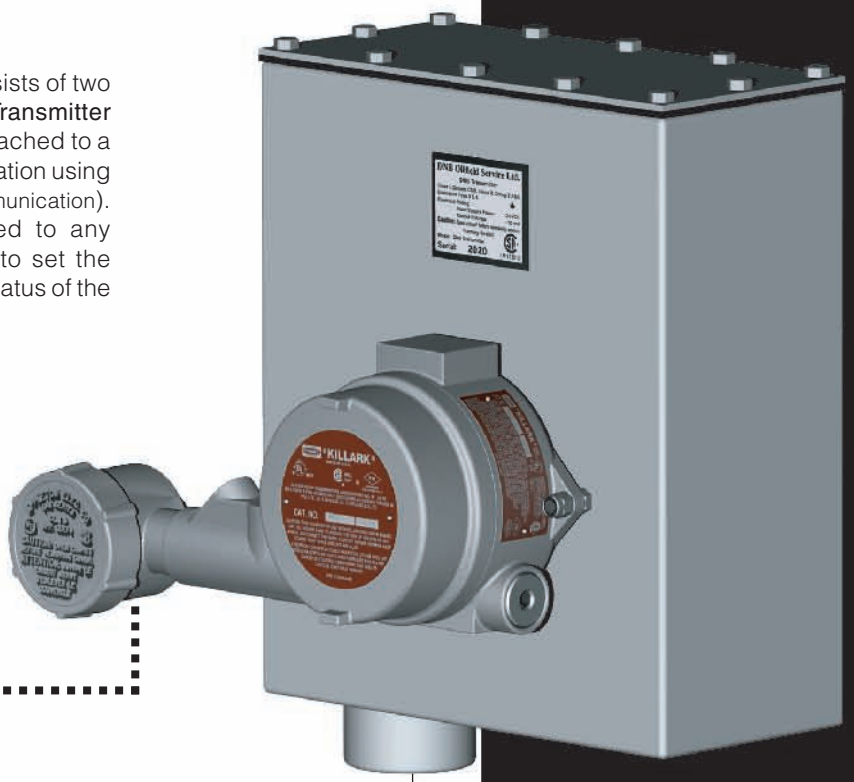
DNB Model 8020
Liquid Level 4-20mA Output Transmitter

System Description
The DNB Liquid Level monitoring system consists of two main components, the **DNB 4-20mA Output Transmitter** and the **DNB Calibrator**. The Transmitter is attached to a tank and electrically connected to a central location using 4 wires (+24VDC, -24VDC , 4-20mA Signal, and Communication). The handheld Calibrator can be connected to any transmitter via the **DNB Connector Module** to set the span/zero and liquid level as well as read the status of the transmitter.

To PLC

DNB Connector Module
- Links field wiring from the level Transmitter to the Calibrator
- Compact DIN rail mounted modular units
- Mini DIN connection port to Calibrator



DNB 4-20mA Output Transmitter
- Sealed gaugehead
- Designed for sour service
- Operating range –45C to +85C
- Float and float guides for any operating environment
- Adaptable to other guageheads
- CSA Class I, Groups C&D
- Easy installation

DNB Calibrator
- Handheld Transmitter Calibrator
- Used to set span/zero and liquid level
- 24VDC power supplied to Calibrator from Connector Module
- Displays levels in cm

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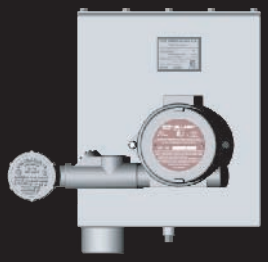
Technical Specifications



DNB Liquid Level Transmitter

Transmitter assembly is housed in and explosion proof water-resistant enclosure. The Transmitter is coupled to a mechanical gaugehead, consisting of a rotating shaft and drum wound with cable and terminated at a float. The Transmitter measures the float movement with a rotary optical encoder and converts it to a 4-20mA output signal. Span/zero and liquid levels can be set via the Calibrator. These values are retained in memory indefinitely. An optional internal battery back up is available that maintains the current liquid level in the event of a 24VDC power interruption.

Output	4-20mA
Communications	1-wire
Operating Voltage	18 to 30VDC
Operating Current	110mA max
Operating Temperature	-45C to +85C
Max overvoltage on power	+32VDC
Reverse polarity protection	-32VDC
Transmission cable length	500m (twisted pair shielded)
Accuracy	0.125cm
CSA Certification LR113815	Class I, Groups C&D, Class II, Groups E, F&G Hazardous locations

