



FANTUZZI
REGGIANE



DIVISION

LOGICONTROL SYSTEM

GEA Logicontrol V. 4.0
Fantuzzi Logicontrol System

DOC7046B4P
del 01 Settembre 1999
Totale pagg.: 56

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ATTENTION:

The operator must read carefully this manual and the instructions supplied by the crane manufacturer before using the machine; only authorized personnel can perform installation, use and maintenance operations.

ATTENTION:

Logicontrol is an electronic System able to give useful information to the operator for the correct use of the machine. It can never substitute the operator in the machine handling. The operator is the only responsible for any operation.

Chapter 1:

MANUAL SPECIFICATION

1.1. MANUAL CONVENTIONS

This manual uses these conventions to underline some instructions:



Warning message: suggestion or indication for a better use



Danger message: not to apply this can result damage to machine or operator.

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1.2. LOGICONTROL IDENTIFICATION

Logicontrol is an electronic device able to monitor and control container handling machine.

Model described in this manual is:.....Logicontrol Version 1.0

Serial Number:.....Not Applicable

Year of construction:.....1999

Logicontrol is built by:

GEA Generale Elettronica ed automazione S.r.l.

Head Offices: Via Renata Bianchi 38 Genova- ITALY

Phone:+39 010 65966 1

Fax:.....+39 010 65966 311

1.3. CONFORMITY

Conforms to the following Directives:

Directive 89/336/EEC

Directive EN/954

Directive 73/23/EEC

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1.4. MANUAL USE DESTINATION

This manual is suitable for operators and technical assistance:

<u>Operators manual:</u>	Chapter 2:	General system description and safeties
	Chapter 3:	Display Description
<u>Assistance manual:</u>	Chapter 4:	System Interface and Calibrations
	Chapter 5:	Troubleshooting
	Chapter 6:	Technical characteristics

Chapter 2:

Logicontrol™ SYSTEM

2.1. INTRODUCTION

Logicontrol is an advanced electronic system able to perform many and useful features into a standard machine.

The System is developed together with traditional electrical system, in order to avoid any machine stop even if electronic system crashes completely.

In fact, basic machine functions (travelling, boom movements, spreader) are hydraulic or low-level electrical based, reducing system complexity and allowing everyone maintenance. Only high level performances are under strictly electronic control.

The System collects only the sensors useful for its functions, and leaves all basic functions to standard electrical system, avoiding any interference between the two systems.

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2.2. STARTING THE SYSTEM

Main dashboard is provided of a LCD display, used to inform the operator of machine status, as regards measures, weight, stability and engine-hydraulic monitoring.

Turning the key ON, the system shows, after a presentation screen, the main screen, and it is ready to operate. See next chapter for screen explanation.

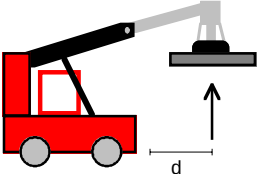
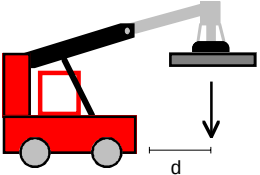
2.3. SYSTEM FUNCTIONS

2.3.1. Automatic height preselection

Pressing the key from H=2 to H= 5 without touching joystick, the system starts movements in order to reach standard heights in vertical lifting or lowering mode. If the container stack is made of high cube containers (9'6"), press first 9 button to inform the system the different height that has to be reached.

Gripping joystick or pushing the red emergency button, automatic movements stops immediately.

Any overload or sensor faults stops immediately all automatic movements.
 Accuracy of automatic movements is ± 30 cm.

Meaning	Machine behaviour	Notes
Vertical lifting		Combination of boom lifting and boom extension so that d is always constant
Vertical lowering		Combination of boom lowering and boom retraction so that d is always constant

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2.3.2. Overload Control Device (LMS: Load Management System)

Logiccontrol has sensors to detect in any moment boom angle, boom length and load. From these values, it calculates load distance and load height. All these parameters are shown in the display.

Then it makes a comparison between actual configuration and the capacity charts supplied by the manufacturer (stored in permanent memory) and it finds maximum load allowed in that condition.

Finally, if load is bigger than the maximum allowed, there are following actions:

- Boom lifting, lowering and extension are disabled
- An alarm appears with buzzer
- The stability factor reaches 100%
- If the overload condition is more than 2 seconds long, it is stored in Black Box

This safety can be disabled by code. When bypass overload control is inserted, there is alarm and the message is stored in Black Box.



**Never pick up a container with boom completely extended.
If the container is full, overload device detects alarm condition when it is too late, and back wheels can lift up.**

Load calculation is performed with load cell, and it is quite accurate in any conditions, because cells are a linear sensor.

To get the best measure, there must be following conditions:

- Engine must be on
- Spreader must be centered
- Boom must be still
- Auto Float control (if present) must be disabled

2.3.3. Engine Shut Off Control

If an alarm occurs on sensors important for engine working, the system shuts down automatically the engine. after a time variable between 20 and 40 seconds. Sensors involved are:

- Engine oil pressure
- Engine oil temperature (120 °C)
- Water cooling temperature (110 °C)
- Transmission Oil temperature (120 °C)
- Low cooling water level
- Low fuel level

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2.4. SAFETIES



Safeties can be responsible of many apparent faults.
Before checking electronic or mechanical parts, be sure that all safeties are disabled.

2.4.1. Safeties List

Safety	Activation when...	Effect	Display Message	Bypass
Minimum Distance	Spreader distance is negative	Boom lifting and retraction locked	<i>Minimum Distance Safety</i>	Code
Unbalanced Load	The container is loaded too much on one side	Sideshift and rotation locked	<i>Unbalanced Load</i>	Code
Lowering Control	Spreader is pushed on the container	Boom lowering and retraction locked	<i>Boom Lowering Locked</i>	Code
Overload	The actual weight exceeds maximum allowed	Boom lifting, lowering and extension locked	<i>OVERLOAD</i>	Key on panel or code
Sensor fault	Some sensor useful for safeties is not working	Boom lifting, lowering and extension locked	<i>Sensor ... fault</i>	Key on panel or code
Height Control	Spreader height is too low (only for machines with piggy back)	Boom Lowering locked	<i>Height Control Safety</i>	Code
Maximum Distance	Spreader distance is too high (only for special boom machines)	Boom lifting, lowering and extension locked	<i>None</i>	Key on panel or code
Stabilizers Control	Machine would be unstable without stabilizers	Stabilizers lifting locked	<i>Stabilizers Control</i>	None
Engine Shut Off	Alarm from engine sensors	Engine if shut off after 20-40 sec.	<i>Engine Shut Off Control</i>	Code
Boom Movements limitation	Boom (up-down-out-in) is at its limit (to avoid hydraulic system shocks)	Boom movement is locked	<i>None</i>	Code
Boom Control for Speed	Machine is running over 9 km/h and spreader is high (8 mt) or far (4 mt)	Boom lifting, lowering and extension locked	<i>None</i>	Code
Speed 4 Control	Stability is over 65% or spreader is high (8mt) or far (4 mt)	Speed 4 is disabled.	<i>None</i>	Code
Speed 3 Control	Machine is on overload or stability is over 65% with spreader high (8mt) or far (4 mt)	Speed 3 and 4 are disabled.	<i>None</i>	Code

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2.4.2. Safeties Bypass



The operator is the only responsible for safeties bypass use.
Without safeties, machine handling can be very dangerous.
Supervisors must communicate passwords to operators only if necessary.

All safeties described above can be bypassed using the key  and entering proper 4 digits bypass code (one different for each safety).

All safeties bypass are stored in black boxes

There are also bypass codes for other functions not listed above:

- Automatic Height Selection Disabling/Enabling
- Alarm Sound Disabling/Enabling
- Operator parameters shown in USA Standard/Metric Standard

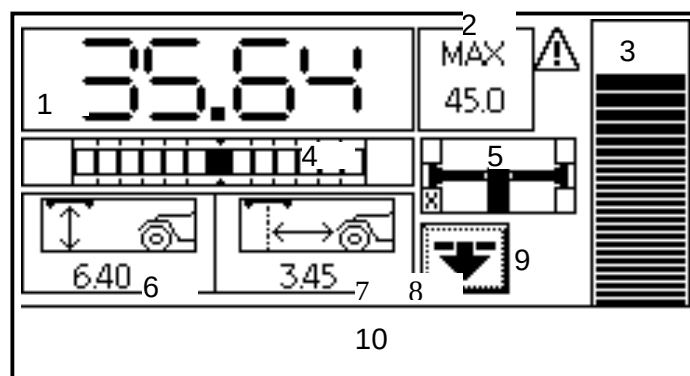
The bypass can be removed by pressing again then  key and entering the same code or turning off and on the power supply (except automatic height selection disabling).

Chapter 3:

DISPLAY DESCRIPTION

3.1. MAIN SCREEN DESCRIPTION

It is possible to switch from main screen to monitor screen pressing OK key



- ❶ Weight Lifted (in tons or thousands of pounds)
- ❷ Maximum Weight allowed (in tons or thousands of pounds)
- ❸ Machine Stability (100% means overload)
- ❹ Unbalanced Load Indicator
- ❺ Spreader Landed (seated) sensors status. It indicates if each corner block is correctly seated (X) or not seated (□)
- ❻ Spreader Height (from twist lock to the ground, in meters or feet)
- ❼ Spreader Distance (from front wheel to spreader center, in meters or feet)
- ❽ Spreader Twist Lock Status
- ❾ Spreader Size
- ❿ Alarms messages and general information

On the panel, it is possible to find:

- a numerical keypad and some function buttons for operations, calibrations and test
- a key to bypass overload safety only
- 2 led for approaching overload warning (yellow) and for overload alarm (red)
- a connector for any serial external device (also for PC external programming)
- 2 potentiometers for contrast and luminosity adjustment

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3.2. MONITORSCREEN DESCRIPTION

Logiccontrol monitor					
	1	°C		6	°
	2	°C		7	
	3	°C		8	
RPM:	4			9	
KM/h:	5			10	

- ❶ Cooling Water Temperature
- ❷ Engine Oil Temperature
- ❸ Transmission Oil Temperature
- ❹ Engine RPM
- ❺ Machine speed
- ❻ Boom Angle (degrees)
- ❼ Boom Length (in meters or feet)
- ❽ Stabilizers
- ❾ Hourmeter
- ❿ Number of containers lifted

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3.3. ALARMS/MESSAGES TABLE

In the following table are listed all alarms provided by Master, according to sensor signals. All alarms are stored in Black Box with the same display message.

Message	Meaning	Activation	Control Action
Boom Angle Sensor Fault	Sensor not connected or fault	Sensor value below 100 units	Boom Up/Down/Out Disabled
Boom Length Sensor Fault	Sensor not connected or fault	Sensor value below 100 units	Boom Up/Down/Out Disabled
Load Cell 1 (SX) Fault	Wrong connection load cell amplifier card-Logicontrol card	Sensor value below 100 units	Boom Up/Down/Out Disabled
Load Cell 2 (DX) Fault	Wrong connection load cell amplifier card-Logicontrol card	Sensor value below 100 units	Boom Up/Down/Out Disabled
Water Temp.Sensor Fault	Sensor wire cut or shorted	Sensor value below 10 units or over 1023 units	None
Trans.Oil Temp.Sensor Fault	Sensor wire cut or shorted	Sensor value below 10 units or over 1023 units	None
Eng.Oil Temp.Sensor Fault	Sensor wire cut or shorted	Sensor value below 10 units or over 1023 units	None
Bypass Overload Control	Boom can be moved with any weight lifted	Code	Movements enabled
Bypass Boom Controls	Minimum distance safety, boom limits safety and height safety are overridden	Code	Movements enabled
Bypass Load Cells Controls	Unbalanced load and lowering controls are overridden	Code	Movements enabled
Bypass Engine Control	Engine doesn't shut off in case of alarms	Code	Engine never stops
Bypass Transmission Safety	All transmission controls are disabled	Code	All speed enabled
OVERLOAD	Weight lifted is bigger than maximum allowed		Boom Up/Down/Out Disabled
Minimum Distance Safety	Spreader distance is negative		Boom Up/In Disabled
Boom Lowering Locked	Spreader is pushed on container	Load cells values over limit	Boom Down/In Disabled
Unbalanced Load	Spreader is loaded too much on one side	Load cells difference over limit	Spreader sideshift and rotation disabled
Stabilizers Control	Machine would be unstable without stabilizers	Capacity charts comparison	Stabilizers lifting locked
Engine Shut Off Control	Alarms from engine or other sensors		Engine is shut off

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Message	Meaning	Activation	Control Action
Height Control Safety	Spreader is too low	Spreader height below limit	Piggy Back legs are locked
Calibration Angle	Boom Angle measure is not calibrated	No parameters in memory	None
Calibration Length	Boom Length measure is not calibrated	No parameters in memory	None
Calibration Load	Weight measure is not calibrated	No parameters in memory	None
Vertical Control Activated	Automatic movements in progress	Button on panel	None
Container 9 6'	Selection of a 9'6" containers stack	Button 9 on panel	None
Minimum Height Selected	Boom is moving to the minimum height	Button 2 on panel	None
Maximum Height Selected	Boom is moving to the minimum height	Button 5 on panel	None
Low Cooling Water Level	Contact closed from sensor	Sensor value: 1	Engine shut off
Low Engine Oil Pressure	Contact closed from sensor	Sensor value: 1	Engine shut off
Low Engine Oil Level	Contact closed from sensor	Sensor value: 1	None
High Water Temperature		Temp. Over 110 °C	Engine shut off
High Transmission Oil Temp		Temp. Over 120 °C	Engine shut off
High Engine Oil Temp.		Temp. Over 130 °C	Engine shut off



Logiccontrol can't detect all kinds of fault from a sensor.
Sometimes, even if a sensor is broken there can be no message.
Only with troubleshooting it is possible to detect all kinds of faults.

