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*Revolution Not Evolution*

**7326**

**DIPTRONIC™  
MEASURING SYSTEM MK1 & L.I.P.S.  
(with GPS)**

**CALIBRATION MANUAL**



**Issue D January 2010**



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## **P7403 Electrical equipment service and installation guide for road tankers**

Liquip supplies the following document as a guide for installing and operating electrical equipment on road tankers. It should be used in conjunction with local legislation and standards, owner's requirements and tank manufacturer procedures.

### **INFORMATION PERTAINING TO WORKING ON A TANK VEHICLE**

1. Prior to working on a tank vehicle it must be degassed or certified to work on. Before working in a tank compartment an appropriate device must be used to check for the presence of volatile gases.
2. Any work carried out on a tank vehicle must be done so in a non-hazardous area.
3. Before working on any electrical equipment on a tank vehicle power must be isolated either via the battery isolation switch (BIS), by disconnecting the truck battery or by disconnecting the positive of the electrical equipment.
4. Never weld on a tank vehicle unless all electronic equipment is completely disconnected electrically from both the tanker and other equipment.
5. Hazardous conditions may be present when working with high voltage devices (such as gantry monitors). Qualified technicians only should be servicing these devices.
6. Do not connect a battery charger or other pulsed power supply to the truck battery without first isolating all electrical equipment as permanent damage may result.
7. Long sleeve and pants protective clothing should be worn at all times. Clothing must be non-static generating. Any petroleum contact with skin should be washed off immediately.
8. Always follow manufacturer guidelines when working on electrical equipment. Failure to do so may void warranty or cause damage.

### **INFORMATION PERTAINING TO INSTALLING EQUIPMENT ON A TANK VEHICLE**

1. All electrical equipment and fittings must be suitable for use on a tanker and meet all local regulations for operation.
2. Use high quality waterproof conduit and fittings to IP66 minimum for all wiring and junction boxes.
3. Use waterproof flexible compound such as Silastic in all glands and joints not available as waterproof by design.
4. Mount all equipment away from direct spray areas such as behind the tyres and out of direct sunlight. Always select the most sheltered aspect.
5. Ensure all installations adhere to appropriate guidelines.
6. Coat all terminals, cable end and joints with non-conducting grease or Vaseline after final testing. This will prevent corrosion.



7. Prior to crimping, check wiring connections are electrically correct. When crimping make sure there is good electrical contact between the wire strands and metal section of the crimp terminal. Pull on the crimp to ensure a good connection has been made.
8. Cable ends may be crimped with ferrules for better connection. Do not solder the cable ends (fatigues and corrodes). Pre-coat with non-conductive grease for corrosion protection.
9. At any point a cable is extended or joined to a standard cable assembly, all cable screens must be connected to the chassis, refer to relevant wiring diagram. Insulate exposed screen wire using heat shrink, terminate with an eye terminal and attach to the junction box mounting screw. If the junction box is mounted to a panel not electrically connected to the chassis, the screens must still be joined together and connected to the chassis at one point, as per wiring diagram.
10. Common grounding of a system is most important. Do not rely on common chassis grounding at various points, run a full-length dedicated ground cable. Max resistance, battery ground to any ground point to be 1Ω. Refer Liquip Tech Talk #48: Electrical Bonding on Tankers. The electrical resistance between the tank and tanker chassis, prime mover chassis, or trailer undercarriage, and between the tank and the connection of the tanker pipework to the delivery hose, shall not exceed 10Ω (refer to AS2809.2).
11. Always fit as much loose cable length into junction boxes and housings as practicable to allow for future servicing.
12. Always segregate power and intrinsically safe wires in accordance with I.S wiring rules.
13. Carry out a complete wiring check for accuracy and continuity before connecting power to any device.
14. Observe international and local legal requirements. In the event of conflicting instructions seek qualified advice before proceeding.
15. Do not route communication cables past 'noisy' electrical apparatus such as solenoids and alternators.
16. Check instruction manual for recommended cable type and torque settings.
17. Use specialised, genuine tools for all electrical work.
18. Mount equipment to clean, dry, bare surfaces on a metal bracket mounted to the chassis/sub-frame. It is recommended the bracket be welded to the chassis/sub-frame to facilitate good electrical contact.
19. Ensure adequate clearance around equipment being installed. This will provide for ease in future maintenance.
20. When bolting equipment into place, the use of Teflon tape or anti-seize compound on threads is advised.
21. Fuses located in hazardous areas must be suited to that location.
22. Always allow suitable separation between intrinsically safe wiring and power from line power source.



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## 1.0 The Diptronic measuring system – automatic calibration

### 1.1 Calibrating a new tanker compartment – for the ultimate in accuracy

To achieve the optimum operational accuracy of the sensors, calibrate according to the instructions below.

Note that in calibrating a sensor the same product must be used as that to be used in normal operation.

If a sensor in a compartment is calibrated using hydrocarbons, then only hydrocarbons can be used in that compartment.

**Note:** Refer P7327 Diptronic Automatic calibration rig setup & operation for details on setup and operation of the rig.

An adaptor harness is required to connect between the mil spec of the auto rig (power out to CPU) to a 10-pin harness connector mounted on a tanker. Contact Liquip for further details.

The DIP400 calibration rig is a pumping system with an EMH500 meter containing a program that pumps a specific quantity of fuel into the compartment which it is connected. It then communicates this known volume to the Diptronic system which assigns the volume to the measured level of product determined by the Diptronic sensor. For more information see ***Diptronic Calibration Rig Manual P7327***.

The DIP400 calibration rig is NOT a master meter and prior to using the rig to calibrate the Diptronic system, it must be certified as accurate according to;

***NMI V 9-1 Uniform Test Procedures for the Verification, Certification and In-service Inspection of Bulk Flowmetering Systems. Part 1: Liquid Hydrocarbons (other than LPG)***

This requires using the calibration rig to pump into a current Regulation 13 certified proving measure as described in section ***4.6.1 Volumetric Method using a Reference Volume Measure***

If the calibration rig is accurate within the maximum permissible error (0.2%), then calibration of Diptronic system can begin as described on the following pages.

After Diptronic calibration is complete, confirm accuracy by re-testing per ***4.6.1 Volumetric Method using a Reference Volume Measure***

The DIP400 calibration rig must be re-tested for accuracy for EVERY vehicle for which a Diptronic system has been installed and is to be automatically calibrated using the rig.



## 1.2 Calibrating the compartment of a tanker

Each sensor must be individually calibrated to its corresponding compartment. This is achieved in much the same way as a conventional dipstick being calibrated to its compartment, i.e. in a series of steps.

For each sensor, *step 1 has been pre-programmed as the zero volume level and maximum sensor length.*

1. Check that the vehicle tank is on a level surface.
2. Deliver between 500 and 1000L of product into the tank compartment.
3. Check for leaks either externally or internally between compartments.
4. Empty the compartment and ensure it drains completely.
5. Eliminate any air in the calibration pump system and pre-pressurise by circulating product via another compartment. This can be achieved by powering on the automatic calibration rig & manually using the EMH500.
6. Setup the automatic calibration rig close to the tanker.
7. Connect communication and power harnesses between rig & CPU (see drawing X352302).
8. Follow the steps indicated below for automatic calibration.

**Note:** The automatic calibration rig CPU communication mil spec harness connects to the bottom left mil spec connector on the CPU.

**When calibrating a replacement pot or restarting a new calibration refer section 9.0 to delete any old data.**

The automatic calibration rig need only be powered up and primed, then connected to the CPU to operate correctly.



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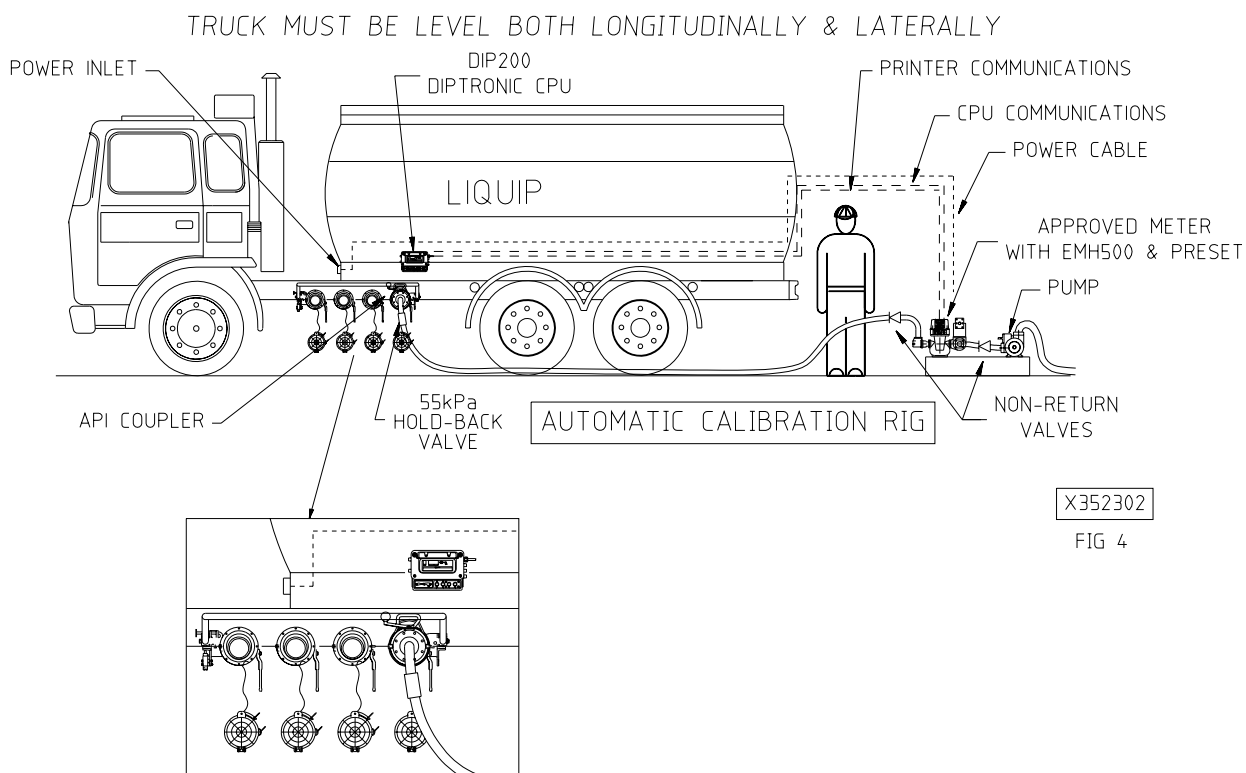
STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK twice	COMPART.CALIBRATION? NO
4	Press INC then OK	SELECT COMP.NO.: 1
5	Continue to press INC for the desired compartment then press OK	MANUAL CALIBRATION? NO
6	Press OK 5 times	AUTOMATIC CALIBRATION? NO
7	Press INC then OK	
8	Use the NEXT and INC buttons to enter the max capacity of the compartment	COMP: # MAX.CAPACITY: #####
9	Press OK to select	
10	Use NEXT & INC buttons to change recommended number of steps if desired	COMP: # MAX.CAP.:#####L STEP:0050.0L NO.OF STEPS: ###(MIN=010, MAX=####)
11	Press OK to select	COMP: # MAX.CAP.:#####L STEP:0050.0L NO.OF STEPS: ###(MIN=010, MAX=####)
12	Hold CAL & press NEXT to start	'COMMUNICATING WITH EMH500'
13	OR press MENU to abort	RESET LEVEL/VOLUME ARRAY? NO
14	Hold CAL & press OK to exit	EXIT CALIBRATION? YES
15	Press OK to confirm exit	





