Thermo
SCIENTIFIC

Ramsey
MINI CK101
Weight Integrator

SERIAL COMUNICATION
Manual

MINI CK101
Part No.: Serial

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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 101Integrator 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, they are 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	n.a.
RS-485 (4 wires)	2-3	*	2-3	2-3	2-3	2-3	2-3	2-3	2-3	#
RS-485 (2 wires)	2-3	*	2-3	2-3	2-3	2-3	2-3	2-3	2-3	#

TABLE 1 – Jumper settings

**** J3*** ***BATTERY***	***# J13*** ***FOR RS-485 ONLY***
ON → 1-2	TERMINATED → 1-2
OFF → 2-3	NOT TERMINATED → 2-3

TABLE 2 – Jumpers setttings details

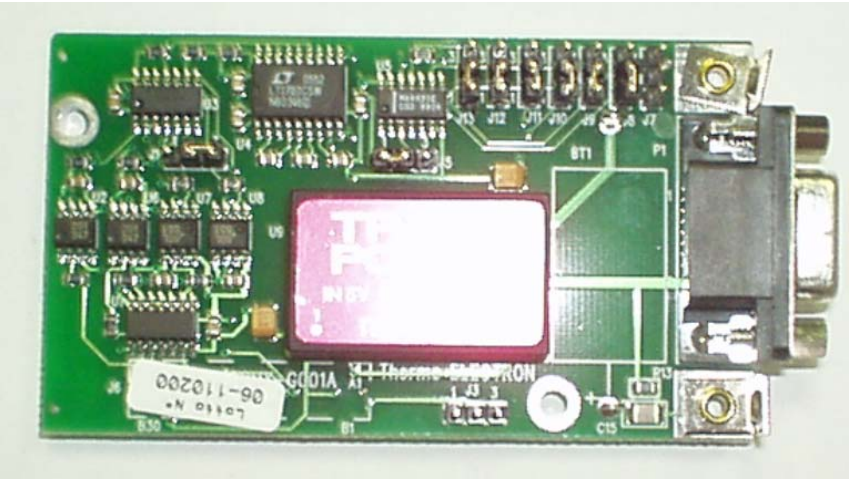


FIGURE 2-1

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 aluminum cover from the aluminum plate
6. Install the board by the socket
7. Fix the board on the aluminum 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 8- appears.
   The following scroll is provided to set up the date, and enter the day, month and year in sequence.

-DIAGNOST. SCROLL 8-
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 9 below).

-DIAGNOST. SCROLL 9-
Time : HH:MM
HOURS: HH
ENTER

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 8- appears.
   The user can define the format for displaying and printing time and date. Select the 24 hours or 12 hours format:

- **DISPLAY SCROLL 8** -
Time
> **24 h**<
CHOICE ENTER

Password: Service

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

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

- **DISPLAY SCROLL 9** -
Date
> **DD-MM-YYYY** <
CHOICE ENTER

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 10.

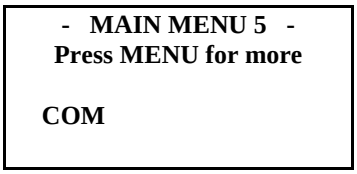
- **DISPLAY SCROLL 10** -
Run display line 3
> **No Display** <
CHOICE ENTER

Password: Service

Default:	NO DISPLAY
Selections:	NO DISPLAY, LOAD, SPEED, DATE/TIME

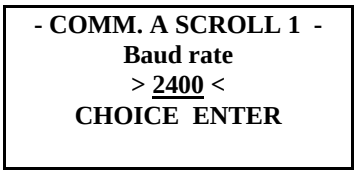
3.2 COM Scroll Set-up

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.
Where not specify differently, all settings on this Menù are enabled if CK has not password set or if password is set to "Service".

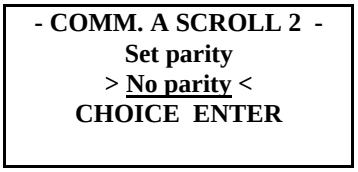


3.2.1 LINE SETTING AND PROTOCOL DEFINITION

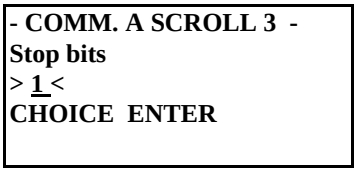
The following screens define the communication parameters of the channel.



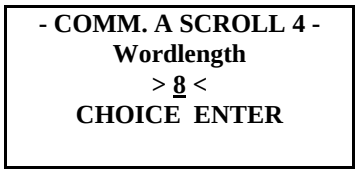
Default: 9600
Selections: 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200



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



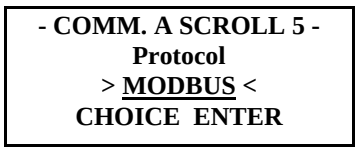
Default: 1
Selections: 1,2



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.



Default: MODBUS
Selections: MODBUS, PRINTER

3.2.2 MULTIDROP OPERATION 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 3.2.3.
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.

- COMM. A SCROLL 6 -
Clear to Send
> Disabled <
CHOICE ENTER

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.

- COMM. A SCROLL 7 -
Address
> 1 <
ENTER

Default: 1
Min: 1
Max: 255

- COMM. A SCROLL 8 -
Access prot
> None <
CHOICE ENTER

Default: NONE
Selection: NONE, LIMITED,

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,

- COMM. A SCROLL 9 -
Half duplex delay
10 ms
ENTER

3.2.3 PRINTER SET-UP

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 3.2.2.

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.

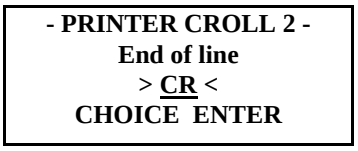
The most commonly used protocol is the CTS, which is a signal generated by the printer to indicate whether it is ready to receive data or not.

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

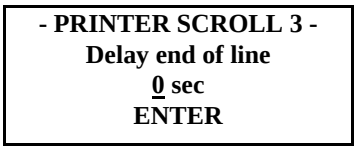
Default: NONE
Selection: NONE, CTS, XON-XOFF

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



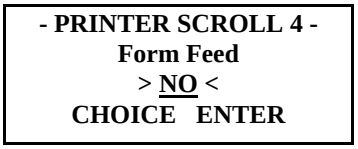
Default:	CR
Selection:	CR, LF, CR+LF

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.



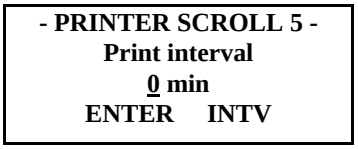
Default:	0 sec
Min:	0 sec
Max:	5 sec

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



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.



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 # 1
time HH:MM
ENTER ON/OFF NEXT

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

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

- PRINTER SCROLL 7 -
Print alarms
> No <
CHOICE ENTER

Default :	NO
Selections:	NO,YES

By selecting YES, the system is set 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
High rate

3.2.4 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.
All Menù settings on this section are enabled if CK has not password set or if password is set to "Operator".

