Ramsey
MINI CK100
Static Weight Indicator

SERIAL COMUNICATION
MANUAL

DOCUMENT HISTORY

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INDEX

About this manual

The *Modbus RTU protocol* manual consists of three parts.

Chapter 1, Brief overview of the MODBUS-RTU protocol.

Chapter 2, Explains how MODBUS-RTU protocol has been implemented in the Ramsey Mini CK instruments. The information contained in this section should be intent as general information, they are valid for all the MINI CK Series models.

Chapter 3, Detailed description of the data that can be transmitted and received to and from the instrument. This part is specific for the instrument model.

Bibliography

- Modicon Modbus Protocol Reference Guide Rev.E

1. MODBUS-SERIAL OVERVIEW

1.1 General

The MINI CK 100 Static Weight Indicator can be equipped with one COM serial communication board to perform exchange of data with all external device that provide support for serial communication with modbus protocol.
Each COM board has one serial channel that can be configured according to the following standards.

- RS232C for point to point asynchronous bidirectional communications, maximum 50 feet (15 m). Modem capability.
- RS422/RS485 for point to point or multidrop 4 wire bidirectional communications, maximum 4000 feet (1200 m).

All of the above are optically isolated.
Once installed in the instrument the board is automatically detected as new board and adds the communication COM set-up scrolls to the Main Menu scrolls.

Each COM A contains a perpetual clock/calendar circuit with battery backup. The battery is located on the mother board. The system automatically detects and uses the clock calendar circuit of the board
Time and date set-up screens become visible after the COMM board is installed.

1.2 Communication Protocol

When a COM line is set up for communication (not for a printer), the system is able to send and receive data to and from another device connected to the COMM line. The COMM option comes with the following software communication protocols already built in:
- Modbus An AEG proprietary protocol, multidrop. The COMM option only contains a subset of the protocol as specified in this manual.

The hardware can be configured (through jumpers) to one of the two standards as listed in the previous paragraph. However, only the RS485/RS422 standard allows multidrop communications, while RS232C can only be used in point to point mode. This does not prevent the use of a protocol; it only prevents physically connecting the MINI CK to more than one device.

CAUTION

The communication protocols have been implemented and tested as described in this document or in other referenced documents. It is the intention of Thermo Ramsey to provide all the necessary information and help the user to connect the instrument to other compatible devices. However, because most of the protocols are specific to other manufacturers, Thermo Ramsey declines any responsibility for any malfunction that may occur when connecting the instrument to devices of other manufacturers, unless tested and approved by Thermo Ramsey.

1.3 Protocol Rules

The communication protocol allows a remote intelligent device to read and write information from and to the MINI CK. For convenience, the available information are organized in a set of registers as listed in this document.
During the communication activity, the MINI CK always acts as Slave, meaning it responds to a request from a Master device on the line, but never attempts to send messages out.
The following rules apply:

a. The MINI CK, give reply only if the message is completely received.
b. The MINI CK reads the message and looks for the address, which is contained into an address byte in the query package. The message is then processed only if the address matches the one specified in the set-up data of the MINI CK, otherwise it is ignored.
c. When the MINI CK receives a message, the integrity of the message is checked. An answer-back message is prepared if the message is formally correct.
d. When a received message, involves a variable to be written, the system checks the correctness of the message and, if it is correct, immediately sends an acknolewdge message. This does not always mean the data is written in memory. The system first checks the register number (which must correspond to a valid address of a variable), then the limits (minimum and maximum), and then the password.
If data are accepted, it is stored in memory and the success flag set to 0 (no error).
If not, it is set to 1. If Master want to check if the last variables sent have been stored, or not the Master must checks (reads) the success flag contained in a read only register.

The following procedure applies:

- The Host sends data to the MINI CK.
- The Host waits at least 100 ms.
- The Host reads the success flag. It should be 0.

Some data are read only, some are read / write, and some write only.

WARNING

In all cases, the maximum number of words the system can transfer is limited to 41 per time. Requests of registers in excess of 41 are considered errors and do not generate an answer.

2. INSTALLATION

This chapter describes the installation procedure and hardware configuration for the communications COM board. If the communication option was installed at the factory, it may not be necessary to continue with this chapter. Proceed to Chapter 3.0, Set-up and Format

To install the COM board, proceed as follows:

1. Select the jumper positions on the COM board for the desired communication standard. Below is a table which summarizes the jumper positions for selection of the electrical interface. Refer to Figure 2-1 for jumper locations.

COM BOARD JUMPERS										
Mode	J1	J3	J5	J7	J8	J9	J10	J11	J12	J13
RS-232	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2
RS-485 (4 wires)	2-3	1-2	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3
RS-485 (2 wires)	2-3	1-2	2-3							

JUMPERS TABLE 2-1

BATTERY
J3
"1-2" ON
"2-3" OFF

FOR RS-485 ONLY
J1
"1-2" NORMAL
"2-3" MULTIDROP

FOR RS-485 ONLY
J13
"1-2" TERMINATED
"2-3" NOT TERMINATED

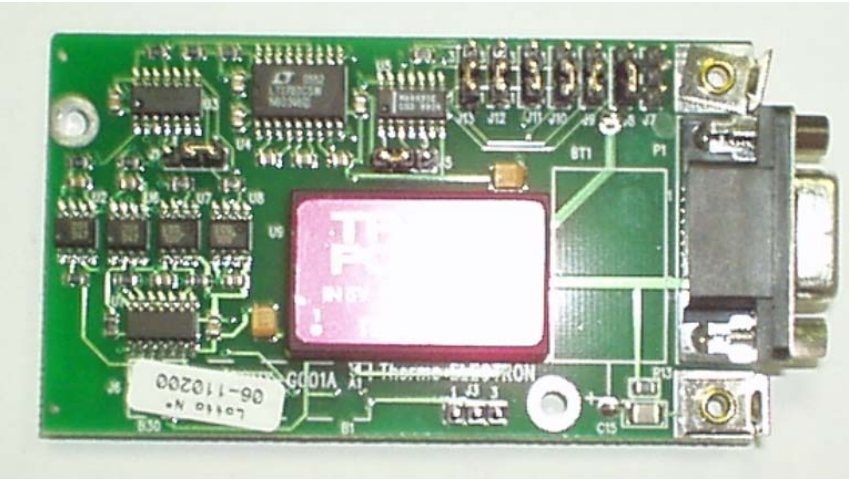


FIGURE 2-1

2. Turn power off on MINI-CK
3. Remove the MINI from the panel (panel version) or form the plate (field version)
4. Remove back cover with max. care to access to the internal side.
5. Remove the alluminum cover from the alluminum plate
6. Install the board by the socket
7. Fix the board on the alluminum plate
8. Close all block from the rear with the max. care
9. Turn power on back .
10. Set-up data for the newly installed COM board can be now entered

3. SET-UP AND FORMAT

This section explains the communication set-up. See Chapter 4 for communication protocols detailed description.

3.1 Clock /Calendar Set-up

When a COM A board is installed, date and time become available and must be set. The battery, located on the expansion board, provides backup for the perpetual calendar/clock. Time and date needs to be set only once.

1. Press the RUN-SETUP key to enter into SETUP MENU then press UP ARROW or DOWN ARROW until Main Menu 3 appears. Press the soft key under the DIAGNOSTICS scroll and scroll down until -DIAGNOST SCROLL 10- appears.
   The following scroll is provided to set up the date, and enter the day, month and year in sequence.

-DIAGNOST. SCROLL 10-
Date: DD-MM-YYYY
DAY: DD
ENTER

Password: SERVICE

Default: 01-01-1970
Min: 01-01-1970
Max: 12-31-2096

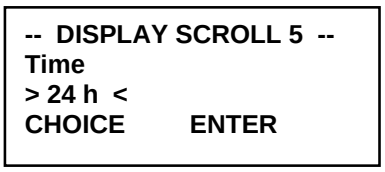
Time is entered in a similar way. The **AM/PM** key is used when time is in the English mode (see Display Scroll 11 below).

-DIAGNOST. SCROLL 11-
Time: HH:MM
HOURS: _____
ENTER AM/PM

Password: SERVICE

	24 hour	am/pm
Default:	00:00	01:00
Min:	00:00	01:00
Max:	23:59	12:59

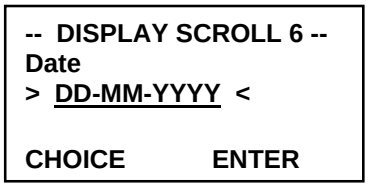
2. Press the RUN-SETUP key then UP / DOWN ARROW until Main Menu 2 appears. Press soft key under DISPLAY scroll and scroll down until -DISPLAY SCROLL 5- appears.
The user can define the format for displaying and printing time and date. Select the 24 hours or 12 hours format:



Password: Service

If USA or English : **Default** : am/pm
If other language : **Default** : 24 h
Selection : am/pm, 24 h

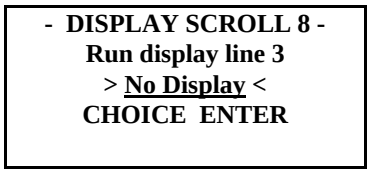
Then date can be set to show month or day first, in three possible configurations:



Password: Service

If USA or English: Default: MM-DD-YYYY
If other language: Default: DD-MM-YYYY
Selections: DD-MM-YYYY, MM-DD-YYYY, YYYY-MM-DD

3. When a COM board is installed, date and time can be displayed line three (3) in the RUN screen if selected using DISPLAY SCROLL 8.

