VPG Transducers

Celtron • Revere • Sensortronics • Tedea-Huntleigh

TECHNICAL MANUAL

WT 2 Weighing Indicator/Transmitter with RS232 and ETHERNET port

Software versione PW0311

TABLE OF CONTENTS

Rel ID 18360302 SW.00

PRECAUTIONS

READ this manual BEFORE operating or servicing the instrument.

FOLLOW these instructions carefully.

SAVE this manual for future use.

CAUTION

The installation and maintenance of this instrument must be allowed to qualified personnel only.

Be careful when you perform inspections, testing and adjustment with the instrument on.

Failure to observe these precautions may be dangerous.

DO NOT allow untrained personnel to work, clean, inspect, repair or tamper with this instrument.

INTRODUCTION

The WT 2 is a transmitter of weight to be matched to the load cells to detect the weight in every situation.

The module is easy to install and can be mounted on 35 mm DIN rail.

The display allows easy reading of the weight, the configuration parameters and errors.

The 3 keys present below the display and protected by the front door allow the Operator to perform the functions of ZERO and CALIBRATION as well as allow the programming.

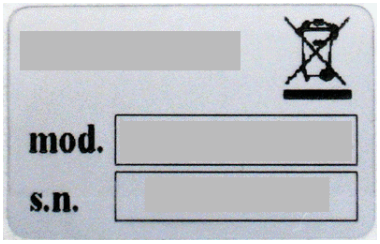
The WT 2 uses the serial interface RS232 in the RTU Modbus and ASCII protocols for connecting to a PC, PLC and remote units.

The presence of the ETHERNET connection allows the use in the most modern industrial environments.

Fieldbus available:

- **WT 2/PROFIBUS:** weight transmitter with serial output RS232 and PROFIBUS DP.
- **WT 2/ETHERNET:** weight transmitter with serial output RS232 and ETHERNET.
- **WT 2/ETHERNET IP:** weight transmitter with serial output RS232 and ETHERNET IP.
- **WT 2/PROFINET:** weight transmitter with serial output RS232 and PROFINET.

IDENTIFICATION PLATE OF THE INSTRUMENT



It's important to communicate this data in the event of a request for information or information concerning the instrument joined to the program number and version that are displayed when the instrument is switched on.

WARNINGS

The following procedures must be performed by qualified personnel.

All connections must be performed when the instrument is turned off.

TECHNICAL FEATURES

Power supply	24 Vdc ±10% protected against reverse polarity. Protection with resettable fuse.
Max. absorption	2W
Insulation	Class II
Operating temperature	-10°C ÷ +50°C (max. humidity 85% non-condensing)
Storage temperature	-20°C ÷ +60°C
Weight display	Numerical with 5 red led digits and 7 segments (h 7 mm)
Led	2 leds of 3 mm
Keyboards	3 mechanical keys (behind the red front door)
Overall dimensions	110 x 120 x 23 mm (l x h x p), including terminal boards 110 x 120 x 35 mm (l x h x p) in case of fieldbus
Installation	Brackets for DIN section of 35 mm
Support material	self-extinguishing Blend PC/ABS
Connections	Removable terminal boards with screws, pitch 5.08 mm
Load cells Input	max. 4 of 350 Ω in parallel (or 8 cells of 700 Ω).
Supply voltage of the load cells	4 Vdc
Linearity	0.01% of the full scale
Temperature drift	0.001% of the full scale / °C
Internal resolution	24 bits
Measuring range	-3.9 ÷ +3.9 mV/V
Digital filter	To be selected from 0.1 Hz to 50 Hz
Number of weight decimals	0 ÷ 4 decimal places
Calibration of zero and full scale	From the buttons.
Control of the cell cable interruption	Always present
Serial ports	RS232 half duplex
Baud rate	2400 ÷ 115200 baud
Maximum length of the cable	15m (RS232)
Fieldbus	ETHERNET
Connection	RJ45 connector
Protocols	TCP, Modbus TCP, UDP, IP, ICMP, ARP
Communications mode	TCP server
In compliance with the standards	EN61000-6-2, EN61000-6-3 for EMC EN61010-1 for Electrical Safety UL: FILE NO E474362

INSTALLATION

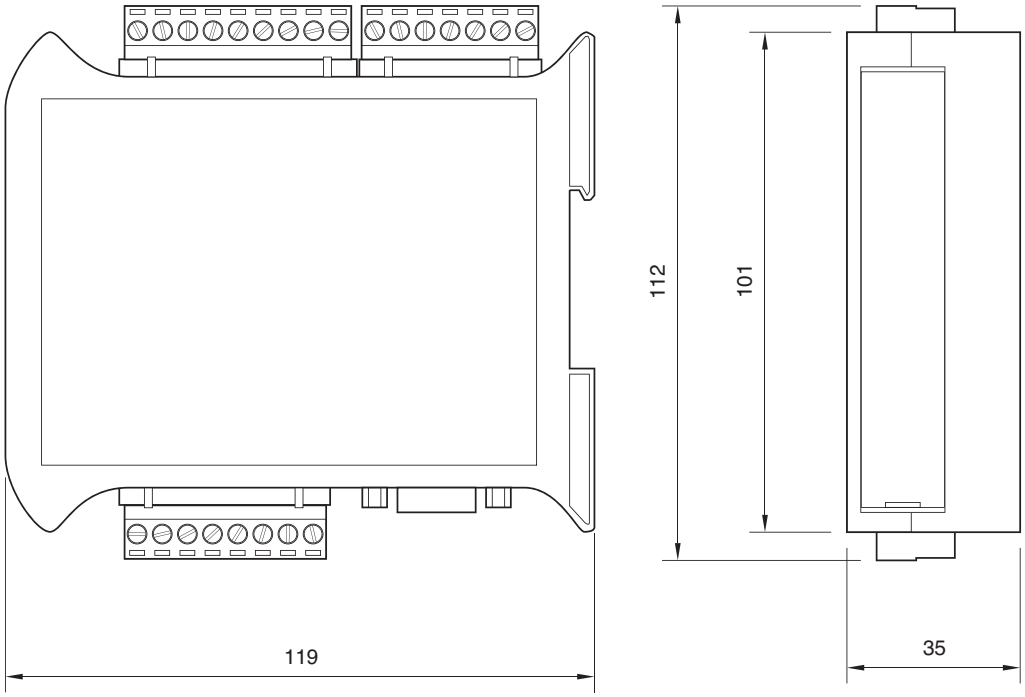
GENERAL DATA

Each WT 2 contains various boards housed in a plastic container mounted on 35mm DIN rail.

The WT 2 should not be immersed in water, subjected to jets of water and cleaned or washed with solvents.

Do not expose to heat or direct sunlight.

OVERALL DIMENSIONS



ELECTRICAL INSTALLATION

The transmitter uses for the electrical connection of the removable screw, pitch 5.08 mm. The shield connection is necessary, apart from 24 VDC. The load cell cable must be shielded and channeled away from tension cables to prevent electromagnetic interference.

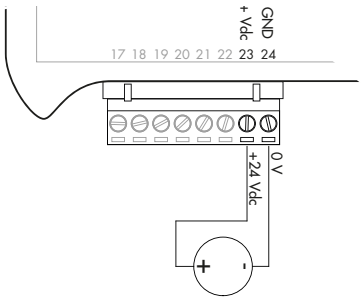
The joints needed to extend the cables must be screened carefully and spliced by welding or special terminal strips in junction box.

INSTRUMENT POWER SUPPLY

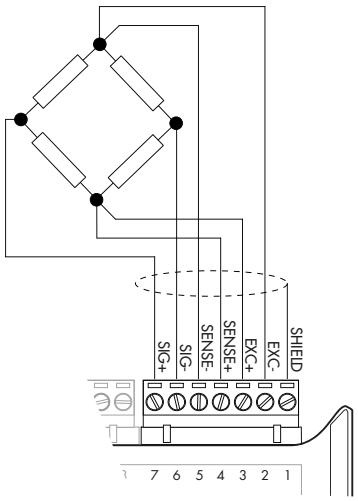
The instrument is powered through the terminals 23 and 24. The power cord must be channeled separately from other power cables of different voltages from the load cell cables and logic inputs / outputs.

