

DIPTRONIC

Software Settings and User Manual

Rev. C

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1. Introduction

Thank you for supporting this product and taking the time to read this manual.

Liquip International Pty Ltd has been manufacturing Diptronic measurement systems in several variants for over 5 years. Over that time the Diptronic concept has undergone significant transformation into complete solutions embracing new technologies being employed to greatly enhance overall functionality.

Diptronic has been specifically designed to meet metrological regulations in Australia and other countries for road tankers using bulk or metered delivery of liquids like: petroleum products, vegetable oils, milk, liquid fertilisers and others.

Flexibility of the design allows for linking it with other electronic equipment thus providing systems like:

- Diptronic Mk 1 ("standard" version).
- LIPS (Load Integrity Protection System) as basic sealed parcel system.
- LIPS2 – with additional temperature conversion for petroleum products.
- LIPS2/GPS – with additional facility for satellite tracking of the cargo.
- COPS (Cross Over Protection System) for protection against cross-contamination of loads.
- MDS (Meterless Delivery System) for metered hose reel delivery of heavy ("brown") petroleum products, vegetable oils and liquid fertilisers.
- Others.

While the Diptronic system remains self-contained and relatively easy to install, the large number of setup parameters and functional options suggests a good understanding of this manual will greatly reduce potential configuration errors.

1.1 Use of this Manual

This manual is designed as a guide for experienced installation technicians familiar with all local codes and standards associated with electrical installations on road tankers. It is supplied with the intent of providing a broad view on installing and configuring the Diptronic system only.

It should be used as a reference for all listed further below installations. However, there are separate Diptronic manuals providing necessary details for wiring diagrams, calibration procedures and setup of associated equipment.

You must be familiar with those manuals as the detailed information will not be repeated in this document. Contact Liquip International Sales Dept. for complete documentation.

We recommend you become familiar with the contents of this manual before attempting to install the product. We also assume you have detailed local knowledge on and certified where required in:

- Electrical Safety Standards.
- Metrological certification and verification.
- Electronic systems installation.
- Hazardous Environment Installation

Ensuring compliance with the highest safety and regulatory standards is of critical importance.

1.2 Document Revision History

A	Initial release.
B	Additions to the troubleshooting section.
C	Corrected mistake in firmware version control (chapter 1.3), added this table.

1.3 Firmware Version Control

The Diptronic firmware utilises the following format for version control of firmware changes. Each firmware release will be notated

ZZ . YY . XX where ZZ represents the version for metrological changes.
 YY represents the family version.
 XX represents the version for non-metrological changes.

Currently there are several firmware versions in operation, depending on the purpose of the installation:

Standard Mk1	01.00.XX
Standard "French"	02.00.XX
LIPS	11.00.XX
LIPS2	13.00.XX
LIPS2 "Polish"	13.01.XX
COPS	01.07.XX
Sump Truck	04.00.XX
MDS	01.02.XX
Cooking Oil	01.08.XX
Liquid Fertiliser	01.05.XX
Milk (UK)	12.00.XX

2. Functionality of the Diptronic system.

2.1 Volume measurement.

For all variants of Diptronic measurement of volume in the compartment is conducted by Guided Wave Radar Sensor DIP1XX with its probe located vertically inside the vessel and through the volumetric centre.

DIP1XX provides frequent measurement of distance between its own reference point located in the upper section of the probe and the surface of the product in the vessel.

This information is further processed by the DIP2XX CPU module and after implementing volume-level lookup table and other correction factors it becomes converted into volume.

The DIP2XX processing unit is responsible for communication with radar sensors (up to 9), mathematical calculations, calibration data entry and storage, interface with the user and communication with peripheral equipment like printer, radio modem, GPS unit, etc.

Volume is displayed on the main LCD panel. It is accompanied by a flag indicating when the reading is stable ("READY") and metrologically accurate.

Movement of the product during loading or delivery as well as heavy sloshing will cause instability of readings and these measurements should be taken as indication only.

Stable readings can be processed as individual transaction where the operator's action is required to manually start and finish delivery. In such case the CPU will calculate volume transferred as the net difference between start and end of delivery.

The Diptronic can support ticket printer for producing delivery dockets and calibration data printouts. Depending on version of the firmware it can also print history of events stored in memory in order to trace integrity of the load.

Basic variant of Diptronic system is also called Mk.1 and involves volume measurement for selected channel only.

2.2 Sealed parcel system (LIPS and LIPS2) including GPS.

Sealed parcel system is designed to monitor integrity of the cargo from its loading at the terminal all the way to the delivery site.

As the radar sensor cannot measure product level very close to the bottom of the tank (so called "bottom dead zone"), typically the last 50-100mm, and it cannot measure contents of the wetleg, LIPS system is equipped with wetleg sensors located at the lowest practical point in the wetlegs.

Those sensors are optical and can be digital (DWS series) or fibre-optic (connected via PPM3XX on-board monitor).

Electronic sealing of the compartment is initiated by disconnecting gantry monitor from the tanker, therefore the Diptronic system can read status of the gantry plug via digital truck plug (DTP series), or via PPM3XX monitor.

LIPS2 variant of the sealed parcel system is additionally equipped with digital temperature sensors BTS1XX for measurement of temperature of the product in the compartment. BTS1XX are located in the bottom of the tank. They allow to calculate volume corrected to +15 degC.

For maximum security of the product the LIPS2 system can be connected to GPS/GPRS unit so that complete information about volumes, tanker location or allowed route can be retrieved in real time.

In opposite to Diptronic Mk.1 the LIPS/LIPS2 system incorporates continuous scanning of all compartments even though volume of only one compartment can be shown on the screen at any time.

2.3 Cross-over protection system (COPS).

In order to prevent cross-contamination of products in the compartment or in the storage tank at the service station the Diptronic is equipped with digital product indicators (CPI series), one for each compartment, and with electronic tite-fill elbow (CTE series).

During loading at the gantry the product indicator CPI identifies product loaded into the compartment and the product name is logged into memory.

At the beginning of delivery the electronic tite-fill elbow CTE identifies product in the storage tank and if it matches the product in the compartment a green light on the product indicator shows permissive state to the operator. In case of mismatch red light on the product indicator provides warning.

Any new connection of the tite-fill elbow to the drop point is recorded into non-volatile memory as an event and is included in a history docket. A printout of history events can be used as an evidence of cross-connections as well as genuine deliveries.

2.4 Meter-less delivery system (MDS).

This variant is designed to eliminate flowmeter as a measurement instrument for product delivery. Instead, the Diptronic can calculate net delivery volume and provide tank gauging at the same time.

The MDS system is equipped with additional components like: remote display RD1XX series for display of net volume on large LED panel and control of solenoid valves, flow sensor to provide faster reaction time at the start and end of delivery and optional MPP102 monitor for low-level product cut-off function.

The MDS has metrological approval (NMI) in Australia for trade use for hose delivery of diesel fuel or other heavy petroleum products.

2.5 Other variants.

2.5.1 Cooking Oil Delivery.

System designed for delivery of vegetable oils to fast-food outlets. It is essentially double MDS system with only one remote display RD100 unit shared between two CPUs DIP200.

The tanker has two compartments for different grades of oils and third compartment for collection of used oil. Volume in the used oil compartment is not measured by Diptronic.

This system has NMI approval in Australia.

2.5.2 Liquid Fertiliser Delivery.

System for delivery of various grades of liquid fertiliser and is based on MDS concept. The tanker has three compartments for fertiliser solutions and one for clean water for flushing the installation after delivery.

It has single remote display RD100, one DIP200 and four radar sensors for volume measurement in all compartments.

This system has NMI approval in Australia

2.5.3 Sump truck.

This variant is for collection of water and fuel from hydrant pits at the airports. The radar sensor is capable of measuring total volume of mixture of water and fuel as well as individual volumes once two liquids separate from each other.

The Diptronic system is located on the collection trucks and in the storage tank where the contents of collection trucks is dumped.

Volume data from the trucks and storage tank can be transmitted via radio back to the host computer in the main office for further processing.

Calibration of both truck and the storage tank is in US Gallons.

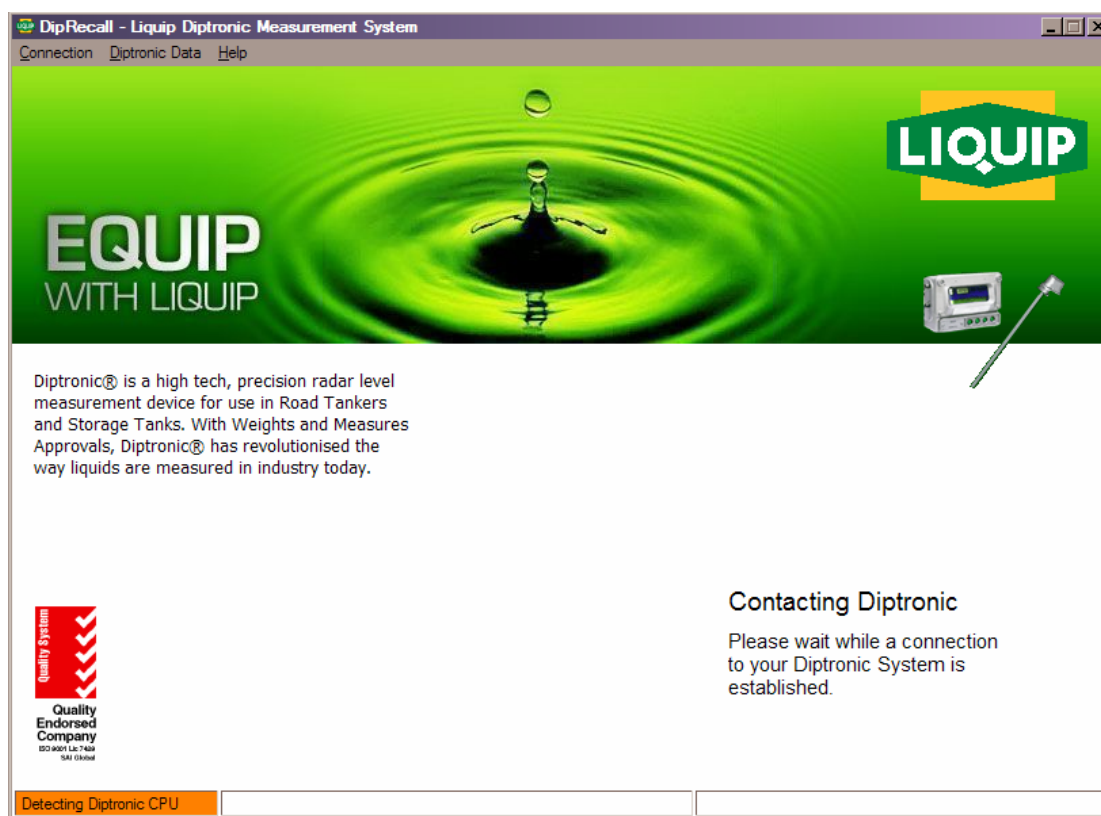
2.5.4 Aviation tanker.

This is essentially standard Mk.1 Diptronic system with addition of PLC for automatic loading to the safe fill level. The PLC estimates flow rate during loading and drives the main cut-off valve when compartment is full.

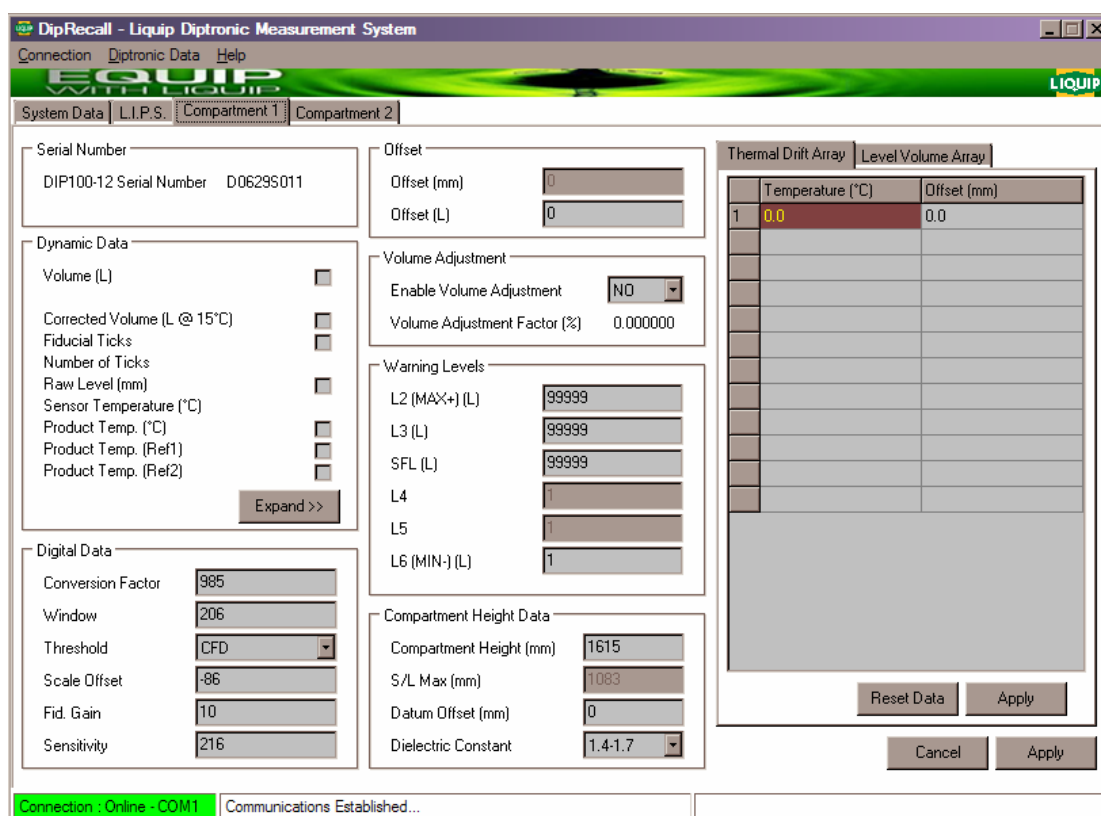
2.5.5 Standard French variant.

