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Revolution Not Evolution

7335

**DIPTRONIC™
MEASURING SYSTEM
MK1 & L.I.P.S**

**SENSOR (AERIAL & POT)
REPLACEMENT INSTRUCTIONS**



Issue E March 2010



P7403 Electrical equipment service and installation guide for road tankers

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

INFORMATION PERTAINING TO WORKING ON A TANK VEHICLE

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

INFORMATION PERTAINING TO INSTALLING EQUIPMENT ON A TANK VEHICLE

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



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



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1. Replacement of sensor aerial (DIP100-3)

A sensor aerial may need to be replaced if it has been damaged or causes the DIP100-12, DIP120-12 or DIP130-12 to become inoperable due to some other reason. Note, for the remainder of this manual the DIP100-12, DIP120-12 & DIP130-12 will be considered the same and referred to as 'pot'.

To replace an aerial follow the steps below:

- 1.1 Isolate power to the CPU.
- 1.2 Take off the sensor cover by cutting the seal wire and unscrewing the 4 lid mounting screws. The seal will remain in the lid. Refer to sketch in appendix 1.
- 1.3 Disconnect the wiring going into the terminal block of the pot. Make a note of the wiring colour coding.
- 1.4 Disconnect the delay line extending from the pot to the aerial using a suitable spanner turning anti-clockwise.
- 1.5 Remove the 4 screws/nuts and shakeproof washers that hold the pot to the base and carefully place the pot to one side.
- 1.6 Loosen the dome nut on the cable gland underneath the body and gently pull the wires clear of the sensor assembly.
- 1.7 Remove the 4 screws affixing the sensor assembly to the tanker.
- 1.8 Carefully remove the sensor assembly and lay to one side.
- 1.9 From underneath the sensor, loosen the grub screw in the large retaining nut.
- 1.10 Whilst holding the main body of the aerial, unscrew the large retaining nut.
- 1.11 Slide the entire aerial assembly upwards through the hole in the mounting body.
- 1.12 Insert the new aerial through the mounting body checking the o-ring is in place and the mating surface for the o-ring is clean and undamaged.
- 1.13 Align the aerial so that the nylon screw in the side is pointed away from where the pot will sit and screw the large retaining nut to a torque of $50 \pm 2 \text{ Nm}$.



- 1.14 Using a pin point punch through the grubscrew hole, make an indentation in the mounting body and fit the grubscrew to a torque of 2Nm.
- 1.15 Fit the sensor back into the compartment in the same orientation, making sure the end fits into the steady on the floor of the compartment.
- 1.16 Fasten the body back onto the mounting flange, tightening bolts to 5Nm.
- 1.16 Fit the pot back in the same orientation to the aerial using the 4 screws and shakeproof washers, ensuring the drain wire eye terminal is fitted back where it was between the screw head and the washer. Torque to 3.5Nm.
- 1.17 Carefully screw the gold plated connector onto the top of the aerial using a torque spanner and tighten to $0.45 \pm 0.1\text{Nm}$. While using the torque spanner, use a second spanner to hold the square gold cap & prevent the delay line from kinking.
- 1.18 Reconnect the wiring in the same configuration as removed. Refer P7329 (LIPS) or P7330 (Measuring) for wiring instructions if in doubt.
- 1.19 Replace the sensor cover, screw in 4 retaining bolts and reseal. Refer to sketch in appendix 1.
- 1.20 Power on the CPU and check communication with new sensor (use the NEXT button to cycle to the corresponding compartment). Check there are no communication error messages.
- 1.21 Recalibrate the sensor according to the instructions in *P7326 Diptronic Measuring System MK1 & L.I.P.S Calibration Manual*. Note that any existing calibration data from a previous calibration of the replaced sensor will have to be deleted. Refer 'Resetting calibrated data'.



2. Replacement of sensor pot (DIP1x0-12)

In the unlikely event that the electronics in the pot is damaged and needs to be replaced, it is not necessary to remove the entire unit from the tank. Follow the procedure below to replace the potted assembly.