Chapter 4:

SYSTEM INTERFACE AND CALIBRATIONS

4.1. INTRODUCTION

Logicontrol has on its panel some keys used to interact with the system, to perform troubleshooting and to manage black boxes.

To prevent access to internal data or calibration, there are 3 types of codes:

MENU Code: with this code it is possible to check system input/outputs and view black boxes.

CALIBRATION Code: with this, it is possible to modify machine calibrations

BLACK BOX Code: with this, it is possible to erase black boxes.



Only supervisors or authorised personnel can know access codes.
The customer is the only responsible of code diffusion.
A wrong calibration can compromise seriously machine safety.

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4.2. MENU KEY

Pressing this key and entering MENU Code, the system shows the main menu:

```
20/06/99  15:14

1.Calibrations
2.Test I/O
3.Alarms Settings
4.Geometrical Settings
5.Safeties
6.Malfunctions Black Box
7.Operative Black Box
8.System Time
9.Change Hourmeter

      DEL: Exit
```

Options 1-4-5-8-9 require Calibration code, all others are accessible. Each option will be explained in the next paragraphs.

4.3. CALIBRATIONS

ACCESS: CALIBRATION CODE



**Only authorised personnel can modify system parameters.
Incorrect parameters setting can compromise seriously machine safety
It is possible to access to these options only with a reserved code.**

This is the complete calibration list:

```
1.Angle Calibration
2.Lenght Calibration
3.Weight Calibration
4.Automatic Heights Calib.

      DEL: Exit
```

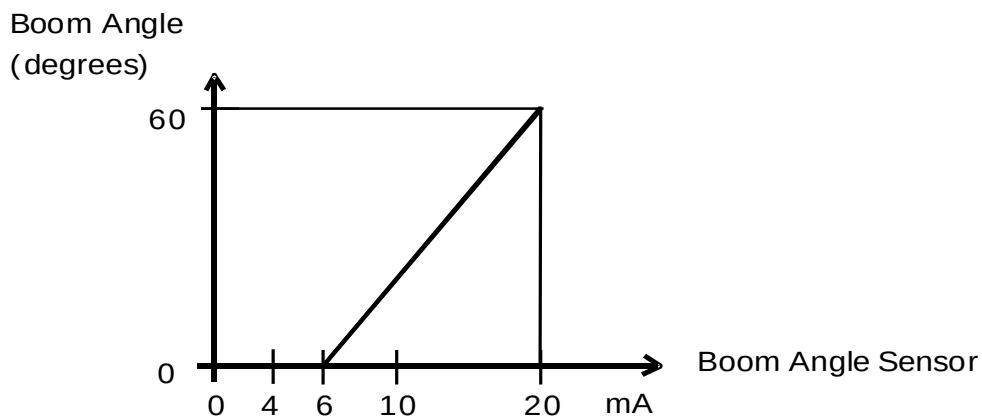
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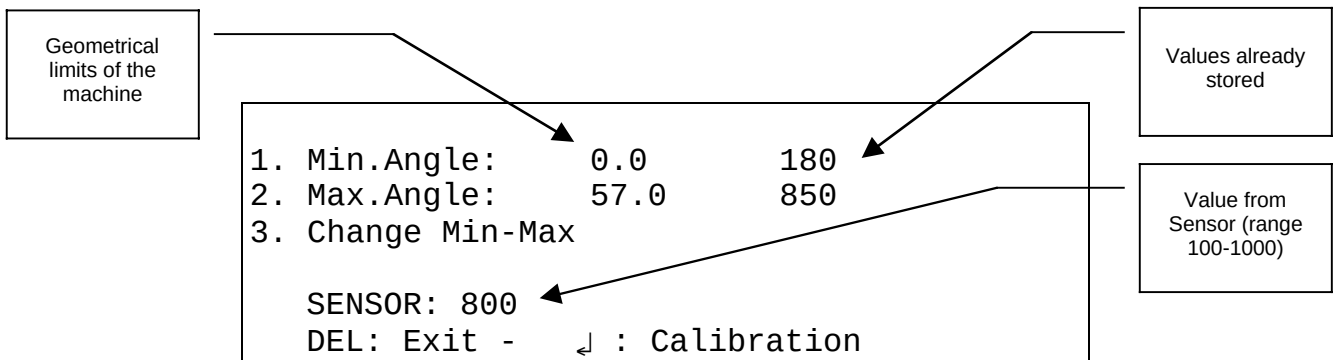
4.3.1. Angle Calibration

Calibration is the procedure that allows the system to know how a sensor is positioned and, from that, to calculate the measure from a signal of a sensor. For example, the system measures boom angle from a potentiometer whose range is 4-20 mA.

Calibration is the procedure that allows the correspondence 4-20 mA → 0-60° that is:



This graph means that sensor supplies about 6 mA at 0 degrees and 20 mA at 60 degrees. These values must be stored into permanent memory; calibration procedures allow automatic storage in order to show on display measures in degrees.



This screen page allows automatic calibration of the sensor that measure the boom angle

To calibrate the angle, take the boom at minimum angle and press **1** ; the corresponding value from the sensor will be stored and will be displayed on the "Min.Angle" line.

Then, take the boom to the maximum angle and press **2** ; this value will be stored and will be displayed on the "Max.Angle" line.

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At this point the calibration operation is complete. Press



to calibrate,



to exit without



Before making any calibration, make sure that no safety could limit all boom movement, otherwise boom angle will be incorrect.

Option3 allows to change real boom angles (0 and 57° in the example) in order to adapt the system to any machine.

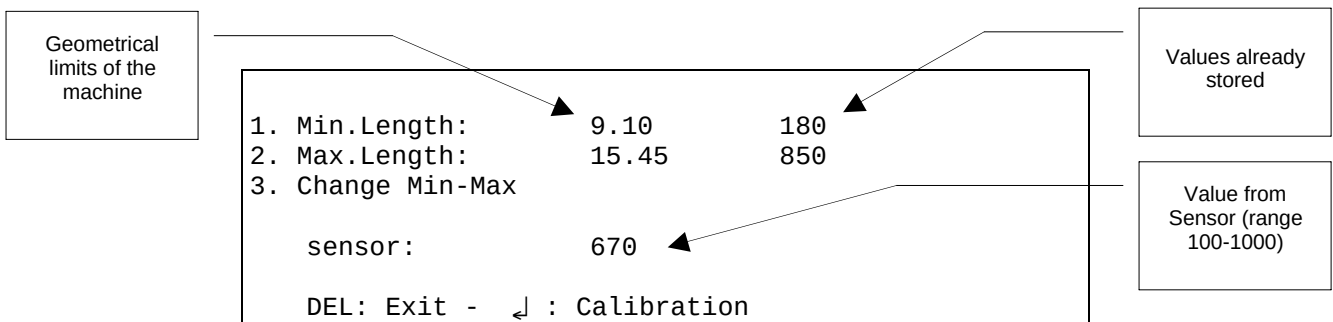
Pressing 3 the cursor goes to the geometrical limits and waits for a number.

It is possible to write any number using numerical keypad with



as comma.

4.3.2. Calibration length



This screen page allows automatic calibration of the sensor that measures the boom length.

To calibrate the length, retract the boom at the minimum length and press **1** ; the corresponding value from the sensor will be stored and will be displayed on the "Min.Length" line.

Then, extend the boom to the maximum length and press **2** ; this value will be stored and will be displayed on the "Max.Length" line.

At this point the calibration operation is complete. Press



to calibrate, to



exit without



Before making any calibration, make sure that no safety could limit all boom movement, otherwise boom length measurement will be incorrect.

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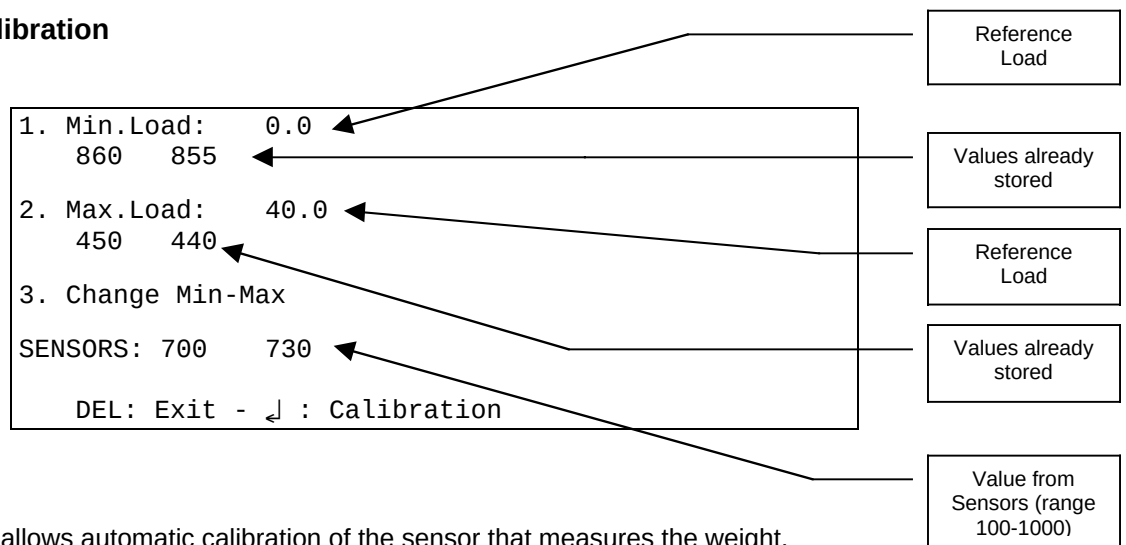
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Option 3 allows to change real boom length (9.1 and 15.45 in the example) in order to adapt the system to any machine.

Pressing 3 the cursor goes to the geometrical limits and waits for a number.

It is possible to write any number using numerical keypad with . as comma.

4.3.3. Load calibration



This screen page allows automatic calibration of the sensor that measures the weight.

To calibrate the weight:

- With spreader empty, press key 1
- Lock container 20 tons loaded, lift it up and press key 2
- Finally, press ↵ to store the values or DEL to exit without calibrating.

Special Notes for Load Calibration:

- To have a better calibration, choose a container whose weight is close to maximum machine capacity
- Use a container well balanced: load cells values difference should be about 20-30 units maximum.

If it is not available a container loaded exactly 40 tons (like in the example), it is possible to change reference load. If, for example, you have a container whose weight is 32.3 tons, do as follow:

- press key 3: Change Min-Max
- write 0.0 for minimum weight
- write 32.3 for maximum weight
- repeat calibration as described above



The maximum load set in this window must not be the real maximum machine capacity, and it does not change the real machine capacity; it is only a reference for the calibration

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4.3.4. Automatic Heights Calibration

Automatic height preselection uses a method based on setting a boom movement speed and reducing it according to the error calculated during the process.

So, it is possible to set the boom speed and the percentage of reduction according to three different error thresholds (10, 20 and 30 cm).

