Parsmega
industrial automation

User Manual

Load Cell Transmitter

PM-LT11T



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Contents

1 INTRODUCTION 4
1.1 Purpose of the manual 4
1.2 Technical knowledge Required 4
1.3 manual validation 4
1.4 technical support 4
2 SAFETY TIPS 4
3 DESCRIPTION 5
3.1 Basic description 5
3.2 ModuleUses 5
3.3 Technical Specifications 5
4 INSTALLATION 6
4.1 Observe EMC item 6
4.2 Things that cause system disruption 6
4.3 Things to consider 6
5 CONNECTIONS 7
5.1 Connections Group 7
5.2 Power Supplyconnection 7
5.3 Connecting digital inputs 8
5.4 Output connections 9
5.5 Load cell connection 10
5.6 Connection RS485 isolated 11

6 PARAMETERS 11

6.1 Communication parameter 12

6.2 Module information parameter 13

6.3 Inputs and outputs status parameter 13

6.4 Output force parameter 14

6.5 Weight display parameter 15

6.6 Filter Parameter 17

6.7 Load cell parameter 19

6.8 Tare setting parameters 20

6.9 Calibration parameters 20

6.10 Digital output setting parameters 21

6.11 Digital input parameters 25

6.12 List of Commands 26

7 COMPUTER SOFTWARE FOR TRANSMITTER SETTINGS 30

7.1 Introduction 30

7.2 The main page of the program 32

1 Introduction

1.1 Purpose of the manual

This manual contains all the information needed to set up, install, wiring and communicate with the PM-LT11T module.

1.2 Technical knowledge Required

In order to understand this booklet, a basic acquaintance with electrical topics is required.

1.3 manual validation

This manual is valid for this specification.

MODEL	Hardware	Software
PM-LT11T	V2.1	V12.0

1.4 technical support

To get technical support through the following contact:

- Email: **info@parsmega.com**
- Phone: **+98 21 91009955**
- WhatsApp: **+98 9981122566**

2 safety tips

- Starting the module by non-experts and ignoring the commands may cause serious damage to the module.
- This module does not directly pose a risk to human life.
- The use of this module is not approved for use in life-threatening devices.

3 Description

3.1 Basic description

PM-LT11T is a versatile and flexible load cell transmitter that has the ability to read weight.
This module has the ability to connect to a computer and control equipment such as (HMI and PLC).
Due to the special features designed in this module, you can easily have a modern weight measurement system.

3.2 Module Uses

This weight reading module is a very suitable option for applications where a weight or force sensor is used. Such as:

- Road scale
- Bag filler
- Packaging machines
- Transit weighing
- Tensile and compression testing machines
- Weighing the elevator cabin

3.3 Technical Specifications

- Isolated RS485 serial communication with MODBUS protocol support (RTU, ASCII)
- Wide range of RS485 port baud rate (from 2400 to 230400)
- Wide sampling range
- Weight reading with an accuracy of 1:100,000
- Ability to define 10 programs (profiles)
- Ability to define 5 load cells and maintain calibration of all load cells
- Automatic calibration without the need for weight calibration
- digital outputs (transistor)
- 2 digital inputs with user adjustable functions
- Ability to display load cell output voltage (for load cell testing)
- The working temperature range is -30 ~ +50 degrees Celsius

4 Installation

4.1 Observe EMC item

This product is designed and manufactured to work in industrial environments. However, for proper operation, you should check and eliminate the issues that cause the module to malfunction.

4.2 Things that cause system disruption

- Electromagnetic field
- Telecommunication cables
- Power circuit cables

4.3 Things to consider

4.3.1 Convenient ground connection

• When installing the module on the panel body, make sure that the panel body is connected to the ground.

• All ineffective metal parts are (firmly) grounded.

• When connecting varnished wires to ground connection, remove the varnish from that part.

4.3.2 Appropriate wiring method

• Divide your system cables into different groups (high voltage, power supply, and signal, analog).

• Always transfer the power cable from another duct.

• Always place your analog cables close to the body of the panel and rails (which are grounded).

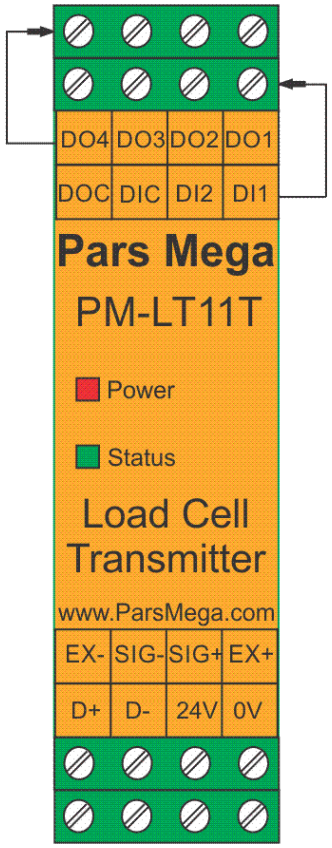
4.3.3 Cable shield connection

• Make sure the shields are properly grounded.

• Try to keep a small part of the cable without a shield.

5 connections

All the connections of this module are screws



5.1 Connections Group

The connections of this module include 6 main groups:

- Power
- Digital inputs
- Digital outputs
- RS485 serial
- analog output
- Load cell

5.2 Power Supply connection

The proper power supply for this module is24 v dc .

Terminal1 :0 v

Terminal2 :+24 v

5.3 Connecting digital inputs

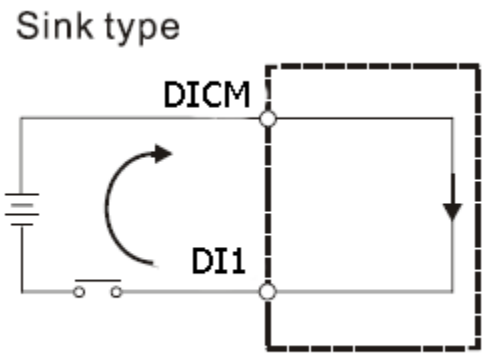
This module has four digital inputs as follows

Label	Application
DI1	Digital input 1
DI2	Digital input 2
DIC	Common digital inputs

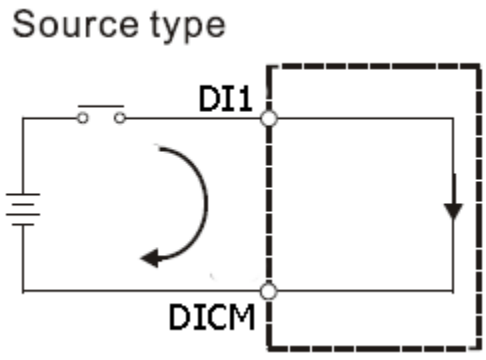
- A voltage level of 12 to 24 volts is required to activate the digital inputs.
- According to the customer's request, this voltage can be changed.
- For each input, a specific function can be defined, when the input is activated, the corresponding function is performed. This topic will be fully discussed in the digital input parameters section.
- Inputs will be activated on the rising edge.

