



3 B6 LMI

Operators Manual

for

TEREX|FRANNA

AT-15 Series III (S/ N 1904 & 1920 Onwards)

Version 25/10/06



Complies to the MACHINES DIRECTIVE Standards: EN60204-1, EN954, EN12077-2
EMC according to the " Heavy Industrial Environment" category: EN50081-2, EN50082-2

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SWITCHING ON THE LMI

The system will switch on automatically after the engine is started, and will display the TEREX-FRANNA logo for a few seconds.



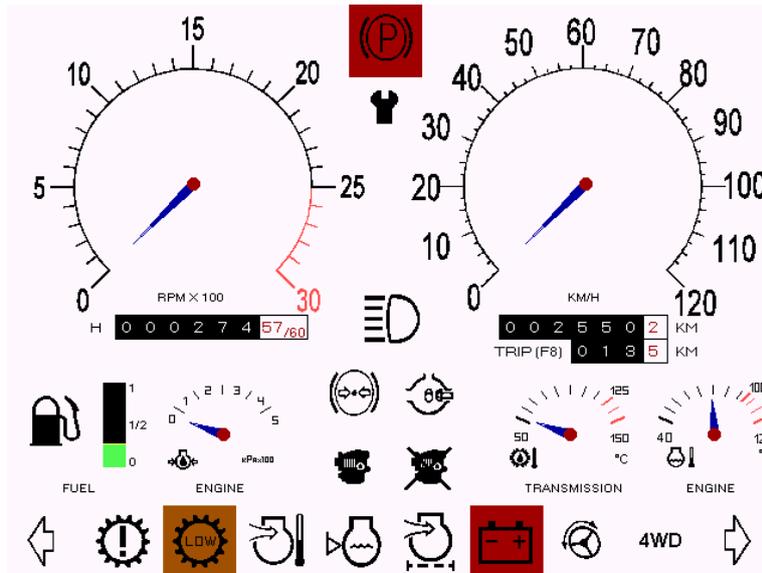
During the start up phase the system performs a self test and sounds the alarm for a short period of time.

The system has two functional modes with different Main Screens:

- 1: Travel Mode (1A and 1B)
- 2: Crane Mode

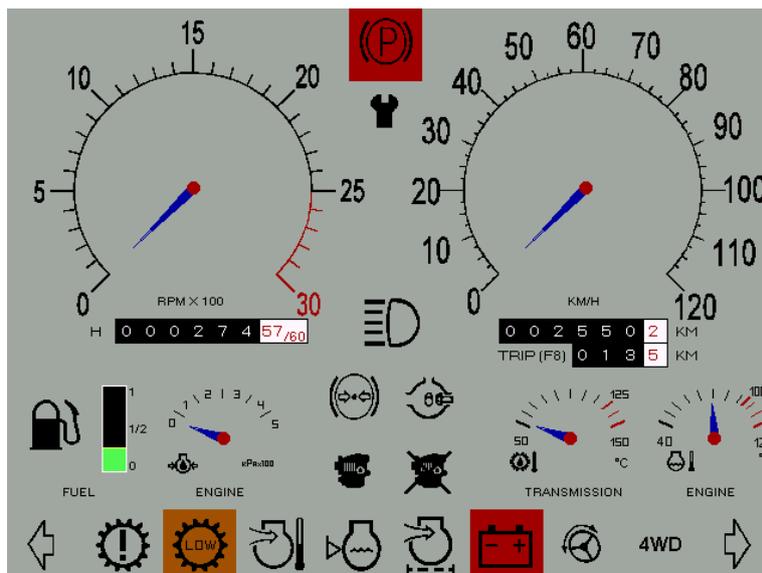
1A) *Travel Mode*

The screen below will be displayed whenever the machine is not in Crane Mode.



1B) *Travel Mode*

For night driving the screen will darken whenever the park lights are switched on, see below.

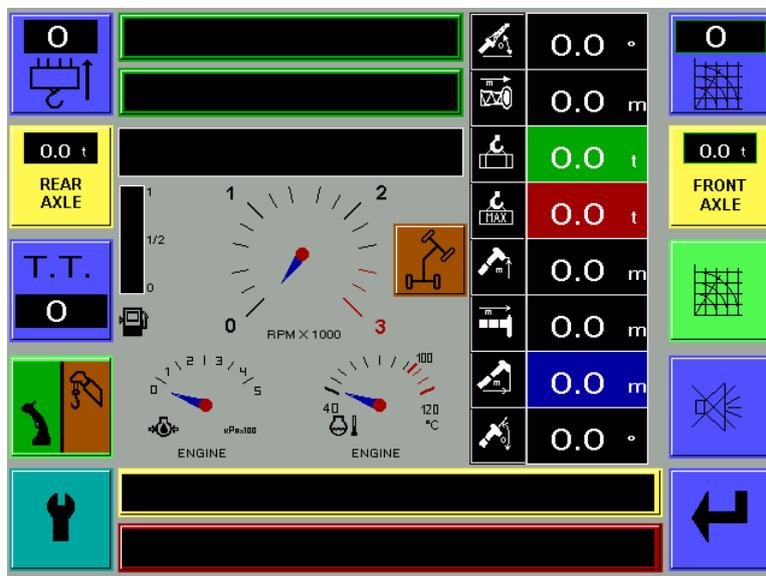


2) Crane Mode

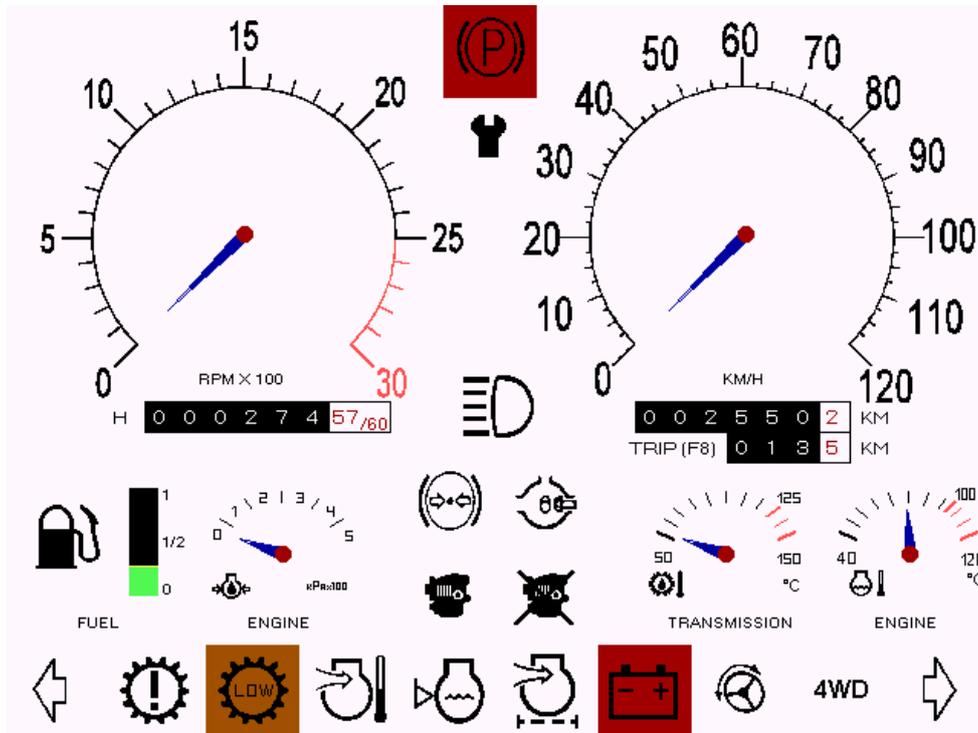
Used when operating the machine as a crane.

Crane Mode is selected by engaging low range and switching the Crane/Travel mode switch on the dash to Crane mode - Travel Mode is selected under all other conditions.

After selecting Crane Mode the operating mode (see page 23) and parts of line (see page 7) for the applicable crane configuration need to be selected and then confirmed by pressing F10.



