USER'S GUIDE

Installation & Operation
Instructions

Tank Farm Transmitter
Model TFT 32
Series 2.4

Pressure Sensor Input (-B-)

Note: This page has been left blank intentionally.

INDEX

IMPORTANT NOTE: This instrument is manufactured and calibrated to meet product specifications. Please read this manual carefully before installation and operation. Any unauthorized repairs or modifications may result in a suspension of the warranty.

Available in Adobe Acrobat pdf format

QUICK BENCH TEST (PRESSURE INPUT):

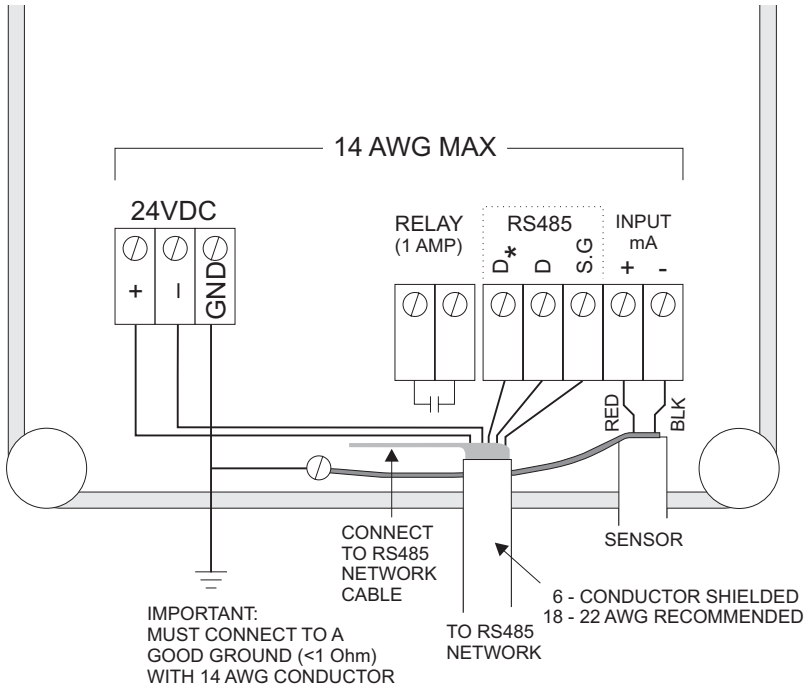
Connect Sensor as shown below, then apply Power. When properly connected figures will be shown on the LCD display. Test operation of the TFT32 by applying pressure to the sensor or 4-20mA input. The TFT32 will now display level in inches or cm.

CONNECTIONS:

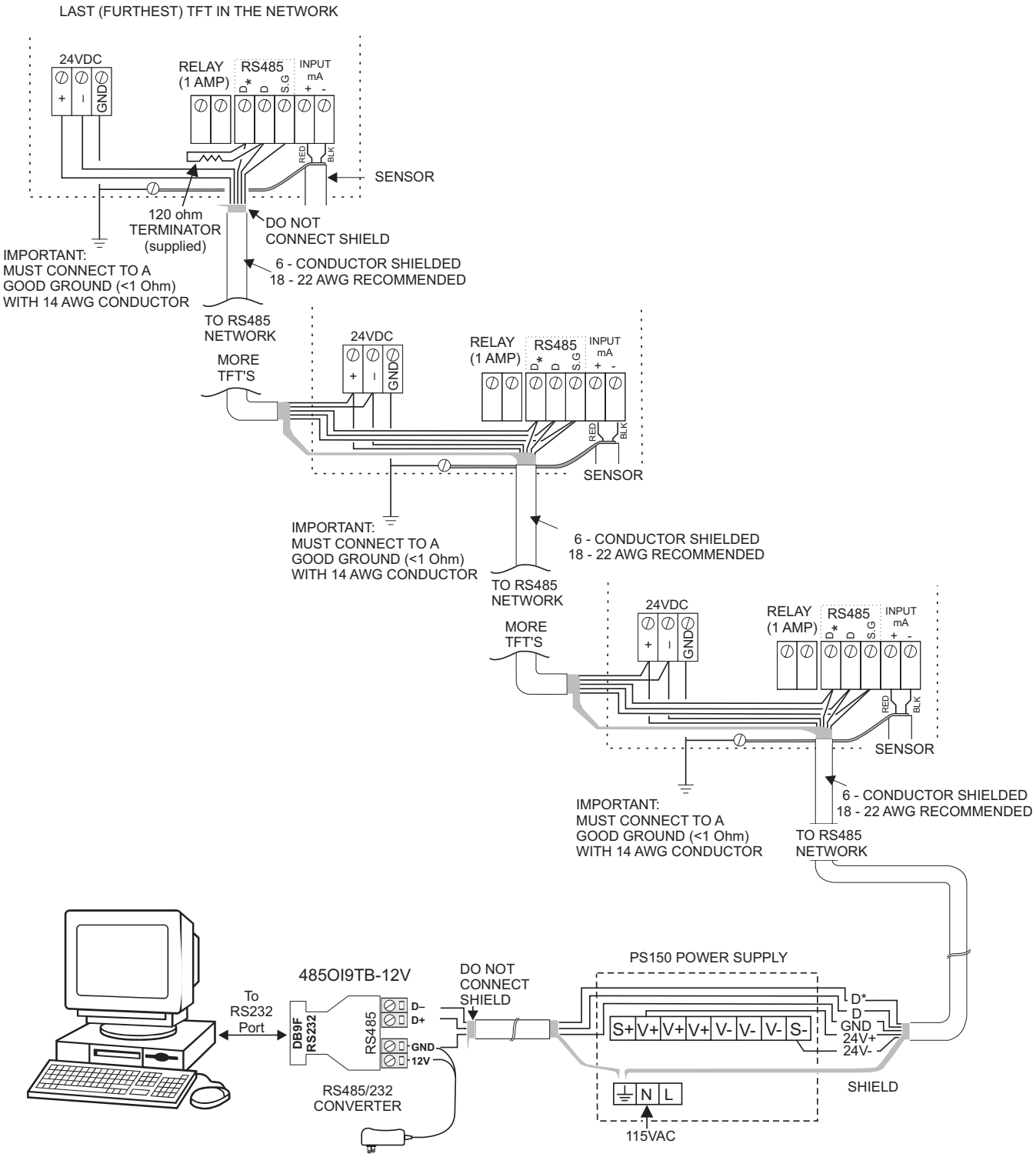
POWER INPUT: The standard model requires DC power input between 15 to 24VDC with current consumption of 120mA maximum. Power GND must be connected to a good "earth" ground for surge protection.

RS485 NETWORK: Connections from the 485 network (other TFT32's and the PC computer) are: Data - (D*), Data + (D) and signal/shield ground (S.G.)

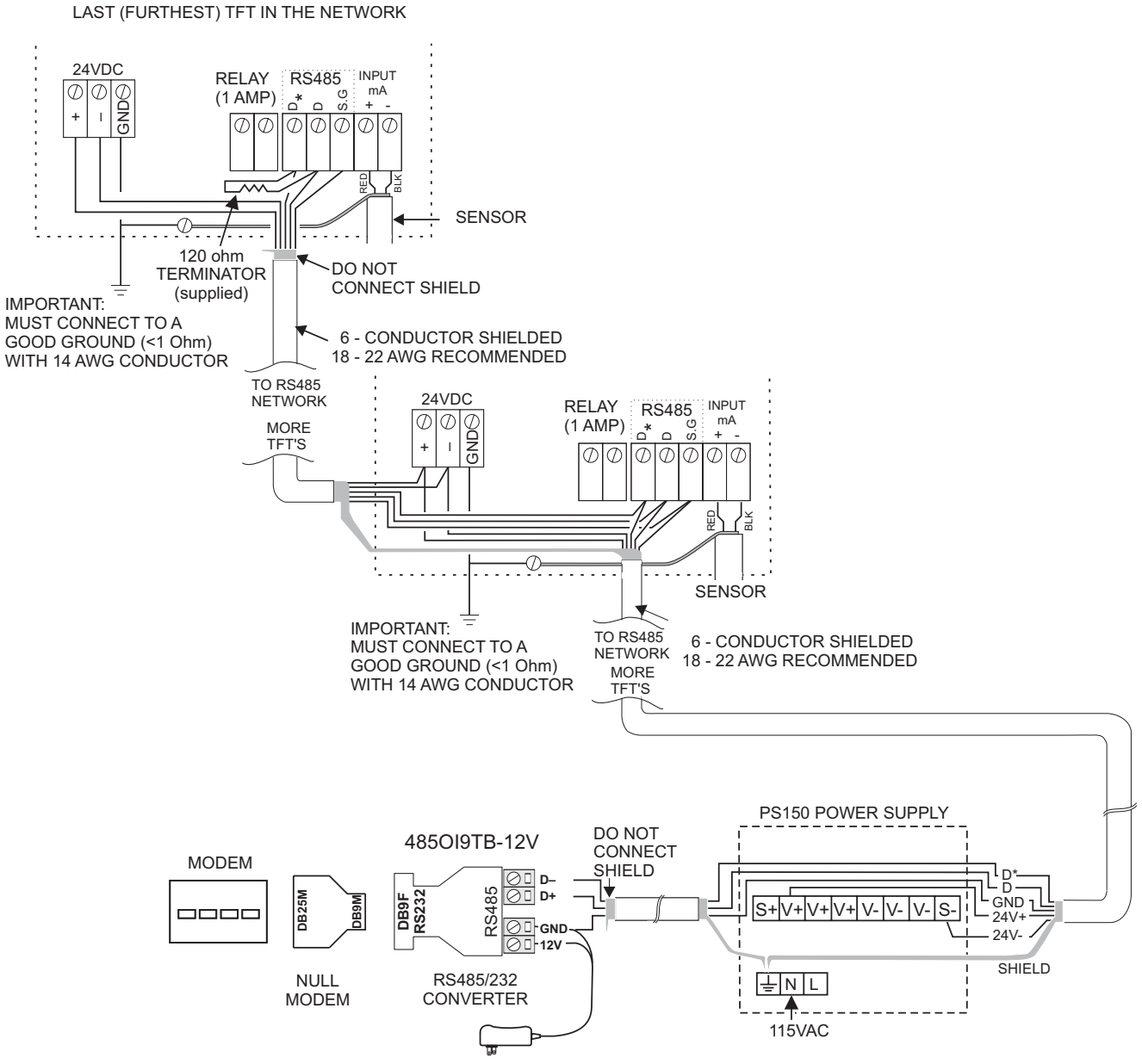
IMPORTANT NOTE: To comply with CSA/NRTL standards, power input and relay connection wires must have a water tight fitting conduit entry to the instrument enclosure.