This version is based on standard Mk.1 Diptronic system where calibration of the compartments has been arranged in true millimetres instead of volume in litres. Thus the Diptronic CPU displays ullage in mms while the operator reads volume in the compartment from the calibration chart. Such unusual arrangement has been introduced in order to comply with French Weights & Measures regulation and verification practice.

3. DipRecall Windows Application.



DipRecall Windows application has been developed to allow for access to calibration data in the DIP200 CPU from the remote PC or laptop computer via RS232 connection. Thus there is no need to break the calibration seals to operate the keypad, however for data protection the DipRecall requires password to be entered at the start-up of the program.



In case the PC has no available RS232 port the operator must use USB-RS232 converter and observe correct communication port selection in the DipRecall menu.

Important notes:

- Some USB-RS232 converters may not work reliably due to excessive length of the communication cables, please contact Liquip Engineering department for further information.
- The operator must use COM1 (printer port) of the Diptronic CPU for correct connection. Although vast number of communication commands could be supported via COM2 as well, this port is not suitable for DipRecall.
- In addition, depending on specific configuration of the system, there are certain requirements in order to achieve maximum performance:
 - With PLC – disconnect from COM2,
 - With GPS unit – disconnect from COM2,
 - With PPM340 – no difference - disconnect or leave it connected to COM2.
- Although majority of calibration data are stored in the DIP200 CPU's memory, a number of other parameters critical for metrological performance are kept in the radar sensors, therefore it is essential that radar sensors remain connected to the DIP200 while loading calibration settings into the system or reading them from Diptronic. Any missing or malfunctioning DIP100 sensors will slow down the system and may cause DipRecall to drop-out.
- Do not manually enter calibration mode on the DIP200 CPU while attempting to connect via DipRecall. The Diptronic CPU must remain in operating mode in order to establish communication with the DipRecall.
- For detailed information on installation, removal and operation of DipRecall ref. manual DIP200_INST_DIPTRONIC_DIPRECALL_INSTRUCTIONS_P7400.pdf.
- Stay in touch with Liquip Engineering or Sales department for latest update of DipRecall. Make sure you have been provided with the latest version of the software.

4. Software Settings



4.1 Display Panel

The Diptronic CPU (DIP200) has two Liquid Crystal Displays:

- the top one 1 x 8 characters for presentation of metrological data like compartment number and volume,
- the bottom one 2 x 40 characters for displaying messages and setup menus in calibration mode.

2

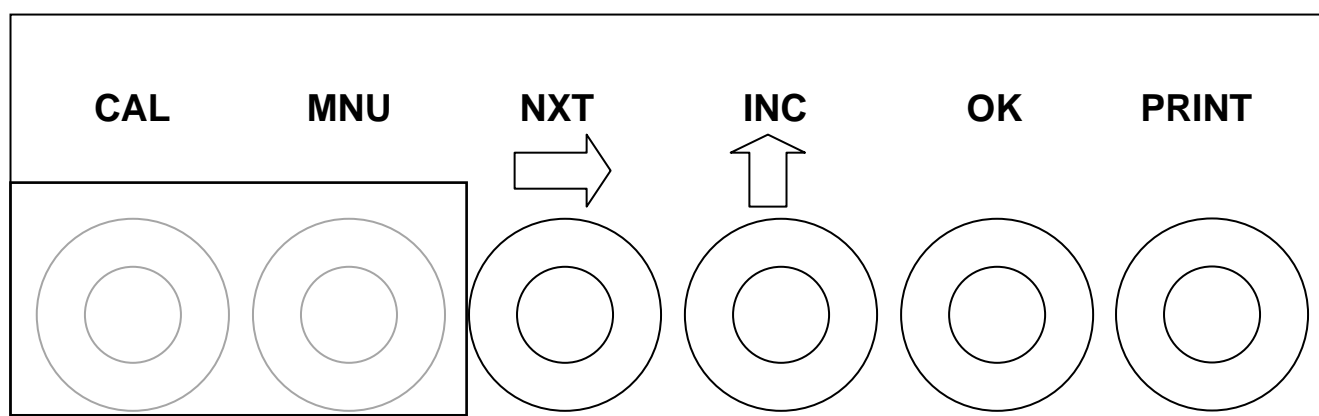
9857

DIESEL
SEALED

wait...
F/V:OPEN

start del: OK+PRINT
RACK:off LEG:wet

4.2 Keypad Operation in Calibration Mode



The Diptronic CPU (DIP200) configuration is achieved by the two push-button switches under the front security panel and the four front push-button switches each assigned with the following functions:

Notes:

- In case of combination of buttons the first one must be pressed and held down while the second button is pressed.
For example:
“CAL + OK” means press and hold CAL, press OK, then release both.
- Quite often response to the action of buttons can be delayed due to processing of other tasks in the background. This will be particularly evident when the CPU communicates with the radar sensor or – even worse – when polling for non-existing sensor. Patience is required.

Button	Standby / Delivery Mode	Calibration Mode
CAL		
MNU		Skip to the next calibration menu item.
NXT	Select next compartment	Move cursor to the next position.
INC	For LIPS2 – show converted volume, temperature of the product and VCF	Modify (increment) the calibration field pointed by the cursor.
OK	For LIPS2 – show flow rates for all compartments	Accept calibration setting, save data in memory.
PRINT	Finish delivery, print delivery docket.	For “driver’s calibration menu” only – skip to the next menu item.
CAL + MNU		Complete storing data for the volume calibration of the compartment. Sort volume / level data.
CAL + NXT		Move cursor to the next calibration entry field. Enter one more step for volume calibration.
CAL + INC		For LIPS2 - Show next product of the database
CAL + OK	Enter calibration mode.	Shortcut to the last calibration menu (EXIT)
CAL + PRINT		Jump every 10 elements of the volume / level calibration array.
CAL + MNU + OK	Press & hold while powered up – reset calibration data.	
NXT + PRINT	Print calibration report.	

INC + NXT	For LIPS2 – show wetlegs status	Clear one element of products database.
INC + OK	Enter “driver’s calibration menu”.	Fast increment of product name entry.
INC + PRINT	For LIPS2 - print history report. Terminate printing of history report.	
OK + PRINT	Start delivery.	

IMPORTANT:

It is legal requirement that access to calibration settings is protected by wire seals. They are normally installed across CAL and MNU protection cover and across heads of the bolts in the top corners of the front lid of the CPU.

Lack of the calibration seal may indicate that the system does not conform to Weights and Measures regulations.

Calibration seal can be fitted by authorised person only.

4.3 How to access Calibration Menu.

In general the calibration menus are divided into two groups: Driver's Calibration Menu and Sealed Calibration Menu.

4.3.1 Driver's Calibration Menu.

This menu is meant to be accessed frequently and without restrictions. Usually it is operated by the driver who can make selections of some control parameters before, during and after the product loading or delivery.

This menu allows for entry of some non-metrological parameters and viewing of diagnostic window.

It is activated by pressing INC+OK buttons and the Diptronic CPU will exit it automatically after 20 second if no button is pressed. Any action of buttons will re-start 20 sec timeout.

As the CAL and MNU buttons remain sealed, thus inaccessible for the driver, use PRINT button to scroll through menu items.

Altering the data can be done with INC button, while the NXT button will move the cursor to the next position on the screen and OK button will accept the new data.

4.3.2 Sealed Calibration Menu.

This menu allows for entry and modifications of metrologically-critical data therefore access to it is restricted by wire seal protecting buttons CAL and MNU.

Only the authorised personnel is allowed to break the seal and alter the data.

Once CAL and MNU buttons are exposed, the operator must press CAL+OK buttons to control the Diptronic CPU into the calibration mode.

CALIBRATION? NO

Once changed to "YES" (with INC button) and accepted (with OK button) the CPU remains in calibration mode. Scrolling through menus is done by use of MNU button.

Usually pressing CAL+OK will activate "shortcut" straight to the exit menu.

EXIT CALIBRATION? YES

Once accepted "YES" (with OK button) the CPU returns to the normal operating mode.

4.4 Driver's Calibration Menu

Depending on settings protected under sealed section of calibration entries some items in the driver's menu may not be allowed to appear.

4.4.1 ENQUIRY TO EMPTY THE COMPARTMENT.

For FERTILISER and MDS only.

Once selected "YES" the DIP200 CPU will override low level cut-off and allow to drain the compartment completely.

FERTILISER:

you must deliver now 0327 L until empty
EMPTY COMPARTMENT? YES

MDS:

EMPTY COMPARTMENT? NO

4.4.2 SELECT PRODUCT.

For LIPS2 or FERTILISER only.

Select product for the chosen compartment, press OK button.

For LIPS2:

C : 1 DIESEL

For FERTILISER:

1: FERTILISER1	2: WATER
3: FERTILISER2	4: FERTILISER3

4.4.2.1 CONFIRM SELECTED PRODUCT.

For LIPS2 only.

Compartment : 1 product : DIESEL
ARE YOU SURE ? NO

4.4.3 ENQUIRY TO LOAD THE COMPARTMENT.

For FERTILISER only.

Once selected "YES" the DIP200 CPU will control loading valve and allow to pump product into the compartment.

LOAD COMPARTMENT? YES

4.4.4 PRINT TRANSACTIONS SUMMARY ENQUIRY.

For LIPS2 only.

Print summary of transactions since the last loading at the gantry.

PRINT TRANSACTIONS SUMMARY? NO

4.4.4.1 PRINT TRANSACTIONS SUMMARY DETAILS.

For LIPS2 only.

TOTAL NO. OF TRANSACTIONS : 5 HOW MANY TO PRINT ? 2
--

4.4.5 VOLUME ADJUSTMENT ENTRY.

Available in majority of firmware versions.

Only if enabled under SYSTEM SETUP calibration menu.

This is to synchronize reading of Diptronic with the gantry meter after finished loading. Correction is applied proportionally while delivery is progressing. Entry remains valid for one loading only (i.e. being cleared once the level drops to MIN-).

COMP : 1	ALLOWED RANGE : 09998.1L – 10001.9L CORRECT VOLUME : 10000.5L
----------	--

4.4.6 PRODUCT LIST ENQUIRY AND EDITING, ENTER PASSWORD.

For FERTILISER only.

Enquiry to edit product data base. In this case access to the data base is password-protected.

EDIT PRODUCT LIST? NO

Once selected "YES" the system will prompt the operator to enter the password for access to the data base.

enter password * * * *

If accepted, the operator is granted access to the product data base for editing.

no. 12	product: FERTILISER1
--------	----------------------

This menu shows the current number of the record in the database, where the maximum capacity is 30 products.

Product name entry field allows for maximum 16 characters.

Keypad functions in this menu:

INC – increment the element pointed by the cursor.

NXT – move cursor to the next position.

OK – save data from the screen.

INC+OK – fast increment of characters when editing product name.

INC+NXT – clear the product name.

4.4.7 DIAGNOSTIC MENU – LEVEL READING.

It shows level in millimetres, temperature of the radar sensor's electronic assembly, radar sensor's serial number, number of sensor setup recoveries (for DIP100 sensor only), automatic recovery enable flag (for DIP100 only), number of power interrupts.

SENSOR : 1	LEVEL : 0678.2mm	TEMP : +22.4 C
S/N : C0304S123	REC: 12 ENBL : Y	PWRINT : 037

4.4.8 SHOW STATUS OF WETLEG SENSORS.

For LIPS / LIPS2 only.

It shows status of all wetlegs either digital DWS1XX via network HART4 or fiberoptic FOB100 via on-board monitor PPM340.

LEG1	LEG2	LEG3	LEG4	LEG5	LEG6	LEG7	LEG8
DRY	DRY	wet	wet	wet	DRY	wet	DRY

4.4.9 SHOW DETAILS OF THE LAST TRANSACTION.

For Standard Mk1 and COPS only.