The internal circuit is galvanically isolated from the supply voltage.

Power supply voltage: 24 Vdc/ ± 10 % max. 2W



LOAD CELLS



The cable of the load cell (or load cells) should not be channeled with other cables, but has to follow its own path.

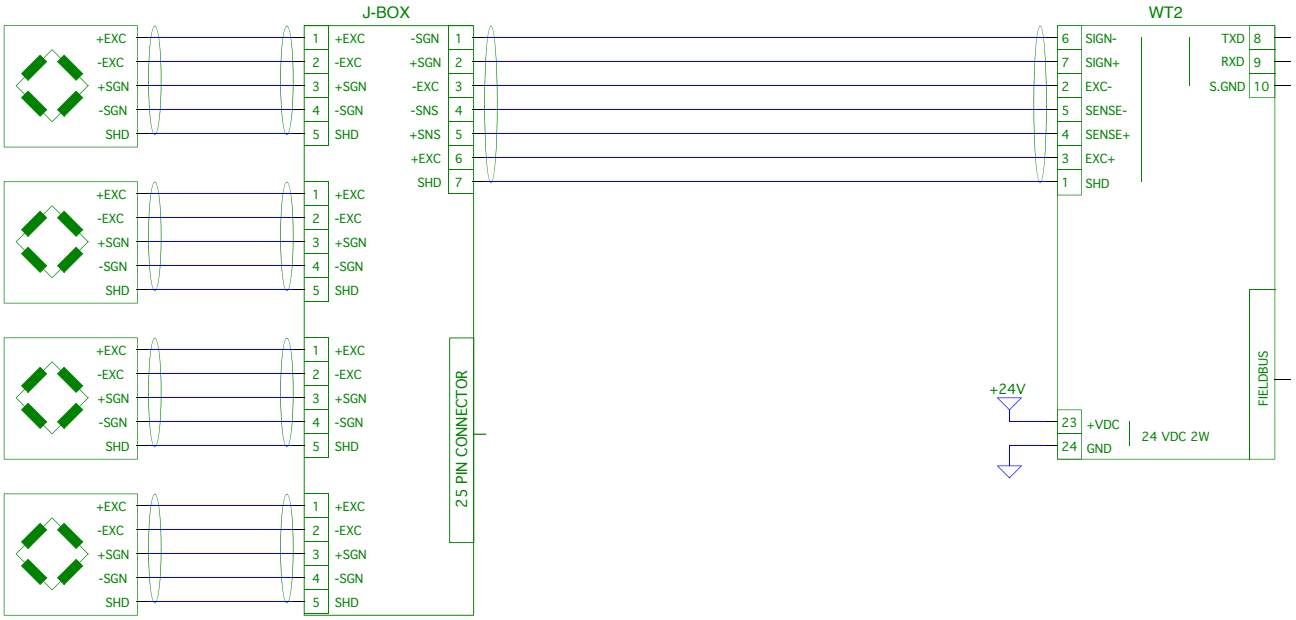
The instrument can be connected up to maximum 4 load cells of 350 ohm in parallel. The supply voltage of the load cells is 4 Vdc and is protected by temporary short circuit.

The measuring range of the instrument involves the use of load cells with a sensitivity of up to 3.9 mV/V.

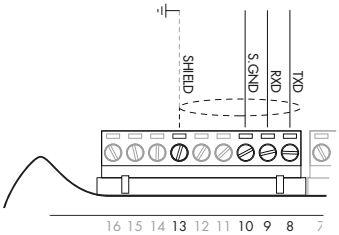
The cable of the load cells must be connected to terminals 2-7 of the 7-pin removable terminal board. In the case of 4-wire load cell cable, jump terminals 2 with 5 and 3 with 4.

Connect the cell cable shield to the terminal 1.

In the case of the usage of two or more load cells, use special junction boxes.



SERIAL COMMUNICATION



RS232:

The RS232 serial port is always present and can handle several protocols.

To achieve the serial connection use a suitable shielded cable and make sure to ground the screen at one of the two ends: to pin 13, if attached on the side of the instrument, to the ground, if connected on the other side.

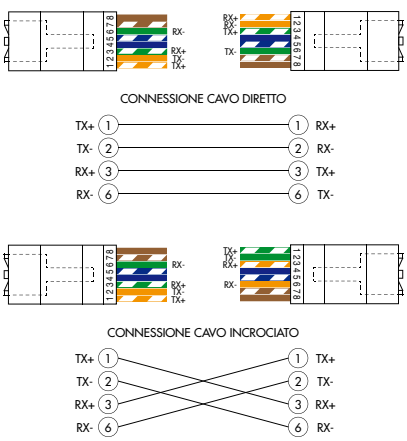
The cable must not be channeled with power cables, maximum length of 15 meters (EIA RS-232-C).

ETHERNET CONNECTION

You can connect the interface to the PC directly without going through other network devices (routers, switches, hubs, LAN-bridge or whatever), but it must be used RJ45 special cables, called “crossover”

Normally the cables are “direct” and allow the connection to network devices such as routers or hubs, but they don’t allow the direct connection of two PCs (although currently there are network cards with auto-sensing technology, which recognize the type of cable and the type of connection, allowing direct connections to PC-PC also using crossover cables).

The cable must not be channeled to other cables (eg outputs connected to contactors or power cables) but, if possible, should follow their own path.

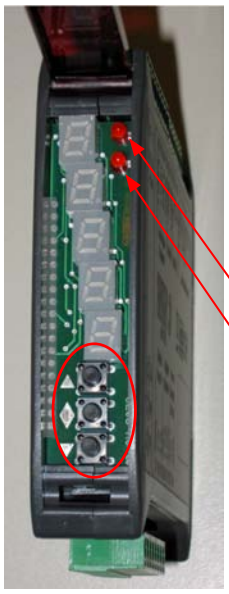


FRONT PANEL OF THE INSTRUMENT

The WT 2 transmitter has a door that protects the 5 digits display, the 2 status LEDs and the three front buttons and allows for instant weight reading.

In this operating mode the display shows the weight and the LEDs indicate the status of weight (net-gross).

The set-up parameters are easily accessed and modified through the use of the three front buttons used to select, edit, confirm and save the new settings.



DISPLAY

On the 5 digits display, it's usually displayed the weight measured where the lower digit shows the less important value. According to the various programming procedures, the display shows the configuration parameters, the relevant value, and the messages that are of aid to the Operator in the management and programming of the instrument.

LED INDICATORS

In the upper part of the display there are two LED indicators:

LED 1 (on = net weight, off = gross weight, flashing = peak)

LED 2 (on = tare inserted, off = no tare)

In bar-graph view, both LEDs flash.

USING THE KEYBOARD

The instrument is programmed and controlled through the 3 keys keyboard, with the following functions:

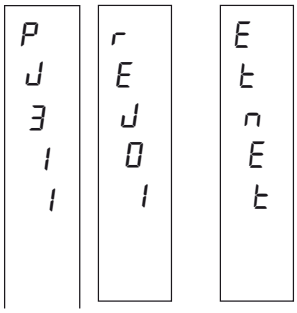
KEY	FUNCTIONS IN WEIGHT INDICATION CONDITIONS
▲	Short press: Display switches from Gross to Net weight. Long press: Display switches from Weight to Peak
◆	Short press: Display switches from Numerical to Bar-graph of to gross weight. Long press: Zeroing of the weight/peak displayed.
▼	Short press: Sending the data to the serial line (if the manual protocol was selected) Long press: Set point programming (WT 2/A)
▼ ◆	Pressed at the same time: Accessing the Main Menu

KEY	FUNCTION IN THE MANAGEMENT OF THE set up MENU
▲	Exits the set up menu or returns to the higher level.
◆	Access its submenu, or access the set up or confirms the selected parameter.
▼	Goes to the next menu item.

KEY	FUNCTION IN THE MANAGEMENT OF THE SET UP SUBMENU
▲	Increases the blinking digit / select the higher value.
◆	Select the next digit. If the flashing digit is the last one, confirm the value and end the set up / selection.
▼	Decrease the blinking digit / select the lower value.

DISPLAY INDICATIONS

When the instrument is switched ON, you can perform the test on the display, then in sequence you can display the identification code of the software, its version and the hardware module installed.