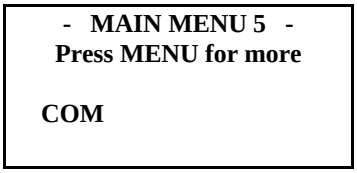


Password: Service

Default: NO DISPLAY
Selections: NO DISPLAY, GROSS,TARE,PEAK
RESET TOT,MASTER TOT,BARGRAPH

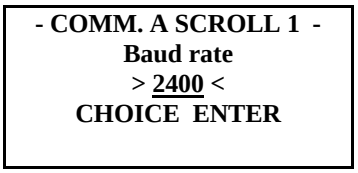
3.2 COM Scroll Set-up

Main Menu 5 is dedicated to the serial line. COM is used to set up the serial line of the COM, regardless if the serial line is connected to a computer or a PLC.



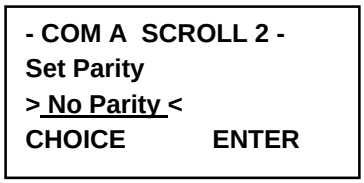
1. LINE SETTING AND PROTOCOL DEFINITION

The following screens define the communication parameters of the channel .



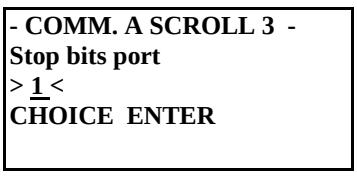
Password: Service

Default: 9600
Selections: 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200



Password: Service

Default: NO PARITY
Selections: EVEN PARITY, ODD PARITY, NO PARITY



Password: Service

Default: 1
Selections: 1,2

- COM A SCROLL 4 -
Wordlength COM #1
> 8 bits <
CHOICE ENTER

Password: Service

Default: 8
Selections: 7,8

The next screen defines the port use. A Modbus protocol is implemented in the system. Possible selections are:

MODBUS: A proprietary protocol of AEG. Multidrop, Master Slave.
PRINTER: Is not a protocol, selects only printer output. (not implemented)

- COMM. A SCROLL 5 -
Protocol
> **MODBUS** <
CHOICE ENTER

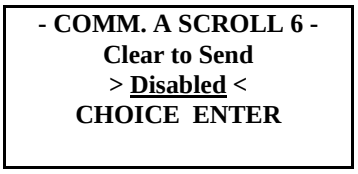
Password: Service

Default: MODBUS
Selections: MODBUS, PRINTER

2. MULTIDROP OPERATOT SET-UP

NOTE: This section only applies to multidrop operation. If you are using the COMM for connecting a printer, skip this section and refer to Section 3.3.4.
The Clear To Send (CTS) line of the port can be used for hardware handshake.
Select Enabled if you want to connect the CTS input of the system to a control signal generated by the other device.

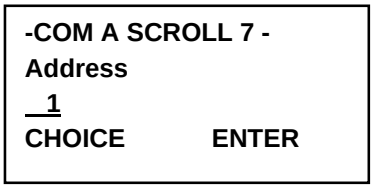
WARNING
THE CTS INPUT CAN ONLY BE USED WHEN JUMPERS ARE SET FOR RS232. ATTEMPTING TO ENABLE THE CTS SOFTWARE CONTROL IN RS485 MODE WILL RESULT IN LOCK-UP OF THE LINE.



Password: Service

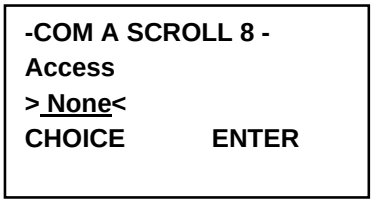
Default: DISABLED
Selections: ACTIVE, DISABLED

The following screens define the ADDRESS of the device in the multidrop line, and the access permission from the remote supervisor. If NONE is selected, the supervisor has full access to the device. If LIMITED is selected, the supervisor can only access those variables that are accessible with the OPERATOR password. If PROTECTED is selected, the unit is read only to the supervisor.



Password: Service

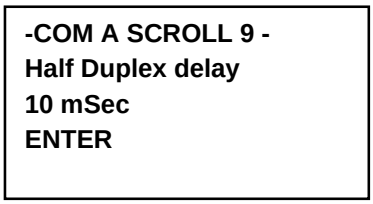
Default: 1
Min: 1
Max: 255



Password: Service

Default: NONE
Selection: NONE, LIMITED, PROTECTED

For two wires connection, there is the ability to set a delay to the response; this allows you to connect the master devices that are very slow to switch in receive mode,



3. PRINTER SET-UP (not implented)

NOTE: This section only applies to printer. If you are using the COM for connecting a computer, PLC or other device using a protocol, skip this section. and refer to Section 3.3.3.

The MINI CK has a fully programmable printer format. The following section explains how to program the Print scroll according to the specific needs.

The system can be configured to operate without any handshake (NONE), or using the Clear To Send signal (CTS) or the XON-XOFF sequence. Refer to the instruction manual of the printer to define which selection is required. The selection NONE is only supplied for testing purposes, but is not recommended for normal use. If NONE is selected, the system is not able to recognize if the printer is on line or not, or if the paper is empty.

The most commonly used protocol is the CTS, which is a signal generated by the printer to indicate whether it is ready to receive data or not.

WARNING
THE CTS INPUT CAN ONLY BE USED WHEN JUMPERS ARE SET FOR RS232. ATTEMPTING TO ENABLE THE CTS SOFTWARE CONTROL IN RS485 MODE WILL RESULT IN LOCK-UP OF THE LINE.

- PRINTER SCROLL 1 -
Handshaking
> **None** <
CHOICE ENTER

Password: Service

Default: NONE
Selection: NONE, CTS, XON-XOFF

Different printers use different end of line patterns. Select the one you need according to the printer.

-PRINTER SCROLL 2 -
End of line
> CR <
CHOICE

Password: Service

Default: CR
Selection: CR, LF, CR+LF

Some simple printers cannot accept characters while they are printing. In some cases the handshake is not well controlled by the printer, so a delay at end of line is helpful.

- PRINTER SCROLL 3 -
Delay end of line
0 sec
ENTER

Password: Service

Default: 0 sec
Min: 0 sec
Max: 5 sec

A Form Feed character can be sent to the printer after each report to force the printer to eject the paper.

- PRINTER SCROLL 4 -
Form Feed
> NO <
CHOICE ENTER

Password: Service

Default: NO
Selections: NO, YES

If you want to generate periodical printing, enter the number of minutes, hours or days in the following screen. By entering 0, the periodical printing is prevented. Use the INTV key to switch from minutes to hours and to days.

- PRINTER SCROLL 5 -
Print interval
0 min
ENTER INTV

Password: Service

Default: 0
Min: 0 min, 0 hour, 0 days
Max: 59 min, 23 hour, 365 days

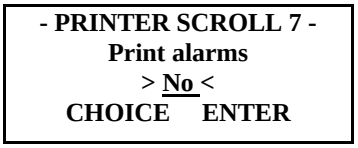
The system can print at specific times during the day. Enter the time you want to obtain the printing. Use the NEXT keys to scroll between the print times. Up to four discrete times may be entered. The ON/OFF key enables or disables the displayed print time.

- PRINTER SCROLL 6 -
Print time
time HH:MM
ENTER ON/OFF NEXT

Password: Operator

Default: OFF
Min: 00:00
Max: 23:59

The system can print an report alarm when this condition occurs :



Default : NO
Selections : NO,YES

By selecting YES in the following screen, the system is instructed to print one line each time a new alarm condition occurs. The alarm is printed as follows:

dd-mm-yyyy hh:mm a/p
kkkkkkkkkk

where:

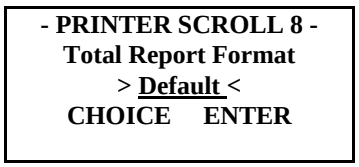
dd-mm-yyyy:	Day, Month, Year, printed according to the local format as defined in Main Menu 2 - Display.
hh:mm a/p:	Hour, Minutes, am/pm printed according to the local format as defined in Main Menu 2 - Display
kkkkkkkkkk:	Alarm message, same message appearing on the screen.

For example:
09-10-2002 8:14a
Threshold #1

4. DEFINE PRINTING FORMAT

The next method is to define your own format using the printer setup screens listed below.

Select DEFAULT if you want the predefined format. Select USER DEFINED if you want to set up your own format.



