

8 Tank Display Unit (Option)

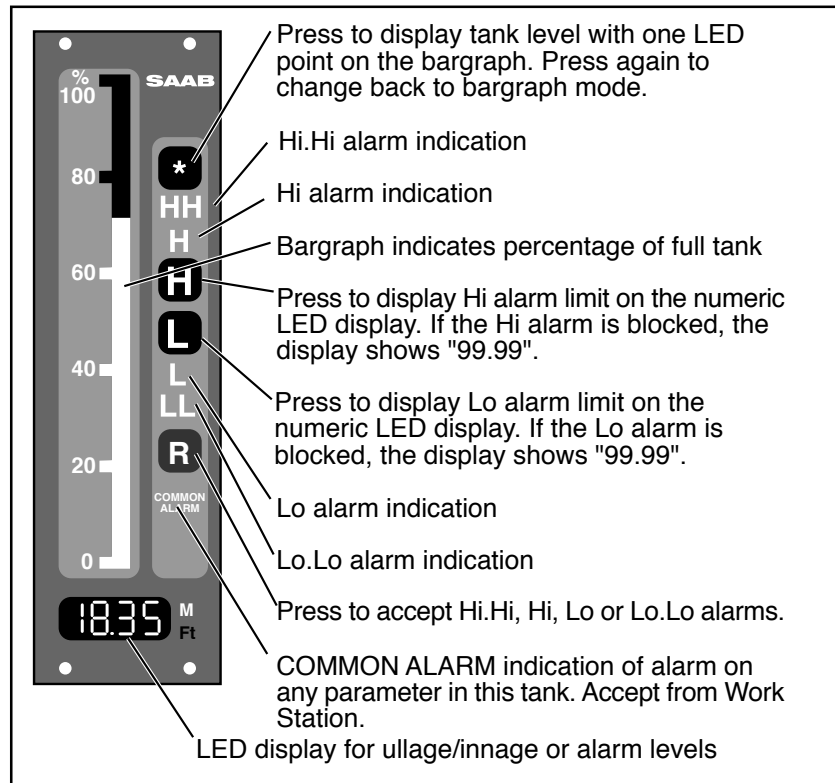


Figure 8-1. Tank Display Unit for ullage indication.

8.1 Replacing a Tank Display Unit

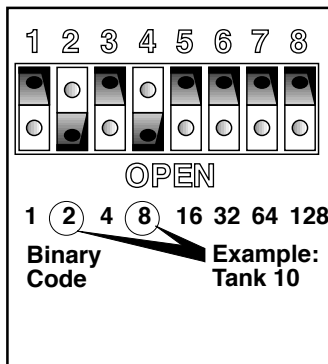


Figure 8-2. In the example the switches have been set to address Transmitter in tank number 10.

1. Begin by loosening the four panel screws and pull the TDU out of its console.
2. Disconnect the wires to the terminal block on the back of the TDU board.
3. Before you install the new TDU you must address the TDU with its unique number. Set the address switch to the same positions as on the TDU you are replacing. The address switches are located in the middle of the TDU board, and accessed through an opening in the black cover plate. The positions of the switches represent a binary "1" or "0".

Note: Use a slightly blunt object to set the DIL switch. Do not use a lead pencil as some of the lead might come off and damage the switch.

8.2 Checking the Tank Display Power Supply Unit

The F1, F2 and F3 fuses (ratings 250 V / 4 A) are located on a separate fuse panel.

1. Loosen the four screws to remove the cover.
2. Check if the fuses are intact. Replace if necessary. Also, reset the circuit breaker next to the transducer by pressing the reset button between the side panel of the unit and the interior vertical panel.
3. Replace the cover and tighten the bolts.