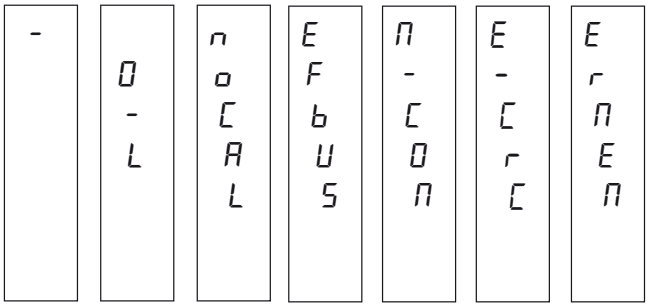


ETNET hardware ETHERNET module

It's important to communicate these codes in the event of a request for assistance.

ERRORS NOTIFICATION

In the operation mode, the display can report the following error codes.



- Overload: The weight applied to the load cell exceeds by more than 9 divisions the maximum capacity of the weighing system.

0-L O-L : No signal from the load cells or outside of the field of measurement mV/V.

noCAL NOCAL: Transmitter not calibrated. Recalibration needed.

EFbuS EFBUS: Fieldbus interface absent or not working.

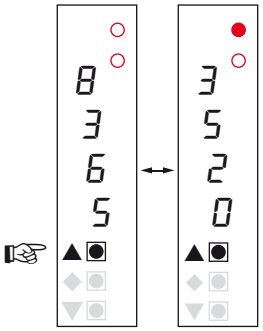
n-CoN N-COM: Fieldbus interface of the instrument is not connected to the network.

E-CrC E-CRC: CRC error during communication with the fieldbus interface of the instrument.

ErnEn ERMEM: Error in E^2PROM. You can reprogram the instrument to the factory settings, erasing any calibration by pressing ◆ key.

VIEWING, ZEROING THE WEIGHT AND SELF-CALIBRATION

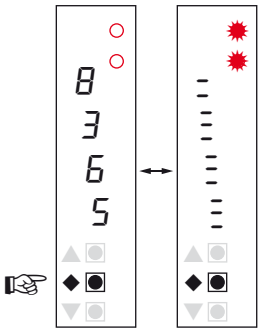
When the instrument is switched ON, the display shows the gross weight.



VIEWING THE NET WEIGHT/GROSS WEIGHT

Press the keys to toggle between the net weight to gross weight and vice versa. The value displayed is signaled by the LED above (lit: net weight). If you have not entered the tare, the net weight is equal to the gross weight.

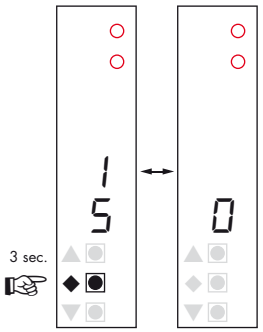
In case of negative weight, it is displayed the minus sign before the most significant digit. In case of negative weight greater than 9999, the minus sign is displayed alternating with the most significant digit.



NUMERICAL VIEWING/BAR-GRAPH OF THE GROSS WEIGHT

Press the key u to toggle the numerical display of the weight to the graphical representation of the gross weight and vice versa. The resolution is limited to 15 divisions and therefore each segment represents 1/15 of full scale.

The bar-graph display is indicated by both LEDs flashing.



ZEROING THE WEIGHT

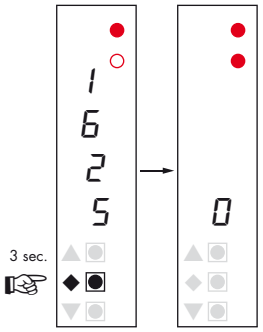
This operation is performed to correct small movements of the zero of the scale. To perform the reset function, it is necessary to switch the display on the gross weight (NET LED off).

The gross weight reset command does not run under the following conditions:

Unstable weight (the weight does not stabilize within 3 sec. since reset command).

Gross weight greater (positive or negative) than the 0BAND value set, with respect to the zero original calibration. In this case you must enter the calibration menu and perform the calibration.

If you previously performed a self-calibration, it is canceled automatically. When the instrument is switched off, it is restored the value of Zero made during calibration.



AUTOMATIC TARE

To perform the auto-tare function, it is necessary to switch the display on the gross weight (NET LED off). (NET LED on).

The automatic tare command does not run under the following conditions:

Unstable weight (the weight does not stabilize within 3 sec. since the auto-tare command).

Negative gross weight.

Gross weight greater than the maximum value.

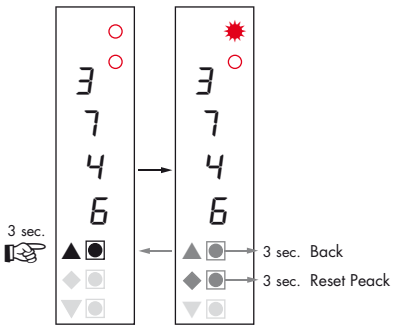
If the automatic tare is performed with gross weight = 0, any tare value is canceled. The tare value entered is not saved at power down.

If you enter a tare, it's indicated by the second LED ON (lit: tare entry).

PEAK FUNCTION

The peak is related to the gross weight and is always calculated, even when the peak is not displayed. When you see the peak, the top LED flashes.

The peak value entered is not saved at power down.



SET UP

GENERAL INFO

All functions of the WT 2 can be and amended through a simple setup menu, shown on the next page. All the settings activated or selected are stored even after switching off the transmitter.

The WT 2 is factory set. See the "default" parameters on the following pages.

At the first installation in the field some parameters need to be amended to obtain a correct indication of the displayed weight (datasheet adjustment).

This procedure may be required when you purchase the WT 2.

The settings of the setup menu can be changed using the three front buttons.

CHANGING AND ENTERING PARAMETERS:

The setup parameters are grouped into a number of main menus.

To access the setup menu press simultaneously for 3 seconds ◆ and ▼ keys.

The display shows the message ConFG which is the first of the main menus

Use the ▼ and ▲ keys to select the menu to edit

Press the ◆ key to enter the selected menu.

KEY	PROGRAMMING FUNCTION DURING THE MAIN MENU
▲	Exits the programming menu or returns to the higher level.
◆	Access the relevant menu or programming or confirm the selected parameter.
▼	Skip to the next menu.

KEY	FUNCTION DURING PARAMETERS PROGRAMMING
▲	Increases the blinking digit / select the higher value.
◆	Select the next digit. If the flashing digit is the last, confirms the value and ends the programming / selection.
▼	Decreases the blinking digit / select the lower.

The parameters of the menu can take selectable values and numerical value.

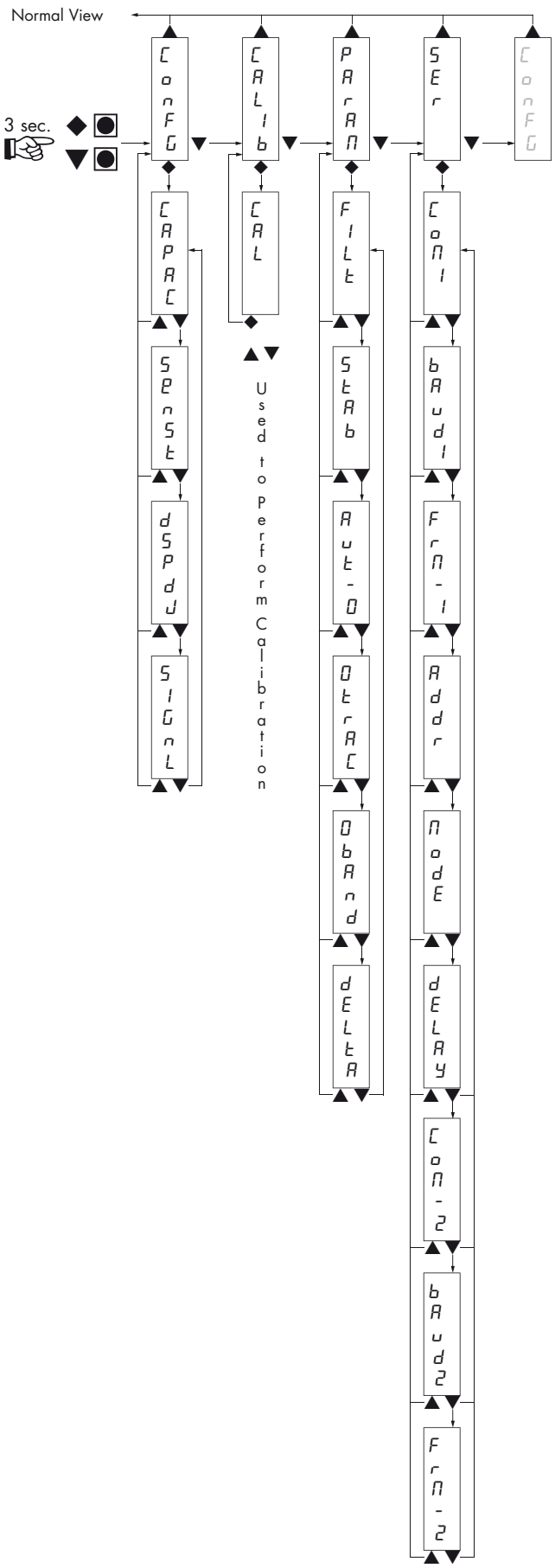
▲ key. Increment the flashing digit, select the next alternative value, goes back to the higher level or exits the setup menu.