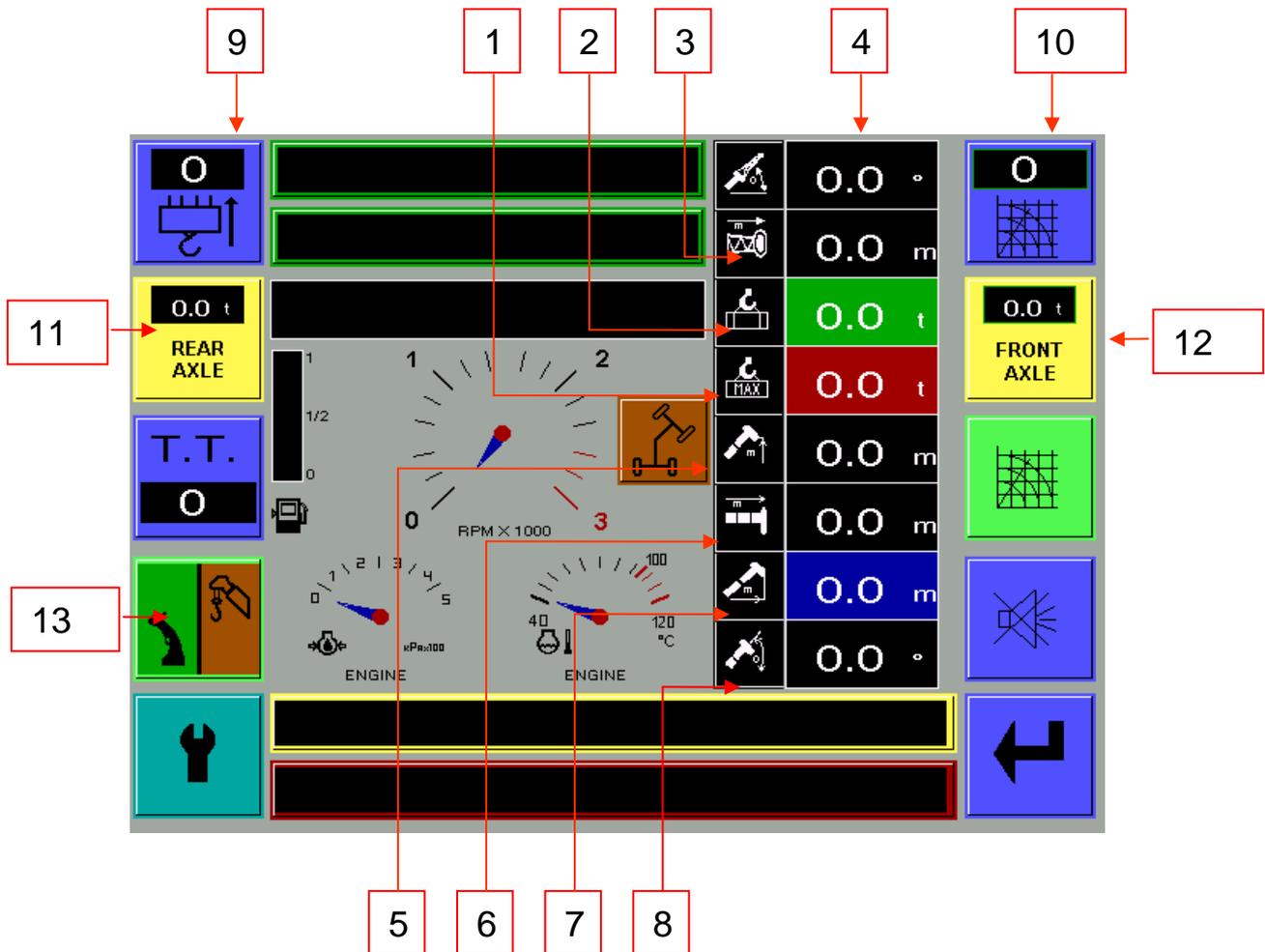
TRAVEL MODE MAIN SCREEN



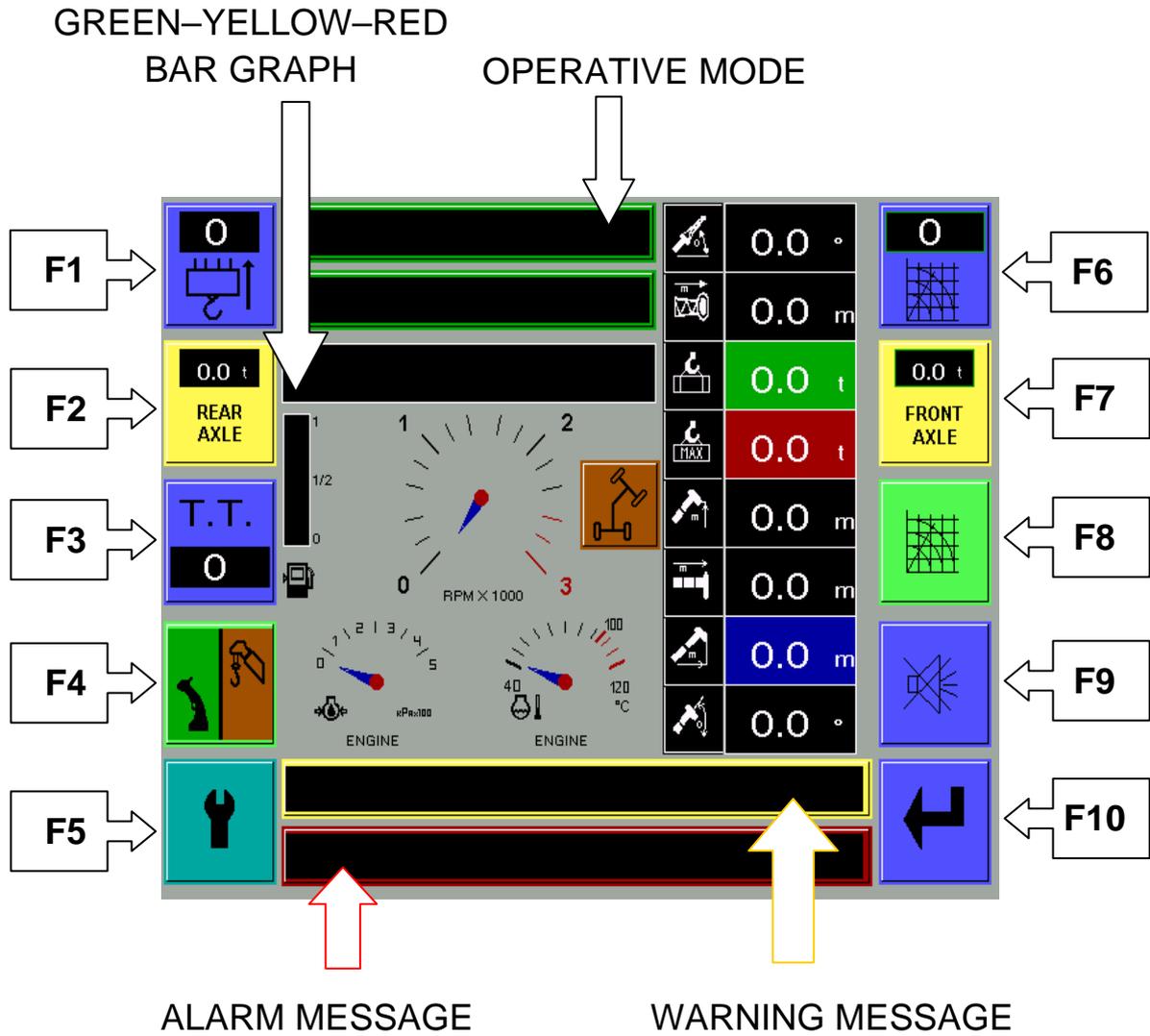
This screen will be displayed automatically when the Crane/Travel Mode switch is on Travel or High Range is selected.

NOTE: Press F10 from this Travel Mode Main Screen to switch to the Diagnostic Access Screen (see page 13).

CRANE MODE MAIN SCREEN



- | | |
|--|---|
| <ol style="list-style-type: none"> 1) SAFE WORKING LOAD 2) ACTUAL LIFTED LOAD 3) JIB LENGTH 4) JIB OFFSET ANGLE 5) TIP HEIGHT FROM GROUND 6) BOOM LENGTH 7) WORKING RADIUS 8) MAIN BOOM ANGLE 9) PARTS OF LINE 10) OPERATING MODE 11) REAR AXLE LOAD 12) FRONT AXLE LOAD 13) JOYSTICK AND WINCH | <p>Displaying “Tonnes”, with a decimal point.</p> <p>Displaying “Tonnes”, with a decimal point.</p> <p>Displaying “Meters”, with a decimal point.</p> <p>Displaying “Degrees”, with a decimal point.</p> <p>Displaying “Meters”, with a decimal point.</p> <p>Displaying “Meters”, with a decimal point.</p> <p>Displaying “Metres”, with a decimal point</p> <p>Displaying “Degrees”, with a decimal point.</p> <p>Manually selectable with F1 button.</p> <p>Corresponds to the Duty of the load charts table.</p> <p>Weight on the rear axle (Refer Notes)</p> <p>Weight on the front axle (Refer Notes)</p> <p>Displaying the Speed of Joystick and Winch</p> |
|--|---|



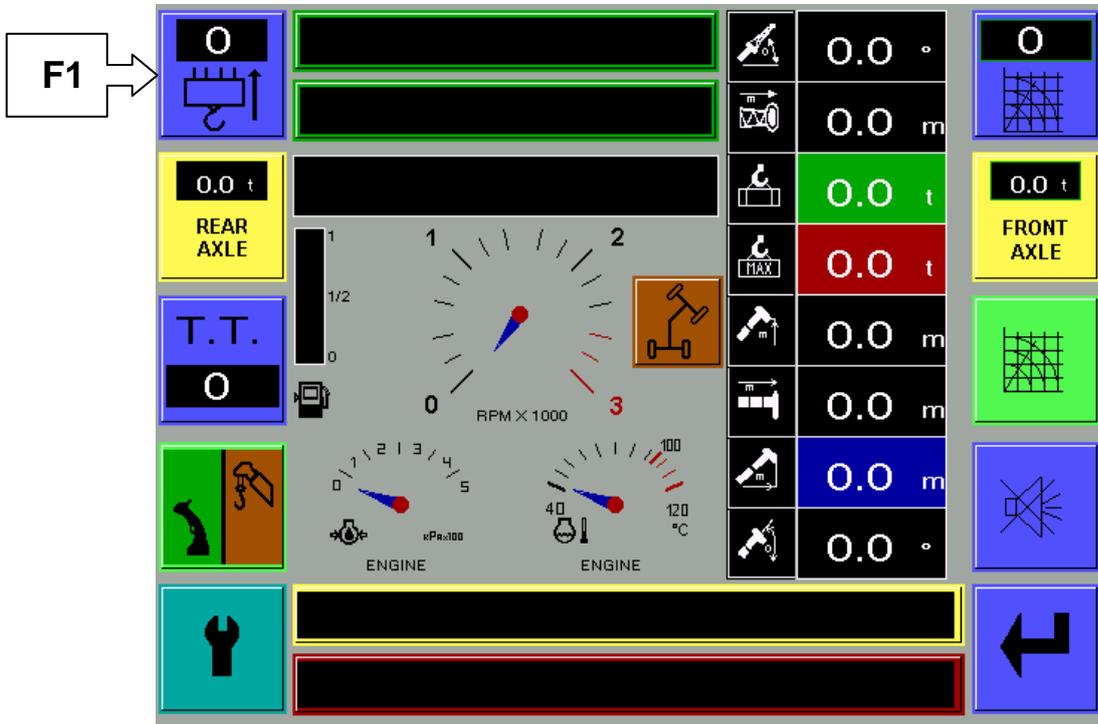
FUNCTION BUTTONS OPERATION

- | | |
|-------------------------------|-----------------------------------|
| F1 → Parts of Line (Increase) | F6 → Operative mode |
| F2 → No Function | F7 → No Function |
| F3 → Turbo Timer | F8 → View the load chart |
| F4 → Black Box access | F9 → Buzzer disable / alarm reset |
| F5 → Diagnostic Access | F10 → ENTER / CONFIRM |

Any time that the operator changes the configuration of the machine, parts of line or operative mode, he must always confirm the operative mode by pressing F10.



F1 SETTING UP PARTS OF LINE



PARTS OF LINE SET-UP

It's necessary to set the correct parts of line every time the fall block is re-reeved, and/or a new operating mode is selected.

WARNING :

An incorrect number of parts of line could lead to a dangerous situation.

To change the number of parts of line proceed as follows:

- Press buttons F1 (increase) intermittently until the correct number of lines is displayed.
- Press the **ENTER** button (F10) to confirm the selection, and re-activate the functions.

NOTE : If the rope capacity is exceeded, the system's alarm is activated and a warning message will appear on the screen.

F3 TURBO TIMER

The LMI controls the engine shut down when turning off the ignition key.

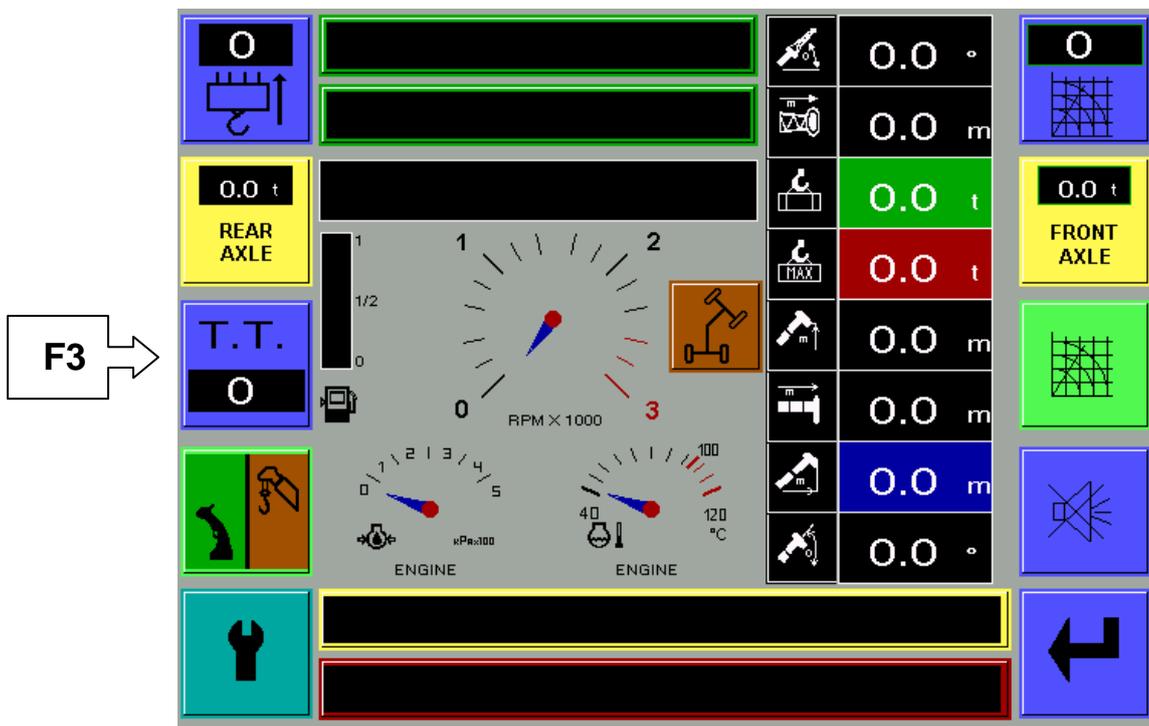
The default turbo timer shutdown time can be changed from 0, 1 or 2 minutes to allow for varying engine load duty usage.

Press the F3 button to toggle the display through these time settings.

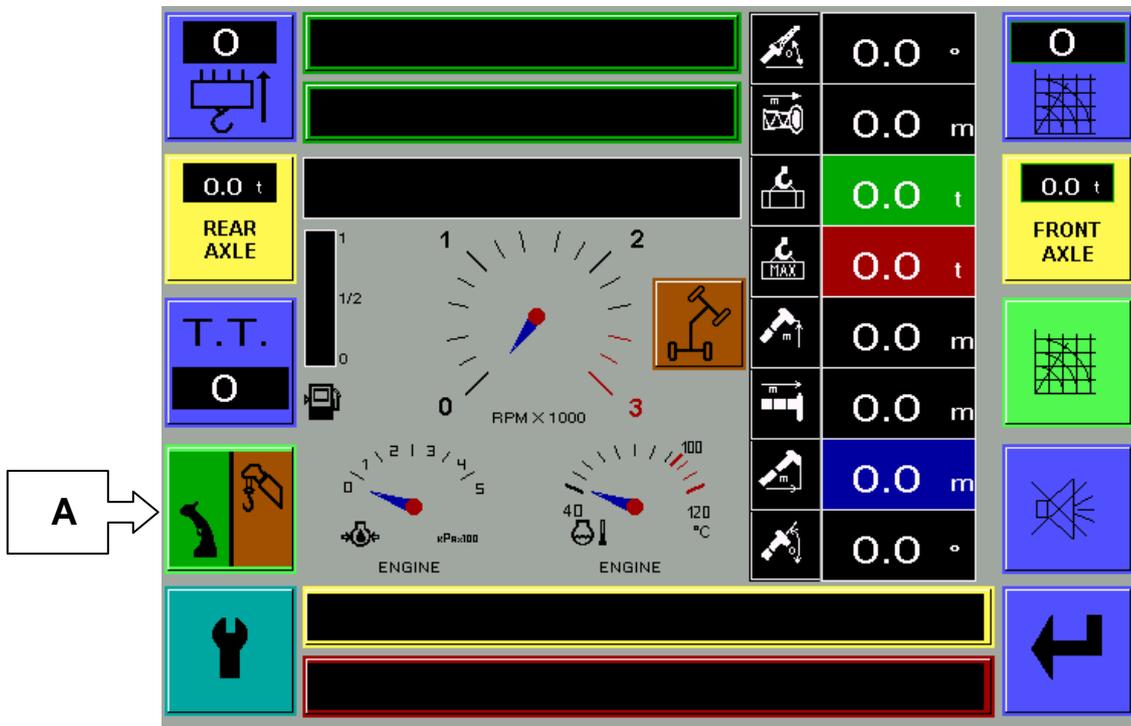
Upon turning the ignition key to the off position, the LMI will begin to countdown for the selected number of minutes until engine and crane electric's are switched off.

During this period of time the engine and crane electric's may be stopped immediately by pressing the F3 button or depressing the emergency stop button.

The emergency stop button may also be pressed at any time (even with the ignition key on) to switch off the engine only. If the ignition key is then switched off the crane electric's will also be switched off.



JOYSTICK AND WINCH SPEED



A → This icon shows two symbols:

the left symbol indicates the joystick speed status selected by the left button on the joystick.