The wiring method is as follows:

❖ Sink mode(low active)



❖ Source mode(High Active)



5.4 Output connections

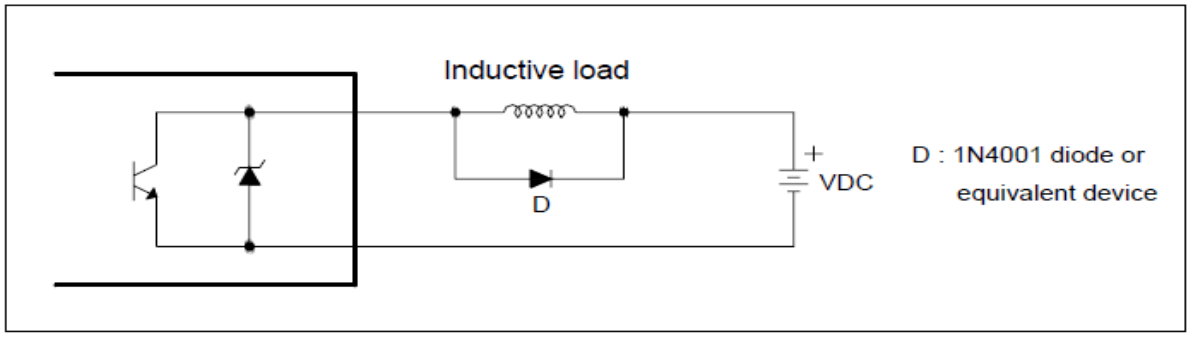
Notice

Be sure to know the status of the outputs before connecting them. During the initial setup, all the outputs may be active.

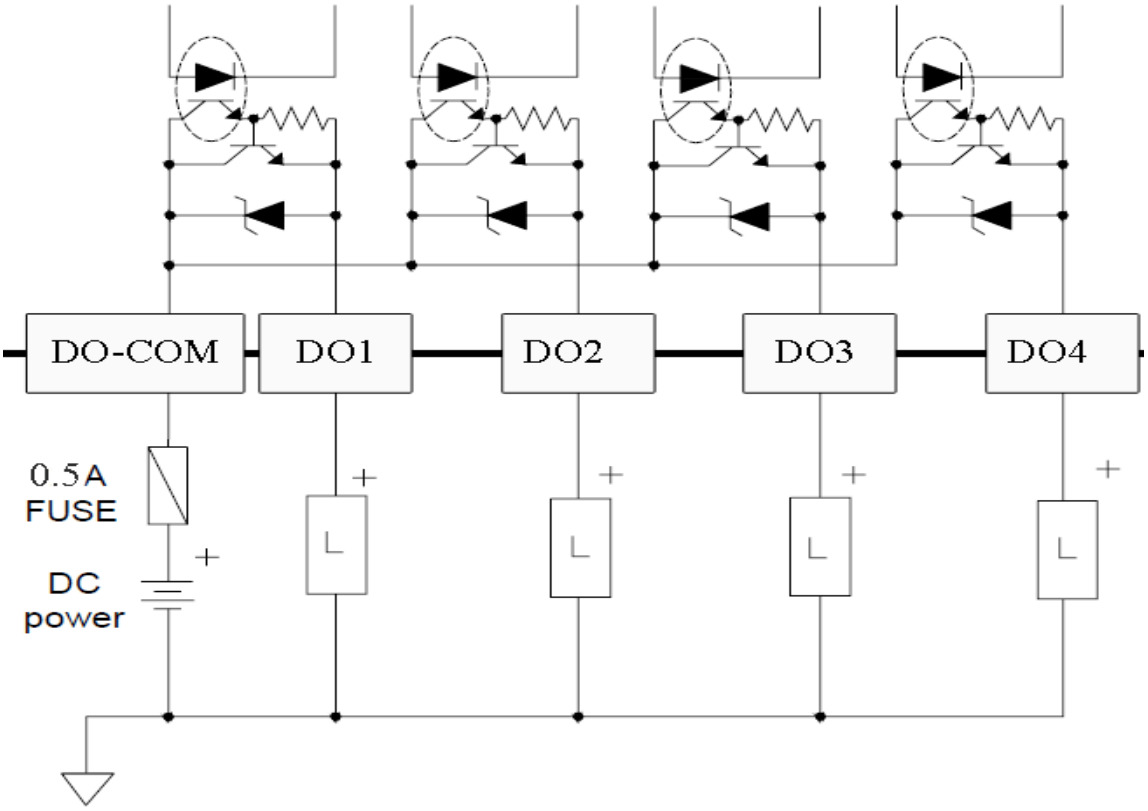
This module has 4 digital outputs as follows

Label	Application
DO1	Digital output 1
DO2	Digital output 2
DO3	Digital output 3
DO4	Digital output 4
DOC	The common voltage of the outputs

- The output voltage range is between 5 and 24 V DC and the maximum current is 200 mA. (in the case that the output is transistorized).
- The activation of the outputs depends on the setting of the parameters, which will be discussed in the parameters section.
- Note: If you use a self-load (for example, a buffer between the relays) in the digital outputs, you must use a freewheeling diode.



How to wire digital outputs



- Note that the above output is a SOURCE digital output and only has the possibility of connecting and disconnecting the positive voltage.

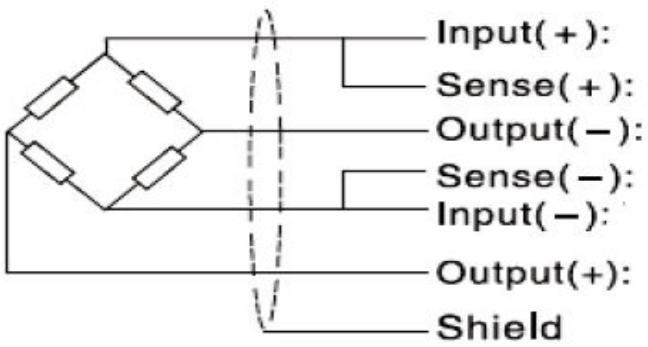
5.5 Load cell connection

Load cells with the following capabilities can be connected to this module:

- Output voltage 1 up to 4mv/V
- Accepting the excitation voltage of 5V

Label	Function
EXC+	Positive excitation voltage
SIG+	Positive output voltage of the sensor
SIG-	The negative voltage of the sensor output
EXC-	Negative excitation voltage

The figure below is a technical view of a load cell



- It should be noted that the only way to secure the cable against noise is to properly connect the shield to the ground.
- Only a few centimeters of the end of the cable should be left without the shield and at the same point the shield should be connected to the ground connection with a strong clamp.