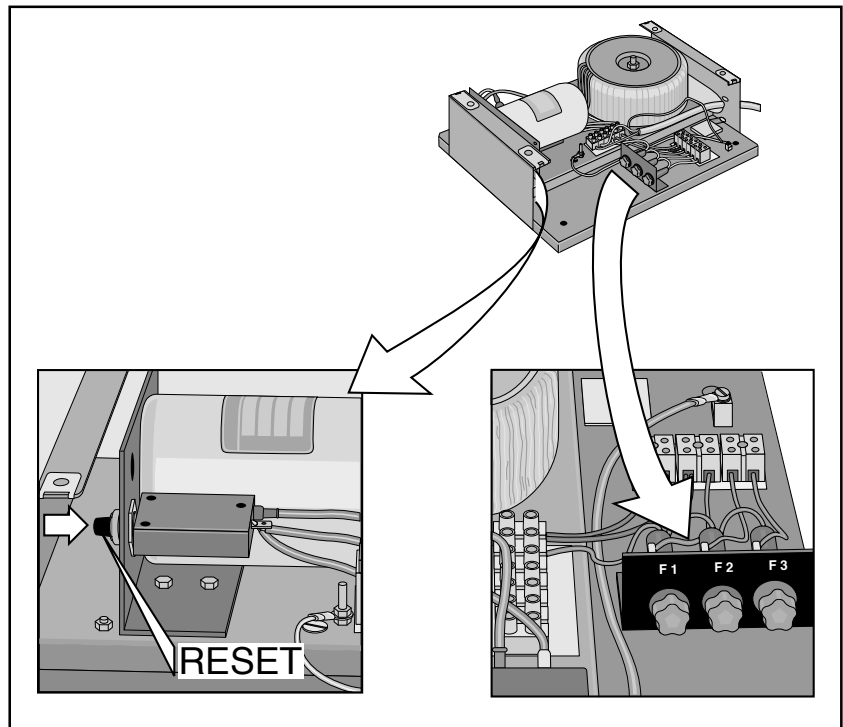


Figure 8-3. Checking the TDU Power Supply Unit.

9 Fault Finding on the Saab TankRadar System

Whenever there are symptoms in the system that may indicate that there is some failure, please start the fault finding by looking at the following pages. Look for a similar symptom as the one your TankRadar system is having, and then look for the cause and the action to take in order to fix the failure.

The symptoms are printed to the far left in bold text. On the line below is one or more descriptions of what is possibly causing the symptoms. Below each cause there are a number of suggested actions preceded by bullets (•). Both causes and actions are listed so that the ones that are most likely to happen or easiest to fix are placed first.

Abbreviations used in the fault finding chart:

LCB	-	Backup Display in Level Unit.
LCI	-	Interface Board in Level Unit.
LCM	-	Processor Memory Board in Level Unit.
LCS	-	Signal Board in Level Unit.
LED	-	Light Emitting Diode.
LI	-	Transmitter Interface in Level Unit.
LP	-	Power Block in Level Unit.
LU	-	Level Unit.
WS	-	Work Station.

9.1 SysFail and Warning Messages Shown on the Work Station

9.1.1 SysFail message: Level Unit SysFail.

Level Unit may not be switched on.

- Press power switch in Level Unit to setting "1", see chapter 5.3.

Mains power supply to Level Unit may be failing.

- Check power supply, cable and fuses. See chapter 5.11.

Fuses in Power Block of Level Unit might be blown.

- Check cause of blown fuse. Replace burnt fuses, see spare parts list in chapter 10.
- If system is new, check setting of voltage in Power Block in the Level Unit. Voltage setting is marked on the Power Block. See chapter 5.11.

LCM Board faulty.

- See chapter 5.6.

Communication to one or more LIs within the Level Unit has failed.

- See chapter 9.1.3 and 9.1.4 below.

9.1.2 SysFail message: Level Unit Communication Failed.

I/O Box may not be functioning.

- Check mains power supply and power cable to I/O Box. Check setting of voltage in I/O Box. See chapter 4.

Contact fault between Work Station and I/O Box or between I/O Box and Level Unit.

- Check cable and connectors.

Serial port Com 1 or Serial Interface Board in Work Station faulty.

- Check Service window "Communication I/O Box" on Work Station. See chapter 3.30.

The RS 485 Interface Board in location Com 4 in I/O Box faulty.

- Check that LEDs in I/O Box are flashing, see chapter 4.

Interface Board (LCI) in Level Unit faulty.

- See chapter 5.7.

9.1.3 SysFail message: Level Unit Power Failure.

Power failure to LI.

- Check status of LIs in Service window Level Unit: LI Status. See chapter 3.16
- Check fuses in the Power Block (LP), see chapters 5.11 and 10.

9.1.4 SysFail message: Level Unit LI Communication Failed.

Contact fault on cable between Calculation Unit and Transmitter Interface (LI).

- Check status of LIs in Service window Level Unit: LI Status. See chapter 3.16.
- Check cables and connectors inside the Level Unit.
- Check if LCM is functioning, see chapter 9.1.7.
- Check setting of switch for addressing of the LI, see chapter 5.10.5.

Power failure to LI.

- See chapter 9.1.3 above.

LI faulty.

- Replace LI. If the system is equipped with more than one LI, try exchanging the LIs. See chapter 5.10.8 "Replacing a Transmitter Interface". Check result.

9.1.5 SysFail message: I/O Box Communication Failed.

Mains power supply to I/O Box failing.

- Check that I/O Box has power and is running. See chapter 4.

Communication cables faulty.