- PRINTER SCROLL 8 -
Total Report Format
> Default <
CHOICE ENTER

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
OPERATOR TOTAL:	0.00 Tons
RATE:	0.00 Tph

USER DEFINE

STRING 1
STRING 2
STRING 3

OPERATOR TOTAL :	0.00 Tons
RESET TOTAL:	0.00 Tons
MASTER TOTAL:	0.00 Tons

DATE: 09-10-2002
TIME: 8:12a
RATE : 0.00 Tph

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

Define how many strings you want to add in your report. Strings can be used to add the Customer name as well as other information that you want to include in the print format.

- PRINTER SCROLL 9A -
Number of strings
1
ENTER

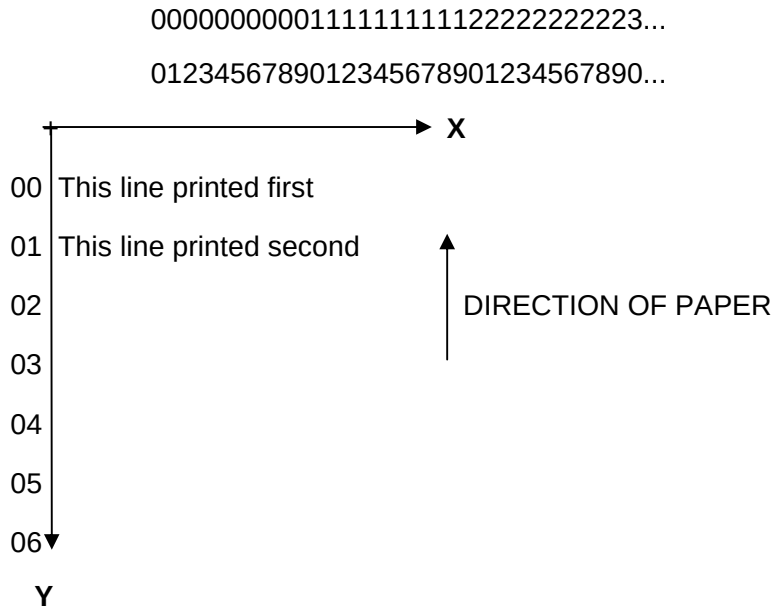
Default: 1
Min: 1
Max: 3

The user can define up to three strings.

- PRINTER SCROLL 9B -
Contents string #1
S1
ENTER

Default: NULL STRING

Press “ENTER” key to start insert mode then use the up-down arrow keys to insert the string. Every time an arrow key is pressed a new character is displayed; press left arrow (F1) or right arrow (F3 key) to move the cursor.
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:



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 9C -
Position string #1
X = 0 , Y = 0
ENTER X-pos Y-pos

X Y

Default:	1,	1
Min:	0,	1
Max:	24,	80

If you set more than one numbers of strings, the following menu allow you to add a second heading string in your report.

- PRINTER SCROLL 9D -
Contents string #2
S2
ENTER

Default: NULL STRING

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 9E -
Position String #2
X = ____, Y = ___
ENTER X-pos Y-pos

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

If you set three strings, the following menu allow you to add a third heading string in your report.

- PRINTER SCROLL 9F -
Contents string #3
S3
ENTER

Default: NULL STRING

.

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 9G -
Position string #3
X =___, Y = ___
ENTER    X-pos     Y-pos
```

	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, RATE, AVG RATE, RUNNING TM

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 9H -
Position oper. total
X =___, Y = ___
ENTER    X-pos     Y-pos
```

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

```
- PRINTER SCROLL 9I -
Position reset total
X =___, Y = ___
ENTER    X-pos     Y-pos
```

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

- PRINTER SCROLL 9J -
Position mast. total
X =___, Y = ___
ENTER X-pos Y-pos

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

- PRINTER SCROLL 9K -
Position date
X =___, Y = ___
ENTER X-pos Y-pos

	X	Y
Default:	7,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 9L -
Position time
X =___, Y = ___
ENTER X-pos Y-pos

	X	Y
Default:	8,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 9M -
Position rate
X =___, Y = ___
ENTER X-pos Y-pos

	X	Y
Default:	9,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 9N -
Position avg rate
X = ___, Y = ___
ENTER X-pos Y-pos

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

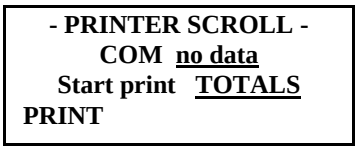
- PRINTER SCROLL 9P -
Position running tm
X = ___, Y = ___
ENTER X-pos Y-pos

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

3.2.5 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:



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.

3.2.6 ADDITIONAL DIAGNOSTIC

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

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 101 Integrator**.

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	An 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 of bytes 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.
DOUBLE variable	A double is a variable of four words (4 register). It contains REAL values in the double precision IEEE format (See Appendix A at the end of this document). The double precision format can represent values in the range 1.79769E+308 to -2.225E-308

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:
Load : 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.
		RW The register can be read or written.
		WO The register can only be written.

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, long or double
Address (word)	Number of words (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.

Please take note that the N° of registers shown in the address (word) column of the table below, is referred to an **“Addresses Protocol”** format (base= 0); if the device connected to the CK has an “Addresses PLC” format (base = 1) the N° of registers shown in the table, must be increase of 1 (Address (word) +1) .
For example of reading/writing operation with this protocol see chapter 5