5.6 ConnectionRS485 isolated

This module is equipped with an isolated RS485 serial port on which the MODBUS (RTU, ASCII) protocol is implemented.

RS485 port isolation specifications:

±15 kV ESD protection

Label	Function
D+	Positive data
D-	Negative data

6 parameters

All parameters are set with default values at the time of purchase.

You can also do this with the reset to factory setting command.

For ease of work, the parameters are divided into different groups.

- The length of all variables is word

• If the save command is not sent after making changes to the parameters, the previous values will be valid after the device is turned off and on.

• Some parameters require a reboot to take effect.

6.1 Communication parameter

Title	Variable type	the length	reading writing	Address	explanation	default
id	Unsigned int	1	RW	40001 0 d 0 h	1~247	1
Baud Rate	Unsigned int	1	RW	40002 1 d 1 h	0~10 0=24001=48002=96003=144004=192005=288006=384007=576008=768009=11520010=230400	2
parity	Unsigned int	1	RW	40003 2 d 2 h	0=none 1=odd2=even	2
Stop bit	Unsigned int	1	RW	40004 3 d 3 h	0=1 1=2	0
Mode	Unsigned int	1	RW	40005 4 d 4 h	0=RTU 1=ASCII (8bit) 2=ASCII (7bit)	0

Note that the system must be reset once to apply the above parameters.

6.2 Module information parameter

- All the following parameters are read only

Title	Variable type	the length	reading writing	Address	Description	Default
Firmware ver	Float	2	R	40007 6 d 6 h		
Hardware ver	Float	2	R	40009 8 d 8 h		
Model	Unsigned int	1	R	40011 10 d Ah		
Serial number	Unsigned long	2	R	40012 11 d Bh		

6.3 Inputs and outputs status parameter

Title	Variable type	the length	reading writing	Address	Description	Default
Digital inputs	Unsigned int	1	R	40016 15 d F h	-	-
Digital outputs	Unsigned int	1	R	40017 16 d 10 h	-	-
Analog Out	Unsigned int	1	R	40018 17 d 11 h	-	-

- The first input is in the LSB.
- The first output is at LSB.

6.4 Output force parameter

Title	Variable type	the length	Ability to write	Address	Description	Default
Out1	Unsigned int	1	W	40022 21 d 15 h	-	-
Out2	Unsigned int	1	W	40023 22 d 16 h	-	-
Out3	Unsigned int	1	W	40024 23 d 17 h	-	-
Out4	Unsigned int	1	W	40025 24 d 18 h	-	-

Note that reading these parameters does not indicate the status of the outputs.

Digital outputs can be stimulated using these parameters.

This feature is very useful for you during startup.

For example, using this feature, you can be sure of the correct wiring of your system.

6.5 Weight display parameter

Title	Variable type	the length	Ability to write	Address	Description	Default
total weight	float	2	R	40026 25 d 19 h	kg	-
net weight	float	2	R	40028 27 d 1B h	kg	-
The weight of the piece of stone	float	2	R	40030 29 d 1D h	kg	-
Rawadc data without filter	U long	2	R	40032 31 d 1E h	-	-
Filtered rawadc data	U long	2	R	40034 33 d 21 h	-	-
input voltage millivolts	float	2	R	40036 35 d 23 h	mv	-

- Gross weight displays all the weight on the load cell.
- Net weight shows the total weight minus the weight of the piece of stone.
- Tare weight, the weight of the sole or piece of stone.
- Unfiltered ADC data is the raw value read from the ADC.
- Filtered raw data read from ADC.
- It is the voltage that appeared at the output of the load cell. This value is in millivolts.
- In cases where weight reading is required in "Long" format, the following table is provided.

Note that the value of the fraction is determined by the user.

For example, if the weight value is 1.235 kg and the fraction value is 3, the corresponding register content will be 1235.

Title	Variable type	the length	reading writing	Address	Description	Default
Net weight of channel 1	signed long	2	R	40146 145 d 91 h	-	-
fraction	Unsigned int	1	RW	40148 147 d 93 h	0~6	3

6.6 Filter Parameter

These parameters are to prevent system output vibration and are very important.

Title	Variable type	the length	Ability to write	Address	Description	Default
Number of sampling	Unsigned int	1	RW	40044 43 d 2B h	2~50	10
Sampling frequency	Unsigned int	1	RW	40045 44 d 2C h	0=4.7 1=102=203 =304=405= 506=607=9 68=1209=1 5010=2001 1=24012=3 0013=400 14=600 15=800 16=960 17=1200 18=1600 19=2400 20=4800	0
Filter type	Unsigned int	1	RW	40046 45 d 2D h	0=simple 1=smart	0
Automatic adjustment of the smart filter	Unsigned int	1	RW	40047 46 d 2E h	-	-