It shows details of the last delivery or loading regardless whether the ticket printer is being used or not. In order to get updated information on the LCD screen the operator must press OK+PRINT right before the transaction and later PRINT right after completed transfer of product.

DEL.NO: 23	DATE: 12/08/07	START: 10558 L
COMP.NO: 4	TIME: 09 : 55	END: MIN-

4.4.10 ENQUIRY TO SET VAPOUR FOR THE SELECTED COMPARTMENT.

For COPS only.

The LCD screen shows current product for the selected compartment and enquiry whether it should be changed to "VAPOUR".

Once selected "YES" this compartment will have "VAPOUR" logged into memory and the new name will be shown on the corresponding product indicator.

COMP.: 5	PRODUCT: DIESEL
SELECT VAPOUR? NO	

4.5 Sealed Calibration Menu – General Structure.

The sealed section of calibration menu contains all setup parameters responsible for operation and metrological performance of the Diptronic system.

The Weight and Measures authority requires access to this calibration setting to be restricted to the authorized personnel only

In general calibration menu items are grouped into several main chapters, where each can be further divided into sub-menus and so on. Some menu item may appear in conjunction with others i.e. some menu setting may activate other menu groups. Finally, some menu items are specific to particular software families.

4.5.1 ENTER CALIBRATION MENU ENQUIRY.

CALIBRATION? NO

4.5.2 SENSOR SETUP ENQUIRY.

Accepting “YES” option allows to access basic settings for the individual radar sensors.

SENSOR SETUP? NO

4.5.3 SYSTEM SETUP ENQUIRY.

Accepting “YES” option allows to access general settings for the whole system.

SYSTEM SETUP? NO

4.5.4 COMPARTMENT CALIBRATION ENQUIRY.

Accepting “YES” option allows to access volume vs. level calibration data for each compartment.

COMPART.CALIBRATION? NO

4.5.5 CLOCK SETUP ENQUIRY.

Accepting “YES” option allows to access settings for the system date and time.

CLOCK SETUP? NO

4.5.6 DIAGNOSTIC MENU ENQUIRY.

Accepting “YES” option allows to access digital settings for the individual radar sensors and view diagnostic menus.

DIAGNOSTICS? NO

4.5.7 PRINTER SETUP ENQUIRY.

Accepting "YES" option allows to access settings for the printer and auxiliary communication port.

PRINTER SETUP? NO

4.5.8 TEMPERATURE CONVERSION SETUP ENQUIRY.

For LIPS2 only.

Accepting "YES" option allows to access settings for the temperature conversion of volume, product data base and diagnostics of temperature sensors.

TEMPERATURE CONVERSION SETUP? NO

4.5.9 WETLEG SENSORS DIAGNOSTICS ENQUIRY.

For LIPS2 only.

Accepting "YES" option allows to access settings and diagnostics for the digital wetleg sensors as well as diagnostics of wetleg sensors connected via PPM340 on-board monitor.

WETLEG SENSORS DIAGNOSTICS? NO

4.5.10 EDIT PRODUCT LIST.

For FERTILISER only.

Enquiry to edit product data base.

EDIT PRODUCT LIST? NO

4.5.11 EXIT CALIBRATION ENQUIRY.

Accepting "YES" option allows quit calibration menu and return to standby mode.

EXIT CALIBRATION? NO

4.6 Sensor Setup

This chapter of the sealed calibration menu is divided into the following sub-menus:

4.6.1 ENTER SENSOR ID NUMBER.

Each radar sensor must have assigned unique address number (i.e. ID no.), corresponding to the compartment number.

Entry of the ID no. can be arranged via port HART no.1 only. Once setup, the sensor must be reconnected into the appropriate network.

Port HART1 can service sensors with ID no 1 to 3, HART2: 4 to 6 and HART3: 7 to 9.

CHANGE INDIVIDUAL SENSOR ID: 1

4.6.2 TEMPERATURE FACTORS SETUP ENQUIRY.

Accepting "YES" option will allow for access to the temperature drift correction array for each radar sensor.

TEMPERATURE FACTOR? NO

4.6.2.1 SELECT SENSOR NUMBER.

Enter compartment number for the corresponding radar sensor to access temp. drift correction array.

SELECT SENSOR NO: 1

4.6.2.2 VIEW TEMPERATURE FACTORS ARRAY ENQUIRY.

To read the temp. drift array without option for altering data.

VIEW TEMP.FACTOR ARRAY? NO

4.6.2.3 DISPLAY TEMPERATURE FACTORS ARRAY – VIEW ONLY.

Show one pair of data from the array: correction offset vs. temperature.

SENSOR: 1	STEP: 03	TEMP. +22.5	FACTOR -03.7
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4.6.2.4 EDIT TEMPERATURE FACTORS ARRAY ENQUIRY.

To read and alter temp. drift array.

EDIT TEMP.FACTOR ARRAY? NO

4.6.2.5 DISPLAY TEMPERATURE FACTORS ARRAY - EDIT.

Show one pair of data from the array: correction offset vs. temperature. Set cursor to allow for editing of data.

SENSOR: 1	STEP: 03	TEMP. +22.5	FACTOR -03.7
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4.6.2.6 ENQUIRY TO ADD ONE MORE ELEMENT TO THE TEMP. FACTORS ARRAY.

ADD ANOTHER STEP? NO

4.6.2.7 ENQUIRY TO RESET TEMPERATURE FACTORS ARRAY.

First enquiry to clear temperature drift factors array for the selected compartment.

RESET TEMP.FACTOR ARRAY? NO

4.6.2.7.1 CONFIRM RESET OF TEMPERATURE FACTORS ARRAY.

Final enquiry to clear temperature drift factors array for the selected compartment.

CONFIRM RESET: NO

4.6.3 SETUP PROBE LENGTH.

This calibration menu is to enter length of the probe, dielectric constant for the product and – for the new generation of radar sensors DIP120 and DIP130 – length of the flange as well.

Flange length: SHORT or LONG.

Compartment height HT is equivalent to distance from the bottom of the flange to the end of the probe plus 15mm.

Parameter S/L MAX is a total (maximum) length of the antenna assembly, calculated automatically once the HT value is entered. Make sure the corresponding radar sensor is connected to the CPU while setting HT.

Normally S/L MAX = HT + 117 for DIP100,

S/L MAX = HT + 97, or HT + 98 for DIP120/130, FLANGE = LONG

S/L MAX = HT + 72, or HT + 73 for DIP120/130, FLANGE = SHORT

Dielectric const.: 1.4-1.7, 1.7-3, 3-10, 10-100, VARIES for DIP100 only,

Dielectric const.: 1.4-1.7, 1.7-3, 3-10, 10-100 for DIP120/130,

Dielectric constant is critical for detection of level of the product and is related to its physical properties. The lowest range (1.4-1.7) is reserved for light petroleum products. In some cases the next range (1.7-3) can be used for petroleum products as well.

Upper range (10-100) is used for water-based products.

Diel. constant settings work in conjunction with GAIN and SENSITIVITY described in DIGITAL SETTINGS paragraph later in this manual.

Changes to diel. const. affect metrological performance – do not modify after calibration without consultation with Liquip.

Compartment height HT, Dielectric constant and Flange length are stored in memory of the DIP200 CPU, while “S/L MAX” is stored in the memory of the DIP1XX radar sensor module therefore it is imperative to have radar sensor connected to the DIP200 while changing setup of this menu.

COMP.: 1

HT: 1800mm
S/L MAX: 1897mmDIEL.: 1.4-1.7
FLANGE: LONGFor SUMP TRUCK only.

Sump Truck application is based on single compartment system. Only DIP120 can be used for detection of two echoes: from the water and from the fuel. Setting UPPER DIEL. is critical, do not attempt to alter it without consultation with Liquip. It refers to properties of the fuel collected on top of water in the tank. and affects accuracy of measurement.

HT: 1200mm
S/L MAX: 1298mm

UPPER DIEL.: 2.09

4.6.4 MOVE SENSOR DATUM.

This is to artificially offset the datum of the radar sensor.

Datum of the DIP1XX sensor is located at the top of the probe, but due to significant non-linearity errors unique for each sensor its precise position varies between sensors.

For calibration purpose the datum remains stable in the same location and its position can be moved afterwards if necessary in order to accommodate some minor modifications to the sensor's flange or fittings. Movement of datum up by negative number is equivalent to movement down.

SENSOR: 3

MOVE DATUM UP BY: - 0012.9 mm

4.7 System Setup

This chapter of the sealed calibration menu is divided into the following sub-menus:

4.7.1 NUMBER OF COMPARTMENTS.

Enter number of compartments i.e. how many sensors are connected to the DIP200 CPU.

NO.OF COMPARTMENTS: 5

4.7.2 UNITS OF MEASUREMENT.

For Standard Mk1 only.

Choose whether the product level measurement will be conducted in centimetres (millimetres) or in “ticks” by the radar sensor DIP1XX.

Measurement in “ticks” as internal units can provide better resolution than millimetres, but the system would react slower.

LEVEL UNITS: CENTIMETERS

4.7.3 COMPANY NAME.

Enter the company name up to 15 characters long.

LIQUIP INTER P/L
COMPANY NAME

4.7.4 TRUCK ID.

Enter the truck (tanker) number up to 6 characters long.

ABC123
TRUCK ID

4.7.5 WARNING LEVELS.

Enter all 6 warning levels for each compartment.

L2 – maximum level (MAX+), the highest calibration point rounded down to the nearest 10L.

L3 – overfill probes level 12mm above SFL rounded down to the nearest 10L.

SFL – safe fill level, 97% of L2 rounded down to the nearest 10L.

L4, L5 – used only in MDS variant of Diptronic as additional warning levels.

L6 – minimum level (MIN-), bottom dead zone, 30mm above the lowest calibration point rounded down to the nearest 10L, but at least 150L.

C:2	L2: 12350 L	L3: 12040 L	SFL:11970 L
	L4: 00001 L	L5: 00001 L	L6: 00200 L

4.7.6 VOLUME ADJUSTMENT ENABLE.

Enquiry to allow for volume adjustment to synchronize reading of Diptronic with the gantry meter after finished loading. Correction is applied proportionally while delivery is progressing. Entry remains valid for one loading only (i.e. being cleared once the level drops to MIN-).

ENABLE VOLUME ADJUSTMENT? NO

4.7.7 SET MINIMUM THICKNESS OF PRODUCT LAYER.

For SUMP TRUCK only.

To set minimum detectable thickness of product layer on top of water layer inside the vessel.

MIN. THICKNESS: 50 mm

4.7.8 ERASE HISTORY.

For LIPS, LIPS2 and SUMP TRUCK only.

To erase history of events for LIPS/LIPS2, or history of transactions for SUMP TRUCK.

Typically the history of events in LIPS or LIPS2 has capacity of up to 2000 events located in the non-volatile memory buffer on rotational basis i.e. the oldest records are overridden with new data.

ERASE HISTORY ? NO

4.7.9 SEALING SENSITIVITY.

For LIPS and LIPS2 only.

Sealing sensitivity determines the positive or negative deviation for the electronic seal.

For LIPS set sealing sensitivity in millimetres for each compartment. Minimum acceptable value is 1mm, maximum is 199mm.

C1: +005	C2: +050	C3: +010	C4: +010
C4: +020	C5: +100	C6: +010	C8: +015

For LIPS2 set sealing sensitivity in litres for each compartment. Minimum acceptable value is 0.5% of SFL.

C1: +100	C2: +050	C3: +070	C4: +120
C4: +200	C5: +200	C6: +050	C8: +100

4.7.10 SENSOR AUTO-DIAGNOSTICS ENABLE.

For old generation of radar sensors DIP100 only, yet Diptronic MDS and Mk1 software 01.00.16 and later do not provide this option at all.

Enable automatic recovery of digital settings of the radar sensor.

Once enabled, the DIP200 CPU checks and compares digital settings of the radar sensors with its copies stored in the non-volatile memory. If found corrupted, the CPU will restore settings into the radar sensor and set warning flag.

Automatic recovery considerably slows down operation of the system therefore is NOT recommended for configuration LIPS2 with GPS.

ENABLE SENSOR AUTO-DIAGNOSTICS? NO

4.7.11 DISPLAY VOLUME ENABLE.

For LIPS2 only.

Display volume on the top LCD panel.

Once disabled, the LCD panel will show status of sealed parcel for the selected compartment.

DISPLAY VOLUME? NO

4.7.12 TEMPERATURE CONVERSION ENABLE.

For LIPS2 only.

Enable temperature conversion to +15 degC for measurement of volume.

Once enabled an appropriate menu appears under DIAGNOSTICS section and SELECT PRODUCT in the Driver's Menu and the DIP200 CPU will read product temperature from the BTS1XX sensors connected to HART4.

TEMP.CONVERSION ENABLE? NO

4.7.13 WETLEGS READING ENABLE.

For LIPS2 only.

Enable wetlegs and foot valves reading in the system.