4.3 List of registers

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
Simulation Key	WO	(**)	(**)	-	Integer	1	
Write flag	RO	0	(*)	-	Integer	2	
DISPLAY DATA							
Display (1)	RO	-	-	200	Integer	3	
Display (2)	RO	-	-	200	Integer	4	
Display (3)	RO	-	-	200	Integer	5	
Display (4)	RO	-	-	200	Integer	6	
Display (5)	RO	-	-	200	Integer	7	
Display (6)	RO	-	-	200	Integer	8	
Display (7)	RO	-	-	200	Integer	9	
Display (8)	RO	-	-	200	Integer	10	
Display (9)	RO	-	-	200	Integer	11	
Display (10)	RO	-	-	200	Integer	12	
Display (11)	RO	-	-	200	Integer	13	
Display (12)	RO	-	-	200	Integer	14	
Display (13)	RO	-	-	200	Integer	15	
Display (14)	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	Modbus Address	Note
Display (15)	RO	-	-	200	Integer	17	
Display (16)	RO	-	-	200	Integer	18	
Display (17)	RO	-	-	200	Integer	19	
Display (18)	RO	-	-	200	Integer	20	
Display (19)	RO	-	-	200	Integer	21	
Display (20)	RO	-	-	200	Integer	22	
Display (21)	RO	-	-	200	Integer	23	
Display (22)	RO	-	-	200	Integer	24	
Display (23)	RO	-	-	200	Integer	25	
Display (24)	RO	-	-	200	Integer	26	
Display (25)	RO	-	-	200	Integer	27	
Display (26)	RO	-	-	200	Integer	28	
Display (27)	RO	-	-	200	Integer	29	
Display (28)	RO	-	-	200	Integer	30	
Display (29)	RO	-	-	200	Integer	31	
Display (30)	RO	-	-	200	Integer	32	
Display (31)	RO	-	-	200	Integer	33	
Display (32)	RO	-	-	200	Integer	34	
Display (33)	RO	-	-	200	Integer	35	
Display (34)	RO	-	-	200	Integer	36	
Display (35)	RO	-	-	200	Integer	37	
Display (36)	RO	-	-	200	Integer	38	
Display (37)	RO	-	-	200	Integer	39	
Display (38)	RO	-	-	200	Integer	40	
Display (39)	RO	-	-	200	Integer	41	
Display (40)	RO	-	-	200	Integer	42	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
STATUS AND DIAGNOSTIC DATA							
Panel Leds	RO	-	-	200	Integer	43	
Status (1)	RO	-	-	-	Integer	44	
Status (2)	RO	-	-	-	Integer	45	
Alarms (1)	RO	-	-	100	Integer	46	
Alarms (2)	RO	-	-	100	Integer	47	
Alarms (3)	RO	-	-	100	Integer	48	
In / Out image	RO	-	-	100	Integer	49	
Commands	RW	0	0Xffff	100	Integer	50	
Virtual Inputs Image	RW	0	0xffff	100	Integer	51	
Virtual Outputs Image	RO	-	-	100	Integer	52	
Enable options	RW	-	0xffff	100	Integer	53	
Commands 1	RW	Tab.6	Tab.6	100	Integer	54	
DYNAMIC DATA							
Batch Counter	RO	-	-	200	Integer	55	
Batch Set next cycle	RW	0	10000	200	Float	56	
Belt Rate	RO	-	-	200	Float	58	
Belt Load	RO	-	-	100	Float	60	
Belt Speed	RO	-	-	200	Float	62	
Master Total	RO	-	-	100	Float	64	
Operator Total	RW	0	0	100	Float	66	
Reset Total	RW	0	0	100	Float	68	
Batch Total	RO	-	-	100	Float	70	
Master Total Double	RO	-	-	100	Double	72	
Operator Total Double	RO	-	-	100	Double	76	
Reset Total Double	RO	-	-	100	Double	80	
Batch Total Double	RO	-	-	100	Double	84	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
Batch Set run	RO	0	10000	200	Float	88	
Manual Zero	RW	0	120000	-	Long	90	
Manual Span	RW	500000	45000000	-	Float	92	
DISPLAY DATA MENU							
Units	RW	Tab.7	Tab.7	-	Integer	96	
Total units	RW	Tab.8	Tab.8	-	Integer	97	
Length units	RW	Tab.9	Tab.9	-	Integer	98	
Rate units	RW	Tab.10	Tab.10	-	Integer	99	
Weight units	RW	Tab.11	Tab.11	-	Integer	100	
Language	RW	Tab.12	Tab.12	-	Integer	101	
Time Format	RW	Tab.13	Tab.13	-	Integer	102	
Date Format	RW	Tab.14	Tab.14	-	Integer	103	
Line 3 Display	RW	Tab.15	Tab.15	-	Integer	104	
Rate Damping	RW	0	400	-	Integer	105	
Load Damping	RW	0	400	-	Integer	106	
Speed Damping	RW	0	400	-	Integer	107	
Speed units	RW	Tab.16	Tab.16	-	Integer	108	
SCALE DATA MENU							
Scale Capacity	RW	1	200000	-	float	110	
Scale Division	RW	Tab.17	Tab.17	-	integer	112	
Scale Model	RW	0	10000	-	integer	113	
Idler Space	RW	Tab.18	Tab.18	-	float	114	
Angle	RW	-25	+25	-	float	116	
Load Cell Capacity	RW	Tab.19	Tab.19	-	float	118	
Load Cell Sensitivity	RW	0.5	3.5	-	float	120	
Load Cell Resistance 1	RW	10	2000	-	float	122	
Load Cell Resistance 2	RW	10	2000	-	float	124	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
Load Cell Resistance 3	RW	10	2000	-	float	126	
Load Cell Resistance 4	RW	10	2000	-	float	128	
Load Cell Resistance 5	RW	10	2000	-	float	130	
Load Cell Resistance 6	RW	10	2000	-	float	132	
Speed Input	RW	Tab.20	Tab.20	-	integer	134	
Dead Band	RW	0.0	5.0	-	float	135	
CALIBRATION DATA MENU							
Calibration Mode	RW	Tab.21	Tab.21	-	Integer	139	
Calibration Resistance	RW	10	1000000	-	long	140	
Calibration Constant	RO	-	-	-	float	142	
Chain Weight	RW	Tab.22	Tab.22	-	float	144	
Chain Constant	RO	-	-	-	float	146	
Test Weight	RW	Tab.23	Tab.23	-	float	148	
Weight constant	RO	-	-	-	float	150	
Calibration Interval	RW	0	365	-	integer	152	
Rcal Factor	RW	-99.99	+99.99	-	float	153	
Chain Factor	RW	-99.99	+99.99	-	float	155	
Weight Factor	RW	-99.99	+99.99	-	float	157	
Test Duration Length	RW	1	100000	-	float	159	
Test Durat. Leng. Full	RW	Tab.24	Tab.24	-	float	161	
Test Durat. Leng. Part.	RW	Tab.25	Tab.25	-	float	163	
Test Durat. Leng. Man.	RW	Tab.26	Tab.26	-	float	165	
Test Duration revs.	RW	1	100	-	integer	167	
Test Duration Time	RW	10	16200	-	integer	168	
Azt opt.	RW	Tab.27	Tab.27	-	Integer	169	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
Azt Range	RW	0.0	10.0	-	float	170	
Azt Deviation	RW	0.0	10.0	-	float	172	
Speed Capacity	RW	Tab.28	Tab.28	-	float	174	
Calibration Number	RW	1	2	-	Integer	176	
Calibr. Code in use	RW	1	2	-	Integer	177	
Protection Level	RO	-	-	-	Integer	179	
DIAGNOSTIC MENU							
AD Gross	RO	-	-	-	long	180	
AD Net	RO	-	-	-	long	182	
Weight Load Cell	RO	-	-	-	float	184	
Zero Load Cell	RW	0	10000	-	integer	186	
Span Load Cell	RW	0	30000	-	integer	187	
Prescaler	RO	-	-	-	integer	188	
Test Duration Pulses	RW	1	1000000	-	long	189	
Test Duration Length	RW	1	100000	-	float	191	
Service Password	RW	Tab.29	Tab.29	-	Char array	193	
Operator Password	RW	Tab.30	Tab.30	-	Char array	198	
Software version	RO	-	-	-	Char array	203	
Date day	RW	1	31	-	Integer	209	
Date month	RW	1	12	-	Integer	210	
Date year	RW	1997	2096	-	integer	211	
Time hour	RW	Tab.31	Tab.31	-	Integer	212	
Time minute	RW	0	59	-	Integer	213	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
TEST MENU							
Analog Out	RO	-	-	-	float	216	
I/O DATA MENU							
Analog Out Definition	RW	Tab.32	Tab.32	-	integer	218	
Analog Out Range	RW	Tab.33	Tab.33	-	integer	219	
Analog Out Delay Length	RW	Tab.34	Tab.34	-	float	220	
Analog Out Delay Time	RW	0	300	-	integer	222	
Analog Out Filter	RW	0	400	-	integer	223	
Digital input 1 assign Function : “Extern. Alarm	RW	Tab.35	Tab.35	100	integer	224	
Digital input 2 assign Function : “Print”	RW	Tab.35	Tab.35	100	integer	225	
Digital input 3 assign Function : “Belt running	RW	Tab.35	Tab.35	100	integer	226	