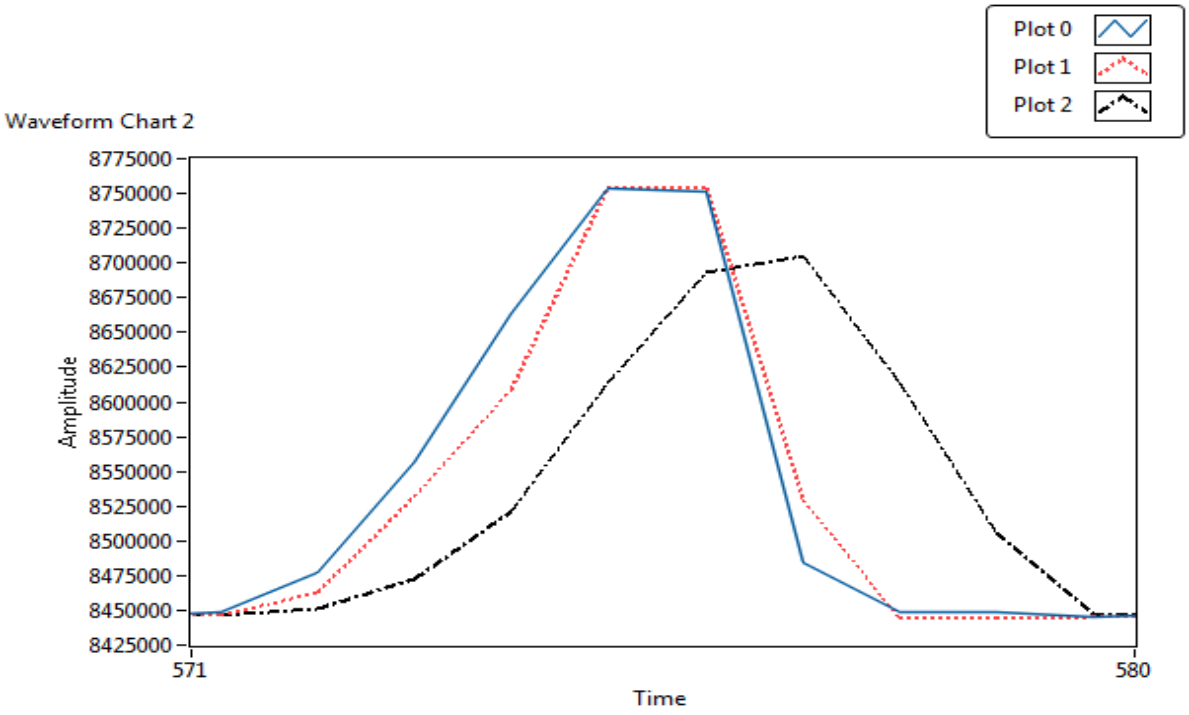
• Note that as the sampling value increases, the accuracy of the output increases and its speed decreases.

• By increasing the frequency, the speed increases and the accuracy decreases.

I In the PM-LT11T, a smart filter is designed that has a great performance. The main reason that all systems use filters is to remove unwanted inputs. In this type of application, we use moving filter to remove unwanted noise. There are

transmitters that may cause problems for the user. To solve this issue, a smart filter has been designed by Pars Mega. This filter applies the same Moving method when the load cell is in a constant state and there is no weight on it, and it reacts quickly during changes.

A comparison is made in the following figure:



The blue graph is the ADC value without applying any type of filter, and the red color is the smart filter and the black color is the moving filter. It is clear how much the effectiveness of the smart filter has improved the system performance.

To choose a smart filter, the following steps must be done:

- The "filter type" parameter at address 40046 should be equal to 1.
- The parameter "automatic setting of the smart filter" at address 40047 should be equal to 1. This parameter remains 1 for 10 seconds and then becomes 0. During these 10 seconds, the system should be without tension and the load should not be reduced or increased. During this time the ADC error rate is obtained.
- Sending the save command in order to save the parameters.

Note: Be sure to perform automatic adjustment after changing the sampling frequency.

Note: Be sure to send the save command after 10 seconds have passed and the "Smart Filter Automatic Adjustment" parameter has been set to 0.

6.7 Load cell parameter

This module has two types of calibration :

- automatic
- weighty

Automatic calibration: In this type of calibration, there is no need to calibrate, you can read the correct weight only by entering the information about the load cell. Note that in this calibration, all the weight on the load cell is read as gross weight.

Title	Variable type	the length	Ability to write	Address	Description	Default
Output voltage per volt	float	2	RW	40051 50 d 32 h	mv/v	2
Maximum load cell weight	float	2	RW	40053 52 d 34 h	kg	50
Number of connected load cells	Unsigned int	1	RW	40055 54 d 36 h	-	1

- These parameters are available in the load cell guide sheet.
- The output voltage per volt is the output sensitivity.
- The maximum readable weight is available as maximum capability in the load cell guide sheet.
- The number of load cells in the default mode is 1, if more than 1 load cells are paralleled together, this number should be included in the number of load cells parameter.

6.8 Tare setting parameters

To avoid unwanted or wrong zeroing, there are two limiting parameters that must be within this range when zeroing the gross weight.

Title	Variable type	the length	Ability to write	Address	Description	Default
Low weight range	float	2	RW	40068 67 d 43 h	kg	-5
Upper weight range	float	2	RW	40070 69 d 68 h	kg	50

6.9 Calibration parameters

Title	Variable type	the length	Ability to write	Address	Description	Default
Calibration mode	Unsigned int	1	RW	40077 76 d 4C h	0=Automatic Mode 1=Weight Mode	0
Calibration Weight 1	float	2	RW	40078 77 d 4D h	kg	0
Calibration Weight 2	float	2	RW	40080 79 d 4F h	kg	0

The steps and methods of weight calibration will be explained below.

6.10 Digital output setting parameters

Title	Variable type	the length	Ability to write	Address	Description	Default
SET POINT 1	float	2	RW	40088 87 d 57 h	kg	2
SET POINT 2	float	2	RW	40090 89 d 59 h	kg	2
SET POINT 3	float	2	RW	40092 91 d 5B h	Kg	2
SET POINT 4	float	2	RW	40094 93 d 5D h	kg	2
Profile number	Unsigned int	1	RW	40096 95 d 5F h	0~10	0
Hysteresis	float	2	RW	40097 96 d 60 h	kg	1
Inverse	Unsigned int	1	RW	40099 98 d 62 h	0=Disable 1=Enable	0
Mode	Unsigned int	1	RW	40100 99 d 63 h	0=independent 1=before between	0
Dead weight 1	Float	2	RW	40101 100 d 64 h	-	0

Dead weight 2	Float	2	RW	40103 102 d 66 h	-	0
Dead weight 3	Float	2	RW	40105 104 d 68 h	-	0
Dead weight 4	Float	2	RW	40107 106 d 6A h	-	0
Load cell profile	Unsigned int	1	RW	40109 108 d 6C h	0~5	0

6.10.1 Set points

- This module has 4 digital outputs that change state according to set point values and net weight.
- There are two modes for comparing set points and net weight
- Writing the value 0 in this variable activates the first mode and writing 1 activates the second mode.

First mode independent :

In this case, each output independent of other set points is compared only with its corresponding set point, if the value of the net weight is smaller than the weight of the set point, the corresponding output is activated and otherwise it is deactivated.

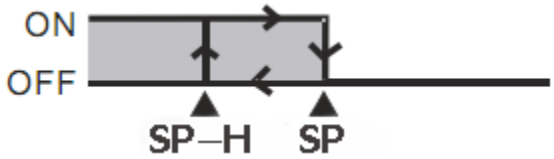
Net Weight < Set Point X -> Outx On

Net Weight > Set Pont X -> Outx Off

Example :

Set Point 1	Net Weight	Out 1
12	11	on
12	13	off

Note that a Hysteresis is considered to prevent the outputs from playing. The function is that when the output is activated at the time of shutdown, the weight of the set point is subtracted from the Hysteresis value and a comparison is made.