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**Note: To pause the calibration at any time hold the CAL & PRINT buttons on the Diptronic CPU. To stop calibration press the start/stop button on the EMH500. See section 15.0 to view the calibrated array once automatic calibration is complete.**



In step 10, the recommended number of steps should not be modified unless it is absolutely necessary.

When entering the maximum capacity of the compartment in step 8, set to approximately 100L less than the compartment maximum capacity. A Liquip MPP100 mini-monitor may also be connected to the auto cal rig can be used to prevent overflow.

When product is within 200L or more of the compartment maximum capacity, have a second person climb onto the tanker & visually monitor the product to ensure there is no overflow. If overflow seems likely, stop the automatic calibration sequence by pressing the START/STOP button on the EMH500 while pump is running or simply close the API valve or shut-off valve from calibration rig.

***Note: Calibration should never be stopped by powering off the CPU***



When climbing on the tanker, do so carefully so as not to disturb the calibration. Also, do not stand directly on the walkway of the compartment being calibrated to prevent possible deflection of the sensor.

At the end of automatic calibration or if the calibration is stopped for any reason, a message will appear asking if the user wants to input any more steps.

Select N using the INC button and press OK if calibration is complete or select Y and press OK if more steps need to be added. Steps will be added up to 200 max.

Following calibration, empty the newly calibrated compartment and verify using the chart in appendix 2. First pump in  $0.05 * \text{FULL}$  litres, record the meter & Diptronic levels and determine the error. Continue until the table is complete. Return to Liquip along with the calibration report ticket.

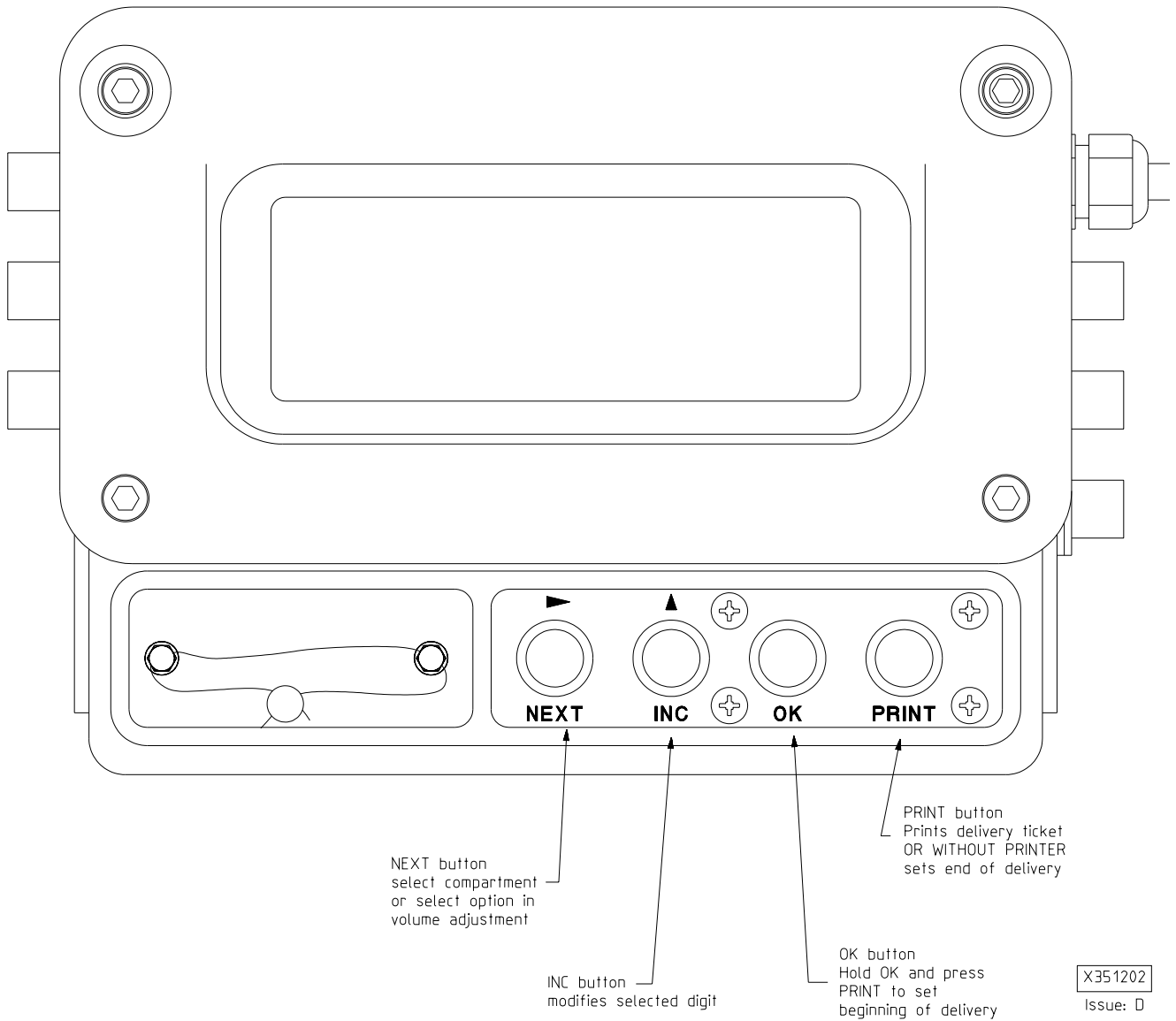
Alternatively, use DipRecall to download the setup of each CPU following a tanker calibration & email the file to Liquip. Refer section 12 for more information.

If a consistent offset is found refer section 7.

**Note:** To change the display to the next compartment press (and hold) the NEXT button. Refer diagram on following page for details.



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## **2.0 Using the automatic calibration rig in conjunction with Diptronic**

It is possible to pause the automatic calibration by holding the CAL & PRINT buttons on the Diptronic CPU. An AUTOMATIC CALIBRATION INTERRUPTED press CAL + PRINT to continue message will be displayed.

Press the START/STOP button (or RESET when paused) on the EMH500 to stop automatic calibration. The CPU will prompt to add any more steps up to 200.

Press the RESET button on the EMH500 to check the flowrate of product (when the pump is running only).

Ensure the EMH500 has been setup correctly prior to calibration. Refer P7327 Manual for Automatic calibration rig setup details.

## **3.0 Compartment level messages**

The level messages L1 to L6 described below are automatically set by the CPU following completion of the automatic or manual calibration. If they need to be changed follow the steps indicated below.

Up to 6 level messages can be displayed to alert the user to different fill states. L2 is used to indicate tank full with a 'MAX+' message. Set L2 to the last calibration step in litres rounded down to the nearest 10L.



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L3 is set between the safe fill level (SFL) and L2 and gives a '\*\*\* MAXIMUM LEVEL EXCEEDED – DOWNLOAD \*\*\*' message. Set L3 at the same level as the probe actuation point. The probe actuation point is set 200L (230L for Exxon Mobil & API RP 1004) under the internal roof level, also known as full capacity.

L4 and L5 are internal messages that are not normally used. They should both be left at the default value of 1.

L6 indicates the lowest measurable level. *For all cases L6 should be a minimum of 3% capacity rounded up to the nearest 10L.*

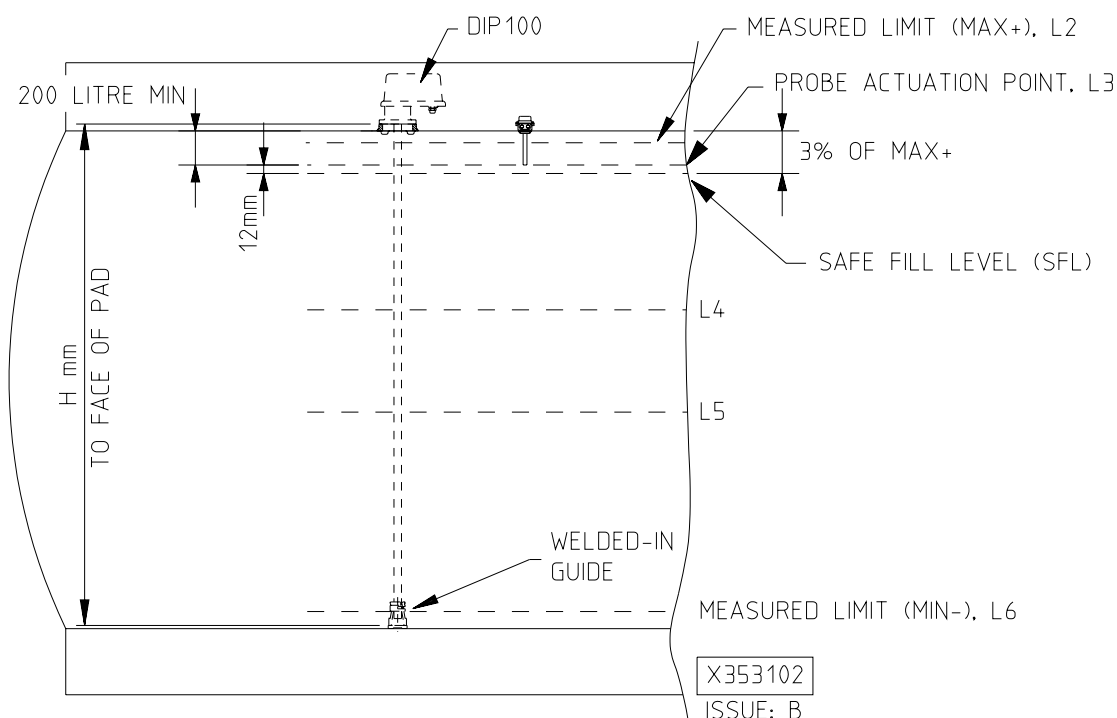
**Note:** In some cases L6 may be automatically calculated less than the 3% capacity. This may result in a volume being displayed by Diptronic even though the compartment is empty. For this case recalculate as above.