Digital input 4assign Function : “Reset totals”	RW	Tab.35	Tab.35	100	integer	227	
Digital input 5 assign Function : “Reset alarm”	RW	Tab.35	Tab.357	100	integer	228	
Digital input 6 assign Function : “Auto zero”	RW	Tab.35	Tab.35	100	integer	229	
Digital input 7 assign Function : “Clip detect”	RW	Tab.35	Tab.35	100	integer	230	
Digital input 8 assign Function : “Start batch”	RW	Tab.35	Tab.35	100	integer	231	
Digital input 9 assign Function : “Stop batch”	RW	Tab.35	Tab.35	100	integer	232	
Digital input 10 assign Function : “Stand-by batch”	RW	Tab.35	Tab.35	100	integer	233	
Digital input 11 assign Function :”Calibration ”	RW	Tab.35	Tab.35	100	Integer	234	
Digital output 1 assign Function : “Cumulative Alarm	RW	Tab.36	Tab.36	100	integer	236	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
Digital output 2 assign Function : “Cumulative shut down”	RW	Tab.36	Tab.36	100	integer	237	
Digital output 3 assign Function : “Ready”	RW	Tab.36	Tab.36	100	integer	238	
Digital output 4 assign Function : “High load”	RW	Tab.36	Tab.36	100	integer	239	
Digital output 5 assign Function : “Low load”	RW	Tab.36	Tab.36	100	integer	240	
Digital output 6 assign Function : “High rate”	RW	Tab.36	Tab.36	100	integer	241	
Digital output 7 assign Function : “Low rate”	RW	Tab.36	Tab.36	100	integer	242	
Digital output 8 assign Function : “High speed”	RW	Tab.36	Tab.36	100	integer	243	
Digital output 9 assign Function : “Low speed”	RW	Tab.36	Tab.36	100	integer	244	
Digital output 10 assign Function : “Totalizer”	RW	Tab.36	Tab.36	100	integer	245	
Digital output 11 assign Function : “Batch preset”	RW	Tab.36	Tab.36	100	integer	246	
Digital output 12 assign Function : “Batch end”	RW	Tab.36	Tab.36	100	integer	247	
Digital output 13 assign Function : “Print ready”	RW	Tab.36	Tab.36	100	integer	248	
Digital output 14 assign Function : “Load WTS”	RW	Tab.36	Tab.36	100	integer	249	
Digital output 15 assign Function : “Dev. Alarms”	RW	Tab.36	Tab.36	100	integer	250	
Digital output 16 assign Function: “Out of range”	RW	Tab.36	Tab.36	100	integer	251	
Totalizer Out. Pulse	RW	0.001	100.0	100	float	252	
Totalizer Out. Duration	RW	0.005	1.0	100	float	254	
Clip Detection Mode	RW	Tab.37	Tab.37	100	Integer	256	
Clip Detection Length	RW	Tab.38	Tab.38	100	float	257	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
ALARMS THRESHOLDS MENU							
Rate dev. Opt.	RW	Tab.39	Tab.39	-	integer	261	
Low rate delay	RW	0	90	-	integer	262	
Low rate set	RW	0	105 %	-	float	263	
High rate delay	RW	0	90	-	integer	265	
High rate set	RW	0	150 %	-	float	266	
Load dev. Opt.	RW	Tab.40	Tab.40	-	integer	268	
Low load delay	RW	0	90	-	integer	269	
Low load set	RW	0	105 %	-	float	270	
High load delay	RW	0	90	-	integer	272	
High load set	RW	0	200 %	-	float	273	
Speed dev. Opt.	RW	Tab.41	Tab.41	-	integer	275	
Low speed delay	RW	0	90	-	integer	276	
Low speed set	RW	0	105 %	-	float	277	
High speed delay	RW	0	90	-	integer	279	
High speed set	RW	0	150 %	-	Float	280	
ALARMS MENU							
Alarm define 1 “Clock fail”	RW	Tab.42	Tab.42		integer	284	
Alarm define 2 “Load cell fail”	RW	Tab.42	Tab.42		integer	285	
Alarm define 3 “RAM fail”	RW	Tab.42	Tab.42		integer	286	
Alarm define 4 “EEPROM fail”	RW	Tab.42	Tab.42		integer	287	
Alarm define 5 “Speed sensor error”	RW	Tab.42	Tab.42		integer	288	
Alarm define 6 “High load”	RW	Tab.42	Tab.42		integer	289	
Alarm define 7 “Low load”	RW	Tab.42	Tab.42		integer	290	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
Alarm define 8 “High rate”	RW	Tab.42	Tab.42		integer	291	
Alarm define 9 “Low rate”	RW	Tab.42	Tab.42		Integer	292	
Alarm define 10 “High speed”	RW	Tab.42	Tab.42		Integer	293	
Alarm define 11 “Low speed”	RW	Tab.42	Tab.42		integer	294	
Alarm define 12 “Warm start”	RW	Tab.42	Tab.42		integer	295	
Alarm define 14 “Pwd during calib.”	RW	Tab.42	Tab.42		integer	297	
Alarm define 15 “Cal. time elapsed”	RW	Tab.42	Tab.42		integer	298	
Alarm define 16 “Extern alarm”	RW	Tab.42	Tab.42		integer	299	
Alarm define 17 “Overflow totalizer”	RW	Tab.42	Tab.42		integer	300	
Alarm define 18 “AZT over limit”	RW	Tab.42	Tab.42		integer	301	
Alarm define 19 “Batch deviation”	RW	Tab.42	Tab.42		integer	302	
Alarm define 20 “Math error”	RW	Tab.42	Tab.42		integer	303	
Alarm define 21 “Printer error”	RW	Tab.42	Tab.42		integer	304	
Alarm define 22 “Communication error”	RW	Tab.42	Tab.42		Integer	305	
Alarm define 23 PROFIB comm. error”	RW	Tab.42	Tab.42		integer	306	
Alarm define 24 “Dynamic data lost”	RW	Tab.42	Tab.42		integer	307	
Alarm define 25 “Prof.config.changed”	RW	Tab.42	Tab.42		integer	308	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
NET MENU							
I.P. Address	RW	0.0.0.0	254.255.255.255	-	integer	316	
Net Mask Address	RW	0.0.0.0	255.255.255.255	-	integer	324	
Gateway Address	RW	0.0.0.0	254.255.255.255	-	integer	332	
M.A.C. Address	RO	0.0.0.0	254.255.255.255	-	integer	340	
Variables selection	RW	Tab. 43	Tab.43	-	integer	344	
Swap integer data	RO	Tab.44	Tab.44	-	integer	345	
Swap float data	RW	Tab.45	Tab.45	-	integer	346	
Swap long data	RW	Tab.45	Tab.45	-	integer	347	
SERIAL MENU							
Baud rate	RW	Tab.46	Tab.46	-	integer	349	
Parity	RW	Tab.47	Tab.47	-	integer	350	
Stop Bit	RW	Tab.48	Tab.48	-	integer	351	
Word Length	RW	Tab.49	Tab.49	-	integer	352	
Protocol	RW	Tab.50	Tab.50	-	integer	353	
Access level	RW	Tab.51	Tab.51	-	integer	354	
Clear to Send	RW	Tab.52	Tab.52	-	integer	355	
Address	RW	1	255	-	integer	356	
Half duplex delay	RW	0 msec	50 msec	-	integer	357	
PRINT MENU							
Handshake	RW	Tab.53	Tab.53	-	integer	366	
End of line	RW	Tab.54	Tab.54	-	integer	367	
End of line delay	RW	0	5	-	integer	368	
Form Feed	RW	Tab.55	Tab.55	-	integer	369	
Print interval	RW	Tab.56	Tab.56	-	integer	370	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
Print interval unit	RW	Tab.57	Tab.57	-	integer	371	
Print time hour 1	RW	Tab.58	Tab.58	-	integer	372	
Print time Minutes 1	RW	0	59	-	integer	373	
Print time hour 2	RW	Tab.58	Tab.58	-	integer	374	
Print time Minutes 2	RW	0	59	-	integer	375	
Print time hour 3	RW	Tab.58	Tab.58	-	integer	376	
Print time Minutes 3	RW	0	59	-	integer	377	
Print time hour 4	RW	Tab.58	Tab.58	-	integer	378	
Print time Minutes 4	RW	0	59	-	integer	379	
Print alarms	RW	Tab.59	Tab.59	-	integer	380	
Report format	RW	Tab.60	Tab.60	-	integer	381	
LOAD OUT MENU							
Batch Option	RW	Tab.61	Tab.61	-	integer	384	
Preset	RW	0	10000	-	float	385	
CutOff Corr	RW	Tab.62	Tab.62	-	Integer	387	
CutOff queue	RW	0	10000	-	float	388	
CutOff Len	RW	Tab.63	Tab.63	-	float	390	
CutOddDev	RW	0	10000	-	float	392	
Start Delay	RW	0	600	-	integer	394	
Stabilization Time	RW	0	600	-	integer	395	
Batch Deviation	RW	0	100	-	integer	396	