You can set this value to 0 .

Second state in between:

In this case, the weight is compared with the next and previous Set Point values.

Net Weight<S.P1	Out 1 On	Out 2 Off	Out 3 Off	Out 4 Off
S.P1<Net Weight<S.P2	Out 1 Off	OUT 2 On	OUT 3 Off	Out 4 Off
S.P2<Net Weight<S.P3	Out 1 Off	Out 2 Off	OUT 3 On	Out 4 Off
Net Weight < S.P4	Out 1 Off	Out 2 Off	OUT 3 Off	Out 4 On

Note that you can reverse the state of the outputs by setting the inverse parameter.

6.10.2 Programs profile

Another feature of this module is **profile definition** for set points

Imagine that you have given **four** set points to the module and you are using it, but you want to set some other set points and call them only when needed.

For example, a packaging machine is working, the Set Points have been given to the module and its output has been used. Now, when the product changes, you need to change the Set Points. For this purpose, the only thing necessary is to change the Profile parameter.

Currently, up to 11 profiles can be defined (0~10)

6.10.3 dead weight

In some cases, in weighing systems, there is an air gap between the main source and the weighing system (for example, the air gap between the hopper and the weighing chamber).

In order to eliminate the effect of this weight on the road (so-called dead weight), a parameter with the same name is embedded in the module, which has an independent value for each Set Point.

• The value of Dead Weight also changes for each profile, that is, an independent Dead weight is saved for each Set Point.

6.10.4 Lodcell profile

One of the unique features of this transmitter is the ability to define several types of load cells for it.

For this, we only write the profile number in the Load cell profile register and write the Save command at the end of the calibration operation.

Example:

We have 2 different types of load cells, number one is 50 kg and number two is 100 kg.

First, I write the number 0 in the Load cell profile register and at the end I write the Save command in the Command register.

To define the second load cell, the same steps as above are repeated, only at the beginning, instead of the number 0, we write the number 1 in the Loadcell profile register.

Now, to call each of the profiles, we write the same number that we wrote in the Load cell profile register when defining it.

• Note that after changing the profile, if you do not send the Save code, it will be done with the same profile after restarting.

A maximum of 6 profiles can be defined for the transmitter (0~5)

6.11 Digital input parameters

Title	Variable type	the length	Ability to write	Address	Description	Default
Input1 code	Unsigned int	1	RW	40121 120 d 78 h	-	0
Input2 code	Unsigned int	1	RW	40122 121 d 79 h	-	0

A specific function can be defined for each digital input.

For each input, a parameter is assigned that can be set.

For any function you want to perform, give the code of that instruction to this parameter.

For example, if you want the action to be performed when the first input (Tare) is activated, first get the Tare command code from the command table (in this case, the code is 13 decimal).

It is enough to write the 13 decimal number in the register corresponding to the first input (Input1 code) so that the Tare operation is performed after this input is activated.

It should be noted that the performance of the inputs is on the rising edge, and at the active level of the input, it does not mean that the command is executed permanently.

6.12 List of Commands

All commands are written in a register, the specifications of that register are as follows.

All commands will be executed after 500 milliseconds at most.

Title	Variable type	the length	Ability to write	Address	Description	Default
Command register	Unsigned int	1	W	40062 61 d 3D h	-	-

List of commands to as expressed in the following

Number	function	code
1	Save Settings Save settings	12
2	Tare broken stone	13
3	Calibration trigger 1 Perform the first stage of calibration	14
4	Calibration trigger 2 Perform the second stage of calibration	15
5	Reset	17
6	Save & Reset	18
7	Reset to factory settings	20
8	Communication Reset to factory setting	21
9	Zero	22
10	Zero and Save	24
11	Tare and Save	25
12	Calibration Restore	26

All values are in decimal

Number 1: Save Setting

Note that all your settings on the parameters are on the module's temporary memory, and in order to transfer these settings to the retentive memory, you must use the Save Setting command. For this purpose, you must send the 12 decimal number to the address 40062.

Number 2: Tare

With this command, the current weight on the load cell is considered as Tare weight and is poured into the Tare weight register.

Note that before applying this command, you must set the zero limit values Tare High limitation and Low tare limitation have been set correctly.

The order is applied only if the gross weight is in the following range.

Low Tare limitation < Gross weight < High Limitation

Number 3: Perform the first stage of weight calibration

In weight calibration, calibration is done in 2 steps.

This command will perform the first stage of weight calibration.

In the first step, the maximum value of 5% of the load cell range should be written in the Calibration Weight 1 register, then the same amount of weight should be placed on the weighing system, and then this command would be sent.

For this, you need to send the 14 decimal value to the command register.

Step 4: Perform the second stage of weight calibration

This command will perform the second stage of calibration

At this stage, a specific weight should be at least 50% of the total weight on the weighing system; and the exact amount of this weight has been poured on the Calibration Weight 2 register. At this stage, you can do this by sending 15 decimal numbers to the instruction register.

Number 5: Reset command

When you need to reset the module, you can send this command to the instruction register. After sending this command, the complete reset will be

done 2 seconds later. During these 2 seconds, the system will not perform any operation.

Number 6: Save and reset command

This command is provided to the user for the convenience of saving and resetting consecutively

After sending this command, first all the parameters are saved and then the system is reset.

Number 7: Return to the default settings

In cases where you need to return the module to the initial settings, you can send this command.

• Note that if the save command is not sent after this command, the previous values will be valid after the reset.

• Note that the parameters of the communication group also return to their default values.

Number 8: Returning the settings of serial communication parameters to the default mode

You can use this command in cases where you want to restore only the serial communication settings to their original state. For this purpose, the value of 21 decimals must be sent to the instruction register.

After sending this command, you need to reset the module to apply the changes.

• After sending this command, there is no need to send a save command and this is done automatically.

Number 9: Zero

This command is used to zero the total weight and net weight.

It is recommended to use this command only during calibration and use Tare command at other times.

Number 10: Zero and Save

This command is the same as the Zero command with the difference that , the Zeroparameters are saved after performing the Zero operation and there is no need to send the Save command .

Number 11: Tare and Save

This command is similar to the Tare command, with the difference that after the Tare operation, the Tare parameters are saved and there is no need to send the save command.