The SFL needs to be entered into the CPU for each compartment. If product is pumped above this level a warning message will be displayed. The safe fill level should be set 3% below L2 or 12mm below L3, whichever is the **lower** in the compartment.

**Note:** There is 70mm up from the tank floor to where the sensor is unable to detect product. This reduces to approximately 40mm for water.

Enter the above values as indicated in the steps on the following page.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK	SYSTEM SETUP? NO
4	Press INC then OK	NO.OF COMPARTMENTS: #
5	Press MENU 4 times	C:1 L2: ##### L3: 00000## SFL: ##### L4: 00000## L5: 00000## L6: #####
6	Repeatedly press NEXT or INC to input C:, L2, L3, L6 & SFL	C:# L2: ##### L3: 00000## SFL: ##### L4: 00000## L5: 00000## L6: #####
7	Press OK to save after entering each compartment.	
8	Hold CAL & press OK to Exit	EXIT CALIBRATION? YES
9	Press OK	





## 4.0 Datum movement

The reference datum at the base of the flange can be moved as necessary (+ to move up, - to move down). This is useful if for example a thicker or thinner gasket replaces the original and the sensor datum has moved.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press INC then OK	CHANGE INDIVIDUAL SENSOR ID:
4	Press MENU 3 times	SENSOR: 1 MOVE DATUM: +0000.0mm
5	Repeatedly press INC then NEXT to change selection. Press OK to save	SENSOR: 1 MOVE DATUM: #####.##mm
6	Hold CAL & press OK	EXIT CALIBRATION? YES
7	Press OK	



## 5.0 Edit calibrated data

Use this menu to edit a calibrated array of data for a sensor.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK twice	COMPART.CALIBRATION? NO
4	Press INC then OK	SELECT COMP.NO.: 1
5	Continue to press INC for the desired compartment then press OK	MANUAL CALIBRATION? NO
6	Press OK twice	EDIT LEVEL/VOLUME ARRAY? NO
7	Press INC then OK	COMP: # STEP: 1 MEASURED TRUE +#####.# +0000.0
8	Continue to press INC then NEXT to edit. Press OK to save	COMP: # STEP: 1 MEASURED TRUE +#####.# +#####.#
9	Hold CAL & press NEXT for next step	COMP: # STEP: 2 MEASURED TRUE +#####.# +#####.#
10	Repeat above steps to end	END
11	Hold CAL & press NEXT	ADD ANOTHER STEP? NO
12	Press INC then OK to add step and proceed as above	COMP: # STEP: # MEASURED TRUE +#####.# +#####.#
13	Alternatively, hold CAL & press OK to exit	EXIT CALIBRATION? YES
14	Press OK	

*Note: To skip by a factor of 10 steps hold CAL & press PRINT.*





## 6.0 Printer setup

Setup a ticket printer to print a calibration report docket. Return the calibration report docket to Liquip for review.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK 5 times	PRINTER SETUP? NO
4	Press INC then OK	PRINTER: OFF
5	Press INC to select TM-295 printer	PRINTER: TM-295
6	Press OK to select	PRINTER: TM-295
7	Press MENU	COM 1 ACK? NO
8	Press INC then OK	COM 1 ACK? YES
9	Press MENU	EXIT CALIBRATION? YES
10	Press OK	

**NOTES:** *Following the initial printer setup, if this menu is re-opened step 6 will change to COM1 ACK? YES. Then press OK to acknowledge, MENU to go to EXIT CALIBRATION? YES, and OK to go back to the main display.*

*Follow the steps above to deactivate the printer if it is not required. In step 5, press INC to change the printer to OFF followed by OK to select. Change COM1 ACK? YES to NO using the INC button if it is not required. Press OK to select and exit as indicated.*

## 7.0 Setting an offset

### 7.1 Adding an offset in mm

An offset in mm can be input if needed. This option may be useful for those cases where a sensor is removed from a compartment, reinstalled and located at a different level to previously. Enter the mm offset to the original level as indicated below.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK twice	COMPART.CALIBRATION? NO
4	Press INC then OK	SELECT COMP.NO.: 1
5	Continue to press INC for the desired compartment then press OK	MANUAL CALIBRATION? NO
6	Press OK 3 times	ADD OFFSET IN mm? NO
7	Press INC then OK	COMP:# OFFSET: ###mm
8	Repeatedly press INC then NEXT for offset then press OK to save	COMP:# OFFSET: ###mm
9	Hold CAL & press OK to exit	EXIT CALIBRATION? YES
10	Press OK	

**Note:** It is only possible to add an offset in mm if the compartment has been calibrated in mm.



## 7.2 Adding an offset in Litres

An offset in Litres can be input if needed. This option may be useful for those cases where a sensor shows a consistent offset in Litres to a certified measure such as verification after calibration or a general verification test.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK twice	COMPART.CALIBRATION? NO
4	Press INC then OK	SELECT COMP.NO.: 1
5	Continue to press INC for the desired compartment then press OK	MANUAL CALIBRATION? NO
6	Press OK 4 times	ADD OFFSET IN LITRES? NO
7	Press INC then OK	COMP# OFFSET: ####L
8	Repeatedly press INC then NEXT for offset, then press OK to save	COMP# OFFSET: ####L
9	Hold CAL & press OK to exit	EXIT CALIBRATION? YES
10	Press OK	

## 8.0 Sealing sensitivity

For LIPS installations, the Sealing sensitivity can be adjusted if necessary. Sealing sensitivity refers to the level in litres that product must move after sealing, before the seal is broken. The default setting for all compartments is  $\pm 500\text{L}$ .

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK	SYSTEM SETUP? NO
4	Press INC then OK	NO.OF COMPARTMENTS: #
5	Press MENU 7 times	C1: $\pm 500$ C2: $\pm 500$ C3: $\pm 500$ C4: $\pm 500$ C5: $\pm 500$ C6: $\pm 500$ C7: $\pm 500$ C8: $\pm 500$
6	Repeatedly press INC then NEXT for mm, then press OK to save	C1: $\pm \text{####}$ C2: $\pm \text{####}$ C3: $\pm \text{####}$ C4: $\pm \text{####}$ C5: $\pm \text{####}$ C6: $\pm \text{####}$ C7: $\pm \text{####}$ C8: $\pm \text{####}$
7	Hold CAL & press OK to exit	EXIT CALIBRATION? YES
8	Press OK	



## 9.0 Resetting calibrated data

To reset an array of data for a specific sensor follow the steps below. This may be useful for those cases where a sensor needs to be recalibrated.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK twice	COMPART.CALIBRATION? NO
4	Press INC then OK	SELECT COMP.NO.: 1
5	Continue to press INC for the desired compartment then press OK	MANUAL CALIBRATION? NO
6	Press OK 5 times	RESET LEVEL/VOLUME ARRAY? NO
7	Press INC then OK	CONFIRM RESET: NO
8	Press INC then OK to reset selected compartment	SELECT COMP.NO.: 1
9	Alternatively, hold CAL & press OK to exit	EXIT CALIBRATION? YES
10	Press OK	

## 10.0 Temperature compensation setup

Diptronic allows the driver to select the type of fuel in each compartment so that it can automatically convert the volume to a standard of 15degC. The CPU monitors the temperature of the fuel via a temperature probe mounted in each compartment.

By default, temperature compensation is disabled in Diptronic. With the appropriate software version it is enabled simply by selecting the type of product in a compartment with an SG other than zero via a sub-menu.

The driver selects the type of product in a compartment by pressing INC and OK in the main menu. For each compartment the driver can scroll through and select up to a maximum of 8 presets depending on the number enabled. Refer P7310 Diptronic Measuring or P7328 Diptronic LIPS Driver Instructions.

### Ten preset factory defaults:

1. CHECK P	0.000kg/L
2. DERV	0.840kg/L
3. GAS OIL	0.848kg/L
4. KERO	0.798kg/L
5. LRP	0.745kg/L
6. P91 UL	0.740kg/L
7. P95 UL	0.740kg/L
8. P98 UL	0.740kg/L
9. PM KERO	0.820kg/L
10. ULSD	0.828kg/L

### Note:

1. Refer to appendix 3 for flowchart of temperature compensation menus.
2. Temperature compensation is essentially disabled when CHECK P (Check Product) is selected. In this case a density of 0kg/L is automatically selected.



There are 10 preset factory default fuels to select from with a further 10 for user input. There is a maximum of 8 that can be preselected for the driver. Modify the factory defaults as required and add or modify the 10 user inputs as necessary. Use the NEXT and INC buttons to highlight the pre-selected option and select as necessary.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK 6 times	TEMP COMP SETUP? NO
4	Press INC then OK	SET TEMP SENSOR ID? NO
5	Press OK	TEMP SENSOR DIAG? NO
6	Press INC then OK	IDENTIFY TEMP SENSOR? NO
7	Press OK 4 times	EDIT PRODUCT LIST? NO
8	Press INC then OK	#01 product :CHECK P dens: 0.000kg/L pre-selected:YES total pre-selected:1
9	Repeatedly press INC or NEXT to make selections then press OK to save	#01 product :##### dens: #.###kg/L pre-selected:### total pre-selected:#
10	Hold CAL & press INC to select the next product.	#02 product:DERV dens: 0.840kg/L pre-selected:NO total pre-selected:#
11	Repeatedly press INC or NEXT to make selections then press OK to save	#02 product :##### dens: #.###kg/L pre-selected:### total pre-selected:#
12	Repeat steps 10 & 11 until all product selections made	
13	Hold CAL & press OK to exit	EXIT CALIBRATION? YES
14	Press OK	



## 11.0 Calibration report ticket

To get a printout of all calibration and setup data for a particular sensor press the NEXT and PRINT buttons at the same time while in the main display. A calibration report will be printed depending on the compartment currently selected. Press (and hold) the NEXT button to cycle between compartments.