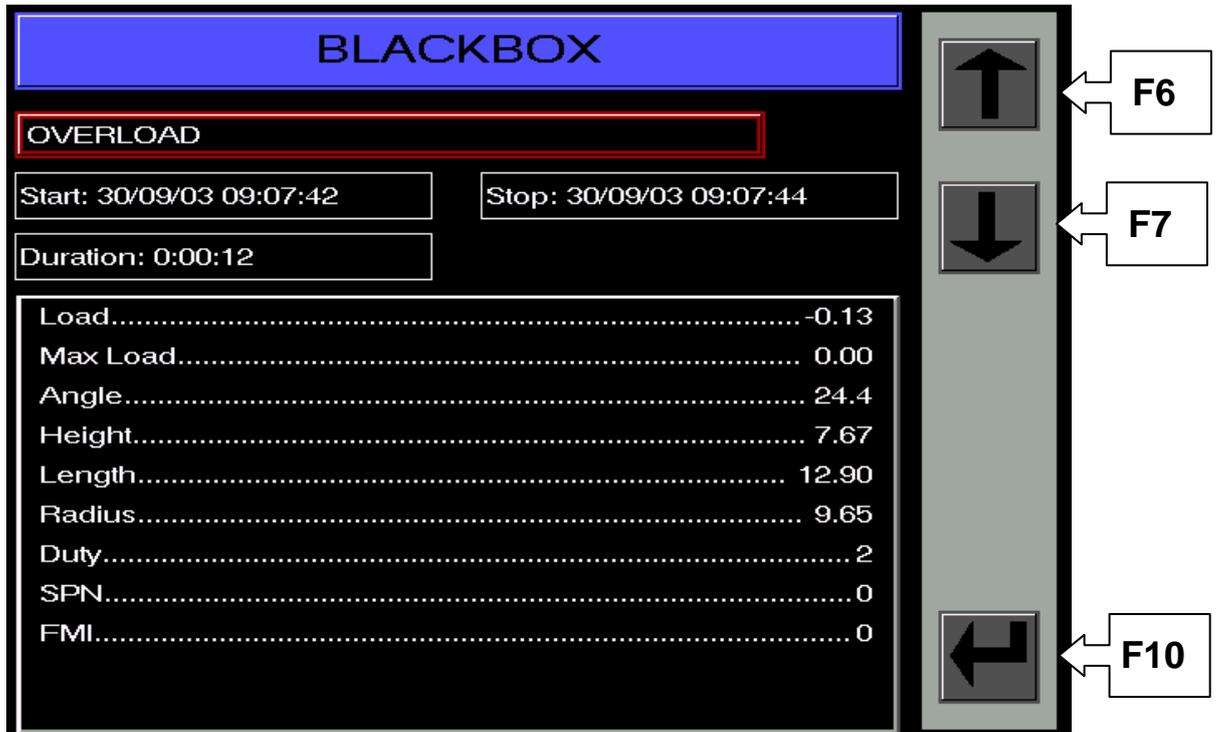
The right symbol indicates the winch speed status selected by the right button on the joystick.

Green colour indicates high/fast speed

Amber colour indicates low/slow speed

F4 BLACK BOX (DATA LOGGER)

To access the black box function press F4 button from the Crane Mode Main Screen and enter the password.



All the files in this page can be scrolled up and down with:

- F6 Up
- F7 Down
- F10 Exit

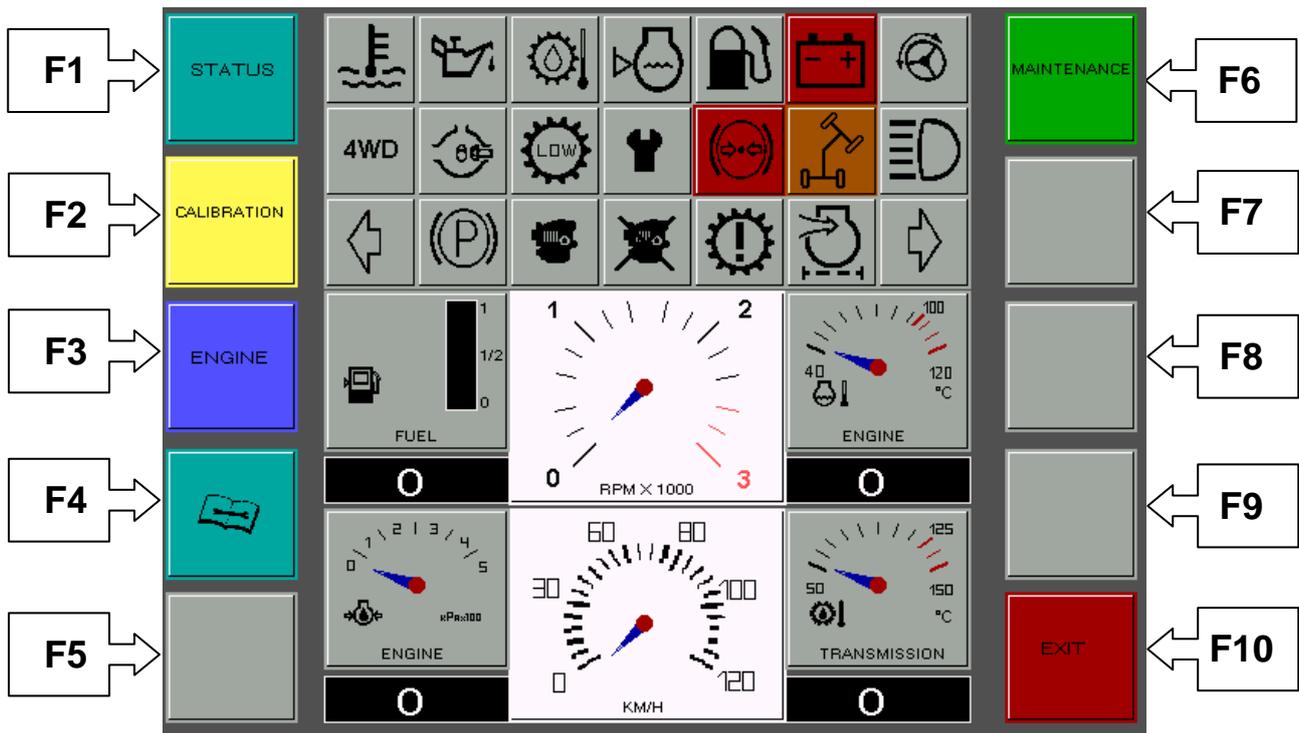
DISPLAY DESCRIPTION

- 1) Date and time of the start of lift cycle recording.
- 2) Date and time of the end of lift cycle recording.
- 3) Duration of the lift cycle recording.
- 4) Data stored in the black box.

F5 DIAGNOSTIC ACCESS

The LMI is equipped with a self-diagnostic system which is able to detect faulty pressure transducers, or boom angle/length sensors, broken cables or internal electronic faults. When an alarm occurs, the LMI goes into a safe mode stopping all dangerous motions, if equipped with optional stop valves, and at the same time the display shows an alarm message code, which will assist in identifying the fault.

The LMI also monitors the status of engine, transmission and other vehicle sensors. To access the diagnostic screen from the Crane Mode Main Screen press F5.



F1 → LMI Diagnostic Access – press F1 to view the status of the CPU’s with the MDS.

F6 → Scheduled Maintenance Menu – press F6 to display the menu

F2 → Calibration Mode Access – press F2 and enter the applicable Password to calibrate the Boom Angle and Length.

F7 → Not Used.

F3 → Engine Diagnostic – press F3 to view the Engine fault codes.

F8 → Not Used

F4 → SW Maintenance access Button – Password for MDS

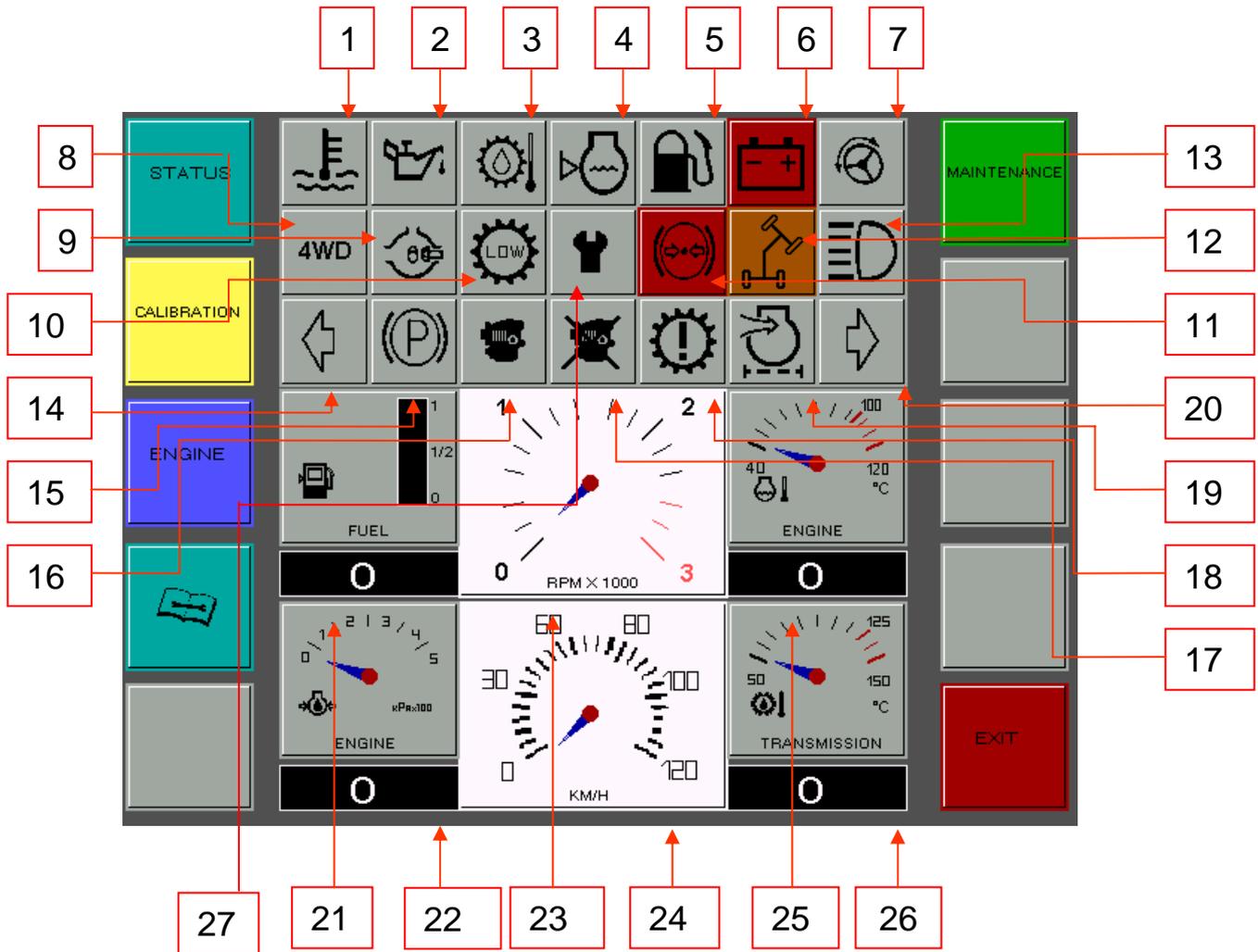
F9 → Not Used

F5 → Not Used

F10 → Exit Button - press F10 to exit.