◆ key. Select the next digit, confirm the setting of the selected parameter, access the set up parameters and access the set up submenu.

▼ key. Decrement the flashing digit, select the previous alternative value.

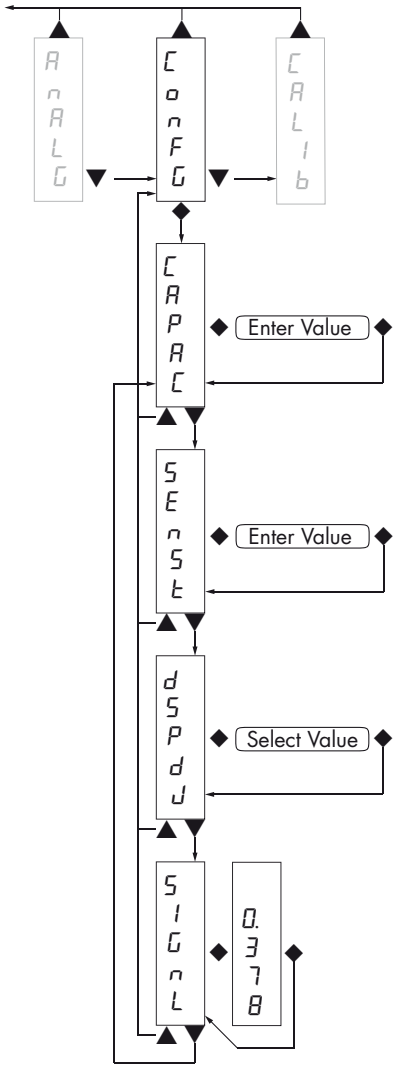
NB. To exit and save the changed data, press the ▲ button until the indicator returns to the operating mode.

FLOW CHART MENU



CONFIGURATION PARAMETERS

Through the setting of the parameters listed below, the WT 2 Full Scale datasheet calibration is performed. You must complete these steps with the zero calibration described on the next page. The procedure ensures, in the absence of mechanical problems, a good accuracy of the system (maximum error <1% FS).



CAPAC CAPACITY OF THE WEIGHING SYSTEM

It defines the value corresponding to the sum of the rated capacity of the load cells. In case of single load cell systems and "N" fixed supports, enter the capacity value of the load cell for the total number of supports. This figure represents the full scale value of the weighing system.Following the change of the parameter value, the datasheet calibration of the weight is recalculated.

Values: from 1 to 99999

Unit: the same of that displayed

Default: 10000

SEnSt LOAD CELLS SENSITIVITY

Set the value corresponding to the average of the load cells sensitivity, in mV/V. The instrument accepts values between 0.5 and 4 mV/V. If no value is entered, the unit assumes it is 2 mV/V.

Following the change of the sensitivity value, the datasheet tare of the weight is recalculated.

Values: from 0.5000 to 4.0000 mV/V

Default: 2.0000

dSPdJ DIVISION VALUE

The ratio between the maximum capacity of the system and the division value is the resolution of the system (number of divisions).

Following the change of the capacity of the system, it is automatically selected the division value to the best of 5000 divisions.

Following the change of the division value, if the maximum capacity does not change, the calibration of the weight is automatically corrected.

Selectable Values:

0.0001 - 0.0002 - 0.0005

0.001 - 0,002 - 0,005

0.01 - 0.02 - 0.05

0.1 - 0.2 - 0.5

1 -2 - 5

10 - 20 - 50

Default: 1

SIGnL TESTING THE LOAD CELLS SIGNAL

It's displayed the signal acquired from the load cells expressed in mV / V.

CALIB - CALIBRATION

The calibration method below, is used to correct or reduce the linearity error of the weighing system. The calibration should be performed with the use of sample weight or pre-weighed product on a sample weighing system.

Before proceeding with the calibration of the full scale, always perform the zero calibration.

During the calibration phase, the display shows the weight intermittently with the inscription CAL .

ATTENTION: at power off without exiting the set-up menu, the programming executed are not stored.

NB In the event that after calibration the system has linearity errors, verify that the structure weighed is completely free from mechanical constraints.

ZERO CALIBRATION

Perform the operation when the system is empty (including the fixed tare) and the weight is stable. The zero of the system is done by pressing the ▼ key. The display shows 2-0h confirming the operation.

The weight displayed resets and the display shows CAL alternated by 0. It is possible to repeat this operation more times.

CALIBRATION OF FULL SCALE

Prior F.S. calibration load the sample weight on the system and wait for the stabilization; the display shows a weight value.

Press the ▲ key to adjust the weight. The display shows 00000 with the first digit flashing.

Use the ▲ or ▼ keys, enter the weight value starting with the first digit flashing. Switch to the next digit by pressing ◆. The confirmation of the last digit performs the correction of the weight. The display shows CAL alternated to the weight entered.

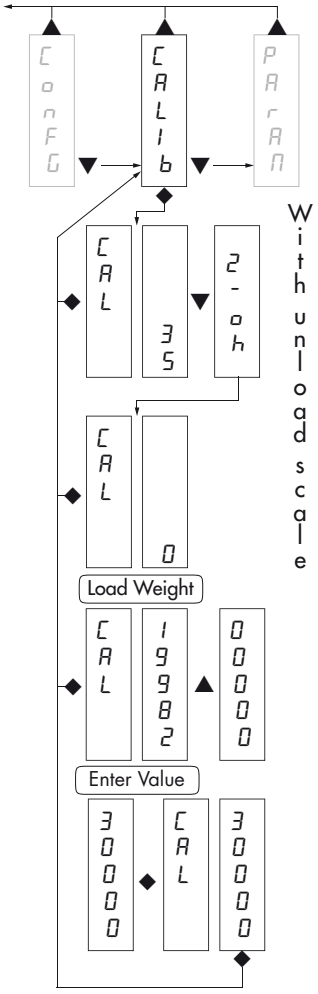
If the weight value is higher than the resolution, it is not accepted and the display shows an error message for a few seconds.

You can always repeat the F.S. calibration.