Wetlegs types: DWS (digital wetleg sensors DWS100 series connected to HART4), or FOB (fibreoptic sensors connected via PPM340 monitor to COM2).

WETLEGS ENABLE? YES	WETLEGS TYPE: DWS
F/VALVES,RACK ENABLE? NO	

4.7.14 FLOWRATE SETTINGS.

For LIPS2 only.

Settings for calculation of flow rates for the product movement.

Flow rate during loading must exceed FLOWRATE MIN in order to activate sealing of the compartment once the loading process is finished.

SAMPLING PERIOD and NO.OF SAMPLES determine averaging process for calculation of flow rate, but at the same time excluding product sloshing.

FLOWRATE MIN: 1000 LPM	
SAMPLING PERIOD: 4 sec	NO.OF SAMPLES: 3

4.7.15 SEALED PARCEL ENABLE.

For LIPS2 only.

Enable sealed parcel facility.

Once the sealed parcel is enabled the DIP200 CPU periodically reads all radar sensors regardless which compartment is shown on the LCD panel.

There are two variants of sealed parcel:

- Triggered by stabilising of the product level after completed loading or unloading in conjunction with minimum flow rate (F/VALVES, RACK ENABLE = NO).
- Triggered by disconnecting of gantry monitor from the truck plug (F/VALVES, RACK ENABLE = YES).

SEALED PARCEL ENABLE ? YES

4.7.16 RADAR SENSORS INSTALLED ENQUIRY.

For COPS only.

Enable reading of radar sensors DIP1XX.

Some COPS systems work as product identification only and do not require volume measurement.

Once this option is enabled the DIP200 CPU periodically reads product level from radar sensors depending on which compartment is shown on the LCD panel.

RADAR SENSORS INSTALLED: YES

4.7.17 SET WATER FLUSH OF THE INSTALLATION.

For FERTILISER only.

Set time duration (in seconds) for activation of the water flushing system right after finished delivery.

WATER FLUSH TIME: 10 sec

4.7.18 SET TIME INTERVAL.

For SUMP TRUCK only.

To set time interval - in minutes - for automatic logging of volumes into NV memory.

The CPU will record time, date, total, water and fuel volumes if the level is stable and the boundary between fuel and water is determined. Otherwise water and fuel volumes are ignored.

TIME INTERVAL: 010

4.8 Compartment Calibration Setup.

This chapter of the sealed calibration menu is divided into the following sub-menus:

4.8.1 SELECT COMPARTMENT.

Select compartment for calibration.

SELECT COMP.NO.: 2

4.8.2 MANUAL CALIBRATION ENQUIRY.

Select manual method of calibration.

MANUAL CALIBRATION? NO

4.8.2.1 MANUAL CALIBRATION DATA ENTRY.

Once manual method of calibration is selected the operator is responsible for controlling the pump to load product in subsequent steps and manual entry of true volume.
Refer to Diptronic Calibration Manuals for detailed information.

COMP: 1	STEP: 045	MEAS.LEVEL: +0768.2 mm
		VOLUME: 04562.1 L

4.8.3 VIEW LEVEL / VOLUME ARRAY ENQUIRY.

View level vs. volume calibration data for the selected compartment

VIEW LEVEL/VOLUME ARRAY? NO

4.8.3.1 SHOW LEVEL / VOLUME ARRAY ELEMENT.

Show single pair of data from the level vs. volume calibration array for the selected compartment

COMP: 2	STEP: 067	MEASURED	TRUE
UNITS: mm,L		+1148.2,	+04231.4

4.8.4 EDIT LEVEL / VOLUME ARRAY ENQUIRY.

Edit level vs. volume calibration data for the selected compartment

EDIT LEVEL/VOLUME ARRAY? NO

4.8.4.1 EDIT LEVEL / VOLUME ARRAY ELEMENT.

Edit single pair of data from the level vs. volume calibration array for the selected compartment.
Once new data is saved, press CAL+NXT to get message "END" (i.e. end of calib. array).
Press CAL+NXT again to get "ADD ANOTHER STEP?" enquiry.

COMP: 2	STEP: 067	MEASURED	TRUE
UNITS: mm,L		+1148.2,	+04231.4

4.8.4.2 ADD ANOTHER STEP ENQUIRY.

Enquiry to add one more step (pair of calibration data) to the level vs. volume calibration array.
Maximum no. of steps is 200 per compartment for most application except for MDS where 255 is the limit.

ADD ANOTHER STEP? NO

4.8.5 ADD OFFSET IN MMS ENQUIRY.

For FRENCH Diptronic only. Inactive in other versions.

ADD OFFSET IN mm? NO

4.8.5.1 ENTER OFFSET IN MMS.

For FRENCH Diptronic only. Inactive in other versions.
Enter offset in millimetres for the radar sensor calibrated "probes millimetres" vs. true millimetres.

COMP: 2	OFFSET: +26 mm
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4.8.6 ADD OFFSET IN LITRES ENQUIRY.

Inactive in FRENCH Diptronic..

ADD OFFSET IN LITRES? NO

4.8.6.1 ENTER OFFSET IN LITRES.

Inactive in FRENCH Diptronic.
Enter offset in litres for the radar sensor calibrated level vs. volume.
Offset in litres is often used after verification of the compartment to bring errors within allowable limits.

COMP: 2	OFFSET: +012 L
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4.8.7 AUTOMATIC CALIBRATION ENQUIRY.

Enquiry to start automatic calibration process for selected compartment.

AUTOMATIC CALIBRATION? NO

4.8.7.1 ENTER MAXIMUM CAPACITY OF THE COMPARTMENT.

Enter maximum capacity of selected compartment. This is to determine the upper limit of automatic calibration.

COMP: 4	MAX.CAPACITY: 12550 L
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4.8.7.2 ENTER NUMBER OF CALIBRATION STEPS.

Diptronic CPU calculates optimum number of calibration steps to achieve best accuracy. Therefore it takes the smallest calibration steps, but not less than 50.0L

$$\text{STEP} = \text{MAX.CAP} / (\text{NO.OF STEPS} - 1)$$

Maximum size of the calibration array is 200 steps (255 for MDS) and the 5 last steps are reserved for manual "top-up" if necessary. This is why the max. no. of steps calculated by the CPU is 195 (+5 reserved), or 250 (+5 reserved) for MDS systems.

The operator can manually reduce no. of steps to speed up calibration process, but at a cost of poorer accuracy.

COMP: 4	MAX.CAP.: 12550 L	STEP: 0064.7 L
NO.OF STEPS: 195	(min=010, max=195)	

4.8.7.3 SHOW LEVEL AND VOLUME.

The CPU shows current step, level and total volume received from the autocalibration rig.

COMP: 1	STEP: 045	MEAS.LEVEL: +0768.2 mm
		VOLUME: 04562.1 L

4.8.7.4 ADD ANOTHER STEP ENQUIRY.

Enquiry to add one more step (pair of calibration data) to the level vs. volume calibration array. Maximum no. of steps is 200 per compartment for most application except for MDS where 255 is the limit.

ADD ANOTHER STEP? NO

4.8.8 ENQUIRY TO RESET LEVEL / VOLUME ARRAY.

First enquiry to clear level vs. volume array for the selected compartment.

RESET LEVEL / VOLUME ARRAY? NO

4.8.8.1 CONFIRM RESET OF LEVEL / VOLUME ARRAY.

Final enquiry to clear level vs. volume array for the selected compartment.

CONFIRM RESET: NO

4.9 Clock Setup

This chapter of the sealed calibration menu is divided into the following sub-menus:

4.9.1 SET TIME.

Adjust time of the 24-hours clock running of the embedded lithium battery.

Format HH : MM

TIME 18 : 47

4.9.2 SET DATE FORMAT.

Allowed formats: DD / MM / YY, MM / DD / YY and YY / MM / DD.

DATE FORMAT DD / MM / YY

4.9.3 SET DATE.

Adjust date.

Date is displayed in the format chosen in the previous menu.

DATE 31 / 12 / 06

4.10 Diagnostic Menu.

This chapter of the sealed calibration menu is divided into the following sub-menus:

4.10.1 IDENTIFY SENSOR ENQUIRY.

Read ID address of the radar sensor.

The sensor must be connected individually to HART no.1 only.

IDENTIFY THE SENSOR? NO

Once selected "YES" the Diptronic DIP200 CPU will interrogate the radar sensor for its ID number. The DIP100 sensor will reply with two ID numbers: one for the radar electronics and the other for the temperature sensor, both should read the same - see below:

RADAR SENSOR ID: 4	TEMP. SENSOR ID: 4
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The new generation of sensors like DIP120 or DIP130 will reply with one ID number only:

RADAR SENSOR ID: 4

4.10.2 SELECT COMPARTMENT.

Select compartment for diagnostics.

SELECT COMP.NO.: 2

4.10.3 DIAGNOSTIC MENU – LEVEL READING.

It shows level in millimetres, temperature of the radar sensor's electronic assembly, radar sensor's serial number, number of sensor setup recoveries (for DIP100 sensor only), automatic recovery enable flag (for DIP100 only), number of power interrupts.

SENSOR : 1	LEVEL : 0678.2mm	TEMP : +22.4 C
S/N : C0304S123	REC: 12 ENBL : Y	PWRINT : 037

For SUMP TRUCK there is Interface Level (INLVL) reading the level of oil-water boundary:

SENSOR : 1	LEVEL : 0678.2mm	TEMP : +22.4 C
S/N : C0304S123	INLVL: 0551.8mm	PWRINT : 037

4.10.4 DIGITAL SETUP ENQUIRY AND TICKS READING.

Enquiry to access digital settings of the selected radar sensor.

SENSOR: 4	DIGITAL SETUP? NO
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Once chosen "YES" the CPU will read fiducial and level ticks figures.

Fiducial Ticks determine position and stability of reference echo, Level Ticks (Number of Ticks) determine location and stability of echo from the surface of the product.

Both readings are allowed to fluctuate a little. For DIP100 and DIP120 typical range of fluctuations is +/-5 counts, for DIP130 is +/-10 counts.

Typical values of fiducial ticks:

for DIP100 = 270-330,

for DIP120 = 600-1100,

for DIP130 = 600-1800.

SENSOR: 4

FIDUCIAL TICKS: 01643

NUMBER OF TICKS: 10592

4.10.5 DIGITAL SETUP.

Digital settings are responsible for metrological performance of the sensor. Their meaning and method of adjustment is propriety information belonging to the manufacturer. They are factory-set for each individual sensor, therefore they are often unique and cannot be used as common for all sensors.

Once setup, normally do not require further adjustment – do not modify without consultation with Liquip.

Depending on generation of the radar sensor the digital setup menu comes in two variants.

For DIP100:

Displayed parameters are: Conversion Factor (CONVF), Window (WIND), Threshold (TSHD), Scale Offset (SCOFF), Range (RNGE) and Gain (GAIN).

Typical values:

WIND = 140-160,

TSHD = CFD,

GAIN = 40-65 when the sensor measures level of petroleum products.

GAIN is dependant on setting of DIELECTRIC CONST.

RNGE value depends on setting of sensor length (HT and S/LMAX)

SENSOR: 2

CONVF: 1642

WIND: 150

TSHD: CFD

SCOFF: 050

RNGE: 101

GAIN: 062

For DIP120 and DIP130:

Displayed parameters are: Conversion Factor (CONVF), Window (WIND), Threshold (TSHD), Blocking Distance (BLKD), Scale Offset (SCOFF), Fiducial Gain (FDGN) and Sensitivity (SENS).

Typical values:

WIND = 140-210,

TSHD = CFD,

BLKD = 0.1-1.0 in [cm],

SCOFF = -086,

FDGN = 10,

SENS = 200-220 when the sensor measures level of petroleum products.

SENS is dependant on setting of DIELECTRIC CONST.

SENSOR: 2

CONVF: 1603

WIND: 162

TSHD: CFD

BLKD: 0.1

SCOFF: -086

FDGN: 010

SENS: 216

For SUMP TRUCK only (DIP120 is used):

SENSOR: 2

CONVF: 1603

WIND: 162

BLKD: 025

SCOFF: -086

FDGN: 010

SENS: 216

Blocking distance "BLKD" has been extended to 3-digits figure with max. input 299 cm

4.11 Printer Setup Menu.

This chapter of the sealed calibration menu is related to setup of both RS232 communication ports. Port COM1 is normally used for communication with the printer, while COM2 is a general purpose port, in most cases for communication with the automatic calibration rig, a PLC, on-board monitor PPM340, remote display RD100 or GPS unit.

4.11.1 SELECT PRINTER TYPE FOR COM1.

This is to enable the port and select printer for the correct protocol.
Allowed settings are: OFF (no printer), TM-295 (Epson), BLASTER (TouchStar thermal printer).

PRINTER: TM-295

4.11.2 SELECT ACKNOWLEDGEMENT FOR COM1.

This is to enable handshaking with the printer to allow for diagnostics while printing.
Usually set to "YES".

COM1 ACK? YES

4.11.3 SELECT BAUD RATE FOR COM1.

For COPS only.