LOCAL NETWORK CONNECTIONS

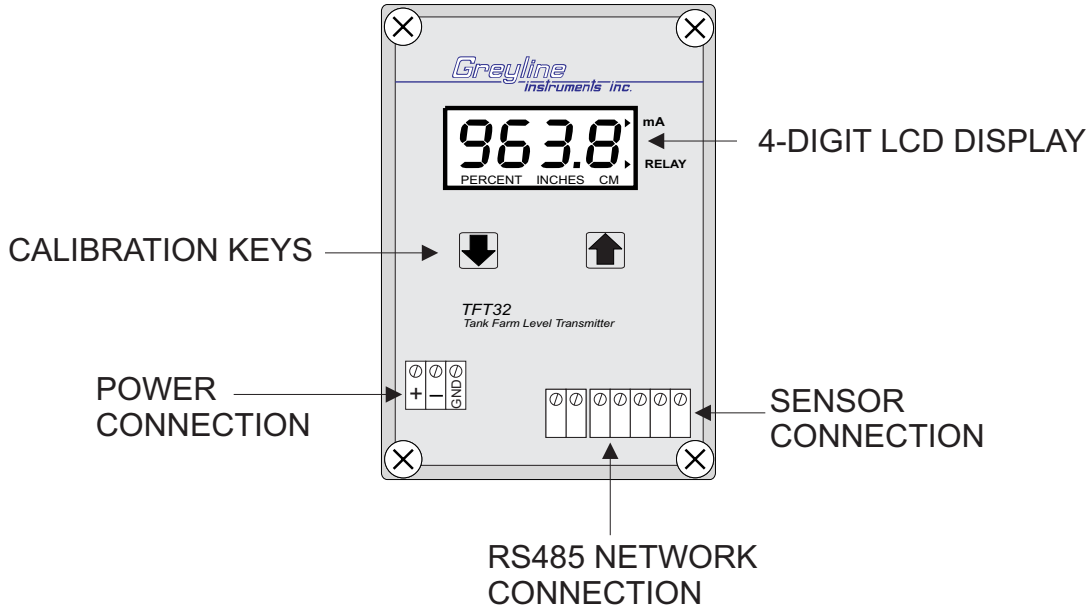


DIAL-UP LOCATION CONNECTIONS



KEYPAD SYSTEM

The TFT32 has a simple 2-key calibration system. Operating and calibration modes are shown on the 4 digit display. The keys are used to calibrate the TFT32, and to view operating mode and functions. If the keys are not used for 10 minutes, the TFT32 will automatically go to **NORMAL MODE**. Except in **OUTPUT SIMULATION** mode, the Relay and RS485 serial output are not affected by use of the keys until your calibration is stored.