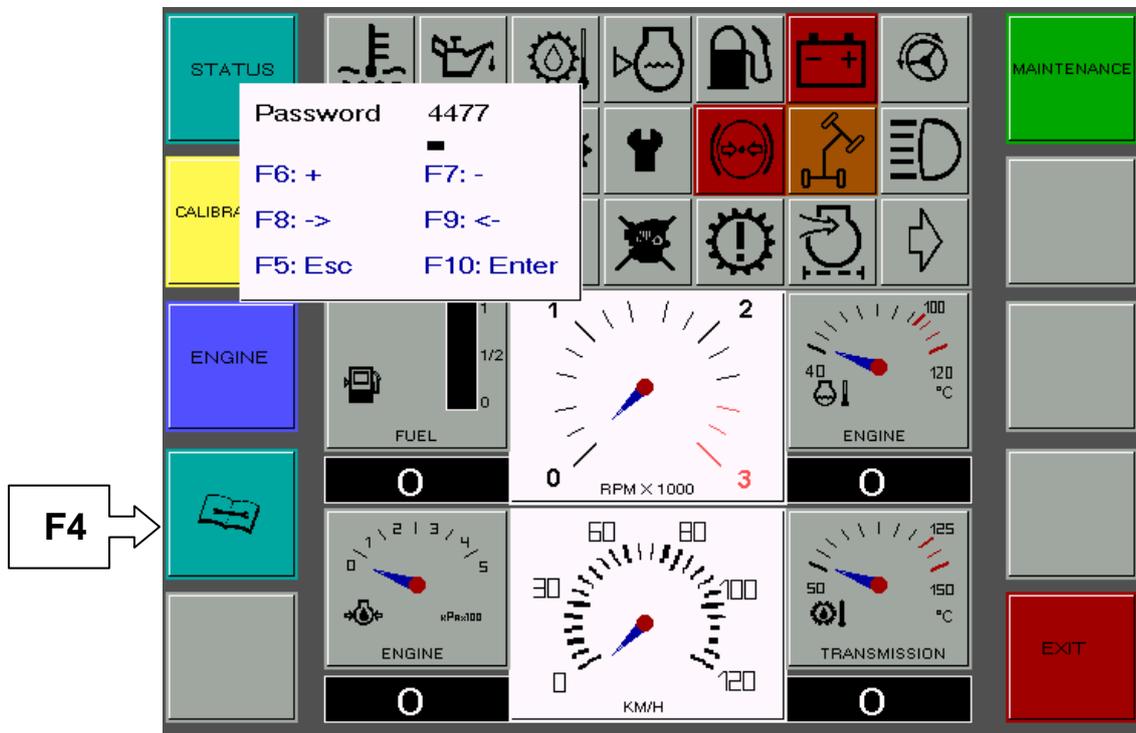
WARNING LIGHTS AND GAUGES



- | | |
|--------------------------------|----------------------------------|
| 1) High engine temperature | 15) Parking Brake |
| 2) Low engine oil pressure | 16) Check Engine |
| 3) High trans. oil temperature | 17) Stop Engine |
| 4) Low water level | 18) Check Transmission |
| 5) Low fuel level | 19) Air Filter Restriction |
| 6) Alternator/Battery | 20) Right Turn Indicator |
| 7) Emergency steering pump | 21) Fuel Gauge |
| 8) 4WD | 22) Engine Oil Pressure |
| 9) Differential Lock | 23) Tachometer RPM |
| 10) Low Range | 24) Speedometer KM/H |
| 11) Low Air pressure | 25) Engine Water Temperature |
| 12) Articulation (green/amber) | 26) Transmission Oil Temperature |
| 13) High Beam | 27) Scheduled Maintenance Due |
| 14) Left Turn Indicator | |

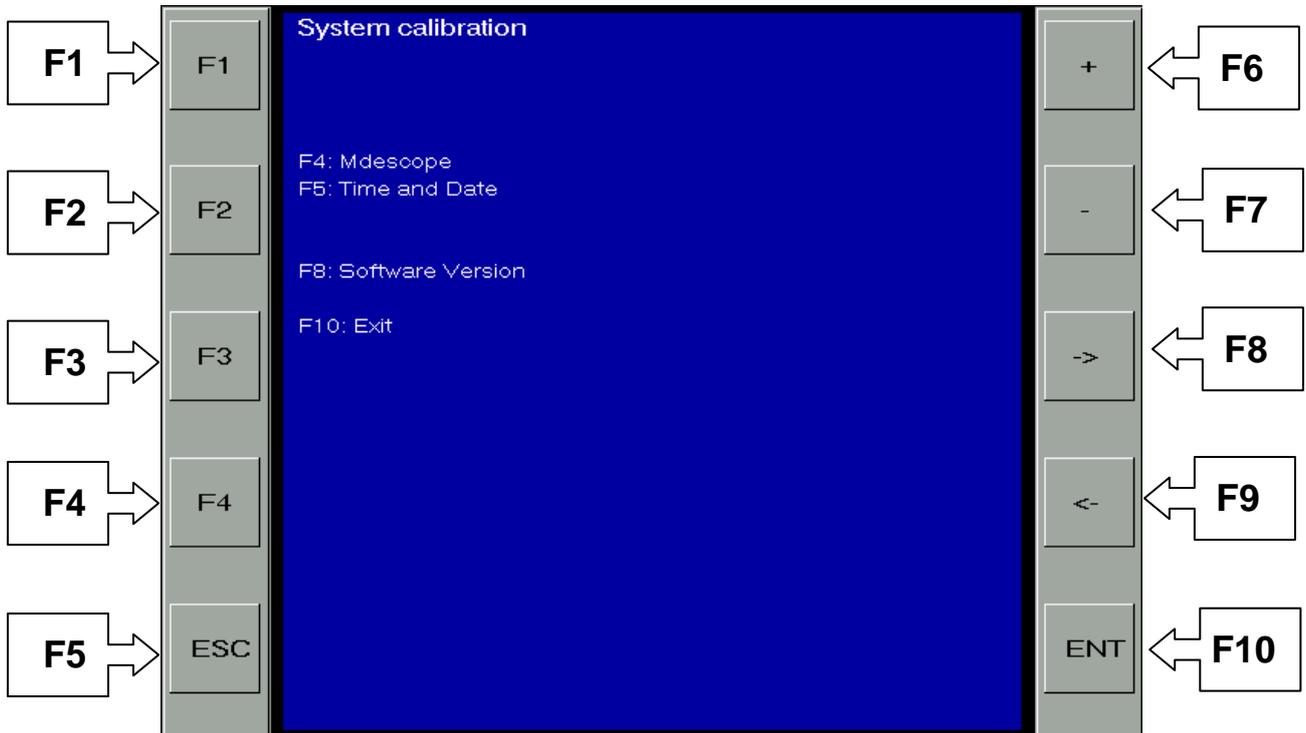


F4 Password for Mdescope



F4 → When pressing this button, a mask password appears on the screen. By inserting the applicable password it will allow access to the Mdescope, and enable the technician to modify the values of the system parameters.

F1 Mdescope



- F1 → Not used
- F2 → Not used
- F3 → Not used
- F4 → Open MDESCOPE
- F5 → Set Time and Date
- F6 → Not used
- F7 → Not used
- F8 → View the Software Version
- F9 → Not used
- F10 → Return to the diagnostic access screen

Set Time and Date



- F1 → Insert Time and Date
- F2 → Not used
- F3 → Not used
- F4 → Not used
- F5 → Not Used
- F6 → Not used
- F7 → Not used
- F8 → Not used
- F9 → Return to previous page
- F10 → Not used

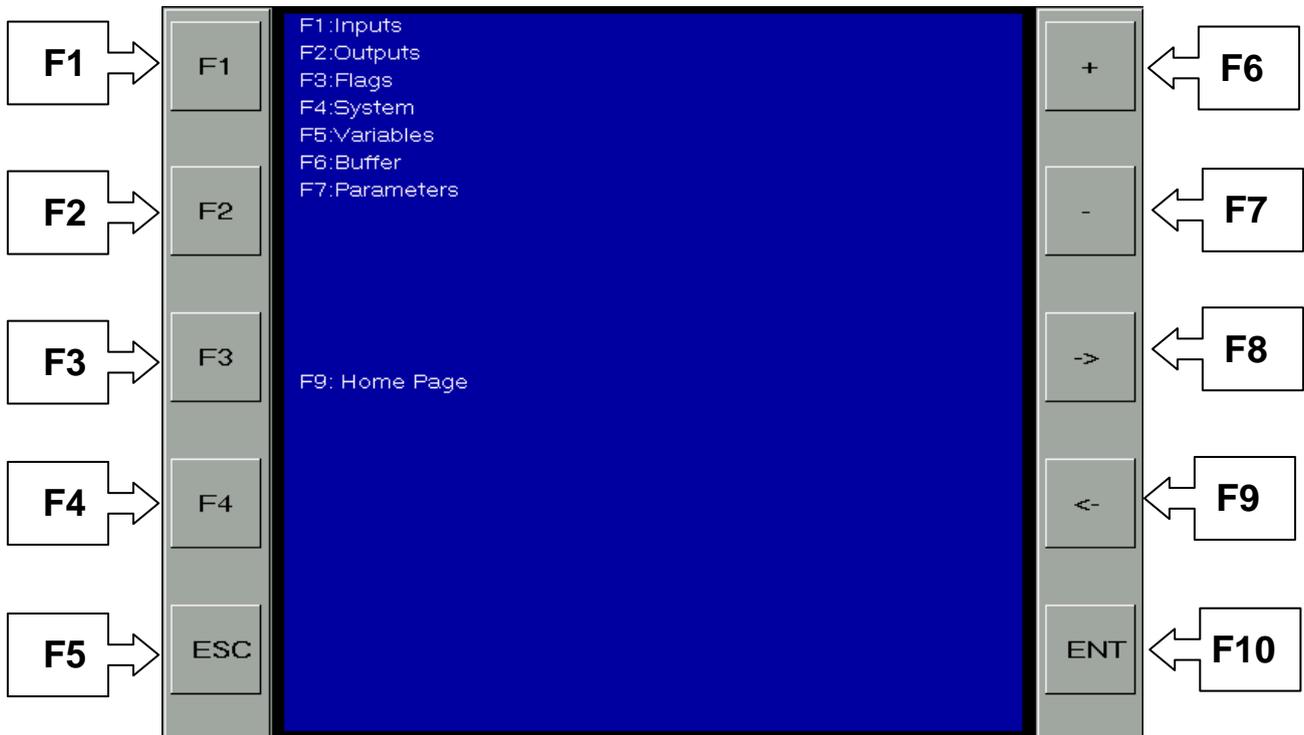
Set Time and Date



Whilst setting the Date and Time, the buttons have other functions.

- F1 → Not used
- F2 → Not used
- F3 → Not used
- F4 → Not used
- F5 → Escape without confirmation
- F6 → Increase value
- F7 → Decrease value
- F8 → Move to right
- F9 → Move to Left
- F10 → Enter and confirmation

Mdescope

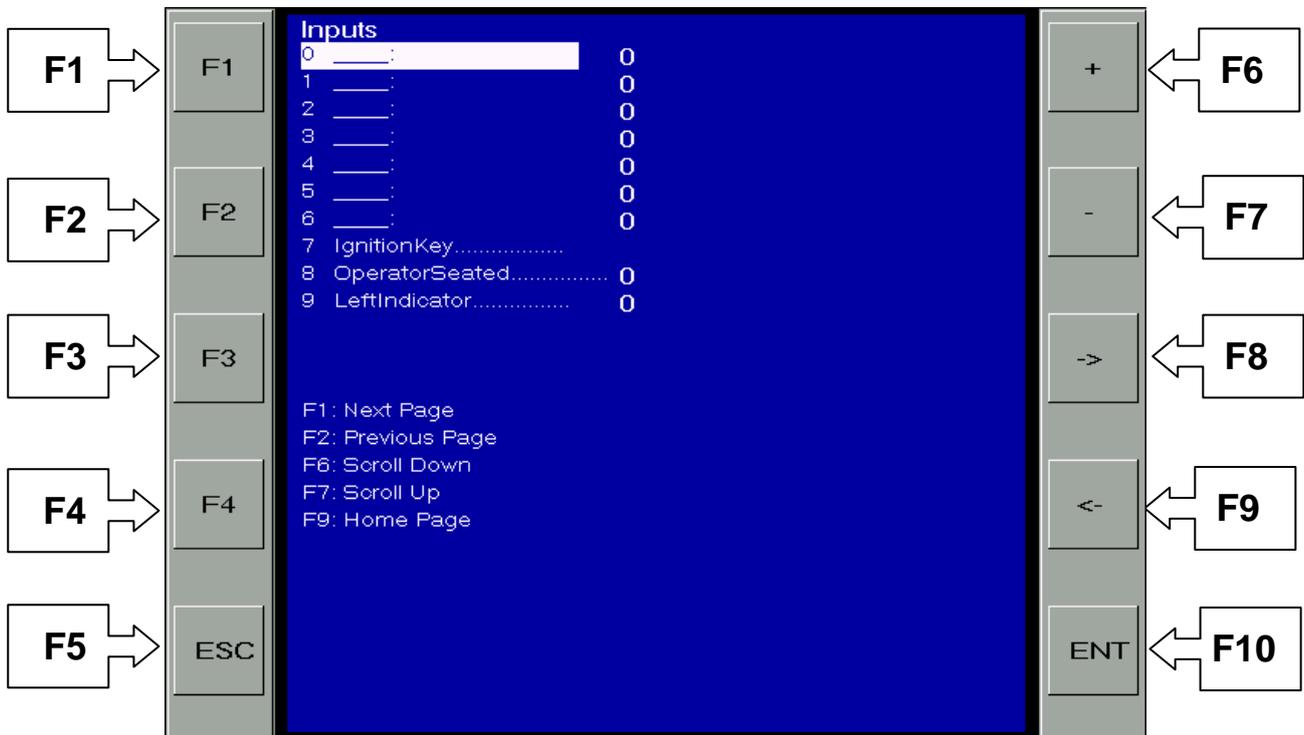


On selecting the Mdescope, the above menu will open.