- Open the cover and watch the LEDs on the main board at the bottom of the box. See chapter 4.1.
- Check communication cables.

Serial Interface Board in Work Station faulty.

- Restart the Work Station (if more than one Work Station – restart the Master Work Station) by pressing the Reset-button. See chapter 3.1.

9.1.6 Warning message: Level Unit Ground Failure.

Ground Failure on one or more LIs.

- Read chapter 9.14 for information on how to find the cause of the ground failure.

9.1.7 **Warning message: Level Unit Memory Failure.**

LCM Board faulty.

- Restart Level Unit and check Service-window LCM Status on Work Station. If box "DF database loaded" is checked, memory in LCM Board is not working and LCM Board needs to be replaced. See chapter 3.14 and 5.6.1.
- In Service-window LCI Status, check LCM status, see chapter 3.15. If LCM is faulty, replace LCM board.

9.1.8 **Warning message: Level Unit Restarted.**

This message is shown while the Level Unit is starting up after the power has been switched off and on again or after it has been ordered to restart after downloading software into the LCI or LCM.

- Wait a few minutes until the Level Unit has started up, then accept the warning in the Warning Summary-window.

9.1.9 **Warning message: Master Communication Failed.**

Communication cables faulty to the master equipment (normally a load calculator) connected to the I/O Box.

- Check cables between master and I/O Box.

Master is not turned on or power supply failing.

- Turn master on or check power supply, cables and fuses.

I/O Box failure.

- See chapter 9.1.5.

RS-232 board for master communication in I/O Box faulty.

- Try exchanging with another RS-232 board, either from the Complete Spare Parts set or if another RS-232 board is used in the I/O Box. See chapter 4.2.

9.1.10 **Warning message: LevelDatic Communication Failed.**

Communication cables faulty from the I/O Box to the LevelDatic equipment.

- Check cables between LevelDatic and I/O Box.

LevelDatic is not turned on or power supply failing.

- Turn LevelDatic on or check power supply, cables and fuses.

I/O Box failure.

- See chapter 9.1.5.

Duplex setting on the RS-485 board is incorrect

- Check setting of jumpers on board, see chapter 4.3.

RS-485 board for LU communication in I/O Box faulty.

- Try exchanging with another RS-485 board, either from the Complete Spare Parts set or from another serial channel in the I/O Box.

However, do not remove the RS-485 Board in location Com 4 as you will lose the communication with the Level Unit. See chapter 4.3.

9.1.11 Warning message: SIOX Communication Failed.

Communication cables faulty from the I/O Box to the SIOX equipment.

- Check cables between SIOX and I/O Box.

Mains power supply failing to SIOX (Mains to box or 24 VDC to each SIOX module).

- Check power supply, cables and fuses.

I/O Box failure.

- See chapter 9.1.5.

Single SIOX module failing

- Check LEDs on each SIOX module. See chapter 4.4.

SIOX Interface Board in I/O Box faulty.

- Try exchanging with another SIOX board from the Complete Spare Parts set. See chapter 4.4.
- Check the fuse for external supply voltage on the SIOX board

9.1.12 Warning message: PRS Communication Failed.

Communication cables faulty from the I/O Box to the PRS equipment.

- Check cables between PRS and I/O Box.

Mains power supply failing to PRS.

- Check power supply, cables and fuses.

I/O Box failure.

- See chapter 9.1.5.

PRS Interface Board in I/O Box faulty.

- Try exchanging with a spare PRS board. See chapter 4.5.
- Check the fuse for external supply voltage on the PRS board

9.2 Other Messages Shown on the Work Station**9.2.1 Message: PROCESS DATABASE NOT RUNNING - Alarm handling is off and pictures are not updated. Please wait until system restart.**

If shown on the Master Work Station there is a serious fault in it. If the Work Station keeps trying to start up over and over again try the following:

- Reinstall the Work Station Software, see chapter 3.6.
- If problem persists: Replace hard disk, see chapter 3.2.
- If problem persists: Replace Work Station. See chapter 3.3.

9.2.2 Message: NO CONTACT WITH MASTER WORKSTATION - Network Error or Master Work Station not running. Please wait until connection established.

This message is shown on the Slave Master Work Station in a network system, when the Master Work Station is not communicating.

Master Work Station is not turned on or power supply is failing.

- Turn the Master Work Station on.

The Master Work Station is starting up.

- Wait approximately one minute to allow the Master Work Station to start up.

If there are more Slave Work Stations, check for any messages on these.

- If only one slave Work Station has the message “NO CONTACT WITH MASTER WORK STATION”, concentrate your fault finding on this Work Station.
- If all Slave Work Stations have the message displayed, check Master Work Station, the network cables or the Network Board in the Master Work Station.