Choose the baud rate for the printer port.

Allowed settings are "1200" or "9600".

If the option 1200 bps is selected the DIP200 CPU will allow for connection of external PC (DipRecall program) at 9600 bps during the first minute after power up. If the communication with DipRecall is established the CPU retains 9600 baud until DipRecall application is closed.

BAUD RATE: 1200

4.11.4 SELECT NUMBER OF COPIES.

Choose how many copies of delivery docket would need to be printed.
Allowed settings are "1", "2" or "3".

NO.OF COPIES: 1

4.11.5 SETTING OF GPS UNIT ON COM2.

For LIPS2 only.

Enable communication with GPS unit ("T4") on COM2.

Allowed settings are "OFF" or "COM2".

T4 CONNECTION: COM2

4.11.6 AUTOMATIC PRINT ENQUIRY.

For MDS system only.

Once selected "YES" the system will produce delivery docket automatically as soon as the product level becomes stable at the end of delivery.

AUTOMATIC PRINT? NO

4.12 COPS Setup Menu.

This chapter of the sealed calibration menu is related to settings *for operation of COPS system only*. It describes the menu structure and its functions. For detailed information on installation and use of the COPS system please refer other relevant manual – contact Liquip for full documentation.

4.12.1 SET COPS SENSOR ID NUMBER ENQUIRY AND MODIFY.

Enquiry to set ID address of the COPS product indicator CPI1XX.

SET COPS SENSOR ID? NO

Once chosen “YES” the data entry menu appears as below. The unique ID address must correspond to the compartment number. While setting up only a single product indicator must be connected to the corresponding port of the Multiplexer CMX1XX.

INPUT COPS SENSOR ID: 2

4.12.2 COPS SENSOR DIAGNOSTICS ENQUIRY.

Enquiry to access COPS product indicator CPI1XX diagnostics.

COPS SENSOR DIAGNOSTICS? NO

4.12.3 IDENTIFY COPS SENSOR ENQUIRY.

Enquiry to read ID number of the COPS product indicator.

Only one sensor can be connected to the corresponding port of the COPS Multiplexer in order to read the ID number.

IDENTIFY COPS SENSOR? NO

Once chosen “YES” the DIP200 CPU will interrogate the COPS product indicator via COPS Multiplexer. The received ID number is shown as follows:

COPS SENSOR ID: 2

4.12.4 SET COPS LOADING TIMEOUT.

Set the timeout for automatic recognition of product transponder while loading the compartment at the loading gantry.

The timeout is specified in number of scans of all product indicators and determines period of time required for logging new product name into the non-volatile memory of the DIP200 CPU.

COPS LOADING TIMEOUT: 2

4.12.5 EDIT PRODUCT LIST ENQUIRY AND EDITING.

Enquiry to edit product data base.

EDIT PRODUCT LIST? NO

Once chosen "YES" the next data entry menu will appear to allow for editing the product data base.

no. 12	product: [DIESEL]	code: [0555]
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This menu shows the current number of the record in the database, where the maximum capacity is 30 products.

Product name entry field allows for maximum 7 characters.

Code consists of 4 digits where first two represent product code number for the Preset Key, and the last two digits represent product code number for the loading arm transponder as well as the delivery point transponder at the service station.

Keypad functions in this menu:

INC – increment the element pointed by the cursor.

NXT – move cursor to the next position.

OK – save data from the screen.

INC+OK – fast increment of characters when editing product name.

INC+NXT – clear the product name and code.

4.12.6 RESTORE DEFAULT PRODUCTS ENQUIRY.

Enquiry to override existing products data base with default data base.

RESTORE DEFAULT PRODUCTS? NO

4.13 Temperature Conversion Setup Menu.

This chapter of the sealed calibration menu is responsible for settings of temperature conversion of the volume measurement.

It is available in LIPS2 variant of Diptronic.

4.13.1 SET TEMPERATURE SENSOR ID NUMBER ENQUIRY AND MODIFY.

Enquiry to set ID address of the temperature sensor BTS1XX.

SET TEMP. SENSOR ID? NO

Once chosen "YES" the data entry menu appears as below. The unique ID address must correspond to the compartment number. While setting up only a single sensor must be connected to HART4.

INPUT TEMP.SENSOR ID: 2

4.13.2 TEMPERATURE SENSOR DIAGNOSTICS ENQUIRY.

Enquiry to access temperature sensor BTS1XX diagnostics.

TEMP.SENSOR DIAGNOSTICS? NO

4.13.3 IDENTIFY THE TEMPERATURE SENSOR ENQUIRY.

Enquiry to read ID number of the temperature sensor.

Only one sensor can be connected to HART4 to read the ID number.

IDENTIFY TEMP.SENSOR? NO

Once chosen "YES" the DIP200 CPU will interrogate the temperature sensor via HART4. The received ID number is shown as follows:

TEMP. SENSOR ID: 2

4.13.4 SELF-TEST REF1 TEMP. SENSOR ENQUIRY.

Enquiry to read reference temperature 0.0 degC from the temperature sensor. This is diagnostic function to check the functionality of the temp. sensor. It can be used for multiple sensors in the network, as long as they have assigned unique ID numbers.

SELF-TEST REF1 TEMP? NO

Once chosen "YES" the DIP200 CPU will control all temperature sensors in the network to read their 0.0 degC reference resistors instead of Pt100 elements.

The received simulated temperature readings are shown as follows (if 6 compartments):

+0.0	+0.0	+0.0	+0.0
+0.0	+0.0		

4.13.5 SELF-TEST REF2 TEMP. SENSOR ENQUIRY.

Enquiry to read reference temperature +51.5 degC from the temperature sensor. This is also diagnostic function to check the functionality of the temp. sensor. It can be used for multiple sensors in the network, as long as they have assigned unique ID numbers.

SELF-TEST REF2 TEMP? NO

Once chosen "YES" the DIP200 CPU will control all temperature sensors in the network to read their +51.5 degC reference resistors instead of Pt100 elements.

The received simulated temperature readings are shown as follows (if 6 compartments):

+51.5	+51.5	+51.5	+51.5
+51.5	+51.5		

4.13.6 SHOW PRODUCT TEMPERATURE ENQUIRY.

Enquiry to read temperature of the product measured the temperature sensor.

SHOW PRODUCT TEMP.? NO

Once chosen "YES" the DIP200 CPU will control all temperature sensors in the network to read their Pt100 elements.

The received temperature readings are shown as follows (if 6 compartments):

+19.5	+20.1	+18.8	+18.0
+17.2	+20.6		

4.13.7 SET OFFSETS FOR TEMPERATURE SENSORS.

Set temperature offsets for temp. sensors in order to adjust readings when compared with the reference thermometer.

C: 1	2	3	4	5	6	7	8
+0.2	+0.0	-0.1	-0.4	+0.0	+0.3	+0.0	+0.2

4.13.8 EDIT PRODUCT LIST ENQUIRY AND EDITING.

Enquiry to edit product data base.

EDIT PRODUCT LIST? NO

Once chosen "YES" the next data entry menu will appear to allow for editing the product data base.

#03 pre-selected: YES	product: DIESEL	dens: 0.820 kg/L total pre-selected: 6
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This menu shows the current number of the record in the database, where the maximum capacity is 20 products.

Product name entry field allows for maximum 7 characters.

Density range is 0.653 to 0.999 kg/L.

Pre-selection flag (YES or NO) is used for allocating the product for selection by the operator under the drivers setup menu. If set to NO the product will not appear on the selection menu for the driver.

"Total pre-selected" tells the operator how many products have been pre-selected so far. Maximum number is 8 products.

Keypad functions in this menu:

INC – increment the element pointed by the cursor.

NXT – move cursor to the next position.

OK – save data from the screen.

INC+PRINT – fast increment of characters when editing product name.

CAL+INC – show next product from the data base.

CAL+MNU – sort the product data base in alphabetical order.

CAL+NXT – jump cursor to the beginning of the next entry field on the screen.

4.14 Wetleg Sensors Setup Menu.

This chapter of the sealed calibration menu is responsible for settings of wetleg sensors.

It is *available in LIPS2* variant of Diptronic.

Also, menus for setting ID number and identifying the sensor are applicable to the Digital Wetleg Sensor DWS1XX only.

4.14.1 SET WETLEG SENSOR ID NUMBER ENQUIRY AND MODIFY.

Enquiry to set ID address of the wetleg sensor DWS1XX.

SET WETLEG SENSOR ID? NO

Once chosen "YES" the data entry menu appears as below. The unique ID address must correspond to the compartment number. While setting up only a single sensor must be connected to HART4.

INPUT WETLEG SENSOR ID: 2

4.14.2 WETLEG SENSOR DIAGNOSTICS ENQUIRY.

Enquiry to access wetleg sensor DWS1XX diagnostics.

READ WETLEG SENSORS STATUS? NO

4.14.2.1 IDENTIFY THE WETLEG SENSOR ENQUIRY.

Enquiry to read ID number of the wetleg sensor.

Only one sensor can be connected to HART4 to read the ID number.

IDENTIFY WETLEG SENSOR? NO

Once chosen "YES" the DIP200 CPU will interrogate the wetleg sensor via HART4. The received ID number is shown as follows:

WETLEG SENSOR ID: 2

4.14.2.2 SHOW STATUS OF WETLEG SENSORS.

The DIP200 CPU will read "WET" or "DRY" status from all wetleg sensors either DWS1XX from the HART4 network, or fiberoptic sensors FOB100 via on-board monitor PPM340.

The received readings are shown as follows (if 6 compartments):

LEG1 DRY	LEG2 wet	LEG3 wet	LEG4 DRY	LEG5 DRY	LEG6 wet
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4.15 Edit Product List Menu.

This chapter of the sealed calibration menu is responsible for management of product database. It is available as a separate chapter *in Diptronic FERTILISER only*.

4.15.1 EDIT PRODUCT LIST.

Data entry menu will appear to allow for editing the product data base.

no. 12	product: FERTILISER1
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This menu shows the current number of the record in the database, where the maximum capacity is 30 products.

Product name entry field allows for maximum 16 characters.

Keypad functions in this menu:

INC – increment the element pointed by the cursor.

NXT – move cursor to the next position.

OK – save data from the screen.

INC+OK – fast increment of characters when editing product name.

INC+NXT – clear the product name.

5. Examples.

5.1 How to setup ID number of the radar sensor.

- Connect radar sensor to the HART1 port of the DIP200 CPU. Make sure there is no other sensor connected to the same line.
- Press and hold CAL + OK buttons. LCD panel shows "CALIBRATION? NO".
- Press INC button " " "CALIBRATION? YES"
- Press OK to accept " " "SENSOR SETUP? NO"
- Press INC button " " "SENSOR SETUP? YES"
- Press OK " " "CHANGE INDIVIDUAL SENSOR ID: "
- Press INC to dial required number (say 4) " " "CHANGE INDIVIDUAL SENSOR ID: 4"
- Press OK LCD displays series of messages to show progress, then "RADAR SENSOR ID: 4"
- Press CAL + OK buttons "EXIT CALIBRATION? YES"
- Press OK DIP200 returns to the operating mode.

5.2 How to setup compartment height (probe length of the radar sensor).

- Make sure there is radar sensor DIP100/120/130 connected to the correct HART port and has been assigned its ID address.
- Press and hold CAL + OK buttons. LCD panel shows "CALIBRATION? NO".
- Press INC button " " "CALIBRATION? YES"
- Press OK to accept " " "SENSOR SETUP? NO"
- Press INC button " " "SENSOR SETUP? YES"
- Press OK " " "CHANGE INDIVIDUAL SENSOR ID: "
- Press MNU button " " "TEMPERATURE FACTOR? NO"
- Press MNU button Setup Probe Length menu
- Enter correct HT using INC and NXT buttons
- Press OK " " "saved"
- Check S/L MAX if calculated correctly
- Press CAL + OK buttons " " "EXIT CALIBRATION? YES"
- Press OK DIP200 returns to the operating mode.

5.3 How to read serial number of the radar sensor.

- Make sure there is radar sensor DIP100/120/130 connected to the correct HART port and is operational.
- Press and hold INC + OK buttons.
- Depending on software version and other settings, press PRINT several times until get diagnostic menu on the LCD panel:

SENSOR : 1	LEVEL : 0678.2mm	TEMP : +22.4 C
S/N : C0304S123	REC: 12 ENBL : Y	PWPRINT : 037

- Serial no. of the sensor is located in the bottom left-hand corner.
- Wait for 20 sec for automatic exit to operation mode.

6. Troubleshooting.

The purpose of this chapter is to assist the operator in problems that may be resolved either by simple hardware repair or alteration to calibration settings, or combination of both.

