Eilersen
The Weighing Experts

5024G Reference Manual FFEx-Scale

5024G LCD weighing terminal

FFEx scale with 2070 PROFINET communication

Software: FFEx-Scale.240430.1v4

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Contents

Introduction

This document describes the use of a 5024G LCD display terminal from Eilersen Electric, when the software version listed on the front page is installed.

The document act as a reference manual containing users guide, intelligent setup description and description of possible PROFINET communication with PLC using the external module option with a 2070 PROFINET module.

Installation

The following steps must be performed before the system is used:

- Install the load cells and check mechanical installation
- Optional: Connect digital outputs and digital inputs
- Connect and apply power
- Check software version
- Optional: Activation of Intelligent Setup feature
- Set up load cell configuration
- Power cycle the unit
- Configure weighing ranges
- Perform coarse taring
- Optional: Configure update rates, filtering, zero tracking range, stability requirement
- Optional: Corner calibration, system calibration, linearization
- **Perform load check**

Please notice: Perform a load check before the system is used to be sure that all requirements regarding accuracy, stability etc. are met before the system is used.

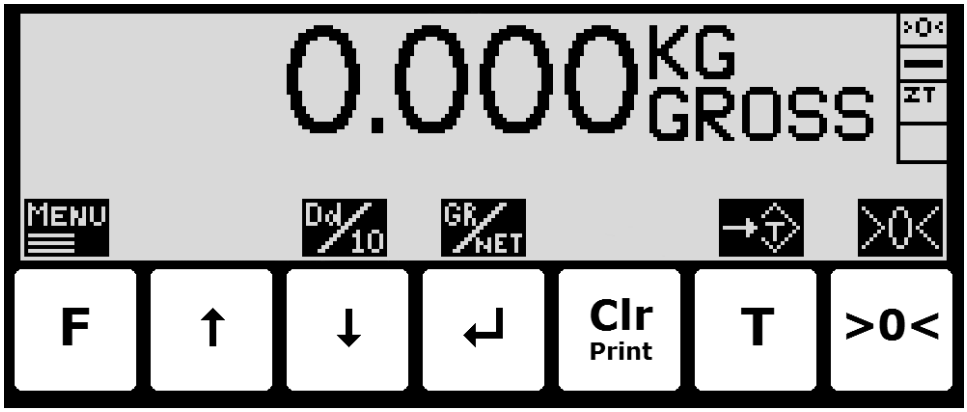
Please notice: If the Intelligent Setup feature is used, this will perform some of the subsequent points in the above list.

Details on the steps needed to install the system are explained below.

How to

– Perform basic operations

When the system is installed and power-up sequence has ended the display will look like this:



Weight reading:

- The actual weight reading is displayed in large types.
- To the right of the weight reading, the unit is indicated, like **KG**, **LB** etc.
- Below the unit gross/net selection is indicated with **GROSS** or **NET**.
- If an error condition is present the weight reading will indicate the error, like **UL**, **OL**, **- 0080 –** etc. Please see below in section *Trouble shooting*, page 31 for details on error codes and how to recover from various error situations.

Status indications:

- **'>0<'** in the upper right corner status field indicates that the actual gross weight is zero (within ± ¼ division).
- **'--'** in the second status field indicates that the weight reading is steady/stable. If the reading is unstable **'~'** will be indicated.
- **'ZT'** in the third status field indicates that a zero tracking device is active, holding the actual gross weight at zero.

Please notice: If none of the icons directly above the keys are visible as shown in the screen shot above, the keyboard is locked, since the **Keyboard unlock length** parameter in the **SETUP SYSTEM** screen has been activated. As long as the keyboard is locked, no keyboard actions will be available. Please see below in section - *Unlock the keyboard*, page 8 on how to unlock the keyboard.

Keys/actions:

F	Invoke the **MAIN** menu.
↑	Not used.
↓	Displays weight with enhanced resolution for 3 seconds. The "**Dd/10**" symbol above the key will flash when enhanced resolution is shown.
↵	Switch between Gross and Net reading.
T	Sets the net weight to zero and select Net reading.
>0<	Sets the gross weight to zero and select Gross reading.

– Operate the menu system

The installation and service of the system is operated by a series of menus and screens. Please see below in section *Appendix E – Screen overview,* page 57, for an overview on all screens. When using setup and maintenance screens these keys are used:

- F — Select a menu depending on the actual screen.
- ↑ — Increase a value, select previous parameter or move cursor up in a menu.
- ↓ — Decrease a value, select next parameter or move cursor down in a menu.
- ↵ — Select entry or accept of a value, or select an action from a menu.
- Clr Print — Return to previous screen. Exit menu without action.

Please notice: Parameters cannot be changed and actions not performed when the system is powered on. Before such operations are possible the parameters must be unlocked as explain below in section - *Unlock for parameter update*, page 8.

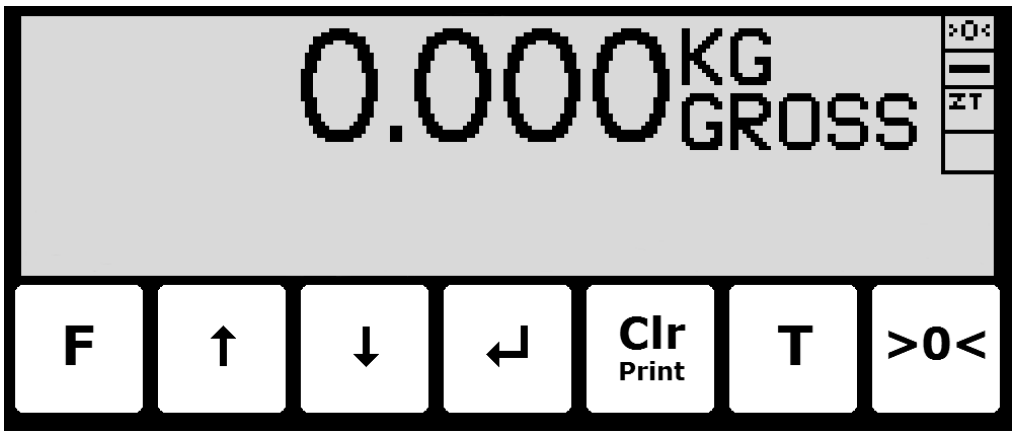
– Set date and time

It is possible to set the date and/or time of the internal clock by use of the **SETUP** menu. To set date and/or time from the **SETUP** screen perform the following:

- F — Press once to select the **SETUP** menu.
- ↓ — Press several times to select the "**SET DATE**" or "**SET TIME**" entry from the **SETUP** menu.
- ↵ — Press once to start entry of the selected parameter (date or time).

- Unlock the keyboard

The terminal is equipped with a keyboard lock feature, which can be enabled or disabled using the **Keyboard unlock length** parameter in the **SYSTEM** screen as described below. If the keyboard lock is disabled, then the keyboard functions will always be active. If the keyboard lock is enabled, and the terminal is in the **NORMAL** screen without any key activation for 10 minutes (or directly after power-on), the keyboard will automatically lock. When the keyboard is locked, the **NORMAL** screen will appear as follows without any icons above the keys:



To unlock the keyboard:

- Press any key to start the keyboard unlock sequence.
- Press the indicated keys one at a time until the required sequence (specified by the **Keyboard unlock length** parameter) is completed without error.

Please notice: This feature is disabled by setting the **Keyboard unlock length** parameter in the **SYSTEM** screen to 0. Any other value specifies the length of the key sequence that must be pressed correctly to unlock a locked keyboard.

- Unlock for parameter update

Parameters cannot be changed and actions not performed when the system is powered on. Before such operations are possible the parameters must be unlocked:

- Press [F] to invoke the menu system.
- Press [↓] to highlight the **SERVICE MODE** menu item.
- Press [↵] to select the **SETUP** screen.
- Press [F] to invoke the menu where the **SYSTEM** menu item is highlighted.
- Press [↵] to select the **SYSTEM** screen.
- Press [↓] to highlight the **Parameters** entry.
- Press [↵] to select the **ENTER UNLOCK PARAM** parameter entry.
- Enter the password 1357 and press [↵]. Parameters are now unlocked and can be changed. Press [Clr Print] once to return to the **SETUP** screen or twice to return to the **NORMAL** screen. Please see below in section – *Enter values,* page 9, for details on how to enter values (like the password).

The status automatically returns to **LOCKED** after 5 minutes without keyboard activity in **NORMAL** screen or when the terminal is power-cycled.

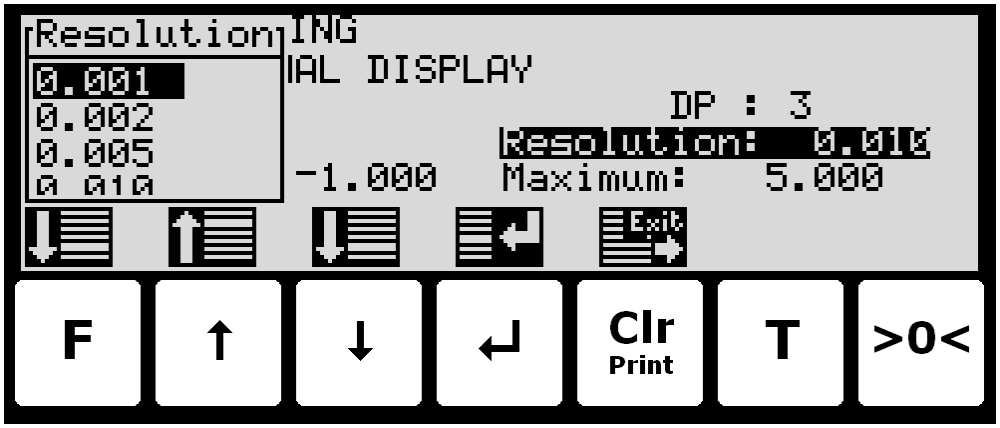
– Enter values

Perform these steps to enter a new parameter value:

- Unlock parameters as described in the above section.
- Use the menus to select the screen where the value is displayed.
- Use [↑] and/or [↓] to highlight the parameter.
- Press [↵] to start entering a new value.

Entry using selection list

Some parameters (such as resolution and decimal point position) are entered using a selection list. When change of this type of parameter is requested, a special pull-down menu will appear with a list of possible values as shown:



The keys can be used as follows:

- F — Move the cursor down in this selection list.
- ↑ — Move the cursor up in this selection list.
- ↓ — Move the cursor down in this selection list.
- ↵ — Accept the selected/marked value as the new desired value.
- Clr Print — Abort the entry without change of parameter. This can also be done by selecting the “CANCEL” entry form the selection list.

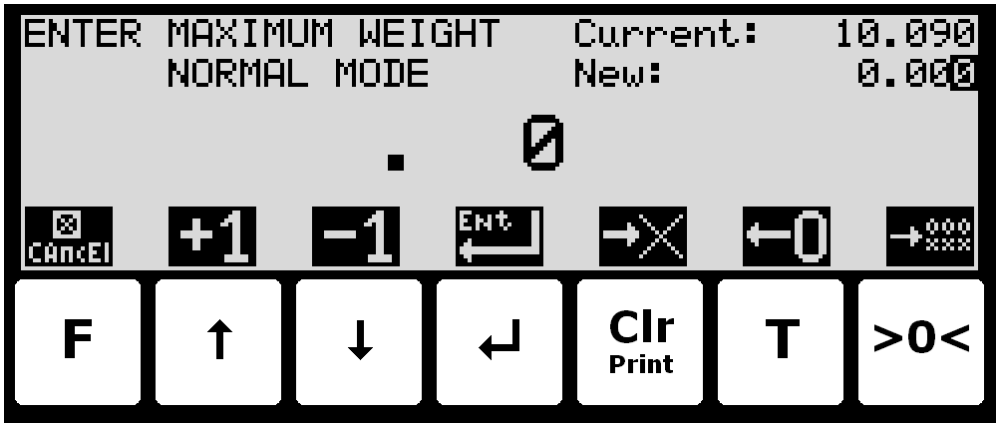
Example - Changing resolution from 0.050 to 0.010:

The screen shown above appears once change of resolution is requested from the **SETUP WEIGHING** screen by moving the cursor using ↑ and ↓ so the **Resolution** parameter is selected and then pressing ↵. In order to change the “Resolution” parameter to 0.010 perform the following:

- Press ↑ and/or ↓ repeatedly until **0.010** is selected in the list.
- Press ↵ to accept the selection.

Entry of numbers

Some parameters (such as minimum and maximum weight of the weighing range) are entered using a data entry screen. When change of this type of parameter is requested, a data entry screen will appear. Please note the layout of the data entry screen may vary slightly depending on the actual parameter to be changed. The data entry screen could look as shown:



The actual parameter changed is indicated in the upper left part of the display. The current parameter value and the currently entered value is shown in the upper right part of the display. The currently entered value is also shown in the middle of the display in large font.

The keys can be used as follows:

- [F] Abort the entry without change of parameter.
- [↑] Increase the value of the digit currently being entered (digit to the right).
- [↓] Decrease the value of the digit currently being entered (digit to the right).
- [↵] Accept the entered value as the new desired value.
- [Clr] Delete rightmost digit and moves all remaining digits one position to the right.
- [T] Move digits one position to the left and inserts a zero on the rightmost position. This new digit can subsequently be changed using [↑] and [↓].
- [>0<] Clears all entered digits setting them to zero as if the data entry screen has just been entered.

When entering a value the digits are entered left to right. This means that leftmost digit is entered first. The active digit is changed by [↑] and [↓]. When the correct value is entered press [T] to advance to the next digit. If an error is made, press [Clr] to return to the previous digit. When the complete value is entered press [↵] to accept it. To abort without any changes press [F].

Example - Changing maximum weight from 10.000 to 10.090:

The screen shown above appears once change of maximum weight is requested from the **SETUP WEIGHING** screen by moving the cursor using [↑] and [↓] so the "Maximum" weight parameter is selected and then pressing [↵].

In order to change the "Maximum" weight parameter to 10.090 perform the following:

[↑]	Press once until	" . 1" is shown in the display.
[T]	Press three times until	" 1.000" is shown in the display.
[↓]	Press once until	" 1.009" is shown in the display.
[T]	Press once until	" 10.090" is shown in the display.
[↵]	Press to accept	" 10.090" as the new desired value.

Example - Changing minimum weight from -1.000 to -0.090:

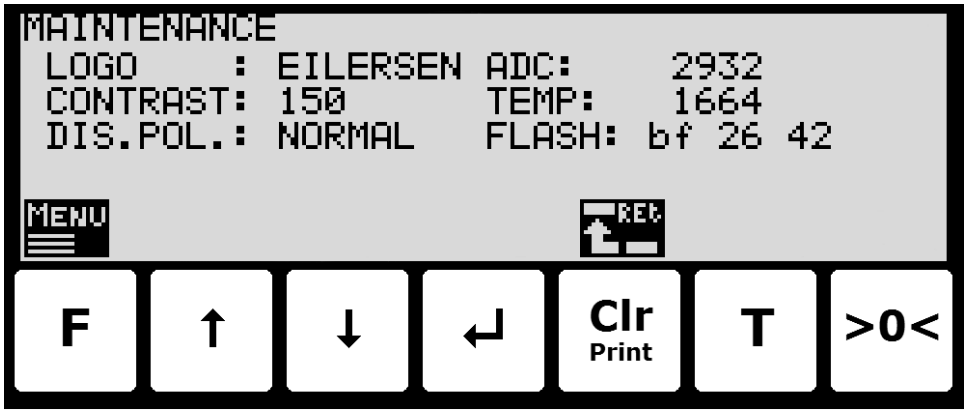
A similar screen to the screen shown above appears once change of minimum weight is requested from the **SETUP WEIGHING** screen by moving the cursor using [↑] and [↓] so the "Minimum" weight parameter is selected and then pressing [↵].