Number 12: Calibration restore

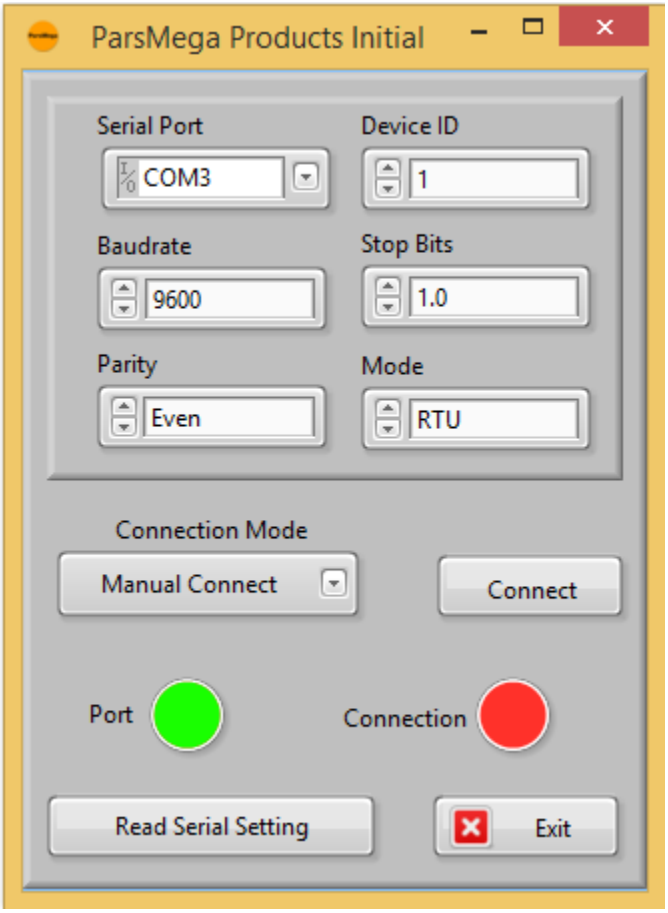
This command returns the last calibration coefficient, so that this coefficient is applied forever, you must use the Save command after this command. This command is only for weight calibration and is not related to automatic calibration.

7 Computer software for transmitter settings

In order to set up and monitor the transmitter, a computer program has been prepared by Pars Mega Company, which includes all the features of the transmitter.

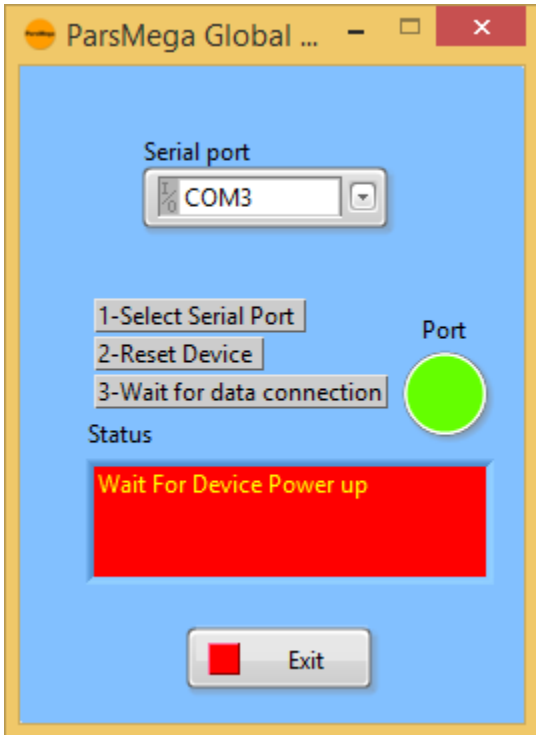
7.1 Introduction

By running the program, the following page will open at first:



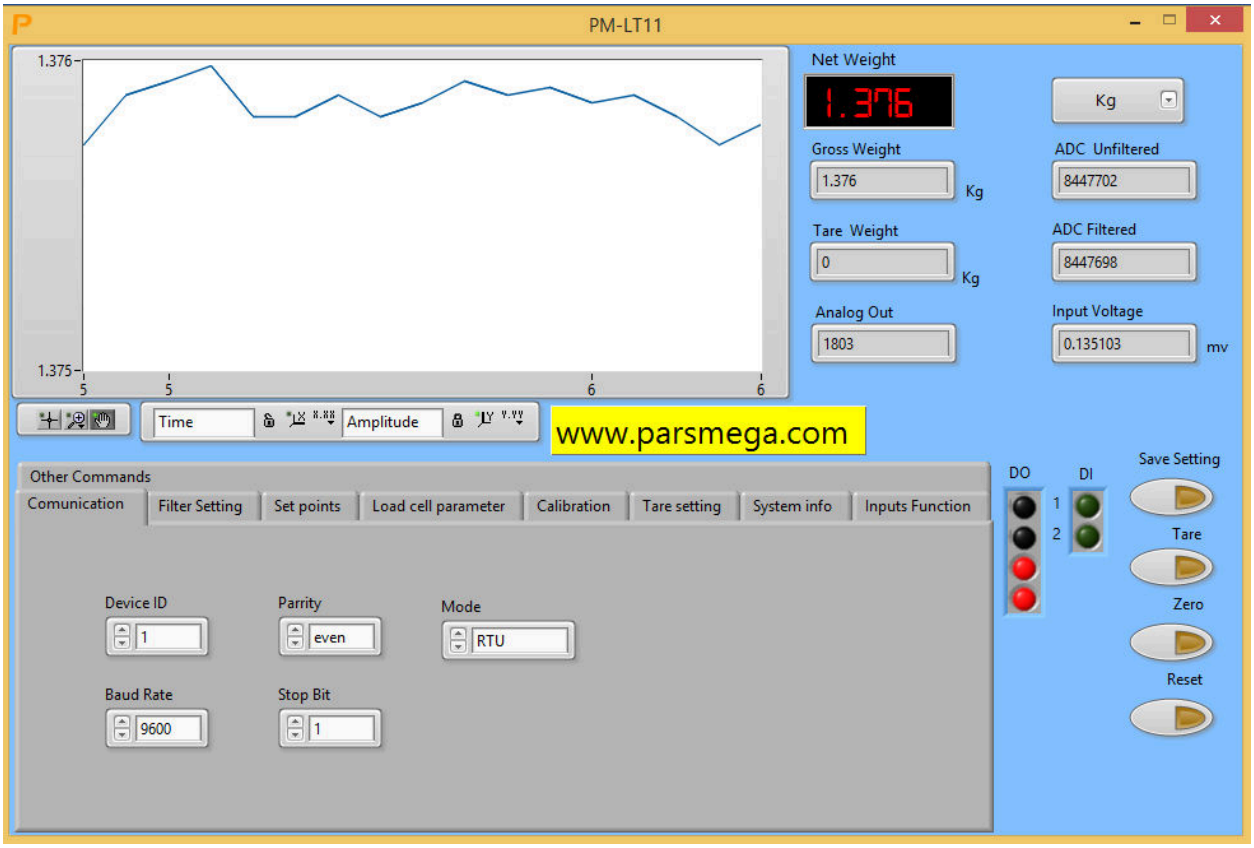
- **Serial Port:** The number of the serial port to which the transmitter is connected. When the correct port is selected, the Port indicator will turn green.
- **Device ID:** ID of the transmitter, which is 1 by default in the transmitter.
- **Baud Rate:** The baud rate of serial communication is 9600 by default.
- **Stop Bit:** The Stop bit specifier is in serial communication and is 1 bit by default.