Default: DEFAULT
Selections: DEFAULT, USER DEFINED

Two predefined printing format are available:

DEFAULT
TOTALS REPORT

DATE: 09-10-2002
TIME: 8:12a

MASTER TOTAL: 0.00 Tons
RESET TOTAL: 0.00 Tons
NET WEIGHT: 0.00 Tons
GROSS WEIGHT: 0.00 Tons
TARE WEIGHT: 0.00 Tons
PT: 0.00 Tons
PEAK WEIGHT: 0.00 Tons

USER
STRING 1
STRING 2
DATE: 09-10-2002
TIME: 8:12a
STRING 3
RESET TOTAL: 0.00 Tons
MASTER TOTAL: 0.00 Tons
NET WEIGHT: 0.00 Tons
GROSS WEIGHT: 0.00 Tons
TARE WEIGHT: 0.00 Tons
PEAK WEIGHT: 0.00 Tons

If your selection is USER DEFINED, the following screens are displayed.

Define if you want to add a heading string in your report. String can be used to add the Customer name as well as other information that you want to include in the print format.

```
- PRINTER SCROLL 9 -
String #1
> yes <
CHOICE              ENTER
```

Password: Operator

Default: NO
Selections: YES, NO

If you selected YES, the next two scrolls are displayed.

This first one allows the operator to define the string. Use the alphanumeric keypad, pressing the numeric key corresponding to the letter that you want to type. Every time you press a new key, the cursor moves to the right one place. If you need to use two times the same key (example for double letters), move the cursor right using the arrow keys (left and right soft keys).

```
- PRINTER SCROLL 9A -
Contents string #1
xxxxxxxxxxxxxxxxxxx
<   ENTER    >
```

Password: Operator

Default: xxxxxxxxxxxxxxxxxxx

Once you have defined the string, specify where the string has to be placed on the printed report. The coordinate is given in the following way:

```
   00000000001111111111222222222223...
   01234567890123456789012345678901...
  +-------------------------------------------------> X
00|This line printed first
01|This line printed second          ^
02|                                  | DIRECTION OF
03|                                  | PAPER
04|
05|
```

06|

. v

. Y

Use the X-pos and Y-pos keys to enter the X and Y coordinates. Confirm with ENTER. By specifying 0,0, the string is not printed.

```
- PRINTER SCROLL 9B -
Position string #1
X = 0 , Y = 0
ENTER       X\Y-pos
```

Password: Operator

	X	**Y**
Default:	1,	1
Min:	0,	1
Max:	24,	80

Define if you want to add a second heading string in your report.

```
- PRINTER SCROLL 10 -
String #2
> yes <
CHOICE              ENTER
```

Password: Operator

Default: NO
Selections: YES, NO

If you selected YES, the next two scrolls are displayed.

```
- PRINTER SCROLL 10A -
Contents string #2

_____________
<    ENTER     >
```

Password: Operator

Default: = =

```
- PRINTER SCROLL 10B -
String #2  pos.
X =___, Y =___
ENTER       X\Y-pos
```

Password: Operator

	X	Y
Default:	2,	1
Min:	0,	1
Max:	24,	80

There is a third string. It is a third heading string exactly as the previous two. .

```
- PRINTER SCROLL 11 -
String #3
> yes <
CHOICE          ENTER
```

Password: Operator

Default: NO
Selections: YES, NO

If you selected YES, the next two scrolls are displayed

```
- PRINTER SCROLL 11A -
Contents string #3
_____________________
SCALE #
```

Password: Operator

Default: = =

ENTER and ARROWS keys compare in the fourth line of the display when the numeric or alphanumeric key is pressed.

```
- PRINTER SCROLL 11B -
String #3  pos.
X =___, Y =___
ENTER     X\Y-pos
```

Password: Operator

	X	Y
Default:	3,	1
Min:	0,	1
Max:	24,	80

A series of variables can be added in the report. Variable are : MASTER TOTAL, RESET TOTAL, DATE, TIME, NET WEIGHT, GROSS WEIGHT TARE and PEAK

The position must be defined for each variable. If you do not intend to add a variable in the report, you should set its X position to 0.

- PRINTER SCROLL 12 -
Date position
X =___, Y =___
ENTER X\Y-pos

Password: Operator

	X	Y
Default:	4,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 13 -
Time position
X =___, Y =___
ENTER X\Y-pos

Password: Operator

	X	Y
Default:	5,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 14 -
Reset total position
X =___, Y =___
ENTER X\Y-pos

Password: Operator

	X	Y
Default:	6,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 15 -
Master total position
X =___, Y =___
ENTER X\Y-pos

Password: Operator

	X	Y
Default:	7,	1
Min:	0,	1

Max: 24, 80

- PRINTER SCROLL 16 -
Net Weight position
X =___, Y =___
ENTER X\Y-pos

Password: Operator

	X	**Y**
Default:	0,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 17 -
Gross Weight position
X =___, Y =___
ENTER X\Y-pos

Password: Operator

	X	**Y**
Default:	0,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 18 -
Tare position
X =___, Y =___
ENTER X\Y-pos

Password: Operator

	X	**Y**
Default:	0,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 19 -
Peak position
X =___, Y =___
ENTER X\Y-pos

Password: Operator

	X	**Y**
Default:	0,	1
Min:	0,	1

Max: 24, 80

5. PRINT KEY

The MINI CK can print out several kinds of data, depending on the system set-up. When the printer has been installed and properly set up, the user can print by means of the PRINT soft key as described below.

When the PRINT key is pressed, the following screen is displayed:

- PRINTER SCROLL -
COM #1 no data
Start print TOTALS
PRINT RETURN COM

The second line gives the status of the printer:
NO DATA: Indicates the printer is idle, no data is being sent to the printer.
RUNNING Indicates the system is sending data to the printer.
The third line indicates what kind of data is printed if the PRINT soft key is pressed.

The UP and DOWN keys select between:
a. TOTALS: prints the selected totals format (Default1or Default2)
b. BATCH: Only if load out option is active, print load out information.
c. SETUP: Print the set-up data of the instrument.

Print starts after the PRINT soft key is pressed.

6. ADDITIONAL DIAGNOSTIC

If a Communication board is detected, the following screen is shown.

- TEST SCROLL 8 -
Test communication A

PORT1

Password: Service

By pressing the PORT 1 soft key the test is initiated. A test pattern is sent out on the TX output and read on the RX input. If the test fails, the message TEST FAILED is shown, otherwise the message TEST PASSED is displayed.

NOTE: This test requires a hardware jumper to be installed between the (RX) and (TX) terminals of the communication board.

4. PROTOCOLS DESCRIPTION AND REGISTERS LIST

4.1 Description of the variables

The Table 1 of the next pages, lists the variables accessible by the Master specifically for the **MINI CK 100 Static Weight Indicator**.

It is necessary at this point make a distinction between register and variables.
A *register* is the basic unit of the data at which the Master can access. The groups are structured in registers, they are numbered and the identification number is used by the Master to identify the portion of a group to read or write. Their dimension is always one word.
A *variable* is the format of storing of the data in the instrument memory. Its dimension can change depending by the variable type, we can have:

CHAR variable	A char is a variable of 1 byte . It contains integer values in the ranges 0 to 255 or +127 to -128. The char variables can be structured in array with various dimensions.
INTEGER variable	An integer is a variable of 1 word (1 register). It contains INTEGER values in the ranges 0 to 65535 or +32767 to -32768. The integer variables can be structured in array of integers with various dimensions.
FLOAT variable	A float is a variable of two words (2 register). It contains REAL values in the single precision IEEE format (See Appendix A at the end of this document). The single precision format can represent values in the range $3.4*10^{+38}$ to $1.18*10^{-38}$
LONG variable	A long is a variable of two words (2 register). It contains INTEGER values in the ranges 0 to 4294967295 or +2147483647 to -2147483648. The integer variables can be structured in array of integers with various dimensions.

NOTE
A lot of real values are displayed on the instrument with a number of decimals that depends by the selected division. For what regards the communication, instrument registers always contain the value with all the decimals.

For example:

Net weight	Displayed value:	10.2
	Sent value:	10.179982

LEGEND:

Register	Conventional name	
Type	Can be:	RO The register can be read but can not be written. It will be inserted only in the read groups.
		RW The register can be read or written. It will be found either in the read or in the write groups.
		WO The register can only be written. It will be inserted only in the read groups.
Low limit	Minimum acceptable value for the variable. Lower values are considered as errors.	
High limit	Maximum acceptable value for the variable. Higher values are considered as errors.	
Refresh time	Time between two updates of the variable in the instrument's memory.	
format	Can be:	char , integer, float or double

Address (word) Number of word (decimal) in the mapping, at which the register can be found.
Note Comments and/or special info on use.

4.2 Description of Protocols

The Modbus protocol has been implemented as described in : - “Gould Modicon Modbus Protocol” – Reference Guide – November 1993 – Rev.A (Gould Inc. Programmable Control Division). The protocol has not been implemented totally but only a subset, as describe.