In order to change the "Minimum" weight parameter to -0.090 perform these steps:

[↓]	Press once until	"- . 9" is shown in the display.
[T]	Press once until	"- . 90" is shown in the display.
[↵]	Press to accept	"- 0.090" as the new desired value.

– Change display contrast

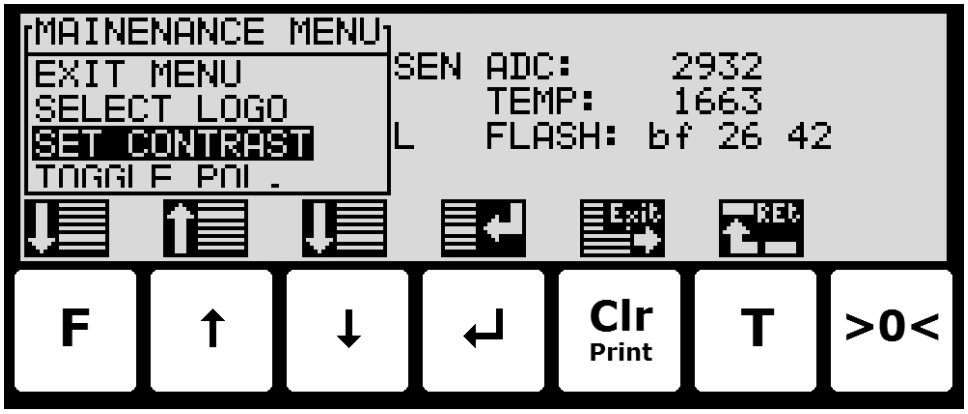
The display contrast can be changed from the **MAINTENANCE** screen, that is shown here:



From the **MAINTENANCE** screen the actual display contrast value can be read.

To change the display contrast value from the **MAINTENANCE** screen perform the following:

- Press [F] to invoke the **MAINTENANCE** menu.
- Press [↓] to select the **SET CONTRAST** menu item.
- Press [↵] to start entering the new display contrast value.



PLEASE NOTICE:

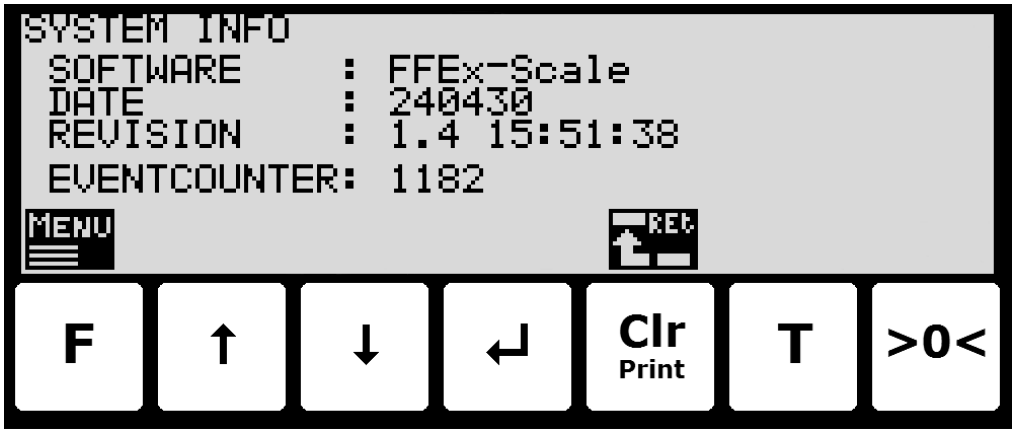
- In most software versions it is not necessary to enter the password before changing the display contrast.
- In order to prevent a too dark/light display and thus unreadable, the contrast value should be changed in small steps (i.e. +/- 10) in the right direction (larger value => darker display).

– Check the software version

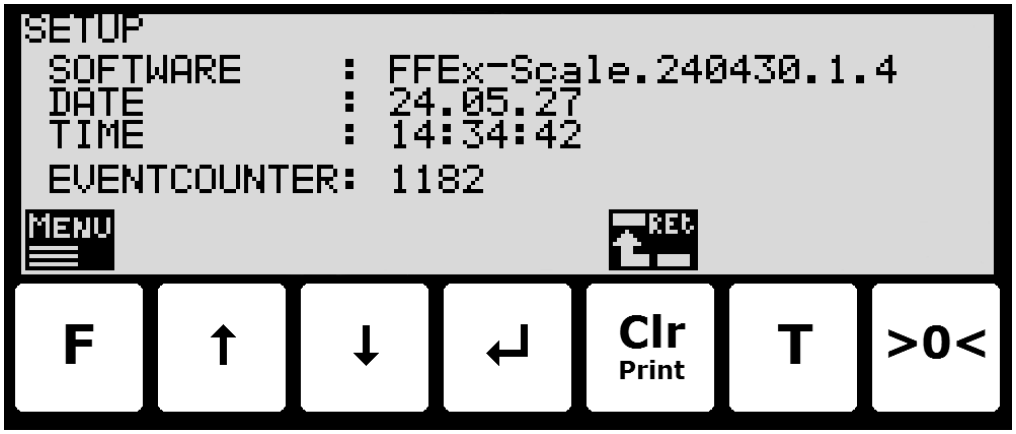
The software version can be checked during the power-on sequence or in the **SYSTEM INFO** or **SETUP** screen. When power is applied to the system, the following will happen:

- The display will show the logo for 5 seconds.
- The display will show the software version (software name, date and revision).
- The weighing terminal is ready and enters the **NORMAL** screen.

Select the **SYSTEM INFO** screen to read the software version (software name, date and revision):



The **SETUP** screen also shows the software version (software name, date and revision):



– Activate Intelligent Setup

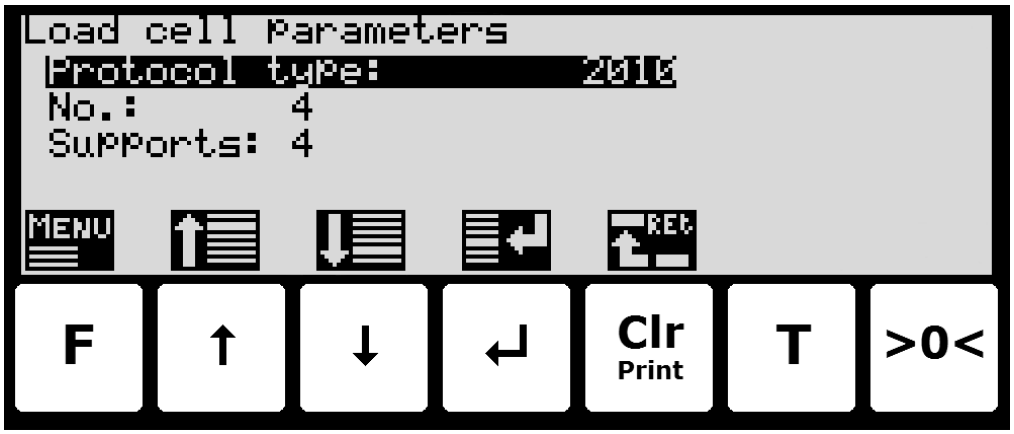
With reference to installation of the weighing system, the weighing terminal has a build-in intelligent setup feature, that automatically comes with suggestions to configuration of the weighing technical parameters. If this feature is to be used, it can be activated/started by performing the following:

- From the **NORMAL** screen press [F] to activate the menu system, and select **SERVICE MODE** menu item to enter the **SETUP** screen.
- From the **SETUP** screen press [F] to activate the menu system, and select **SYSTEM** menu item to enter the **SETUP SYSTEM** screen.
- Unlock the parameters for change by entering the password as described earlier.
- Press [F] to activate the menu system, and select **INTELLIGENT SETUP** menu item to enter the **INTELLIGENT SETUP** screen.
- **NOTE:** Refer to the 'Intelligent Setup' chapter for further information regarding this feature.

– Set up the load cell configuration

To set up the load cell communication protocol type, number of load cells and supports please follow these steps:

- From the **NORMAL** screen select the **SERVICE MODE** menu item to reach the **SETUP** screen.
- From the **SETUP** screen select the **WEIGHING** menu item to reach the **SETUP WEIGHING** screen.
- From the **SETUP WEIGHING** screen select the **LOAD CELLS** menu item to reach the **Load cell parameters** screen.
- Enter the correct values for load cell communication protocol type, number of load cells and supports, or detect this automatically from the menu.
- **Please notice:** The terminal must be power-cycled and the load cells must be connected before changes take effect!



Load cell communication protocol type

The weighing terminal can be connected to and communicate with different kinds of load cells from Eilersen Electric. Depending on load cells and how they are connected, the weighing terminal can communicate with the load cells using the following load cell protocols:

- **2010:** Load cells connected using MCE2010 (StdBB protocol).
- **401x:** Load cells connected using 4015 connection module.
- **4x40-StdBB:** Load cells connected using 4x40 unit (StdBB protocol).
- **4x40-StdLC:** Load cells connected using 4x40 unit (StdLC protocol).

Please notice: Therefore, selection of protocol type must also take into consideration, the software version in the used load cell modules (MCE2010/4x40).

Number of load cells

The weighing terminal can be connected to a maximum of 16 load cells.

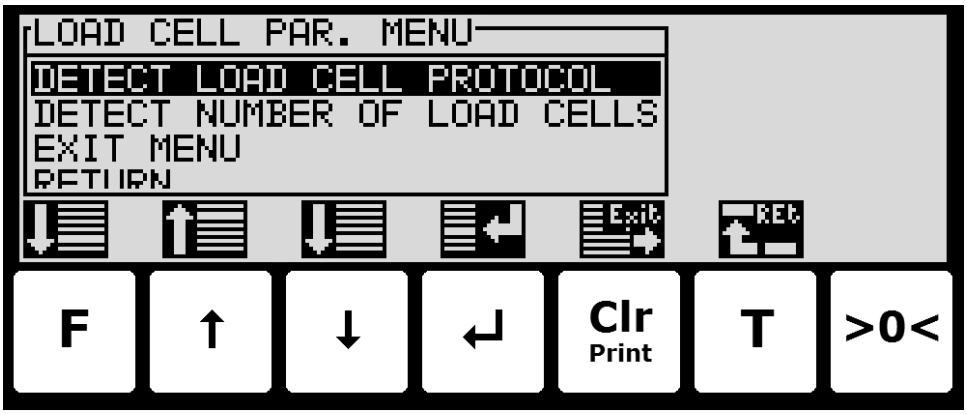
Number of supports

The actual number of supporting points must be in the range 1-16. Note that it is the total number of supporting points including corners supported by load cells. As an example, the **Supports** parameter should be 3 in a system consisting of a three legged tank.

– Detect the load cell configuration

To detect load cell protocol, number of load cells and number of supports the following is performed:

- Use the screens and menu system to select the **LOAD CELLS** screen.
- Press [F] to invoke the **LOAD CELL PAR.** menu.
- Press [↓] to select the **DETECT LOAD CELL PROTOCOL** or **DETECT NUMBER OF LOAD CELLS** menu item.
- Press [↵] to perform the selected action, and follow the instructions in the following screens.



Please notice: The load cells must be connected for the above detection to work correctly.

– Configure the weighing ranges

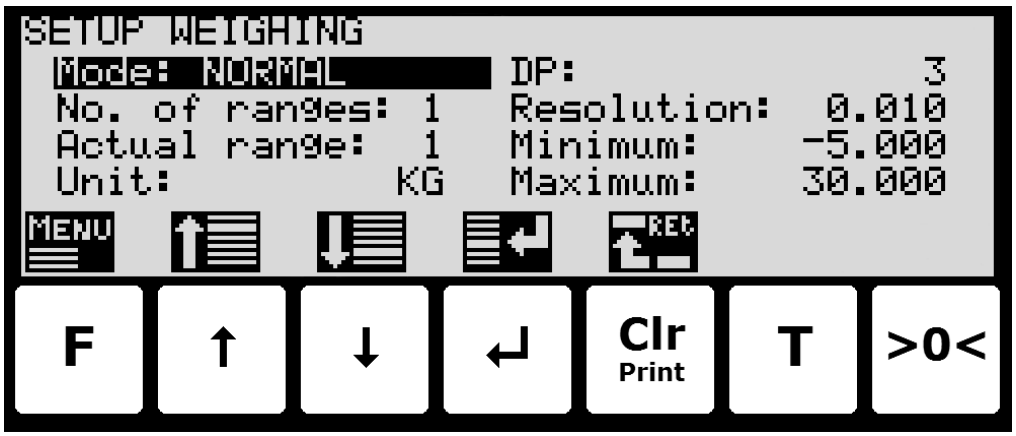
The weighing terminal is equipped with three different weighing range modes that specify the weighing range used for:

NORMAL: Weight readings during normal display reading.

CALIBRATION: Weight readings during calibration and enhanced/high resolution weight display.

PROTOCOL: Weight readings transferred using communication protocols.

Using the screens and menu system as described above in section *Operate the menu system*, page 8 select the **WEIGHING** screen to configure the three weighing ranges:



Weighing range modes

The weighing range mode can be selected from the **WEIGHING** screen. The weighing range mode is changed by using [↑] and [↓] to select the **Mode** parameter with the cursor, and then pressing [↵] to request change of **Mode** parameter using a selection list as described earlier.

When configuring weighing ranges as described below, values shown as well as changes made only apply to the currently selected weighing range/interval specified by the **Mode** parameter and the actual weighing range/interval (selected using the **Actual range** parameter), when the terminal is configured as a multi-interval scale (using the **No. of ranges** parameter).

Multi-interval weighing ranges

The weighing terminal can be configured as a multi-interval scale. The number of weighing ranges/intervals in the scale is selected using the **No. of ranges** parameter. The number of ranges/intervals can be set from 1 to 5. If more than 1 range/interval is selected for the scale, the weighing ranges have to be specified/entered for each/all of the intervals/ranges in each of the three different weighing range modes (**NORMAL** , **CALIBRATION** and **PROTOCOL**).

The **Actual range** parameter is used to select the different ranges/intervals in each of the three different weighing range modes of the weighing terminal.

When configuring weighing ranges as described below, values shown as well as changes made only apply to the currently selected weighing range/interval specified by the **Mode** parameter and the **Actual range** parameter.

Procedure for weighing range configuration

An appropriate weighing range can be configured from the **WEIGHING** screen. A specific weighing range is changed by using [↑] and [↓] to select a weighing range parameter with the cursor, and then pressing [↵] to request change of the given parameter. The following weighing range parameters need to be configured individually for each of the three specific weighing range modes (**NORMAL** , **CALIBRATION** and **PROTOCOL**) and for each of the weighing ranges/intervals (1-5) when the weighing terminal is configured as a multi-interval scale using the **No. of ranges** parameter:

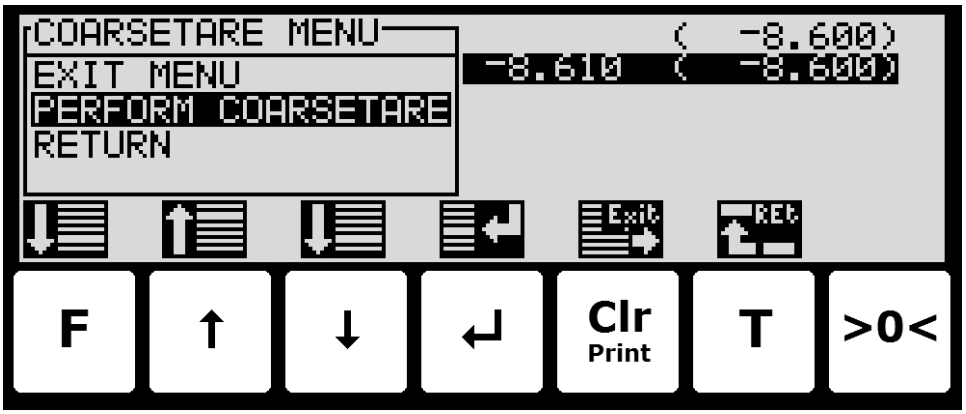
1) **Unit** is selected using a selection list as described earlier. In multi-interval scales this parameter is shown and must be selected for all the ranges/intervals available. The **Unit** for each range/interval must be set to the same unit.
2) **DP** is selected using a selection list as described earlier. In multi-interval scales this parameter is shown and must be selected for all the ranges/intervals available. The **DP** for each range/interval must be set, so the **DP** has the same or a lower value for rising range/interval number.
3) **Resolution** is selected using a selection list as described earlier. In multi-interval scales this parameter is shown and must be selected for all the ranges/intervals available.
4) **Minimum weight** is entered using a data entry screen as described earlier. In multi-interval scales this parameter is only shown and entered for the first interval (i.e. when **Actual range** parameter is 1).
5) **Maximum weight** is entered using a data entry screen as described earlier. In multi-interval scales this parameter is shown and must be entered for all the ranges/intervals

available. The **Maximum weight** for each range/interval must be entered in rising order for rising range/interval number.