DNB Connector Module

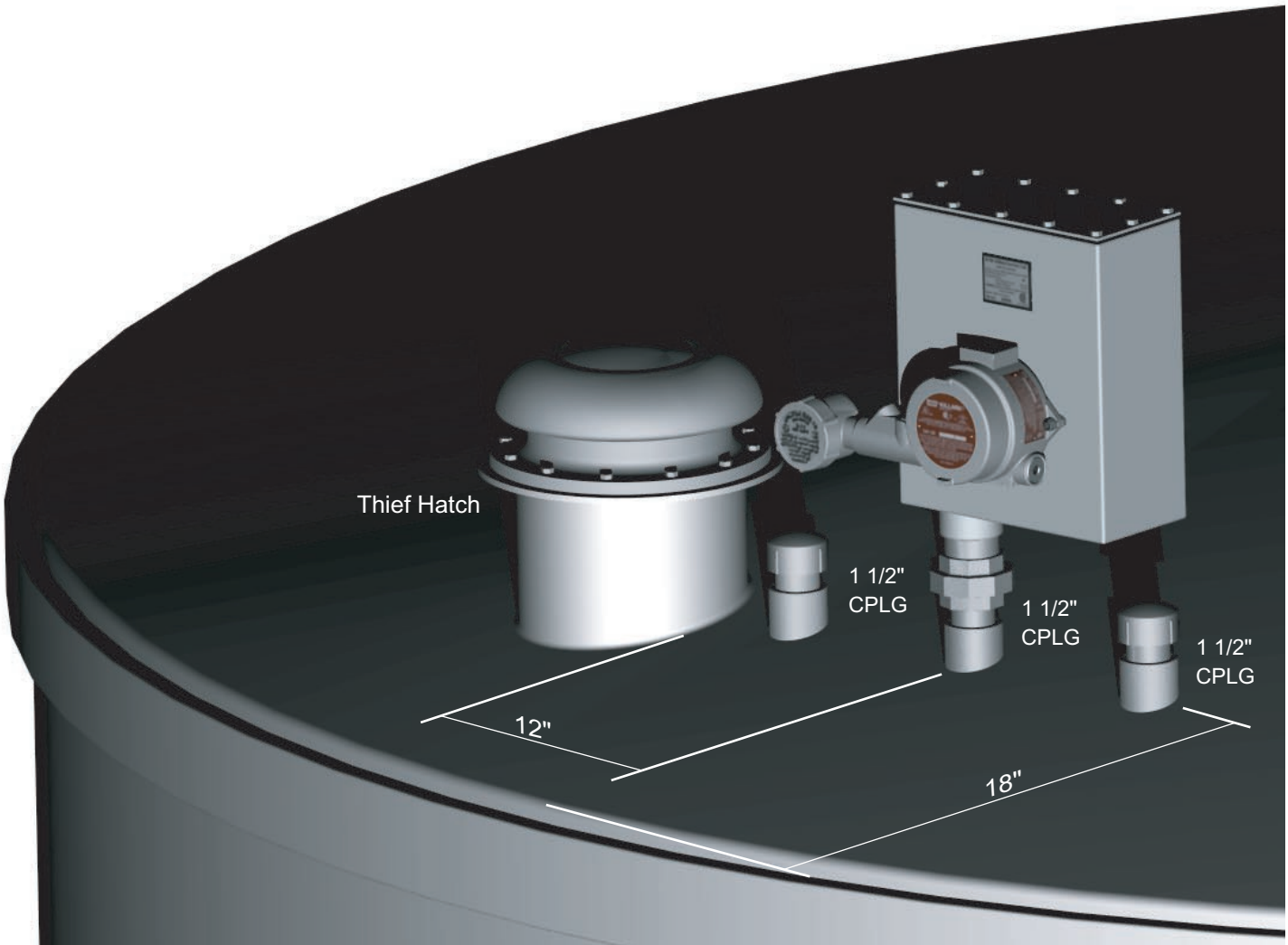
The Connector Module provides a convenient means of accessing the Transmitter for calibration from the MCC. It uses a mini DIN connector port which the Calibrator is plugged into. The module is DIN rail mounted and takes up very little panel space. Up to eight Transmitters can be accessed with one Connector Module or each Transmitter can have its own dedicated Module.

Enclosure Size	22.5mm x 74.0mm x 79.0mm
Panel Mounting Method	DIN Rail
Connection to Calibrator	Mini DIN connection port

DNB Handheld Calibrator

The Handheld Calibrator provides a means of calibrating the Transmitter (span/zero and liquid level) and displaying its current status. It is connected to the Transmitter via the Connector Module using a mini DIN cable. Each Transmitter can be given a unique address that identifies it to the Calibrator by setting DIP switches on the Transmitter circuit board. This enables the Calibrator to read up to eight Transmitters from one Connector Module. The Calibrator is powered from the Connector Module.

Operating Voltage	18 to 30VDC
Operating Current	44mA max
Operating Temperature	-10C to +55C
Max overvoltage on power	+32VDC



Typical Top of Tank Fitting Assembly
Fittings (1 1/2" CPLG) are positioned 12" from the Thief Hatch and 18" or more from the tank wall. Clips for float guides are attached to the tank floor to correspond with the two outside fittings.

Alternate Mounting Assemblies
A variety of mounting options are available to accommodate different tank and installation requirements. A system for installing the Transmitter and float assembly on in-service tanks is also available.