For example of reading/writing operaation with this protocol see chapter 5

4.3 List of registers

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Address (word)	Note
Simulation Key	WO	(**)	(**)	-	integer	0	
Write flag	RO	-	(*)	-	integer	1	
DISPLAY DATA							
Display (1)	RO	-	-	200	integer	2	
Display (2)	RO	-	-	200	integer	3	
Display (3)	RO	-	-	200	integer	4	
Display (4)	RO	-	-	200	integer	5	
Display (5)	RO	-	-	200	integer	6	
Display (6)	RO	-	-	200	integer	7	
Display (7)	RO	-	-	200	integer	8	
Display (8)	RO	-	-	200	integer	9	
Display (9)	RO	-	-	200	integer	10	
Display (10)	RO	-	-	200	integer	11	
Display (11)	RO	-	-	200	integer	12	
Display (12)	RO	-	-	200	integer	13	
Display (13)	RO	-	-	200	integer	14	
Display (14)	RO	-	-	200	integer	15	
Display (15)							

	RO	-	-	200	integer	16	

(*) Max limit is the number of digital inputs, it depends by the hardware configuration of the instrument.

(**) All the values are accepted but only a specific set of codes are interpreted as keys. See description of the variable.

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Address (word)	Note
Display (16)	RO	-	-	200	integer	17	
Display (17)	RO	-	-	200	integer	18	
Display (18)	RO	-	-	200	integer	19	
Display (19)	RO	-	-	200	integer	20	
Display (20)	RO	-	-	200	integer	21	
Display (21)	RO	-	-	200	integer	22	
Display (22)	RO	-	-	200	integer	23	
Display (23)	RO	-	-	200	integer	24	
Display (24)	RO	-	-	200	integer	25	
Display (25)	RO	-	-	200	integer	26	
Display (26)	RO	-	-	200	integer	27	
Display (27)	RO	-	-	200	integer	28	
Display (28)	RO	-	-	200	integer	29	
Display (29)	RO	-	-	200	integer	30	
Display (30)	RO	-	-	200	integer	31	
Display (31)	RO	-	-	200	integer	32	
Display (32)	RO	-	-	200	integer	33	
Display (33)	RO	-	-	200	integer	34	
Display (34)	RO	-	-	200	Integer	35	
Display (35)	RO	-	-	200	integer	36	
Display (36)	RO	-	-	200	integer	37	

Display (37)	RO	-	-	200	Integer	23	
Register	**Type**	**Low Limit**	**High Limit**	**Refresh Time [ms]**	**Format**	**Address (word)**	**Note**
Display (38)	RO	-	-	200	integer	38	
Display (39)	RO	-	-	200	integer	39	
Display (40	RO	-	-	200	integer	40	
STATUS AND DIAGNOSTIC DATA							
Panel Leds	RO	-	-	200	Integer	42	
Status (1)	RO	-	-	-	Integer	43	
Status (2)	RO	-	-	-	Integer	44	
Alarms (1)	RO	-	-	100	Integer	45	
Alarms (2)	RO	-	-	100	Integer	46	
In / Out image	RO	-	-	100	Integer	47	
Commands	RW	0	0xffff	-	Integer	48	
Commands 1	RW	0	0xffff	-	Integer	49	
DYNAMIC DATA							
Net weight	RO	-	-	100	float	52	
Gross weight	RO	-	-	100	float	54	
Peak weight	RO	-	-	100	float	56	
Master total	RO	-	-	100	float	58	
Reset total	RW	-	-	100	float	60	
Master total double	RO	-	-	100	double	62	
Reset total double	RO	-	-	100	double	66	
Manual zero	RW	-	-	-	long	72	
Manual span	RW	-	-	-	float	74	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Address (word)	Note
Linearization							
Linear option	RW	Tab.06	Tab.06	-	integer	78	
Linear weight 1	RW	0	SCALE CAP.	-	float	79	
Linear factor 1	RW	0	1.5	-	float	81	
Linear weight 2	RW	0	SCALE CAP.	-	float	83	
Linear factor 2	RW	0	1.5	-	float	85	
Linear weight 3	RW	0	SCALE CAP.	-	float	87	
Linear factor 3	RW	0	1.5	-	float	89	
Linear weight 4	RW	0	SCALE CAP.	-	float	91	
Linear factor 4	RW	0	1.5	-	float	93	
Linear weight 5	RW	0	SCALE CAP.	-	float	95	
Linear factor 5	RW	0	1.5	-	float	97	
DISPLAY DATA MENU							
Units	RW	Tab.07	Tab.07	-	integer	101	
Weight units	RW	Tab.08	Tab.08	-	integer	102	
Total units	RW	Tab.09	Tab.09	-	integer	103	
Language	RW	Tab.10	Tab.10	-	integer	104	
Time format	RW	Tab.11	Tab.11	-	integer	105	
Date format	RW	Tab.12	Tab.12	-	integer	106	
Line 2	RW	Tab.13	Tab.13	-	integer	107	
Line 3							

	RW	Tab.14	Tab.14	-	integer	108	
Register	**Type**	**Low Limit**	**High Limit**	**Refresh Time [ms]**	**Format**	**Address (word)**	**Note**
Weight damping	RW	0	16	-	integer	109	
Tare mode	RW	Tab.15	Tab.15	-	integer	110	
SCALE DATA MENU							
Scale capacity	RW	1	1000000	-	float	113	
Scale div.	RW	Tab.16	Tab.16	-	integer	115	
Load cell nr.	RW	1	6	-	integer	120	
Load cell cap.	RW	1	500000	-	float	121	
Load cell sens.	RW	0.5	3.36	-	float	123	
Load cell res1	RW	10	2000	-	float	125	
Load cell res2	RW	10	2000	-	float	127	
Load cell res3	RW	10	2000	-	float	129	
Load cell res4	RW	10	2000	-	float	131	
Load cell res5	RW	10	2000	-	float	133	
Load cell res6	RW	10	2000	-	float	135	
Motion band	RW	0	3	-	integer	138	
Motion band delay	RW	0	60	-	float	139	
CALIBRATION DATA MENU							
Calibrat. mode	RW	Tab.17	Tab.17	-	integer	143	
Test weights	RW	0	SCALE CAP.	-	float	144	
Rcal res	RW	10	1000000	-	long	146	
Rcal calcon	RW	-	-	-	float	148	
Rcal factor	RW	-99.99	+99.99	-	float	150	
Calibr. interval	RW	0	365	-	integer	152	
AZT option	RW	Tab.18	Tab.18	-	integer	153	

Register	type	Low Limit	High Limit	Refresh Time [ms]	Format	Address (word)	Note
AZT range	RW	0	10	-	float	154	
AZT dev	RW	0	10	-	float	156	
AZT duration	RW	2	60	-	Integer	158	
PROTECTION LEVEL MENU							
Protection level	RW	0	2	-	Integer	161	
DIAGNOSTIC MENU							
AD gross	RO	-	-	100	long	162	
AD net	RO	-	-	100	Long	164	
Load cell zero	RW	0	10000	-	Integer	166	
Load cell span	RW	0	30000	-	Integer	167	
Gain	RO	-	-	-	Integer	168	
Drift	RO	-	-	-	Long	169	
Drift reference	RO	-	-	-	Long	171	
Mech. tare	RO	-	-	-	Long	173	
Service password	RW	Tab.19	Tab.19	-	Integer	175	
Operator password	RW	Tab.20	Tab.20	-	Integer	180	
Software version	RO	-	-	-	Integer	185	
Analog output	RO	-	-	-	Float	191	
I/O DATA MENU							
Analog out assign	RW	Tab.21	Tab.21	-	Integer	193	
Analog out range	RW	Tab.22	Tab.22	-	Integer	194	
Analog out delay	RW	0	300	-	Integer	195	
Analog out damping	RW	0	16	-	Integer	196	
Digital input 1 assign	RW	Tab.23	Tab.23	-	Integer	197	
Digital input 2 assign	RW	Tab.23	Tab.23	-	Integer	198	

Register	type	Low Limit	High Limit	Refresh Time [ms]	Format	Address (word)	Note
Digital input 3 assign	RW	Tab.23	Tab.23	-	Integer	199	
Digital input 4assign	RW	Tab.23	Tab.23	-	Integer	200	
Digital input 5 assign	RW	Tab.23	Tab.23	-	Integer	201	
Digital input 6 assign	RW	Tab.23	Tab.23	-	Integer	202	
Digital input 7 assign	RW	Tab.23	Tab.23	-	Integer	203	
Digital input 8 assign	RW	Tab.23	Tab.23	-	Integer	204	
Digital input 9 assign	RW	Tab.23	Tab.23	-	Integer	205	
Digital input 10 assign	RW	Tab.23	Tab.23	-	Integer	206	
Digital input 11 assign	RW	Tab.23	Tab.23	-	Integer	207	
Digital input 12 assign	RW	Tab.23	Tab.23	-	Integer	208	
Digital input 13 assign	RW	Tab.23	Tab.23	-	Integer	209	
Digital input 14 assign	RW	Tab.23	Tab.23	-	Integer	210	
Digital input 15 assign	RW	Tab.23	Tab.23	-	integer	211	
Digital input 16 assign	RW	Tab.23	Tab.23	-	integer	212	
Digital output 1 assign	RW	Tab.24	Tab.24	-	integer	213	
Digital output 2 assign	RW	Tab.24	Tab.24	-	integer	214	
Digital output 3 assign	RW	Tab.24	Tab.24	-	integer	215	
Digital output 4 assign	RW	Tab.24	Tab.24	-	integer	216	
Digital output 5 assign	RW	Tab.24	Tab.24	-	integer	217	
Digital output 6 assign	RW	Tab.24	Tab.24	-	integer	218	
Digital output 7 assign	RW	Tab.24	Tab.24	-	integer	219	
Digital output 8 assign	RW	Tab.24	Tab.24	-	integer	220	
Digital output 9 assign	RW	Tab.24	Tab.24	-	integer	221	
Digital output 10 assign	RW	Tab.24	Tab.24	-	integer	222	