If there is insufficient paper inserted in the ticket printer to print all the data, a warning message will be displayed prompting for more paper. If no paper is inserted within a 10sec period after the warning message is displayed the screen will revert back to the main display.

Return each calibration report ticket to Liquip following a tanker calibration along with the Diptronic Electrical Installation and Commissioning Checklist. Alternatively, use DipRecall to download the setup of each CPU & email the file to Liquip. Refer section 12 for more information.

## 12.0 DipRecall

DipRecall is a Windows application whereby a communication link is established between the Diptronic CPU and a computer (generally a laptop). DipRecall can be used to read from, write to or monitor status of sensors and setups.

Use DipRecall to download the setup of a CPU following each calibration. E-mail the file created from each download to Liquip. Each file will be stored in a national database for future reference.

Refer the DipRecall manual (P7400) for operating instructions.



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## 13.0 Sample printer tickets

### Sample Loading ticket

----- DELIVERY DOCKET -----

LIQUIP  
TRUCK No: ABC123  
DATE: 28/3/2002  
TIME: 10:08  
COMPARTMENT: 1  
START VOLUME [L]: 00667  
END VOLUME [L]: 00691  
\* \* \* DELIVERY INTO TANK \* \* \*

----- END -----

### Sample Delivery Ticket

----- DELIVERY DOCKET -----

LIQUIP  
TRUCK No: ABC123  
DATE: 28/3/2002  
TIME: 16:26  
COMPARTMENT: 1  
START VOLUME [L]: 01381  
END VOLUME [L]: 00270  
DELIVERED [L]: 01111

----- END -----

### Sample Ticket that is emptied and goes into the dead zone

----- DELIVERY DOCKET -----

LIQUIP  
TRUCK No: ABC123  
DATE: 28/3/2002  
TIME: 16:10  
COMPARTMENT: 1  
START VOLUME [L]: 00352  
END VOLUME [L]: MIN-  
IF COMPARTMENT IS EMPTY  
DELIVERED [L]: 352

----- END -----

### Sample Ticket with product that is in the top dead zone and then a delivery is made

----- DELIVERY DOCKET -----

LIQUIP  
TRUCK No: ABC123  
DATE: 28/3/2002  
TIME: 16:23  
COMPARTMENT: 1  
START VOLUME [L]: MAX+  
END VOLUME [L]: 01382  
\* \* \* \* \* INVALID DELIVERY \* \* \* \* \*

----- END -----

## **14.0 The Diptronic measuring system – manual calibration**

If automatic calibration is not available it is possible to do a manual calibration using Diptronic.

### **14.1 Calibrating a new tanker compartment – for the ultimate in accuracy**

To achieve the optimum operational accuracy of the sensors, calibrate according to the instructions below. Note that in calibrating a sensor the same product must be used as that to be used in normal operation. For example, if a sensor in a compartment is calibrated using hydrocarbons, then only hydrocarbons can be used in that compartment.

### **14.2 Calibrating the compartment of a tanker**

Each sensor must be individually calibrated to its corresponding compartment. This is achieved in much the same way as a conventional dipstick being calibrated to its compartment, i.e. in a series of steps. For each sensor, *step 1 has been pre-programmed as the zero volume level and maximum sensor length.*



Initially, empty all product out of the compartment. Eliminate any possible air in the calibration pump system and pre-pressurise by circulating product via another compartment.

Pump in 50L of product using a certified measure and allow the product to settle. Wait for the 'PLEASE WAIT' message to be replaced by the 'READY' message.

If the indicated radar level in mm has not changed after pumping in 50L, continue to pump in 50L increments until a change occurs. This may vary between different compartment capacities.

This level will be entered into the CPU as calibration step 2. Allow suitable time for the measured level reading to stabilise and press the OK button to save as indicated in the instructions below.

Pump product to the next known level for calibration step 3 and continue in the same manner as indicated above until fill complete i.e. pump in 50L increments up to the compartment roof.

If a compartment is greater than 10000L capacity, calibrating in 50L increments is not possible, as there is a limit of 200 calibration steps that can be entered into the CPU. Use 50L increments in the 1<sup>st</sup> 1000L of fill and 50L increments from 1000L below the compartment roof to the compartment roof (calculate the increments in the rest of the compartment by dividing the remaining volume by 160). Another option is to divide the compartment volume by 200 and calibrate the entire compartment in equal steps.



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**Notes:** *The sensor is only as accurate as the number of steps in the calibration. The greater the number of steps the better the accuracy. Increase the number of steps at the narrow section of a compartment where the level increase of product is greatest.*

*It is advised that the data entered into each calibration step be written down for a hard copy version. A chart is included in appendix 2 for convenience.*

*Always wait for the 'READY' message before saving the indicated level at each step.*

*Enter all calibrated data into the tables supplied in Appendix 1. Retain tables as a permanent record for future reference & fax to Liquip along with the Diptronic Electrical Installation and Commissioning Checklist.*

**FOR MANUAL CALIBRATION, RESET EACH COMPARTMENT PRIOR TO CALIBRATION AS PER INSTRUCTIONS IN SECTION 9.0.**



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STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK twice	COMPART.CALIBRATION? NO
4	Press INC then OK	SELECT COMP.NO.: 1
5	Continue to press INC for the desired compartment then press OK	MANUAL CALIBRATION? NO
6	Press INC then OK	COMP:# STEP: 2 MEAS.LEVEL:#####.mm VOLUME:+0000.0L
7	Use the NEXT and INC buttons to enter volume indicated by certified measure	COMP:# STEP: 2 MEAS.LEVEL:#####.mm VOLUME:#####.L
8	Press OK to save	COMP:# STEP: 2 MEAS.LEVEL:#####.mm VOLUME:#####.L
9	Hold CAL & press NEXT for another step	COMP:# STEP: 3 MEAS.LEVEL:#####.mm VOLUME:#####.L
10	Meter known amount of product	
11	Continue to press INC then NEXT to select volume indicated by certified measure	COMP:1 STEP: 3 MEAS.LEVEL:#####.mm VOLUME:#####.L
12	Repeat above steps (8-11) until fill complete	
13	Hold CAL & press MENU when calibration complete	VIEW LEVEL/VOLUME ARRAY? NO
14	Hold CAL & press OK to exit	EXIT CALIBRATION? YES
15	Press OK to confirm exit	

**Notes:** *If the operator fails to press either OK to save or CAL & NEXT to go to the next step and then continues the calibration procedure, the missed step can be included in the edit section (refer section 5.0).*

*If after pressing OK the measured level changes, press OK again to save the changed level (the previously saved level will automatically be overwritten).*

*Following calibration, empty the newly calibrated compartment and verify using the chart in appendix 2. First pump in 0.05 x FULL litres, record the meter & Diptronic levels and determine the error. Continue until the table is complete. Return to Liquip along with the calibration report ticket.*

*Alternatively, use DipRecall to download the setup of each CPU following a tanker calibration & email the file to Liquip. Refer section 12 for more information.*

*If a consistent offset is found refer section 7.*





## 15.0 Viewing calibrated data

Use this menu to view all calibrated data for a particular sensor. This is useful to compare data entered into the CPU with the data written in Appendix 1 to check for any discrepancies. It is recommended this function be performed following the calibration of each sensor.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK twice	COMPART.CALIBRATION? NO
4	Press INC then OK	SELECT COMP.NO.: 1
5	Continue to press INC for the desired compartment then press OK	MANUAL CALIBRATION? NO
6	Press OK	VIEW LEVEL/VOLUME ARRAY? NO
7	Press INC then OK	COMP:# STEP: 1 MEAS.LEVEL:#####.mm VOLUME:#####.L
8	Hold CAL & press NEXT to view next step	COMP:# STEP: 2 MEAS.LEVEL:#####.mm VOLUME:#####.L
9	Repeat above steps to end	
10	Hold CAL & press OK to exit	EXIT CALIBRATION? YES
11	Press OK to confirm exit	

**Note:** See section 5.0 Edit calibrated data if any errors are found while viewing above.

## 16.0 Labelling & Sealing Requirements for NMI Approval

Each compartment in the DIP200 CPU is to be sealed separately after calibration by attaching certification marked lead seals to a laser engraved stamping label (7332) containing calibration data.

**LIQUIP INTERNATIONAL DIPTRONIC**

TANK MANUFACTURER

NMI APPROVAL No: 5/1/5A

FRONT OF TANK

TANK NUMBER

PRODUCT

REAR OF TANK

COMPARTMENT	1	2	3	4	5	6
TOTAL CAPACITY <small>litres</small>						
MAX. MEASURABLE LEVEL <small>litres</small>						
MIN. MEASURABLE LEVEL <small>litres</small>						
MIN. DELIVERY (MMQ) <small>litres</small>						
<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; width: 20px; height: 20px; margin-right: 5px;"></div> <div>7332</div> </div>	●	●	●	●	●	●

— ∅2 HOLES TO BE DRILLED OUT AS REQUIRED


After calibration, all applicable data is added to the label and the ∅2 holes along the bottom are drilled out as required for each compartment. Each calibrated compartment is to have a lead seal fitted through the appropriate hole and stamped with Certification Marks which includes the Certifier's company ID, individual ID & date of calibration. This label is then attached to the tanker curtain plate in the vicinity of the API adaptors & Diptronic CPU.

Each stick and the CPU calibration buttons are to be sealed with a lead seal stamped with Control Marks which includes the Certifier's company ID & individual ID only, no date.

In addition, a safe fill level (SFL) label must be positioned near each API adaptor as required by NMI. This is an engraved plastic label (7316) showing compartment number, SFL and probe height and is made as two sets so one is fitted near the API adaptor and another on the walkway.