EXIT FROM CALIBRATION MENU

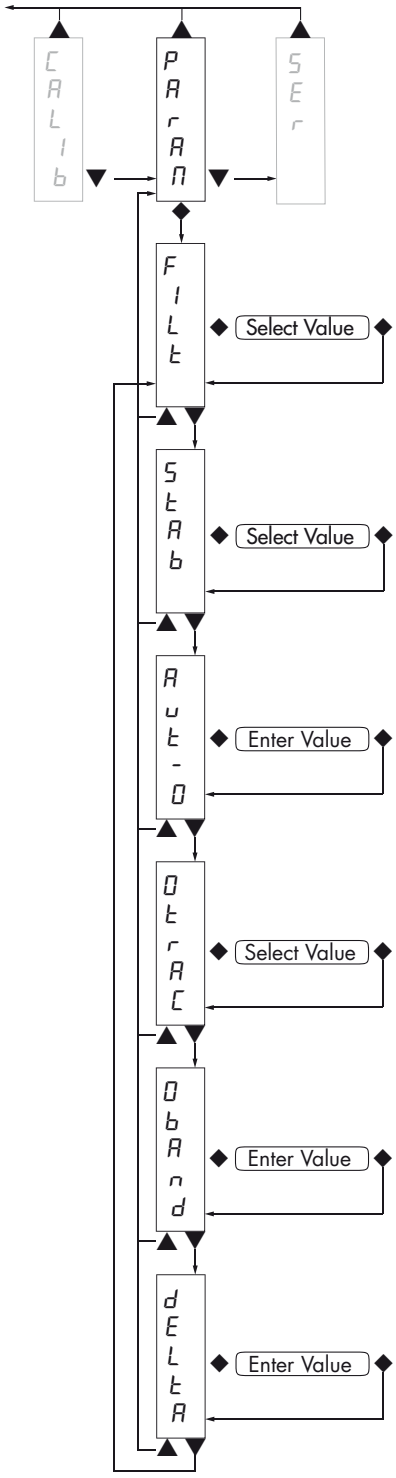
The exit from the menu CALIb is done by pressing ◆ key.

The display shows CALIb. To store the new setting and exit the setup menu, press the ▲ key.



PARAM - WEIGHING PARAMETERS

The parameters in this menu allow to adjust the timing of the acquisition and updating of the display and the manual or automatic zeroing that the transmitter performs.



FILt WEIGHT FILTER

This parameter adjusts the refresh speed of the display and the analog output.

Low values of the filter speed up the display refresh.

High values of the filter slow down the display refresh.

Value	*Updated*	*Response*
0	*123 Hz*	*25 Hz*
1	*62 Hz*	*16 Hz*
2	*50 Hz*	*8 Hz*
3	*33 Hz*	*5 Hz*
4	*16 Hz*	*2.5 Hz*
5	*12 Hz*	*1.5 Hz*
6	*10 Hz*	*1 Hz*
7	*8 Hz*	*0.7 Hz*
8	*6 Hz*	*0.4 Hz*
9	*4 Hz*	*0.2 Hz*

Default: 5

StAb WEIGHT STABILITY

This parameter defines the divisions number needed to deem the weight stable.

A large number of divisions allows the transmitter to detect quickly the weight stability, which is needed when executing tare and print commands.

Value	*Change*
0	*Always stable weight*
1	*Stability reached quickly*
2	*Stability reached with medium parameters*
3	*Stability reached accurately*
4	*Stability reached with the highest accuracy*

Default: 2

Aut-0 AUTOZERO AT POWER ON

This parameter defines the maximum resettable weight upon power on.

This operation corresponds to a zero calibration of the system and is executed only if the weight is stable and below the set value.

Value from 0 to the value of the CAPAC parameter.

Default: 0

OtrAc TRACKING THE ZERO

This function allows a momentary zero calibration compensating the eventual temperature drift of the weight.

At power off it automatically returns to the previous calibration.

The maximum weight resettable by this parameter is 2% of the range of the system.

To disable this feature, use the value 0.

Value	*Change*
0	*Control OFF*
1	*0.5 div/sec*
2	*1 div/sec*
3	*2 div/sec*
4	*3 div/sec*

Default: 0

ObAnd ZERO BAND

This parameter defines the number of divisions resettable by pressing the zero front button or Input 1.

Values: from 0 to 200

Default: 100

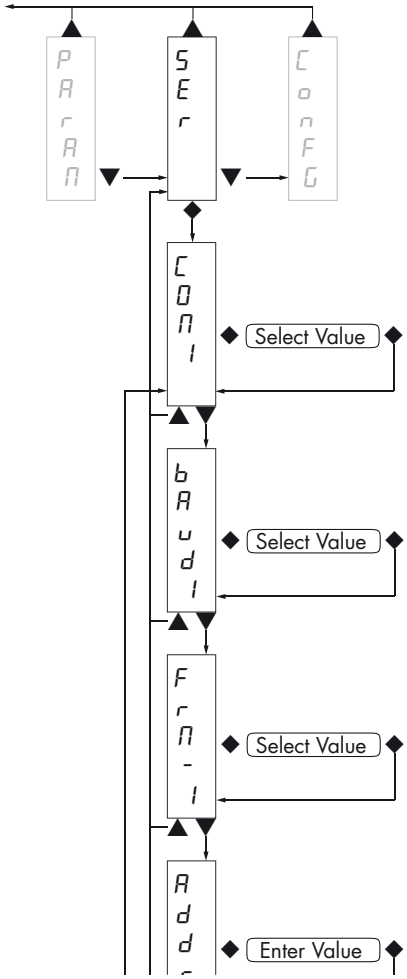
dELtA WEIGHT DELTA

It defines the minimum number of divisions needed to discriminate two consecutive weighing in serial transmissions of the weight.

Values: from 0 to 200

Default: 20

SER - SETTING THE SERIAL COMMUNICATION PORTS



COM1 **COM1:** It defines the use of the COM1 serial port.

None: Serial communication OFF

Contn: Continuous transmission of the weight string. It can be used, for example, to drive a remote display. See details in the relevant paragraph.

Deman: When the Operator presses the front button or through Input 2, a string of weight is transmitted. The command is accepted if the weight is stable. Between two consecutive transmissions the weight must have a variation of at least the parameter "Weight delta".

Auto: It's automatically transferred to a string of weight when the weight stabilizes at a value higher than the minimum weight (20 divisions). Between two consecutive transmissions the weight must have a variation of at least the value set in the parameter "Delta Weight".

Slav: ASCII protocol. See details in the relevant paragraph.

Mdbs: MODBUS RTU (slave) protocol. See details in the relevant paragraph.

Selectable Values:
None
Contn
Deman
Auto
Slav
Mdbs
Default: Mdbs

bAud1 **BAUD RATE COM1**

It defines the RS232 serial port baudrate.

The value must be set to the same value of the PC / PLC or remote display.

Selectable Values:
2400
4800
9600
19200
38400
57600
115200
Default: 9600

FrM-1 COM1 DATA FORMAT

It defines the data format of the RS232 serial port.

The value must be set to the same value of the PC / PLC or remote display.

In the case of MODBUS or SLAVE protocol, selections of the 7-bit data formats (E-7-1 and O-7-1) are not accepted (error message "Nvalid").

Selectable Values:

N-8-1

N-8-2

E-8-1

O-8-1

E-7-1

0-7-1

Default: N-8-1

Addr COM1 / COM2 SERIAL COMMUNICATION ADDRESS

Configuration of the address used in the transmission protocols and in the MODBUS protocol.

Value from 000 to 99.

Default:01

ModE TRANSMITTED DATA WEIGHT COM1 / COM2

Selecting the value transmitted with continuous, automatic and manual protocols (see relevant paragraph).

Selectable Values:

Net

Gross

Peak

Default: Gross

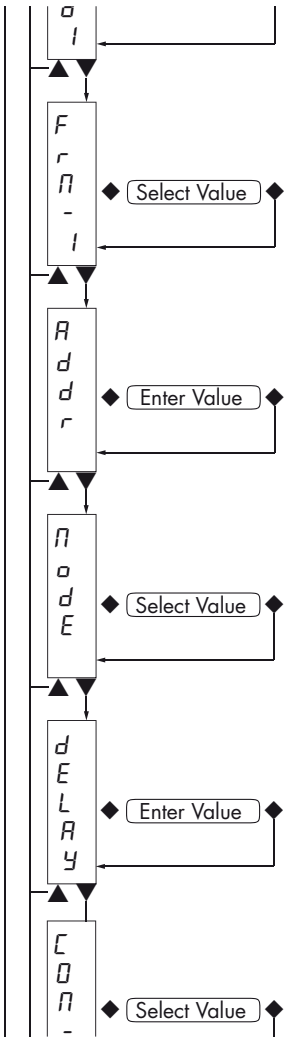
dELAY DELAYED RESPONSE OF THE SLAVE AND MODBUS RTU COM1 PROTOCOLS

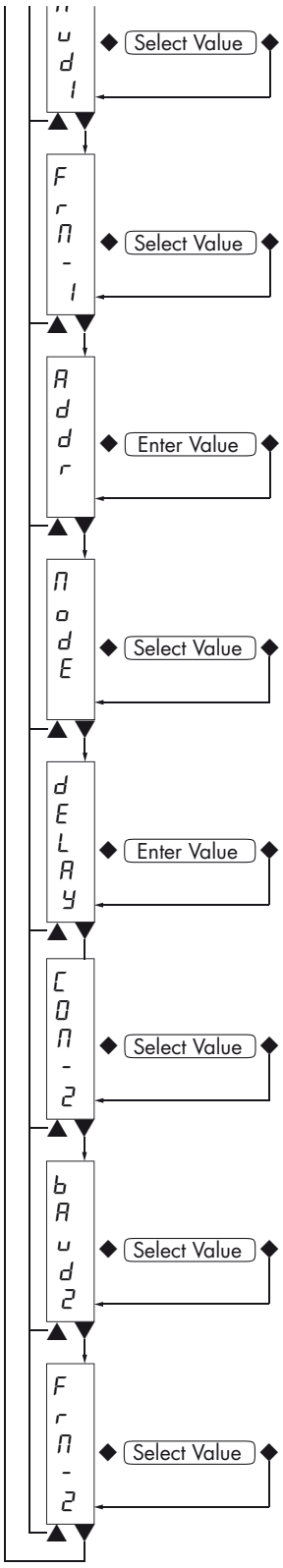
Value in milliseconds, representing the delay of the instrument when sending the response to the request of the master.

Values: from 0 to 999

Default: 000

(without leading zeros, with possible decimal point and





COM2: COM2:

It defines the use of the ETHERNET serial port.

None: ETHERNET communications disabled

Contn: Continuous transmission of the weight string. It can be used, for example, to drive a remote display. See details in the relevant paragraph.

Deman: When the Operator presses the front button or through Input 2, a string of weight is transmitted. The command is accepted if the weight is stable. Between two consecutive transmissions the weight must have a variation of at least the parameter "Weight delta".

Auto: It's automatically transferred to a string of weight when the weight stabilizes at a value higher than the minimum weight (20 divisions). Between two consecutive transmissions the weight must have a variation of at least the value set in the parameter "Delta Weight".

Slav: ASCII protocol. See details in the relevant paragraph.

Mdbs: MODBUS RTU (slave) protocol. See details in the relevant paragraph.

Selectable Values:

None
Contn
Deman
Autom
Slave
Modbs
Default: Modbs

bAud2 BAUD RATE COM2

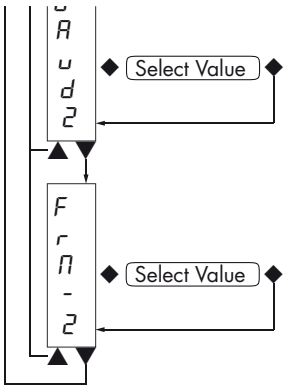
It defines the ETHERNET port baudrate.

The value must be set to the same value of the PC / PLC or remote display.

Selectable Values:

2400
4800
9600
19200
38400
57600
115200
Default: 9600

FrM-2 COM2 DATA FORMAT



It defines the data format of the ETHERNET serial port.

The value must be set to the same value of the PC / PLC or remote display.

In the case of MODBUS or SLAVE protocol, selections of the 7-bit data formats (E-7-1 and O-7-1) are not accepted (error message "Nvalid").

Selectable Values:

N-8-1

N-8-2

E-8-1

O-8-1

E-7-1

0-7-1

Default: N-8-1

SERIAL COMMUNICATION PROTOCOLS

CONTINUOUS, AUTOMATIC AND MANUAL TRANSMISSION PROTOCOL

These protocols have been programmed into their programming menu.

The string transmitted is as follows:

STX	<state>	<weight>	ETX	<chksum>	EOT

Where

STX (start of text) = 0x02h

ETX (end of text) = 0x03h

EOT (end of transmission) = 0x04.

<state> = character encoded as per the following table (bit = 1 if condition TRUE)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	1	1	Tare entered	Zero band	Stable weight	Zero center

<weight> = field consisting of 8 ASCII characters with the weight value justified on the right. (without leading zeros, with possible decimal point and negative sign).

The weight value transmitted can be the net weight, the gross weight or the peak value based on the selection of the transmitted data (MODE parameter) in the setting menu of the serial communication ports (see relevant paragraph).

Under conditions of overload, the weight field assumes the value: "^^^^^^^^".

Under conditions of underload (negative weight greater than 99999), the weight field assumes the value: "_ _ _ _ _ _ _ _".

In reading error conditions, the weight field assumes the value: " O-L ".

<csum> = checksum of the string data. It is calculated by performing the exclusive OR (XOR) of all characters from STX (or from <ind>) to ETX excluded the latter; the result of the XOR is decomposed into 2 characters by considering separately the upper 4 bits (first character) and lower 4 bits (second character); the 2 characters obtained are then ASCII encoded (example: XOR = 5Dh; <csum> = "5Dh" namely 35h and 44h).

In the case of continuous communication protocol, the given string is transmitted at a frequency of 10 Hz, regardless of the weight filter selected.

In the case of automatic and manual communication protocols, between 2 consecutive weight transmissions, they must undergo a corresponding change to the value set in DELTA parameter, in the setup menu of weighing parameters (see relevant paragraph).

SLAVE TRANSMISSION PROTOCOL

LIST OF THE CONTROLS AVAILABLE:

- Request of the current gross weight.
- Request of the current net weight.
- Request of the current peak value.
- Control of self-calibration.
- Control of semi-automatic zero.
- Control to reset the peak value.

The unit connected to the instrument (typically a personal computer) acts as a MASTER and is the only unit that can start a process of communication.

The process of communication must be made by the transmission of a string by the MASTER, followed by a reply from the SLAVE concerned.

CONTROLS FORMAT DESCRIPTION:

The double quotes enclose constant characters (observe upper and lower case); the <and> symbols contain variable numeric fields.

REQUEST OF THE CURRENT GROSS WEIGHT

Master: <Addr> "L" EOT

WT 2: <Addr> "L" <status> <gross> ETX <chksum> EOT

REQUEST OF THE CURRENT NET WEIGHT

Master: <Addr> "N" EOT

WT 2: <Addr> "N" <status> <net> ETX <chksum> EOT

REQUEST OF THE CURRENT PEAK VALUE

Master: <Addr> "P" EOT

WT 2: <Addr> "P" <status> <peak> ETX <chksum> EOT

CONTROL OF SELF-CALIBRATION

Master: <Addr> "A" EOT

WT 2: <Addr> "A" ACK EOT

CONTROL OF SEMI-AUTOMATIC ZERO

Master: <Addr> "Z" EOT

WT 2: <Addr> "Z" ACK EOT

CONTROL TO RESET THE PEAK VALUE

Master: <Addr> "X" EOT

WT 2: <Addr> "X" ACK EOT

In the case of communication error or otherwise unrecognized command from WT 2, it will respond with the following string:

WT 2: <Addr> NAK EOT

FIELDS DESCRIPTION

The double quotes enclose constant characters (observe upper and lower case); the <and> symbols contain variable numeric fields.

STX (start of text) = 0x02h,

ETX (end of text) = 0x03h,

EOT (end of transmission) = 0x04h,

ACK (acknoledgment) = 0x06h,

NAK (No acknoledgment) = 0x15h.

<Addr> = Serial communication address + 0x80h (i.e., address 2: <Addr> = 0x82h (130 decimal number)).

<status> = character encoded as per the following table (bit = 1 if condition TRUE)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	1	1	Tare entered	Zero band	Stable weight	Center of Zero

<gross>, <net>, <peak> = field consisting of 8 ASCII characters with the weight value justified on the right (no leading zeros, with possible decimal point and negative sign).

Under conditions of overload, the weight field assumes the value: "^^^^^^^^".

Under conditions of underload, the weight field assumes the value: "_ _ _ _ _ _ _ _".

In reading error conditions, the weight field assumes the value: " O-L ".

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	1	1	0	0	not used	not used

<csum> = checksum of the string data. It is calculated performing the exclusive OR (XOR) of all characters from STX (or from <ind>) to ETX excluded the latter; the result of the XOR is decomposed into 2 characters considering separately the upper 4 bits (first character) and lower 4 bits (second character); the 2 characters obtained are then ASCII encoded (example: XOR = 5Dh; <csum> = "5Dh" namely 35h and 44h).