6.1 DIPTRONIC CPU DOES NOT WORK.

SYMPTOM: The DIP200 CPU is blank, no backlight and in-line fuse for the power supply keeps blowing.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Short circuit between positive and negative lines to the CPU 	<ul style="list-style-type: none"> Check wiring for short circuit.
<ul style="list-style-type: none"> Excessive voltage in the installation, over 32V even for a short time. Usually caused by incorrect wiring of the alternator. 	<ul style="list-style-type: none"> Remove the front lid of the CPU, remove internal wiring from terminals 1 and 2 of the screw terminal block and check for short circuit between those terminals on the CPU. If short circuit is found the CPU has to be replaced. The alternator must be checked and recommended installation of power conditioner EPC200.

SYMPTOM: The LCD panel on the DIP200 CPU is blank and no backlight.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Interruption of power supply to the CPU. 	<ul style="list-style-type: none"> Check wiring, in-line fuse, connections. Measure the voltage with multimeter. Required at least 8V stable. Typical current draw of Diptronic CPU is less than 800mA at 10V and drops down to less than 400mA at 24V. Remove the front lid of the CPU, check internal wiring all the way to the terminals 1 and 2 of the screw terminal block.

SYMPTOM: The LCD panel on the DIP200 CPU is lit, but no information is displayed, only rows of black squares.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> CPU is powered up, but the firmware does not work. 	<ul style="list-style-type: none"> Remove the front lid from the CPU. Check whether the correct EPROM chip has been fitted. Check its orientation in the socket. Check whether the EPROM has been correctly inserted (pressed into its socket fully home, all pins are straight and in the socket). Check whether the EPROM has been programmed with firmware (not blank).

SYMPTOM: The LCD panel on the DIP200 CPU is lit, the CPU periodically starts-up but drops out after a short time.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Insufficient power supply to the CPU. 	<ul style="list-style-type: none"> Check the power supply voltage. Required at least 8V stable.
<ul style="list-style-type: none"> The CPU goes into shutdown due to hardware problem. 	<ul style="list-style-type: none"> Remove the front lid of the CPU and check internal components for water ingress. If evidence of severe corrosion, the CPU has to be replaced. If only minor water ingress, wipe the exposed areas with absorbent cloth and leave for several hours to dry. Inspect gaskets, cable gland and MIL spec connectors for possibility of water penetration, consult with Liquip and replace components if necessary.

<ul style="list-style-type: none">• The firmware does not work correctly.	<ul style="list-style-type: none">• Check whether the EPROM has been correctly inserted (pressed into its socket fully home, all pins are straight and in the socket).• Replace the EPROM with the same, or newer, firmware version.
<ul style="list-style-type: none">• Faulty CPU	<ul style="list-style-type: none">• Replace the CPU. Reload calibration data.

6.2 PROBLEMS WITH THE CPU HARDWARE.

SYMPTOM: Diptronic CPU skips some compartments when button “NXT” is pressed.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The CPU could not recognise some of the radar sensors right after the power-up. 	<ul style="list-style-type: none"> Right after the power-up the CPU tries to communicate with each sensor to determine its model and settings. If the communication fails the sensor is “removed” from the network and will not appear in operation mode from then on. If no sensor is found, the CPU will display comp.no.1 only with “communication error” message. <p>Investigation involves thorough inspection of wirings of the DIP1XX for open or short circuit or connection to another network. If found correct, each of the DIP1XX sensors needs to be connected individually to HART#1 and identified.</p> <p>Ref. Diptronic installation instruction: DIP200_INST_DIPTRONIC_LIPS_INSTALLATION_INSTRUCTIONS_P7330.pdf</p>

SYMPTOM: The CPU keypad works incorrectly or does not work at all.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Incorrect operation. 	<ul style="list-style-type: none"> Press buttons slowly, more like “press and hold” rather than quick press and release. Depending on software version and operating mode the CPU may react to buttons action with noticeable delay.
<ul style="list-style-type: none"> Faulty push-button. 	<ul style="list-style-type: none"> Press the button a few times. You should hear distinctive “click”. If not, the button may be faulty and the CPU has to be inspected at Liquip. Otherwise, remove the front lid of the DIP200 CPU and follow the cable harness of the keypad all the way to the connector on the pcb. Check if the connector is fully plugged-in. Any other case requires check by Liquip technician.
<ul style="list-style-type: none"> Water ingress to the CPU 	<ul style="list-style-type: none"> Remove the front lid and inspect the CPU inside. Any moisture inside has to be dried. Gaskets of the lid, keypad, MIL connectors and power cable gland have to be inspected to find the reason for water ingress. Contact Liquip for further assistance.

SYMPTOM: The CPU loses some or all calibration parameters. Message “DATA IN MEMORY IS CORRUPTED” on start-up.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Severe interference on the power supply line. 	<ul style="list-style-type: none"> Check power conditions and wiring. Install additional power filter for the CPU.
<ul style="list-style-type: none"> The EPROM is incorrectly inserted. 	<ul style="list-style-type: none"> Remove the front lid of the CPU and inspect the EPROM chip located to the right of the top LCD panel. Make sure it is pushed into the socket fully home and no pins are bent or skewed.
<ul style="list-style-type: none"> Severe water ingress to the CPU, corrosion. 	<ul style="list-style-type: none"> Remove the front lid and inspect the CPU inside. Any moisture inside has to be dried. Gaskets of the lid, keypad, MIL connectors and power cable gland have to be inspected to find the reason for water ingress. Contact Liquip for further assistance.

<ul style="list-style-type: none"> Faulty CPU. 	<ul style="list-style-type: none"> Replace the CPU. Reload calibration data.
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SYMPTOM: LCD panel does not display messages correctly, missing pixels or does not work at all.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Water ingress to the CPU 	<ul style="list-style-type: none"> Remove the front lid and inspect the CPU inside. Any moisture inside has to be dried. Gaskets of the lid, keypad, MIL connectors and power cable gland have to be inspected to find the reason for water ingress. Contact Liquip for further assistance.
<ul style="list-style-type: none"> Ambient temperature is too low. 	<ul style="list-style-type: none"> It is normal that the LCD panel reacts slower and with poor contrast in temperature below -10 degC, despite thermal correction circuit built-in into the Diptronic CPU. If the ambient temperature drops even lower some pixels may disappear. This is fully reversible process and the display returns to its normal operation once the ambient temperature rises.
<ul style="list-style-type: none"> Faulty LCD module. 	<ul style="list-style-type: none"> It cannot be repaired on site. Contact Liquip for further assistance.

SYMPTOM: LCD panel displays messages correctly, but is too dark.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Ambient temperature is too high. 	<ul style="list-style-type: none"> It is normal that the LCD panel gets darker in temperature above +70 degC inside the housing, despite thermal correction circuit built-in into the Diptronic CPU. This is fully reversible process and the display returns to its normal operation once the ambient temperature falls.
<ul style="list-style-type: none"> Contrast setting is too high. 	<ul style="list-style-type: none"> If the display works with excessive contrast even at room temperature, it may require adjustment of contrast. Locate two trimpots just below the bottom left-hand corner of the bottom LCD panel. The trimpot to the left is for contrast adjustment of the top LCD unit, while the trimpot to the right is for the bottom LCD unit. Use small screwdriver to gently rotate the knob clockwise until required setting is achieved.

SYMPTOM: LCD panel displays messages correctly, but the text looks faded.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Ambient temperature is too low. 	<ul style="list-style-type: none"> It is normal that the LCD panel reacts slower and with poor contrast in temperature below -10 degC, despite thermal correction circuit built-in into the Diptronic CPU. If the ambient temperature drops even lower some pixels may disappear. This is fully reversible process and the display returns to its normal operation once the ambient temperature rises.
<ul style="list-style-type: none"> Contrast setting is too low. 	<ul style="list-style-type: none"> If the display works with inadequate contrast even at room temperature, it may require adjustment of contrast. Locate two trimpots just below the bottom left-hand corner of the bottom LCD panel. The trimpot to the left is for contrast adjustment of the top LCD unit, while the trimpot to the right is for the bottom LCD unit. Use small screwdriver to gently rotate the knob anticlockwise until required setting is achieved.

SYMPTOM: CPU real-time clock is not accurate or does not work at all. Error exceeds 5 seconds per day, or time/date cannot be corrected.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none">Water ingress to the CPU	<ul style="list-style-type: none">Remove the front lid and inspect the CPU inside. Any moisture inside has to be dried. Gaskets of the lid, keypad, MIL connectors and power cable gland have to be inspected to find the reason for water ingress. Contact Liquip for further assistance.
<ul style="list-style-type: none">Faulty clock module.	<ul style="list-style-type: none">It cannot be repaired on site. Contact Liquip for further assistance.

6.3 NO MEASUREMENT.

SYMPTOM: The top LCD panel shows row of asterisks, the bottom panel displays message “COMMUNICATION ERROR”. The problem is permanent.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Lack of communication between the CPU and the radar sensor as a result of: Faulty wiring to the sensor. 	<ul style="list-style-type: none"> Check the wiring (cable harness) for continuity between the CPU and the sensor. Remove the front lid of the CPU and trace cables all the way to the terminal block. Check for short circuit between the wires or between the wires and the housing and any metal parts. Check the MIL spec connector and socket for dislocated or crooked pins. Check if the sensor is connected to the right HART port.
<ul style="list-style-type: none"> Wrong ID settings of the sensor. 	<ul style="list-style-type: none"> Make sure all sensors in the network have correct ID address set. Follow Diptronic Installation Instruction for mor details. Check if there are any other sensors setup with the same ID address. Connect one sensor at the time to HART1 and identify them (ref. 4.10.1). Make sure the address is unique for each sensor. Re-set ID numbers if necessary (ref. 4.6.1).
<ul style="list-style-type: none"> Faulty sensor. 	<ul style="list-style-type: none"> Replace the sensor. Recalibrate the compartment. Ref. instruction DIP200_INST_DIPTRONIC_SENSOR_REPLACEMENT_INSTRUCTIONS_P7335.pdf <p>Note: Check every sensor in the network as one faulty unit can cause “COMMUNICATION ERROR” message on all compartments belonging to the same group.</p>

SYMPTOM: The top LCD panel shows row of asterisks, the bottom panel displays message “COMMUNICATION ERROR”. The problem is intermittent.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Poor communication between the CPU and the radar sensor as a result of: Faulty or poor quality wiring to the sensor. Excessive length of the cable. Inadequate screening of the cable. Cable run next to high-power source of EMI noise. 	<ul style="list-style-type: none"> Check the wiring (cable harness) for continuity between the CPU and the sensor. Remove the front lid of the CPU and trace cables all the way to the terminal block. Check for short circuit between the wires or between the wires and the housing and any metal parts. Check the MIL spec connector and socket for dislocated or crooked pins. Check screening of the cables. Follow Diptronic Installation Instruction for wiring details.
<ul style="list-style-type: none"> Wrong settings of the sensor. 	<ul style="list-style-type: none"> Check if there are any other sensors setup with the same ID address. Connect one sensor at the time to HART1 and identify them (ref. 4.10.1). Make sure the address is unique for each sensor. Re-set ID numbers if necessary (ref. 4.6.1).
<ul style="list-style-type: none"> Water ingress into the DIP1XX assembly. 	<ul style="list-style-type: none"> Remove the lid of the DIP1XX, dry all components inside, inspect screw terminals and wires for corrosion.
<ul style="list-style-type: none"> Faulty sensor. 	<ul style="list-style-type: none"> Replace the sensor. Recalibrate the compartment.

6.4 INACCURATE MEASUREMENT.

SYMPTOM: The top LCD panel shows message “MIN-“ when product is present in the compartment. The problem is permanent.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The compartment is not calibrated, or the calibration data is incomplete or corrupted. 	<ul style="list-style-type: none"> Review calibration data on the CPU (ref. 4.8.3). If found corrupted recalibrate the compartment or reload data via DipRecall. Check power supply to the CPU if the wiring is in good condition and the voltage is stable. Finally cycle power to the CPU to make sure it retains the calibration data.
<ul style="list-style-type: none"> The CPU backup battery is faulty and the calibration data cannot be retained. 	<ul style="list-style-type: none"> Power up the CPU and observe the message on start-up. If shown “memory backup battery LOW” contact Liquip for further instructions.
<ul style="list-style-type: none"> The radar sensor is incorrectly setup. 	<ul style="list-style-type: none"> Review calibration data for the DIP1XX radar sensor. Verify length of the probe, remove it from the compartment and measure if in doubt (ref. 4.6.3). Verify dielectric constant settings (ref. 4.6.3) and GAIN / SENSITIVITY settings (ref. 4.10.5) – contact Liquip for further instructions.
<ul style="list-style-type: none"> The radar sensor electronic module is not connected to the probe, or the connection is poor. 	<ul style="list-style-type: none"> Remove the lid of the DIP1XX assembly and check if the RF cable is firmly connected to the probe. Check for any damage to the cable like broken shield, sharp bends or loose RF connector.
<ul style="list-style-type: none"> Faulty sensor. 	<ul style="list-style-type: none"> Replace the sensor. Recalibrate the compartment.