– Perform coarse taring

To coarse tare the system follow these steps:

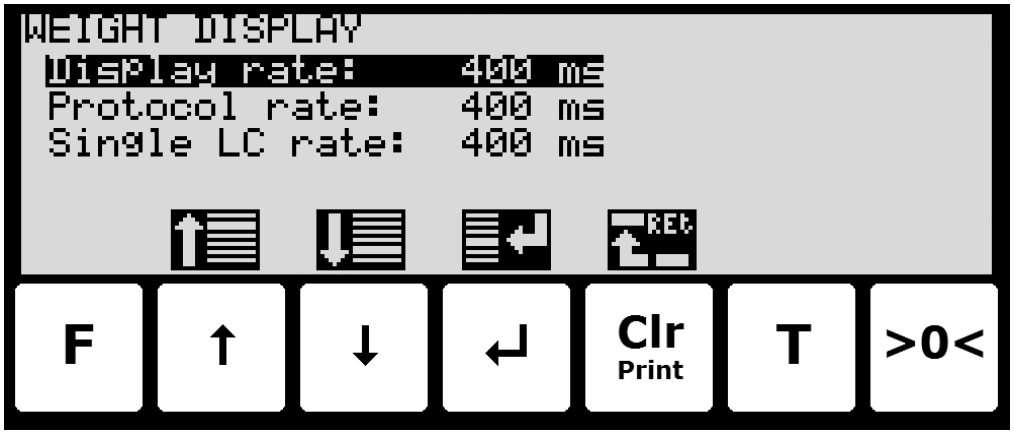
- Use the screens and menu system to select the **COARSETARE** screen.
- Press [F] to invoke the **COARSETARE** menu.
- Press [↓] to select the **PERFORM COARSETARE** menu item.
- Press [↵] to perform a coarse tare.



Please notice: Coarse taring should only be done when the system is empty!

– Configure update rates

To configure update rates for weight indication in display, weight indication in communications protocol and individual load cell signal indication, select the **WEIGHT DISPLAY** screen:



Display update rate

The update rate (the interval) between each update of the weight indication in the display is entered in **Display rate** in milliseconds (ms). A small value results in fast update of the weight

indication, while a larger value results in a more steady weight indication. A good starting/default value is 400 ms.

Protocol update rate

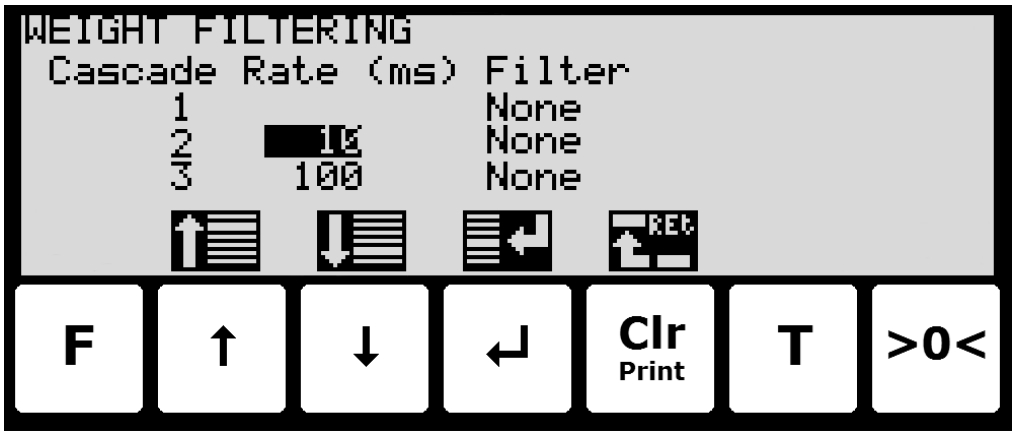
The update rate (the interval) between each update of the weight indication in the communication protocol is entered in **Protocol rate** in milliseconds (ms). A small value results in fast update of the weight indication, while a larger value results in a more steady weight indication. A good starting/default value is 400 ms.

Individual load cell signal update rate

The update rate (the interval) between each update of the individual load cell signals is entered in **Single LC rate** in milliseconds (ms). A small value results in fast update of the signal indication, while a larger value results in a more steady signal indication. A good starting/default value is 400 ms.

– Configure filtering

To configure and include up to 3 different cascade (serie) filters used to filter the weight indication, select the **WEIGHT FILTERING** screen:



Cascade filters (1-3)

For each of the 3 possible cascade filters it is possible to enable one of 15 different FIR filters (from 7 to 100 taps). This is done by selecting the desired **Cascade Filter** (1-3), and then using the appearing menu to select the FIR filter used for this cascade filter.

Cascade rates (2-3)

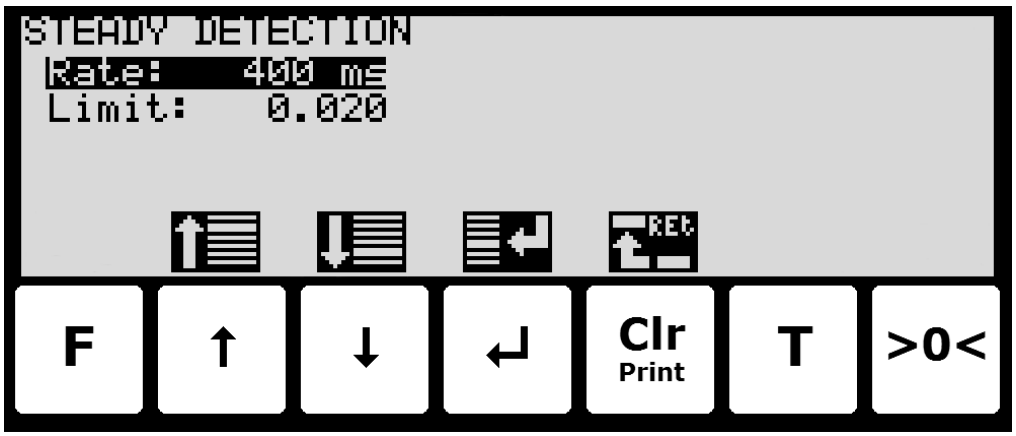
For cascade filter 2 and 3 it is possible to enter the frequency (interval in ms) by which these two filters are called. This is done by selecting the desired **Cascade Rate** (2-3), and then entering the desired cascade rate (in ms) for this cascade filter.

NOTE: If cascade filter 1 is enabled, then this filter will always be called every time a complete sampling of the load cells has been made.

NOTE: Filtering is a time consuming operation – so selecting long filters (with many taps) along with short filter update rates may slow operation/performance considerably or even stop Ethernet or load cell communication.

– Configure stability requirement

To configure stability requirement, select the **STEADY DETECTION** screen:



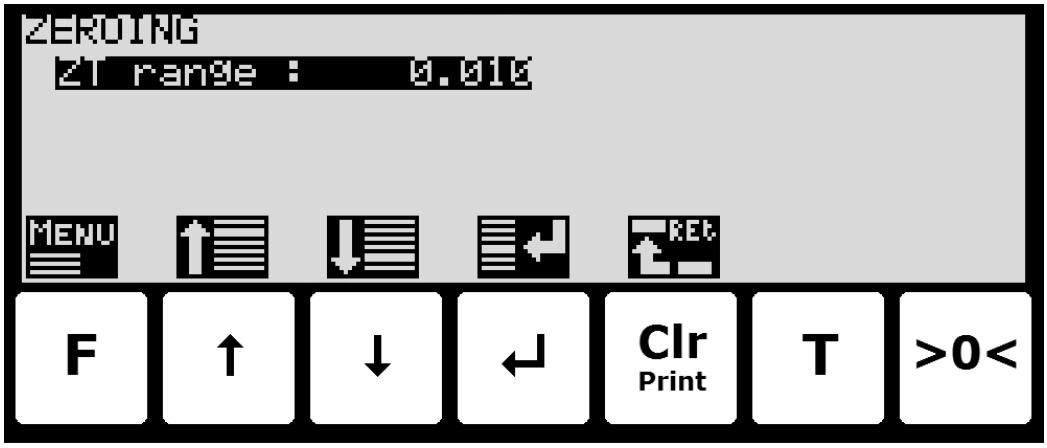
Steady/stability detection

The weight is considered stable when the readings are within the limit (**Limit**) entered here.

The update rate (the interval) of the weight indication used for steady detection is entered in **Rate** in milliseconds (ms).

– Configure zero tracking

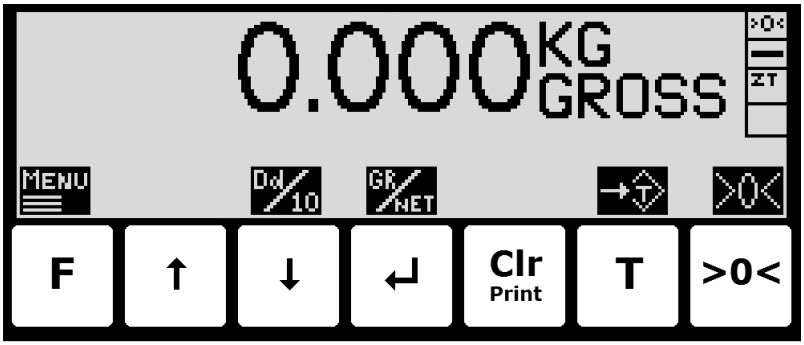
To configure the zero tracking range, select the **ZEROING** screen:



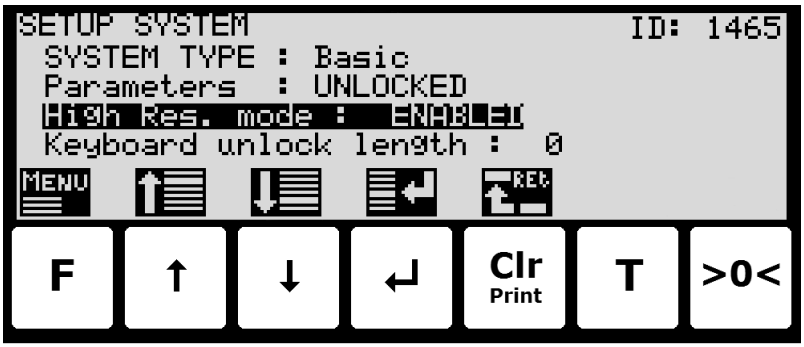
– Change reading to high resolution mode

High resolution mode changes the display reading to the enhanced resolution entered as the **CALI** weighing range. This can be done in two ways:

- Press ↓ in the **NORMAL** screen. This will select high resolution mode for 3 seconds (assuming the **High res. mode** parameter in the **SETUP SYSTEM** screen is set to DISABLED). The symbol above ↓ will flash while high resolution is active.



- In the **SETUP SYSTEM** screen, change the **High res. mode** parameter to ENABLED (this can only be done when parameters are unlocked). Now when pressing [↓] in the **NORMAL** screen high resolution mode will be selected until [↓] is pressed again. The symbol above [↓] will flash while high resolution is active.



– Perform load check

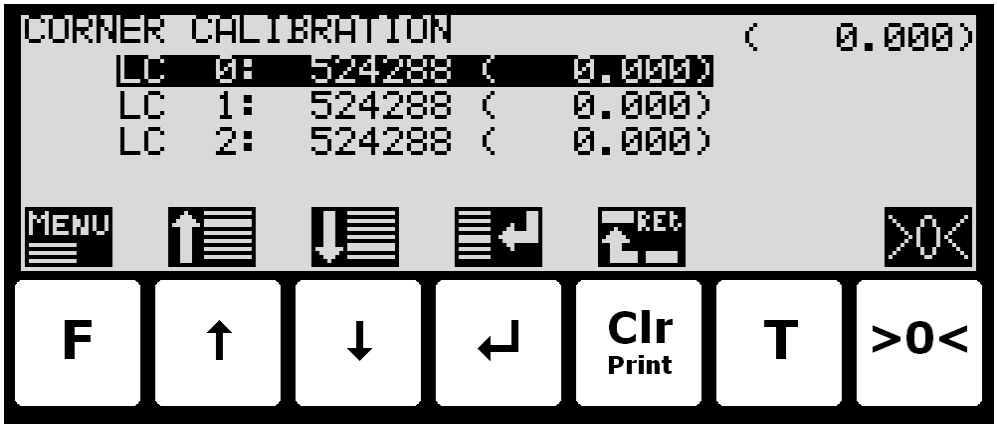
When checking the weight reading please observe these points:

- Use different loads; small and near the maximum load.
- Do not place the full load on the corners.
- Use approx. 1/3 of full load to check the corners.
- Use High resolution mode for a more accurate reading.

– Perform corner calibration

Please notice: Corner calibration is only necessary in system with more than one load cell. Corner calibration is not possible when there are more supports than load cells and should only be used in weighing systems where system mechanics shows non ideal behavior regarding load in the corners.

Use the **CORNER CALIBRATION** screen to perform a corner calibration if necessary.



In this screen corner calibration parameters such as corner calibration factor, and actual load on corresponding load cell is shown on one line for each load cell. The actual gross weight is shown in the upper right corner. This makes it possible to manually enter the corner calibration factor for each load cell. From the **CORNER CAL.** menu it is possible to select the **CORNER CAL. PROC.** screen for corner calibration of the system. It is also possible to reset the corner calibration factors to default values from the menu. A cursor (inverted text) indicates the currently selected parameter.

Corner calibration factor

The corner calibration factors can be changed/specified in the **CORNER CALIBRATION** screen by performing a calibration of the corners by switching to the **CORNER CAL. PROC.** screen as described below or by manually entering a new factor.

The corner calibration factors can be manually changed by using [↑] and [↓] to select the desired load cell/corner with the cursor, and then pressing [↵] to request change of the selected corner calibration **FACTOR** parameter. This is useful when a previous calibration must be re-established. Note that this is only possible, if the calibration factor for this previous calibration is known. The standard calibration factor is 524288. If this value is changed 1% (up or down), the signal from that load cell/corner will also change 1% (up or down).

Reset corner calibration factors

It is possible to reset the corner calibration factors to default values (524288) by using the **CORNER CAL.** menu. To perform a reset of corner calibration factors from the **CORNER CALIBRATION** screen use these steps:

- [F] Press once to select the **CORNER CAL.** menu.
- [↓] Press once to select the “RESET CORNER CAL. FACTORS” entry from the **CORNER CAL.** menu.
- [↵] Press once to perform the reset of the corner calibration factors.

Corner calibration procedure

It is possible to perform an automatic corner calibration of the system by selecting the **CORNER CALIBRATION PROCEDURE** screen from the **CORNER CAL.** menu.