Register	Type	Low Limit	High Limit	Refresh Time [ms]	Format	Modbus Address	Note
LINEARIZATION MENU							
Linearization option	RW	Tab.64	Tab.64	-	integer	399	
Linearization weight 1	RW	0	Scale cap.	-	float	400	
Linearization factor 1	RW	0	1.5	-	float	402	
Linearization weight 2	RW	0	Scale cap.	-	float	404	
Linearization factor 2	RW	0	1.5	-	float	406	
Linearization weight 3	RW	0	Scale cap.	-	float	408	
Linearization factor 3	RW	0	1.5	-	float	410	
Linearization weight 4	RW	0	Scale cap.	-	float	412	
Linearization factor 4	RW	0	1.5	-	float	414	
Linearization weight 5	RW	0	Scale cap.	-	float	416	
Linearization factor 5	RW	0	1.5	-	float	418	

Tab. 4 – Variables list

4.4 Description of Registers

WARNING !!!
If data READED / WROTE are outside the limits indicated on the table 4, the Function Code field of the response, is setted by CK with an "Exception Code" (MSB =1) with a value above 80 hex.

Below the description of the register and their use.

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	004D 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.

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 MENU FOR MORE
ZERO    SPAN    MAT'L
CAL     CAL     CAL
```

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

4.3.1 Status

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 Run Led
PL1.03 Span Led
PL1.02 Zero Led
PL1.01 Ready Led
PL1.00 Alarm Led

Status

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

Status 1 - Generals

15	14	13	NU	NU	10	NU	08	07	06	05	04	03	02	NU	NU

S1.15 Cumulative shut down
S1.14 Cumulative Alarms
S1.13 Calibration running
S1.12 Free
S1.11 Free
S1.10 Running
S1.09 Free
S1.08 Ready
S1.07 High load
S1.06 Low load
S1.05 High rate
S1.04 Low rate
S1.03 High speed
S1.02 Low speed
S1.01 Free
S1.00 Free

Status 2 - Control deviations & Batch

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

Only applicable if Load Out option is activated :

S2.03	S2.02	S2.01	S2.00	
x	0	0	0	Batch not running
x	0	1	0	Batch running at high rate
x	0	1	1	Batch running at low rate
x	1	0	0	Waiting start delay time
x	1	0	1	Waiting stabilization time
1	x	x	x	Batch suspended

x can be : 0 Normal status
1 Stand by status

S2.15 Free
S2.14 Free
S2.13 Free
S2.12 Free
S2.11 Free
S2.10 Free
S2.09 Free
S2.08 Free

S2.07 Free
S2.06 Free
S2.05 Free
S2.04 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	NU	11	10	09	08	07	06	05	04	03	02	01	00

A1.15 Free
A1.14 CELL FAIL
A1.13 Free
A1.12 Free
A1.11 SPEED SENSOR ERROR
A1.10 HIGH LOAD
A1.09 LOW LOAD
A1.08 HIGH RATE
A1.07 LOW RATE
A1.06 HIGH SPEED
A1.05 LOW SPEED
A1.04 WARM START
A1.03 COLD START
A1.02 PWD DURING CALIB
A1.01 CAL TIME ELAPSED
A1.00 EXTERNAL ALARM

Alarms 2

15	14	13	12	11	10	09	08	07	06	NU	NU	NU	NU	NU	NU

A2.15 OVERFLOW TOTALIZER
A2.14 AZT OVER LIMIT
A2.13 BATCH DEVIATION
A2.12 MATH ERROR
A2.11 PRINTER ERROR
A2.10 COM ERROR
A2.09 PROFIB ERROR
A2.08 DYNAMIC DATA LOST
A2.07 PROFIBUS CONFIG. CHANGED
A2.06 SETUP DATA LOST
A2.05 Free
A2.04 Free
A2.03 Free
A2.02 Free
A2.01 Free
A2.00 Free

Alarms 3

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

A3.15 Free
A3.14 Free
A3.13 Free
A3.12 Free
A3.11 Free
A3.10 Free
A3.09 Free
A3.08 Free
A3.07 Free
A3.06 Free
A3.05 Free
A3.04 Free
A3.03 Free
A3.02 Free
A3.01 Free
A3.00 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/Output Image – Inputs/Output installed on board

NU	NU	NU	NU	NU	NU	09	08	NU	NU	NU	04	03	02	01	00

I1.15	Not Used	O1.07	Not Used
I1.14	Not Used	O1.06	Not Used
I1.13	Not Used	O1.05	Not Used
I1.12	Not Used	O1.04	output 5 - mother board
I1.11	Not Used	O1.03	output 4 - mother board
I1.10	Not Used	O1.02	output 3 - mother board
I1.09	in 2 - mother board	O1.01	output 2 - mother board
I1.08	in 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	14	13	12	NU	10	09	08	07	06	05	04	03	02	01	00

C1.15	SAVE SETUP DATA	C1.07	REMOTE SPAN CALIBR.(CHAIN)
C1.14	REINIT NETWORK CARD	C1.06	REMOTE SPAN CALIBR. (WTS)
C1.13	SET DATE AND TIME	C1.05	REMOTE START ZERO
C1.12	PRINT SETUP	C1.04	CONFIRM ZERO / SPAN
C1.11	NOT USED	C1.03	STANDBY BATCH
C1.10	CLEAR OPER. TOTAL	C1.02	STOP BATCH
C1.09	CLEAR RESET TOTAL	C1.01	START BATCH
C1.08	REMOTE SPAN CALIBR. (RCAL)	C1.00	RESET ALARM

Calibration commands:

It is possible to start a calibration function from remote. At the end of the calibration (calibration flag in status registers should be tested to determines when cal function ends) it is possible to verify the calibration error ('cal_error' register) and eventually accept the new zero or span.

Autospan RCAL	Start the autospan function with RCAL method. The Rcal is automatically connected by the instrument at the begin of the function and disconnected at its end. This operation needs a delay of 0.5 seconds. In case a RCAL remote calibration is aborted, the calibration flags will turn off after this delay.
Autospan WTS	Start the autospan function with WTS method. An output of the MiniCK can be programmed to automatically load the test weights, this adds a 10 seconds delay at the begin and at the end of the calibration function. In case a WTS remote calibration is aborted , the calibration flags will turn off after this time.
Autozero	Start the autozero function.

Confirm zero/span (C1.04) at the end of the calibration function tells to the instrument to save the new zero or span. If this command is sent during a remote calibration it aborts the running function.

Batch commands:

The batch can be controlled by serial communication:

Stop Batch	Temporarily stops a Load Out (batch) sequence. Batch can resume if a Start command is sent later.
Abort Batch	Definitively interrupt a Load Out (batch) sequence.
Start Batch	Starts a Load Out (batch) sequence.

Reset Commands

When the instrument receives a 'Clear Reset total' or a 'Reset alarm' command, it executes the command for all the scales.

Clear Operator total	Clear the operator total register.
Clear Reset total	Clear the reset total register.
Reset Alarms	Reset any pending alarm

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.

Virtual I/O Image

To allow an easy management when the MINI CK 101 is connected to a serial line, is possible to perform the I/O exchange only at level software, without using the available hardware I/O . Two words are dedicated for this function one for the Inputs and one for the outputs according the mapping and description below.

Virtual Input Image

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

VI1.15	Free	VI1.07	Start batch
VI1.14	Free	VI1.06	Clip detect
VI1.13	Free	VI1.05	Auto zero
VI1.12	Free	VI1.04	Reset alarms
VI1.11	Calib. 2	VI1.03	Reset totals