2.1 Power up CPU.

2.2 Write down the existing compartment height entered into the CPU (unless already known). Follow the steps below to check:

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC	CALIBRATION? YES
3	Press OK	SENSOR SETUP? NO
4	Press INC	SENSOR SETUP? YES
5	Press OK	CHANGE INDIVIDUAL SENSOR ID:
6	Press MENU twice	COMP.: 1 HT: #####mm DIEL.:1.4 – 1.7 S/L MAX: #####mm
7	Continuously press INC to select sensor being replaced	COMP.: # HT: #####mm DIEL.:1.4 – 1.7 S/L MAX: #####mm
8	Record HT value for future reference	COMP.: # HT: #####mm DIEL.: ## - ### S/L MAX: #####mm
9	Hold CAL & press OK to exit	EXIT CALIBRATION? YES
10	Press OK	



2.3 Set up the temperature factors of the new pot in the CPU as follows;

2.3.1 Delete previous pot factors:

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC	CALIBRATION? YES
3	Press OK	SENSOR SETUP? NO
4	Press INC	SENSOR SETUP? YES
5	Press OK	SET SENSOR ID:
6	Press MENU button	TEMPERATURE FACTOR? NO
7	Press INC	TEMPERATURE FACTOR? YES
8	Press OK	SELECT SENSOR NO.: 1
9	Repeatedly press INC to select sensor being replaced	SELECT SENSOR NO.: #
10	Press OK	VIEW TEMP.FACTOR ARRAY? NO
11	Press OK twice	RESET TEMP.FACTOR ARRAY? NO
12	Press INC	RESET TEMP.FACTOR ARRAY? YES
13	Press OK	CONFIRM RESET: NO
14	Press INC	CONFIRM RESET: YES
15	Press OK to confirm	SELECT SENSOR NO.: 1
16	Hold CAL & press OK	EXIT CALIBRATION? YES
17	Press OK to exit	



2.3.2 Enter factors of new pot by reading off the label on the top of the pot:

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	CALIBRATION? NO
2	Press INC	CALIBRATION? YES
3	Press OK	SENSOR SETUP? NO
4	Press INC	SENSOR SETUP? YES
5	Press OK	CHANGE INDIVIDUAL SENSOR ID:
6	Press MENU	TEMPERATURE FACTOR? NO
7	Press INC	TEMPERATURE FACTOR? YES
8	Press OK	SELECT SENSOR NO.: 1
9	Continuously press INC to select sensor being replaced	SELECT SENSOR NO.: #
10	Press OK	VIEW TEMP.FACTOR ARRAY? NO
11	Press OK	EDIT TEMP.FACTOR ARRAY? NO
12	Press INC	EDIT TEMP.FACTOR ARRAY? YES
13	Press OK	SENSOR:1 STEP:1 TEMP. FACTOR ###.#, ###.#
14	Repeatedly press NEXT & INC to enter correct temp & factor	SENSOR:# STEP:1 TEMP. FACTOR ###.#, ###.#
15	Press OK to save	SENSOR:# STEP:1 TEMP. FACTOR ###.#, ###.#



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STEP	OPERATION	DISPLAY
16	Hold CAL & press NEXT for next step, OR	SENSOR:# STEP:2 TEMP. ###.#, FACTOR ###.##
17	If END displayed hold CAL & press NEXT	ADD ANOTHER STEP? NO
18	Press INC	ADD ANOTHER STEP? YES
19	Press OK to add another step	SENSOR:# STEP:# TEMP. ###.#, FACTOR ###.##
20	Repeat steps 14 – 19 until all steps added	
21	Hold CAL & press NEXT	ADD ANOTHER STEP? NO
22	Press OK	VIEW TEMP.FACTOR ARRAY? NO

2.3.3 View entered data: Check to make sure data entered correctly.

STEP	OPERATION	DISPLAY
1	Press INC	VIEW TEMP.FACTOR ARRAY? YES
2	Press OK	SENSOR:# STEP:1 TEMP. ###.#, FACTOR ###.##
3	Check entered data matches recorded data	
4	Hold CAL & press NEXT for next step	SENSOR:# STEP:2 TEMP. ###.#, FACTOR ###.##
5	Repeat to end of steps	END
6	Hold CAL & press MENU to exit	EDIT TEMP.FACTOR ARRAY? NO
7	Hold CAL & press OK	EXIT CALIBRATION? YES
8	Press OK to exit	



Note: AT ALL TIMES UNTIL STEP 2.17 ENSURE THE CPU HAS AUTO DIAGNOSTICS DISABLED. REFER APPENDIX 2.