- **Parity**: The serial communication parity parameter is even by default. When the connection is established, the Connection indicator will turn green and this page will be closed automatically and the main page of the program will be opened.
- **Read Serial Setting:** If you do not know what settings are on the device and communication is not established, press this button to go to another page where it is possible to read these parameters.



❖ If you have pressed the "Read Serial Setting" button on the previous page, the above page will open, after opening this page, first select the port (if selected correctly, the port will turn green) and then turn the device off and on. After reading these values, this page is closed and the main page is opened.

7.2 The main page of the program



The Save Setting button is for saving the settings.

The Tare button is for stone chips.

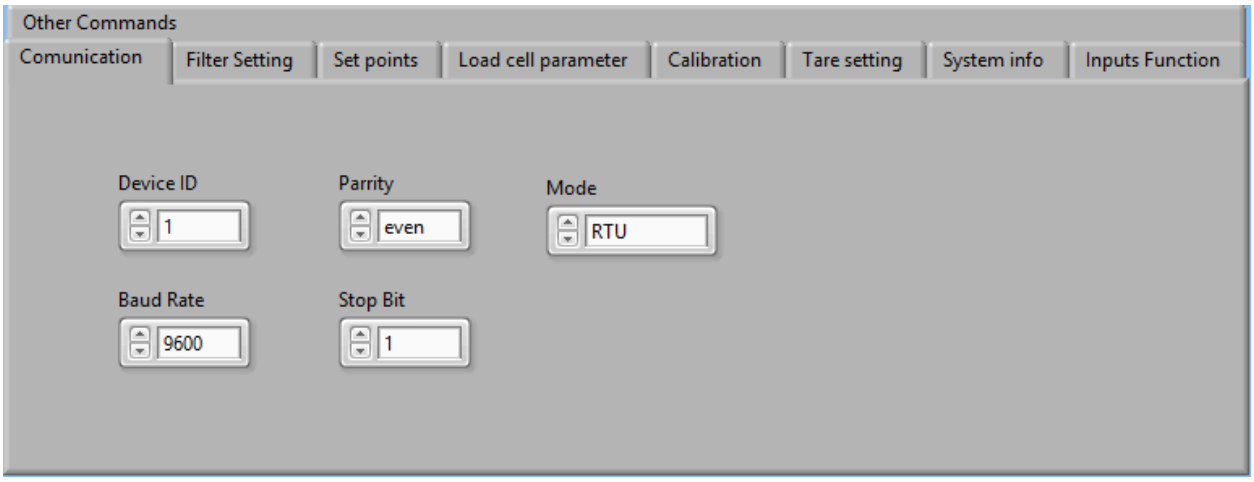
The Reset button is for restarting.

Transmitter variable values

- ADC Unfiltered raw value of ADC without filtering
- ADC Filtered Raw ADC value with filter applied
- Gross Weight amount
- Net Weight
- Tare Weight
- Input Voltage: The output voltage value of the load cell
- Analog output value

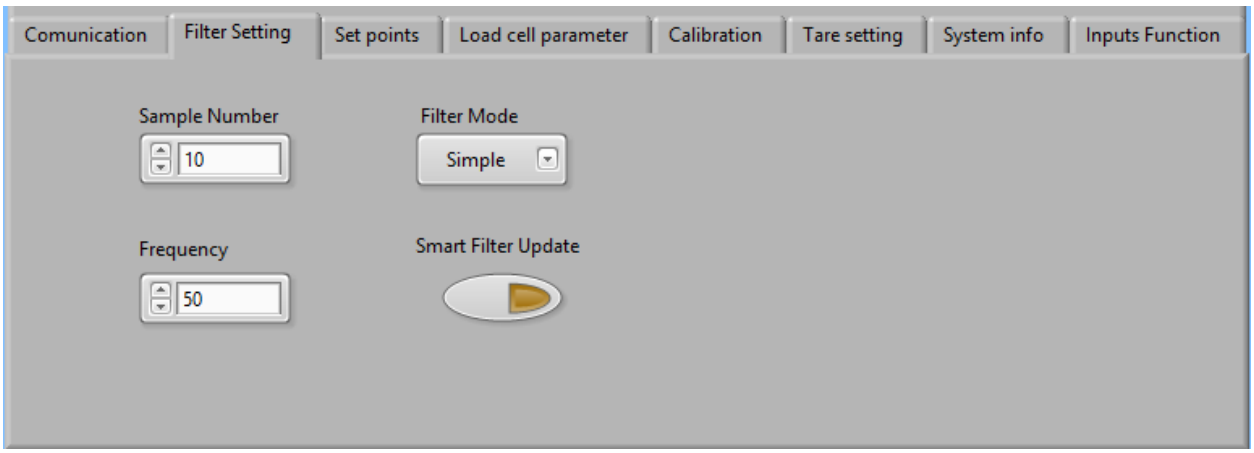
Adjustable transmitter values

7.2.1 Setting related to RS485 serial communication



❖ Note that in order to apply the changes to the settings related to serial communication, it is necessary to reset the transmitter once.