VI1.10	Calib. 1	VI1.02	Belt running
VI1.09	Stand-by batch	VI1.01	Free
VI1.08	Stop batch	VI1.00	Ext. Input

Virtual Output Image

15	14	NU	12	11	10	09	08	07	06	05	04	03	02	01	00

VO1.16	Cumul. Rate Deviation	VO1.07	High Speed
VO1.14	Cumul. Deviation Alarm	VO1.06	Low Rate
VO1.15	Load Test weight	VO1.05	High Rate
VO1.13	Free	VO1.04	Low Load
VO1.12	Batch High Rate	VO1.03	High Load
VO1.11	Batch Low Rate	VO1.02	Ready
VO1.10	Totalizer	VO1.01	Cumulative Shut down
VO1.08	Low Speed	VO1.00	Cumulative Alarm

Enable Options

This register allows to specify the format of the threshold values : percent or engineering.

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

EO.00	Percent unit
EO.01	Engineering unit

Commands 1 Additional register of commands provided for future use and for currently “reset Instrument” function.

CODE	FUNCTION
0X5245	RESTART INSTRUMENT

Tab. 6 – Special codes function

4.3.2 Dynamic Values

Batch Counter The number of the currently running load out or the number of the last finished one. The integrator automatically increments the batch number when a new batch is started.

Batch_Set Next The set point for the next load out cycle. Usually entered or downloaded by the user.

If the batch cycle is stopped, this set is copied to actual load out set point(**Batch set run**).

During the batch cycle the displayed setpoint is always **Batch set run** except when a input action is initiated. During input phase the displayed value is **Batch_Set_Next .**

As soon as the input phase end the displayed set will be again **Batch set run** and the value just setted will be the setpoint for the next batch cycle.

Rate The instantaneous rate in engineering units as currently displayed on the RUN screen.

Belt Load The instantaneous linear weight in engineering units.

Belt Speed The instantaneous belt speed in engineering units.

Master Total The current value of the master Totalizer of the integrator.

Operator Total The current value of the operator Totalizer of the integrator.
Operator total can be zeroed by writing zero to this register.

Reset Total The current value of the reset Totalizer of the integrator.
Reset total can be zeroed by writing zero to this register.

Batch Total The current contents of the load out totalizer. Usually read at end of batch to check the result of the load out. This register is automatically cleared when a new batch is started

Master Total The current value of the master Totalizer of the integrator, in double format

Operator Total The current value of the Operator Totalizer of the integrator, in double format

Reset Total The current value of the Reset Totalizer of the integrator, in double format

Batch Total The current value of the Batch Totalizer of the integrator, in double format

Batch set run The set point for the actual load out cycle. When a new batch start the **Batch_Set Next** value is copied to **Batch set run.**

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.

The value of the manual span from a read operation is shown in MENU 1 / CAL SPAN / MANUAL.

4.3.3 Display Data

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

SETTINGs	CODE
METRIC	00H
ENGLISH	01H
MIXED	02H

Tab. 7 – Units codes

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. 8 – Total units code

Length Units Code of the “Lenght Units” displayed according the table below:

SETTINGs	CODE
METERS	00H
FEET	01H

Tab. 9 – Length unit codes

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

SETTINGs	CODE
PERCENT %	00H
KG/H	01H
t/H	02H
LB/H	03H
TPH	04H
LTPH	05H
KG/MN	06H
t/MN	07H
LB/MN	08H
T/MN	09H
LT/MN	0AH

Tab. 10 – Rate units codes

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

SETTINGs	CODE
KG	00H
POUNDS	02H

Tab. 11 – Weight units codes

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

SETTINGs	CODE
USA	00H
SPANISH	01H
ITALIAN	02H
FRENCH	03H
GERMAN	04H
DUTCH	05H

Tab. 12 – Language code

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

SETTINGs	CODE
24H	00H
12H	01H

Tab. 13 – Time format codes

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

SETTINGs	CODE
GG-MM-YYYY	00H
MM-GG-YYY	01H
AAA-MM-GG	02H

Tab. 14 – Date format codes

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

SETTINGs	CODE
SPEED	00H
LOAD	01H
DATE/TIME	02H
NO DISPLAY	03H

Tab. 15 – Line 3 display codes

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

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

Speed Damping The Value in seconds of the displayed “Speed Damping”

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

SETTINGs	CODE
m / sec	00H
m / min	01H
FPM	02H

Tab.16 – Speed codes

4.3.4 Scale Data

Scale Capacity The maximum rate of the integrator, entered by the user in the instrument setup. It is the reference value for the high and low rate set expressed in percentage.

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. 17- scale division codes

Scale model The code number of Ramsey Scale used for internal calibration calculation.

Idler Space The value in engineering units of the distance between the idlers across the scale. The min and maximun limits for this one are:

UNITS	Feet	Meters	
LANGUAGE		ITA	OTHER
MAX	120	25000	2500
MIN	2	50	50

Tab. 18- Idler space limits

Angle The value in engineering units of the Angle of Inclination of the Scale.

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

UNITS	Pounds	Kg
MAX	15000	5000
MIN	1	1

Tab. 19- Load cell capacity limits

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

Speed Input Code of the “Speed Sensor Input” selected according the table below:

SETTINGs	**CODE**
SIMULATED	00H
SINGLE	01H

Tab. 20 – speed input code

Dead Band The value in percentage of the scale capacity (rate) in which the rate is ignored.

4.3.5 Calibration Data

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

SETTINGs	CODE
R-CAL	00H
TEST CHAIN	01H
TEST WEIGHT	02H

Tab 21 – calibration code

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.

Chain Weight The value in engineering units of the chain used as a sample weight for calibration.

UNITS	English	Metric
MAX	1000	3000
MIN	0	0

Tab. 22- Chain weight limits

Chain Constant The value of the constant for the chain calculated by instrument.

Test Weight The value in engineering units of the sample weight used for calibration:

UNITS	English	Metric
MAX	LC CAP * LC NUMBER	LC CAP * LC NUMBER
MIN	0	0

Tab. 23- Test weight limits

Weight Constant The value of the constant for the sample weight calculated by instrument.

Calibration Interval Number of selected days between two calibration.