7316

COMP No:



COMPARTMENT SETTINGS

SFL: (LITRES)	
PROBE HEIGHT: <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; width: 15px; height: 15px; margin-right: 5px;"></div> <div>(mm)</div> </div>	<div style="text-align: center;"> <div style="display: flex; align-items: center; justify-content: center;"> <div style="width: 20px; border-bottom: 1px dashed black; margin-bottom: 5px;"></div> <div style="display: flex; align-items: center;"> <div style="width: 10px; height: 10px; border: 1px solid black; margin: 0 5px;"></div> <div style="width: 10px; height: 10px; border: 1px solid black; margin: 0 5px;"></div> </div> </div> </div>



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## APPENDIX 1 - Data sheets for manual sensor calibration (print a copy of this sheet for every sensor/compartment commissioned) – see section 2 for calibration procedure.

### DIPTRONIC SENSOR INFORMATION

COMPANY:	
DATE:	
TRUCK ID:	
NO. OF COMPARTMENTS:	
DATE:	
CUSTOMER:	
CALIBRATOR:	
TRUCK NO.:	
COMPARTMENT NO.:	
CPU SERIAL #:	
SENSOR SERIAL #:	
L2:	
L3:	
L6:	
SAFE FILL LEVEL:	
LITRES OFFSET:	
mm OFFSET:	

### TEMPERATURE FACTOR DATA REFERENCE (AS PER LABEL ON SENSOR):

TEMP (DEG C)	FACTOR (mm)

### CALIBRATION DATA:

STEP	SENSOR LEVEL (mm)	CERTIFIED LEVEL (L)
1	pre - programmed	0
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

STEP	SENSOR LEVEL (mm)	CERTIFIED LEVEL (L)
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
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40		



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Continued...

COMP:

DATE:

STEP	SENSOR LEVEL (mm)	CERTIFIED LEVEL (L)
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
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89		
90		

STEP	SENSOR LEVEL (mm)	CERTIFIED LEVEL (L)
91		
92		
93		
94		
95		
96		
97		
98		
99		
100		
101		
102		
103		
104		
105		
106		
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Continued...

COMP:

DATE:

STEP	SENSOR LEVEL (mm)	CERTIFIED LEVEL (L)
141		
142		
143		
144		
145		
146		
147		
148		
149		
150		
151		
152		
153		
154		
155		
156		
157		
158		
159		
160		
161		
162		
163		
164		
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169		
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171		
172		
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175		
176		
177		
178		
179		
180		
181		
182		
183		
184		
185		
186		
187		
188		
189		
190		

STEP	SENSOR LEVEL (mm)	CERTIFIED LEVEL (L)
191		
192		
193		
194		
195		
196		
197		
198		
199		
200		

## APPENDIX 2 - Verification table

**Tanker No.:**

**Sensor Serial No.:**

**Calibrator:**

**Date:**

**Company:**

**License No.:**

Level (litres)	Compartment:			
	Meter	Diptronic	Error (L)	Error (%)
EMPTY	0			
L(0.05 x FULL)				
L(0.10 x FULL)				
L(0.15 x FULL)				
1000L				
2000L				
3000L				
4000L				
5000L				
6000L				
7000L				
L(0.75 x FULL)				
L(0.85 x FULL)				
SAFE FILL				
L(FULL - 50)				

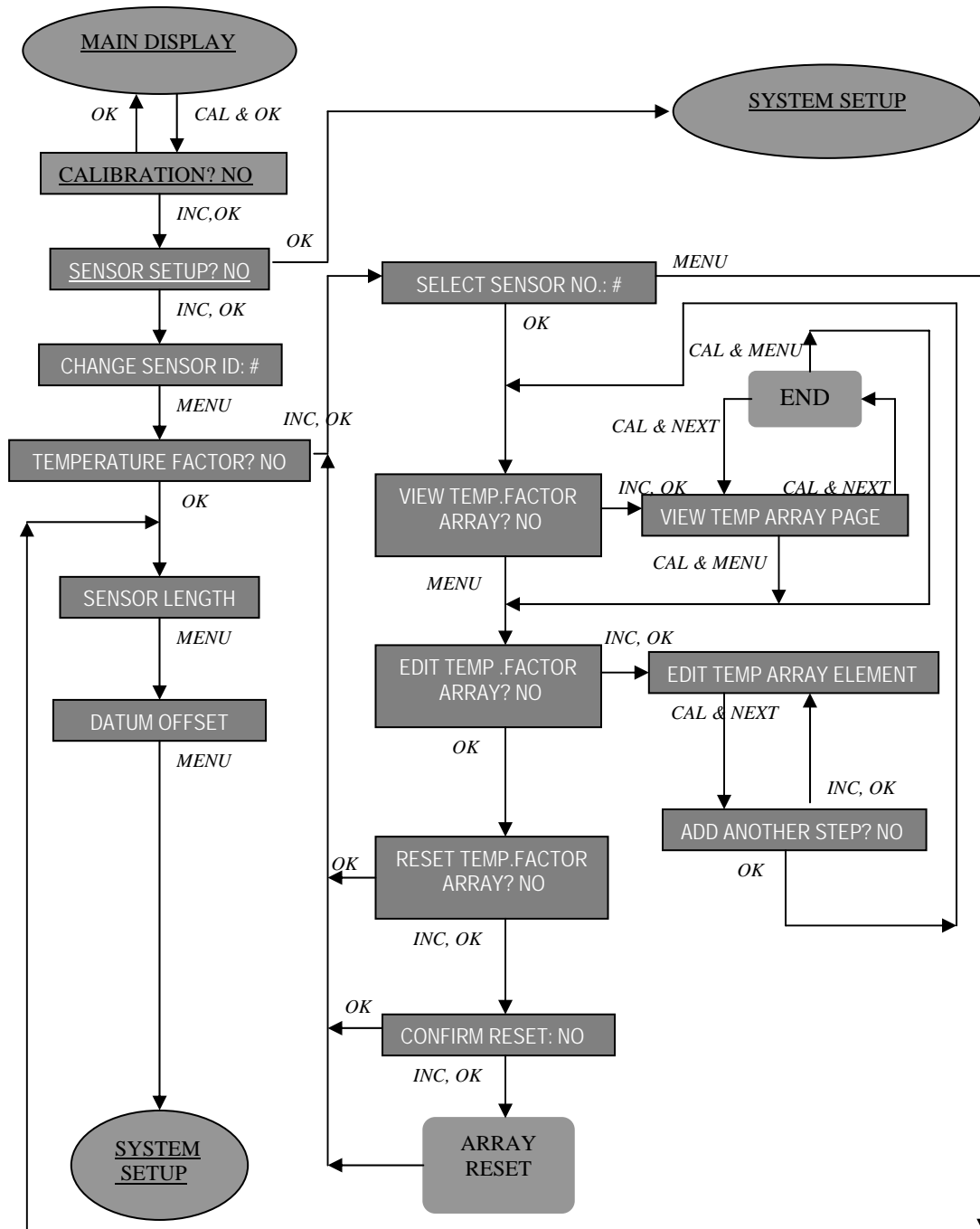
Liquip International  
Ph: +612 9725 9000  
Fax: +612 9725 1252  
Email: sales@liquip-nsw.com.au

**Note:** FULL  $\equiv$  L2 = \_\_\_\_\_ L

Make a copy of this page for each compartment & fax back to Liquip along with a Calibration Report Ticket (section 11).



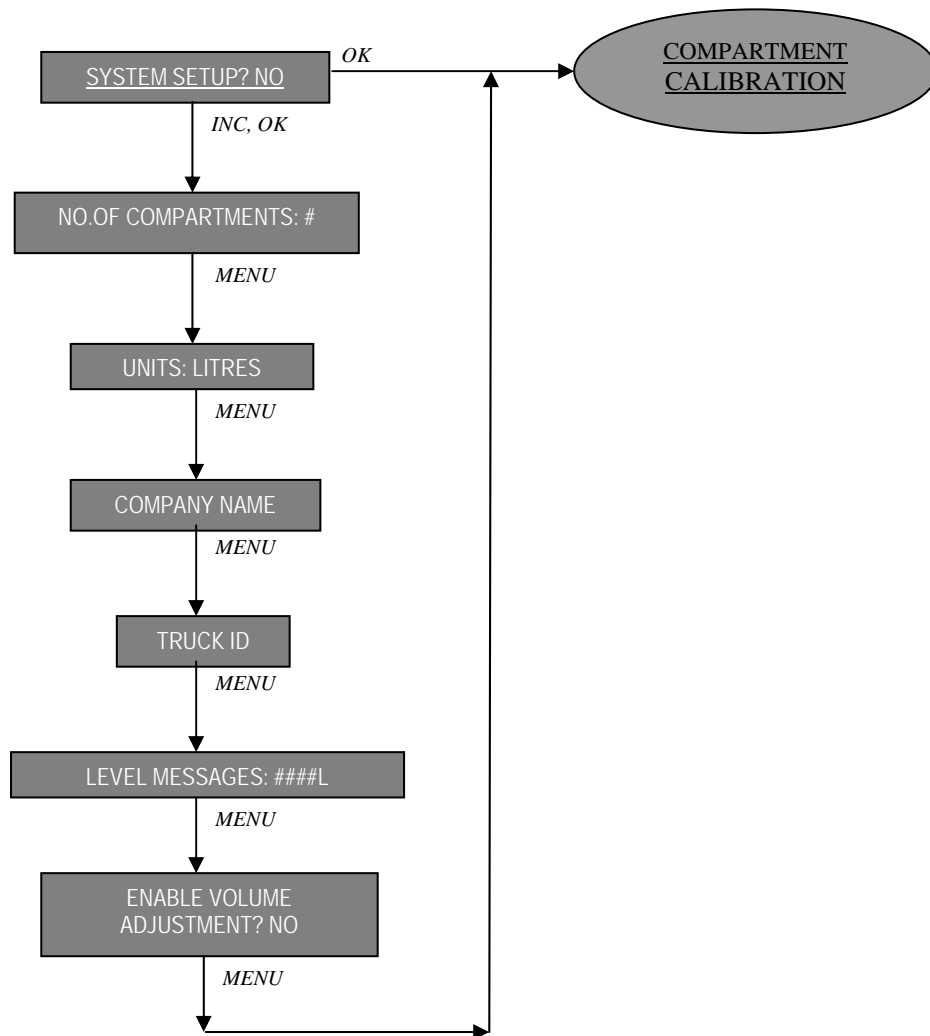
## APPENDIX 3 - System Flowchart Diptronic MK1, version 01.00.15