In this screen a line for each load cell will be shown indicating “NOT registered“. Once the signal resulting from a given load placed above a load cell is registered this indication will change to “Registered” followed by the registered load for this load cell/corner. The actual gross weight is shown in the upper right corner.

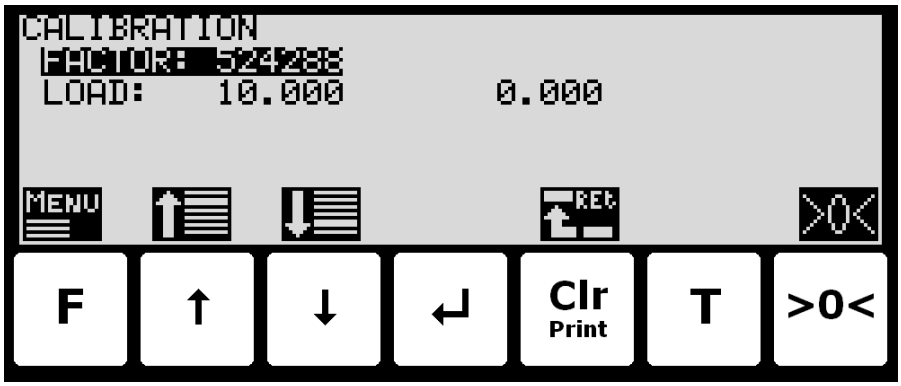
To corner calibrate the system use the following steps:

1. The system must be previously coarse tared.
2. Zero the gross reading in the upper right corner by pressing [>0<].
3. Place the used calibration load directly above one of the load cells/corners.
4. Perform the sampling/registration of the load cell/corner in question by pressing the [↵] key. The weighing terminal will automatically detect above which load cell/corner the load is actually placed and register the corresponding signal. The registered value is indicated on the screen and the status is changed from ”NOT registered” to ”Registered”.
5. Remove the calibration load. Zero the weight reading if necessary by pressing [>0<] before the load is placed above a new load cell/corner.
6. Repeat 2-4 for each load cell/corner in the system as the calibration load is moved to a new load cell/corner each time. It is important that 2-4 is performed for every load cell/corner in the system. When all load cells/corners are registered all status indications should indicate **Registered**.
7. The corner calibration can be restarted at any given time by selecting ”RESTART CORNER CAL. PROC.” from the **CORNER CAL. PROC.** menu or by leaving the **CORNER CALIBRATION PROCEDURE** screen.
8. Once all load cells/corners have been sampled/registered the corner calibration itself can be performed. This is done by selecting **PERFORM CORNER CAL.** from the **CORNER CAL. PROC.** menu. **IMPORTANT:** Until this is done the corner calibration is **NOT** performed and the corner calibration factors will remain unchanged.
9. The corner calibration will now be performed based on the sampled values, and the weighing terminal returns to the **CORNER CALIBRATION** screen.
10. Following the corner calibration it should be verified that the corner calibration factors are reasonable values. It should also be checked that identical weight readings are achieved when the calibration load is placed above each of the load cells/corners.

Please notice: The calibration load parameter from the **CALIBRATION** screen is not used during corner calibration; instead the corner calibration procedure will result in a gross reading of approximately the average value of the registered load cell/corner values.

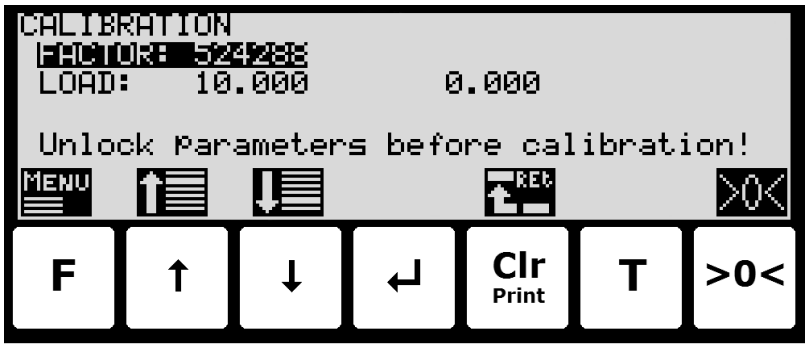
– Perform system calibration

A common system calibration can be done from the **CALIBRATION** screen:



In this screen calibration parameters such as calibration factor, calibration load (to the left) and actual gross weight (to the right) are shown and can be changed. This makes it possible to calibrate the system. From the **CALIBRATE** menu it is possible to select the **CORNER CALIBRATION** screen for corner calibration of the system. A cursor (inverted text) indicates the currently selected parameter.

If parameter change is locked, then remember to unlock parameter change prior to calibration attempt, as shown in the display:



Calibration factor

The actual system calibration factor can be changed/specified in the **CALIBRATION** screen by performing a calibration of the system as described below or by manually entering a new factor.

The calibration factor indication can be manually changed. This is useful when a previous calibration must be re-established. Note that this is only possible, if the calibration factor for this previous calibration is known. The standard calibration factor is 524288. If this value is changed 1% (up or down), the gross weight indication will also change 1% (up or down).

Calibration load

The actual mass of the load used for calibration must be specified in the **CALIBRATION** screen before calibration is performed.

Perform calibration

It is possible to calibrate the system by performing the following calibration procedure:

- Ensure the weighing scale is has been coarse tared.
- Ensure the weighing scale is empty and clean.

>0< Press once to zero the gross reading of the empty weighing scale.

↓ Press repeatedly until “LOAD” parameter is selected with the cursor.

↵ Press once to start entry of the actual calibration load if necessary.

- Place the load on the weighing arrangement. The gross weight of the load displayed to the far right in the **LOAD** line will now be inside +/- 10% of the correct reading. If this isn’t the case the mechanical and electrical installation must be checked. Furthermore all weighing range parameters must be checked again.

F Press once to select the **CALIBRATE** menu.

↓ Press once to select the “PERFORM CALIBRATION” entry from the **CALIBRATE** menu.

↵ Press once to perform the calibration.

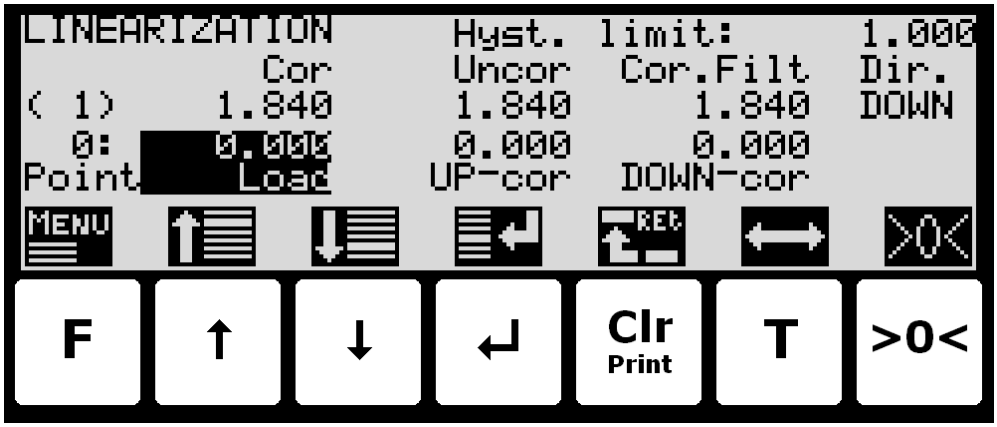
- The gross weight shown in the display will now match the used calibration load and the calibration factor will have been updated correspondingly.

Please notice: The accuracy of the calibration is highly dependent on the accuracy and size of the calibration load. Please select a load with a mass not less than the maximum weight normally applied to the system.

– Perform linearization

Please notice: Linearization is normally not used, and should only be used in weighing systems where system mechanics shows non ideal behavior.

If decided to do so the relevant parameters can be entered in the **LINEARIZATION** screen.



In this screen linearization parameters are shown and can be changed in order to compensate for hysteresis etc. in the weighing system. In the lower half of the screen just above the key icons the selected linearization point number, the entered load for this point and the up/down corrections (added/subtracted) for this point are shown. Just above this in the upper half of the screen the actual used interval, the corrected gross weight, the uncorrected gross weight, the corrected “filtered” gross weight and the direction is shown. In the upper

right corner the hysteresis limit is shown. A cursor (inverted text) indicates the currently selected parameter.

Load points

The load points in which the given corrections are performed must be specified in the **LINEARIZATION** screen. The load points are changed by using ↑ and ↓ to select the desired point number in the "Load" column with the cursor, and then pressing ↵ to request change of the selected load parameter.

The load parameters must be entered in rising order; i.e. starting with 0kg for point no. 0 and always rising upwards for rising point numbers. It must be ensured all load points including the up/down corrections are valid.

Up/Down corrections

The up/down corrections performed in the different load points must be specified in the **LINEARIZATION** screen. The up/down corrections are changed by using ↑ and ↓ to select the desired point number in the "UP-cor" or "DOWN-cor" column with the cursor, and then pressing ↵ to request change of the selected up/down correction parameter.

Please notice: The UP corrections are added while the DOWN corrections are subtracted.

Hysteresis limit

The hysteresis limit must be specified in the **LINEARIZATION** screen. The hysteresis limit specifies the weight change in a given direction that must take effect for a direction change to be detected. The hysteresis limit is changed by using ↑ and ↓ to select the hysteresis limit parameter with the cursor, and then pressing ↵ to request change of the hysteresis limit parameter.

Reset linearization

The entered linearization (load points and up/down corrections) can be reset (setting load points to default values and up/down corrections to 0) by using the **LINEARIZATION** menu. Select the RESET LINEARIZATION item and press ↵.

– Zero with extended range (power-up zeroing)

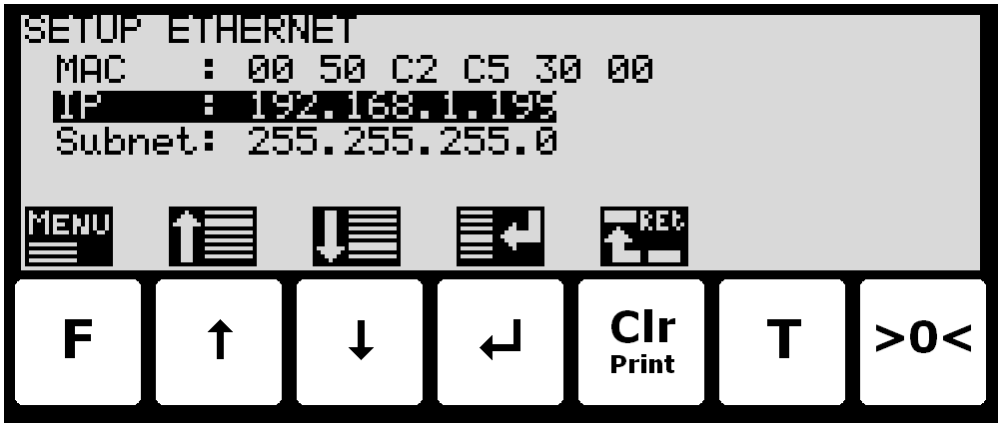
If a zeroing is to be performed during power up (with extended zeroing range), >0< must be pressed while the program identification (software name, date and revision) is shown. Pressing >0< before this is ignored.

– Configure Ethernet settings

Address settings

Ip addresses, subnet masks etc. are normally set from a PC with the EEConnect software. Please refer to the EEConnect documentation for further details.

If the terminal is unreachable e.g. due to network topology, the Ethernet settings can be entered in the **SETUP ETHERNET** screen:

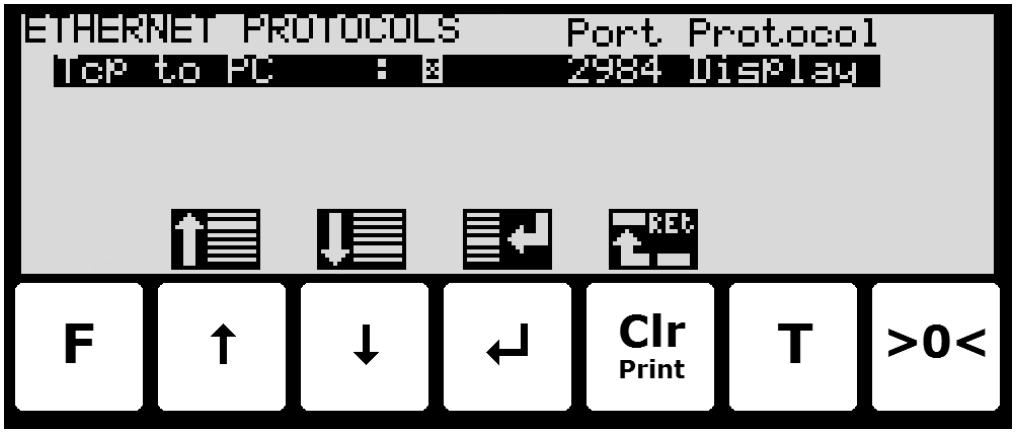


– Configure Ethernet TCP communication

The terminal can perform Ethernet communication on its RJ45/Cat5 Ethernet connector (J7) using a TCP protocol and using the Ethernet settings previously configured. The weighing terminal acts as a TCP server. For this to work the following must be performed:

Enable TCP protocol

The TCP protocol must be enabled. This can be done in the **ETHERNET PROTOCOLS** screen shown below:



Select TCP port

Once the TCP protocol has been enabled, the used TCP port number must be set. This can also be done in the **ETHERNET PROTOCOLS** screen shown above.

Select data output

Once the TCP protocol has been enabled, it can be selected when data are to be transmitted. This can also be done in the **ETHERNET PROTOCOLS** screen shown above.

It is possible to select ***None***, ***Registration***, ***Display*** or ***Poll***.

NOTE: In this application either ***None***, ***Display*** or ***Poll*** should be selected.

With ***Display*** selected the data shown below is transmitted as an ASCII string on the TCP connection every time the display reading is updated. This is only done if a client is connected to the weight terminal TCP server. Only 1 TCP connection can be opened.

GGG.GGG,NNN.NNN<CR><LF>

GGG.GGG	Gross weight with decimal point position and resolution as in display reading.
NNN.NNN	Net weight with decimal point position and resolution as in display reading.
<CR><LF>	Carriage return and linefeed characters.

The length of the gross and net fields may vary due to sign, decimal point, error codes etc.

With ***Poll*** selected a connected client can read gross or net weight by sending one of the following 4 byte long ASCII "poll" telegrams on the TCP connection:

RG<CR><LF>	(*for reading of gross weight*)
RN<CR><LF>	(*for reading of net weight*)

When one of the valid "**poll**" telegrams is received on the 5024G terminal, one of the following ASCII telegrams below, is send back on the TCP connection (depending on what was received from the client):

GGG.GGG<CR><LF>	(when reading gross weight)
NNN.NNN<CR><LF>	(when reading *net weight*)

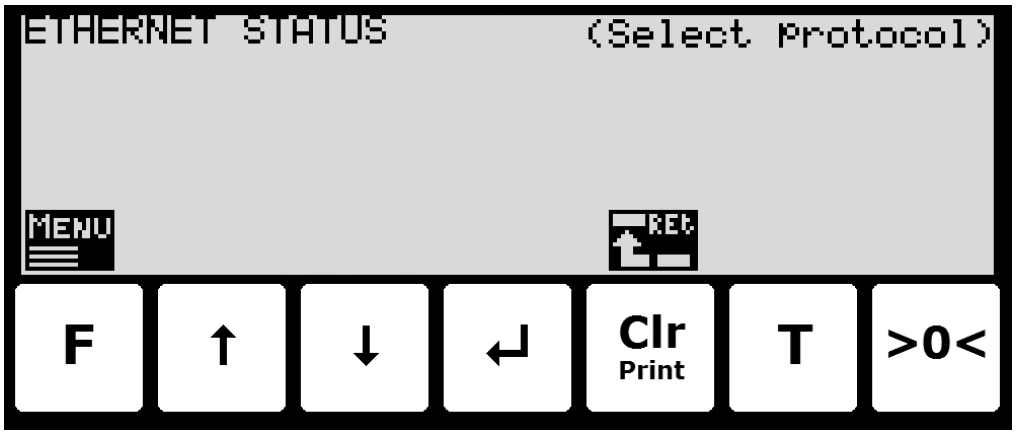
Here the indications of the telegram contents is defined in the same way as described earlier above under the ***Display*** description.