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

Chain Factor Number in percentage used to correct the “Chain Constant” value to the real value.

Weight Factor Number in percentage used to correct the “Weight Constant” value to the real value.

Test Duration Length The value in engineering units of one complete belt revolution.

Test Durat. Length Full The value in engineering unit of the measured length of “one belt revolution” :

UNITS	Feet	Meters
MAX	10000	3000
MIN	1	0.5

Tab. 24- Test duration length full limits

Test Durat. Length Partial The value in engineering unit of the measured partial length of “belt”.

UNITS	Feet	Meters
MAX	10000	3000
MIN	1	0.5

Tab. 25- Test duration length partial limits

Test Durat. Length Manual The value in engineering unit of the measured length of “one belt revolution” set manually:

UNITS	Feet	Meters
MAX	10000	3000
MIN	1	0.5

Tab. 26- Test duration length manual limits

Test Duration The value in engineering units of the last performed calibration.

Test Duration Time The value in second of the last performed calibration.

Azt opt. The enable option for AZT function.

SETTINGs	**CODE**
NO	00H
YES	01H

Tab. 27 – 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.

Speed Capacity The value in engineering units of the maximum speed capacity of the system.

UNITS	Feet	Meters
MAX	2000	10
MIN	1	0.1

Tab. 28- Speed capacity limits

Calibration Number The value of Number of calibration defined

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

4.3.6 Diagnostic data

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.

Prescaler Reduction factor for speed sensor count.

Test Duration Pulses N° of counted pulses during the material calibration.

Test Duration Length Length in meter equivalent to one or more belt revolution used for material calibration.

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 29- 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. 30- Operator password limit

Software version Release of the Instrument firmware's.

Time hour The value in engineering units of the Time of the system.

UNITS	24 H	AM/PM
MAX	23	12
MIN	0	1

Tab. 31- Time limits

4.3.7 I/O Data

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

SETTINGs	CODE
NONE	00H
RATE	01H
SPEED	02H
LOAD	03H

Tab.32 – analog out define code

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. 33 – analog out range code

Analog Out Delay Length The value in meter of the delay of the Analog Output.

UNITS	Feet	Meters
MAX	10000	300
MIN	0	0

Tab. 34- Analog out delay length limits

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

Analog Out Filter The value in second that the output takes for the stabilization after a status variation.

Digital inputs assign The digital inputs configuration.

N.O Edge [Code]	N.O Level [Code]	N.C. Edge [Code]	N.C. Level [Code]
0XH	20XH	10XH	30XH
"X": Stands for Number of Input Min : 1 Max: 2			

Tab.35- Digital input assignement numbers limits

Digital outputs assign The digital outputs configuration.

N.O. [Code]	N.C. [Code]
0XH	10XH
"X": Stands for Number of Input Min : 1 Max : 5	

Tab. 36- Digital output assignement numbers limits

Totalizer Output Pulse Frequency value (divisor) relevant the weight for which the output is activate.

Totalizer Output Durat. The value in seconds of the duration of the pulse of the totalizer output's

Clip Detection Mode Code of the setted "Clip Detection Mode" according the table below:

SETTINGs	CODE
MANUAL	00H
AUTO	01H

Tab. 37 – Clip detect range code

Clip Detection Length The value in meter, of the belt length, for which the calculation of Rate, must be kept freezed.

UNITS	Feet	Meters
MAX	10	3
MIN	0.5	0.1

Tab. 38- Clip detect length limits

4.3.8 Alarms

Rate deviation opt. Enable the rate alarm condition.

SETTINGs	CODE
NO	00H
YES	01H

Tab. 39 – Rate dev. option limits

Low rate delay Delay time for low rate alarm condition.

Low rate set Set value for low rate alarm condition.

High rate delay Delay time for high rate alarm condition.

High rate set Set value for high rate alarm condition.

Load deviation opt. Enable the load alarm condition.

SETTINGs	CODE
NO	00H
YES	01H

Tab. 40– Load dev. option limits

Low load delay Delay time for low load alarm condition.

Low load set Set value for low load alarm condition.

High load delay Delay time for high load alarm condition.

High load set Set value for high load alarm condition.

Speed deviation opt. Enable the speed alarm condition.

SETTINGs	CODE
NO	00H
YES	01H

Tab. 41 – Speed dev. option limits

Low speed delay Delay time for low speed alarm condition.

Low speed set Set value for low speed alarm condition.

High speed delay Delay time for high speed alarm condition.

High speed set Set value for high speed alarm condition.

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. 42 – Alarm define code

4.3.9 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. 43– Variable selection range code

Swap integer data Mode to swap “Integer Data” in the communication protocols:

SETTINGs	WORD
NO_SWAP	00H
SWAP_BYTES	01H

Tab. 44– Integer data swap selection range code

Swap float data Mode to swap “Float Data” in the communication protocols:

SETTINGs	WORD
NO_SWAP	00H
SWAP_BYTES	01H
SWAP_WORDS	02H
SWAP_BYTES+WORDS	03H

Tab. 45– Float data swap selection range code

Swap Long Integer Mode to swap the LONG INTEGER DATA in the communication protocols.
See Tab.45 for selection code

3.3.10 Serial Settings

Baud Rate Communication parameter: byte per seconds

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

Tab. 46 – Baud rate

Parity Communication parameter: Parity

SETTINGs	CODE
None	00H
Even	01H
Odd	02H

Tab. 47 – Parity

Stop Bit Communication parameter: Stop bit

SETTINGs	CODE
1	00H
2	01H

Tab. 48 – Stop Bit

Word length Communication parameter: Word length

SETTINGs	CODE
7	00H
8	01H

Tab. 49 – Word length

Protocol Communication parameter: Protocol

SETTINGs	CODE
PRINTER	00H
MODBUS	01H

Tab. 50 – Protocol

Access level Communication parameter: access level

SETTINGs	CODE
PROTECTED	00H
LIMITED	01H
NONE	02H

Tab. 51 – Access level

Clear to send Communication parameter: Clear to send

SETTINGs	CODE
ACTIVE	00H
DISABLED	01H

Tab. 52 – Clear to Send

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

Half duplex delay Response delay for two wire connection.

4.3.11 Printer Settings

This section only applies to printer. If you are using the COMM for connecting a computer, PLC or other device using a protocol, skip this section.

The MiniCK 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.

Handshake Select Handshaking sequence.