The menu shows following options:

- | |
|--|
| <ol style="list-style-type: none">1. Boom Up2. Boom Down3. Boom Out4. Boom In5. Correction UP6. Correction Down |
|--|

From 1 to 4, it is possible to set following values:

- | | |
|--------------------------|---|
| <u>1.Step:</u> | Response from the system: higher numbers correspond to quicker speed reduction or increasing. A number too high can introduce oscillations (Range: 10-500). |
| <u>2.Vel.Min:</u> | Minimum movement speed (Range 1-1000). Check with Test PWM the numbers that correspond to real minimum movement speed. |
| <u>3.Vel.Max:</u> | Maximum movement speed (Range 1-1000). Check with Test PWM the numbers that correspond to real maximum movement speed. |

Options 5-6 set correction values, separately for each lifting or lowering operations:

- | | |
|--------------------------|--|
| <u>1.% 10 cm:</u> | Percentage of movement speed reduction when error is at 10 cm (Range 0-100). |
| <u>2.% 20 cm:</u> | Percentage of movement speed reduction when error is between 10 and 20 cm. |
| <u>3.% 30 cm:</u> | Percentage of movement speed reduction when error is over 20 cm. |

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4.4. TEST PROCEDURES

Logicontrol allows to make a complete system check and troubleshooting only using display and test operation. All system signals are processed by an appropriate test.
If any fault occurs, the assistance has to investigate through tests in order to find the reason of the fault.



During technical assistance with Fantuzzi Personnel, there will be many questions regarding system status; so read very carefully this part of the manual

Before analyzing each test, it is necessary to discuss about sensors and system characteristics.

4.4.1. Input sensors characteristics

Logicontrol supports basically three kinds of sensors: Analogue, Digital and Frequency Sensors.

ANALOGUE SENSORS:

They are intended to be sensors that can assume different values or a range. Typically, they are potentiometers, bulbs or variable resistance.

Range allowed for Logicontrol is:

- Voltage sensors: from 0 to 5 Volts
- Current sensors: from 0 to 20 mA

Then Logicontrol system performs an A/D conversion, that is transforms this values in numbers, according to following table:

VALUE	NUMBER
0 V	0
5V	1023
0 mA	0
20 mA	1023

Any voltage or current inside the range, corresponds an appropriate number among 0 and 1023. These numbers will be very important for test comprehension.

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DIGITAL SENSORS:

They are intended to be sensors that can assume only 2 values or states. Typically, they are switches, contacts or proximity sensors. Logicontrol can understand if a sensor is closed (N.C.) or open (N.O.); in particular DCD considers (apart some cases) a sensor closed if it is at 0 V (GND) or 24 V (power supply), open in any other case.

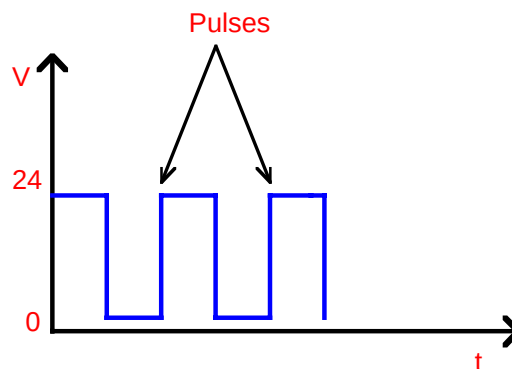
Slaves supply 12 V to all digital sensors installed. So, reading 12V on a particular sensor, it means that sensor is open. Then, if the sensor changes state and closes indifferently to GND or 24 V, the reading will be 0 V or 24 V respectively.

Again, this state is converted into a number, that will be used in test operations:

Sensor Closed: 1
Sensor Open: 0

FREQUENCY SENSORS:

They are intended to be sensors that supply a signal with variable frequency, for example:



Logicontrol is able to count pulses number and therefore to calculate signal frequency.

An example of frequency signal is given by alternator, that has an output signal from 0 to 24V with frequency proportional to engine R.P.M.

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4.4.2. Output signals characteristics

Slaves are able to set two different kinds of output: digital and analogue outputs.

DIGITAL OUTPUTS:

They are intended to be normal output in voltage, typically 24 V. These outputs can supply 4 A.

ANALOGUE OUTPUTS - PWM (Pulse Width Modulation) :-

Hydraulic system has 4 proportional electrovalves to perform movements.

Logicontrol commands directly electrovalves through special output signals, called PWM. These signal are connected in parallel with standard electro-hydraulic system and they are used for automatic movements.

Logicontrol converts this signal into numbers, according to following table (considering a 20 Ohm valve):

Logicontrol Output Current	EFFECT	Logicontrol Conversion	MOVEMENT
0 mA	Valve closed	0	No movement
12 mA	Valve just open	10	Movement low speed
600 mA	Valve half open	500	Movement middle speed
1.2 A	Valve fully open	1000	Movement high speed

Each valve has its own specifications for current requirements to be opened completely. See hydraulic diagrams for more details.

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4.4.3. Test Analogue Inputs

j.(0)	50	f.(8)	889
k.(1)	0	g.(9)	1023
Z.(2)	1023	h.(10)	1023
a.(3)	1023	j.(11)	900
b.(4)	800	k.(12)	800
c.(5)	1000	m.(13)	309
d.(6)	345	n.(14)	257
e.(7)	1023	p.(16)	900
DEL: Exit			

Test analogue inputs shows the sensor value converted into a number close to the pin connector letter name. See electrical drawings to know which sensor is connected to each pin.

These are the rules to perform a diagnostic:

- Normal range for sensors is from 8-12 units to 1010-1015 units.
Values out of this range mean:
 - Below 10 units: sensor is fault or is short-grounded
 - Fixed at 1023 volts: sensor is not connected
- If the value never changes, but it is still in the range, it means that sensor is fault.
- If connecting and disconnecting a sensor the value doesn't change, it means that connection cable is interrupted or Logicontrol input is fault.

4.4.4. Test digital inputs

F.(0)	0	S.(10)	0
G.(1)	1	T.(11)	0
H.(2)	1	U.(12)	0
J.(3)	0	V.(11)	1
K.(4)	1	W.(12)	0
L.(5)	0	X.(13)	0
M.(6)	1	B.(14)	1
N.(7)	1	C.(16)	1
P.(8)	0	D.(18)	1
R.(9)	0	E.(19)	1
DEL: Exit			

Test analogue inputs shows the sensor value converted into a number close to the pin connector letter name. See electrical drawings to know which sensor is connected to each pin.

In order to check correct connection between sensor and slave, it is enough to disconnect the sensor and make a short circuit to GND.

In this case, if connection is good the value must change from 0 to 1.

Otherwise, cable is interrupted or this Logicontrol input is fault.

If the value is already 1, it is enough to disconnect the sensor to cause a change to 0.

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4.4.5. Test PWM -analogue outputs-

TEST PWM OUTPUTS	
1.Boom Up	0
2.Boom Dw	0
3.Boom Out	0
4.Boom In	0
1-4: Increase PWM	
0	: Erase PWM
DEL	: Exit

With this test, it is possible to drive current directly to each electrovalve without joystick or safeties controls. This is very useful to check connections electronic-hydraulic, and to calibrate minimum and maximum speed for each movements for automatic height selection calibration.



With engine on, this test produces boom movements, and joystick has no effect.

Movements can be stopped only pressing DEL or 0 keys.

Operation Mode:

- Press number (from 1 to 4) to select the movement to test. Each key pressing corresponds to 50 units of PWM (about 60 mA); range is 0-1000 units.
- Press number 0 to stop the movement
- Don't set current at the same time on opposite electrovalves (i.e. up and down or out and in).

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4.4.6. Test Digital Output

TEST DIGITAL OUTPUTS	
G.(0): 1	R.(8) : 0
H.(1): 0	S.(9) : 0
J.(2): 0	T.(10): 0
K.(3): 0	U.(11): 0
L.(4): 0	V.(12): 0
M.(5): 0	W.(13): 0
N.(6): 0	X.(14): 0
P.(7): 0	Z.(15): 0
DEL: Exit - RET:Set Outputs	

Operation Mode:

- Normally, this test shows current output status. 1 means that output is activated, 0 not activated. See electrical diagrams to check the correspondence output pin name and actuator.
- Pressing key enter, it is possible to force each output to be set, using the right arrow key. This is very useful to check all connections and outputs activation.

Note that a number 1 on test does not guarantee that 24 V is actually supplied on that output, but only that there must be 24V; that means that there is no feed-back measurement on the output real power.

4.4.7. Test RPM

TEST RPM INPUTS		
	UNITS	FREQ.
r.(0):	289	720
s.(1):	1020	300
DEL: Exit		

This test shows RPM signals status: the first number (units) is the pulse counter (running quickly from 0 to 1023); the second number (Freq.) is the signal frequency, measured in Hertz.
For example, diesel engine has a frequency that goes from about 200 Hz (at 600 rpm) to about 700 Hz (at 2500 rpm).

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4.5. ALARMS SETTINGS

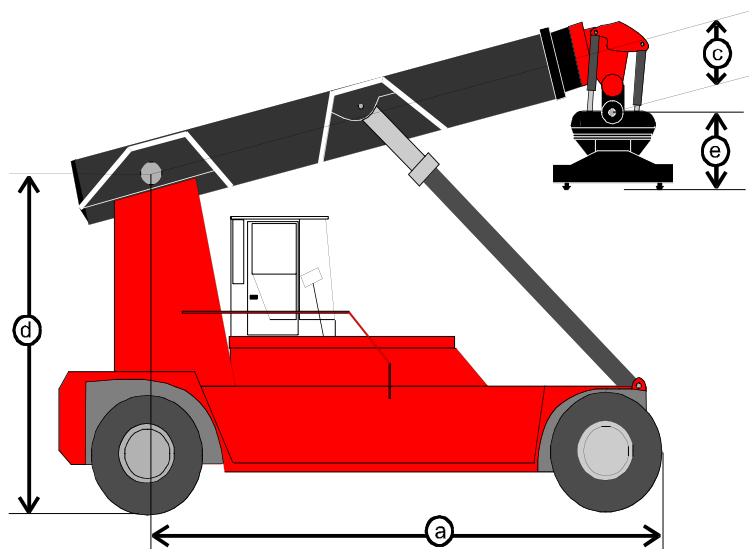
This option changes threshold for overload protection system. This can be useful to avoid many movements interlocks if the operator is working with a load at limits. This is the meaning of the values displayed:

- 1. Pre Alarm:** This is the threshold for approaching overload limit (yellow light and buzzer come on); 100 means maximum machine capacity.
- 2. Overload:** This the threshold for "OVERLOAD" alarm and safety activation (100 means maximum machine capacity)
- 3. Lock Delay:** This is the time elapsed from an overload detection and movements interlock (1 means about 0.25 sec)
- 4. UnLock Delay:** This is the time elapsed from the end of an overload and the movements release (1 means about 0.25 sec)

4.6. GEOMETRICAL SETTINGS

ACCESS: CALIBRATION CODE

This option defines basic machine measures, and they must be never changed. Only in case of Logicontrol card replacement, old values must be copied into new card. Check in the figure the correspondence with the machine:



$$\begin{aligned} A &= a \\ B &= c-b \\ C &= d-e \end{aligned}$$

- 1. Distance:** distance between boom rotational center (pin) and front wheel (A in the figure), expressed in mt.
- 2. Spread.Boom D.:** spreader-boom attachment length, (B in the figure), expressed in mt.
- 3. Spread Height:** spreader height relative to ground (C in the figure), expressed in mt.

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4.7. SAFETIES THERESHOLD

ACCESS: CALIBRATION CODE

This option allows to change limits in order to customize all safeties activation:

- | | |
|------------------------------------|---|
| <u>1. Min. Distance:</u> | When spreader distance is below this limit, "Minimum Distance Safety" is activated. |
| <u>2. Unbalanc.Load:</u> | When difference between load cells values (0-1023 range) is over this limit, "Unbalanced load" safety is activated. |
| <u>3. Cell1 Limit:</u> | when load cell 1 value (intended into 0-1023 range) goes over these limits, "Boom Lowering Locked" safety is activated. |
| <u>4. Cell2 Limit:</u> | when load cell 2 value (intended into 0-1023 range) goes over these limits, "Boom Lowering Locked" safety is activated. |
| <u>5. Minimum Height:</u> | when spreader height is below this limit, piggy back legs lowering is locked. |
| <u>6. Maximum Distance:</u> | when spreader distance is over this limit, all boom movements except retraction are locked. |

4.8. MALFUNCTION BLACK BOX

System's Black Box stores all malfunctions, anomalies and overloads in permanent memory.