NOTE: If an error is detected on the 5024G terminal all of the above described telegrams will be replaced by the following error telegram (ASCII):

ERROR<CR><LF>

– Check Ethernet communication status

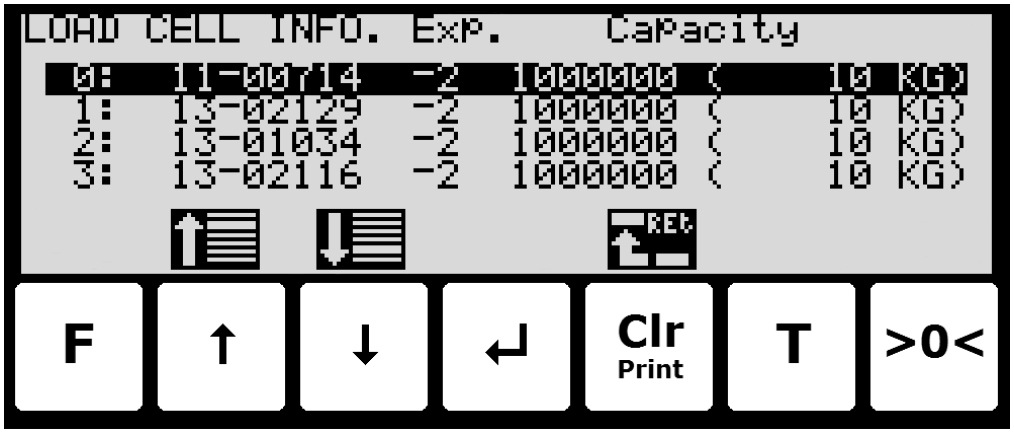
In the **ETHERNET STATUS** screen, the status of a selected Ethernet communication protocol can be read:



By use of the screen menu (the F key) the active Ethernet protocol, whose status is to be read, is selected. For an Ethernet protocol to be selected, it must be active. This means, that the protocol itself must be enabled in the **ETHERNET PROTOCOLS** screen (which again also may require, that the corresponding communication option must be enabled).

– Check load cell serial no., exponent and capacity

In the **LOAD CELL INFO.** screen, the load cell serial number, exponent and capacity can be read for the individual load cells:

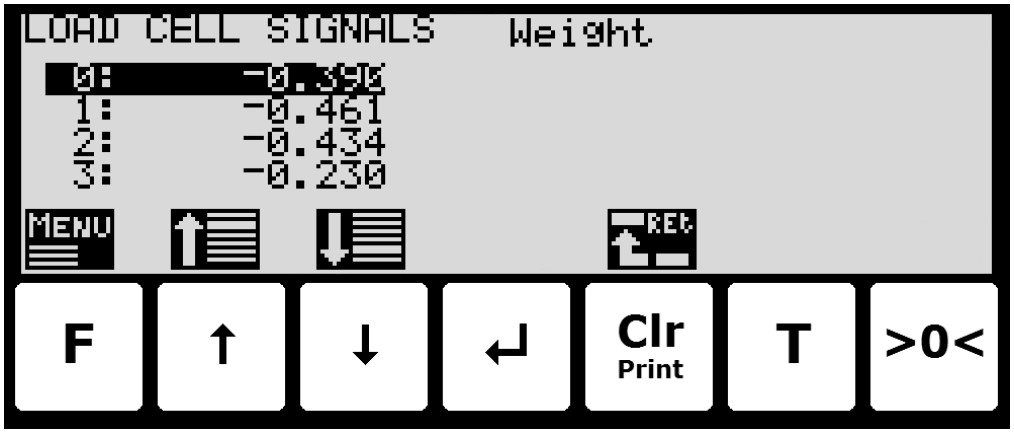


On each line for each load cell the serial number, exponent and capacity as well as in parenthesis the capacity converted to an appropriate unit depending on the exponent is shown.

Please notice: If a line is flashing this indicates, that an error code is present for the corresponding load cell. This can be examined further using the **STATUS** and **LOAD CELL INFO.** screens.

– Check individual load cell signals

In the **LOAD CELL SIGNALS** screen, the individual load cell readings can be checked:



Three different readings can be selected from the **LOAD CELL SIGNALS** menu:

DIRECT

The internal load cell output value is displayed as it is received. This number is in SI units, but the resolution is load cell dependent and may be an unusual value like 100mg, 10 gr. etc. Furthermore no zeroing is used and the load cell value will NOT be 0 when the load cell is empty, so this value is NOT the absolute load on this load cell.

WEIGHT

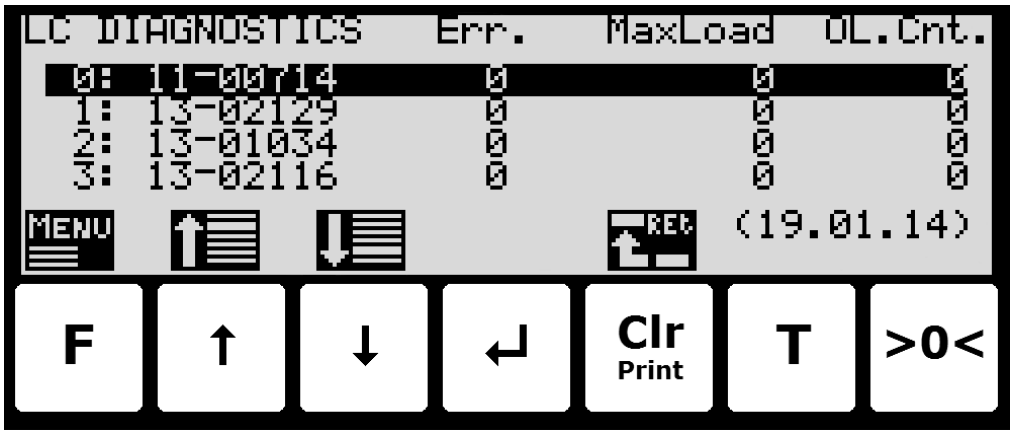
The load cell output value in the resolution etc., selected for the display. No zeroing is used and the load cell value will NOT be 0 when the load cell is empty, so this value is NOT the absolute load on this load cell.

ZEROED

The load cell output value in the resolution etc., selected for the display. The value is zeroed along with the normal display reading. So this value is the change since the last zeroing.

– Check load cell diagnostics

In the **LOAD CELL DIAGNOSTICS** screen, the load cell diagnostics can be read for the individual load cells:



On each line for each load cell the serial number, number of detected errors (**Err.**), the maximum load measured on the load cell (**MaxLoad**) and the number of times the load cell has been overloaded (**OL.Cnt.**). All these numbers apply since the last reset of diagnostics data, which took place on the date shown in parenthesis in the lower right corner (YY.MM.DD).

Please notice: Diagnostics data can be reset from the **LOAD CELL DIAGNOSTICS** menu if the correct password has been entered.

Trouble shooting

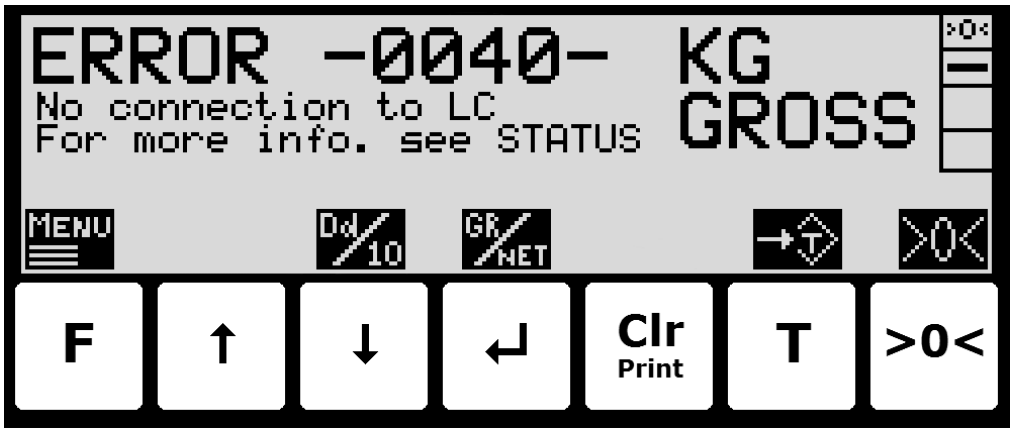
– Error situations

Problem	**Explanation and possible solutions**
UL *displayed* ***OL*** *displayed*	Weight is below or above the weighing range. Check installation for mechanical errors, e.g. surroundings touching the weighing arrangement. It the load too heavy for the scale capacity? Make sure that load cell and weighing range configuration is correct. Empty the system. Zero the system, first during operation if this is not sufficient then during power-up. As a final possibility perform a coarse taring operation when the system is empty.
-XXXX- *displayed*	Load cell error. Make sure that load cell configuration is correct and that the system has been power-cycled. Check all load cell connections. Refer to load cell documentation for further details, as well as to the description of error code display and **STATUS** screen below.
Weight indication is blank	Make sure that configuration of load cell communication format is correct and that the system has been power-cycled. Check all load cell connections. Refer to load cell documentation for further details.
Weight never stable *Weight always stables*	Check installation for mechanical errors, e.g. surroundings touching the weighing arrangement. Check that stability requirements are configured correctly.
Zero tracking never on *Zero tracking always on*	Check installation for mechanical errors, e.g. surroundings touching the weighing arrangement. Check that zero tracking is configured correctly.
Unable to zero *Unable to autotare*	Check installation for mechanical errors, e.g. surroundings touching the weighing arrangement. Check that stability requirements are configured correctly.
No keyboard icons shown	Keyboard is locked. Press a key, and then press indicated key sequence until keyboard is unlocked.
Cannot enter parameter value	Unlock parameters.
PLC unable to receive/transmit data from/to 5024G	Check connection between PLC and external module is ok (see below). Check connection between 5024G and external module is ok (see below).
No connection between PLC and external module	Check the field bus cabling between 5024G and PLC is made correctly. Check possible termination of field bus is made correctly. Check the external module is powered correctly. Check the PLC is configured correctly possibly using the supplied configuration file. If possible check the field bus communication address is set correctly using DIP switches or configuration tool. Check if status lamps on external module indicate connection to PLC is ok.
No connection between 5024G and	Check the RS485 connection between 5024G and external module is made correctly.

external module	Check the external module is powered correctly. Check the AUX (RS485) communication address is set correctly on the external module using its DIP switches. If possible check status lamps (typical **TXBB** and **D1**) on external module indicate communication with 5024G (typical they will toggle). Check parameters in **EXTERNAL MODULE** screen are configured correctly: - Check "***Device Type***" parameter matches external module type. - Check "***Address***" parameter corresponds to DIP switch setting on external module. - Check "***Bytes Out***" parameter matches specification in configuration file; typical 14 for this application. Check "***Bytes In***" parameter matches specification in configuration file; typical 14 for this application.
Values change rapidly between random values	Check "***Endian***" parameter selected in **EXTERNAL MODULE** screen corresponds to the used field bus and PLC type.
Implemented protocol does not behave as expected	Use the **EXTERNAL MODULE DATA** screen to debug 5024G received data from PLC (IN) results in expected transmit data to PLC (OUT).

– Error code display (in NORMAL screen)

When the system detects a load cell error (***-XXXX-***) this will be shown in the **NORMAL** screen as follows:

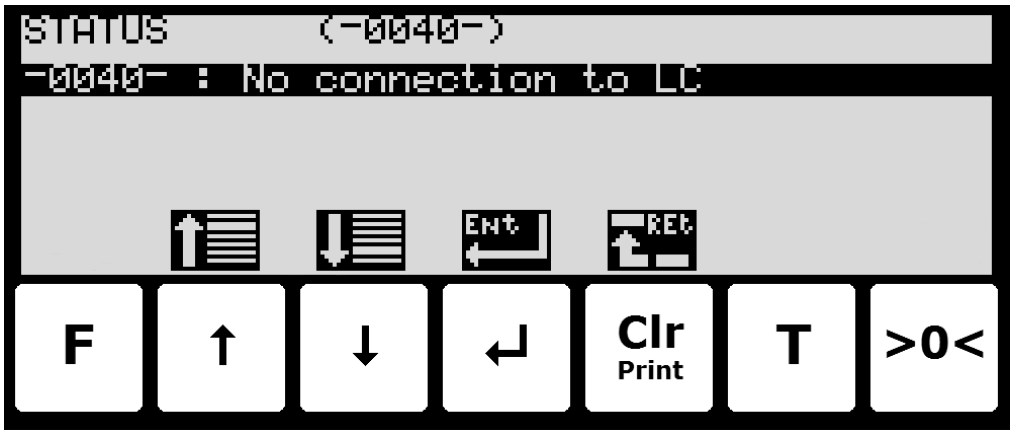


The weight indication normally shown in large types is replaced by an error code with a corresponding description and reference to the **STATUS** screen, where the error code is elaborated and possible tips to how the individual error codes can be solved are given.

Please notice: If an error is indicated the **STATUS** screen can be accessed from the **NORMAL** menu.

– Error solving (in STATUS screen)

In the **STATUS** screen, a list of error codes currently present on the system is shown as follows:



Please notice: Depending on the load cell protocol, a given error may result in multiple error codes at the same time. These error codes will be logical OR'ed together, and the resulting error code shown in the **NORMAL** screen is also shown in the top line of this screen.

Please notice: If more error codes are present at once, a given error code can be selected by moving the cursor up or down in the list with the ↑ and ↓ keys. More error codes than can be shown, can be present. In such case these can also be shown using the arrow keys.

Please notice: If ↵ is pressed, a list of possible tips to solve the currently selected (using the cursor) error code will appear.

Intelligent Setup

This chapter describes how the Intelligent Setup feature is activated and used during installation of the weighing system. This feature can automatically come with proposals to configuration of the different weighing technical parameters.

The weighing technical parameters that can be set using this feature are:

- Load cell protocol type
- Number of load cells and number of supports
- Weighing ranges (Unit, Decimal Point position, Resolution, Max. weight, Min. weight)
- Update rates (intervals)
- Filters
- Steady limit
- Range for automatic zeroing
- System calibration and Corner calibration
- Linearization
- Coarsetare

– Comments regarding Intelligent Setup

Regarding the use of Intelligent Setup the user must be observant on the following:

- Before Intelligent Setup feature is activated the weighing system and load cells must be connected correctly both mechanically and electrically according to the supplied documentation.
- For the feature to be activated and used change of parameters must be unlocked by entering password as described in the separate 'Users guide'.
- The detection sequence can be aborted from the keyboard, but parameter changes already made cannot be undone except by manual entry.
- When detecting weighing ranges all weighing range parameters (Unit, Decimal Point position, Resolution, Max. and Min. weight) are detected/kept as one common group.
- The found PROTOCOL weighing range is identical to the found NORMAL weighing range.
- The found CALIBRATION weighing range will normally be identical (if possible) to the found NORMAL weighing range, BUT (if possible) with a resolution that is 10 times better than the resolution for the found NORMAL weighing range.

- **IMPORTANT:** Change of most parameter will result in a change of event counter, which in certified systems will mean, that the system must be verified again.
- **IMPORTANT:** It is the responsibility of the user to subsequently check, that the found parameter values are reasonable, and can be accepted for the specific system.