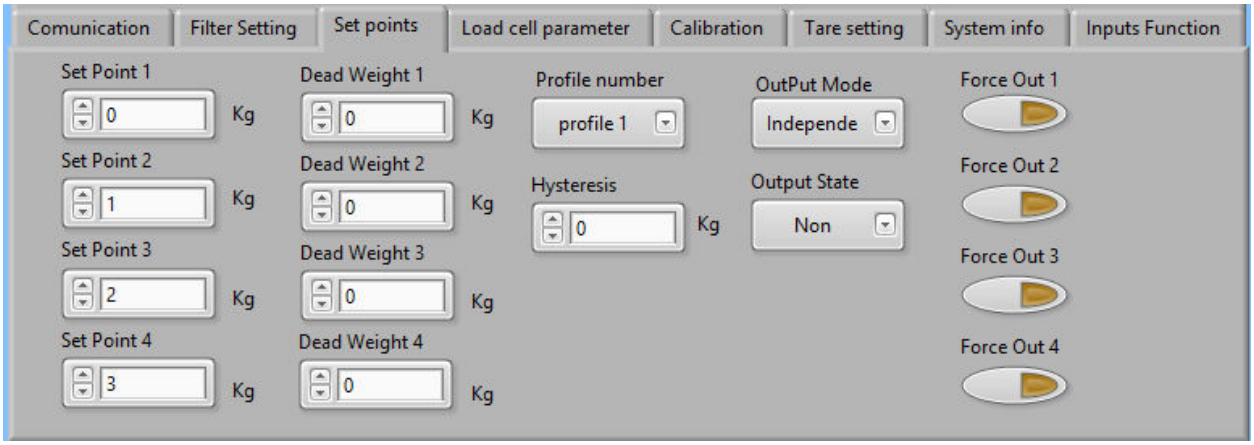
7.2.2 Filter settings



- **Filter Mode** is a type of filter that can be simple or intelligent Moving.
- **Smart Filter Update** is the automatic setting of the smart filter that is explained in the filter parameters section. After pressing this button for 10 seconds, the system should be in a state without tension and conflict.
- **Sample Number** The number of samples to filter.
- **Frequency** sampling speed.

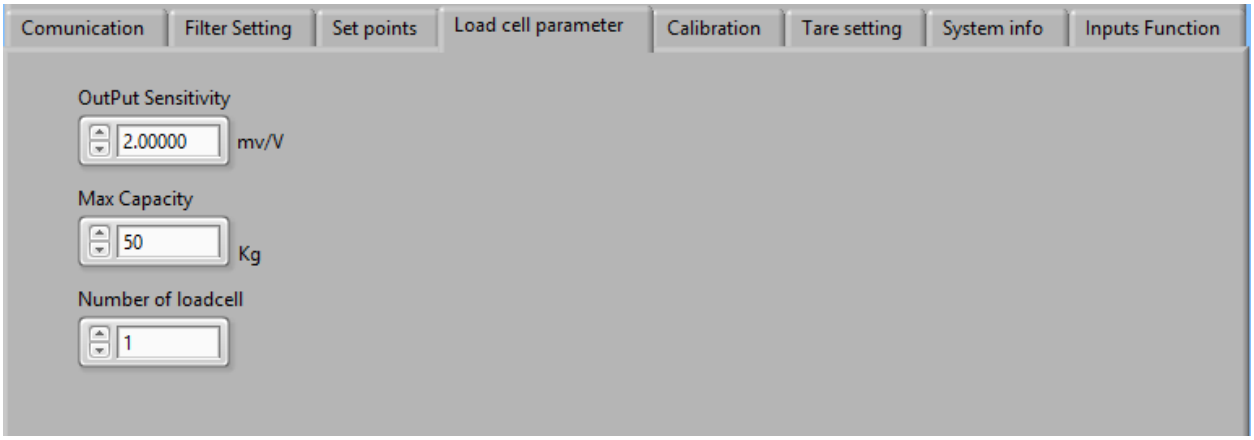
❖ It should be noted that by increasing the sampling speed, the accuracy of sampling decreases.

7.2.3 Settings related to digital outputs



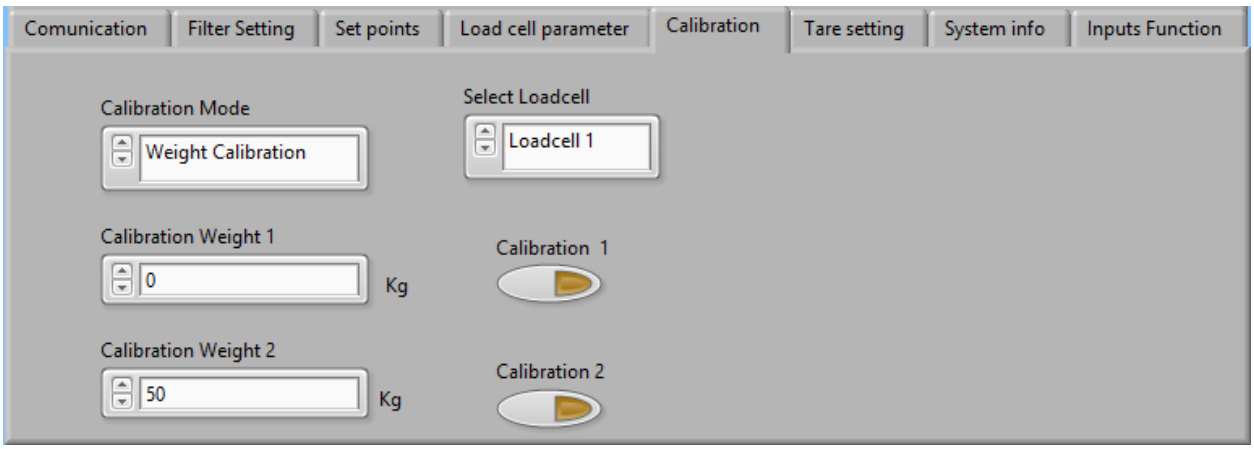
These parameters are fully explained in "6.10 Set points parameters".

7.2.4 Settings related to load cell values



- **Output Sensitivity** is the amount of voltage that the load cell puts in the output at its maximum range for each volt of excitation. You can find this amount with the same name in the load cell sheet.
- **Max Capacity** is the maximum working range of the load cell.
- **Number of Load cells** is the number of parallelized load cells.

7.2.5 Calibration settings



Note: Be sure to hit the Save button after completing the calibration.

To perform weight calibration, perform the following steps:

1. Set Calibration Mode to Weight calibration
2. Putting the system in idle mode and pressing the ZERO button.
3. Placing a load with a specific weight on the weighing system (up to 5% of the total range of the load cell).
   (In this section, you can use no-load mode, in this case, enter 0 value as "Calibration weight1" in the next section.
4. Entering the exact weight of the load in Calibration weight 1
5. Pressing the Calibration1 button
6. Placing a load with a specified weight on the weighing system (at least 50% of the total range of the load cell)
7. Entering the exact weight of the load in Calibration weight 2
8. Pressing the Calibration2 button
9. Save calibration

For automatic calibration, do the following steps:

1. Enter the load cell values in the Load cell Parameter field.
2. Set Calibration Mode to Automatic Calibration.
3. Calibration storage