It is possible to show data, send or print (using a serial printer) data and erase black box (only with BLACK BOX Code)

Events are shown as the following example:

EVENTS BLACK BOX

14.02.99	10:05	High Coolant Temp	130 °C
14.02.99	11:20	Low Brake Pressure	8 bar
13.02.99	18:40	Angle sensor fault	
12.02.99	12:00	Overload	7.1 ton

Operation Mode:



Scroll o Scroll one page up



Scroll one page down



Exit

It is possible to store about 1000 messages. When this limit is reached, new messages replace the oldest one. An alarm is stored if it lasts for at least 1-2 seconds.

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4.9. OPERATIVE BLACK BOX

Operative Black Box is a container management system. Logicontrol is able to store and count all containers moved by operators, with many information related to each handling session.

It is possible to show data, send or print (using a serial printer) data and erase black box (only with BLACK BOX Code)

Containers are shown as the following example:

OPERATIVE BLACK BOX						
(	DATE	TIME	CONT.Nr.	HANDL.Time	SIZE	WEIGHT)
	12 Feb 97	10:05	1	20	20	3.5 ^Y
	13 Feb 97	11:25	2	15	20	2.0
	13 Feb 97	18:40	3	30	PB	27.0
	14 Feb 97	12:00	4	45	40	17.0

Legend:

Container nr: This is a container counter that starts from 1 every time machine is started. It is useful for shift statistics.

Handling time: This is the number of seconds that are elapsed for the complete movement.

Size: This is the container type: 20-30-40 for standard containers, PB for Piggy Back use and JBH for special JBH spreader.

Weight: Average weight of container during all handling session.



Scroll o Scroll one page up



Scroll one page down



Exit

It is possible to store about 1000 messages. When this limit is reached, new messages replace the oldest one.

System works only if spreader sensors are working correctly, if operator doesn't use any safeties bypass and if display is always on pages 1 or 2 (not inside test or calibrations).

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4.10. PRINTING BLACK BOX DATA

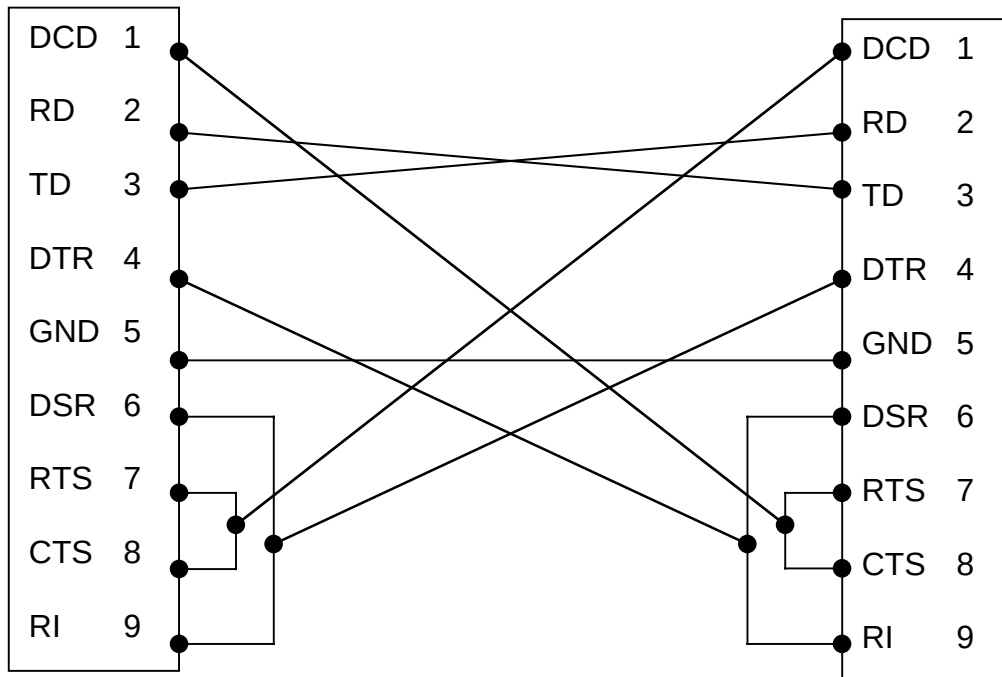
In case of printing black boxes data over a serial printer, or sending data to an external PC, it is necessary to set the printer or the serial port as follows:

Baud Rate: 9.600 bps
Parity: None
Data Bits: 8
Stop Bits: 1
Flow Control: None

The connection cable has to be a standard NULL MODEM cable, with following connections:

Cannon 9 pin Female

Cannon 9 pin Female



All data are in ASCII format, that means that are readable. To receive data with an external PC, it is possible to use any standard communication program (i.e. Hyperterminal for Windows environment).

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4.11. SYSTEM TIME

ACCESS: CALIBRATION Code

With this option, it is possible to change date and system time. It will ask in order:

- Year: 2 digits
- Month: 2 digits
- Day: 2 digits
- Hour: 2 digits
- Minute: 2 digits

If an error occurs, it is necessary to complete the input session and repeat it again with other values.

4.12. CHANGE HOURMETER

ACCESS: CALIBRATION Code

With this option, it is possible to set a new value for the hourmeter. This is useful in case of Logicontrol card replacement, in order to start the hourmeter from the old value.

Chapter 5:

TROUBLESHOOTING GUIDE

5.1. INTRODUCTION

This guide shows how assistance has to move through tests in order to discover almost all fault causes. In the following examples there are some typical malfunctions that can be easily solved only using test operations, the assistance must follow the block diagrams and find the solution.

In general, if there are software problems or memory problems this always better to call Fantuzzi technicians; otherwise, most of the faults hide connection or sensor problems that can be solved using electrical diagrams.

5.2. JOYSTICK PROBLEMS

- **Moving Joystick, the boom doesn't move**

All Boom movements are hydraulic, check electrical or hydraulic system

- **Spreader buttons on Joystick don't work**

All spreader functions are electrically based, check electrical diagrams.

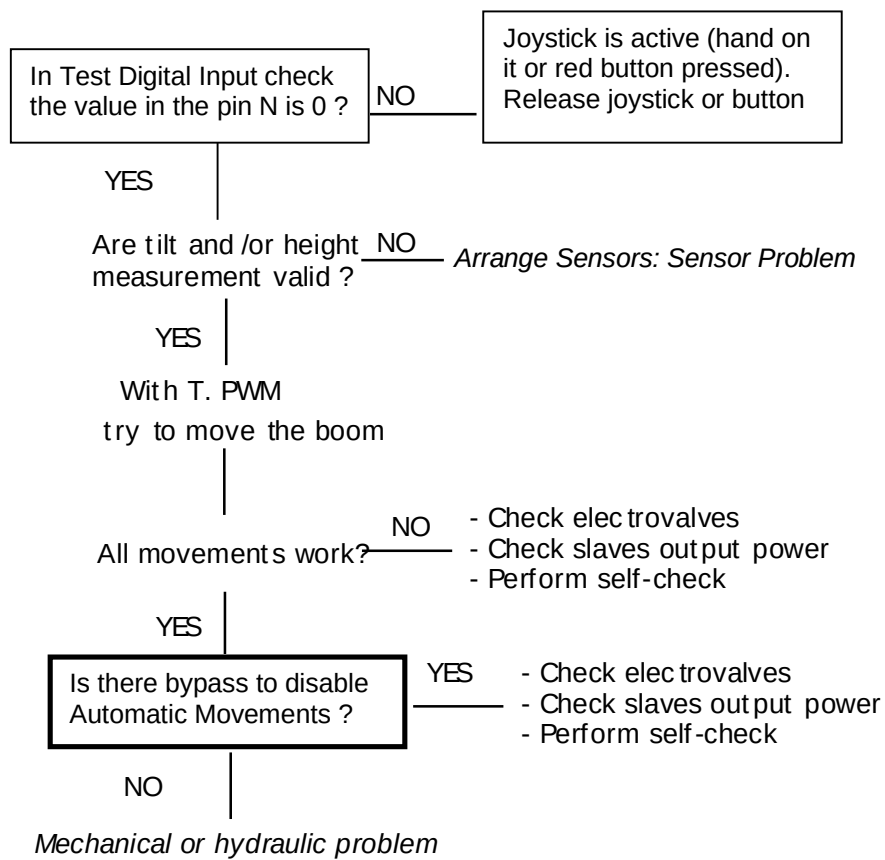
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5.3. AUTOMATIC HEIGHT SELECTION PROBLEMS

- Automatic height selection doesn't work

ACTION

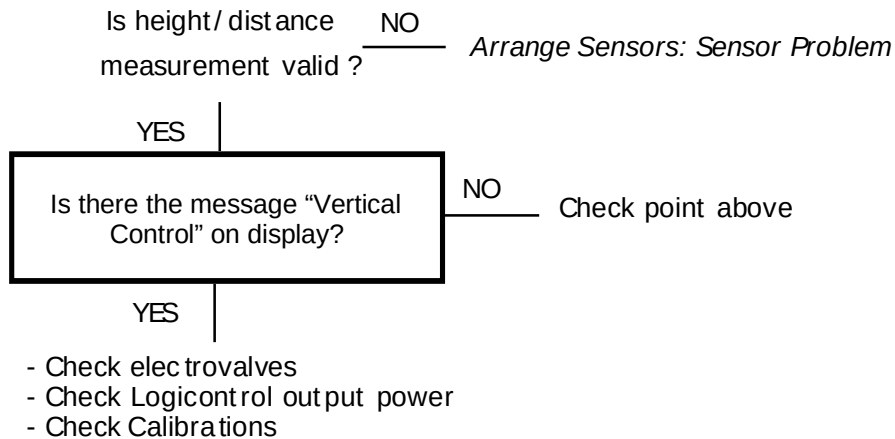


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- **Automatic height selection never reaches selected height**

ACTION



5.4. ANALOGUE INPUTS PROBLEMS

Analogue inputs are following signals:

- Cooling water temperature
- Transmission oil temperature
- Engine Oil temperature
- Boom Angle
- Boom Length
- Load Cells

The general rule to check if sensor is well connected and if electronic is working is the following:

- Select Test Analogue Input
- Disconnect the sensor from the connection box
- Look at the voltage in the test: if it changes, it means that everything is good; otherwise there are connections problems or slave could be defective

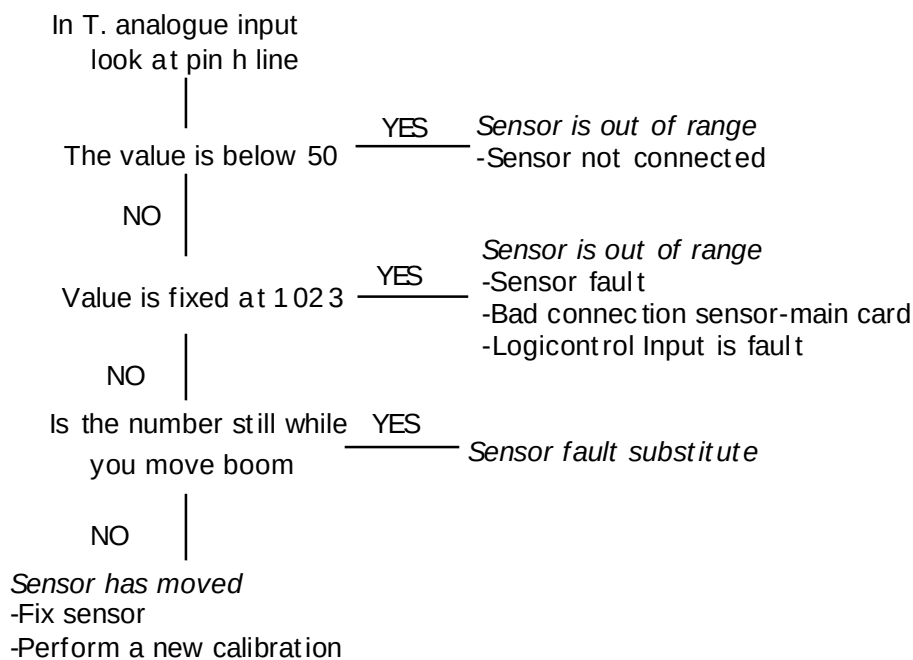
In the following example it is described how to go through test if there is a problem. This is valid for all sensors, according to the characteristics of each sensor (current or voltage).