If Master Work Station is turned on and running without any problems:

- Check cables between the Master and Slave Work Station.
- Check Network Board in both Slave and Master Work Station.

9.3 Channels with status **CFAIL**, **ERROR** or **INVAL**

9.3.1 **CFAIL** status on one Transmitter

Cables from Level Unit to Transmitter faulty

- Disconnect Transmitter cables at Transmitter Interface (LI) in Level Unit and check cables to Transmitter.
- Interchange connectors of failing Transmitter with one that is OK. Watch these two channels on Work Station. If failing Transmitter becomes OK, find a spare connection on LIZ. Connect the Transmitter and configure to new address using Transmitter Data-window in the service part of the Work Station software.

LIZ board in LI may be faulty

- If there are two LIs in the Level Unit, try exchanging them to find out if it is broken. See chapter 5.10.8 for information on how to change an LI.
- Exchange with LIZ board from the Complete Spare Parts set. See chapter 5.10.9.

Faulty Electronic Box

- Replace Electronic Box, see chapter 6.1.

9.3.2 **CFAIL** status on five Transmitters

LIZ board in LI may be faulty

- Check if the five Transmitters are connected to the same LIZ board in the LI (that the connectors are placed in a vertical row). If they are, the LIZ board needs to be replaced. See chapter 5.10.9 for information on how to replace it.
- Exchange with LIZ board from the Complete Spare Parts set. See chapter 5.10.9.

9.3.3 **ERROR** status on one Transmitter, but not **CFAIL** status

Surface echo is lost. There can be waves, turbulence or foam on the surface of the product. A very large list angle could also cause the echo to be lost.

- Wait while system searches for the surface echo.
- Order an echo search on that tank from the TX Service-window in the Service-part of the Work Station software. See chapter 3.25.

Faulty Electronic Box

- Replace Electronic Box, see chapter 6.1.

9.3.4 Warning “Clean antenna on tank XXX”

If the signal strength is reduced due to a thick layer of cargo or other contamination on the antenna, this warning will be displayed.

- Clean antenna. See chapter 6.3 for cleaning of the antennas.

9.3.5 All warnings associated with one tank shown on Work Station

If warnings about communication failure, error etc. are shown for a single tank, the cabling might be broken.

- Check cabling between faulty Transmitter and Level Unit.

If there is a warning on Level Unit ground failure, there may be water within the Transmitter housing or in any associated cable connection box.

- Check inside of transmitter housing. Clean and dry out if necessary.

9.3.6 ERROR status on one temperature sensor

Faulty cabling between Transmitter and temperature sensor.

- Check cabling and, if necessary, repair.

Temperature sensor faulty.

- Replace temperature sensor. See chapter 7.2.

9.3.7 INVAL status on average temperature

This message normally does not indicate any fault. None of the temperature sensors are below the product surface (immersed in the liquid).

- Check Tank Setup-window for tank in question on the Work Station. Sensors that are immersed in the product are shown with INCL in the Mode column. See Operating Manual.

9.3.8 ERROR status on one IG pressure sensor

Cable to sensor may be faulty

- Check cable between sensor and cable terminal on Transmitter.

Sensor may be supplying a signal that is out of range

- Try to zero adjust the sensor and if that is not possible, replace the sensor. See chapter 6.4.

9.4 Work Station**9.4.1 Work Station screen blank.**

Monitor not turned on.

- Check that switch on the front panel below the screen is set to “1”. See chapter 3.5.

Incorrect brightness/contrast setting.

- Change setting, see chapter 3.5.

Contact fault between PC and monitor

- Check cables and connectors between PC and monitor.

Power supply to monitor failing

- Check power supply to PC and from PC to monitor, cables and fuses.

Setting of BNC – D-Sub incorrect on front of monitor.

- Switch setting to D-Sub position, see chapter 3.5.

9.4.2 Work Station monitor image located incorrectly, distorted or discolored.

Static field distorting the image.

- Press the degauss-switch, see chapter 3.5.

Image settings incorrect.

- Adjust image settings, see chapter 3.5.

Some object is disturbing the magnetic field controlling the image.

- Check for any large metal object, radio transmitter, magnet or transformer placed close to the monitor.

9.4.3 No new windows can be opened on the Work Station or Work Station cannot be started.

Hard disk failure or software incorrect.

- Install new software, see chapter 3.6. Start the Work Station. If it is still not possible start it, replace the hard disk, see chapter 3.2.

9.4.4 Light Pen is not functioning

The setting of the light intensity of the monitor is too low.