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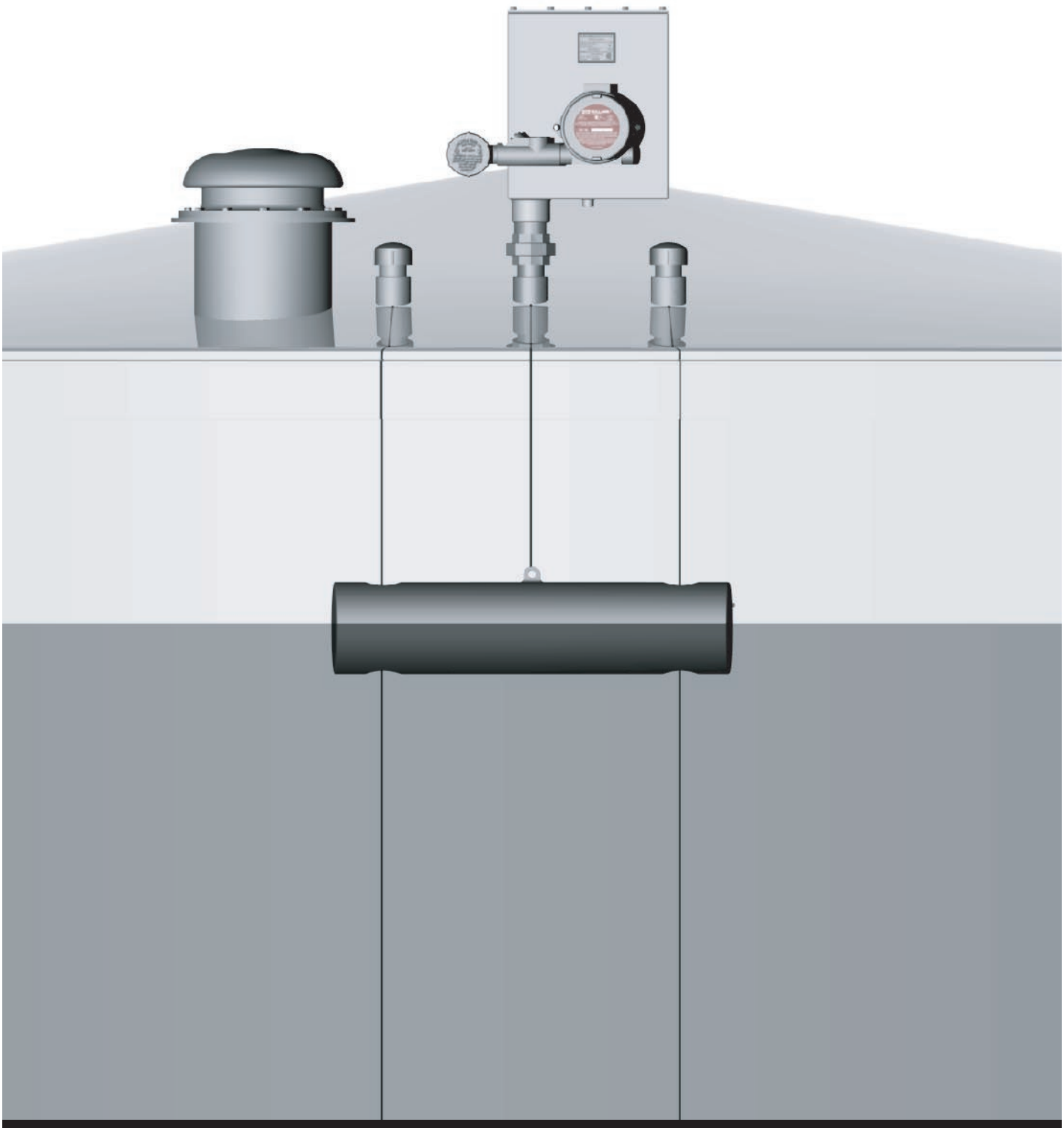

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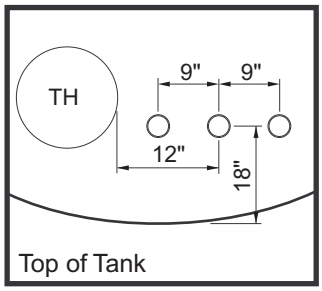
INSTALLATION OF EQUIPMENT:

FROM THE TOP OF THE TANK,

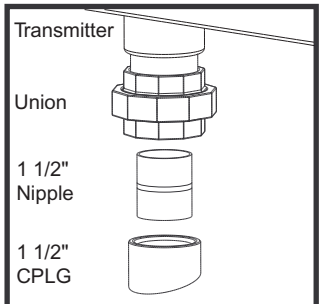
1. ATTACH FLOAT GUIDE LINE ENDS TO FLOAT GUIDES AND INSTALL ON THE TWO OUTSIDE CPLG'S
2. MOUNT TRANSMITTER ON CENTER CPLG USING THE 1 1/2" UNION AND NIPPLE
3. ATTACH LENGTH OF ROPE TO TRANSMITTER CABLE ON TRANSMITTER AND LOWER INSIDE TANK . THIS ROPE IS USED TO PULL THE FLOAT CABLE OUT OF THE TRANSMITTER TO THE FLOAT.
4. ADD FIVE LITRES OF LOWTEMP OIL TO TRANSMITTER SPOOL CASE THROUGH THE OIL PLUG.