Register	type	Low Limit	High Limit	Refresh Time [ms]	Format	Address (word)	Note
Digital output 11 assign	RW	Tab.24	Tab.24	-	integer	223	
Digital output 12 assign	RW	Tab.24	Tab.24	-	integer	224	
Digital output 13 assign	RW	Tab.24	Tab.24	-	integer	225	
Digital output 14 assign	RW	Tab.24	Tab.24	-	integer	226	
Digital output 15 assign	RW	Tab.24	Tab.24	-	integer	227	
Digital output 16 assign	RW	Tab.24	Tab.24	-	integer	228	
ALARM THRESHOLD MENU							
Threshold 1 option	RW	Tab.25	Tab.25	-	integer	231	
Threshold 1 set	RW	0	105	-	float	232	
Threshold 1 delay	RW	0	90	-	integer	234	
Threshold 1 hyst.	RW	0	105	-	float	235	
Threshold 1 mode	RW	Tab.26	Tab.26	-	integer	237	
Threshold 1 var	RW	Tab.27	Tab.27	-	integer	238	
Threshold 2 option	RW	Tab.28	Tab.28	-	integer	241	
Threshold 2 set	RW	0	105	-	float	242	
Threshold 2 delay	RW	0	90	-	integer	244	
Threshold 2 hyst.	RW	0	105	-	float	245	
Threshold 2 mode	RW	Tab.29	Tab.29	-	integer	247	
Threshold 2 var	RW	Tab.30	Tab.30	-	integer	248	
Threshold 3 option	RW	Tab.31	Tab.31	-	integer	251	
Threshold 3 set	RW	0	105	-	float	252	
Threshold 3 delay	RW	0	90	-	integer	254	
Threshold 3 hyst.	RW	0	105	-	float	255	
Threshold 3 mode	RW	Tab.32	Tab.32	-	integer	257	
Threshold 3 var							

	RW	Tab.33	Tab.33	-	integer	258	
Register	**type**	**Low Limit**	**High Limit**	**Refresh Time [ms]**	**Format**	**Address (word)**	**Note**
Threshold 4 option	RW	Tab.34	Tab.34	-	integer	261	
Threshold 4 set	RW	0	105	-	float	262	
Threshold 4 delay	RW	0	90	-	integer	264	
Threshold 4 hyst.	RW	0	105	-	float	265	
Threshold 4 mode	RW	Tab.35	Tab.35	-	integer	267	
Threshold 4 var	RW	Tab.36	Tab.36	-	integer	268	
ALARMS MENU							
Alarm define 1	RW	Tab.37	Tab. 37	-	integer	271	
Alarm define 2	RW	Tab.37	Tab. 37	-	integer	272	
Alarm define 3	RW	Tab.37	Tab. 37	-	integer	273	
Alarm define 4	RW	Tab.37	Tab. 37	-	integer	274	
Alarm define 5	RW	Tab.37	Tab. 37	-	integer	275	
Alarm define 6	RW	Tab.37	Tab. 37	-	integer	276	
Alarm define 7	RW	Tab.37	Tab. 37	-	integer	277	
Alarm define 8	RW	Tab.37	Tab. 37	-	integer	278	
Alarm define 9	RW	Tab.37	Tab. 37	-	integer	279	
Alarm define 10	RW	Tab.37	Tab. 37	-	integer	280	
Alarm define 11	RW	Tab.37	Tab. 37	-	integer	281	
Alarm define 12	RW	Tab.37	Tab. 37	-	integer	282	
Alarm define 13	RW	Tab.37	Tab. 37	-	integer	283	
Alarm define 14	RW	Tab.37	Tab. 37	-	integer	284	
Alarm define 15	RW	Tab.37	Tab. 37	-	integer	285	
Alarm define 16	RW	Tab.37	Tab. 37	-	integer	286	
Alarm define 17	RW	Tab.37	Tab. 37	-	integer	287	

Register	type	Low Limit	High Limit	Refresh Time [ms]	Format	Address (word)	Note
Alarm define 18	RW	Tab.37	Tab. 37	-	integer	288	
Alarm define 19	RW	Tab.37	Tab. 37	-	integer	289	
Alarm define 20	RW	Tab.37	Tab. 37	-	integer	290	
Alarm define 21	RW	Tab.37	Tab. 37	-	integer	291	
Alarm define 22	RW	Tab.37	Tab. 37	-	integer	292	
Alarm define 23	RW	Tab.37	Tab. 37	-	integer	293	
Alarm define 24	RW	Tab.37	Tab. 37	-	integer	294	
Alarm define 25	RW	Tab.37	Tab. 37	-	integer	295	
Alarm define 26	RW	Tab.37	Tab. 37	-	integer	296	
Alarm define 27	RW	Tab.37	Tab. 37	-	integer	297	
Alarm define 28	RW	Tab.37	Tab. 37	-	integer	298	
Alarm define 29	RW	Tab.37	Tab. 37	-	integer	299	
Alarm define 30	RW	Tab.37	Tab. 37	-	integer	300	
NET MENU							
I.P. Address	RW	0.0.0.0	254.255. 255.255	-	integer	303	
Net Mask Address	RW	0.0.0.0	255.255. 255.255	-	integer	311	
Variable Selection	RW	Tab.38	Tab.38	-	integer	319	
Swap integer data	RW	Tab.39	Tab.39	-	integer	320	
Swap float data	RW	Tab.40	Tab.40	-	integer	321	
SERIAL MENU							
Baud rate	RW	Tab.41	Tab.41	-	integer	324	
Parity	RW	Tab.42	Tab.42	-	integer	325	
Stop Bit	RW	Tab.43	Tab.43	-	integer	326	
Word Length	RW	Tab.44	Tab.44	-	integer	327	

Protocol	RW	Tab.45	Tab.45	-	integer	328	
Access level	RW	Tab.46	Tab.46	-	integer	329	
Clear to Send	RW	Tab.47	Tab.47	-	integer	330	
Address	RW	1	255	-	integer	331	
Half duplex delay	RW	0	50	-	integer	332	

Tab.4 Variable list

4.4 Description of Registers

Sim_Key The master has the possibility to send a key code to the instrument. Interpreted key codes are:

Key	Key Code	Key	Key Code
UP ARROW	0048 H	F1	003F H
DOWN ARROW	0050 H	F2	0040 H
RUN	0052 H	F3	0041 H

Tab 5 - key codes

Write Flag Set to 0 after a message has been received and properly processed. If a message is correctly received but cannot be processed because password protection or size error, this flag is set to 1. The user may read this register after a write message to ensure the data have been accepted.

4.4.1 Display data

Display Contains the messages actually shown on the display of the instrument in form of an ASCII string. For example the following screen:

```
-          MENU MAIN 1          -
PRESS  RUN/SETUP FOR MORE
ZERO   SPAN
CAL    CAL     LINEAR
```

Will be stored in registers in the following way:

Display(1)	2DH	20H	Characters 1 and 2 from left of first row
Display(2)	4DH	45H	
Display(3)	4EH	55H	
Display(4)	20H	4DH	
Display(5)	41H	49H	
Display(6)	4EH	20H	
…..			
Display(10)	….	….	Characters 19 and 20 from left of first row
Display (11)	….	….	Characters 1 and 2 from left second row

…..			
Display(20)	….	….	Characters 19 and 20 from left of second row
Display(21)	….	….	Characters 1 and 2 from left of third row
…..			
Display(30)	….	….	Characters 19 and 20 from left of third row
Display(31)	….	….	Characters 1 and 2 from left of fourth row
…..			
Display(38)	4CH	20H	
Display(39)	20H	20H	
Display(40)	20H	20H	Characters 19 and 20 from left of fourth row

4.4.2 Status & Diagnostic

Panel Leds

The word below indicates the status of the 5 leds on the front panel of the instrument.

Panel Led

NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	04	03	02	01	00

PL1.04 Alarm (Alr) Led
PL1.03 Ready (Rdy) Led
PL1.02 Zero Led
PL1.01 Stab weight led
PL1.00 NET (tare) led

Status

The actual status of the instrument is resumed in four words, each bit has an own meanings, when the bit is 1 the associated status is true.