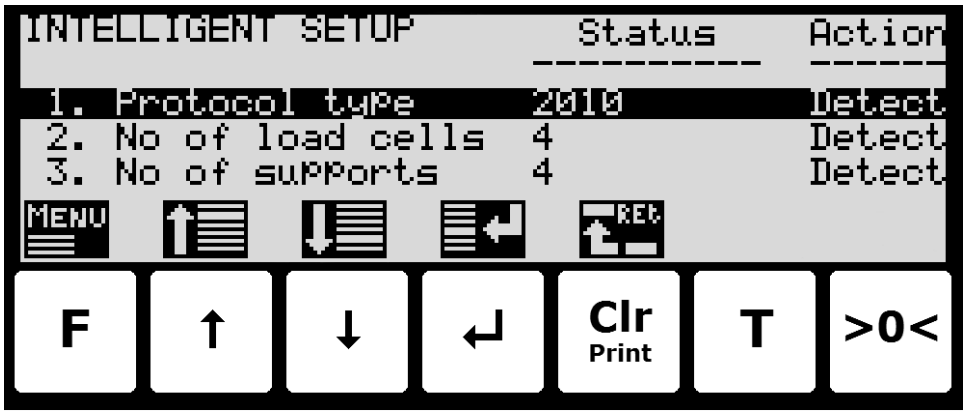
– Activate Intelligent Setup

The Intelligent Setup feature can be activated/started by performing the following:

- From the **NORMAL** screen press [F] to activate the menu system, and select **SERVICE MODE** menu item to enter the **SETUP** screen.
- From the **SETUP** screen press [F] to activate the menu system, and select **SYSTEM** menu item to enter the **SETUP SYSTEM** screen.
- Unlock the parameters for change by entering the password (1357) as previously described.
- Press [F] to activate the menu system, and select **INTELLIGENT SETUP** menu item to enter the **INTELLIGENT SETUP** screen.

– Use the Intelligent Setup screen

When Intelligent Setup is activated the **INTELLIGENT SETUP** screen will look as follows:



The screen shows a list of the different weighing technical parameters that the Intelligent Setup feature can try and detect. For every parameter in the list ***Status*** corresponding to the actual value of the parameter is shown, as well as ***Action*** corresponding to if the parameter is chosen to be detected (***Detect***) or kept unchanged (***Ignore***) during **SEMI** auto. detection. During **FULL** auto. Detection this column is ignored as it is assumed that ***Detect*** has been chosen for all parameters.

Keys/actions:

[F] Show the **INTELLIGENT SETUP** menu for start of **FULL** or **SEMI** automatic detection sequence.

[↑] Move cursor op in the list of parameters.

[↓] Mover cursor down in the list of parameters.

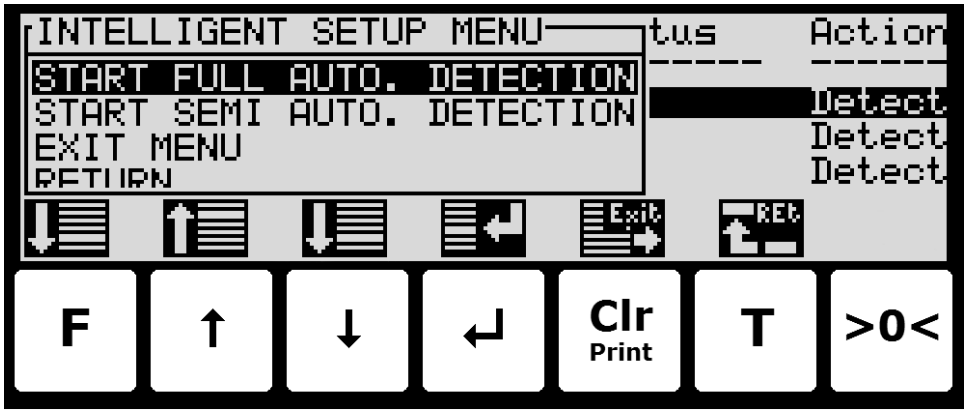
[↵] Allows selection of action (***Detect*** or ***Ignore***) for the parameter selected using the cursor.

[Clr Print] Return to the previous **SETUP SYSTEM** screen.

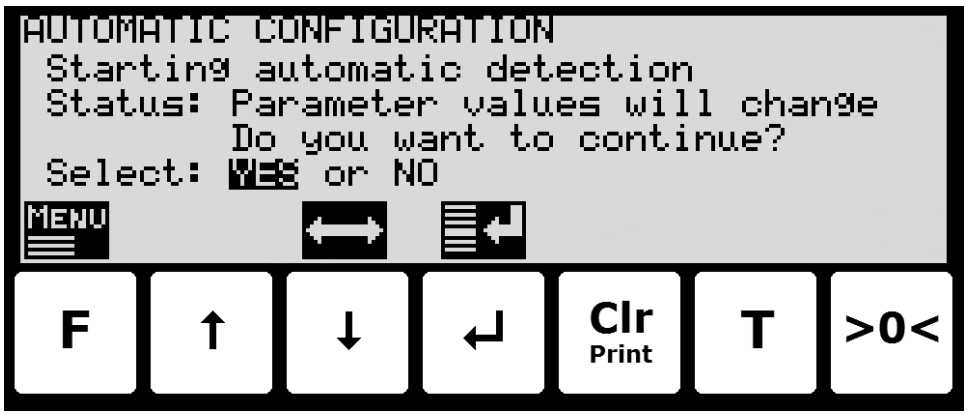
– Start the detection sequence (FULL/SEMI automatic)

To start a **FULL** or **SEMI** automatic detection sequence the following is performed:

- Use the screens and menu system to select the **INTELLIGENT SETUP** screen.
- Press [F] to show the **INTELLIGENT SETUP** menu.
- Press [↓] or [↓] to mark the **START FULL AUTO. DETECTION** or **START SEMI AUTO. DETECTION** menu item.
- Press [↵] to select the marked detection sequence.



When a detection sequence has been chosen, a warning screen will appear, and depending on the selection made the detection sequence will be started or not:



Keys/actions:

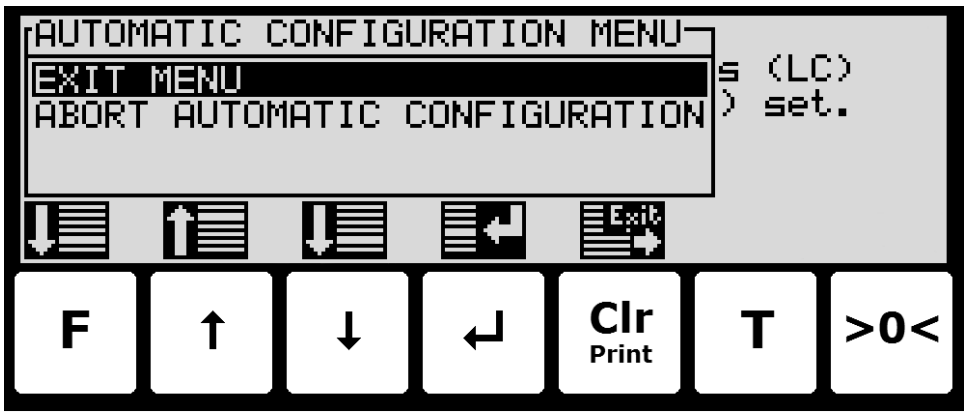
[↓] Moves cursor between the two possible selections.

[↵] Selects the answer marked by the cursor.

– Abort the detection sequence

A detection sequence can always be aborted by performing the following:

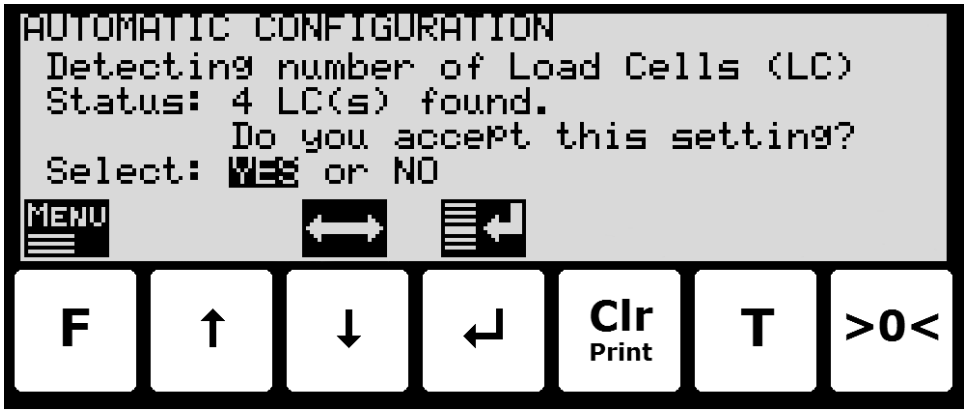
- Press [F] to show the **AUTOMATIC CONFIGURATION** menu.
- Press [↓] to mark the **ABORT AUTOMATIC CONFIGURATION** menu item.
- Press [↵] to abort the detection sequence and return to the **INTELLIGENT SETUP** screen.



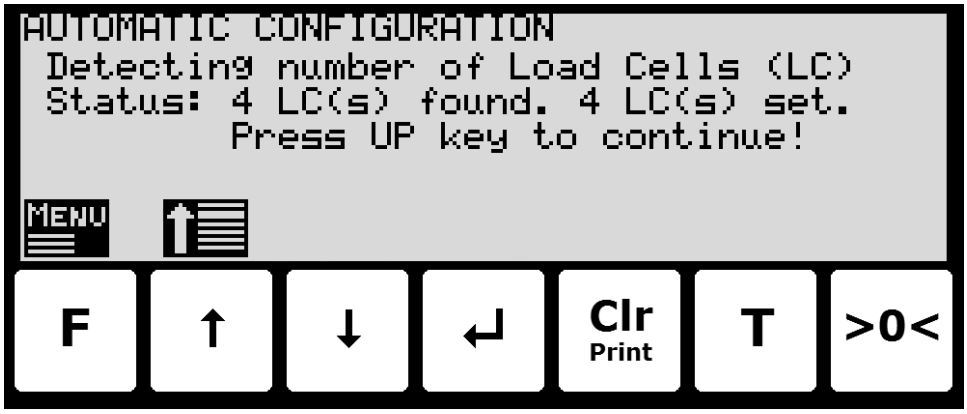
– Run the detection sequence

When a detection sequence is started, the weighing terminal will try and detect a reasonable value for all parameters shown in the **INTELLIGENT SETUP** screen. In a **SEMI** automatic detection sequence only the parameters marked as ***Detect*** will be detected. Parameters will be determined one at a time in the order shown in the **INTELLIGENT SETUP** screen.

For each parameter the screen will first show which parameter is actually being detected and what value has been found, and then ask if the user can accept the value found:



Depending on the answer the screen will then show the found value and what the parameter was actually set to, and then wait for the user to advance to the next parameter by pressing [↑]:



The different texts and questions will vary from parameter to parameter.

If a suggested values is rejected, the user will for certain parameters be asked to enter/select an alternate value.

This is repeated until the sequence has been through all parameters and is done.

PROFINET Communication

This chapter describes the use of the External Module option on the 5024G weighing terminal, which with a on RS485 externally connected communications module (2070 PROFINET) from Eilersen Electric can communicate with external controller/PLC using PROFINET.

With the later stated software version installed in the external module the external communication module can transfer 14 input bytes from the 5024G terminal to the PROFINET master, and transfer 14 output bytes from PROFINET master to the 5024G terminal.

Exchange of data between 5024G terminal and the external controller/PLC is made according to the profile/protocol described later (see ***PROFINET protocol*** descriptio).

– Installation of external module

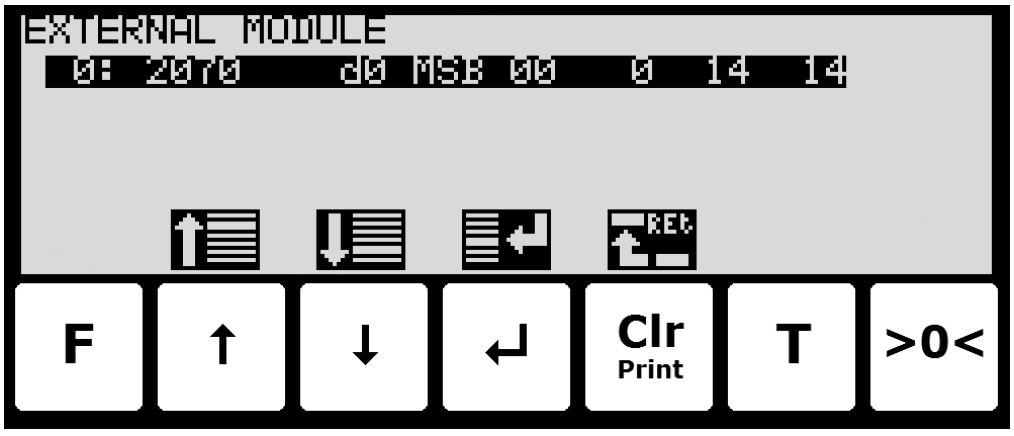
The used external module (**xxxx**) must be connected to the 5024G weighing terminal and to the external controller/PLC according to the description in the appropriate appendix.

Please notice:

- no matter what module type, the module must be connected to the 5024G terminal using a RS485 connection.
- depending on module type, the module must be connected to the external controller/PLC using bus type as described in the appendix belonging to the module.
- depending on module type, the 5024G terminal must be configured to exactly the module used according to the guidelines below.

– Enable and configure external module on 5024G

Below the **EXTERNAL MODULE** screen is shown when a 2070 PROFINET module has been enabled.



In this screen the external module is shown and can be changed. A cursor (inverted text) indicates the currently selected module. With this version of the software only one module can be installed.

The line with module data shows in forth running order after the Device Index (always 0 in this software version): Device Type, Device Address, Endian, Status, Error Counter, Bytes Out and Bytes In, which all are described in detail below.

Enable or change Device Type

To enable or select a new module type (Device Type) press ↵ on the selected line, and from the **EXTERNAL MODULE** menu select the **DEVICE TYPE** menu item to get the selection list with possible module types. Possible module types are ***MCExx35*** Profibus-DP module, ***MCE9637*** DeviceNet module, ***2050*** Ethernet module and ***2070*** PROFINET module. If no external module is enabled the 5024G display will show "**-------**" / "***None***".

Once a module type is enabled/selected the other settings (see descriptions below) are set to default values, which should normally be used.

Set/Read Device Address

The address is the entered address plus the base address for the module type selected.

During change enter a number in the interval 0-15. With this software version where only one external module can be connected, 0 is the normally entered address value.

Set/Read Endian

Endian of the individual data values transferred: *MSB* most significant byte first: Big endian. *LSB* least significant byte first: Little endian. MSB is normally used with Profibus-DP and PROFINET while LSB is normally used with all other types of modules.

Read Status

00: Communication up and running.

40: *Connection established earlier to the module has been lost.*

80: No connection to the module has been established.

Read Error Counter

Current number of errors in communication.

Set/Read Bytes Out

Number of bytes to be sent from the 5024G to the external module and from there to the Profibus-DP/PROFINET/DeviceNet/Ethernet master. This is the number of input bytes in the Profibus-DP/PROFINET/DeviceNet/Ethernet master.

The value must be the same as the value in the external module. Normally this is 14.