Select the appropriate field to be viewed

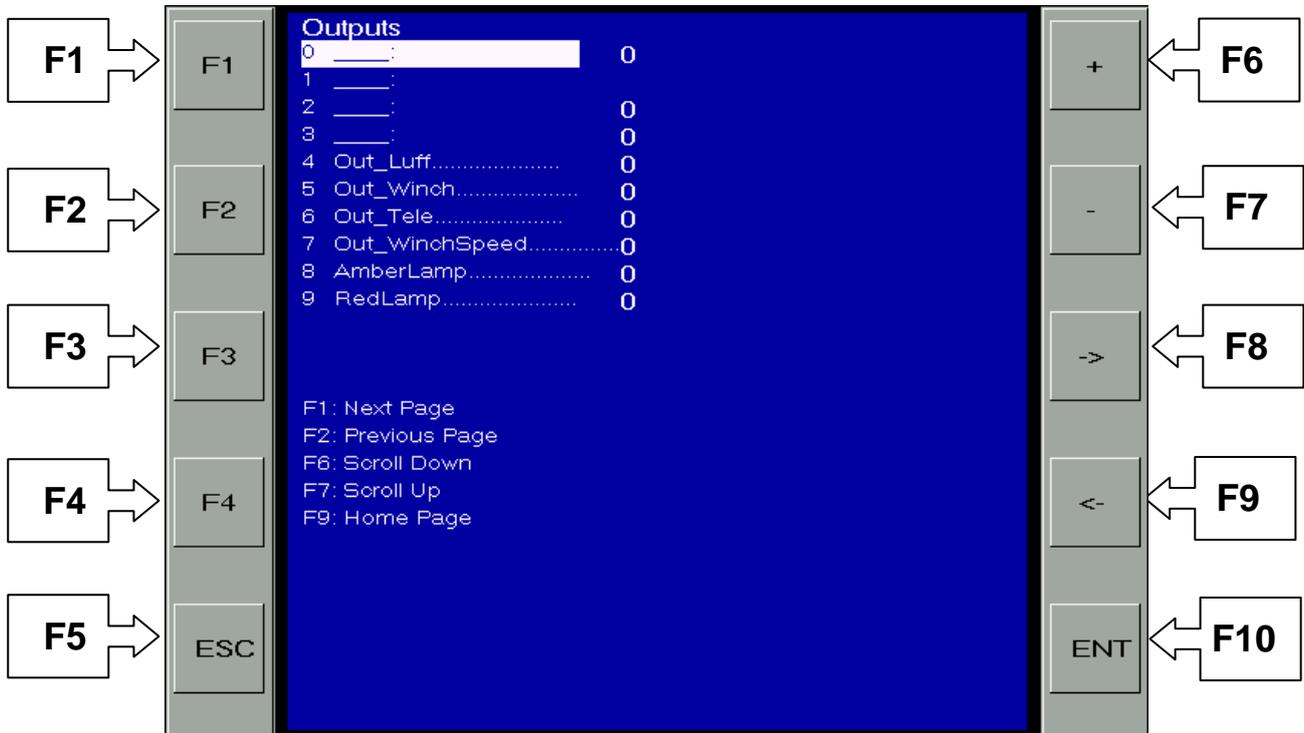
- F1 → Inputs: all the inputs to the HEAD unit can be viewed.
- F2 → Outputs: all the outputs from the HEAD unit can be viewed.
- F3 → Flags: flags used in the software.
- F4 → System: system variables used in the software and ADC values
- F5 → Variables: variables used in the software
- F6 → Buffer: other variables used in the software
- F7 → Parameters: all parameters used in the software and system calibration.
- F8 → Not Used
- F9 → Return to the previous page
- F10 → Not Used

MDS - INPUT



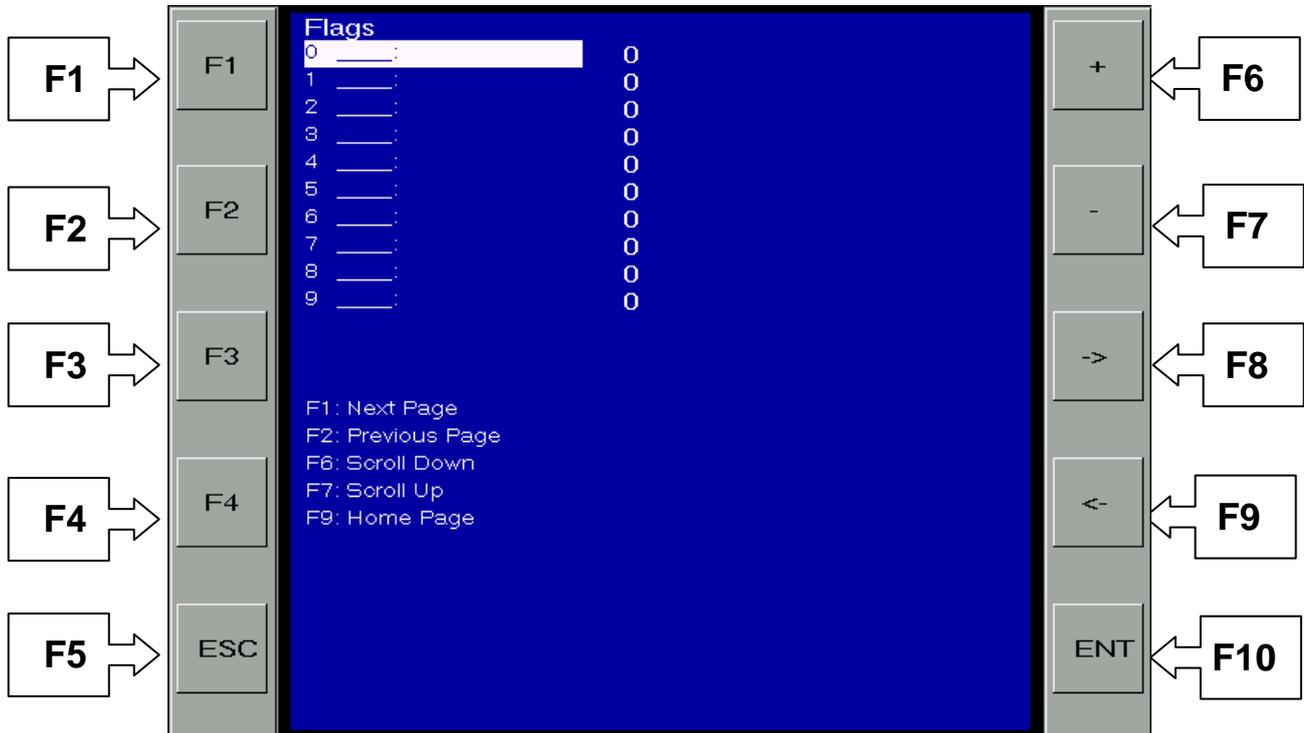
- F1 → Press F1 to open the next Inputs page
- F2 → Press F2 to return to previous Inputs page
- F3 → Not used
- F4 → Not used
- F5 → Not used
- F6 → Scroll up
- F7 → Scroll down
- F8 → Not used
- F9 → Return to the previous menu page
- F10 → Enter / Change value

MDS - OUTPUT



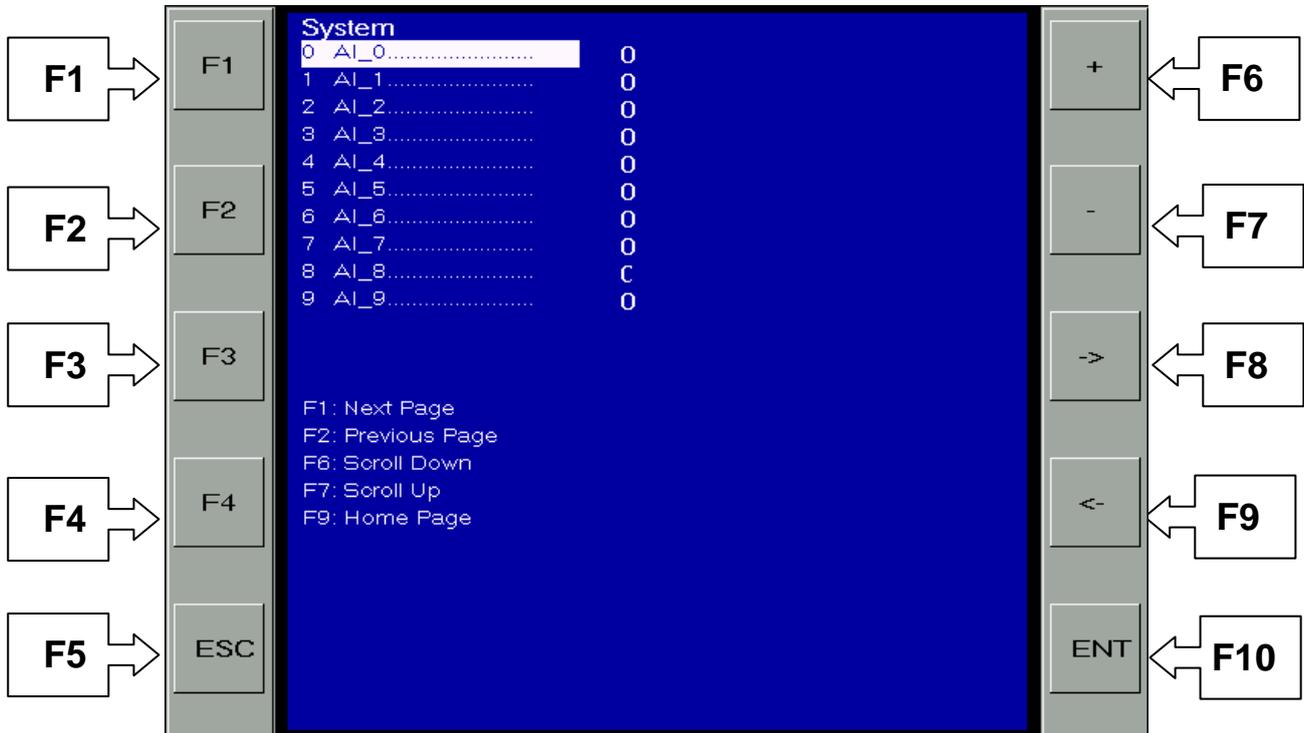
- Press F1 to open the next Outputs page
- Press F2 to return to previous Outputs page
- Not used
- Not used
- Not used
- Scroll up
- Scroll down
- Not used
- Return to the previous menu page
- Enter / Change value

MDS - FLAGS



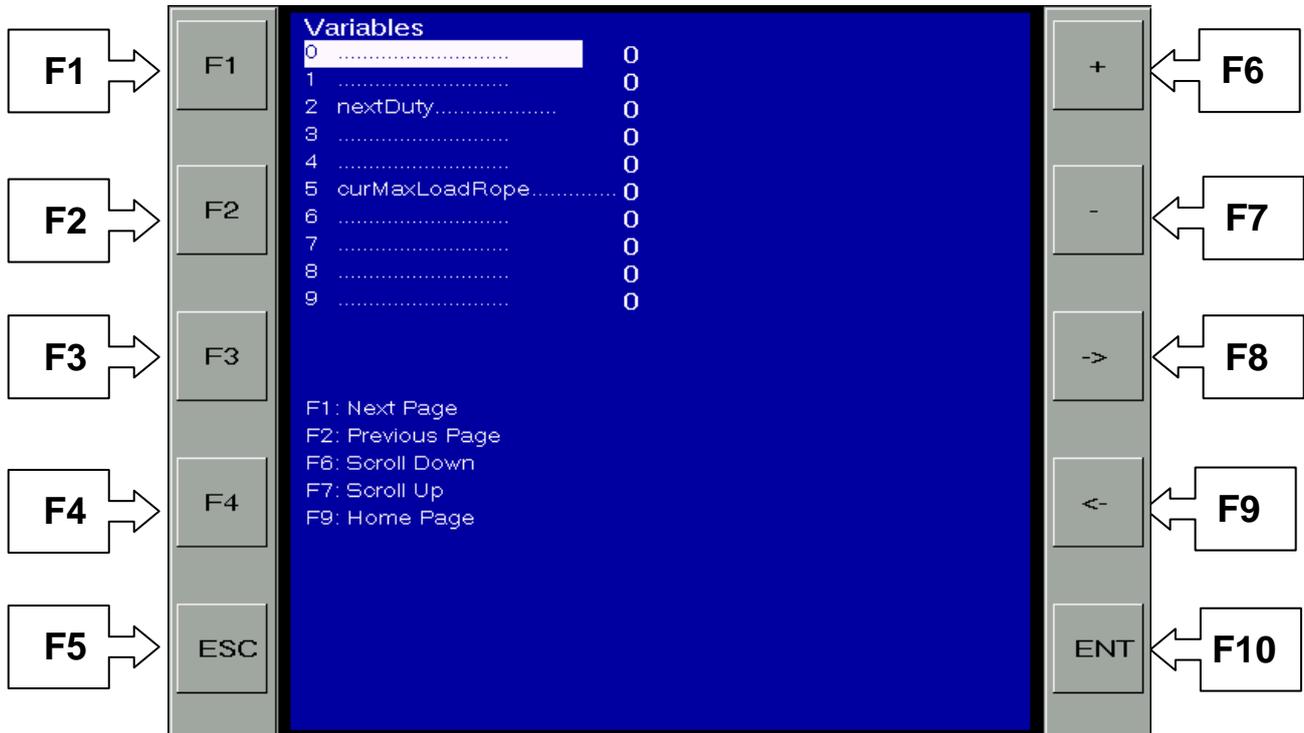
- F1 → Press F1 to open the next Flags page
- F2 → Press F2 to return to previous Flags page
- F3 → Not used
- F4 → Not used
- F5 → Not used
- F6 → Scroll up
- F7 → Scroll down
- F8 → Not used
- F9 → Return to the previous menu page
- F10 → Enter / Change value