- 2.4 Do not remove the sensor assembly from the tanker. Remove the sensor cover by cutting the seal wire and unscrewing the 4 lid mounting screws. The seal will remain in the lid. Refer to sketch in appendix 1.
- 2.5 Disconnect the wiring going into the terminal block of the old pot. Make a note of the wiring colour coding.
- 2.6 Using a small spanner loosen and remove the gold plated delay line connector from the top of the sensor aerial, being careful not to damage the connector.
- 2.7 Remove the 4 screws and shakeproof washers that hold the old pot to the base.
- 2.8 Place the old pot to one side to be sent to Liquip for inspection.
- 2.9 Place the new pot into position and secure with the 4 screws and washers ensuring the drain wire eye terminal is fitted between the screw head and the washer.
- 2.10 Carefully screw the gold plated connector onto the top of the aerial using a torque spanner and tighten to $0.45 \pm 0.1\text{Nm}$. While using the torque spanner use a second spanner to hold the square gold cap & prevent the delay line from kinking.
- 2.11 Connect the wires to the terminal block of the pot in the same configuration as before. Ensure the fork terminals protruding from the epoxy (if present) are secured in the screw terminals in the correct configuration as well.
- 2.12 Record the Window value on the sticker attached to the delay line of the pot for future reference. Note this value is the second set of digits on the sticker under *PASSED* reading from left to right.



2.13 Cross out the old serial number on the label of the top cover and stamp the new serial number. Note that the serial number is written on the thermal characteristics label of the pot.

2.14 Setup of sensor ID, length & dielectric:

The ID of the new pot should be set (unless it has already been set in the factory – check Liquip for info) as the same as the previous pot that was replaced. This is the same as the compartment number.

To set the ID, all sensors except the new sensor must be disconnected from the CPU. Also, the ID can only be set through sensor 1,2,3 military spec connector on the CPU (refer drawing X351702).

Follow the steps listed under the example below to set the ID of the new sensor.

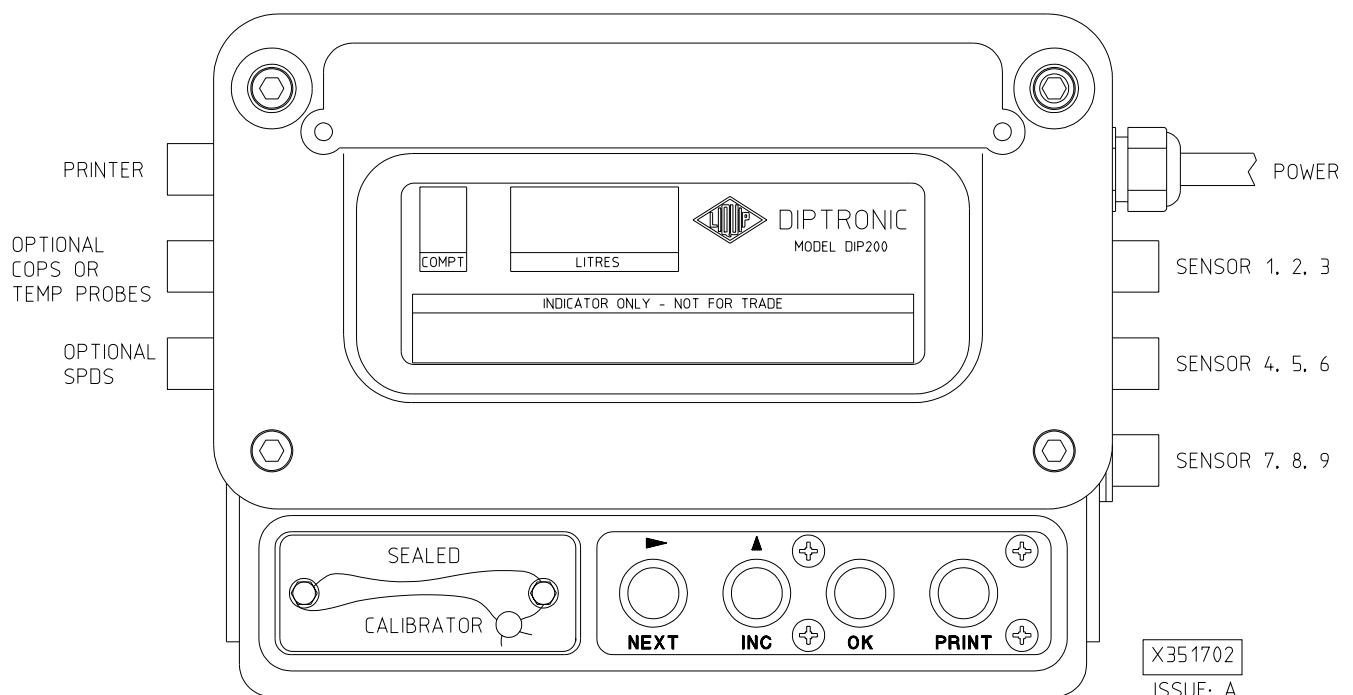
E.g.. To replace sensor 5 of a 6 compartment tanker:

1. *Remove sensor 1,2,3 and 4,5,6 military spec connectors from the CPU.*
2. *Connect sensor 4,5,6 military spec connector to sensor 1,2,3 military spec connector on the CPU.*
3. *Disconnect sensors 4 and 6 from the 4,5,6 military spec connector (either remove the cover of each sensor and temporarily disconnect the wires in the terminal on the pot or disconnect from the junction box).*



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STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	EXIT CALIBRATION? YES
2	Press INC	EXIT CALIBRATION? NO
3	Press OK	SENSOR SETUP? NO
4	Press INC	SENSOR SETUP? YES
5	Press OK	CHANGE INDIVIDUAL SENSOR ID:
6	Repeatedly press INC to select correct ID	CHANGE INDIVIDUAL SENSOR ID: #
7	Press OK to save	CHANGE INDIVIDUAL SENSOR ID: #





2.15 Verify the correct ID has been set following saving of the new ID:

STEP	OPERATION	DISPLAY
1	Slowly press MENU 7 times	DIAGNOSTICS? NO
2	Press INC	DIAGNOSTICS? YES
3	Press OK	IDENTIFY THE SENSOR? NO
4	Press INC	IDENTIFY THE SENSOR? YES
5	Press OK	<i>CHECK TEMP AND RADAR ID OK</i>

Note: If in step 5 above the ID of either TEMP or RADAR is incorrect repeat the steps on the previous page. Then re-identify.

Reconnect all sensor mil spec connectors to their original configuration.



2.16 Setup of compartment height:

The compartment height of the new pot needs to be set. Use the NEXT and INC buttons as indicated below to enter it. It is the same value as recorded in section 2.2.

Set the dielectric (DIEL) according to the type of liquid to be used in normal operation. The default (factory) setting is for hydrocarbons (1.4 – 1.7). For water set to 10 – 100. The MAX value is for factory diagnostic purposes only and is non-alterable.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	EXIT CALIBRATION? YES
2	Press INC	EXIT CALIBRATION? NO
3	Press OK	SENSOR SETUP? NO
4	Press INC	SENSOR SETUP? YES
5	Press OK	CHANGE INDIVIDUAL SENSOR ID:
6	Press MENU twice	COMP.: 1 HT: #####mm DIEL.: 1.4 – 1.7 S/L MAX: #####mm
7	Repeatedly press NEXT or INC to change to the correct COMP, HT and DIEL values	COMP.: # HT: #####mm DIEL.: ## - ### S/L MAX: #####mm
8	Press OK to save	COMP.: # HT: #####mm DIEL.: ## - ### S/L MAX: #####mm