- Increase light intensity, see chapter 3.5.

Cable or Light Pen is faulty or disconnected.

- Check cable and connectors.
- Replace Light Pen. It is included in the Complete Spare Parts set.
- Use arrow-keys on keyboard to move the cursor. Hold an arrow-key down to move the cursor quickly.

Light Pen Interface Board in PC is out of order.

- Replace Light Pen Interface board, see chapter 3.4.

9.5 Level Unit

9.5.1 Backup Display is blank.

The display automatically switches off after approximately 20 minutes after the last key pressing.

- Press any key on the keyboard.

9.5.2 No response when pressing the keys on the Backup Display's keyboard.

Connectors or flat cable between LCI and Backup Display is faulty.

- Check cable with connectors. If necessary, repair or replace cable.

Display or keyboard is broken

- Replace the Backup Display (including keyboard).

LCI board is not functioning

- Check LCI board. If faulty, exchange the board. See chapter 5.7.

9.5.3 Watch Dog LED on LCI board is on (the lowest LED)

LCI Board might be faulty

- Restart Level Unit and then watch the LCI's watch dog LED. Check Work Station for message "Level Unit Communication Failed". If watch dog LED goes on again, replace the LCI board, see chapter 5.7.

9.5.4 Backup Display shows "No flash program"

LCI Software faulty

- Load new software into the LCI. See chapter 3.23.

9.6 Transmitters

9.6.1 Ullage indication not updated close to empty tank.

Too weak radar echo due to inclined bottom or sludge on tank bottom.

- Ullage indication will be resumed when the tank is loaded again.

9.7 Local Display

9.7.1 Local Display blank

Setting of display mode may be incorrect.

- Check setting either on Backup Display in Level Unit, see chapter 5.9.4, or from the Transmitter Data-window in the Service part of the Work Station, see chapter 3.9.

Cabling between Local Display and Transmitter may be faulty.

- Restart Transmitter and Local Display by disconnecting the connector for that Transmitter on the LI, and then connect it again. Check if the Local Display starts working.
- Check cabling, and repair if necessary.

Saab TankRadar system may be starting up.

- Wait approximately 15 min and then check if the Local Display works.

Communication failure to Transmitter.

- Check for CFAIL status on Transmitter. See chapter 9.3.5.

9.8 Temperature Measurement

9.8.1 Incorrect temperature values on one tank

Incorrect setting of temperature range

- Check temperature range in Cargo Tank Sensors-window in Configuration part of Work Station software. If necessary, change to correct range and restart Transmitter by disconnecting and connecting its cable at the LI in the Level Unit.

9.9 Inert Gas Pressure Measurement

9.9.1 Incorrect reading of the IG pressure

IG Pressure sensor not correctly zero adjusted.

- If, or when, conditions allow it, do a zero adjustment of the IG pressure sensor. See chapter 6.4.

Venting hose of the sensor may be clogged or squeezed.

- Check that the venting hose ventilates to the outside of the Transmitter housing. See chapter 6.4.

IG pressure sensor may have been subjected to a too high pressure (more than twice the maximum range).

- Zero adjust sensor. See chapter 6.4.
- If it is not possible to adjust, replace it. See chapter 6.4.

9.9.2 Indicated inert gas pressure always the same

IG pressure sensor's opening to the tank may be clogged.

- Clean the sensor's opening to the tank. See chapter 6.4.

IG pressure sensor faulty.

- Replace sensor, see chapter 6.4.

9.10 Tank Display Unit

9.10.1 Display on TDU not working.

No voltage supply

- Check fuses in TDU-Power Supply. See chapter 8.2.
- Check power cables and DC distribution to TDUs.

Communication failure

- Check communication cables
- Check I/O Box. See chapter 4 and 9.4.

9.11 Portable Readout System:

9.11.1 Indication of communication error (CERR) on PRU.

Low walkie-talkie battery voltage

- Charge battery. This may be necessary even if voice communication works.

Bad radio conditions.

- Move PRU (walkie-talkie) to another position. This may be necessary even if voice communication works.
- Check base radio antenna.

Low volume control on either radio.

- Increase volume control.

Incorrectly adjusted squelch control on either radio.

- Adjust squelch (if any) to low level without noise between transmissions.

9.11.2 No voice communication between walkie-talkie and base radio (PRS).

No power supply.

- Check batteries in walkie-talkie and power supply to base radio.

Unit faulty.

- Replace units one by one: base radio, walkie-talkie, PRU, PRS Interface Board in I/O Box.

Cable faulty.

- Check the cabling between base radio and I/O Box.

9.11.3 No display on PRU.

Low walkie-talkie battery voltage

- Walkie talkie battery needs to be recharged

PRU cable faulty.