Status 1 - Generals

15	14	13	12	11	10	NU	08	07	06	05	04	NU	NU	NU	00

S1.15 Cumulative shut down
S1.14 Cumulative Alarms
S1.13 Calibration running
S1.12 Weight stable
S1.11 Center of zero
S1.10 Tare acquired
S1.09 Not used
S1.08 Ready

S1.07 Threshold 1
S1.06 Threshold 2
S1.05 Threshold 3
S1.04 Threshold 4
S1.03 not used
S1.02 not used
S1.01 not used
S1.00 success flag

Status 2 - Free

NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU

S2.15 Free
S2.14 Free
S2.13 Free
S2.12 Free

S2.07 Free
S2.06 Free
S2.05 Free
S2.04 Free

S2.11 Free
S2.10 Free
S2.09 Free
S2.08 Free
S2.03 Free
S2.02 Free
S2.01 Free
S2.00 Free

Alarms

In the alarms register, each bit represents the status of an alarm. If the alarm is active, the relevant bit will contain '1', otherwise it will contain '0'.

Alarms 1

NU	14	NU	12	11	10	09	08	07	06	05	04	03	02	01	00

A1.15 Free
A1.14 CELL FAIL
A1.13 free
A1.12 EPROM FAIL
A1.11 THRESHOLD 1
A1.10 THRESHOLD 2
A1.09 THRESHOLD 3
A1.08 THRESHOLD 4
A1.07 WARM START
A1.06 COLD START
A1.05 PWD DURING CALIBRATION
A1.04 CAL. TIME ELAPSED
A1.03 EXTERNAL ALARM 1
A1.02 EXTERNAL ALARM 2
A1.01 EXTERNAL ALARM 3
A1.00 AZT OVER LIMIT

Alarms 2

NU	NU	NU	12	11	10	09	NU	NU	NU	NU	NU	NU	NU	NU	NU

A2.15 Free
A2.14 Free
A2.13 Free
A2.12 PROFIBUS COMM.ERROR
A2.11 CALIBRATION CHANGED
A2.10 DYN DATA LOST
A2.09 SETUP DATA LOST
A2.08 Free
A2.07 Free
A2.06 Free
A2.05 Free
A2.04 Free
A2.03 Free
A2.02 Free
A2.01 Free
A2.00 Free

I/O Image

The instrument has physical inputs and outputs to which logical input and output functions are associated. As far as communication is concerned, only the status of physical inputs and outputs are transferred.

Input Image – Inputs installed on board

NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	01	00

I1.01 in 2 - mother board
I1.00 in 1 - mother board

Output Image – Outputs installed on board

NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	04	03	02	01	00

O1.04 output 5 - mother board

O1.03 output 4 - mother board
O1.02 output 3 - mother board
O1.01 output 2 - mother board
O1.00 output 1 - mother board

Commands

Each bit of the commands register is specified as follows. In order to give a command, the Host must set the relevant bit to 1 and write (send) the register to the instrument. The action will be performed if the write message is accepted.

Commands

15	NU	NU	NU	NU	NU	NU	NU	NU	NU	05	04	03	02	01	00

C1.15 SAVE SETUP DATA
C1.14 Free
C1.13 Free
C1.12 Free
C1.11 Free
C1.10 Free
C1.09 Free
C1.08 Free
C1.07 Free
C1.06 Free
C1.05 CLEAR PEAK
C1.04 CLEAR RESET TOTAL
C1.03 UPDATE TOTALS
C1.02 RESET TARE
C1.01 SET TARE
C1.00 RESET ALARM

Reset Commands

When the instrument receives a 'Clear Reset total' or a 'Reset alarm' command, it executes the command for the scale :

Clear Reset total Clear the reset total register.

Reset Alarms Reset any pending alarm

Commands 1

NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	00

C1.15 Free
C1.14 Free
C1.13 Free
C1.12 Free
C1.11 Free
C1.10 Free
C1.09 Free
C1.08 Free
C1.07 Free
C1.06 Free
C1.05 Free
C1.04 Free
C1.03 Free
C1.02 Free
C1.01 Free
C1.00 RESET INSTRUMENT

In order to give a command, the Host must set the relevant bit to 1 and write (send) the register to the instrument.

The action will be performed if the write message is accepted.

4.4.3 Dynamic data

Net weight The instantaneous net weight in engineering units. .
Gross weight The instantaneous gross weight in engineering units. .
Peak weight The absolute highest value of the actual net weight .
Master Total The current value of the master Totalizer of the static indicator.
Reset Total The current value of the Reset Totalizer of the static indicator.
Master Total double The current value of the master Totalizer of the static indicator in double format
Reset Total double The current value of the Reset Totalizer of the static indicator in double format.
Manual Zero The value in engineering units of the "Zero" constant of the scale.
Manual Span The value in engineering units of the "Span" constant of the scale.

4.4.4 Linearization

Linear option The enable option for linearization function.

SETTINGs	CODE
NO	00H
YES	01H

Tab. 06 – Linearization option limits

Linear weight 1 This value is a known test weight(s) or a bin with pre-weighed material . Pressing the ACQuire soft key display the scale weight for the applied known weight for 1st step.
Linear factor 1 Linearization factor as applicable to the 1st weight zone .
Linear weight 2 This value is a known test weight(s) or a bin with pre-weighed material . Pressing the ACQuire soft key display the scale weight for the applied known weight for 2nd step.
Linear factor 2 Linearization factor as applicable to the 2nd weight zone .
Linear weight 3 This value is a known test weight(s) or a bin with pre-weighed material . Pressing the ACQuire soft key display the scale weight for the applied known weight for 3rd step.
Linear factor 3 Linearization factor as applicable to the 3rd weight zone .
Linear weight 4 This value is a known test weight(s) or a bin with pre-weighed material . Pressing the ACQuire soft key display the scale weight for the applied known weight for 4th step.
Linear factor 4 Linearization factor as applicable to the 4th weight zone .
Linear weight 5 This value is a known test weight(s) or a bin with pre-weighed material . Pressing the ACQuire soft key display the scale weight for the applied known weight for 5th step.
Linear factor 5 Linearization factor as applicable to the 5th weight zone .

4.4.5 Display Data

Units Code of the “Measure Units” displayed according the table below:

SETTINGs	CODE
METRIC	00H
ENGLISH	01H
MIXED	02H

Tab 07 – Measure units codes

Weight Units Code of the “Weight Units” displayed according the table below:

SETTINGs	CODE
PERCENT %	00H
KG	01H
TONNES	02H
POUNDS	03H
TONS	04H
LTONS	05H

Tab 08 – Weight units code

Total Units Code of the “Totalization Units” displayed according the table below:

SETTINGs	CODE
KG	00H
TONNES	01H
POUNDS	02H
TONS	03H
LTONS	04H

Tab 09 – Total units code

Language Code of the setted “Language” according the table below

SETTINGs	CODE
USA	00H
ITALIAN	01H

Tab 10 – Language units code

Time Format Code of the setted “Time Format” according the table below:

SETTINGs	CODE
24H	00H
12H	01H

Tab 11– Time format units code

Date Format Code of the setted “Date Format” according the table below:

SETTINGs	CODE
DD-MM-YYYY	00H
MM-DD-YYY	01H
YYYY-MM-DD	02H

Tab 12 – Date format units code

Line 2 Display Code of the setted “Line 3 Display” according the table below:

SETTINGs	CODE
NONE	00H
GROSS	01H
TARE	02H
PEAK	03H
RESET TOTAL	04H
MASTER TOTAL	05H
DATE & TIME	06H
BARGRAPH	07H

Tab 13 – Line 2 display format units code

Line 3 Display Code of the setted “Line 3 Display” according the table below:

SETTINGs	CODE
NONE	00H
GROSS	01H
TARE	02H
PEAK	03H
RESET TOTAL	04H
MASTER TOTAL	05H
DATE & TIME	06H
BARGRAPH	07H

Tab 14 – Line 3 display format units code

Weight Damping The Value in seconds of the displayed “Weight Damping”.

Tare mode Select the mode to acquire the tare weight**:**

SETTINGs	CODE
ACQUIRED	00H
MANUAL	01H

Tab 15 – Tare mode units code

4.4.6 Scale Data

Scale Capacity The maximum weight of the indicator, entered by the user in the instrument setup. It is the reference value for the thresholds 1, 2, 3, 4 .

Scale Division Code of the Scale decimal places (Division) actually setted, according the table below:

SETTINGs	CODE
50	00H
20	01H
10	02H
5	03H
2	04H
1	05H
0,5	06H
0,2	07H
0,1	08H
0,05	09H
0,02	0AH
0,01	0BH
0,005	0CH
0,002	0DH
0,001	0EH

Tab 16 – Scale division code

Load Cell numbers The numbers of the load cells..

Load Cell Capacity The value in engineering units of the Capacity of the load cell, as it appear on the label.

Load Cell Sensitivity The value in mV/V of the load cell Sensitivity.

Load Cell Resistance 1 The value in engineering units of the Input Resistance of the load cell N° 1

Load Cell Resistance 2 The value in engineering units of the Input Resistance of the load cell N° 2

Load Cell Resistance 3 The value in engineering units of the Input Resistance of the load cell N° 3

Load Cell Resistance 4 The value in engineering units of the Input Resistance of the load cell N° 4.