SETTINGs	CODE
NONE	00H
XON_XOFF	01H
CTS	02H

Tab. 53 – Handshaking limits

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

SETTINGs	CODE
CR	00H
LF	01H
CD+LF	02H

Tab. 54 – End of line pattern limits.

End of Line Delay 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.

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

SETTINGs	CODE
NO	00H
YES	01H

Tab. 55 – Form feed limits

Print Interval 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.

UNITS	Minutes	Hours	Days
MAX	59	23	365
MIN	0	0	0

Tab. 56- Print interval limits

Print Interval Unit Select the units for print interval.

SETTINGs	**CODE**
Minutes	00H
Hours	01H
Days	02H

Tab. 57 – Print interval units limits.

Print Time hour 1 -2-3-4 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.

UNITS	24 H	AM/PM
MAX	23	12
MIN	0	1

Tab. 58- Print Time limits

Print Time minutes See "**Print Time hour**"description.

Print Alarms If YES is selected, the system prints all alarms that have been set to alarm in the Alarm scroll.

SETTINGs	**CODE**
NO	00H
YES	01H

Tab. 59 – Print alarms limits

Total Report Format This 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.

SETTINGs	**CODE**
DEFAULT	00H
USER DEFINED	01H

Tab. 60 – Total report format limits

4.3.12 Load Out (Batch)

Batch Option Enable the load out function.

SETTINGs	CODE
NO	00H
YES	01H

Tab. 61 – Batch option limits

Batch Preset The pre-set point for the current or the next load out. Defines when the rate will be lowered to increase batch accuracy.

CutOff Corr. The CutOff correction is the amount of material which flows on the belt scale after the batch end has been turned off. Select the method you want to use :

SETTINGs	WORD
S_COFFNONE	00H
S_COFFADJ	01H
S_COFFAUTO	02H

Tab. 62 – CutOff correction code

CutOff queue If the selection of the **CutOff Corr** is S_COFFNONE, the user can directly enter the CutOff queue.

CutOff len If the selection of the **CutOff Corr** is S_COFFAUTO , the user can enter the length of belt travel between the scale and the feeding point:

UNITS	Feet	Meters
MAX	300	100
MIN	0	0

Tab. 63- CutOff len limits

CutOff dev If the selection of the **CutOff Corr** is S_ S_COFFADJ, the user must enter the maximum correction that the system is allowed to perform to the cut-off value.

.

Start Delay After the start command has been given, the system will wait the start delay entered here before activating the batch command**.**

Stabilization time After the batch command has been turned off at end of batch, the system will wait the coasting time entered here before freezing the batch total and print the batch data**.**

Batch deviation At end of batch, the system checks the error. If error is larger than the batch deviation entered here, an alarm is generated**.**

4.3.13 Linearization

Linearization Option Enable the linearization function.

SETTINGs	CODE
NO	00H
YES	01H

Tab. 64 – Linearization option limits

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)
For each Protocol below is possible to find an example of the query.
Starting from the slave address field, the structure is that of the MODBUS message, except for error check field.

5.1 MODBUS

5.1.1 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	...	xxx
N° Data LO	xxx	Data LSB	xxx
Error check HI	xxx	Error check HI	xxx
Error check LO	xxx	Error check LO	xxx

EXAMPLE 1 – READ HOLDING REGISTER
The Host wants to receive the scale capacity variable :

Address of slave : 01
Register N°: 109 (6d Hex)
Type of register: Float
Load value: 500,0 t/h

HOST (PLC)				**SLAVE (MINI CK)**	
Slave Address	01H				
Function	03H				
Address HI	00H				
Address LO	6DH				
N° Data HI	00H				
N° data LO	02H				
Error check HI	55H				
Error check LO	D6H	→	←	01H	Slave Address
				03H	Function
				04H	Byte Count
				00H	Data Hi
				00H	Data Lo
				43H	Data Hi
				FAH	Data Lo
				4BH	Error check HI
				40H	Error check LO

EXAMPLE 2 – READ HOLDING REGISTER
The Host wants to receive the Scale Division Settings :

Address of slave : 01
Register N°: 111 (6F Hex)
Type of register: integer
Division: 0,1

HOST (PLC)					**SLAVE (MINI CK)**	
Slave Address		01H				
Function		03H				
Address HI		00H				
Address LO		6FH				
N° Data HI		00H				
N° data LO		01H				
Error check	HI	B4H				
Error check	LO	17H	→	←	01H	Slave Address
					03H	Function
					02H	Byte Count
					00H	Data MSB
					08H	Data LSB
					B9H	Error check HI
					82H	Error check LO

5.1.2 Write Operation Example

PRESET SINGLE REGISTER(1 Word)

QUERY		**RESPONSE MESSAGE**	
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
Error check HI	xxx	Error check HI	xxx
Error check LO	xxx	Error check LO	xxx

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

Address of slave : 01
Register N°: 100 (64 Hex)
Type of register: integer
Settings: French (03Hex)

HOST (PLC)			**SLAVE (MINI CK)**	
Slave Address	01H			
Function	06H			
Address HI	00H			
Address LO	64H			
Preset Data HI	00H			
Preset Data LO	03H			
Error check HI	88H			
Error check LO	14H	→	←	01H Slave Address
				06H Function
				00H Address HI
				64H Address LO
				00H Preset Data HI
				03H Preset Data LO
				88H Error check HI
				14H Error check LO

PRESET MULTIPLE REGISTERS

QUERY		RESPONSE MESSAGE	
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	Error check HI	xxx
Data Hi	xxx	Error check LO	xxx
Data Lo	xxx		
Data Hi	xxx		
Data Lo	xxx		
Error check HI	xxx		
Error check 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 t/h

HOST (PLC)			SLAVE (MINI CK)	
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			
Error check HI	05H			
Error check LO	28H	→	←	01H Slave Address
				10H Function
				00H Start Address HI
				6DH Start Address LO
				00H N° Data HI
				02H N° Data LO
				D0H Error check HI
				15 Error check 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 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 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 1 1 0 0 1 1 0 0 1 1 0 1 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 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
      —      — — — — — — — — — — — — — — — — — — — — — — — — — — — — —
Bit   Imp    22                                                        0
```

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

APPENDIX B

SERIAL BOARD TERMINALS CONNECTION

RS 232 CONNECTION

Terminal N°	Function
1	-
2	Rx
3	Tx
4	-
5	Gnd
6	-
7	Rts
8	Cts
9	-

RS 485 4 wires CONNECTION

Terminal N°	Function
1	TxD-
2	TxD+
3	RxD+
4	RxD-
5	Gnd
6	-
7	-
8	-
9	-

RS 485 2 wires CONNECTION

Terminal N°	Function
1	TxD-
2	TxD+
3	RxD+
4	RxD-
5	Gnd
6	-
7	-
8	-
9	-