MDS - SYSTEM



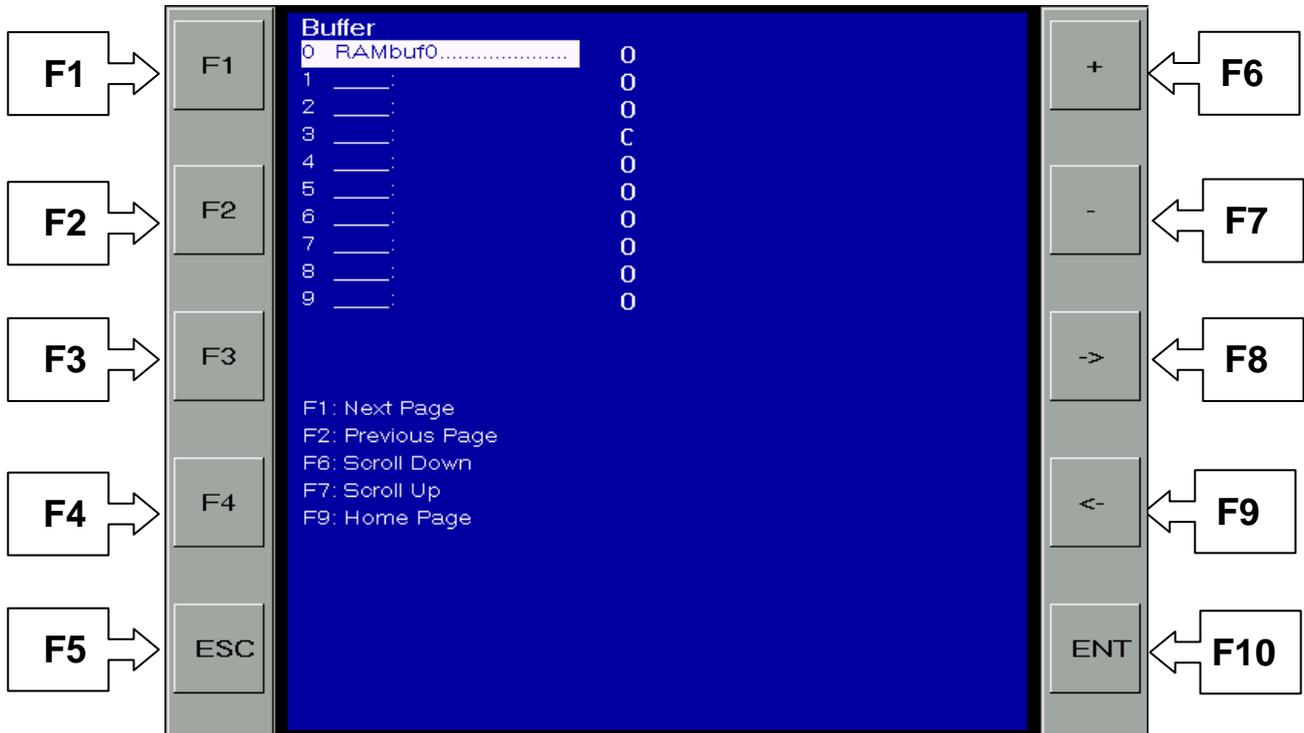
- F1 → Press F1 to open the next System page
- F2 → Press F2 to return to previous System page
- F3 → Not used
- F4 → Not used
- F5 → Not used
- F6 → Scroll up
- F7 → Scroll down
- F8 → Not used
- F9 → Return to the previous menu page
- F10 → Enter / Change value

MDS - VARIABLES



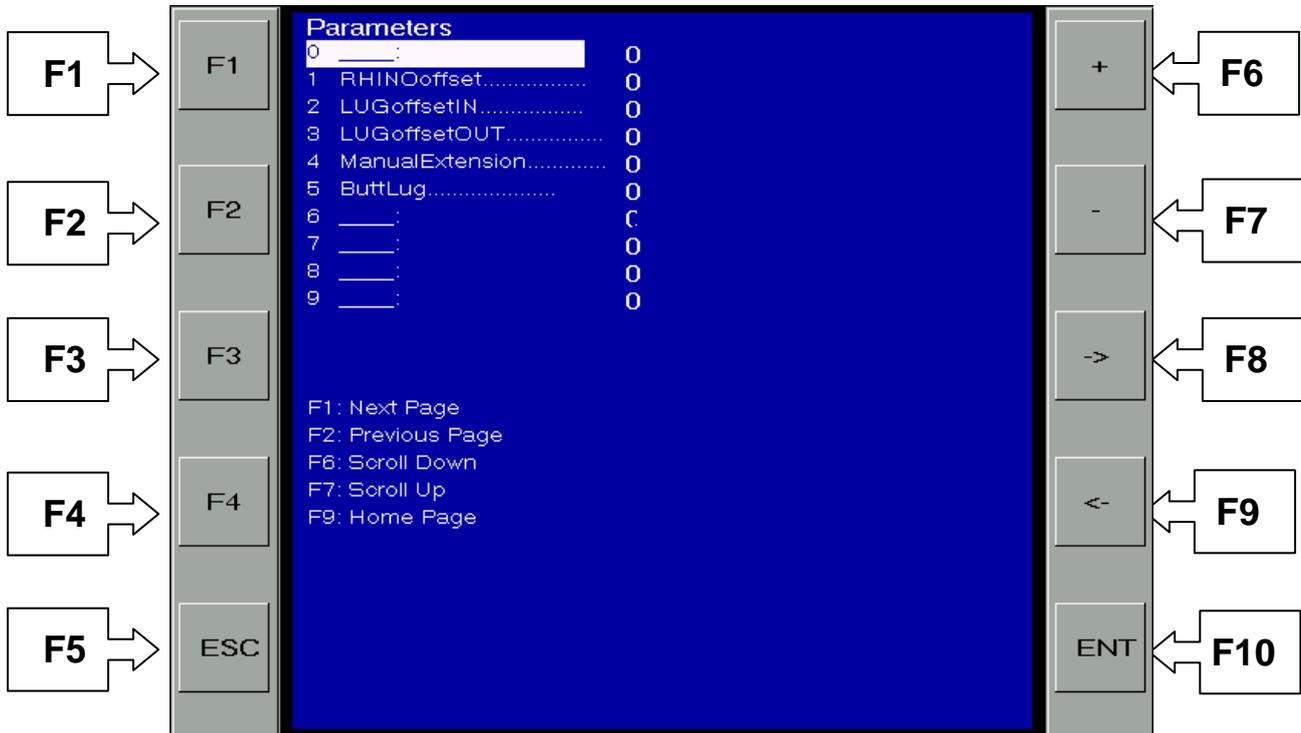
- F1 → Press F1 to open the next Variables page
- F2 → Press F2 to return to previous Variables page
- F3 → Not used
- F4 → Not used
- F5 → Not used
- F6 → Scroll up
- F7 → Scroll down
- F8 → Not used
- F9 → Return to the previous menu page
- F10 → Enter / Change value

MDS - BUFFER



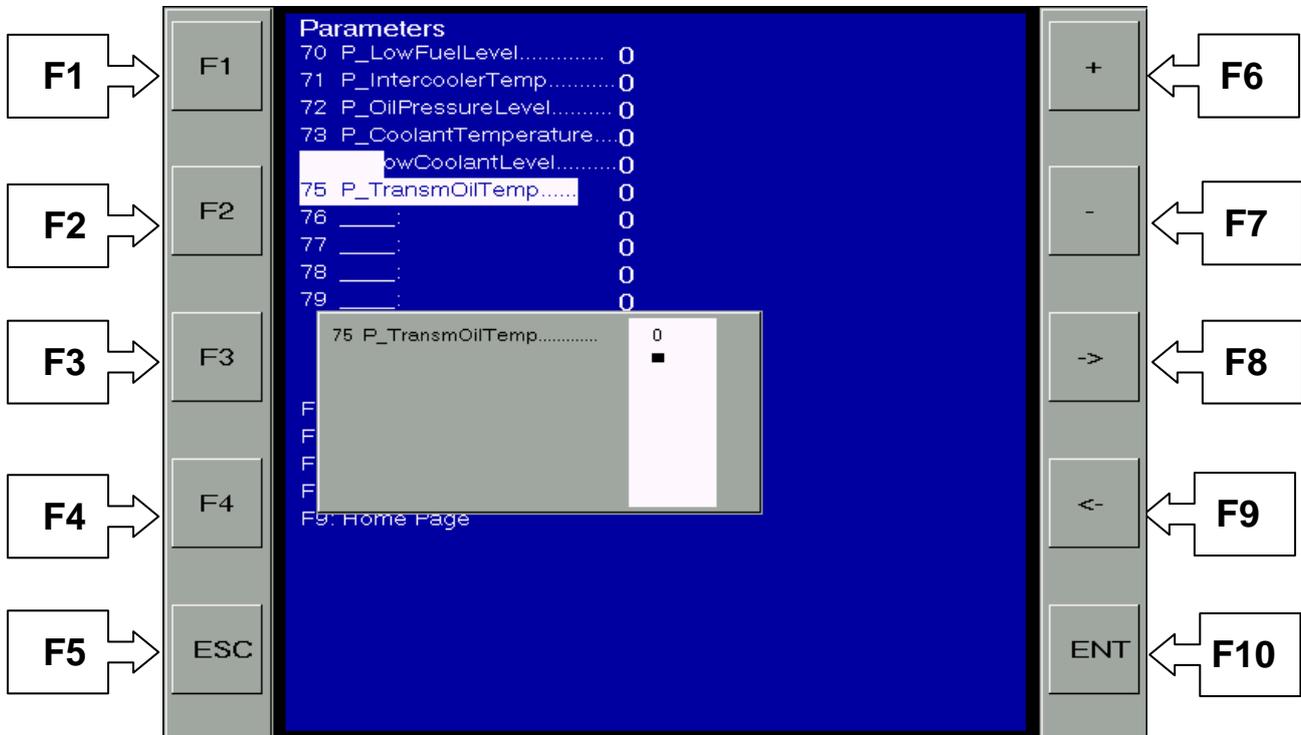
- F1 → Press F1 to open the next Buffer page
- F2 → Press F2 to return to previous Buffer page
- F3 → Not used
- F4 → Not used
- F5 → Not used
- F6 → Scroll up
- F7 → Scroll down
- F8 → Not used
- F9 → Return to the previous menu page
- F10 → Enter / Change value

MDS - PARAMETERS



- F1 → Press F1 to open the next Parameters page
- F2 → Press F2 to return to the previous Parameters page
- F3 → Not used
- F4 → Not used
- F5 → Not used
- F6 → Scroll up
- F7 → Scroll down
- F8 → Not used
- F9 → Return to the previous menu page
- F10 → Enter / Change value

MDS – Change a Value



To modify the Parameters' values it is necessary to insert the proper password in the applicable dialogue box.

Press F6 or F7 to select the parameter to be modified, when pressing F10 a window will open as above with the name of the parameter selected; modify the parameter by increasing or decreasing its value with F6 or F7 buttons.

Whilst in this mode, the buttons have different functions.

Buttons F1 to F4 have no function.

F5 → Exit without confirmation

F6 → Increase value

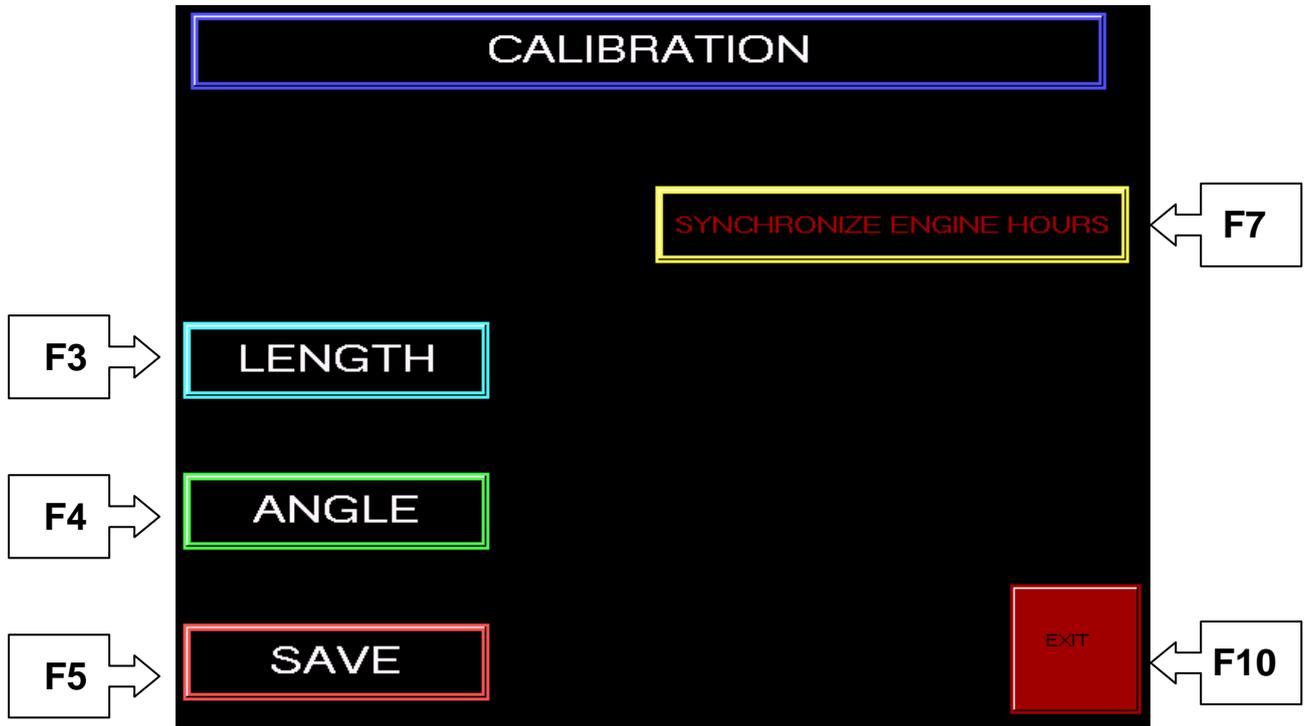
F7 → Decrease value

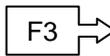
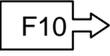
F8 → Move to right

F9 → Move to Left

F10 → Enter and Confirm

F2 CALIBRATION MODE



-  Press F3 to calibrate the boom length
-  Press F4 to calibrate the boom angle
-  Press F5 to save the data after calibration
-  Press F7 to synchronize Hourmeter with the Engine Hours – Engine must be running for at least 10 seconds after synchronizing for hours to be saved.
-  Press F10 to exit and return to the previous screen

F3 BOOM LENGTH CALIBRATION

LENGTH MIN	LENGTH	0.00 m
LENGTH MAX	Ado LENGTH	0
	Noto1	0
	Noto2	0
	Ado1	0
	Ado2	0
EXIT		

F1 → To calibrate the minimum boom length press F1, retract the boom fully then press F10, the system will acquire automatically the minimum length.