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- **Angle measure is still or wrong**

ACTION



- **Cooling water temperature is wrong**

See diagram above, checking cooling water sensor. In this case it is not possible to perform any calibration, so it is enough to substitute the sensor

- **Load is not correct**

Load cell fault or conditioner card fault. Check "Load Cell Test Procedure" described in this Manual

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5.5. DIGITAL INPUTS PROBLEMS

All signals that work as a switch (open-close) are digital inputs; for example:

- *All levels*
- *All spreader input sensors*
- *Pressure switches*

The rule of connecting and disconnecting the wire looking at value in Test Digital Input is still valid.

5.6. SAFETIES AND CONTROL PROBLEMS

The system is provided of many safeties. They are all described in chapter 1. So, if it happens that a movement (boom, spreader or stabilizers) is not allowed, the first rule is to check if there are any safeties that doesn't allow that movement.

Anyway, any sensor fault can confuse computer system and not allow the movement even if it is not necessary. So, always check in the safeties table which is the effect of the safety inserted, and check if machine conditions are different.

For example, if the boom does not lift, there are three safeties that can be involved:

- Speed safety
- Limit safety
- Minimum distance safety
- Overload or sensor fault

Checking machine actual conditions (measured speed, boom angle measure or alarms from sensors) it is possible to detect where is the problem.

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5.7. MEMORY PROBLEMS

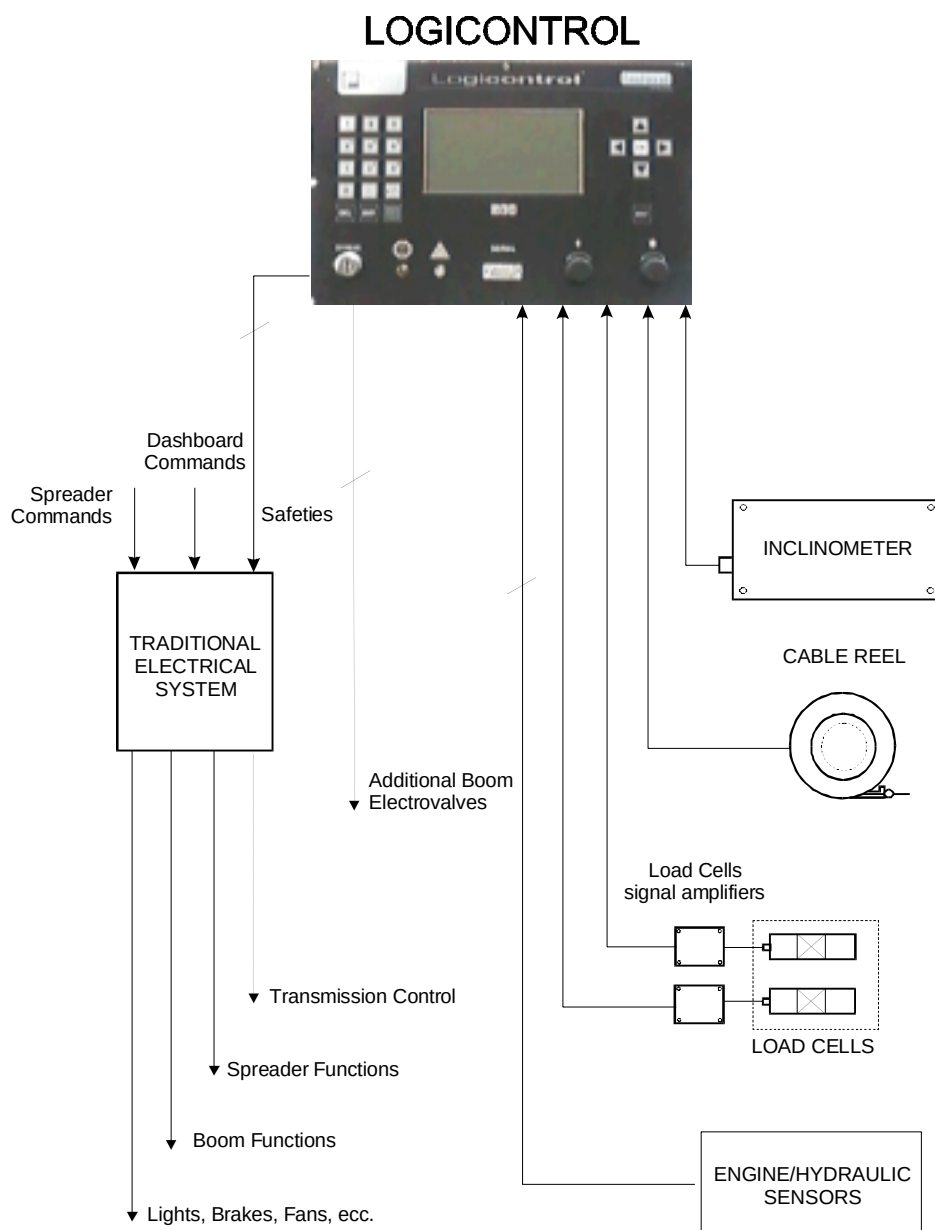
System permanent memory is involved in these functions:

- *Calibrations*
 - *Black Box (operative and normal)*
 - *Date and Time*
-
- **Date, time or hour meter sometimes change or they must be regulated too often**
Internal clock and memory are lost. Logicontrol card has to be replaced
-
- **Black Box loses data**
Logicontrol card has to be replaced
-
- **Angle, length or load measures are absurd; maybe "Calibration" messages appear**
Logicontrol is losing calibrations and data. Replace main card.

Chapter 6:

TECHNICAL CHARACTERISTICS

6.1. SYSTEM DESCRIPTION



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6.2. SYSTEM COMPONENTS

6.2.1. Logicontrol Main Card

Main card has following technical characteristics:

Power supply:	15-30 VDC
Main processor:	SIEMENS C167
Memory lay-out:	120 Bytes of static memory on RTC Two banks of 512K and 128K of Flash Memory
Input Signals:	20 digital inputs with optocoupler (they close to GND or power supply) 2 frequency inputs (0-5 kHz) 16 Analogue Inputs with multiple configurations (0-5 VDC, 0-20 mA, with hardware current injection)
Output signals:	20 digital outputs self protected on short and temperature with 4A at 24 VDC 4 PWM outputs with programmable frequency and duty cycle self protected on short and temperature with 4A at 24 VDC
Temperature Range (working):	-20 +60 °C
Temperature Range (stock):	-30 +80 °C
Display Type:	240x128 pixels, transfective technology

6.2.2. Load cells

Load cells are used to calculate the weight of the load under the spreader. They are installed on the pins that sustain the spreader on the boom.

Cells signals are processed by a card that transforms the small output cells voltage into a 4 - 20 mA signal suitable for slave.

See appendix for a detailed explanation and connection of load cell.

6.2.3. Boom angle measuring system

The boom angle is measured by a gravitational inclinometer.

This device is capable of measuring angles from 0 to 90° relative to the ground utilising a contacts-less sensor and a magnet, with a response time of 0.8 seconds.

Associated to this sensor is a signal conditioner to overcome the effects of temperature change and fluctuations in power voltage.

The conditioner amplifies the signal current, in the range 4 - 20 mA, so that it may be transmitted over long distances without suffering from interference and signal loss.

See appendix for a detailed explanation and connection of inclinometer.

6.2.4. Boom extension measuring system

The extension of the telescopic boom is measured by spring operated cable drum mounted on a shaft connected to multi-turn potentiometer that relays a voltage signal corresponding to the angle through which the cable drum rotates.

Associated to this sensor is a signal conditioner to overcome the effects of temperature change and fluctuations in power voltage.

The conditioner amplifies the signal current, in the range 4 - 20 mA, so that it may be transmitted over long distances without suffering from interference and signal loss.

See appendix for a detailed explanation and connection of cable reel.

Appendix 1:

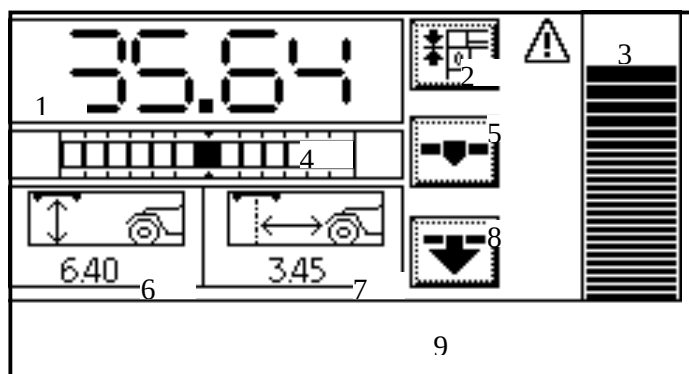
LOGICONTROL FOR CS42 Machines

1.1. INTRODUCTION

CS42K machines are supplied with a Logicontrol system with reduced safeties and cabling, owing to the simplicity of the electrical system that controls this kind of machines.
In the following sections will be explained only the differences towards standard system

1.2. DISPLAY

Main screen:

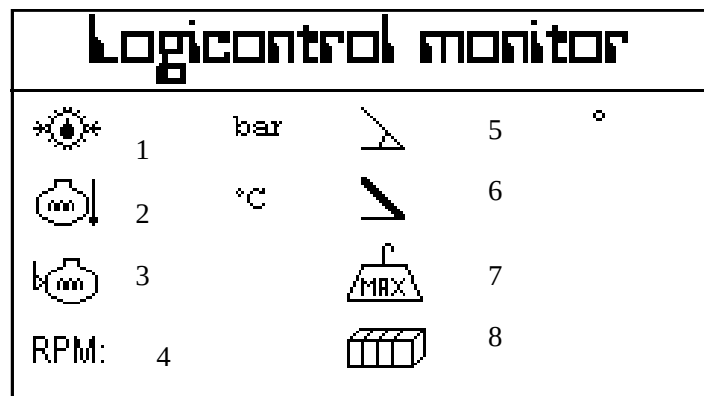


- ❶ Weight Lifted (in tons or thousands of pounds)
- ❷ Spreader seated
- ❸ Machine Stability (100% means overload)
- ❹ Unbalanced Load Indicator
- ❺ Spreader Unlocked
- ❻ Spreader Height (from twist lock to the ground, in meters or feet)
- ❼ Spreader Distance (from front wheel to spreader center, in meters or feet)
- ❽ Spreader Locked
- ❾ Alarms messages and general information

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1.3. MONITOR SCREEN



- ❶ Engine oil pressure
- ❷ Cooling water temperature
- ❸ Cooling water level
- ❹ Engine RPM
- ❺ Boom angle (degrees)
- ❻ Boom length (in meters or feet)
- ❼ Maximum weight allowed
- ❽ Number of containers lifted

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1.4. SAFETIES

Safety	Activation when...	Effect	Display Message	Bypass
Minimum Distance	Spreader distance negative	Boom lifting and retraction locked	<i>Minimum Distance Safety</i>	Code
Unbalanced Load	The container is loaded too much on one side	Sideshift and rotation locked	<i>Unbalanced Load</i>	Code
Lowering Control	Spreader is pushed on the container	Boom lowering and retraction locked	<i>Boom Lowering Locked</i>	Code
Overload	The actual weight exceeds maximum allowed	Boom lifting, lowering and extension locked	<i>OVERLOAD</i>	Key on panel or code
Sensor fault	Some sensor useful for safeties is not working	Boom lifting, lowering and extension locked	<i>Sensor ... fault</i>	Key on panel or code
Height Control	Spreader height is too low (only for machines with piggy back)	Boom Lowering locked	<i>Height Control Safety</i>	Code
Maximum Distance	Spreader distance is too high (only for special boom machines)	Boom lifting, lowering and extension locked	<i>None</i>	Key on panel or code
Stabilizers Control	Machine would be unstable without stabilizers	Stabilizers lifting locked	<i>Stabilizers Control</i>	None
Engine Shut Off	Alarm from engine sensors	Engine if shut off after 20-40 sec.	<i>Engine Shut Off Control</i>	Code

1.5. BYPASS

All safeties described above can be bypassed using the



key and entering proper 4 digits bypass

code (one different for each safety).

All safeties bypass are stored in black boxes.

There are also bypass codes for other functions not listed above:

- Automatic Height Selection Disabling/Enabling
- Alarm Sound Disabling/Enabling
- Operator parameters shown in USA Standard/Metric Standard

The bypass can be removed by pressing again then



key and entering the same code or turning off

and on the power supply (except automatic height selection disabling).