FROM INSIDE THE TANK,

5. THREAD FLOAT GUIDES THROUGH GUIDE FERRULES ON FLOAT.
6. ATTACH FLOAT GUIDES TO CLIPS ON FLOOR.
7. PULL TRANSMITTER CABLE OUT OF THE TRANSMITTER TO THE FLOAT.
8. PASS THE FLOAT CABLE THROUGH EYELET ON THE FLOAT AND ATTACH A 1/8" SST WIRE CLIP.
9. REMOVE LENGTH OF ROPE FROM TRANSMITTER CABLE



Top of Tank



Exploded View

Please call if you have any questions.

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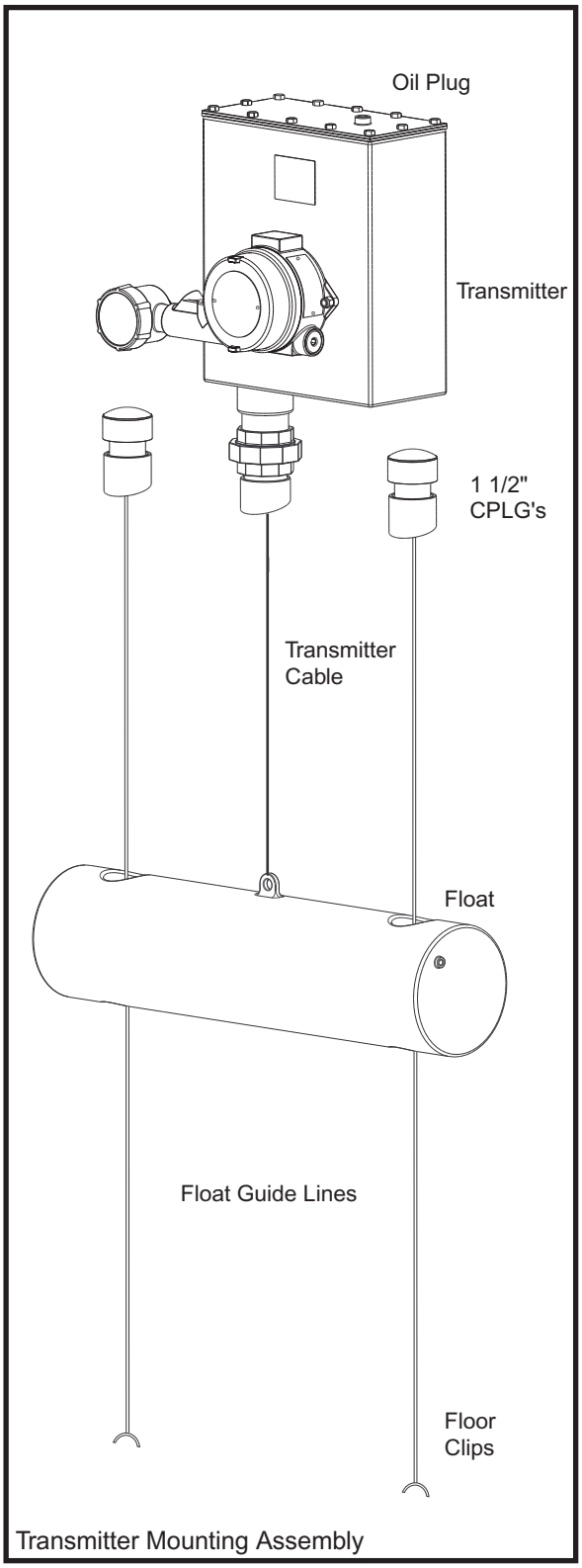
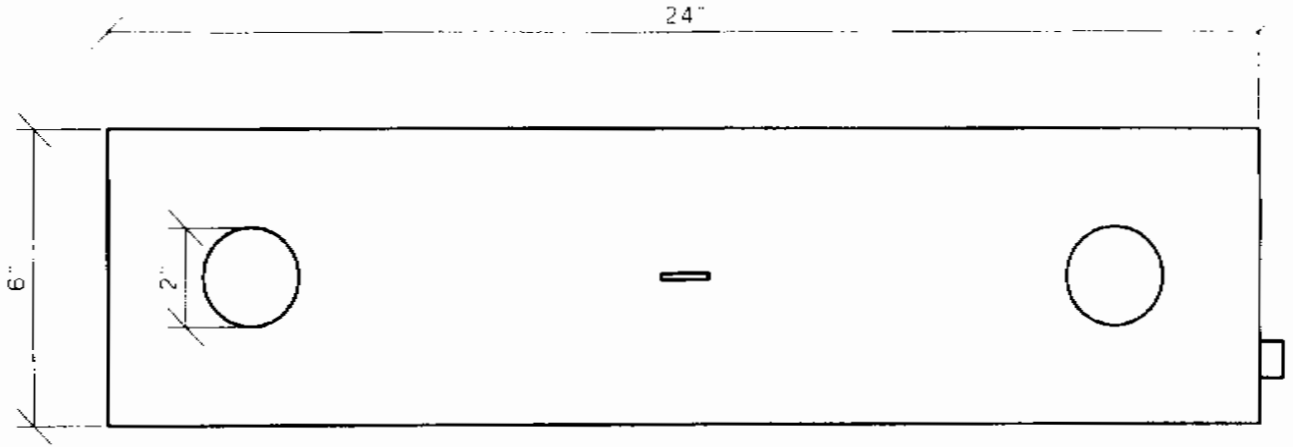