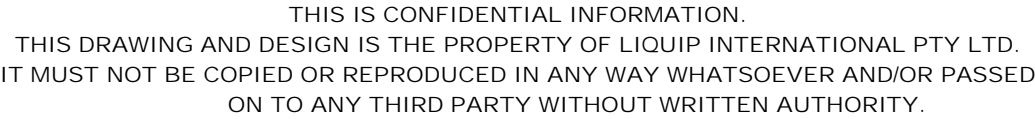






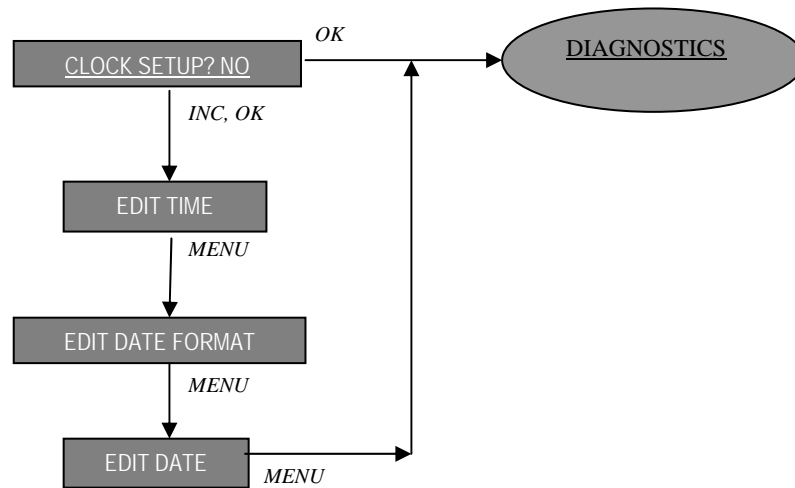
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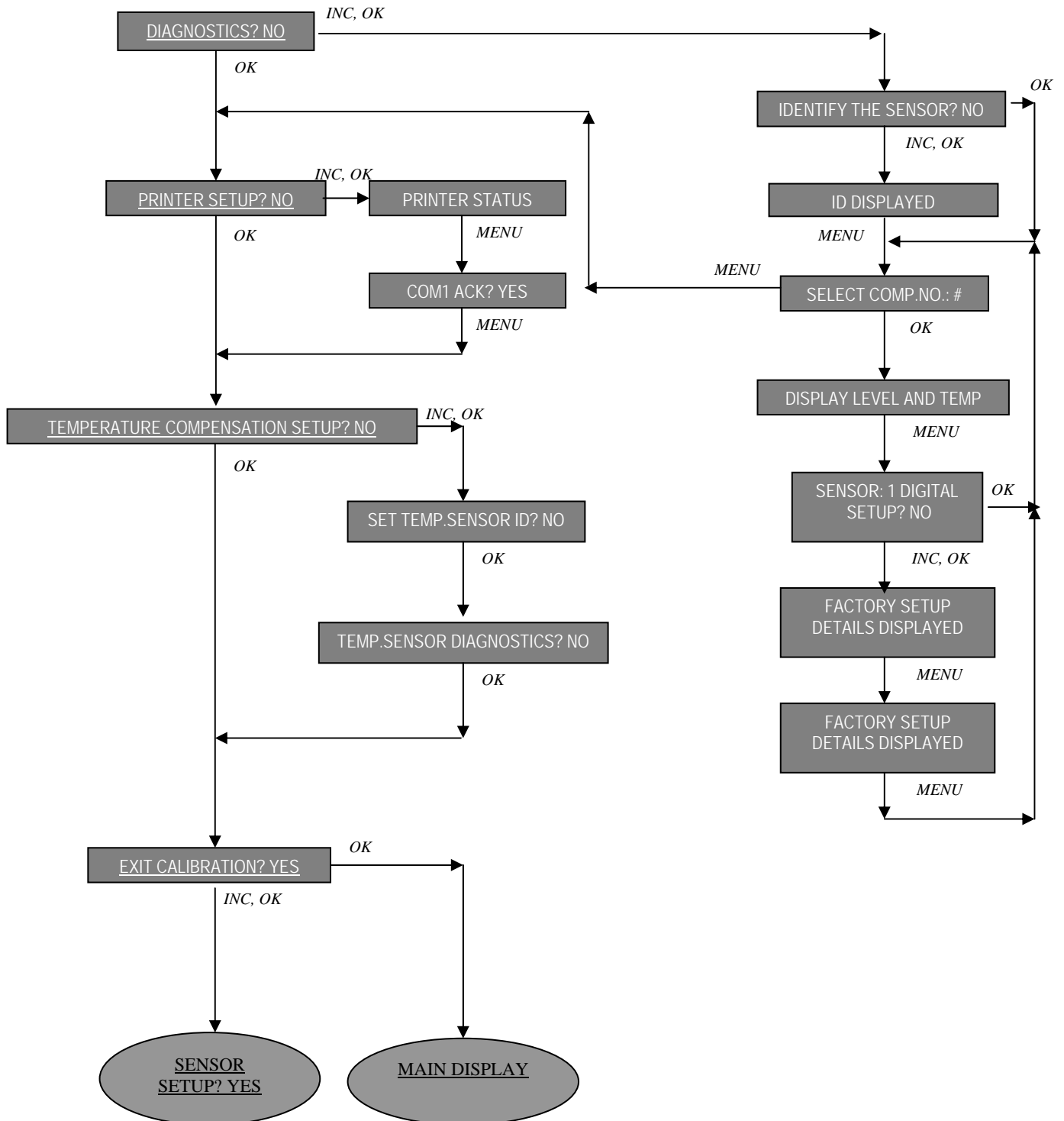


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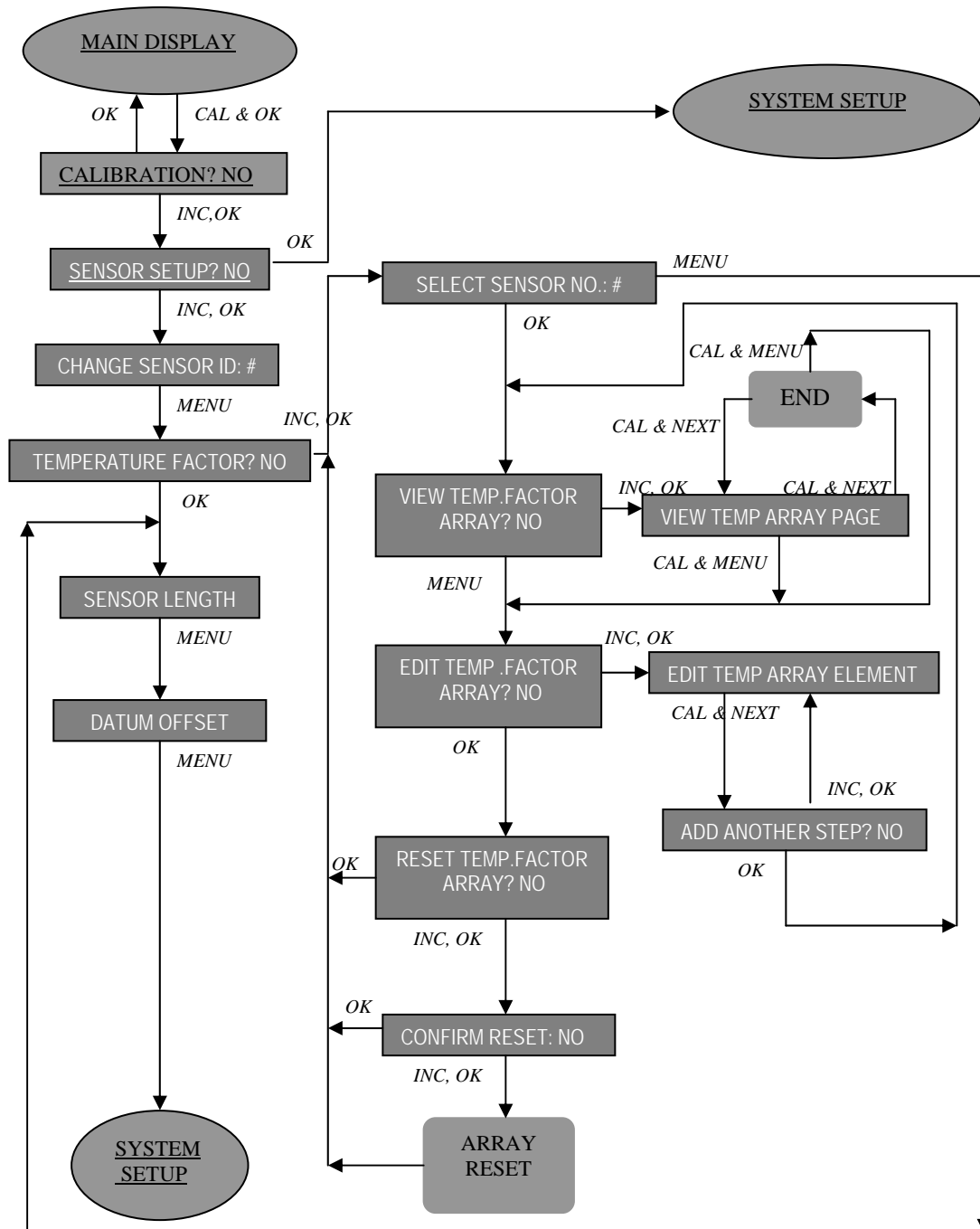