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1.6. MAIN MENU

```
20/06/99  15:14  H: 230

1.Calibrations
2.Test I/O;
3.Alarms Settings;
4.Geometrical Settings
5.Safeties
6.Malfunctions Black Box
7.Containers Black Box
8.System Time

DEL: Exit
```

In the first line, it is displayed the hour meter.
All other functions (calibrations, test and parameters changing) are the same.

1.7. AUTOMATIC VERTICAL LIFTING

In this machines, the only difference is the absence of the dead man sensor on the joystick. So, it is not enough to grip the joystick to stop the automatic movements.

They are anyway stopped as soon as the correct height is reached.

For emergency, or for any other operation requirements, there is a red button close to the joystick, normally used to cut off joystick movements, that makes the job: in the first position, joystick is enabled and automatic movements are disabled.

In the other position, automatic movements are enabled and joystick is disabled.

1.8. ENGINE SHUT OFF CONTROL

In these machines, engine shut off control is activated with following alarms:

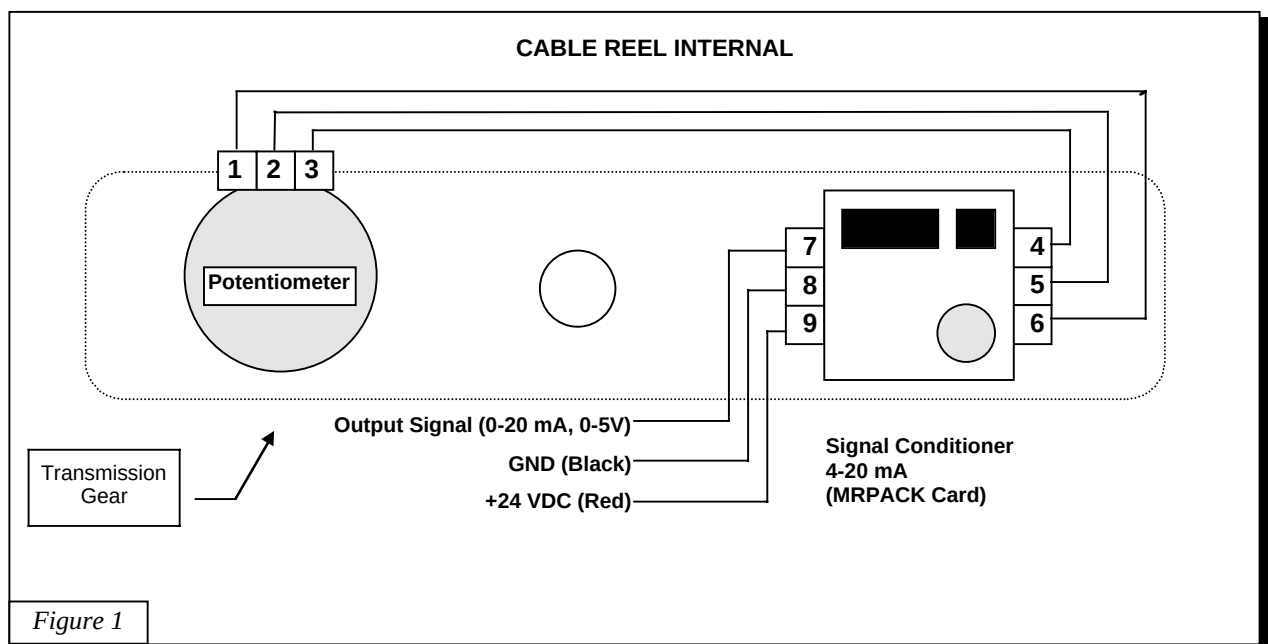
- High cooling water temperature (over 110 °C)
- Low engine oil pressure (below 0.8 bar)
- Low cooling water level

Appendix 2

TROUBLESHOOTING GUIDE: Sensor Test

2.1. TEST PROCEDURES FOR CABLE REEL

2.1.1. Installation



From figure 1, we note that:

Potentiometer is fixed on the plate and connected to the transmission gear trough a dowel
Jumpers on MRPACK card are not necessary
All connections must be as shown

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2.1.2. Cable Reel and Potentiometer characteristics

Table 1

Cable Length	8 mt (+ 3 mt spare)
Cable Reel Mechanics	Steel Cable and Springs
Potentiometer Resistance	5 kohm $\pm$ 5%
Number of Turns	10
Linearity	$\pm$ 0.25%
Operating Temperature	-10° C - +70° C
Storage Temperature	-40° C - +70° C

2.1.3. Resistance Test

Turn power supply off

Disconnect wires 4-5-6 (fig. 1)

Check resistance between wires 1-3: it must be about 5 Kohm for any cable length

Resistance between wires 1-2 or 2-3 must be a value in 0 and 5 Kohm range, slipping cable off

If you find an open circuit, 0 Ohm even if only in some points, potentiometer be replaced

2.1.4. Voltage Test

Make sure all connections are as shown in fig.1.

Turn power supply on

Table 2

Wires	Correct Voltage	If not...
1-3 or 4-6	10 VDC	No power supply or MRPACK fault
8-9	24 VDC	No power supply: check fuses
4-5 or 5-6	2 - 8 VDC	Potentiometer fault or bad positioned: it is out of range
7-8	1 - 5 VDC	No connection MRPACK-Main Card or MRPACK fault

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2.1.5. Working Test

In Test Analogue Inputs, cable reel values must change with boom in/out movements.

In Test Analogue Inputs, sometimes, main card converts current coming from sensor into numbers, with following correspondence (it is an A/D conversion at 10 bit):

Sensor	Value Converted
0 mA (or 0V)	0
20 mA (or 5V)	1023

Correspondence is linear, that means that a 10 mA current is converted into a number like 512.

Values must be as follows:

Maximum value swinging, with boom still, must be about 5 units

During all boom movements, sensor must have a value between 150 and 1000. Out of this range, it is possible to use cable reel inside its non-linear zone, with errors in length calculation and the possibility to damage the potentiometer

Values below 100 cause a system alarm for sensor not connected or fault

With all cable inside drum (zero position), the value must be about 180-200, that corresponds to a signal 0,8 - 1 VDC from MRPACK. In the case it is necessary to replace the potentiometer, this is the condition for a correct position on the assembly.

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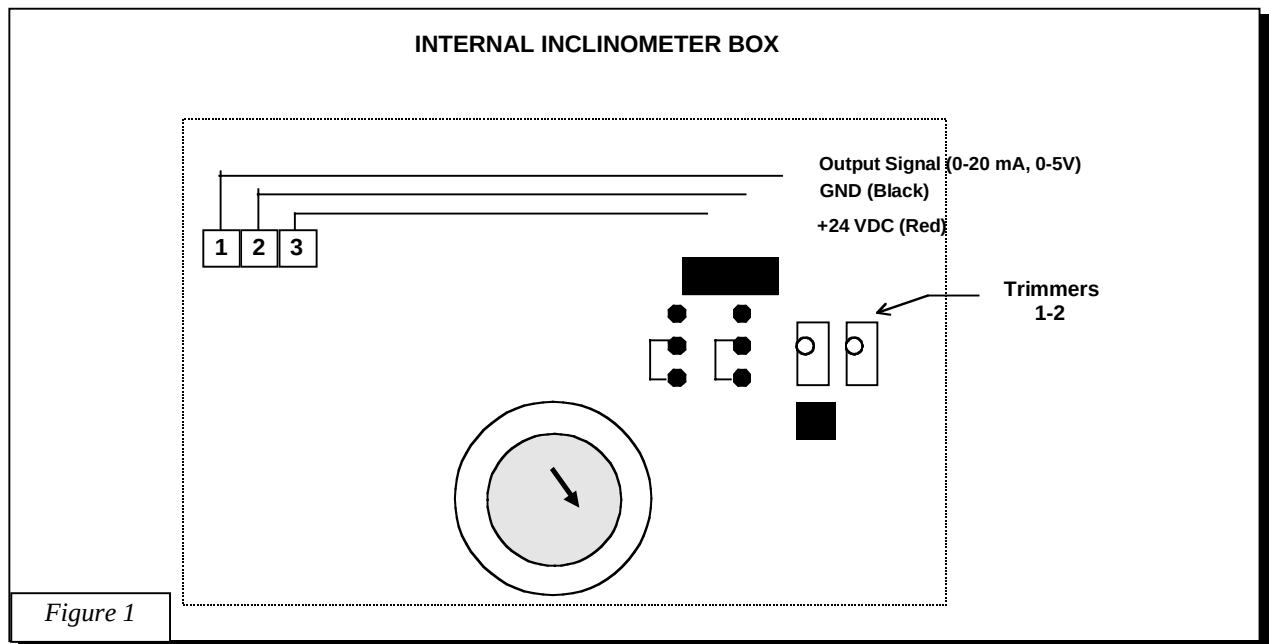
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2.1.6. Troubleshooting

- If the value is at 1023 fixed, at any boom (or cable) length:
 - ⇒ Check connections
 - ⇒ Check for humidity or dirty inside box or into connections
 - ⇒ Check potentiometer signal in zero position
 - ⇒ Replace main card and repeat calibration
- If the value is at 1023 only in some boom positions:
 - ⇒ Check connections
 - ⇒ Potentiometer could be damaged. Perform all tests described above
- If calibration values change during operations:
 - ⇒ Sensor is moving from its original location. Tight dowel on potentiometer shaft and repeat calibration
 - ⇒ Sensor is damaged: replace it
 - ⇒ Cable is slipping off or it has broken: replace all cable reel
- If alarm "Length Sensor fault or not connected" appears on display:
 - ⇒ Check connections
 - ⇒ Perform all tests described above
 - ⇒ Try to take the cable off little by little checking the value from the sensor: if the alarm appears only in some positions, potentiometer is damaged and must be replaced
- If the value never changes:
 - ⇒ Perform all tests described above
 - ⇒ Check connections between MRPACK card and Main Card
- If the value swings a lot or is not moving with linearity:
 - ⇒ Check for humidity or dirty inside cable reel or connections
 - ⇒ Check connections quality
 - ⇒ Perform all tests described above
 - ⇒ Replace Main Card

2.2. TEST PROCEDURES FOR INCLINOMETER (Pendulum Potentiometer)

2.2.1. Installation



From figure 1, we note that:

- Arrow inclination must be about 45 ° respect to ground (with box flat)
- Jumpers must be in the shown position
- There are two trimmers for zero (to get 0 output voltage with 0 degrees) and span adjustment (to increase or decrease output voltage range according to angle measurement)
- All connections must be as shown

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2.2.2. Inclinometer Characteristics

Table 1

Angle range	90° (± 45°)
Maximum Input Voltage	10 VDC
Input Resistance	15 Kohm ± 30%
Linearity	2% f.s.
Tilt Sensitivity Max.	0,01°
Pendulum damper	Silicon Oil
Operating Temperature	0° C - 80° C
Storage Temperature	-40° C - 80° C

2.2.3. Voltage Test

- Make sure all connections are as shown in fig.1
- Turn power supply on

Table 2

Wires	Correct Voltage	If not...
2-3	24 VDC	No power supply: check fuses or power line
1-2	1 - 5 VDC	No connection with Main Card or Amplifier fault

2.2.4. Working Test

In Test Analogue Inputs, inclinometer values must change with boom movements. It is not important if the value increases with boom hoisting or vice-versa.