MODBUS RTU PROTOCOL

WARNINGS: The addresses listed in the tables below follow the standard routing specified in the reference guidelines of the Modicon PI-MBUS-300 Rev.J (www.modbus.org), referred to below is an excerpt that helps the user to communicate with the instrument.

"All data addresses in Modbus messages are referenced to zero. The first occurrence of a data item is addressed as item number zero. For example:

The coil known as 'coil 1' in a programmable controller is addressed as coil 0000 in the data address field of a Modbus message.

Coil 127 decimal is addressed as coil 007E hex (126 decimal).

Holding register 40001 is addressed as register 0000 in the data address field of the message. The function code field already specifies a 'holding register' operation. Therefore the '4XXXX' reference is implicit."

The values of the registers with address greater than 40100 are permanently stored in memory only after the data save command (see Command Register table). If this function is not performed by turning off the instrument, it will return to the value before the change.

If not otherwise specified, the numerical values (such as addresses, codes and data) are expressed as decimal values.

COMMUNICATION ERRORS HANDLING

In case of MODBUS RTU, the communication strings are controlled by the CRC (Cyclic Redundancy Check). In the case of a communication error, the slave does not respond with a string. The master must consider a timeout for the receipt of the response. In case of no answer there is a communication error.

RECEIVED DATA ERROR HANDLING

In the case of string received correctly, but that cannot be executed, the slave responds with an EXCEPTION RESPONSE according to the following table.

Code	Description
1	ILLEGAL FUNCTION (The function is not valid or not supported)
2	ILLEGAL DATA ADDRESS (The address of the specified data is not available)
3	ILLEGAL DATA VALUE (The received data have invalid value)

SUPPORTED FUNCTIONS

FUN 03 READ HOLDING REGISTER

FUN 06 WRITE SINGLE REGISTER

FUN 16 WRITE MULTIPLE REGISTERS

LIST OF THE MODBUS PROTOCOL HOLDING REGISTERS

Address	Holding Register	R/W	Format	Notes
40001	Status Register	R	INT	See Table A.
40002	Gross weight (MSB)	R	INT	
40003	Gross weight (LSB)	R	INT	
40004	Net weight (MSB)	R	INT	
40005	Net weight (LSB)	R	INT	
40006	Peak (MSB)	R	INT	
40007	Peak (LSB)	R	INT	
40501	Data Register (MSB)	W	INT	Writing before or with the same query of Command Register.
40502	Data Register (LSB)	W	INT	Writing before or with the same query of Command Register.
40503	Command Register	W	INT	See Table B page 27.
41001	Load cell capacity (MSB)	R/W	INT	
41002	Load cell capacity (LSB)	R/W	INT	
41003	Load cell Sensitivity	R/W	INT	
41004	Weight division value	R/W	INT	See Table B page 27.
41101	Weight filter factor	R/W	INT	
41102	Weight stability factor	R/W	INT	
41103	Auto-zero at power ON	R/W	INT	
41104	Auto-zero at power ON	R/W	INT	
41105	Zero tracking factor	R/W	INT	
41106	Zero band	R/W	INT	
41107	Weight Delta	R/W	INT	
42000	Monitor register	W	INT	The programmed value is automatically copied to Monitor Register (42100).
42100	Monitor register	R	INT	

REGISTER STATUS CODING TABLE

BIT	15	14	13	12	11	10	9	8
Description	Not used	Not used	0	0	0	0	Memory Flag	Not used

BIT	7	6	5	4	3	2	1	0
Description	Not calibrated	Wrong weight	Over-load	Under-load	Tare entered	Zero band	Stable weight	Zero center

WARNING: bits 13, 12, 11 and 10 are always 0.

TABLE B: COMMAND REGISTER

Register value	COMMAND REGISTER FUNCTION	DATA REGISTER FUNCTION
0x0001	Semiautomatic zero	-
0x0002	Self-calibration	-
0x0003	Peak reset	-
0x0010	Calibration of the weight zero	-
0x0011	Calibration of the full weight scale	sample weight
0x0020	Saving the data in the permanent memory	-
0x7FFF	Direct access memory	

Warning: the value entered in the Command Register is always active until you write again 0x0000.

Address	Data stored in memory with command 0x0020
41001-41002	Load cells capacity
41003	Load cells sensitivity
41004	Weight division value
41101	Weight filter factor
41102	Weight stability factor
41103-41104	Auto-zero SET POINT
41105	Zero tracking factor
41106	Zero band
41107	Weight Delta

TABLE C: DIVISION VALUE

Register value	0	1	2	3	4	5	6	7	8
Division value	0.0001	0.0002	0.0005	0.001	0,002	0,005	0.01	0.02	0.05

Register value	9	10	11	12	13	14	15	16	17
Division value	0.1	0.2	0.5	1	2	5	10	20	50

READING EXAMPLE

To read the gross weight on the WT 2 it is needed to read the addresses 40002 and 40003.

To read the net weightit is needed to read the addresses 40004 and 40005.

When the display shows the gross weight value of 12351 in the corresponding bytes there will be:

Register	**40002**		**40003**	
	Byte 1	**Byte 2**	**Byte 1**	**Byte 2**
Hex	00	00	30	3F
	0		12351	

WRITING EXAMPLES

To write the set-up parameters following the example:

Example: to change the default values of the WT 2 like the Capacity of the load cells, the Sensitivity and Division value to 15000, 2.9965 and 2:

Capacity	41001		41002	
	Byte 1	Byte 2	Byte 1	Byte 2
Hex	00	00	3A	98
Dec	15000			

Sensitivity	41003	
	Byte 1	Byte 2
Hex	75	0D
Dec	29965	

Division	41004	
	Byte 1	Byte 2
Hex	00	0D
Dec	13	

Save the data by writing the value Hex 20 in Command Register. In case Zero and FS Calibration is not performed, put value Hex 0 in Command Register.

N.B. The WT 2 does not accept writing of the same values already written.

Zero Calibration:

Whit empty system put Hex 10 in Command Register (40503). The new Zero value is stored. To de-activated the Zero Calibration command put value Hex 0 in Command Register.

Full Scale Calibration:

Put a know weight on the system and write its value in the Data Register (40501 e 40502). Put value Hex 11 in Command Register. The weight value will be displayed.

To store the new value put value Hex 20 in Command Register.

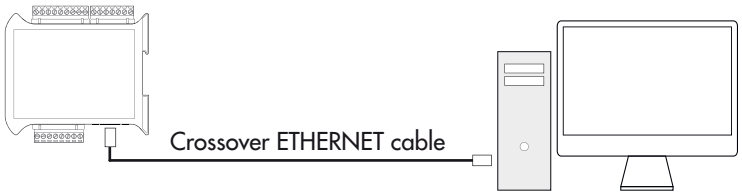
To end the procedure put value Hex 0 in Command Register.

ETHERNET INTERFACE CONFIGURATION

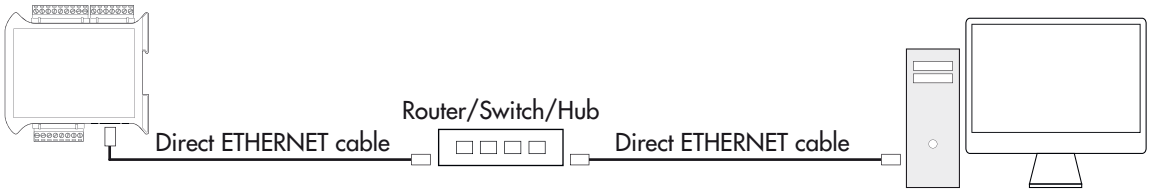
To configure the Ethernet interface it is necessary to use the PC application " TCPBridge Configurator" supplied with the instrument. To install the application, run the "setup.exe" file and follow the installation wizard .