- Replace cable.

PRU faulty.

- Replace.

9.12 Draft measurement

9.12.1 Draft measurement incorrect

Failure on LevelDatic equipment

- Check LevelDatic equipment. See separate documentation in "As-built drawings and user's manual"-binder.

Incorrectly configured data for draft measurement.

- Check that configured ship data in Ship measures-window on Work Station correspond to real distances on ship.

Faulty communication with LevelDatic equipment.

- See chapter 9.1.10.

9.13 Load Calculator

9.13.1 Values displayed on TankRadar and load calculator differ.

Ullage values differ due to a delay of information during quick loading or discharging, especially in small tanks.

- When the surface is stable, wait for approximately one minute to see that the values become equal.
- Concentrate on ullage values displayed on TankRadar since they are updated more often than on the load calculator.

Trim/List correction is set to off on Work Station, but the protocol to the load calculator is using trim/list corrected values.

- Check setting of trim/list correction in the Setup-window. See Operating Manual.

Presentation units changed from m to feet or vice versa.

- Check setting of units in the Setup-window. See Operating Manual.

9.14 Finding Cause of Ground Failure Warning

When the warning message "Level Unit Ground Failure" is displayed on the Work Station or when the ground failure LED on a Transmitter Interface in the Level Unit lights up, there is a need to find the cause of the ground failure.

The ground failure could be located in the cables between the Transmitter and Level Unit or between Transmitter and temperature sensors, IG pressure sensors, extra temperature sensors or Local Display (if these options are included). It could also be located within the units themselves or in their wire terminals.

You need a multimeter when searching for a ground failure. Follow the steps below to find the cause of the ground failure:

1. Open the LI Status-window in the Service part of the Work Station Software. In this window the status of the LI's ComFail, GroundFail, +15 V and -15V are shown. Find the LI that is causing the ground failure. Or check ground failure LED on LI to find out which LI is causing the ground failure.

9.14.1 Ground Failure – Transmitter Interface

Note: Before pulling the connectors out, check that they are marked so that they can be replaced correctly.

2. On the LI that is causing the ground failure, pull out the connectors to the Transmitters one by one. Check when ground failure LED goes off, to find which transmitter that is causing the ground failure.

9.14.2 Ground Failure – Transmitter Cable

3. Check the cable between Transmitter and Transmitter Interface in the Level Unit following the steps in chapter 9.14.8 below.

9.14.3 Ground Failure – Temperature Sensors

4. Check both temperature sensors and cable to temperature sensor by removing the wires to the temperature sensors from the terminal in the transmitter housing.
5. Hold the wires together so that they are in contact with each other and measure the resistance to ground. If the resistance is larger than 10 M Ω go to step 10 below.
6. Check the cable between the Transmitter and the wire terminal of the temperature sensors following the steps in chapter 9.14.8 below.

7. If there is no ground failure on the cable between the Transmitter and the temperature wire terminal, you need to check each individual temperature sensor.
8. Remove the wires to the temperature sensor from the terminal inside the Temperature Connection Box.
9. Measure the resistance between each wire and ground to find which temperature sensor is causing the ground failure. Replace troubling temperature sensor with a new spare sensor ordered from Saab Marine Electronics or any of the service agents, see list of agents in chapter 12.

9.14.4 Ground Failure – IG Pressure Sensor

10. Remove the wires of the cable to the IG pressure sensor (if included in system) from the wire terminal inside the transmitter housing.
11. Hold all the wires of the sensor cable together so that they are in contact with each other. Measure the resistance to ground, which should be more than 10 M Ω . If it is, go to step 13 below.
12. If the resistance measured in step 12 is less than 10 M Ω , replace the IG pressure sensor with a spare sensor. See chapter 6.4.2.

9.14.5 Ground Failure – Extra Temperature Sensors

13. If there are extra temperature sensors connected (there can be up to two extra sensors except for the one, two or three inside the tank) these can also be the cause of a ground failure. These extra sensors can either be connected to the wire terminal inside the transmitter housing or the temperature housing. Remove one sensor's wires from the terminal and hold them together. Measure resistance, which should be more than 10 M Ω . If it is, go to step 15 below.
14. If the resistance measured in step 13 is less than 10 M Ω replace with new spare sensor.

9.14.6 Ground Failure – Local Display

15. If a Local Display is connected to the Transmitter this could also be causing ground failure. Remove all the wires to the Local Display from the terminal inside the Transmitter Housing.
16. Hold all the wires of the sensor cable together so that they are in contact with each other. Measure the resistance to ground, which should be more than 10 M Ω . If it is, go to step 19 below.