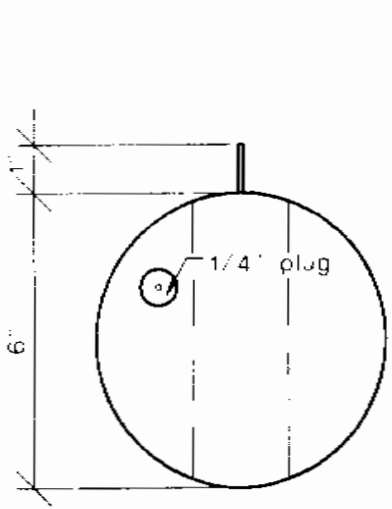
Transmitter Mounting Assembly

EQUIPMENT REQUIRED FOR INSTALLATION:

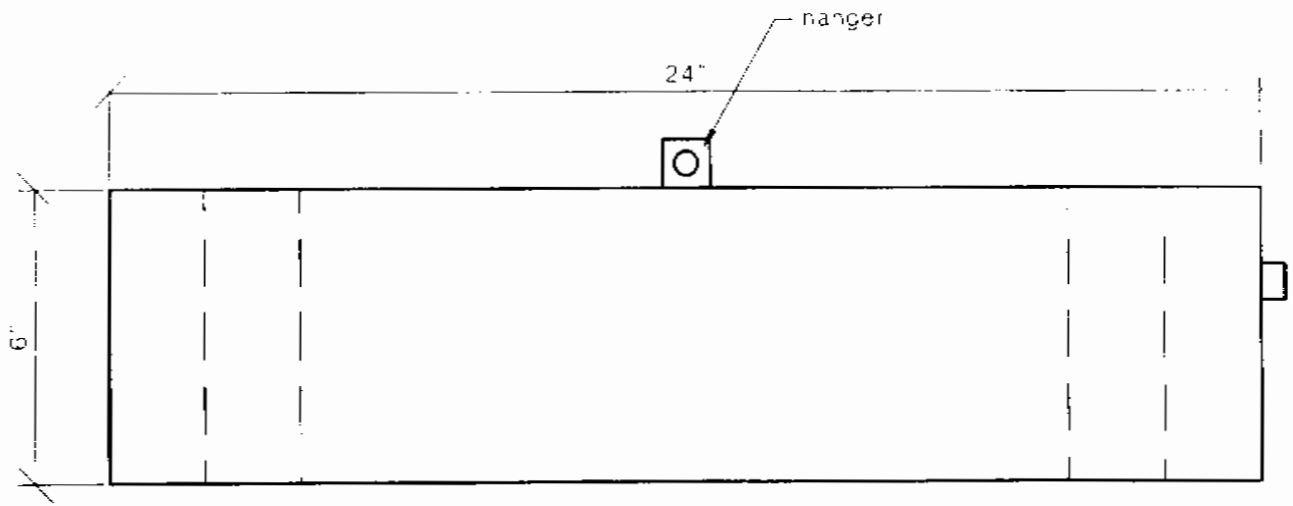
-THREE 1 1/2" CPLG'S WELDED ON ROOF OF TANK
-TWO CLIPS ON FLOOR OF TANK
-DNB TRANSMITTER
-FLOAT, 18" CENTERS ON GUIDE FERRULES, WEIGHT 9 - 11 POUNDS
-TWO FLOAT GUIDE LINES - 5/16" BRAIDED NYLON ROPE, LENGTH IS THE HEIGHT OF TANK PLUS 5'
-TWO FLOAT GUIDE LINE ENDS, (TWO 1 1/2" CAPS, 1 1/2"X 3" NIPPLES, 3/4" WASHERS AND 1/2" NUTS)
-ONE 1 1/2" UNION AND TWO 1 1/2" X 2" NIPPLE
-FIVE LITRES LOW TEMPERATURE HYDRAULIC OIL
-ONE LENGTH OF ROPE THE HEIGHT OF TANK FOR USE DURING INSTALLATION