2.17 Save the digital settings of each sensor in the CPU.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	EXIT CALIBRATION? YES
2	Press INC	EXIT CALIBRATION? NO
3	Press OK 5 times	DIAGNOSTICS? NO
4	Press INC	DIAGNOSTICS? YES
5	Press OK	IDENTIFY THE SENSOR? NO
6	Press OK	SELECT COMP.NO.: #
7	Repeatedly press INC for Compartment 1	SELECT COMP.NO.: 1
8	Press OK	DISPLAY LEVEL AND TEMP
9	Press MENU	SENSOR: 1 DIGITAL SETUP? NO
10	Press INC	SENSOR: 1 DIGITAL SETUP? YES
11	Press OK	DISPLAY FIDUCIALS & TICKS
12	Press (hold) MENU	DISPLAY FACTORY PARAMETERS
13	Check WIND recorded on pot is same as in CPU. If not enter correct value	
14	Press OK to save	DISPLAY FACTORY PARAMETERS
15	Hold CAL & press OK	EXIT CALIBRATION? YES
16	Press OK to exit	



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2.18 Calibration of replacement sensor (following replacement of either aerial or pot):

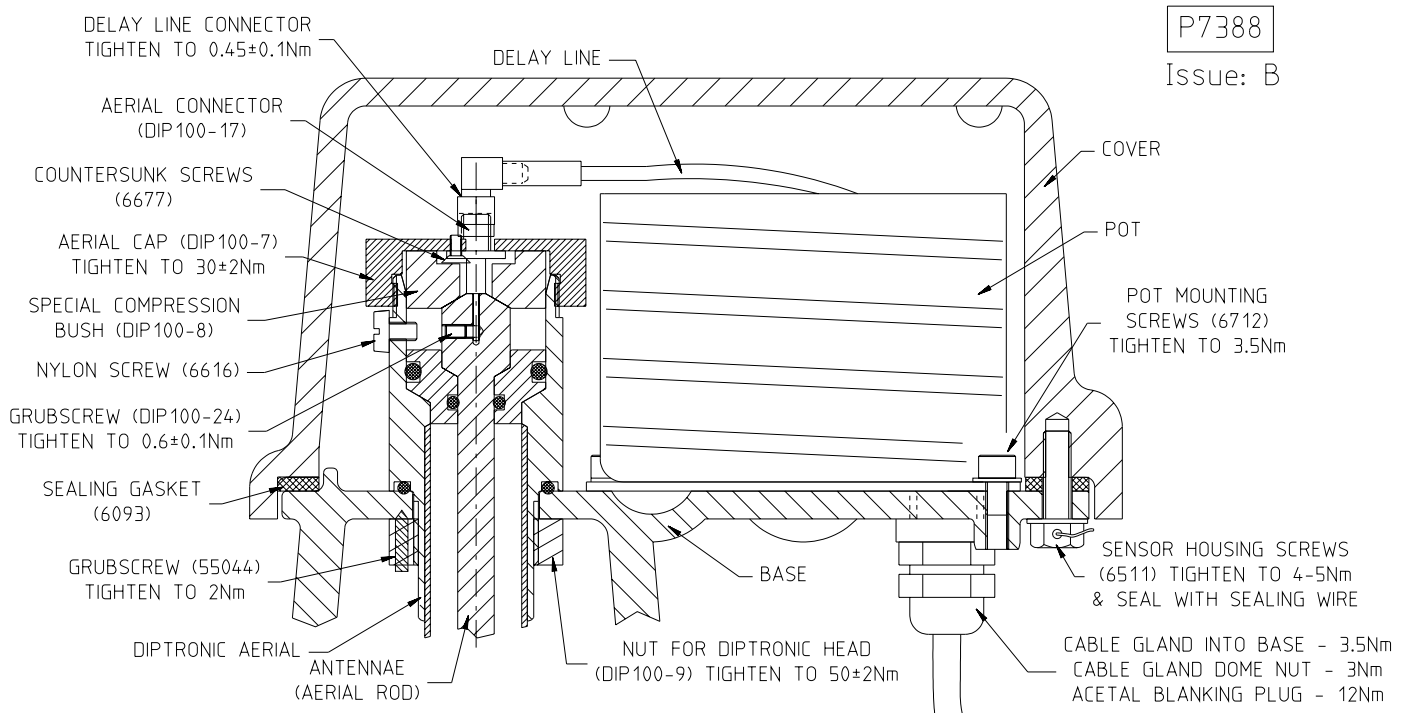
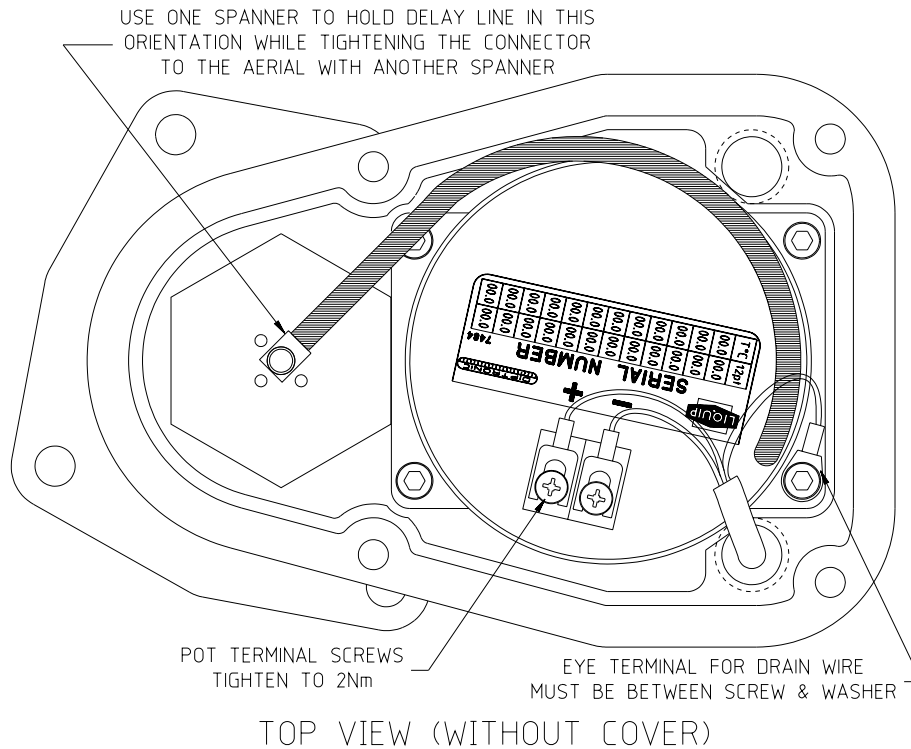
Following the sensor replacement and input of all associated parameters described above, the new sensor must be recalibrated to its compartment.

