed	x	x
45	Minimum print	20 kg	x	x
46	Print control	0 = With Print Key	x	x
47	Line feed	11 = 1 LF + 1 LF	x	x
48	Form feed	0 = No	x	x
49	Quantity of copies	1	x	x
1--	**Configuration**		x	x
11-	**Start Up**		x	x
111	Auto power off	0 = Disable	x	x
112	Store Tare at power off	0 = Disable	x	x
113	Auto tare clear	0 = Disable	x	x
114	Buzzer active?	0 = Disable		
115	Key lock	0 = Disable	x	
12-	**Filter**		x	x
120	Filter	FT-11: 7 / FT-11D: 0	x	x
13-	**Digital I/0**		x	x
130	Outputs	0 = Disable	x	x
131	Input 1	0 = Disable	x	x
132	Input 2	0 = Disable	x	x
133	Input 3	0 = Disable	x	x
14-	**Entries**		x	x
142	Label no. entry		x	x

Parameter		Factory defaults	FT-11	FT-11D
2--	**Scale Parameters**		x	x
20-	**Set up**		x	x
200	Approved	0 = No	x	x
201	Increased indication	0 = With x10 key	x	x
202	Power on zero	2 = ± %10	x	x
203	Zero with key	1 = ± %2	x	x
204	Auto zero tracking	0 = Disable	x	x
205	Tare	1 = With Tare Key	x	x
206	Motion detector	1 = ± 0,5e	x	x
207	Tilt switch	0 = Disable	x	
208	Stability time	0.0 s	x	
21-	**Scale Build**		x	x
210	Scale Type	0 = Single Range	x	x
211	Capacity 1 / d1		x	x
212	Capacity (2) / d(2)	6 kg / 1 g	x	x
22-	**DLC Configuration Block**			x
220	DLC Type	0 = Flintec RC3D		x
221	Quantity of DLC	1		x
222	DLC Address			x
3--	**Calibration / Adjustment**		x	x
30-	**Calibration**		x	x
300	Gravity		x	
301	Calibration		x	x
31-	**Adjustment**		x	x
310	Zero adjustment		x	x
311	Span adjustment		x	x
312	Span adjustment under load		x	
313	ecal		x	x
32-	**Eccentricity Adjustment**			x
320	Adjustment Method	0 = independend DLC		x
321	Auto Adjustment			x
322	Manual Adjustment			x
323	Temporarily set constants to “1”	0 = normal operation		x
4--	**Analogue Output**		x	
40-	**Signal Selection**		x	
400	Analogue Output Signal Type		x	
41-	**Zero Adjustment**		x	
410	Coarse Zero Adjustment		x	
411	Fine Zero Adjustment		x	
42-	**Span Adjustment**		x	
420	Coarse Span Adjustment		x	
421	Fine Span Adjustment		x	
8--	**Metrological Data**		x	x
80-	**Legal Metrology**		x	x
800	Calibration counter		x	x
801	Alibi memory		x	x
802	Calling a record		x	x
803	Print Alibi memory		x	x
804	Alibi memory information		x	x
9--	**Diagnostics**		x	x
90-	**Tests**		x	x
900	Key Pad test		x	x
901	Serial interface 1 test		x	x
902	Digital input test		x	x
904	mV indication		x	
905	DLC internal count			x
91-	**Serial numbers**		x	x
910	FT-1x serial no.		x	x
911	Option 1 serial no. (if installed)		x	x
912	Option 2 serial no. (if installed)		x	x
913	Option 3 serial no. (if installed)		x	x
97-	**Calibration coefficients**		x	x
97X	Calibration coefficients		x	x
99-	**Print Parameters**		x	x
990	All parameters		x	x
991	Load default parameters		x	x

Appendix 9: Calibration Table

The n = maximum capacity / e values are given in the table below.
Use this table for selecting your Max and e values.

SCALE INTERVAL (e)	NUMBER OF SCALE INTERVAL (n)																							
	1000	2000	2400	2500	3000	4000	5000	6000	8000	10000	12000	15000	16000	20000	25000	30000	40000	50000	60000
0,001	1	2			3	4	5	6	8	10	12	15	16	20	25	30	40	50	60
0,002	2	4		5	6	8	10	12	16	20	24	30	32	40	50	60	80	100	120
0,005	5	10	12		15	20	25	30	40	50	60	75	80	100	125	150	200	250	300
0,01	10	20	24	25	30	40	50	60	80	100	120	150	160	200	250	300	400	500	600
0,02	20	40	48	50	60	80	100	120	160	200	240	300	320	400	500	600	800	1.000	1.200
0,05	50	100	120	125	150	200	250	300	400	500	600	750	800	1.000	1.250	1.500	2.000	2.500	3.000
0,1	100	200	240	250	300	400	500	600	800	1.000	1.200	1.500	1.600	2.000	2.500	3.000	4.000	5.000	6.000
0,2	200	400	480	500	600	800	1.000	1.200	1.600	2.000	2.400	3.000	3.200	4.000	5.000	6.000	8.000	10.000	12.000
0,5	500	1.000	1.200	1.250	1.500	2.000	2.500	3.000	4.000	5.000	6.000	7.500	8.000	10.000	12.500	15.000	20.000	25.000	30.000
1	1.000	2.000	2.400	2.500	3.000	4.000	5.000	6.000	8.000	10.000	12.000	15.000	16.000	20.000	25.000	30.000	40.000	50.000	60.000
2	2.000	4.000	4.800	5.000	6.000	8.000	10.000	12.000	16.000	20.000	24.000	30.000	32.000	40.000	50.000	60.000	80.000	100.000	120.000
5	5.000	10.000	12.000	12.500	15.000	20.000	25.000	30.000	40.000	50.000	60.000	75.000	80.000	100.000	125.000	150.000	200.000	250.000	300.000
10	10.000	20.000	24.000	25.000	30.000	40.000	50.000	60.000	80.000	100.000	120.000	150.000	160.000	200.000	250.000	300.000	400.000	500.000	600.000
20	20.000	40.000	48.000	50.000	60.000	80.000	100.000	120.000	160.000	200.000	240.000	300.000	320.000	400.000	500.000	600.000	800.000		
50	50.000	80.000 100.000	120.000	125.000	150.000	200.000	250.000	300.000	400.000	500.000	600.000	750.000	800.000						
100	100.000	200.000	240.000	250.000	300.000	400.000	500.000	600.000	800.000										
200	200.000	400.000	480.000	500.000	600.000	800.000													

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