Top View
1/4 Scale



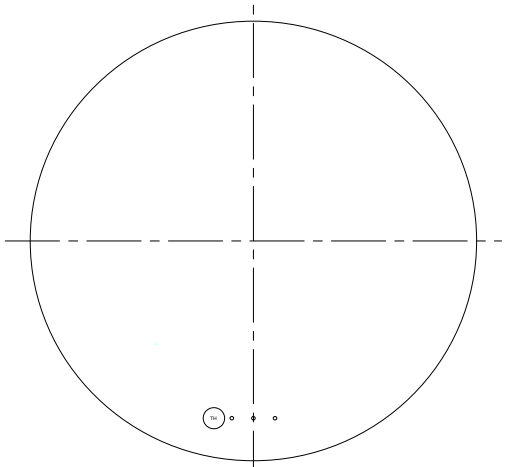
Side View
1/4 Scale



Front View
1/4 Scale

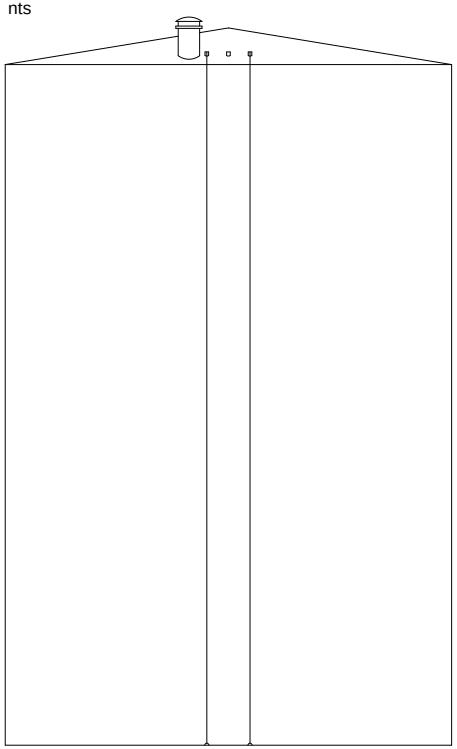
DNB Oilfield Service Ltd.
Tank Liquid Level Monitors and Controlers
Box 72070 GLPO 1600 90 Avenue S.W. Calgary, Alberta T2V 5H0 Phone/Fax (403)251-1795 Cellular (403)651-6888

title	316 Stainless Steel Float			project no	97-010
project	Tank Liquid Level Monitor			scale	1/4 scale
date	June 1997	drawn CB	checked DB	drawing no	10"1
				drawing	2.1



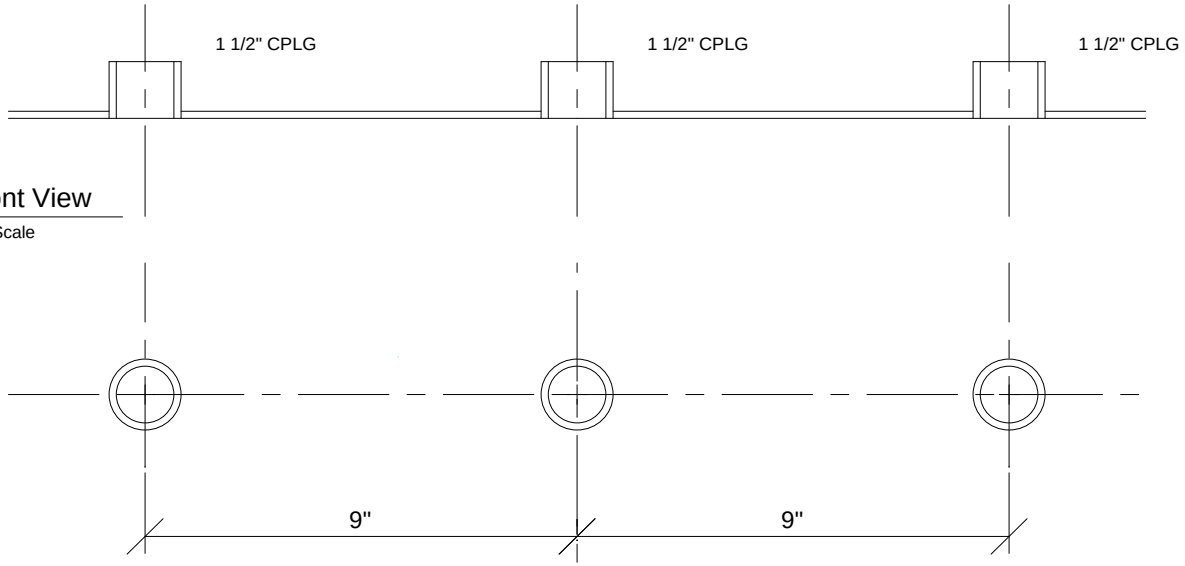
Top View Tank

nts



Front View Tank

nts

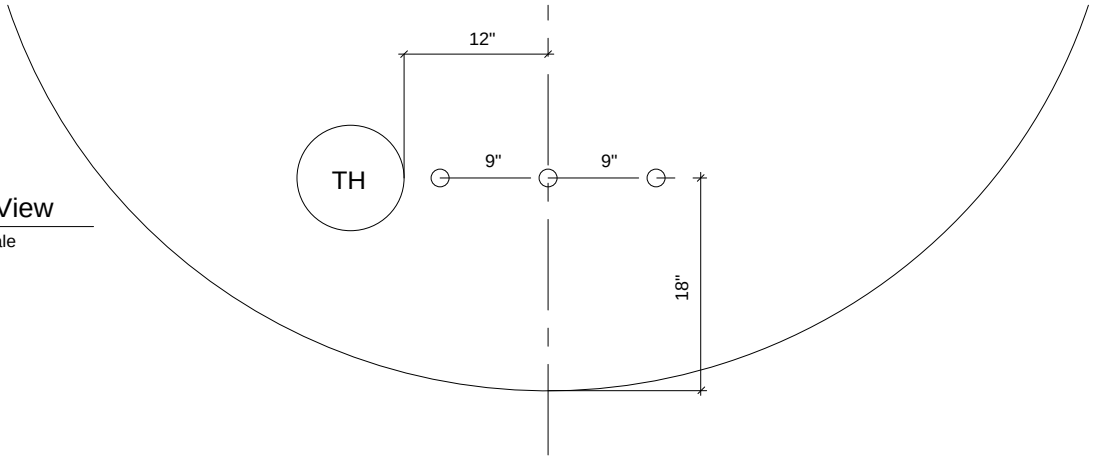


Front View

1/4 Scale

Top View

1/4 Scale



Plan View

1/16 Scale

Note:

Position center fitting (1 1/2" CPLG) 12" from the Thief Hatch and 18" or more from the tank wall. Attach clips on floor of tank to correspond with the two outside fittings.