F2 → To calibrate the maximum boom length press F2, extend the boom fully then press F10, the system will acquire automatically the maximum length.

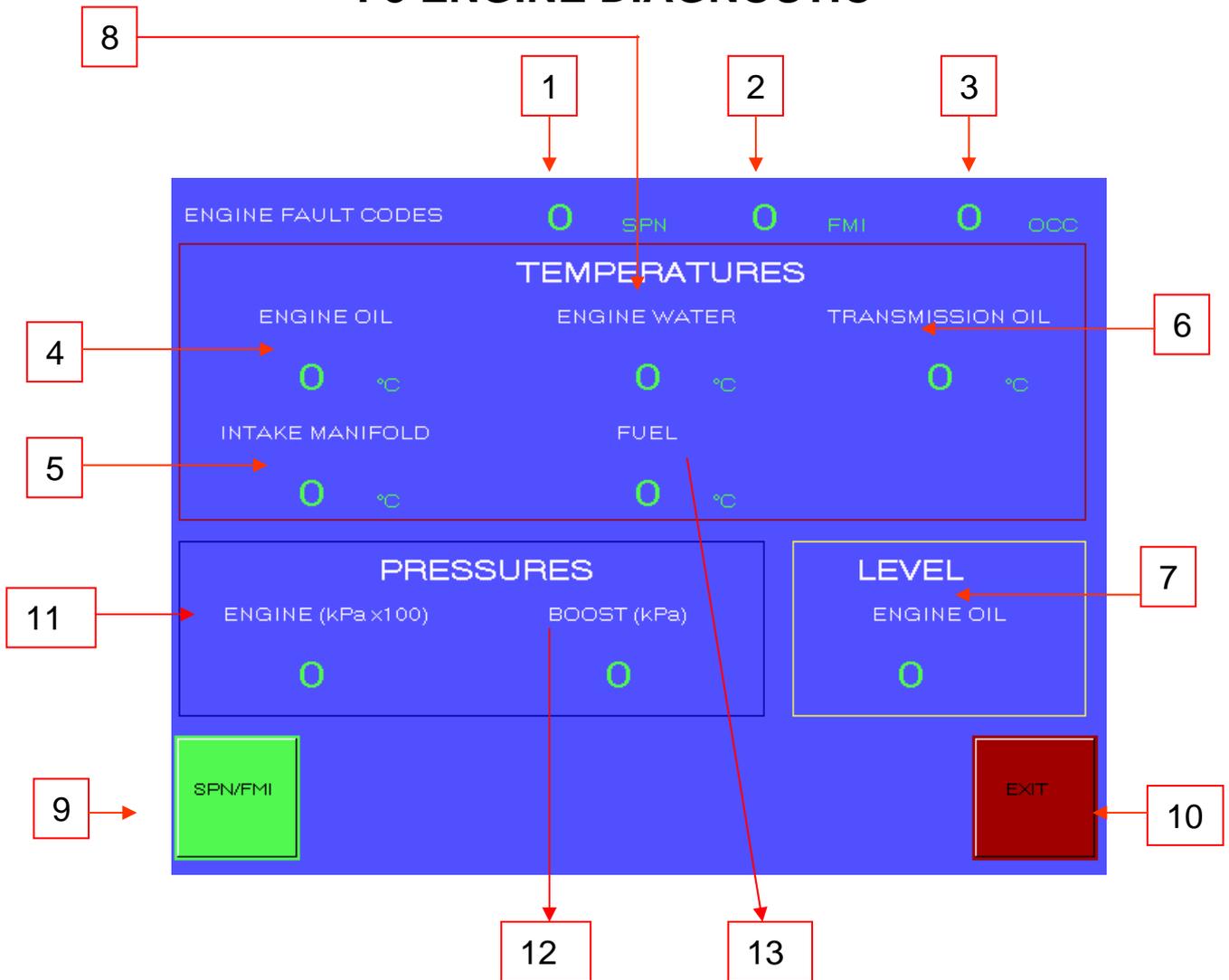
F5 → Press F5 to return to the previous page, then press F5 again to save the calibration data.

F4 BOOM ANGLE CALIBRATION

Angle	0.0 °
Adc Angle	0
Noto1	0
Noto2	0
Adc1	0
Adc2	0

- F1 → To calibrate the minimum boom angle press F1, lower the boom to the horizontal position and verify 0 degrees with inclinometer then press F10, the system will acquire automatically the zero angle.
- F2 → To calibrate the maximum boom angle press F2, raise the boom to the maximum position and check the actual angle with inclinometer and verify that the value displayed in the grey box corresponds to actual angle then press F10, the system will acquire automatically the maximum angle.
- F5 → Press F5 to return to the previous page, then press F5 again to save the calibration data.

F3 ENGINE DIAGNOSTIC



- 1) SPN Code - Press F5 to view the engine fault code list
- 2) FMI Code - Press F5 to view the engine fault code list
- 3) OCC Code - Number of occurrences of this code
- 4) Engine Oil Temperature
- 5) Intake Manifold Temperature
- 6) Transmission Oil Temperature
- 7) Engine Oil Level
- 8) Engine Water Temperature
- 9) SPN/FMI - Press **F5** to view the engine fault codes list
- 10) Exit - Press F10 to return to the Main Diagnostic screen
- 11) Engine Oil Pressure
- 12) Boost Pressure
- 13) Fuel Temperature



F5 SPN/FMI – ENGINE FAULT CODES LIST

```
SPM/FMI_CODES
-
SPN=_3_Cylinder_head_temperature
__FMI=_0_Temperature_high
-
SPN=_18_Ext_Fuel_pressure
__FMI=_0_Pressure_high
__FMI=_1_Pressure_low
__FMI=_3_Sensor_input_voltage_high
__FMI=_4_Sensor_input_voltage_low
-
SPN=_19_Ext_Oil_pressure
__FMI=_0_Pressure_high
__FMI=_1_Pressure_low
__FMI=_3_Sensor_input_voltage_high
__FMI=_4_Sensor_input_voltage_low
-
SPN=_20_Ext_Coolant_pressure
__FMI=_0_Pressure_high
__FMI=_1_Pressure_low
__FMI=_3_Sensor_input_voltage_high
```

F5 – Next Page

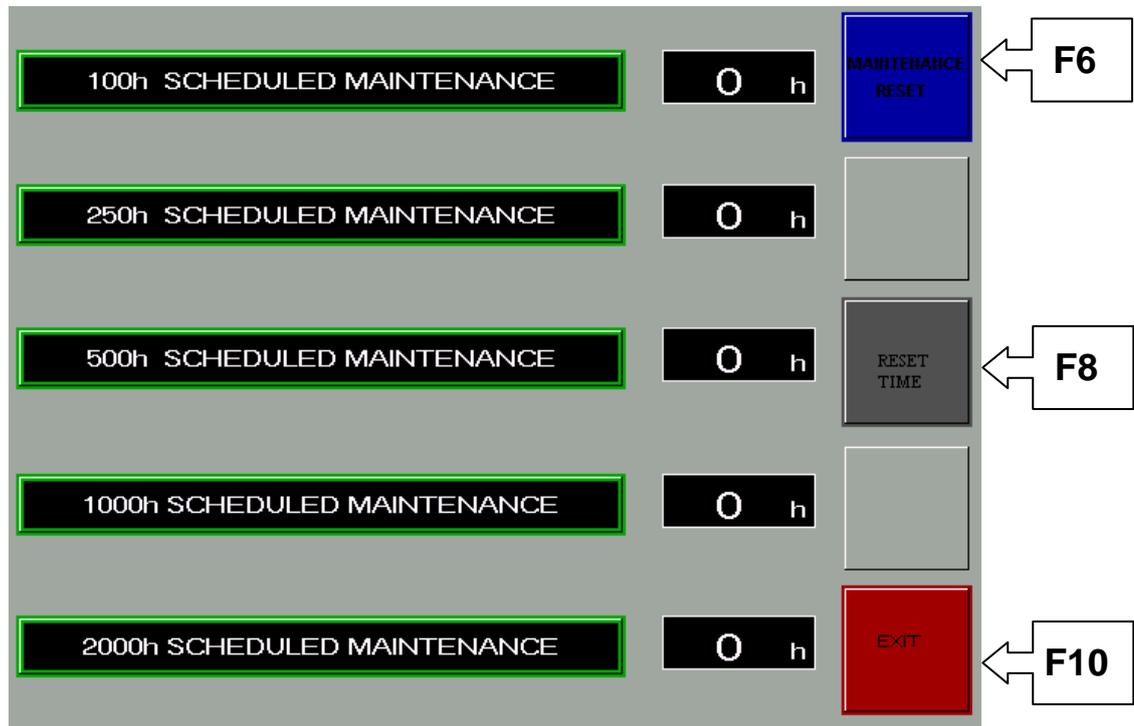
F10 – Exit

Scroll through the list for the applicable SPN number and then FMI number.

Press F5 to display the next page.

Press F10 to return to the previous screen.

F6 MAINTENANCE SCHEDULE



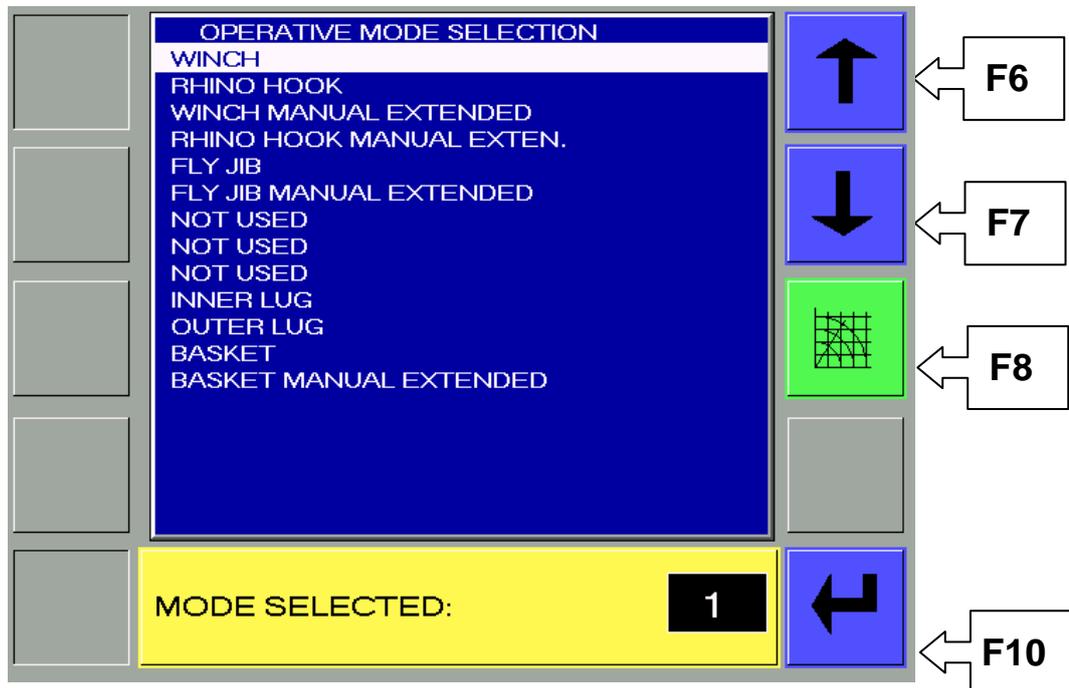
F6 → Press F6 to insert the password for the Maintenance's reset.

F8 → Reset the time for the appropriate schedule after entering the applicable Password.

F10 → Exit Button. Press F10 to return in the previous screen.

When the correct password is inserted, the dark grey button will change to green; this means maintenance period can now be reset.

F6 OPERATIVE MODE SELECTION



Setting up the operating mode:

From the Crane Mode Main Screen press button F6, the display will show the above screen.

To change the crane operating mode follow the instructions below:

- Press button F6 to scroll up, or F7 to scroll down, until the cursor highlights the description of the correct operating mode.
- Refer to the load charts table supplied by the manufacturer for the applicable Operating Mode list.
- Press button F10 to confirm the selection and return to the Crane Mode Main Screen

NOTE :It's not possible to change an Operating Mode whilst a load is being lifted.

F8 LOAD TABLE

From the Crane Mode Main Screen the operator may view the applicable load table by pressing button F8.