17. If the resistance measured in step 16 is less than 10 M Ω , check the cable between the Transmitter and the Local Display according to the steps in chapter 9.14.8 below.
18. If the Local Display is causing the ground failure, try cleaning and drying the inside of the display. If this does not help replace the Local Display.

9.14.7 Ground Failure – Wire Terminals

19. If you have come this far in your search for the ground failure, check the wire terminals. See chapter 9.14.9.

9.14.8 Checking a Cable for Ground Failure

Note: If the cables have not previously been marked, mark them before removing them from the wire terminal.

1. Disconnect all wires in both ends of the cable. Make sure the wires are not in contact with anything.
3. Hold all the wires of the cable together so that they are in contact with each other and measure the resistance between cable and ground (for example, use ground bar inside the transmitter housing). If the resistance is larger than 10 M Ω , the cable is OK.
4. If the resistance measured in step 3 is less than 10 M Ω , measure between each single wire and ground to find which wire that is causing the ground failure. When it has been located, check if there is any spare wire in the cable or lay a new cable.

9.14.9 Checking a Wire Terminal for Ground Failure

1. Remove all wires from the terminal. Measure the resistance between each terminal and ground. If the resistance is larger than 10 M Ω , the terminal is OK.
2. If the resistance is less than 10 M Ω , try to dry the terminal as well as spraying it with CRC666-spray or equivalent de-moisturizing spray.

9.15 Comparing Ullages

The best reference point for ullage measurement is the ullage plug on the flange of the transmitter housing if the Parabolic Antenna is used.

When measuring on the Cone Antenna, the Waveguide Cone has to be removed. See instructions in chapter 6.3.4. Hand dip from the top of the edge of the cone. Reduce the hand dipped measure with 555 mm. The 555 mm includes the length of the cone and the thickness of the gasket (approximately 4 mm).

If separate ullage plugs are used for hand dipping and as reference points, the vertical distances (A-distances) between the two ullage plugs are stored in the database of the Work Station and the Level Unit. The ullage displayed by TankRadar is corrected so that it is equal, at even keel, to the ullage at the separate ullage plug.

Normally TankRadar makes trim/list corrections to the centre of gravity, C.O.G., at 98% filled tank (C and E distances refer to C.O.G.). On some ships TankRadar makes trim and list correction to a separate ullage plug.

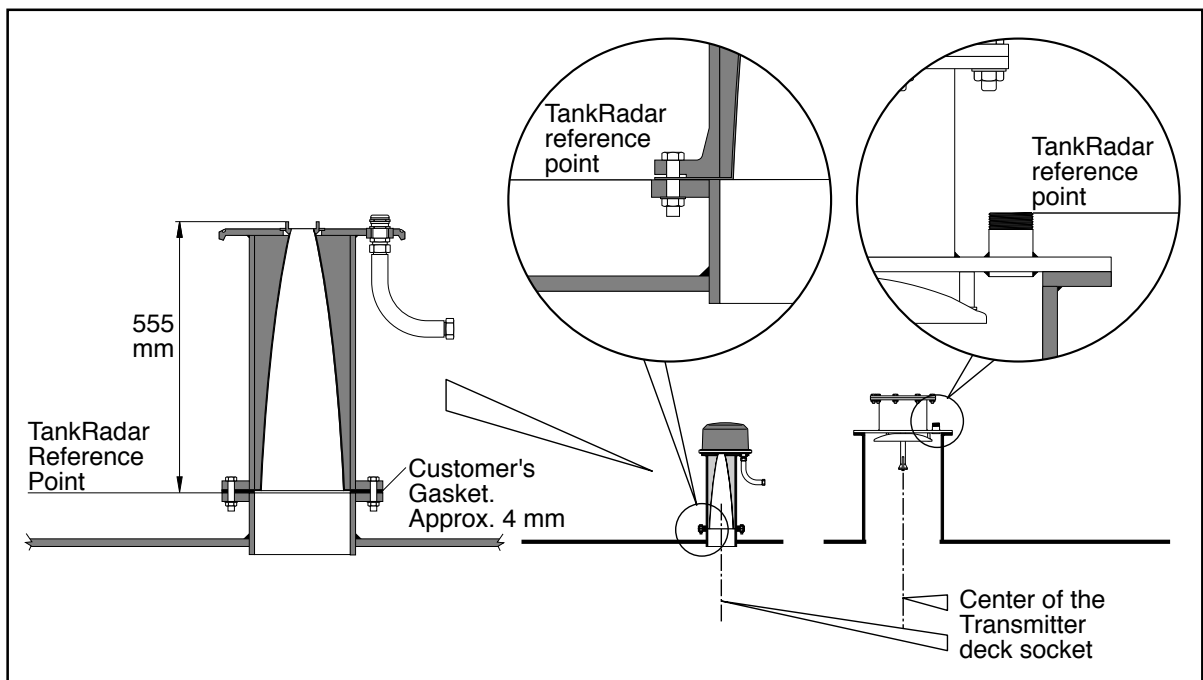


Figure 9-1 shows the TankRadar reference point.