In Test Analogue Inputs, sometimes, main card converts current coming from sensor into numbers, with following correspondence (it is an A/D conversion at 10 bit):

Sensor	Value Converted
0 mA (or 0V)	0
20 mA (or 5V)	1023

Correspondence is linear, that means that a 10 mA current is converted into a number like 512. Values must be as follows:

- Maximum value swinging, with boom still, must be about 5 units
- During all boom movements, sensor must have a value between 150 and 1000. Out of this range, it is possible to use inclinometer inside its non-linear zone, with errors in angle calculation
- Values below 100 cause a system alarm for sensor not connected or fault

GEA Logicontrol V. 4.0
Fantuzzi Logicontrol System

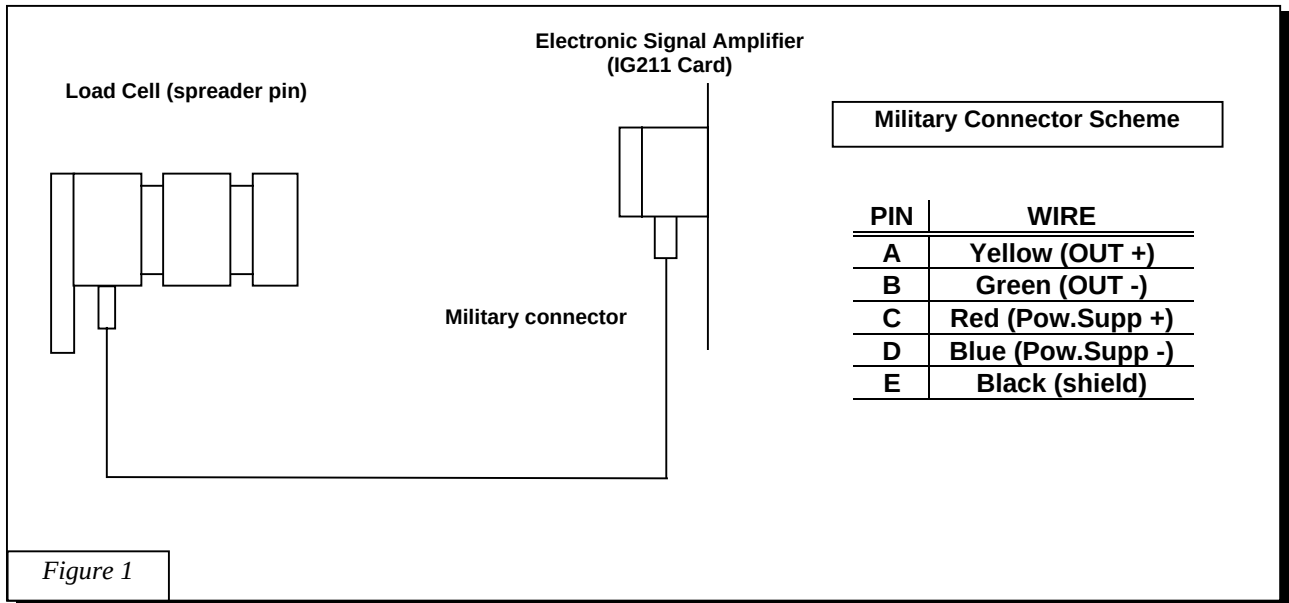
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2.2.5. Troubleshooting

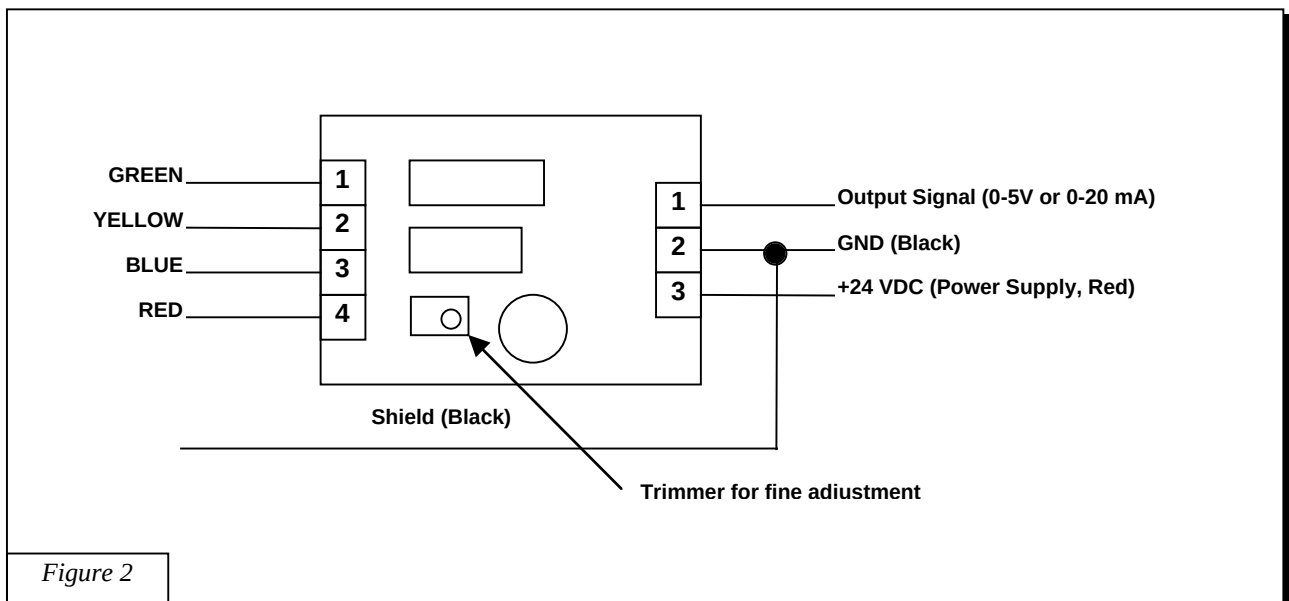
- If the value is at 1023 fixed, at any boom angle:
 - ⇒ Check connections
 - ⇒ Check for humidity or dirty inside box or into connections
 - ⇒ Check inclinometer position
 - ⇒ Replace main card and repeat calibration
- If the value is at 1023 only in some boom positions:
 - ⇒ Check connections
 - ⇒ Inclinometer is bad positioned. Perform all tests described above
- If calibration values change during operations:
 - ⇒ Sensor is rotating from original location. Tight nuts and repeat calibration
 - ⇒ Sensor is damaged: replace it
 - ⇒ Ground is not flat (i.e., if, with boom at minimum, angle displayed is not 0°, check if ground is pendent, because this affects directly sensor reading)
- If alarm "Angle Sensor fault or not connected" appears on display:
 - ⇒ Check connections
 - ⇒ Perform all tests described above
 - ⇒ Check inclinometer position
- If the value never changes:
 - ⇒ Perform all tests described above
 - ⇒ Check connections between MRPACK card and Main Card
- If the value swings a lot or is not moving with linearity:
 - ⇒ Check for humidity or dirty inside box and connections
 - ⇒ Check connections quality
 - ⇒ Perform all tests described above
 - ⇒ Replace Main Card

2.3. TEST PROCEDURES FOR LOAD CELLS

2.3.1. Installation



2.3.2. Amplifier connections



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2.3.3. Load Cells Characteristics

Table 1

	Max. Load	Output
CS 7.5 Machines (type 1)	9 Tons	0,5 mV / V
CS 42-45-50 Machines (type 2)	40 Tons	0,5 mV / V

Output means that load cell supplies 0,5 mV for every Volt of its power supply. Since power supply is 10 VDC, it means that load cell has 5 mV maximum output voltage, for the whole range.

2.3.4. Resistance Test

- Turn power off
- Disconnect wires 1-2-3-4 (fig. 2)
- Check resistances between all wires, two at time (red-blue, red-yellow, and so on)
- If there is any open circuit or 0 ohm, load cell must be replaced

2.3.5. Voltage test

- Make sure all connections are as shown in fig. 1-2
- Turn power on
- With spreader empty:

Table 2

Wires	Voltage Correct	If not
3-4	10 VDC	No power supply / Amplifier fault
6-7	24 VDC	No power supply: check fuses
1-2	1,0 mV - 1,5 mV (type 1) 0,2 mV - 0,9 mV (type 2)	Load cell fault or out of range
5-6	1 - 5 VDC	Bad connections amplifier-main card / Amplifier fault

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2.3.6. Working Test

This table shows correct range and interaction between load cell-Amplifier card.

Table 3

	Load	Output cell voltage	Output Amplifier Voltage	Value Converted
TYPE 1	0 TON	0,0 mV	over 5VDC	1023
	9 TON	5 mV	0 VDC	0
TYPE 2	0 TON	0,0 mV	over 5 VDC	1023
	40 TON	5 mV	0 VDC	0

In analogue input test, load cells values must be as follows:

Empty Spreader:

- 700 - 800 (type 1)
- 800 - 900 (type 2)
- Maximum values difference, with spreader centered, must be 20-30 units

Loaded Spreader:

- Value must decrease about 100 units per ton applied (type 1)
- Value must decrease about 30 units per ton applied (type 2)
- Maximum values difference, with spreader centered and load balanced, must be 20-30 units

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2.3.7. Troubleshooting

- If the load cell value is always 1023 (even only sideshifting):
 - ⇒ Check connections
 - ⇒ Check for humidity or water inside boxes
 - ⇒ If working is anyway correct (value decreases when a load is applied), put a resistance (500 Kohm - 600 Kohm value) into 2-4 (see fig. 2). If values goes back to a correct value, repeat calibration; otherwise, replace load cell
- If the calibration value changes during lifetime:
 - ⇒ Load cell is going out of range: repeat calibration often, put resistance if necessary and replace load cell as soon as possible
 - ⇒ A big or too unbalanced load has moved or damaged load cell: repeat calibration
- If the values of the two load cells are different:
 - ⇒ Check load balancing
 - ⇒ Check connectors and wires (humidity, dirty, ...)
 - ⇒ Recalibrate load: unbalanced load control (if exists) won't work properly
 - ⇒ If the value, with a load applied, goes below alarm threshold, replace load cell
- If the value never changes:
 - ⇒ Make all tests described above
 - ⇒ Check connections Amplifier-Main Card
- If the alarm "Load Cell fault" appears on display:
 - ⇒ Make all tests described above
 - ⇒ Check connections Amplifier-Main Card

Logicontrol V4.3

1. NEW FEATURES

- The movements limitation thresholds are changeable
- “All Safeties Bypass” is stored in the black box and displays a message.
- It is stored into the Operative Black Box the progressive number of the container, that starts from 1 every time the machine is started. This information is available only through data transfer (download to PC or printer)
- Insertion of a special menu to modify access and bypass codes.

2. AVAILABLE VERSIONS

- Stacker CS45/50 (except KM), english language: **V43 CS45 ING.BIN**
- Stacker CS45/50 (except KM), italian language:..... **V43 CS45 ITA.BIN**
- Forklift for full containers (load cells), english language: **V43 FDC-C ING.BIN**
- Forklift for full containers (load cells), italian language:..... **V43 FDC-C ITA.BIN**
- Forklift for empty containers (pressure sensor), english language: **V43 FDC-P ING.BIN**
- Forklift for empty containers (pressure sensor), italian language:..... **V43 FDC-P ITA.BIN**

3. NEW FEATURES DESCRIPTION

3.1 STACKERS

3.1.1 Movements Limitation Thresholds

From menu “1. Calibrations”, the option “4. Boom Limits” has been added, and appears like that:

1. Offset Min.Ang: 1.0
2. Offset Max.Ang: 1.5
3. Offset Min.Len: 0.3
4. Offset Max.Len: 0.2

These values can be modified and they mean the measure of the interlock before reaching the real limit (for example, if the real maximum boom angle is 58 degrees, with the parameters in the example the boom will stop lifting at 57 degrees)

3.1.2 Container Progressive Number

The download of the operative black box has following data:

Date	Time	Container Size	Handling Time (sec)	Average Weight	Machine Hourmeter	Container number
11/04/00	18:02:10	40	10	15.8	4	2
11/04/00	18:01:50	40	20	12.9	4	1
11/04/00	17:50:00	20	30	22.1	3	1

3.1.3 Change of Access and Bypass Codes

It is possible to access to the special menu with the  (arrow down) key. It is required a access code, **fixed and not changeable** (8356). Then, a menu appears:

```
1. Change Codes
2. Codes List
```

Option1 shows the codes list that it is possible to change:

```
1. Menu      5. Overl
2. Calibr    6. Buzzer
3. E.Bbox    7. Distance
              8. L.Cells
              9. Eng.Stop
             10. Din.Saf.
             11. Total

0: Exit
```

On the left side, (from 1 to 3) there are the access codes:

Menu: code to access to the main menu (Menu key, standard 178)

Calibr: code to access to calibrations (standard 300)

E.Bbox: code to erase the black boxes (standard 182)

On the right side (from 5 to 11) there are all bypass codes:

Overl: bypass for overload control, sensors not connected and maximum distance (standard: 1234)

Buzzer: sound alarm (standard: 4444)

Distance: bypass minimum distance control, height safety and boom limits (standard: 2468)

L.Cells: bypass unbalanced load and lowering lock (standard: 2679)

Eng.Stop: bypass engine shut off control (standard: 3434)

Din.Saf: bypass automatic transmission control, in relationship with speed and stability (standard: 1111)

Total: all safeties bypass (standard: 1590)

It is not possible to change automatic movements enable/disable code (1470) and USA standards enable/disable code (9855)

Inserting the number of the code that it is necessary to modify, the system asks first the old code; if the code is correct, the new code is stored.