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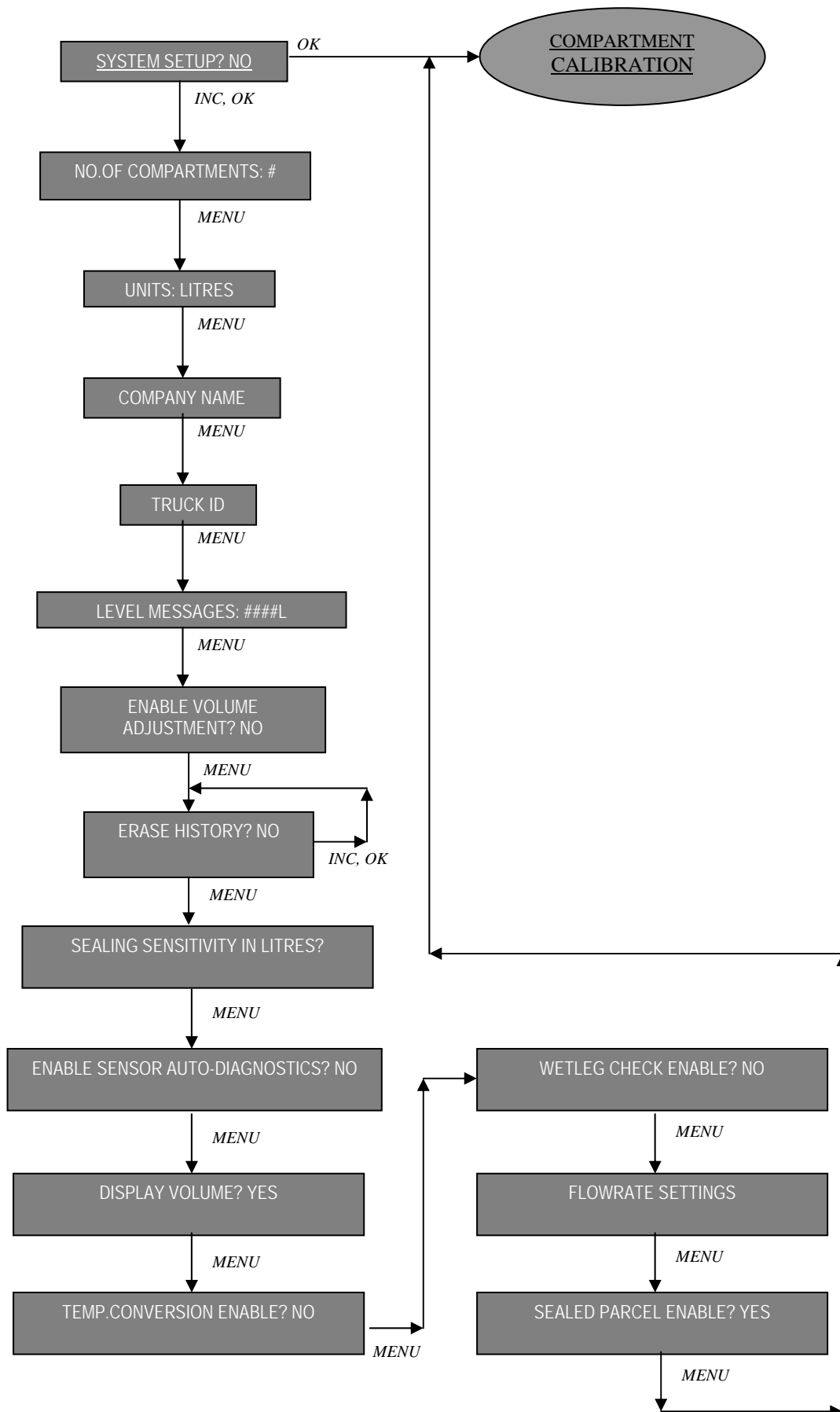


## APPENDIX 4 - System Flowchart Diptronic LIPS, version 13.00.02



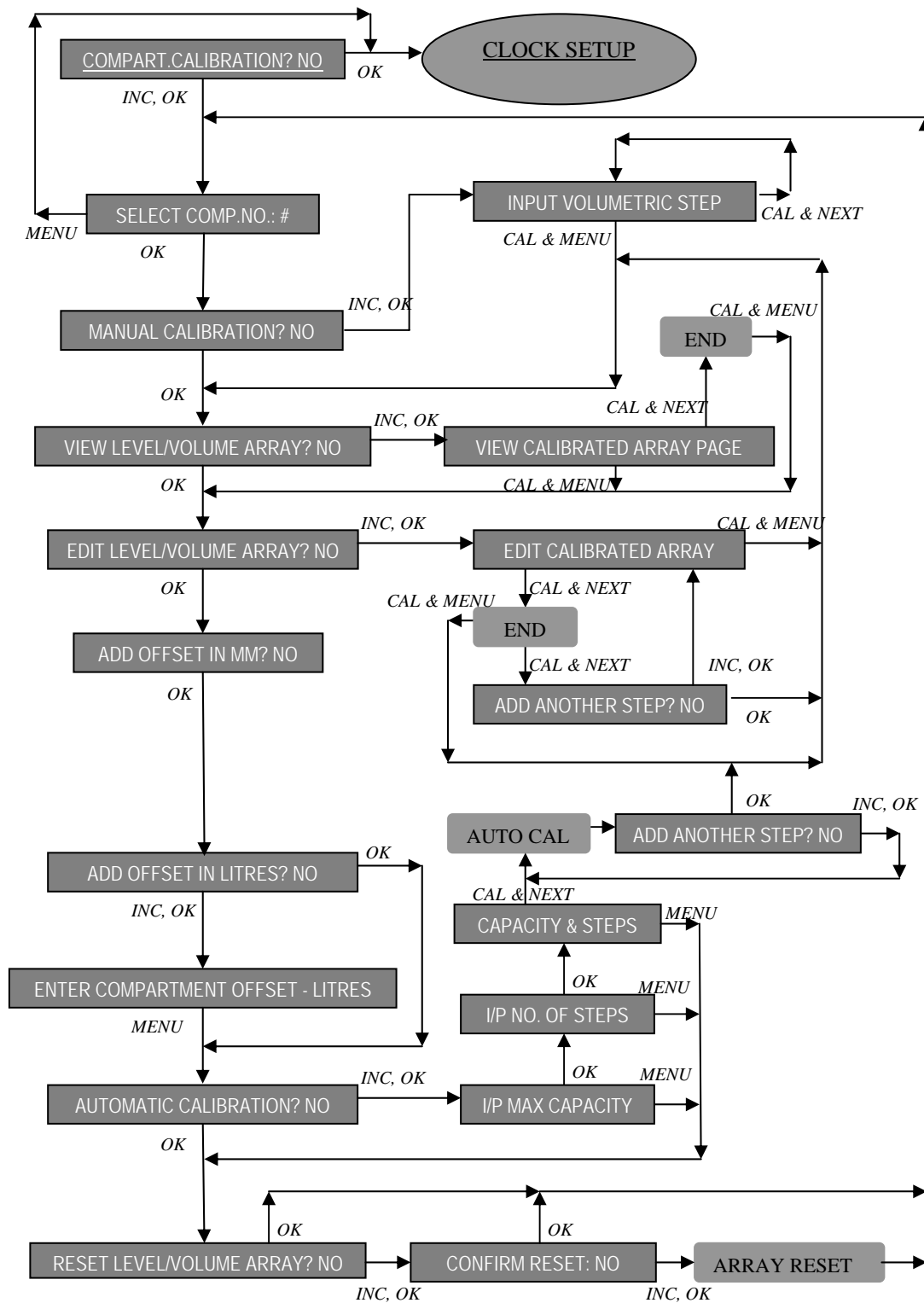


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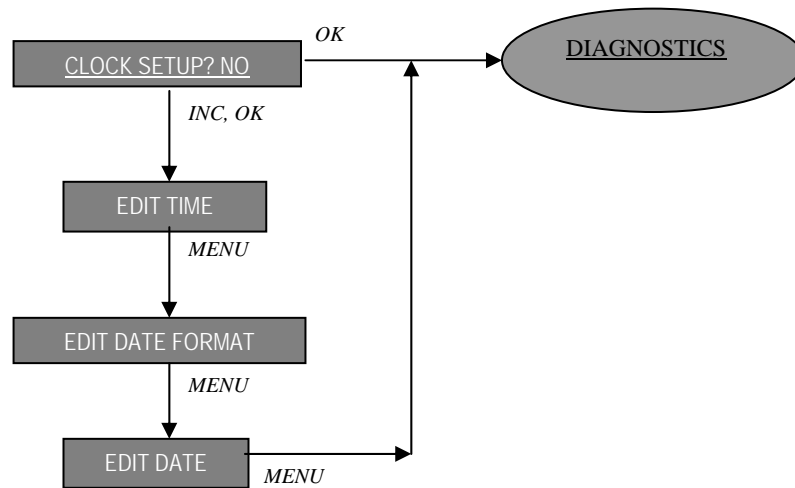