Connect the WT 2 to the PC according to the two procedures:

1. Direct connection by using special ethernet cable called "cross" or "crossover".

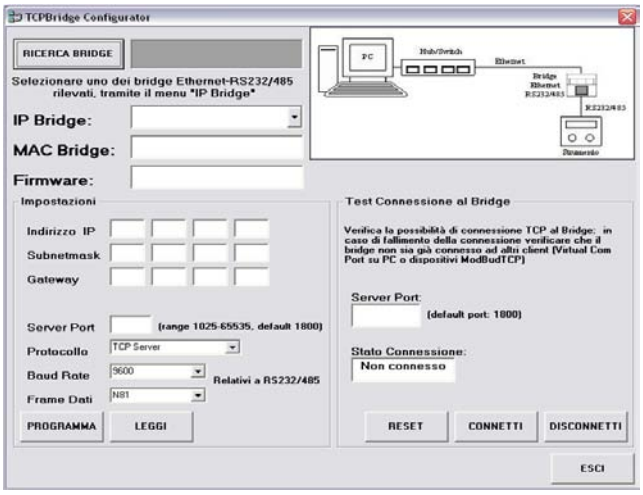


2. Connection to a LAN Network (Local Area Network) using ethernet "direct" cables . In this case, the instrument must be connected to a network device (router , switch or hub) to access the LAN.



From the Programs menu, select the application " Configurator " , under " TCPBridge Configurator" .

You will see the screen as shown in the image here.



It may not be possible to immediately establish a connection with WT 2/Ethernet. This may be due to an incompatibility between the programmed IP address by default on WT 2/Ethernet LAN and the network in which the device is installed for the first time. The IP addresses of devices on a LAN must adhere to a certain format. Check in the PC "network connection" (Control Panel - > Network Connections) the format of your IP address.

To configure the Ethernet interface of the instrument WT 2, follow the steps below .

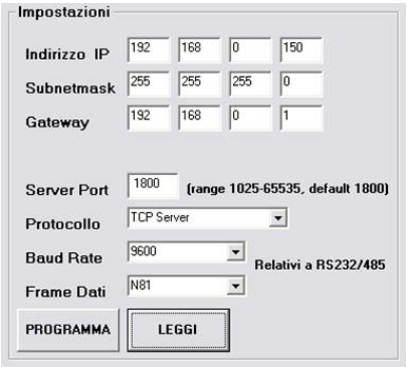
SEARCH DEVICES

To perform a search for devices WT 2/Ethernet on the network, press the "RICERCA BRIDGE". Each device detected in the network can be selected from the drop down "IP Bridge" menu; in additional to that by selecting a specific device, it displays its MAC address and the version of the firmware loaded on the device.

Select the device you want to configure.

To avoid communication problems, the application buttons are disabled during the search of the devices.

PARAMETERS CONFIGURATION



After selecting the device you want to configure, perform the function reading of the parameters currently programmed in the device. To perform this function, use the "LEGGI" key, after a few seconds the configurable parameters (see image at right) will be updated with the values stored in the device at the time of the request.

These are the programmable parameters:

- **IP Address:** address of the device WT 2, four numerical values (values between 0 and 255, mandatory field).
- **Subnet Mask:** four numerical values (values between 0 and 255, this parameter can be omitted or set to 0).
- **Gateway:** four numerical values (values between 0 and 255, this parameter can be omitted or set to 0).
- **Server Port:** communication port for TCP / IP, numeric value between 1025 and 65535. This value has different meanings depending on the selected protocol:

  1. When the connection is established by other devices present in the network (eg a PC) to the WT 2/Ethernet (TCP Server protocol or Modbus TCP Server protocol), the Server Port parameter indicates the "TCP port" on which a Client device (eg, a PC) may perform a TCP connection with WT 2/Ethernet.
  2. When the connection is established from WT 2/Ethernet to a particular device in the network (TCP Client), the Server Port parameter indicates the "TCP port" Device Server (for example, a PC in the network) on which WT 2/Ethernet can establish a TCP connection.

The TCP Client can only be used if PETH02 firmware is loaded in the Ethernet interface of the WT 2/Ethernet instrument; check the firmware version after the search of the devices.

- **Protocol:** the device can be configured to operate in three different modes:

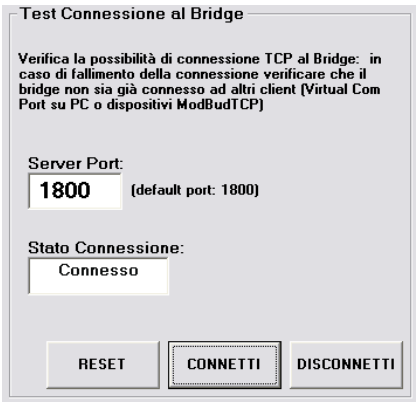
  1. TCP Client: Select this protocol if you want that WT 2/Ethernet (Client) establish as a connection to a particular device on the network (Server). In this case it is need an additional input parameter (Server IP), this parameter represents the IP address of the server to which WT 2 must establish a TCP connection.

     The TCP Client can only be used if PETH02 firmware is loaded in the Ethernet interface of the WT 2/Ethernet instrument; check the firmware version after the search of the devices.
  2. TCP Server: Select this protocol if WT 2/Ethernet (Server) must wait to receive TCP connections from other devices in the network (Client).
  3. Modbus TCP Server: Select this protocol if WT 2/Ethernet (Server) must wait to receive TCP connections from other devices in the network (Client), which use the MODBUS TCP communication protocol.

- **Baud Rate:** This value must match the parameter "BAUD2" selected in the instrument WT 2 (refer to the paragraph on page 20 of this manual, default 9600).
- **Frame Data:** This value must match the parameter "FRM-2" selected in the instrument WT 2. Following the execution of the automatic reset function, the parameter values stored in the device no longer appear on your PC "TCP Bridge Configurator" (PWIN41), repeat the procedure for searching the device and the reading function of the parameters to check the correct storing of parameters.

The TCP Client can only be used if PETH02 firmware is loaded in the Ethernet interface of the WT 2/Ethernet instrument; check the firmware version after the search of the devices.

TCP TEST CONNECTION



In case of "TCP Server" or "Modbus TCP Server" protocol, you can test the connection directly via the "TCPBridge Configurator" PC application (PWIN41). This function can not be performed in case of "TCP Client" protocol. Manually enter the "Server Port" parameter, or use the reading parameters function described on the previous page.

The "Server Port" parameter indicates the "TCP port" available by WT 2/Ethernet (Server) on which the "TCPBridge Configurator" PC application (Client) can establish a TCP connection.

Press the "CONNECT" key to establish a TCP connection with WT 2/Ethernet. The connection status is displayed in the "Stato Connessione" section. To end a TCP connection press the "DISCONNETTI" button.

WT 2/Ethernet can accept and maintain only one connection; before the test of the connection make sure that other client devices in the network are not associated with WT 2/Ethernet.

If the TCP connection test is successful (Stato Connessione: Connesso), the device WT 2 is ready to be used. The communication protocol selected by parameter "COM-2" (refer to the paragraph on page 20 of this manual) is available on the Ethernet interface of the device WT 2.

The reset function of the ethernet interface of the instrument WT 2 can be performed at any time (for example in case of problems during testing of the TCP connection or when programming parameters), using the appropriate "RESET" button. This function does not reset the instrument WT 2, but only its Ethernet interface.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
The display shows the O-L message.	The weight gained is not detectable because the cell is absent or incorrectly connected	Check the connections of the cells.
The display shows the upper hyphen on the display	The weight gained cannot be shown because it exceeds the available five digits or is greater than the capacity of the cells.	
The display shows the lower underscore on the display.	The weight gained is not representable because negative, more than -9999.	
The number of decimal places is wrong.	You have not selected the correct division value.	Select the correct division value in the main menu.
The serial communication does not work properly.	You have not performed the installation correctly. The selection of the operation of the serial interface is incorrect.	Check the connections as described in the installation manual. Select the settings as appropriate.
The function of semiautomatic zero doesn't work.	The gross weight exceeds the action limit of semi-automatic zero. The weight doesn't stabilize.	To re-establish the zero, you need to calibrate the weight. Wait for the stabilization of the weight or adjust the weight filter parameter.
The semiautomatic tare function does not work.	The gross weight is negative or exceeds the maximum capacity. The weight doesn't stabilize.	Check the gross weight. Wait for the stabilization of the weight or adjust the weight filter parameter.