Load Cell Resistance 5 The value in engineering units of the Input Resistance of the load cell N° 5

Load Cell Resistance 6 The value in engineering units of the Input Resistance of the load cell N° 6

Motion Band Define the motion band for stable weight indication.

Motion band delay Define the motion delay for stable weight indication..

4.4.7 Calibration Data

Calibration Mode Code of the “Calibration mode” selected according the table below:

SETTINGs	CODE
R-CAL	00H
TEST CHAIN	01H

Tab 17– Calibration mode code

Test Weights The value in engineering units of the sample weight used for calibration.

Calibration Resistance The value of the resistor used for the “Calibration with Resistance”.

Calibration Constant The value of the constant for the resistance calculated by instrument.

RCal Factor Number in percentage used to correct the “Calibration Constant” value to the real

Calibration Interval Number of selected days between two calibration.

Azt opt. The enable option for AZT function:

SETTINGs	CODE
NO	00H
YES	01H

Tab 18 – Azt option limits

Azt Range The value in percentage of the Range of action of AutoZero tracking with reference to the scale capacity.

Azt Deviation The value in engineering units of the Maximum amount of zero error, that the AutoZero tracking can automatically compensate.

Azt Duration The value in engineering units of the azt duration time.

4.4.8 Diagnostic data

Protection Level Protection level of the instrument when password is entered.

AD Gross Instantaneous value in engineering units of the AD counter converter (Gross).

AD Net Instantaneous value in engineering units of the AD counter converter (Net Only).

Weight Load Cell Instantaneous Value in mV of the load cell.

Zero Load Cell Value in engineering units of the AD converter equivalent to the Zero Calibration.

Span Load Cell Value in engineering units of the AD converter equivalent to the Span Calibration.

Gain Gain of the ADC converter

Drift Compensation value for thermic drift at runtime.

Drift reference Compensation value for thermic drift at calibration time.

Mechtare Mechanical tare value.

Service Password Numeric digit or a letter of the alphabet used by service people.The maximum length is 10 ascii characters:

VALID RANGE
a – z
A – Z
0 - 9

Tab 19- Service password limit

Operator Password Numeric digit or a letter of the alphabet used by operator people. The maximum length is 10 ascii characters:

VALID RANGE
a – z
A – Z
0 - 9

Tab 20- Operator password limit

Software version Release of the Instrument firmware's.

Analog output Analog out value sameas shown in the diagnostic menu.

4.4.9 Analog & Digital I/O

Analog Out Assign Code of the setted "Out function" according the table below:

SETTINGs	CODE
NONE	00H
NET WEIGHT	01H
GROSS WEIGHT	02H
TARE WEIGHT	03H
PEAK WEIGHT	04H

Tab 21 – Analog out assign limits

Analog Out Range Code of the setted "Range" according the table below:

SETTINGs	CODE
0-20 mA	00H
4-20 mA	01H
20-0 mA	02H

20-4 mA	03H

Tab 22 – Analog out range limits

Analog Out delay The value in second of the delay of the Analog Output.

Analog Out damping The value in second that the output takes for the stabilization after a status variation.(digital filter)

Digital inputs assign The digital inputs configuration.

INPUT ASSIGN NUMBERS	
MAX	2
MIN	0

Tab 23- Digital input assign numbers limits

Digital outputs assign The digital oputputs configuration.

OUTPUT ASSIGN NUMBERS	
MAX	5
MIN	0

Tab 24- Digital output assign numbers limits

4.4.10 Alarms

Threshold 1 opt. Enable the threshold 1 alarm condition.

SETTINGs	CODE
NO	00H
YES	01H

Tab 25 – Threshold 1 option limits

Threshold 1 set Set value for threshold 1 alarm condition.

Threshold 1 delay Delay time for threshold 1 alarm condition.

Threshold 1 hyst. Set value for threshold 1 hysteresis..

Threshold 1 mode Set value for threshold mode alarm condition :

SETTINGs	CODE
LOW WEIGHT	00H

HIGH WEIGHT	01H

Tab 26 – Threshold 1 mode limits

Threshold 1 var. Variable on which alarm 1 threshold is managed :

SETTINGs	CODE
NET WEIGHT	00H
GROSS WEIGHT	01H
ABS NET WEIGHT	02H
ABS GROSS WEIGHT	03H

Tab 27 – Threshold 1 var. limits

Threshold 2 opt. Enable the threshold 2 alarm condition.

SETTINGs	CODE
NO	00H
YES	01H

Tab 28 – Threshold 2 option limits

Threshold 2 set Set value for threshold 2 alarm condition.

Threshold 2 delay Delay time for threshold 2 alarm condition.

Threshold 2 hyst. Set value for threshold 2 hysteresis..

Threshold 2 mode Set value for threshold 2 mode alarm condition :

SETTINGs	CODE
LOW WEIGHT	00H
HIGH WEIGHT	01H

Tab 29 – Threshold 2 mode limits

Threshold 2 var. Variable on which alarm 2 threshold is managed :

SETTINGs	CODE
NET WEIGHT	00H
GROSS WEIGHT	01H
ABS NET WEIGHT	02H
ABS GROSS WEIGHT	03H

Tab 30 – Threshold 2 var. limits

Threshold 3 opt. Enable the threshold 3 alarm condition.

SETTINGs	CODE
NO	00H
YES	01H

Tab 31 – Threshold 3 option limits

Threshold 3 set Set value for threshold 3 alarm condition.

Threshold 3 delay Delay time for threshold 3 alarm condition.

Threshold 3 hyst. Set value for threshold 3 hysteresis..

Threshold 3 mode Set value for threshold 3 mode alarm condition :

SETTINGs	CODE
LOW WEIGHT	00H
HIGH WEIGHT	01H

Tab 32 – Threshold 3 mode limits

Threshold 3 var. Variable on which alarm 3 threshold is managed :

SETTINGs	CODE
NET WEIGHT	00H
GROSS WEIGHT	01H
ABS NET WEIGHT	02H
ABS GROSS WEIGHT	03H

Tab 33 – Threshold 3 var. limits

Threshold 4 opt. Enable the threshold 4 alarm condition.

SETTINGs	CODE
NO	00H
YES	01H

Tab 34 – Threshold 4 option limits

Threshold 4 set Set value for threshold 4 alarm condition.

Threshold 4 delay Delay time for threshold 4 alarm condition.

Threshold 4 hyst. Set value for threshold 4 hysteresis..

Threshold 4 mode Set value for threshold 4alarm condition :

SETTINGs	CODE

LOW WEIGHT	00H
HIGH WEIGHT	01H

Tab 35 – Threshold 4 mode limits

Threshold 4 var. Variable on which alarm 4 threshold is managed :

SETTINGs	CODE
NET WEIGHT	00H
GROSS WEIGHT	01H
ABS NET WEIGHT	02H
ABS GROSS WEIGHT	03H

Tab 36 – Threshold 4 var. limits

Alarm defines The user can select the desired mode between ALARM (just a warning message), SHUT DOWN (Warning message) and NONE (no action).

Code of the setted “Alarm define mode” according the table below:

SETTINGs	CODE
AD_NONE	00H
AD_ALARM	01H
AD_SHUTDOWN	02H

Tab 37 – Alarm define code

4.4.11 Ethernet Settings

I.P. Address Represent the value of the I.P address of the device (default : 169.254.1.3).

SubNet Mask Represent the value of the Subnet Mask configured on the device (default : 255.255.255.000).

Variable Selection Code of mode on how the variable are transmitted according the table below:

SETTINGs	WORD
NO DUMPED	00H
DUMPED	01H
DISPLAYED	02H

Tab. 38– Variable selection range code

Swap integer data Mode to swap integer data in the communication protocols :

SETTINGs	WORD
S_COM_SWAP_NONE	00H
S_COM_SWAP_BYTES	01H
S_COM_SWAP_WORD	02H
S_COM_SWAP_BYTES_WORD	03H

Tab. 39– Variable selection range code

Swap float data Mode to swap float data in the communication protocols :

SETTINGs	WORD
S_COM_SWAP_NONE	00H
S_COM_SWAP_BYTES	01H
S_COM_SWAP_WORD	02H
S_COM_SWAP_BYTES_WORD	03H

Tab. 40– Variable selection range code

4.4.12 Serial Settings

Baud Rate Communication parameter: Speed

SETTINGs	CODE
110	00H
150	01H
300	02H
600	03H
1200	04H
2400	05H
4800	06H
9600	07H
19200	08H

Tab 41 – Baud rate

Parity Communication parameter: Parity

SETTINGs	CODE
None	00H
Even	01H
Odd	02H

Tab 42 – Parity

Stop Bit Communication parameter: Stop bit

SETTINGs	CODE
1	00H
2	01H

Tab 43 – Stop Bit

Wordlenght Communication parameter: Wordlenght

SETTINGs	CODE
7	00H
8	01H

Tab 44 – Word length

Protocol Communication parameter: Protocol

SETTINGs	CODE
PRINTER	00H
MODBUS	01H

Tab 45 – Protocol

Access level Communication parameter: access level

SETTINGs	CODE
PROTECTED	00H
LIMITED	01H
NONE	02H

Tab 46 – Access level

Clear to send Communication parameter: Clear to send

SETTINGs	CODE
ACTIVE	00H
DISABLED	01H

Tab 47 – Clear to Send

Address Address of the device in the serial Line (only for multidrop)

Half duplex delay Response delay for two wire connection.