Calibrate according to the instructions in P7326 Diptronic Calibration Manual. Note that any existing calibration data from a previous calibration of the replaced sensor will have to be deleted. Refer 'Resetting calibrated data'.

2.19 Replace the sensor lid and secure with the 4 screws and spring washers. Refer to sketch in appendix 1.

2.20 Re-seal with lead seals and sealing wire.

APPENDIX 1 - Diptronic Torque Settings





APPENDIX 2 - Enabling or Disabling Auto Diagnostics

Auto Diagnostics should be disabled prior to a pot being replaced and enabled once replaced and calibrated. Follow the steps below to enable or disable.

STEP	OPERATION	DISPLAY
1	Hold CAL & press OK	EXIT CALIBRATION? NO
2	Press INC then OK	SENSOR SETUP? NO
3	Press OK	SYSTEM SETUP? NO
4	Press INC then OK	NO.OF COMPARTMENTS: #
5	Press MENU 6 times	ENABLE SENSOR AUTO DIAGNOSTICS? ###
6	Press INC then OK to change	ENABLE SENSOR AUTO DIAGNOSTICS? ###
7	Hold CAL & press OK to Exit	EXIT CALIBRATION? YES
8	Press OK to confirm exit	



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APPENDIX 3 - DIPTRONIC REFERENCE BOOKLETS

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



NOTICE FOR USE IN CEN

Instructions specific to hazardous area installations (reference European ATEX Directive 94/9/EC, Annex²², 1.0.6.)

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

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

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



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