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Tank Liquid Level Monitors and Controllers

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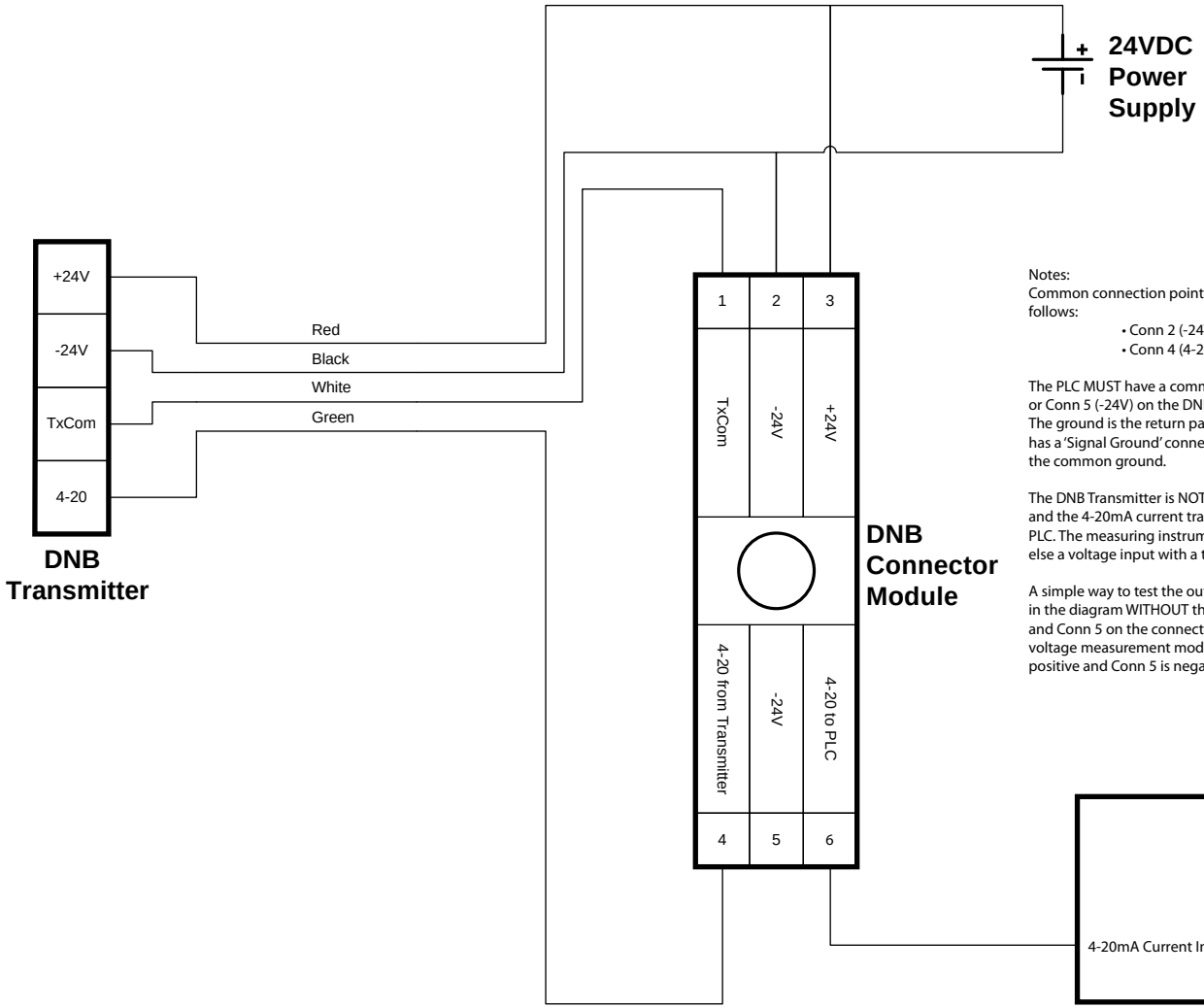
title	Tank and Fitttings				project no.	97-010	
project	Tank Liquid Level Monitor				scale	As noted	
date	Oct 2004	drawn	CB	checked	DB	drawing no. 1of1	dwg 3.0



Notes:
Common connection points terminated together inside the DNB Connector Module are as follows:

- Conn 2 (-24V) is equivalent to Conn 5 (-24V)
- Conn 4 (4-20 from Transmitter) is equivalent to Conn 6 (4-20 to PLC)

The PLC MUST have a common ground with the DNB Transmitter. Use either Conn 2 (-24V) or Conn 5 (-24V) on the DNB Connector Module as the common ground connection point. The ground is the return path for the current to complete the 4-20 current loop. If the PLC has a 'Signal Ground' connection point, use this. Otherwise use the PLC power ground as the common ground.