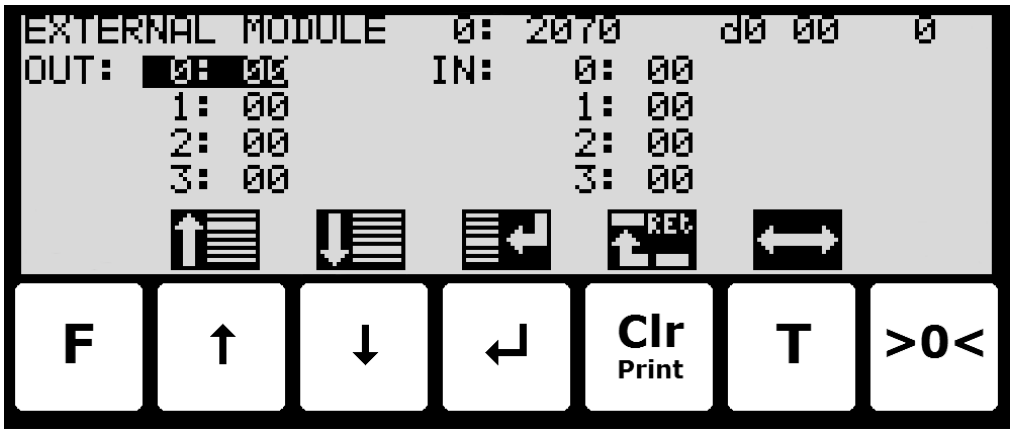
Set/Read Bytes In

Number of bytes to be received in the 5024G from the external module and transmitted from the Profibus-DP/PROFINET/DeviceNet/Ethernet master. This is the number of output bytes in the Profibus-DP/PROFINET/DeviceNet/Ethernet master.

The value must be the same as the value in the external module. Normally this is 14.

– Monitor external module data on 5024G

Below the **EXTERNAL MODULE DATA** screen is shown when a 2070 PROFINET module has been enabled.



This screen will show the data sent to the external module (*OUT*) and the data received from the external module (*IN*).

The following keys can be used for the described special functions:

↵ Selects entry of the selected input data byte for test purposes. If an external module is communication the value will immediately be overwritten by the value receive form the external module.

T Toggles the cursor between the output and the input bytes.

PROFINET protocol description

– External communication using PPO

The communication with the external module is made using a *'parameter-process data object'* (PPO) consisting of 14 bytes data. This telegram (object) is used during both reception and transmission of data. The structure of this telegram is as follows:

MOD	PCV							PCD					
MDS	PCA	PNU		PVA				CTW STW		MRV MAV			
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Byte 1 **Byte 14**

The telegram is made up of 3 blocks; a MOD part (1 byte), a PCV part (the next 7 bytes) and a PCD part (the last 6 bytes). The three blocks are as follows:

MOD (Mode)

MDS (Byte 1): Mode selector

PCV (Parameter-Characteristic-Value)

PCA (Byte 2): Parameter Characteristics

PNU (Bytes 3-4): Parameter number

PVA (Bytes 5-8): Parameter value

PCD (Process Data)

CTW (Bytes 9-10) (Master to Slave): Control Word

STW (Bytes 9-10) (Slave to Master): Status Word

MRV (Bytes 11-14) (Master to Slave): Main Reference Value

MAV (Bytes 11-14) (Slave to Master): Main Actual Value

In the following the meaning of the individual blocks of the telegram is explained further.

IMPORTANT: During transfer/reception of data (i.e. the MAV) it is up to the master (the PLC) to ensure consistent data, when a parameter consisting of several bytes is read/updated and when AS/MAV or RS/MRV is read/set.

– MOD

The MOD part of the telegram indicates which value is to be transferred as **Main Reference Value** (MRV) and as **Main Actual Value** (MAV). Please see below for further information.

MDS

MDS contains an RS part for selection of **Main Reference Value** (MRV) and an AS part for selection of **Main Actual Value** (MAV), as shown in the figure below.

Bit 7 **Bit 0**

7	6	5	4	3	2	1	0
RS				AS			

RS: Reference value selector (Values: 0..15)

AS: Actual value selector (Values: 0..15)

– PCV Description

The PCV part of the telegram is made up of a PCA part, a PNU part and a PVA part. The function of these different parts of the PCV part is described here.

PCA

The PCA part contains an RC part for 'request' and 'response' indication.

Bit 7 **Bit 0**

7	6	5	4	3	2	1	0
RC							

RC: Request/Response Characteristics (Values: 0..255)

RC is used by the master to tell the slave which ’request’ is desired. Similarly the slave uses RC to inform the master the status of the received 'request' (’response’). The contents of RC has the following function during ’request:

REQUEST	FUNCTION
0	No request
1	Request parameter value
2	Change parameter value (2 bytes)
3	Change parameter value (4 bytes)
Others	*Reserved for future use*

The contents of RC has the following function during response:

RESPONSE	FUNCTION
0	No response
1	Transfer parameter value (2 bytes)
2	Transfer parameter value (4 bytes)
3	Request rejected (incl. Error#, see later)
4	Cannot be serviced by PCV interface
Others	*Reserved for future use*

PNU

The PNU part indicates the parameter number of the parameter to be read/changed. The parameters and their function is described below.

PVA

The PVA part contains 4 bytes for reception and transmission of parameter values. The PVA part transfers '2 byte' parameters in bytes 5 and 6, while '4 byte' parameters are transferred in bytes 5 and 8.

If the slave rejects a request from the master the RC part assumes the value 3 (see above) and the error number itself is transferred in the PVA part (bytes 5 and 6). The following error indications are possible:

ERROR #	CAUSE
0	Illegal command for this PNU or PNU not used.
1	*Reserved for future use*
2	Upper or lower limit exceeded

– PCD Description

The PCD part of the telegram is made up of a CTW/STW part and a MRV/MAV part. The function of these two parts of the PCD part is described here. Note that the PCD part (the last 6 bytes) always transfers these data disregarding the contents of the PCV part.

CTW/STW

During communication from the master to the slave, the first two bytes of the PCD part are used as a Control Word (CTW). Using the Control Word (CTW) it is possible to tell the slave how to react as different commands can be transferred to the slave.

During communication from the slave to the master, the first two bytes of the PCD part are used as a Status Word (STW). Using the Status Word (STW) it is possible for the master to gain information on the status of the slave.

MRV/MAV

During communication from the master to the slave the last four bytes of the PCD part are used as a **Main Reference Value** (MRV); a setpoint. Using the RS defines exactly which value is transferred as MRV.

During communication from the slave to the master the last four bytes of the PCD part are used as a **Main Actual Value** (MAV); the actual value. Using the AS defines exactly which value is transferred as MAV.

– Communication overview

Please note the following:

1. All weights are transferred as shown in the display without a decimal point (i.e. 300.0 kg is transferred as 3000 and 67.2 kg is transferred as 672) scaled according to the weighing range interval with most digits after the decimal point.
2. All negative numbers are transferred as 2-complement numbers.
3. Actual unit and decimal point position can be read from the appropriate parameter.

– RS – Reference Value Selector, MRV – Main Reference Value

RS **Reference Value Selector**	**MRV** **Main Reference Value**
0	*Not used*
Others	*Not used*

– AS – Actual Value Selector, MAV – Main Actual Value

AS **Actual Value Selector**	**MAV** **Main Actual Value**
0	*Not used*
1	Actual gross weight
2	Actual net weight
Others	*Not used*

Actual gross weight is the actual gross weight on the 5024G terminal.

Actual net weight is the actual net weight on the 5024G terminal.

– CTW – Control Word

Bit	Function
0	Zero
1	Autotare (zero of net weight)
Others	*Not used*

Zero must be activated if a zero of the gross weight is desired.

Autotare must be activated if a zero of the net weight is desired.

– STW – Status Word

Bit	Function
0	Weight reading not possible
1	Zero OK
2	Zero not possible
3	Autotare OK
4	Autotare not possible
5 - 14	*Not used*
15	OK – always ON

Weight reading not possible is active when the 5024G terminal is unable to determine weight.

Zero OK is active when zero was possible.*)

Zero not possible is active when zero was NOT possible.*)

Autotare OK is active when autotare was possible.*)

Autotare not possible is active when autotare was NOT possible.*)

OK – always ON is always activated. Can be used as a control of the communication.

Bits marked with *) are cleared again when the corresponding request bit is cleared.

– Parameters

NO	TYPE	PARAMETER
1	4, R	Actual gross weight
2	4, R	Actual net weight
3 - 9	-	*Not used*
10	2, R	Unit *0: kg* *1: lbs* *2: gram*
11	2, R	Decimal point position
20 - 35	2, R	Load cell-Status[x]
40 - 55	4, R	Load cell-Gross[x]
Others		*Not used*

Actual gross weight is the actual gross weight on the 5024G terminal.

Actual net weight is the actual net weight on the 5024G terminal.

Unit indicates the unit used in the display reading. It should be used to scale weight indications received/transmitted using the Profibus-DP/PROFINET/DeviceNet/Ethernet-IP communication.

Decimal point position indicates the number of digits after the decimal point in the display reading. It should be used to scale weight indications received/transmitted using the Profibus-DP/PROFINET/DeviceNet/Ethernet-IP communication.

Load cell-Status[x] contains the actual status for load cell x.

Load cell-Gross[x] contains the actual gross signal (not zeroed) on load cell x.

Appendices

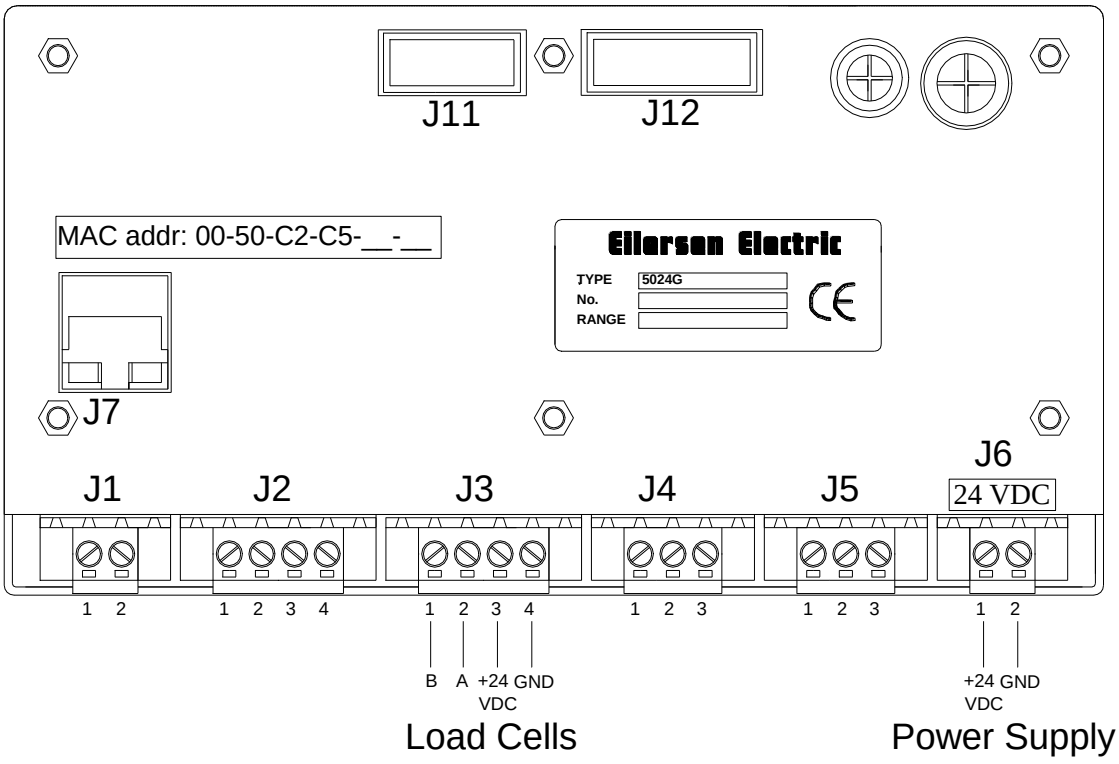
Appendix A – Installation checklist

ACTION	5024 SCREEN	PARAMETERS
1. Check electrical connections	-	Power, Load cells, Digital I/O, RS485 (external modules/equipment), analog output (4-20mA or 0-10V) and Ethernet.
2. Apply power and check software ID	**ServiceMode**	**Software: FFEx-Scale.240430.1.4**.
3. Unlock parameters	**ServiceMode** -> **System**	**Parameters:** <Locked / Unlocked>
4. Intelligent Setup? (Optional)	**ServiceMode** -> **System**	**Intelligent Setup:** Possible activation of Intelligent Setup feature for automatic proposal of weighing technical parameters below. See separate 'Intelligent Setup' manual for further information.
5. Configure load cells used	**ServiceMode** -> **Weighing** -> **Load Cells**	**Protocol type:** <Protocol type: 2010/401x/4x40-StdBB/4x40-StdLC> **No.:** <Number of connected load cells> **Supports:** <Number of supporting points>
6. Power off/on and check load cells	**SystemInfo** -> **Load Cell Signals**	**Load Cell Signals:** Verify all load cells found without error indications?
7. Configure the 3 weighing ranges (each possibly consisting of multiple intervals)	**ServiceMode** -> **Weighing**	**Mode:** NORMAL / CALIBRATION / PROTOCOL each consisting of: - **Unit:** <Desired unit> - **DP:** <Number of digits after decimal point> - **Resolution:** <Desired resolution> - **Minimum:** <Desired minimum weight> - **Maximum:** <Desired maximum weight>
8. Configure update rates, filtering and stability requirement	**ServiceMode** -> **Weighing** -> **Display** **Filtering** **Steady Detection**	**Display rate/Protocol rate/Single LC rate:** <Default: *400ms /400ms / 400ms*> **Cascade Rate 2** / **3:** <Default: *10 / 100*> **Cascade Filter 1** / **2** / **3:** <Default: *None / None / None*> **Steady Detection Rate** / **Limit:** <Default: *400ms / 1 division*>
9. Perform coarsetare	**ServiceMode** -> **Weighing** -> **Coarsetare**	Perform coarsetare with no load on weighing arrangement.
10. Configure zero tracking range	**ServiceMode** -> **Weighing** -> **Zeroing**	**ZT range:** <Range for automatic zero tracking. Default: *½ division*>
11. Perform load check	**Normal**	Verify weight reading with known load.
12. Perform corner calibration (Optional)	**ServiceMode** -> **Weighing** -> **Calibration** -> **Corner.Cal.**	Perform corner calibration if needed.
13. Perform system/span calibration	**ServiceMode** -> **Weighing** -> **Calibration**	Perform calibration of system/span. Note calibration factor.
14. Perform linearization (Optional)	**ServiceMode** -> **Weighing** -> **Linearization**	Perform linearization (Up/Down correction) if needed.
15. Perform final load check	**Normal**	Verify weight reading with known load if necessary.
16. Configure analog output (Possible option)	**ServiceMode** -> **Analog**	**Output:** <Analog output type: 4-20mA or 0-10V> **Value:** <Analog output follows: Gross or Net weight> **Full scale:** <Value resulting in maximum analog signal> **Error value:** <Output value on error: Maximum or Minimum> **Test mode/value:** <Used for test to force an output signal>
17. Configure Ethernet connection (Optional)	**ServiceMode** -> **Ethernet** (-> **Protocols**)	Configure Ethernet connection (IP, subnet and protocol) on Ethernet connector of the 5024 if needed.
18. Configure external equipment, module or remote display (Possible option)	**ServiceMode** -> **Ext.Module** or **ServiceMode** -> **Remote Display** or **ServiceMode** -> **RS485 COMM.**	Configure the connection of any external equipment, module or remote display on the RS485 channel if needed: - **MCEXX35:** Profibus-DP module - **MCE9637:** DeviceNet module - **2X50:** Ethernet module - **2070:** PROFINET module - **5024:** Remote Display

Appendix B – Electrical connections

The following describes the main hardware features such connection of power, connection of load cells, various connectors for connection of external equipment and jumpers as well as internal indicators (LEDs).

Rear view



Power Connection

The 5024 system is powered by +24VDC which is connected to either J1 or J6 (J1 and J6 are internally short-circuited). This powers the entire system including the connected load cells.