There are three different ways in which the TankRadar can be configured as far as hand dipping and trim/list corrections are concerned. Depending on the configuration please follow the appropriate steps below when comparing ullages. It is important to know which reference point the system uses for correction. See the Setup-window on the Work Station.

If the TankRadar ullage plug is the only reference then proceed as follows to compare ullages:

1. Take a hand dip ullage reading and the TankRadar ullage (not corrected for trim and list. Off-button pressed in the Setup-window on the Work Station).
2. Compare the ullages.

If a separate ullage plug is used as reference and TankRadar is trim/list-corrected to C.O.G. (C and E distances to C.O.G.) then proceed as follows to compare ullages:

1. Take a hand dip ullage reading in the separate ullage plug and use the ship's volume tables to get a volume related to the tank's C.O.G.
2. Take the trim/list corrected TankRadar ullage (with trim/list-correction on). This is equal to the ullage at C.O.G. at even keel. Use this ullage to get the volume.
3. Compare the volumes.

If the separate ullage plug is the reference and the TankRadar ullage is trim/list corrected to the separate ullage plug (C and E distances to the separate ullage plug) then proceed as follows:

1. Take a hand dip ullage reading at the separate ullage plug.
2. Take the trim/list corrected TankRadar ullage (with trim/list-correction on).
3. Compare the ullages.

I0 Spare Parts

I0.1 Standard Spare Parts Set, 9150065-981

Part no.	Spare Part	Quantity
9150065-615	Transmitter test cable G3	1
9150020-891	Cleaning brush nylon for crude & products CRUDE&PRODUCT	1
9150020-893	Cleaning brush stainless steel for chemicals CHEM	1
9150021-048	Box spanner for temperature sensors (ONLY for systems with TEMP)	1
0980240-002	Fuse 0.125 A slow 5x20 (F3 & F4 in I/O-box)	1
0990117-014	Fuse 2 A 6.3x32 slow (F1,F3,F4,F6,F7 in LP)	2
0990117-011	Fuse 1 A 6.3x32 fast (F2,F5 in LP)	1
0990117-020	Fuse 8 A 6.3x32 slow (F8 in LP)	1
0980240-002	Fuse 0.125 A 5x20 (F1 in SIOX module type R02 & F1 on SIOX board). ONLY for systems with SIOX	3

I0.2 Extended Spare Parts Set, 9150065-982

Part no.	Spare Part	Quantity
9150065-981	Standard Spare Parts Set	1
9150064-871	Electronic Box	1
6853489-420	Light Pen Assembly	1

I0.3 Complete Spare Parts Set, 9150065-983

Part no.	Spare Part	Quantity
9150065-982	Extended Spare Parts Set	1
9150064-541	Analog/Digital/Power Board, LIA	1
9150064-552	Zener Barrier Board, LIZ	1
9150064-511	Processor Memory Board, LCM	1
9150064-501	Signal Board, LCS	1
9150065-541	Power supply, LCP	1
9150064-531	Interface Board, LCI	1
6853489-388	Torx screw-driver (for LI & LP unit disassembly)	1
9150020-036	Rubber gasket top cover TAP TX, 4x 378 mm TAP ONLY	1
6853488-852	O-ring 54.5 x 3.0 Floursil TAC ONLY	1
6853489-438	O-ring 329.6 x 6.99 Nitrile TAC ONLY	1

Note: Contents subject to change without prior notice.

11 Recycling of Saab TankRadar

At a point in time when your TankRadar system has served you well for many years and it is time to scrap the ship, we at Saab Marine Electronics are more than willing to help you with the recycling of the TankRadar system.

At our factory, we are able to sort out the various parts of the system that are possible to recycle. Saab Marine Electronics will see to it that your TankRadar system does not burden our environment when the ship is scrapped.

We would very much appreciate if you would contact us when a decision has been taken to scrap the ship. We will take appropriate measures to be able to remove and transport the TankRadar system to our factory for recycling. We thank you in advance for your kind assistance in helping us care for the environment in the world we live in.

Please contact:

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Marine Service Department
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402 51 Göteborg
Sweden
Telephone +46 31 37 00 00
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Telex 21652 saabra s

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