SYMPTOM: The top LCD panel shows message “MIN-“ when product is present in the compartment. The problem is intermittent.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The radar sensor is incorrectly setup. 	<ul style="list-style-type: none"> Review calibration data for the DIP1XX radar sensor. Verify length of the probe, remove it from the compartment and measure if in doubt (ref. 4.6.3). Verify dielectric constant settings (ref. 4.6.3) and GAIN / SENSITIVITY settings (ref. 4.10.5) – contact Liquip for further instructions.
<ul style="list-style-type: none"> The radar sensor electronic module is not connected to the probe, or the connection is poor. 	<ul style="list-style-type: none"> Remove the lid of the DIP1XX assembly and check if the RF cable is firmly connected to the probe. Check for any damage to the cable like broken shield, sharp bends or loose RF connector.
<ul style="list-style-type: none"> There are excessive solid deposits inside the radar sensor probe 	<ul style="list-style-type: none"> Disassemble the probe, clean inside and renew Teflon spacers if necessary.
<ul style="list-style-type: none"> Radar sensor probe is damaged. 	<ul style="list-style-type: none"> Remove the probe and inspect for damages. Check for short circuit between the internal rod and the outer tube. Check for any excessive movement (rattling) of the rod. If in doubt, dismantle the probe - ref instruction DIP200_INST_DIPTRONIC_UPGRADE_INSTRUCTIONS_P7388.pdf

<ul style="list-style-type: none"> Faulty sensor. 	<ul style="list-style-type: none"> Replace the sensor. Recalibrate the compartment.
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SYMPTOM: The top LCD panel shows message “MAX+“ even if the compartment is empty
The problem is permanent.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The radar sensor is incorrectly setup. 	<ul style="list-style-type: none"> Review calibration data for the DIP1XX radar sensor. Verify length of the probe, remove it from the compartment and measure if in doubt (ref. 4.6.3). Verify dielectric constant settings (ref. 4.6.3) and GAIN / SENSITIVITY settings (ref. 4.10.5). In this case adjustment of GAIN (if DIP100) or SENSITIVITY (for DIP120/130) may not solve the problem – contact Liquip for further instructions.
<ul style="list-style-type: none"> The radar sensor electronic module is not connected to the probe, or the connection is poor. 	<ul style="list-style-type: none"> Remove the lid of the DIP1XX assembly and check if the RF cable is firmly connected to the probe. Check for any damage to the cable like broken shield, sharp bends or loose RF connector.
<ul style="list-style-type: none"> Radar sensor probe is damaged. 	<ul style="list-style-type: none"> Remove the probe and inspect for damages. Check for short circuit between the internal rod and the outer tube. Check for any excessive movement (rattling) of the rod. If in doubt, dismantle the probe - ref instruction DIP200_INST_DIPTRONIC_UPGRADE_INSTRUCTIONS_P7388.pdf
<ul style="list-style-type: none"> The top section of the sensor is wet (water penetration inside the housing of the DIP100) 	<ul style="list-style-type: none"> Remove the lid of the DIP100 assembly and check for water ingress. If found wet, usually it is necessary to dismantle the probe and replace teflon insulating bushes as described in the instruction DIP200_INST_DIPTRONIC_UPGRADE_INSTRUCTIONS_P7388.pdf <p>Note: If the sensor is DIP120 or DIP130 contact Liquip for instruction as replacement of teflon bushes may not be required.</p>
<ul style="list-style-type: none"> Faulty sensor. 	<ul style="list-style-type: none"> Replace the sensor. Recalibrate the compartment.

SYMPTOM: The top LCD panel shows message “MAX+“ even if the compartment is empty
The problem is intermittent.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The radar sensor is incorrectly setup. 	<ul style="list-style-type: none"> Review calibration data for the DIP1XX radar sensor. Verify length of the probe, remove it from the compartment and measure if in doubt (ref. 4.6.3). Verify dielectric constant settings (ref. 4.6.3) and GAIN / SENSITIVITY settings (ref. 4.10.5). Sometimes is needed slight increase of GAIN (if DIP100) or reduction of SENSITIVITY (for DIP120/130) or adjustment of BLOCKING DISTANCE (for DIP120/130) – contact Liquip for further instructions.
<ul style="list-style-type: none"> The connection between the radar sensor electronic module and the probe is poor. 	<ul style="list-style-type: none"> Remove the lid of the DIP1XX assembly and check if the RF cable is firmly connected to the probe. Check for any damage to the cable like broken shield, sharp bends or loose RF connector.
<ul style="list-style-type: none"> Radar sensor probe is damaged. 	<ul style="list-style-type: none"> Remove the probe and inspect for damages. Check for short circuit between the internal rod and the outer tube. Check for any excessive

	<p>movement (rattling) of the rod. If in doubt, dismantle the probe - ref instruction DIP200_INST_DIPTRONIC_UPGRADE_INSTRUCTIONS_P7388.pdf</p>
<ul style="list-style-type: none"> The top section of the sensor is wet (water penetration inside the housing of the DIP100) 	<ul style="list-style-type: none"> Remove the lid of the DIP100 assembly and check for water ingress. If found wet, usually it is necessary to dismantle the probe and replace teflon insulating bushes as described in the instruction DIP200_INST_DIPTRONIC_UPGRADE_INSTRUCTIONS_P7388.pdf <p>Note: If the sensor is DIP120 or DIP130 contact Liquip for instruction as replacement of teflon bushes may not be required.</p>
<ul style="list-style-type: none"> Faulty sensor. 	<ul style="list-style-type: none"> Replace the sensor. Recalibrate the compartment.

SYMPTOM: The top LCD panel readings cannot settle on “MIN-“ when the compartment is empty, but readings are correct if there is product in the compartment.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The radar sensor is incorrectly setup. 	<ul style="list-style-type: none"> Review calibration data for the DIP1XX radar sensor. Verify length of the probe, remove it from the compartment and measure if in doubt (ref. 4.6.3). Verify dielectric constant settings (ref. 4.6.3) and GAIN / SENSITIVITY settings (ref. 4.10.5). Sometimes is needed slight increase of GAIN (if DIP100) or reduction of SENSITIVITY (for DIP120/130) – contact Liquip for further instructions.
<ul style="list-style-type: none"> Radar sensor probe is damaged. 	<ul style="list-style-type: none"> Remove the probe and inspect for damages. Check for short circuit between the internal rod and the outer tube. Check for any excessive movement (rattling) of the rod. If in doubt, dismantle the probe - ref instruction DIP200_INST_DIPTRONIC_UPGRADE_INSTRUCTIONS_P7388.pdf
<ul style="list-style-type: none"> There are excessive solid deposits inside the radar sensor probe 	<ul style="list-style-type: none"> Disassemble the probe, clean inside and renew Teflon spacers if necessary.
<ul style="list-style-type: none"> The top section of the sensor is wet (water penetration inside the housing of the DIP100) 	<ul style="list-style-type: none"> Remove the lid of the DIP100 assembly and check for water ingress. If found wet, usually it is necessary to dismantle the probe and replace teflon insulating bushes as described in the instruction DIP200_INST_DIPTRONIC_UPGRADE_INSTRUCTIONS_P7388.pdf <p>Note: If the sensor is DIP120 or DIP130 contact Liquip for instruction as replacement of teflon bushes may not be required.</p>
<ul style="list-style-type: none"> Faulty sensor. 	<ul style="list-style-type: none"> Replace the sensor. Recalibrate the compartment.

SYMPTOM: The measurement is unstable.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The product level in the compartment is unstable. 	<ul style="list-style-type: none"> Wait until product stops sloshing. Wait until loading or delivery is finished.
<ul style="list-style-type: none"> The radar sensor is incorrectly setup. 	<ul style="list-style-type: none"> Review calibration data for the DIP1XX radar sensor. Verify length of the probe, remove it from the compartment and measure if in doubt

	(ref. 4.6.3). Verify dielectric constant settings (ref. 4.6.3) and GAIN / SENSITIVITY settings (ref. 4.10.5). Sometimes is needed an adjustment of GAIN (if DIP100) or SENSITIVITY (for DIP120/130) – contact Liquip for further instructions.
<ul style="list-style-type: none"> The connection between the radar sensor electronic module and the probe is poor. 	<ul style="list-style-type: none"> Remove the lid of the DIP1XX assembly and check if the RF cable is firmly connected to the probe. Check for any damage to the cable like broken shield, sharp bends or loose RF connector.
<ul style="list-style-type: none"> Radar sensor probe is damaged. 	<ul style="list-style-type: none"> Remove the probe and inspect for damages. Check for short circuit between the internal rod and the outer tube. Check for any excessive movement (rattling) of the rod. If in doubt, dismantle the probe - ref instruction DIP200_INST_DIPTRONIC_UPGRADE_INSTRUCTIONS_P7388.pdf Check for evidence of contact between the internal rod and the tank body. Inspect the insulation teflon bush at the end of the probe for any damage. If found damaged, replace it, however the probe might be too long for the compartment.
<ul style="list-style-type: none"> There are excessive solid deposits inside the radar sensor probe 	<ul style="list-style-type: none"> Disassemble the probe, clean inside and renew Teflon spacers if necessary.
<ul style="list-style-type: none"> The top section of the sensor is wet (water penetration inside the housing of the DIP100) 	<ul style="list-style-type: none"> Remove the lid of the DIP100 assembly and check for water ingress. If found wet, usually it is necessary to dismantle the probe and replace teflon insulating bushes as described in the instruction DIP200_INST_DIPTRONIC_UPGRADE_INSTRUCTIONS_P7388.pdf <p>Note: If the sensor is DIP120 or DIP130 contact Liquip for instruction as replacement of teflon bushes may not be required.</p>
<ul style="list-style-type: none"> Faulty sensor. 	<ul style="list-style-type: none"> Replace the sensor. Recalibrate the compartment.

SYMPTOM: The measurement is stable, but inaccurate always by the same amount. The problem is found either in the whole range of the probe or in some section only.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The radar sensor is incorrectly setup. The compartment has been incorrectly calibrated. 	<ul style="list-style-type: none"> Review calibration data for the DIP1XX radar sensor. Verify length of the probe, remove it from the compartment and measure if in doubt (ref. 4.6.3). Verify litres offset value – it may be incorrect if the calibration process was incorrect. Ref. instruction DIP200_INST_DIPTRONIC_CALIBRATION_P7326.pdf Recalibrate the compartment if no evident problem with calibration data was found.

SYMPTOM: The measurement is lagging behind real movement of level in the compartment.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> Bear in mind the Diptronic has in-built averaging function in order to stabilise measurements even if product is sloshing. This causes some lagging of measurements behind the real movement of the product. This is a dynamic process where “long” or “short” averaging time is

	automatically applied depending whether the system works as sealed parcel ("LIPS"), or standard, and whether delivery takes place or not.
<ul style="list-style-type: none"> Partially blocked breather hole in the probe. 	<ul style="list-style-type: none"> Remove the probe and inspect the breather hole located in the top section of the probe just below thread, under the flange. Clean it thoroughly.

SYMPTOM: The measurement is severely lagging behind real movement of level in the compartment then stalls at certain level.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Blocked breather hole in the probe. 	<ul style="list-style-type: none"> Remove the probe and inspect the breather hole located in the top section of the probe just below thread, under the flange. Clean it thoroughly.

SYMPTOM: The measurement is correct until certain level then stops while the product level goes up.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Bad calibration if accompanied by message "MAX+". 	<ul style="list-style-type: none"> Check calibration data for this compartment. The problem suggests the compartment has been calibrated only up to certain level below the maximum. Diptronic cannot measure higher than the highest level of the calibration table (so called "L2") rounded down to the nearest 10L.
<ul style="list-style-type: none"> Faulty radar sensor. 	<ul style="list-style-type: none"> Replace the sensor. Recalibrate the compartment.

6.5 PROBLEMS WITH PRINTING DOCKETS.

SYMPTOM: The CPU cannot print docket. No error message.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Wrong settings on the CPU. 	<ul style="list-style-type: none"> Enter calibration and check PRINTER SETUP. Make sure correct printer model has been selected. Usually printer handshaking should be enabled (ACK=Yes).

SYMPTOM: The CPU cannot print docket. Error message “NO PAPER”.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The printer has run out of paper. Paper incorrectly loaded. 	<ul style="list-style-type: none"> Make sure paper is loaded into the printer as per instruction manual.