The DNB Transmitter is NOT loop powered. A 24VDC power supply powers the Transmitter, and the 4-20mA current travels from the Transmitter to a measurement device, such as a PLC. The measuring instrument can be a 4-20 input (NOT a loop powered 4-20 type) or else a voltage input with a termination resistor (e.g. 250 = for 1 to 5 volts).

A simple way to test the output of the DNB Transmitter is to connect the system as shown in the diagram WITHOUT the 2 connections to the PLC. Put a 250 = resistor across Conn 4 and Conn 5 on the connection module. Use a handheld digital multimeter set in DC voltage measurement mode to measure the voltage across Conn 4 and Conn 5 (Conn 4 is positive and Conn 5 is negative). You should get a voltage reading between 1 and 5 volts.

DNB Transmitter Field Connection Diagram

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DNB Tank Level Transmitter
Wiring and Grounding Procedures

The DNB Tank Level Transmitter system works reliably when wiring and grounding connections are made correctly. Please ensure the following when connecting the transmitter.

- Use a two pair shielded cable to connect transmitter (Fig 1).
- Connect cable shields to earth ground at one point in the MCC Panel.
- The cable shield must not be connected to 24(-)
- Do not share the 24(-) line with other devices.
- Ensure the 24(-) to the transmitter is the only negative line back to the MCC
- Isolating the power to the transmitter will help keep the (-) line separate from other system grounds.
- Ensure tank is grounded
- At TEC Connector (Fig 2) at transmitter ensure all three shields are isolated from ground AND each other

Fig 1. Two pair shielded cable

Fig 2. Two pair shielded cable with TEC Connector

All three shields need to be isolated from **ground** and **each other.**

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DNB CALIBRATOR MANUAL

1. Operation of the DNB Handheld Calibrator

- Connect the handheld Calibrator to the Connector Module using the calibrator cable.
- The level (in cm) of the first tank (Channel 1) will appear on the display.

2. **RUN Mode**

- When the Calibrator is first connected, it is by default in **RUN** mode. **RUN** mode is used to view the level of the selected tank or channel. To view another channel or to make calibration changes switch to calibration mode **(CAL)**.

3. **Calibration Mode (CAL)**

Calibration Mode is used for the following:

- To change to a different channel - *see Set Channel*
- To set **SPAN**, **LEVEL** or **ZERO** - *see Initial Calibration*
- To view the calibration number, serial number, or DAC output

Note:
Before starting the initial calibration of a tank, ensure the correct channel is selected on the calibrator and that it corresponds to the channel number of the tank, which is set at the DNB Transmitter using the DIP switches on the circuit board.

CHANNEL	DIP 1	DIP 2	DIP 3	DIP 4
1	ON	ON	ON	OFF
2	OFF	ON	ON	OFF
3	ON	OFF	ON	OFF
4	OFF	OFF	ON	OFF
5	ON	ON	OFF	OFF
6	OFF	ON	OFF	OFF
7	ON	OFF	OFF	OFF
8	OFF	OFF	OFF	OFF

DIP Switch Settings for Multiple Channels

SET Channel

- Press **RUN/CAL** switch
- Press **FUNC** switch to view the channel
- Move the selector knob to the desired channel
- Press **SET** switch

Initial Calibration - Setting SPAN, LEVEL and ZERO

Upon installation of a DNB Transmitter, the **SPAN**, **LEVEL** and **ZERO** of the tank must be defined. This is called the initial calibration and consists of three steps:

1. Setting the **SPAN** (upper tank level) of the tank.
2. Setting the **LEVEL** (current tank level) of liquid within the tank, as measured manually at this time.
3. Setting the **ZERO** (lowest tank level) of the tank (normally left at zero)

Note:
The **ZERO** and **SPAN** are entered partly for the purpose of setting the 4-20mA output range. Whatever is entered as **ZERO** will be equivalent to 4mA. Whatever is entered as **SPAN** will be the equivalent of 20mA.

To Set SPAN

- Press **RUN/CAL** switch
- Press **SPAN** to display current span
- Move the selector knob to the desired value
- Once the desired value is reached, press the **SET** switch to save it to the Transmitter

To Set LEVEL

- Press **RUN/CAL** switch
- Press **LEVEL** to display current level
- Move the selector knob to the desired value
- To increment the value more quickly, press the **LEVEL** key again and the value will increment by a factor of one when the knob is turned
- To increment more slowly, press the **LEVEL** key again and the value will decrement by a factor of one tenth when the knob is turned
- Once the desired value is reached, press the **SET** switch to save it to the Transmitter.

To Set ZERO

- Press **RUN/CAL** switch
- Press **ZERO** to display current zero
- Move the selector knob to the desired value
- Once the desired value is reached, press the **SET** switch to save it to the Transmitter

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DNB Transmitter Maintenance Guide

Oil Level:
Inspect transmitter oil levels yearly.

To inspect oil level:

- Remove 3/8" oil plug located on top of the transmitter.
- Maintain oil level to 7in (17cm).
- Use XL Lo-Temp Hydraulic oil. Example: Esso Univis 22.

Float Assembly:
Examine float guides for wear and proper tension during regular maintenance inspections.

Transmitter Calibration:
Check tank levels and calibrate transmitter yearly. See "DNB Handheld Calibrator Operating Manual" for proper calibrating procedures.