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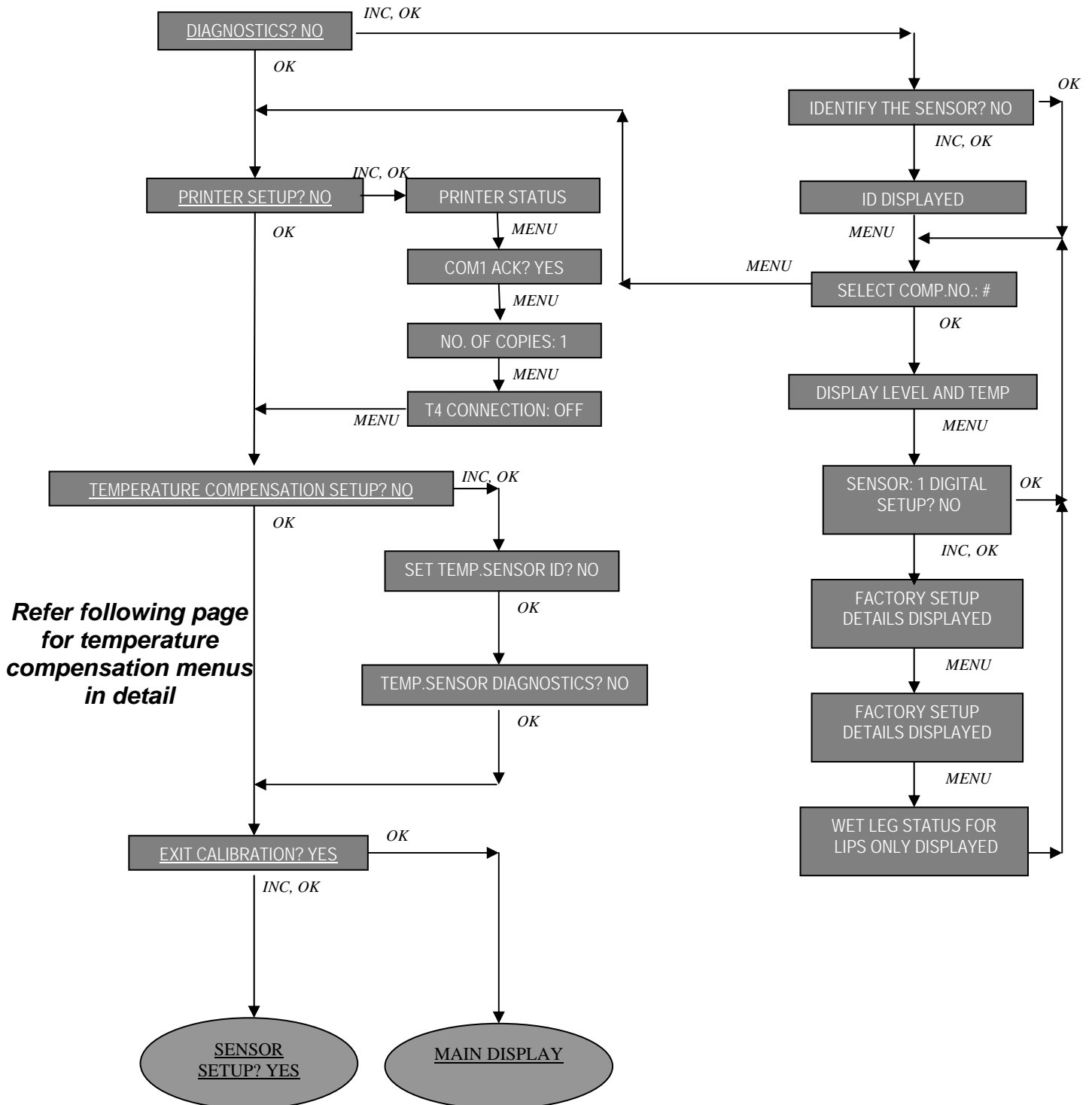
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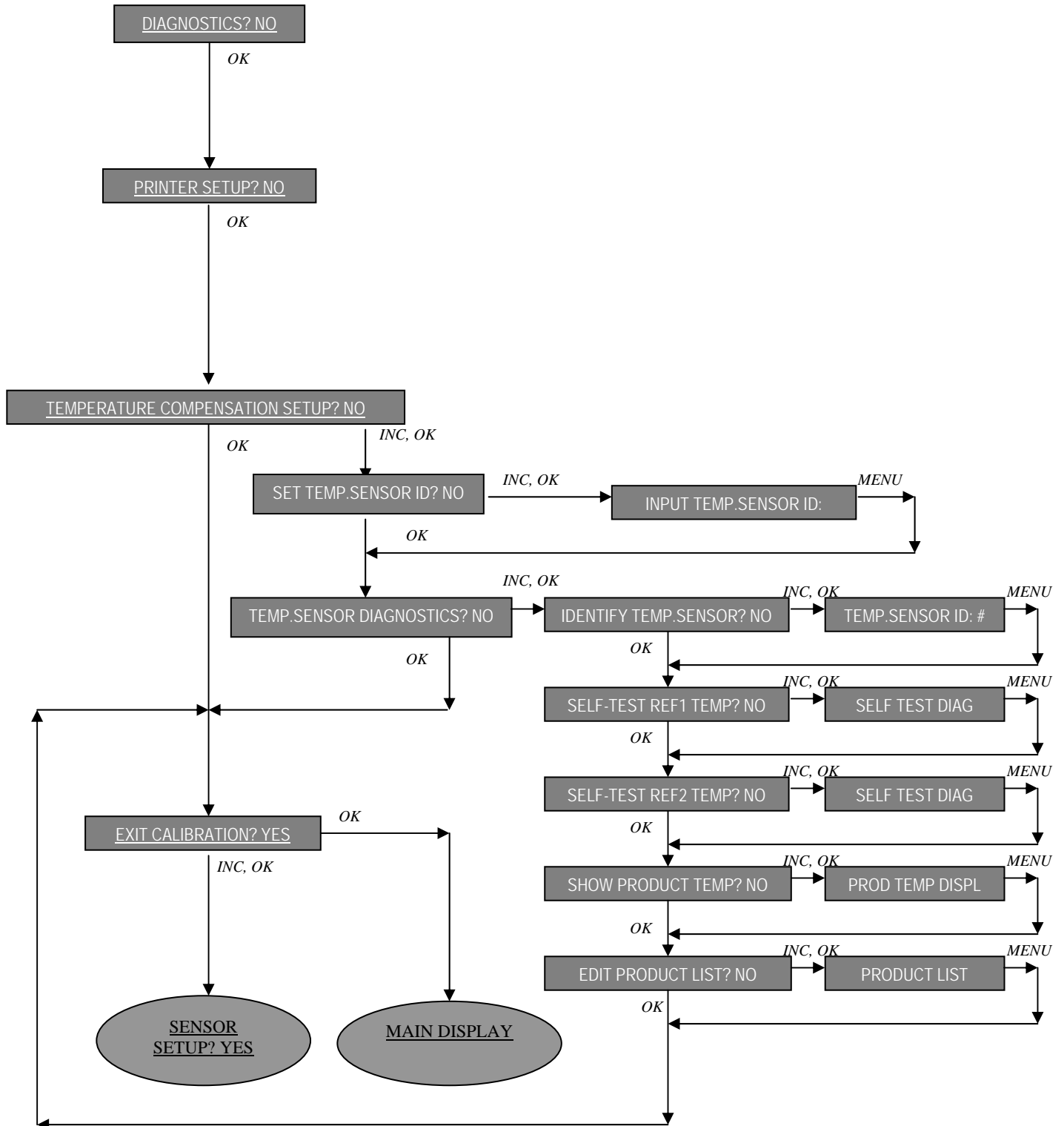


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## APPENDIX 5 - Diptronic reference booklets

PART #	DOCUMENT	FILENAME
7310	DIPTRONIC MEASURING SYSTEM MK1 DRIVERS MANUAL	DIP200_INST_DIPTRONIC_MEASURING_DRIVER_INSTRUCTIONS_P7310.pub
7326	DIPTRONIC MEASURING SYSTEM MK1 & L.I.P.S. (WITH GPS) CALIBRATION MANUAL	DIP200_INST_DIPTRONIC_CALIBRATION_P7326.pub
7327	DIPTRONIC MEASURING SYSTEM MK1 & LIPS AUTOMATIC CALIBRATION RIG MANUAL	DIP200_INST_DIPTRONIC_CALIBRATION_RIG_P7327.pub
7328	DIPTRONIC L.I.P.S DRIVERS MANUAL	DIP200_INST_DIPTRONIC_LIPS_DRIVER_INSTRUCTIONS_P7328.pub
7329	DIPTRONIC MEASURING SYSTEM MK1 INSTALLATION MANUAL	DIP200_INST_DIPTRONIC_MEASURING_INSTALLATION_INSTRUCTIONS_P7329.pub
7330	DIPTRONIC L.I.P.S. & GPS INSTALLATION MANUAL	DIP200_INST_DIPTRONIC_LIPS_INSTALLATION_INSTRUCTIONS_P7330.pub
7331	DIPTRONIC GENERAL INFORMATION	DIP200_INST_DIPTRONIC_GENERAL_INFORMATION_P7331.pub
7333	DIPTRONIC CPU (DIP200 & DIP240) SOFTWARE UPGRADE INSTRUCTIONS	DIP200_INST_DIPTRONIC_SOFTWARE_UPGRADE_INSTRUCTIONS_P7333.pub
7334	DIPTRONIC MEASURING SYSTEM MK1 & L.I.P.S. CPU REPLACEMENT INSTRUCTIONS	DIP200_INST_DIPTRONIC_CPU_REPLACEMENT_INSTRUCTIONS_P7334.pub
7335	DIPTRONIC MEASURING SYSTEM MK1 & L.I.P.S. SENSOR (ANTENNAE & DIP100-12, DIP120-12 & DIP130-12) REPLACEMENT INSTRUCTIONS	DIP200_INST_DIPTRONIC_SENSOR_REPLACEMENT_INSTRUCTIONS_P7335.pub
7400	DIPTRONIC MEASURING SYSTEM MK1 & L.I.P.S. DipRecall MANUAL	DIP200_INST_DIPTRONIC_DIPRECALL_INSTRUCTIONS_P7400.pub




## **NOTICE FOR USE IN CEN**

### **Instructions specific to hazardous area installations (reference European ATEX Directive 94/9/EC, Annex<sup>22</sup>, 1.0.6.)**

The following instructions apply to equipment covered by certificate numbers Sira 02ATEX3323X (DIP200) and Sira 02ATEX2322X (DIP100):

1. The equipment may be used in a hazardous area with flammable gases and vapours with apparatus group IIA and with temperature classes T1, T2, T3, and T4.
2. The apparatus is only certified for use in ambient temperatures in the range -20°C to +60°C and should not be used outside this range.
3. The certified numbers have an 'X' suffix that indicates that special conditions of certification apply. These conditions are; The DIP100 has an aluminium cover and precautions must be taken to reduce the risk of a frictional spark occurring. The DIP200 power must be supplied via a fuse that has a breaking capacity capable of clearing the maximum short circuit current of the truck battery.
4. Installation shall be carried out in accordance with the applicable code of practice by suitably trained personnel.
5. Repair of this equipment shall be carried out in accordance with the applicable code of practice.
6. Certification marking as detailed in DIP100 series drawing number P7278 & DIP200 series drawing number P7284.
7. If it is likely the equipment will come in contact with aggressive substances, then it is the responsibility of the user to take suitable precautions to prevent the equipment being adversely effected, ensuring the type of protection is not compromised.

Aggressive Substances: e.g. acidic liquids or gases that may attack metals or solvents that may effect polymeric materials. inspections or establishing from the materials data sheet that it is resistant to specific chemicals.

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