J1 pin	Function
1	+24V
2	GND

J6 pin	Function
1	+24V
2	GND

Load cell connection

Load cells can be connected to the system in one of the following three ways:

- J11 connector using a ribbon cable to 2010 load cell modules (without use of MCE9601).
- J3 connector using a shielded cable to either 2010 load cell modules (by using a MCE9601 connector module), or to a 4x40 unit.

J3 pin	Function
1	RS485-B (negative line)
2	RS485-A (positive line)
3	+24V (output – may be used to supply the load cells)
4	GND

- J12 connector using a ribbon cable to a 4015 load cell connection module, for System 4000 compatible load cells.

Digital I/O connector

The 4 pin digital I/O connector (J2) can be used for connecting digital inputs and outputs to the 5024 system. This connector has the following pin-out:

J2 pin	Function
1	**IO_1** *Reserved for future use*
2	**IO_2** *Reserved for future use*
3	**IO_3** *Reserved for future use*
4	**IO_4** *Reserved for future use*

IMPORTANT: Connection of the digital I/O signals to external equipment must be made using solid-state-relays (SSR).

RS485 communication with external module

The 3 pin RS485 serial communication connector (J4) can be used for RS485 communication with external equipment. This connector has the following connections:

J4 pin	Function	Connection
1	**RS485-B** (negative line)	**External module MCE9601: B** or **RS485-B** on communication connector on the external module.
2	**RS485-A** (positive line)	**External module MCE9601: A** or **RS485-A** on communication connector on the external module.
3	**RS485-GND**	**External module MCE9601: GND** or **RS485-GND** on communication connector on the external module.

Please notice: A and B line definition may be switched on eternal equipment. Especially on Siemens equipment and a few other German manufacturers A and B lines definitions are different.

IMPORTANT: Remember to supply power to any external communication module used. This can be done by connecting +24V and GND (possibly taken from the J1 or J6 connector on the 5024G terminal) to the used MCE9601 connection module or directly to any power connector on the external module.

Analog output connector

The 3 pin analog output connector (J5) can be used for output of analog control signals from the 5024 system. This connector has the following pin-out:

J5 pin	Function
1	*Reserved for future use*
2	*Reserved for future use*
3	*Reserved for future use*

Ethernet connector

The RJ45/Cat5 Ethernet connector (J7) is a standard Ethernet connector that can be used to connect the 5024 system to Ethernet.

Appendix C – 2070 PROFINET module

If a 2070 PROFINET module is connected it must have the following software version:

2070.AUXSLAVE.200311.1v4 (or newer)

It is possible to connect the 2070 communication module to an PROFINET network, where it will act as a slave. It will then be possible from the PROFINET master to transfer data to/from the 5024G terminal (RS485 master).

2070 Checklist during installation

During installation of the system the following should be checked/performed:

1. All hardware connections are made as described below.
2. If necessary, the PROFINET master should be configured to communicate with the 2070 PROFINET module using the supplied GSDML file.
3. Set the RS485 communication address by use of **SW1**.1 – **SW1**.4 as described later.
4. The 2070 PROFINET module is connected to the PROFINET network using the PORT1 PROFINET connector (and possibly also PORT2) in the front of the 2070 module.
5. The 2070 PROFINET module is connected to the RS485 master using the 3 pole RS485 connector (J1).
6. Power (24VDC) is applied at the two pole power connector (J2) or through the ten pole connector (J7) connected to the MCE9601 connection module using the supplied ribbon cable.
7. The PROFINET communication is started.
8. Verify that the BF, SF, MT and ST lamps of the 2070 module end up OFF.
9. Verify that the RDY lamp ends up green.
10. Verify that the TxBB lamp (green) and D1 lamp (green) on the 2070 PROFINET module starts toggling rapidly shortly after power up.
11. Verify that expected data can be transferred across the PROFINET.

2070 Connection without MCE9601

If the 2070 PROFINET module is connected to the 5024G terminal **without** an external MCE9601 connection module, the connection is made as described in the following.

The grey ten pole ribbon connector (J7) of the 2070 module is **NOT** used.

The green two pole power connector (J2) of the 2070 module is connected as follows:

2070 J2 CONNECTOR	CONNECTION
J2.1	5024G J6.1: +24VDC (Vin)
J2.2	5024G J6.2: 0 VDC (GNDin)

The green three pole RS485 connector (J1) of the 2070 module is connected as follows:

2070 J1 CONNECTOR	FUNCTION	CONNECTION
J1.1	RS485-B (DATA-)	5024G J4.1: RS485-B
J1.2	RS485-A (DATA+)	5024G J4.2: RS485-A
J1.3	0 VDC (GNDin)	5024G J4.3: RS485-GND

2070 Connection with MCE9601

If the 2070 PROFINET module is connected to the 5024G terminal **with** an external MCE9601 connection module, the connection is made as described in the following.

The green two pole power connector (J2) of the 2070 module is **NOT** used. The green three pole RS485 connector (J1) of the 2070 module is **NOT** used. Instead the grey ten pole ribbon connector (J7) of the 2070 module is used.

The ten pole connector (J7) on the 2070 module is connected to the 10 pole connector on the MCE9601 connection module using the supplied ribbon cable with mounted connectors. Through this bus cable connection of power supply is achieved as well as connection to the 5024G terminal (RS485 master).

The MCE9601 module is connected to the 5024G terminal as follows:

MCE9601 CONNECTOR	CONNECTION
GND	-
B (DATA-)	5024G J4.1: RS485-B
A (DATA+)	5024G J4.2: RS485-A
GND	5024G J4.3: RS485-GND
+24V	5024G J6.1: +24VDC (Vin)
GND	5024G J6.2: 0 VDC (GNDin)
I/O	-

2070 DIP-switch settings

The 2070 PROFINET module is equipped with a 4 pole DIP switch block located in the front of the module. This DIP switch block is named **SW1** and has the following function:

SWITCH	FUNCTION
SW1.1 – **SW1**.4	**Selection of RS485 communication address** The address is selected as the DIP-switches are binary coded, so that **SW1**.1 is MSB and **SW1**.4 is LSB. Note that these switches are only read during power on. The address should not be set so that the module has an address that matches another PROFINET module.

The 2070 PROFINET module is also equipped with an 8 pole DIP switch block also located in the front of the module. This DIP switch block is named **SW2** and has the following function:

SWITCH	FUNCTION
***SW2**.1 – **SW2**.8*	*Reserved for future use*

2070 Light Emitting Diodes

The front of the 2070 PROFINET module is equipped with a number of status lamps (light emitting diodes). These have the following functionality:

LED	FUNCTION
PORT1 connector (Green) (RJ45)	**Link (PORT1)** PROFINET is connected.
PORT1 connector (Yellow) (RJ45)	**Activity (PORT1)** PROFINET data is received or transmitted.
PORT2 connector (Green) (RJ45)	**Link (PORT2)** PROFINET is connected.
PORT2 connector (Yellow) (RJ45)	**Activity (PORT2)** PROFINET data is received or transmitted.
TxBB (Green)	**2070 communication with AUX-master** PROFINET module is communicating with AUX-master.
BF (Red)	**Bus Fail LED** The 2070 Bus Fail LED can be lit/flashing depending on the status of the network. The function of the BF LED is given below.
SF (Red)	**System Fail LED** The 2070 System Fail LED can be lit/flashing depending on the status of the system. The function of the SF LED is given below.
MT (Yellow)	**MainTenance required LED** The 2070 MainTenance required LED can be lit/flashing depending on the status of the system. The function of the MT LED is given below.
RDY (Green)	**ReaDY LED** The 2070 device ReaDY LED can be lit/flashing depending on the status of the device. The function of the RDY LED is given below.
ST *(Red)*	*Reserved for future use*
D1 (Green)	**Communication with RS485 master** Toggles when the PROFINET module receives a valid telegram on the RS485 bus.

The TXBB, BF, SF, MT, RDY, ST and D1 LED's display the status of the PROFINET device, and can in conjunction with the table below be used for error finding.

LED	Color	Status	Description
BF	Red		**Bus Fail:**
		ON	No link status available.
		Flashing	Link status ok. No communication link to a PROFINET IO controller.
		OFF	The PROFINET IO controller has an active communication link to this PROFINET IO device.
SF	Red		**System Fail:**
		ON	PROFINET diagnostic exists.
		Flashing	Reserved.
		OFF	No PROFINET diagnostic.
MT	Yellow		**Maintenance Required:**
		ON	Manufacturer specific - depends on the capabilities of the device.
		Flashing	
		OFF	
RDY	Green		**Device Ready:**
		ON	TPS-1 has started correctly.
		Flashing	TPS-1 is waiting for synchronization of the host CPU (firmware start is complete).
		OFF	TPS-1 has not started correctly.

2070 PROFINET connector

The front of the 2070 PROFINET module is equipped with two standard Ethernet RJ45 connectors (**PORT1** and **PORT2**) for PROFINET connection using Cat5 cables.

Appendix D – 2070 Tips for PROFINET configuration

MAC addresses

The MAC addresses of the 2070 PROFINET module are noted on a label on the side of the 2070 module. The MAC addresses of the 2070 module are pre-set to unique values within the Eilersen Electric A/S range.

GSDML file

The supplied GSDML can be used to configure the PROFINET master to communicate with the 2070 PROFINET module.
Please note that on a Siemens SIMATIC STEP 7 software platform, once the GSDML file has been imported, the imported 2070 PROFINET module will normally be placed in the following location of the "Hardware catalog":

Other field devices \ *PROFINET IO* \ *I/O* \ *Eilersen Electric* \ *2x70 AUXSLAVE*

Factory settings

Upon delivery the 2070 PROFINET module contains the following default factory settings:

Device Name:	d2x70
IP Address:	192.168.1.199
Subnet Mask:	255.255.255.0
Default Gateway:	192.168.1.254
Vendor ID:	840 (0x348)
Device Type:	D2x70

Setting DeviceName, IP Address etc.

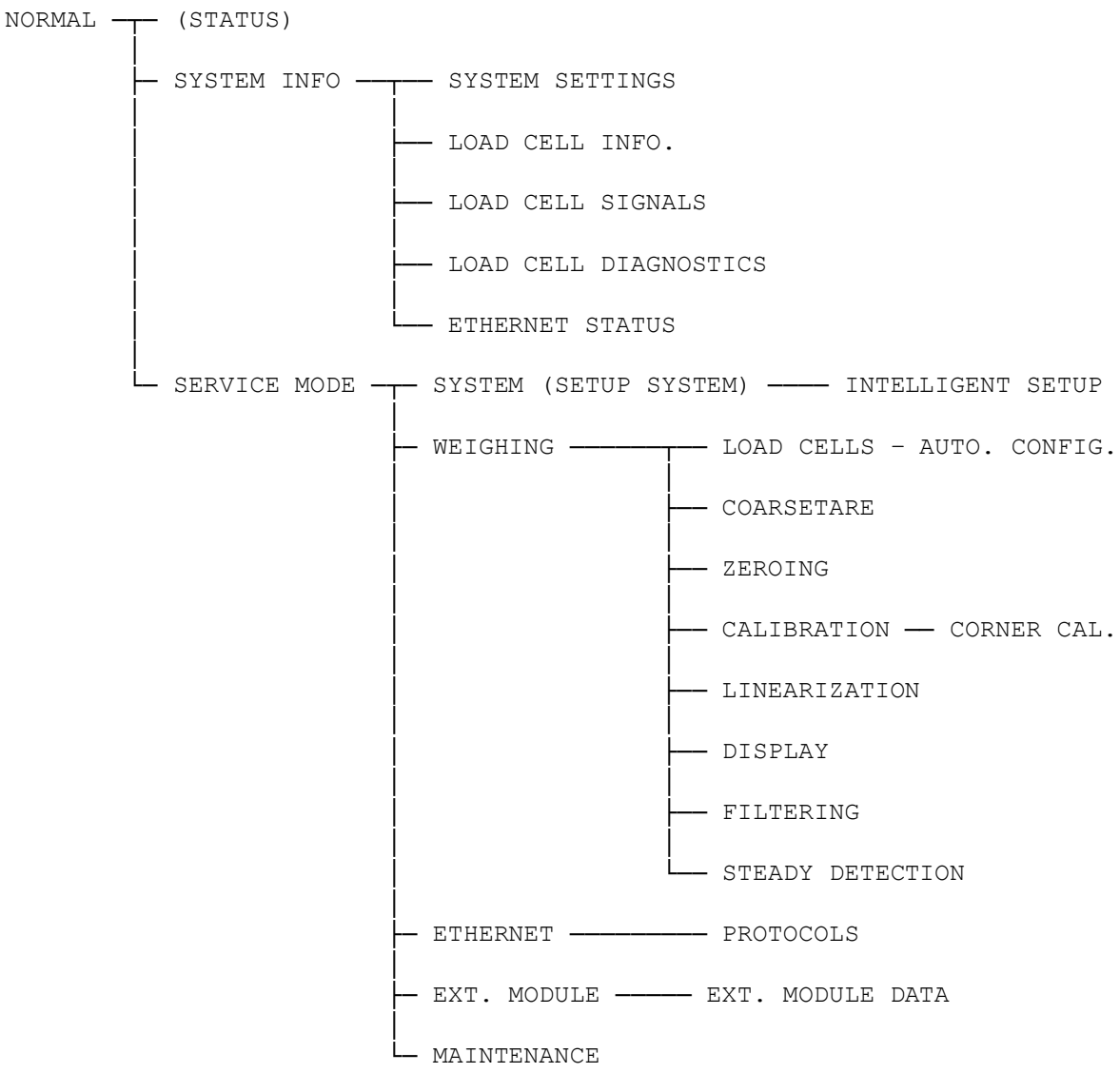
The default factory settings of the 2070 PROFINET module, such as device name (d2x70) and IP address (192.168.1.199) etc., must be changed according to the actual PROFINET configuration.
Please note that on a Siemens SIMATIC STEP 7 software platform (TiA Portal), this is normally done under "Online Access" where the different node parameters (MAC address, IP address, DeviceName etc.) can be viewed and changed.

Data sizes

The amount of data exchanged between the PROFINET master and the 2070 PROFINET module is specified in the GSDML file. This application with the software specified on the front page of the manual uses 14 input bytes and 14 output bytes.
NOTE: Please beware that the terms "input" and "output" may be confusing and are used differently from vendor to vendor. Throughout this manual, these terms are always from the PROFINET masters (PLC's) point of view. Therefore, the data from the 2070 module to the PLC are referred to as "input" data, while the data from the PLC to the 2070 module are referred to as "output" data.

Appendix E – Screen overview

The system has the following screens, which are selected using the menu system, with the external module option enabled:



During normal use it is only necessary to use the **NORMAL** screen. The other screens are used during installation and calibration.

Appendix G – Setting of MAC Address

The MAC Address is pre-set to a unique value from the pool assigned by the IEEE to Eilersen Electric.

Eilersen Electric MAC Address ranges:

00-50-C2-C5-30-00 to 00-50-C2-C5-3f-ff

20-85-93-60-00-00 to 20-85-93-6f-ff-ff

The MAC Address is set to a default value within this range and **CAN NOT** be set to a random value.

If the user has obtained another pool of MAC Addresses from IEEE and wishes to use one of these, please contact Eilersen Electric for details.

Always apply to the IEEE standards especially regarding the uniqueness of MAC Addresses.

Appendix H – Software download

New firmware may be downloaded on the Ethernet connection. This is done from a Windows PC with the EEConnect software.

Revision History

Date	Author	Rev.	*Update*
2024-05-24	HJA	1v4	*Initial document created and adapted.* *(based on FFEx-Scale-240304-1v1-RefMan-eng)*

Contact

With further questions or improvement suggestions please contact us:

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