5 QUERY, RESPONSE MESSAGES AND EXAMPLE

Below there are the structure of the data query from a Master (PLC) to the Salve (MINI CK 101)

5.1 Read Operation Example (Function 03)

QUERY		**RESPONSE MESSAGE**	
Slave Address	xxx	Slave Address	xxx
Function	03H	Function	03H
Address. HI	xxx	Byte Count	xxx
Address. LO	xxx	Data MSB	xxx
N° Data HI	xxx	Data LSB	xxx
N° Data LO	xxx	Data MSB	xxx
Error check	xxx	Data LSB	xxx
		Error check	

EXAMPLE 1
The Host wants to receive the Net Weight :

Address of slave : 01
Register N°: 52 (34 Hex)
Type of register: Float
Net value: 100,0 Kg

HOST (PLC)				**SLAVE (MINI CK)**	
Stamp	3AH	→			
Slave Address	01H				
Function	03H				
Address HI	00H				
Address LO	34H				
N° Data HI	00H				
N° data LO	02H	→			
			←	3AH	Stamp
				01H	Slave Address
				03H	Function
				04H	Byte Count
				42H	Data Hi
				C8H	Data Lo
				00H	Data Hi
				00H	Data Lo

EXAMPLE 2
The Host wants to receive the Scale Division Settings :

Address of slave : 01
Register N°: 115 (73 Hex)
Type of register: integer
Division: 0,05

HOST (PLC)				**SLAVE (MINI CK)**	
Stamp	3AH	→			
Slave Address	01H				
Function	03H				
Address HI	00H				
Address LO	73H				
N° Data HI	00H				
N° Data LO	01H	→			
			←	3AH	Stamp
				01H	Slave Address
				03H	Function
				02H	Byte Count
				00H	Data Hi
			←	09H	Data Lo

5.2 Write Operation Example

SINGLE REGISTER(1 Word – Function 06)

QUERY		**RESPONSE MESSAGE**	
Stamp	xxx	Stamp	xxx
Slave Address	xxx	Slave Address	xxx
Function	06H	Function	06H
Address. HI	xxx	Address. HI	xxx
Address. LO	xxx	Address. LO	xxx
Preset Data HI	xxx	Preset Data HI	xxx
Preset Data LO	xxx	Preset Data LO	xxx

EXAMPLE 1
The Host wants to select (write) the language of the Instrument :

Address of slave : 01
Register N°: 104 (68 Hex)
Type of register: integer
Settings: ITA (01Hex)

HOST (PLC)				**SLAVE (MINI CK)**	
Stamp	3AH	→			
Slave Address	01H				
Function	06H				
Address HI	00H				
Address LO	68H				
Preset Data HI	00H				
Preset Data LO	01H	→			
			←	3AH	Stamp
				01H	Slave Address
				06H	Function
				00H	Address HI
				68H	Address LO
				00H	Preset Data HI
				01H	Preset Data LO

MULTIPLE REGISTERS (Functuion 16)

QUERY		**RESPONSE MESSAGE**	
Stamp	xxx	Stamp	xxx
Slave Address	xxx	Slave Address	xxx
Function	10H	Function	10H
Start Address. HI	xxx	Start Address. HI	xxx
Start Address. LO	xxx	Start Address. LO	xxx
N° of Registers HI	xxx	N° of Registers HI	xxx
N° of Registers LO	xxx	N° of Registers LO	xxx
Byte Count	xxx		
Data Hi	xxx		
Data Lo	xxx		
Data Hi	xxx		
Data Lo	xxx		

EXAMPLE 1
The Host wants to write the scale capacity of the Instrument :

Address of slave : 01
Register N°: 109 (6D Hex)
Type of register: float
Settings: 100.0 Kg

HOST (PLC)				**SLAVE (MINI CK)**
Stamp	3AH	→		
Slave Address	01H			
Function	10H			
Start Address. HI	00H			
Start Address. LO	06D			
N° of Registers HI	00H			
N° of Registers LO	02H			
Byte Count	04H			
Data Hi	00H			
Data Lo	00H			
Data Hi	42H			
Data Lo	C8H	→		
			←	3AH Stamp
				01H Slave Address
				10H Function
				00H Start Address HI
				6DH Start Address LO
				00H N° of Registers HI HI
				02H N° of Registers LO

APPENDIX A

FLOATING POINT NOTATION

MINI CK 101 stores floating point data types using the IEEE single precision format. The format contains a sign bit, an exponent field and a fraction field or mantissa.

- The represented value

  the value of the number being represented is equal to the exponent multiplied by the fractional part with the sign specified by the bit sign field:

  $$(-1)^{sign} * (1.0+fraction) * s^{(exp-bias)}$$

  For detailed information, refer to the *ANSI IEEE Standard for Binary Floating Point Arithmetic.*

- Sign Bit

  The sign of the number being represented is stored in the sign bit. If the number is positive, the sign bit contains the value 0. If it is negative, it contains the value 1. The sign bit is stored in the most significant bit of a floating point value.

- Exponent Field

  Using an exponent increases the range of representable numbers. The exponent field of the number contains a 'biased' form of the exponent. A bias is subtracted from the exponent field, letting the actual exponent represent both positive and negative exponents. The value of this bias is hexadecimal 7F therefore the effective exponent (Rexp) of the number can be obtained as:

  Rexp = Exp - 7F

  Note

  If both the exponent field and the fraction field are equal to zero, the number being represented is zero.

- Fraction field (Mantissa)

  IEEE floating point format stores the fractional part of a number in a "normalized" form. It assumes that all nonzero numbers are of the following form:

  1.xxxxxxxx (binary)

  The character x represent either 0 or 1 (binary).
  Since all floating point numbers being with 1, the 1 becomes the implicit normalized bit. It is the most significant bit of the fraction and is not stored in memory. The binary point is located immediately to the right of the normalized bit. All bits after the binary point represent values less the 1 (binary).
  Example:

  The number 1.625 (dec) can be represented as:

1.101 (bin)

This number can be represented in decimal as:

$2^0 + 2^{-1} + 2^{-3}$ (dec) Or 1 + 0.5 + 0.25

- Examples

some example has been added to help in the understanding of the rules explained above.

Ex 1.

The number 100.0 is represented as : 42 c8 00 00 (hex) or:

```
      0   1  0  0  0  0  1  0  1    1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
      —   — — — — — — — —  — — — — — — — — — — — — — — — — — — — — — — — — — — — —
Bit   31  30                  23  22               16                                  0
```

The sign is positive (bit 31 is 0).
The Exponent Field is : 1 0 0 0 0 1 0 1 (bin), 85 (hex). The *exp* is : *exp* = 85(hex) - bias (7F hex) = 6.
Thus the first implicit bit to 1 has weight 6
At this point the mantissa can be represented in this way, with the weight of each bit.

```
      2^6   2^5 2^4 2^3 2^2 2^1 2^0 2^-1 2^-2 2^-3 .....
      1     1   0   0   1   0   0   0   0    0    0 ..... 0
      —     — — — — — — — — — — — ..... —
Bi t  Imp   22                                      0
```

Now it is enough to sum the weight of the bits at 1.

Value = 2^6(imp) + 2^5 + 2^2 = 100.0

Ex 2.

Value = 0.15, binary representation is:

```
      0   0  1  1  1  1  1  0  0    0  0  1  1  0  0  1  1  0  0  1  1  0  0  1  1  0  1  0—
— — — — — — — —  — — — — — — — — — — — — — — — — — — — — — — — — — — — — — — — —
Bit   31  30                  23  22                                              0
```

Sign = 0 positive
Exp = 7C hex - 7F hex = -3

Mantissa =

```
      2^-3   2^-4 2^-5 2^-6 2^-7 2^-8 2^-9 2^-10 .....
      1      0    0   1   1   0   0   1   1    0 ..... 0
      —      — — — — — — — — — — — — — — — — — — — — — —
Bit   Imp    22                                        0
```

Value = $2^{-3} + 2^{-6} + 2^{-7} + 2^{-10} + 2^{-11}$ ..... = 0.15 (approx.)

Ex 3.

Value = -5.5, binary representation is:

```
      1   1  0  0  0  0  0  0  0  1   0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
      —   —  —  —  —  —  —  —  —  —   —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —
Bit   31  30                      23  22                                                                0
```

Sign = 1 negative
Exp = 81hex - 7F hex = +2
Mantissa =

```
      2^2   2^1  2^0  2^-1 2^-2 2^-3 2^-4 2^-5 2^-6 2^-7 2^-8 2^-9 2^-10 .....
      1     0    1    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
      —     —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —
Bit   Imp   22                                                                                    0
```

Value = 2^2 (imp.) + 2^0 + 2^{-1} = 5.5 (negative)