		5.65					6.00		6.50	
	0 %						4 %		10 %	
	0 %						4 %		10 %	
	0 %						0 %		0 %	
0.0										
1.60	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	
2.0	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	
2.50	10.40	9.25	10.35	9.25	10.35	9.25	10.35	9.25	9.25	
3.0	8.50	7.60	8.50	7.60	8.50	7.60	8.50	7.60	7.60	
3.50	7.20	6.40	7.20	6.40	7.20	6.40	7.20	6.40	6.40	
4.0	6.95	6.15	6.25	5.55	6.20	5.50	6.20	5.50	5.50	
4.50	0.00	0.00	0.00	0.00	5.45	4.85	5.45	4.85	4.85	
5.0					0.00	0.00	0.00	0.00	0.00	

The operator can navigate inside this page in the direction of the arrows with buttons F6, F7, F8, F9.

There are two rated capacity columns published for each boom length.

The left column refers to the rated capacity of the crane with an articulation of less than 10deg, the right column refers to articulation up to 40deg.

When button F10 is depressed, the screen will return to the previous screen.

SENSORS' TROUBLESHOOTING GUIDE

Fault Description	Suggested Corrective Action
<p>ANGLE SENSOR (1) Signal from Angle sensor lower than the minimum value</p>	<ul style="list-style-type: none"> • Verify that the wiring is not open circuited. If the alarm persists, please, contact Technical Assistance : • Verify the anglesensor integrity.
<p>ANGLE SENSOR (2) Signal from Angle sensor higher than the maximum value</p>	<ul style="list-style-type: none"> • Verify that the wiring is not short circuited. If the alarm persists, please, contact Technical Assistance : • Verify the anglesensor integrity.
<p>LENGTH SENSOR (1) Signal from boom length sensor lower than the minimum value</p>	<ul style="list-style-type: none"> • Verify that the wiring is not open circuited. If the alarm persists, please, contact Technical Assistance : • Verify the length sensor integrity.
<p>LENGTH SENSOR (2) Signal from boom length sensor higher than the maximum value</p>	<ul style="list-style-type: none"> • Verify that the wiring is not short circuited. If the alarm persists, please, contact Technical Assistance : • Verify the length sensor integrity.
<p>TRANSDUCER PISTON SIDE (1) Reading of piston pressure lower than the minimum.</p>	<ul style="list-style-type: none"> • Verify that the wiring is not open circuited. If the alarm persists, please, contact Technical Assistance : • Verify the pressuretransducer integrity
<p>TRANSDUCER PISTON SIDE (2) Reading of piston pressure higher than the maximum.</p>	<ul style="list-style-type: none"> • Verify that the wiring isnot short circuited. If the alarm persists, please, contact Technical Assistance : • Verify the pressuretransducer integrity.
<p>TRANSDUCER ROD SIDE (1) Reading of rod pressure lower than the minimum.</p>	<ul style="list-style-type: none"> • Verify that the wiring is not open circuited. If the alarm persists, please, contact Technical Assistance : • Verify the pressuretransducer integrity.
<p>TRANSDUCER ROD SIDE (2) Reading of rod pressure higher than the maximum.</p>	<ul style="list-style-type: none"> • Verify that the wiring isnot short circuited. If the alarm persists, please, contact Technical Assistance : • Verify the pressuretransducer integrity.

WARNINGS

- The LMI is an electronic device with the aim to help and assist the operator in the current use of the machine, warning him by means of visual and acoustic signals while approaching dangerous conditions.
- However this device can't replace the operator's good experience in the safe use of the machine.
- The responsibility of the operations in safe conditions of the machine is the operator's concern as well as the accomplishment of all prescribed safety rules
- The Operator must be able to detect if the data given by the LMI are correct and correspond to actual working conditions.
- He must be able to utilise the data given by the LMI in order to operate in safe conditions at all times.
- The LMI is an electronic device including several sensing components, therefore it can be subject to failures or defects.
- The operator must recognise these events and he must take action (to proceed to repair if possible or to call Assistance).
- Before starting the operations with the machine, the user must fully read this manual and follow the instructions at all times.

Shut down procedure for machine equipped with Turbo Timer.

- When the ignition key is switched off, the Turbo Timer defaults automatically to a 2 minutes shutdown delay to allow cooling down of the engine turbo.

The operator can vary the time delay with F3 button prior to turning off the ignition key, at the expiration of the time set the engine will stop and all lights and display panel will switch off.

In an emergency situation the engine can be shut down with the **Emergency Button**.

NB: Before switching on again, it is utmost important to wait several seconds to allow the system to reset like any other computer.

FRONT AND REAR AXLE LOAD DISPLAY

- The system calculates the front and rear load and axle weights from the factory set tare weights using the boom configuration and lifted load. If additional rigging equipment is added to the machine, it should be noted that this will not be included in the calculated front and rear axle weights.



The LMI has a powerful FAIL-SAFE self diagnostic program able to verify its correct operations and the transducers' conditions.

In case a fault has been detected, the LMI puts goes into safe mode by stopping the unsafe motions, if equipped with optional stop valves, (please refer to the Troubleshooting Guide).

- In spite of this, the Operator, before starting the operation with the machine, must take care that the LMI is working correctly.
To do this, he must verify the validity of the values displayed by doing some tests.
He must verify that there are no messages or alarm indications; he must verify the correct operation of the motion cut functions, if so equipped.
- The operator is responsible for selecting the applicable load table and therefore for the correct LMI settings.
When switching-on the machine the last selected Duty is kept valid, to allow Operator check.
- Please follow the instructions given in the OPERATING MODE SELECTION chapter.
An incorrect setting of the tables, can cause an incorrect LMI operation and therefore can create a dangerous situation for the machine.
- Operating conditions usually change when:
Further attachments are fitted or removed (jib and/or counterweight), therefore the relevant Duty/Load Table must be selected on the control panel.

Generally, it's compulsory to follow the Manufacturer instructions and procedures at any time.

DATE:25/10/2006

CUSTOMER: TEREX|FRANNA

HEAD - CS CONNECTIONS AT-15 Series III

S/N 1904 & S/N 1920 onwards

PIN	ID Code	Signal	Comment	Type	Note
1	RX2	RS232-2 - RX			RS232-2 Serial Line - Receive Signal
2	TX2	RS232-2 - TX			RS232-2 Serial Line - Transmit Signal
3	DGND	RS232-2 - GND			RS 232-2 Serial Line - Ground
4	+5V	+5V			Power Supply + 5 V for external sensors (max.current 100 mA)
5	AGND1	GND			Analog ground for external analog sensors
6	AGND2	GND			Analog ground for external analog sensors
7	AI0	PRESS. TRASD. PISTON SIDE		AI	Analog Input 12 bit - range: 0-5,5V or 0-20 mA (jumper selection)
8	AI1	PRESS. TRASD. ROD SIDE		AI	Analog Input 12 bit - range: 0-5,5V or 0-20 mA (jumper selection)
9	AI2	ANGLE		AI	Analog Input 12 bit - range: 0-5,5V or 0-20 mA (jumper selection)
10	AI3	LENGTH		AI	Analog Input 12 bit - range: 0-5,5V or 0-20 mA (jumper selection)
11	AI4	FUEL LEVEL		AI	Analog Input 12 bit - range: 0-5V or 0-20 mA (jumper selection)
12	AI5	LUFF DOWN DETECTION	Not Used	AI	Analog Input 12 bit - range: 0-5V or 0-20 mA (jumper selection)
13	AI6	WINCH DOWN DETECTION	Not Used	AI	Analog Input 12 bit - range: 0-5V or 0-20 mA (jumper selection)
14	AI7	TELE IN DETECTION	Not Used	AI	Analog Input 12 bit - range: 0-5V or 0-20 mA (jumper selection)
15	DO0/PWM0	LUFF CONTROL		PWM	On/Off output 2A or PWM output 0-500 Hz 2A (software selection)
16	DO1/PWM1	WINCH CONTROL		PWM	On/Off output 2A or PWM output 0-500 Hz 2A (software selection)
17	DO2/PWM2	TELE CONTROL		PWM	On/Off output 2A or PWM output 0-500 Hz 2A (software selection)
18	DO3/PWM3	TELE BOOM 3 CONTROL	Not Used	PWM	On/Off output 2A or PWM output 0-500 Hz 2A (software selection)
19	DO4/DI0	LUFF FUNCTION RELAY	+ve Luff Down	DO	On/Off Inp.(On=24V or On=Gnd) or On/Off Outp.2A (sw selection)
20	DO5/DI1	WINCH FUNCTION RELAY	+ve Winch Down	DO	On/Off Inp.(On=24V or On=Gnd) or On/Off Outp.2A (sw selection)
21	DO6/DI2	TELE FUNCTION RELAY	+ve Tele In	DO	On/Off Inp.(On=24V or On=Gnd) or On/Off Outp.2A (sw selection)
22	DO7/DI3	WINCH SPEED	+ve High Speed	DO	On/Off Inp.(On=24V or On=Gnd) or On/Off Outp.2A (sw selection)
23	DO8/DI4	AMBER LAMP	+ve On	DO	On/Off Inp.(On=24V or On=Gnd) or On/Off Outp.2A (sw selection)
24	DO9/DI5	RED LAMP	+ve On	DO	On/Off Inp.(On=24V or On=Gnd) or On/Off Outp.2A (sw selection)
25	DO10/DI6	BUZZER	+ve On	DO	On/Off Inp.(On=24V or On=Gnd) or On/Off Outp.2A (sw selection)
26	DO11/DI7	IGNITION KEY	+ve On	DI +ve switched	On/Off Inp.(On=24V or On=Gnd) or On/Off Outp.2A (sw selection)
27	DO12	TRANSFER CASE ENABLE	+ve TC Enabled	DO	On/Off output 2A (not under watchdog)
28	DO13	ENGINE STOP	+ve Engine Run	DO	On/Off output 2A (not under watchdog)
29	AI8/DI8	SEAT POSITION	+ve On	DI +ve switched	Analog Inp.10 bit 0-27 V or On/Off Inp.(On=24V) (sw selection)
30	AI9/DI9	LEFT INDICATOR	+ve Icon On	DI +ve switched	Analog Inp.10 bit 0-27 V or On/Off Inp.(On=24V) (sw selection)
31	AI10/DI10	RIGHT INDICATOR	+ve Icon On	DI +ve switched	Analog Inp.10 bit 0-27 V or On/Off Inp.(On=24V) (sw selection)
32	AI11/DI11	PARK LIGHTS	+ve On	DI +ve switched	Analog Inp.10 bit 0-27 V or On/Off Inp.(On=24V) (sw selection)
33	AI12/DI12	HIGH BEAM	+ve Icon On	DI +ve switched	Analog Inp.10 bit 0-27 V or On/Off Inp.(On=24V) (sw selection)
34	AI13/DI13	4WD	+ve Icon On	DI +ve switched	Analog Inp.10 bit 0-27 V or On/Off Inp.(On=24V) (sw selection)
35	AI14/DI14	DIFFERENTIAL LOCK	+ve Icon On	DI +ve switched	Analog Inp.10 bit 0-27 V or On/Off Inp.(On=24V) (sw selection)
36	AI15/DI15	EMERGENCY STEERING PUMP	+ve Icon On	DI +ve switched	Analog Inp.10 bit 0-27 V or On/Off Inp.(On=24V) (sw selection)
37	DI16	ARTICULATION	+ve <10 degree	DI +ve switched	On/Off Input (On=24V)
38	DI17	OVERLOAD OVERRIDE	+ve Override	DI +ve switched	On/Off Input (On=24V)
39	DI18	BATTERY CHARGE	+ve Icon Off	DI +ve switched	On/Off Inp.(On=24V or On=Gnd) or Encoder Input (sw selection)
40	DI19	LOW AIR PRESSURE	+ve Icon On	DI +ve switched	On/Off Inp.(On=24V or On=Gnd) or Encoder Input (sw selection)
41	DI20	AIR FILTER RESTRICTION	+ve Icon On	DI +ve switched	On/Off Inp.(On=24V or On=Gnd) or Rpm Inp.0-2.5 KHz(sw selection)
42	DI21	A2B (OPTIONAL)	+ve NO alarm	DI +ve switched	On/Off Inp.(On=24V or On=Gnd) or Rpm Inp.0-2.5 KHz(sw selection)
43	+15V	+15V			Power Supply + 15 V for external sensors (max.current 100 mA)
44	DGND	RS232-1 - GND			RS 232-1 Serial Line - Ground
45	RX1 / D+	RS232-1 - RX / CAN 2 L	Eng/Transm		RS232-1 Receive Signal / RS485 D+ / CAN 2 Low (jumper selection)
46	TX1 / D-	RS232-1 - TX / CAN 2 H	Eng/Transm		RS232-1 Transmit Signal / RS485 D- / CAN 2 High (jumper selection)
47	CAN1H	CAN H	Joystick/HTD		CAN 1 High Line (Green Pin 7 of 9 Pin D-Plug)
48	CAN1L	CAN L	Joystick/HTD		CAN 1 Low Line (Yellow Pin 2 of 9 Pin D-Plug)
49	+VB	+24V			Power supply for Head logic
50	+VB	+24V			Power supply for Head logic
51	0VB	GND			GND supply for Head logic
52	WDO1	Watchdog Output			Watchdog Output - Command for Watchdog Relay (Optional)
53	+VB_PW1	+24V			Power Supply for Outputs DO0-3
54	+VB_PW2	+24V			Power Supply for Outputs DO4-7
55	+VB_PW3	+24V			Power Supply for Outputs DO8-11
56	+VB_PW4	+24V			Power Supply for Outputs DO12-13 - Connect to Optional Watchdog