SYMPTOM: The CPU cannot print docket. Error message “COMMUNICATION ERROR”.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Wrong settings on the CPU. 	<ul style="list-style-type: none"> Enter calibration and check PRINTER SETUP. Make sure correct printer model has been selected. Usually printer handshaking should be enabled (ACK=Yes).
<ul style="list-style-type: none"> Poor (or lack of) communication between the CPU and the printer. 	<ul style="list-style-type: none"> Inspect the wiring from the CPU to the printer. If LIPS system is fitted, make sure there is enough air pressure in the installation to activate in-line pneumatic switch DPS100. Normally required more than 400kPa. If in-line Zener barrier fitted, check if it is correct model and resistance between input #1 and output #8 as well as input #4 and output #5 should not exceed 115 Ohms. Ref. Diptronic installation instruction: DIP200_INST_DIPTRONIC_LIPS_INSTALLATION_INSTRUCTIONS_P7330.pdf
<ul style="list-style-type: none"> Wrong settings on the printer. 	<ul style="list-style-type: none"> Inspect settings of the printer (DIP-switches of the Epson printer). Ref. Diptronic installation instruction: DIP200_INST_DIPTRONIC_LIPS_INSTALLATION_INSTRUCTIONS_P7330.pdf
<ul style="list-style-type: none"> Voltage to the printer is too low. 	<ul style="list-style-type: none"> Make sure the installation delivers at least 21V / 3A to the printer.
<ul style="list-style-type: none"> Ambient temperature is too low for the printer. 	<ul style="list-style-type: none"> Check the operating temperature range for the printer. Typically EPSON TM-295 cannot work below -10degC. The Blaster printer cannot work below zero deg C. Move printer to cabin or install safety approved heater or safety approved heating lamp in the printer cabinet.
<ul style="list-style-type: none"> Faulty printer. 	<ul style="list-style-type: none"> Replace the printer.

6.6 PROBLEMS WITH COMMUNICATION WITH THE GPS MODULE.

SYMPTOM: The CPU cannot transfer data to/from the GPS module.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Wrong settings on the CPU. 	<ul style="list-style-type: none"> Enter calibration and check PRINTER SETUP. Make sure the setting is "T4 CONNECTION = COM2"
<ul style="list-style-type: none"> Connection between the CPU and the GPS unit is poor. 	<ul style="list-style-type: none"> Make sure the communication cable for the GPS unit is plugged to COM2 on the CPU. Check the CPU internal harness of the port COM2. Remove the front lid and inspect the screw terminal block and individual cables of the harness. Check connection to of the CPU to the in-line Zener barrier. Make sure the Zener barrier is of correct type and is operational. Check if resistance between input #1 and output #8 as well as input #4 and output #5 does not exceed 115 Ohms. Contact Liquip for technical information. Check connection of the RJ45 cable from the Zener barrier to the GPS unit. <p>For detailed wiring diagrams ref. Diptronic installation instruction: DIP200_INST_DIPTRONIC_LIPS_INSTALLATION_INSTRUCTIONS_P7330.pdf</p>
<ul style="list-style-type: none"> Faulty port COM2 of the CPU 	<ul style="list-style-type: none"> Replace the CPU.
<ul style="list-style-type: none"> Faulty GPS unit 	<ul style="list-style-type: none"> Replace the GPS unit.

6.7 PROBLEMS WITH COMMUNICATION WITH THE PLC OR REMOTE DISPLAY.

SYMPTOM: The CPU cannot transfer data to/from the remote device (PLC or RD100).

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Connection between the CPU and the remote device is poor. 	<ul style="list-style-type: none"> Make sure the communication cable for the remote unit is plugged to COM2 on the CPU. Check the CPU internal harness of the port COM2. Remove the front lid and inspect the screw terminal block and individual cables of the harness. Check connection to of the CPU to the in-line Zener barrier. Make sure the Zener barrier is of correct type and is operational. Check if resistance between input #1 and output #8 as well as input #4 and output #5 does not exceed 115 Ohms. Check connection of the RJ45 cable from the Zener barrier to the remote unit. <p>For detailed wiring diagrams ref. Diptronic installation instruction: DIP200_INST_DIPTRONIC_LIPS_INSTALLATION_INSTRUCTIONS_P7330.pdf</p>
<ul style="list-style-type: none"> Faulty port COM2 of the CPU 	<ul style="list-style-type: none"> Replace the CPU.
<ul style="list-style-type: none"> Faulty PLC or RD100 unit 	<ul style="list-style-type: none"> Replace the faulty unit.

6.8 PROBLEMS WITH COMMUNICATION WITH THE COPS COMPONENTS.

SYMPTOM: The CPU does not display data or communicate with the Product Indicator CPI100.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Connection between the CPU and the multiplexer CMX100 is poor. 	<ul style="list-style-type: none"> Make sure the correct communication cable from the CMX100 is plugged into HART3 port on the CPU. Check the CPU internal harness of the port HART3. Remove the front lid and inspect the screw terminal block and individual cables of the harness.
<ul style="list-style-type: none"> No power, or inadequate power supply is provided to the CMX100 unit. 	<ul style="list-style-type: none"> Remove the lid of the CMX100. Pay attention if the green LED is on. Measure voltage on the power input screw terminal. Required at least 10V.
<ul style="list-style-type: none"> Poor connection between CPI100 and CMX100. 	<ul style="list-style-type: none"> Check wiring from the multiplexer to the product indicator.
<ul style="list-style-type: none"> Faulty CPI100 unit 	<ul style="list-style-type: none"> Replace the faulty unit.
<ul style="list-style-type: none"> Faulty CMX100 unit 	<ul style="list-style-type: none"> Replace the faulty unit.
<ul style="list-style-type: none"> Faulty port HART3 of the CPU 	<ul style="list-style-type: none"> Replace the CPU.

SYMPTOM: The CPU does not communicate with the TiteFill Elbow CTE100.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Connection between the CPU and the multiplexer CMX100 is poor. 	<ul style="list-style-type: none"> Make sure the correct communication cable from the CMX100 is plugged into HART4 port on the CPU. Check the CPU internal harness of the port HART4. Remove the front lid and inspect the screw terminal block and individual cables of the harness.
<ul style="list-style-type: none"> Poor connection to the CTE100 through the hose. 	<ul style="list-style-type: none"> Inspect the hose for low resistance connection – less than 10 Ohms.
<ul style="list-style-type: none"> No return signal. 	<ul style="list-style-type: none"> Check if the returning ground is low resistance – less than 10 Ohm. Inspect the static reel for correct connection to the chassis.
<ul style="list-style-type: none"> No power, or inadequate power supply is provided to the CMX100 unit. 	<ul style="list-style-type: none"> Remove the lid of the CMX100. Pay attention if the green LED is on. Measure voltage on the power input screw terminal. Required at least 10V.
<ul style="list-style-type: none"> Poor connection between CPI100 and CMX100 or its mounting bracket. 	<ul style="list-style-type: none"> Check wiring from the multiplexer to the product indicator. Check connection from the CPI100 to the mounting bracket.

<ul style="list-style-type: none">• Short circuit between the API adaptor and the chassis.	<ul style="list-style-type: none">• Inspect the installation for possible short circuits to the chassis on the insulation bushes, mounting bolts, API and other metal components. Refer to the Diptronic COPS documentation.
<ul style="list-style-type: none">• Faulty CPI100 unit	<ul style="list-style-type: none">• Replace the faulty unit.
<ul style="list-style-type: none">• Faulty CMX100 unit	<ul style="list-style-type: none">• Replace the faulty unit.
<ul style="list-style-type: none">• Faulty port HART4 of the CPU	<ul style="list-style-type: none">• Replace the CPU.

6.9 COMPARTMENT CALIBRATION PROBLEMS.

SYMPTOM: The CPU does not communicate with the Calibration Rig.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Connection between the CPU and the Calibration Rig is poor. 	<ul style="list-style-type: none"> Check connection between COM2 of the Diptronic CPU and the EMH500 register on the Calibration Rig. Make sure there is continuous grounding between those two devices. Remove the front lid of the Diptronic CPU DIP200 and inspect COM2 harness connection the screw terminal.
<ul style="list-style-type: none"> The Calibration Rig is equipped with wrong firmware. 	<ul style="list-style-type: none"> Power up the Rig and observe the LCD panel of the EMH500 register. The correct firmware version is 01.09.00 or later. If found different, contact Liquip for the latest firmware. Note: The Calibration Rig is factory fitted with the latest firmware and this investigation is not necessary if you are sure that no unauthorised person would tamper with the Rig.
<ul style="list-style-type: none"> Settings of the Calibration Rig are wrong. 	<ul style="list-style-type: none"> Check the settings of the EMH500 register on the Rig. Ref. manual: DIP200_SALES_DIPTRONIC_CALIBRATION_RIG_P7327.pdf
<ul style="list-style-type: none"> Faulty EMH500 unit of the Calibration Rig. 	<ul style="list-style-type: none"> Replace faulty unit. Fit correct firmware and settings. Ref. manual: DIP200_SALES_DIPTRONIC_CALIBRATION_RIG_P7327.pdf
<ul style="list-style-type: none"> Faulty DIP200 CPU 	<ul style="list-style-type: none"> Replace faulty CPU.

SYMPTOM: Compartment calibration data is consistent, but shows excessive error in the top section of the probe.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Deformation of the vessel. 	<ul style="list-style-type: none"> Do not climb the compartment when calibration is in progress. Do not walk on the walkway as it pushes the sensor down into the product. If you have to stay on top of the vessel, rest on the coaming only. Recalibrate the compartment. Ref. manual: DIP200_SALES_DIPTRONIC_CALIBRATION_P7326.pdf

SYMPTOM: While calibrating the compartment readings of the product level in mms are not following the real level movement.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Deformation of the probe. 	<ul style="list-style-type: none"> Check if the probe is installed correctly, no bends, bowing or indentation of the tube. The probe must be straight and its tip secured in the bottom steady. Recalibrate the compartment. Ref. manual: DIP200_SALES_DIPTRONIC_CALIBRATION_P7326.pdf

<ul style="list-style-type: none"> Wrong setup of the radar sensor. 	<ul style="list-style-type: none"> Enter correct compartment height (HT parameter), as in p. 4.6.3 and datum offset as in p.4.6.4. If unsure, remove the sensor from the compartment and measure probe length. Ref. sensor setup in p.4.6. Once sensor is setup, the compartment must be recalibrated.
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SYMPTOM: Bottom dead zone is too large.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Wrong setup of the radar sensor. 	<ul style="list-style-type: none"> Enter correct compartment height (HT parameter), as in p. 4.6.3 and datum offset as in p.4.6.4. If unsure, remove the sensor from the compartment and measure probe length. Ref. sensor setup in p.4.6. Once sensor is setup, the compartment must be recalibrated.

6.10 PROBLEMS WITH COMMUNICATION WITH DIPRECALL.

SYMPTOM: The DipRecall application does not establish communication with the Diptronic CPU.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> Incorrect COM port selected on the DipRecall. 	<ul style="list-style-type: none"> Make sure the correct port is selected in the setup menu of the DipRecall. If unsure which port is the cable plugged to, run Windows Device Manager to locate connection and its COM number. Check the CPU internal harness of the port HART3. Remove the front lid and inspect the screw terminal block and individual cables of the harness.
<ul style="list-style-type: none"> The communication cable is connected to incorrect COM port on the CPU. 	<ul style="list-style-type: none"> Always use COM1 of the CPU to communicate with DipRecall.
<ul style="list-style-type: none"> Poor connection between PC and CPU. 	<ul style="list-style-type: none"> Check the communication cable. Make sure you have Liquip genuine cable p/n 6952.
<ul style="list-style-type: none"> Bad RS232-USB converter. 	<ul style="list-style-type: none"> Check the RS232-USB converter. Replace if in doubt. Contact Liquip for recommended models.
<ul style="list-style-type: none"> The CPU is not in standby mode. 	<ul style="list-style-type: none"> Do not enter calibration mode manually at the same time when connecting to DipRecall. Exit to standby mode.
<ul style="list-style-type: none"> There are other devices connected to the CPU requesting communication via RS232. 	<ul style="list-style-type: none"> Disconnect other devices like PLC or GPS unit from COM2 on the CPU. You can leave connected PPM340 if necessary.

SYMPTOM: Communication between DipRecall and the CPU is sluggish and/or drops-out.

POSSIBLE CAUSE	HOW TO RECTIFY
<ul style="list-style-type: none"> The communication cable is connected to incorrect COM port on the CPU. 	<ul style="list-style-type: none"> Always use COM1 of the CPU to communicate with DipRecall.
<ul style="list-style-type: none"> Poor connection between PC and CPU. 	<ul style="list-style-type: none"> Check the communication cable. Make sure you have Liquip genuine cable p/n 6952.
<ul style="list-style-type: none"> Bad RS232-USB converter. 	<ul style="list-style-type: none"> Check the RS232-USB converter. Replace if in doubt. Contact Liquip for recommended models.
<ul style="list-style-type: none"> There are other devices connected to the CPU requesting communication via RS232. 	<ul style="list-style-type: none"> Disconnect other devices like PLC or GPS unit from COM2 on the CPU. You can leave connected PPM340 if necessary.
<ul style="list-style-type: none"> There are radar sensors missing from the network or incorrectly addressed. 	<ul style="list-style-type: none"> If the CPU cannot establish communication with the sensor it causes additional polling and delays. Before running DipRecall, make sure there is no wiring problems in the system and all sensors are connected and identified correctly.

<ul style="list-style-type: none">• The DipRecall requests for data which the CPU cannot provide.	<ul style="list-style-type: none">• Older versions of the firmware for the CPU may not respond to some queries from the DipRecall, which causes delays in communication. If possible, upgrade the firmware in the CPU with the latest version.
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7. Notes.