Option2 require a code, **fixed and not changeable** (2166). Then, a menu appears:

1. Menu : 178	5. Overl : 1234
2. Calibr: 300	6. Buzzer : 4444
3. E.Bbox: 182	7. Distance : 2468
	8. L.Cells : 2679
	9. Eng.Stop : 3434
	10. Din.Saf : 1111
	11. Total : 1590
DEL: Exit	

NOTE: System safety is strictly linked to the diffusion of the codes 8356 e 2166.

3.2 FORKLIFTS WITH LOAD CELLS

3.2.1 Movements Limitation Thresholds

From menu “5. Safeties”, two options have been added:

1. Unbalanced Load: 300
2. L.Cella 1 Limit: 900
3. L.Cella 2 Limit: 900
4. Minimum Height : 1.0
5. Offset Min.Heig: 0.2
6. Offset Max.Heig: 1.5

Options 1-4 are standard. Options 5-6 are the measure of the interlock before reaching the real limit (for example, if real maximum height is 12.0 meters, with the limit at 1.5, lifting will stop at 10.5 meters)

3.2.2 Container Progressive Number

See paragraph 3.1.2

3.2.3 Change Access and Bypass Codes

See paragraph 3.1.3

3.3 FORKLIFTS WITH PRESSURE SENSORS

3.3.1 Movements Limitation Thresholds

In this Logicontrol program version, these limits were already changeable (from version 4.1). From main menu: "5. Safeties":

1. Lower Lock Pr : 60
2. Offset Min.Hei: 0.2
3. Offset Max.Hei: 1.5

If the real maximum height is 12 meters, with 1.5 lifting will stop at 10.5 meters.

3.3.2 Container Progressive Number

See paragraph 3.1.2

3.3.3 Change Access and Bypass Codes

See paragraph 3.1.3

Logicontrol System™

FRED Version 1.0

1. Versions Explanation

The Logicontrol System software has been re-designed in inside Fantuzzi-Reggiane Company, in its Electronic Department.

All programming capabilities using Logicontrol Manager program are the same, in order to maintain compatibility with existing system already installed.

The main program now starts from 1.0, and follows this coding:

V10 CS45-STD ENG.BIN

V10: Version number (1.0). A slight modification changes the number after the comma (1.1), a big modification changes the first number (2.0). It is possible that this kind of modification makes the program not compatible with previous versions.

CS 45: Machine type where the system is installed. There are 4 types of machines:

- **CS 45:** Applied on all CS45, CS50 with Opera Cabin
- **CS 42:** Applied on CS45KM, CS42 without Opera Cabin
- **FDC-C:** Applied on forklifts for full containers, using load cells as weight sensor and with Opera Cabin
- **FDC-P:** Applied on forklifts for empty containers, using a pressure transducer as weight sensor and with Opera Cabin

STD: Standard Version, that can be applied on machines of the same type. If a machine has some special functions, here there is the machine code (i.e.: V1.1 CS45-567 ENG.BIN), or the machines group of codes (i.e.: V1.2 CS45-531/36 ENG.BIN) if there are many machines with the same program version

ENG: Language installed (normally only english and italian are available, other languages on request). Language can't be changed without downloading another program.

FRED – Fantuzzi Reggiane Electronic Department

2. New Features

The new program has following basic modifications compared to the last V4.3 version (for all machine types):

2.1 Black Box Viewing

Black Boxes view now shows all information on the screen, and there is one screen page for each data.

This is an example of a Events Black box screen:

```
EVENTS BLACK BOX
Message 50/87

15/10/00      12:43

Message:      OVERLOAD
MAX:          25.7
Hourmeter:    144

DEL: Exit - Arrows: Scroll
```

This is an example of a Operative Black box screen:

```
OPERATIVE BLACK BOX
Message 101/101

15/10/00      12:43
Size:          20
HTime:         120
Weight:        13.6
Hourmeter:     144
Container:     24

DEL: Exit - Arrows: Scroll
```

Use arrows up/down to scroll through the list.

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2.2 High Boom Speed Control

Machines (stackers only) are now using a hydraulic system able to improve boom speed.

Logicontrol controls these additional electro valves.

The first electro valves group is installed on the distributors, and it is activated at following conditions:

- Spreader distance over 4.5 meters $\Rightarrow$ Normal Speed
- Low Engine RPM (value adjustable) $\Rightarrow$ Normal Speed
- Distance below 4.5 meters, high rpm, weight below 28 tons and stability over 80% $\Rightarrow$ High Speed

When high speed is disabled, a message: “**High Boom Speed Disabled**” appears on display. The engine RPM threshold can be set in the Safeties Settings screen.

The second electro valves group is installed on the lifting cylinders, and it is activated simply when the weight is below 8 tons.

No additional message is provided.

2.3 Temperature sensors

Some machines install digital temperature switches instead of analogue switches for cooling water, engine oil and transmission oil.

When normal analogue sensors are installed, in the second screen page there is the real temperature measurement.

When digital sensors are installed, in the second screen page there is the message “OK” when temperature is in the correct range, “ALARM” when there is high temperature.

2.4 Machine Configuration Menu

A new menu “Machine Configuration” has been added in the Calibration menu, where it is possible to enable/disable automatic movements, USA standards and temperature sensors type.

Bypass codes for USA standards and automatic movements enabling has been deleted.

This is the screen:

1. Automatic Mov.	YES
2. USA Standards	YES
3. Analog. Sensors	NO
DEL: Exit	

Logicontrol System™

V11 CS45 STD

FRED Version 1.1 Standard for STACKER CS 45-50
- English -

VERSIONS AVAILABLE:

- V11 VS45-STD ITA.BIN: Italian language
- V11 VS45-STD ENG.BIN: English language
- V11 VS45-STD ESP.BIN: Spanish language

1. Black Box Window

In the black box display window, in case of overload message, it has been added the information of the working radius at the overload moment:

EVENTS BLACK BOX	
Message 50/87	
Date: 15/10/00	12:43
Message:	
OVERLOAD	
Distance :	2.7
MAX :	43.5
Hourmeter:	144
DEL: Exit - Arrows: Scroll	

2. Calibrations Menu

Menu **machine calibrations** is now like that:

```
1.Calibration Angle
2.Calibration Length
3.Calibration Load
4.Boom Limits
5Automatic Heights Calib.
6.Machine Configuration
7.Engine RPM Calibration
8.Speed Calibration
9.Download Calibrations

DEL: Exit
```

Here follows the explanation of the new options:

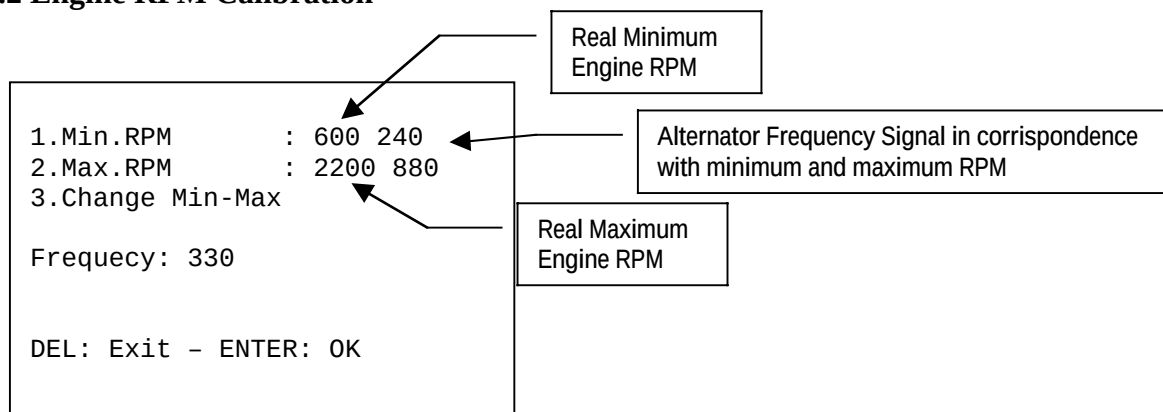
2.1 Machine Configuration

```
1Automatic Mov.      YES
2.USA Standards      YES
3.Analog.Sensors     NO
4.Stabilizers        YES

DEL: Exit
```

There is a new option (4) that allows the system to know if the stabilizers are installed. Different machine controls will change consequently.

2.2 Engine RPM Calibration



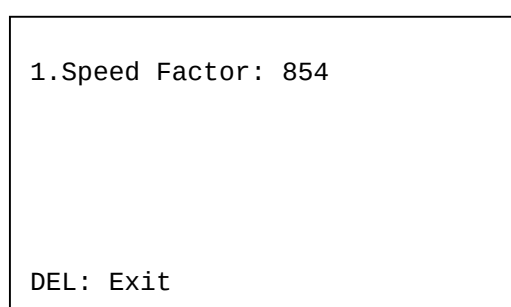
Engine RPM is calculated according to the frequency signal coming from alternator (input pin “r”). Using this window, it is possible to calibrate real engine RPM from this signal:

- Leave engine at minimum RPM (no accelerator)
- Press 1 (frequency value is copied in the line “Min . RPM”)
- Push throttle at maximum and set engine at maximum RPM
- Press 2 (frequency value is copied in the line “Max . RPM”)
- Press ENTER to store the calibration

If reference RPM was different (600 and 2200 in the example) it is possible to change them using the option 3 and inserting the real reference RPM.

This calibration is necessary in case of alternator type replacement.

2.3 Speed Calibration



If real machine speed is different from the speed shown on Logicontrol screen, it is possible to adjust it changing the speed factor: this is proportional to the speed displayed (a bigger number means a higher speed)

2.4 Download Calibrations

In the Logicontrol Manager program it is provided the option to store and recover standard calibrations (only for stackers).

All parameters added for version updating or for special machine requirements can't be managed by Logicontrol Manager.

Besides, it is not possible to update the Logicontrol Manager program, because this would create an incompatibility with the existing machines, with many problems for the Service.

So, to overcome this problem, it is now added the possibility to download all existing machine calibrations using the serial port, in order to store them into a text file.

Eventually, it is possible to print them directly using a serial printer with this settings:

9600,n,8,1.

In the following table there is an example of a calibrations download:

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Value	Meaning
201 - 820	Values of angle sensor corresponding to minimum and maximum calibration angles
0.0 - 59.2	Minimum and maximum calibration angles
209 - 760	Values of length sensor corresponding to minimum and maximum calibration length
8.85 - 15.65	Minimum and maximum calibration boom length
1693 – 1288	Load cells values sum correspondign to minimum and maximum calibration weights
0.0 - 25.0	Minimum and maximum calibration weights
950 - 950	Load cells limits for boom lowering control
0.00	Distance limit for distance control
0.10	Minimum height for piggy back legs control
300	Load cells difference for unbalanced load control
9.00	Maximum distance for boom control
1500	Engine RPM for high boom speed
6.95	Wheel Distance for machine geometry
1.70	Spreader-Ground Distance for machine geometry
0.30	Boom spreader distance for machine geometry
80	Overload prealarm threshold
100	Overload limit threshold
2	Delay on movements lock for overload
2	Delay on movements unlock after overload
1.50 - 1.50	Degrees before minimum and maximum angles for boom movements limits
0.08 - 0.10	Meters before minimum and maximum boom length for boom movements limits
YES NO YES NO	Machine Configuration: Automatic Movements – USA standards – Analogue Sensors – Stabilizers
296	Speed Factor
690 - 2300	Real minimum and maximum calibration engine RPM
280 - 800	Frequency of alternator signal corresponding to engine minimum and maximum RPM
10 – 200 - 800	Step, minimum and maximum speed of automatic movements (lifting)
10 – 200 - 800	Step, minimum and maximum speed of automatic movements (lowering)
10 – 200 - 800	Step, minimum and maximum speed of automatic movements (extersion)
10 – 200 - 800	Step, minimum and maximum speed of automatic movements (retraction)
20 – 30- 30	Percentage of speed reduction for automatic movements (lifting)
20 – 30- 30	Percentage of speed reduction for automatic movements (lowering)
178	Code for main menu access
300	Code for calibrations
182	Code for black box erasing
0	Spare Code (not used)
1234	Code bypass overload
4444	Code bypass buzzer
2468	Code bypass distance control
2679	Code bypass load cells controls
3434	Code bypass engine shut off control
1111	Code bypass automatic transmission controls
1590	Code bypass all safeties