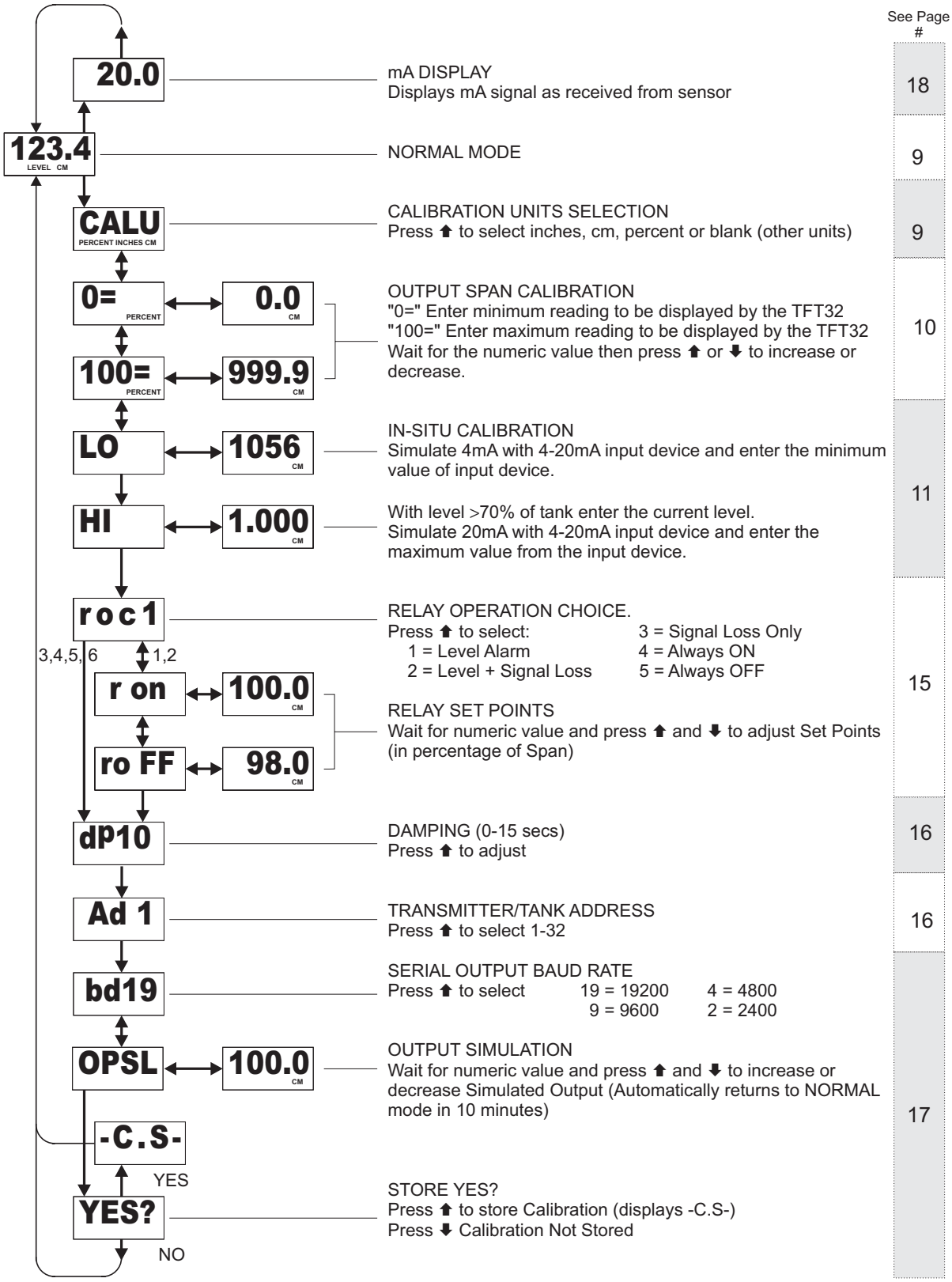


MENU - FLOW CHART

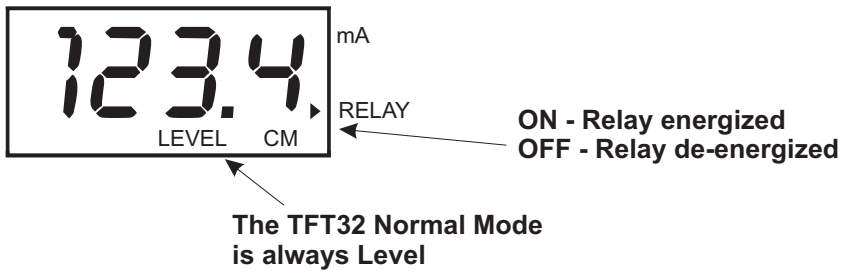
The following diagram shows the TFT32 Menu system. Arrows show the directions to leave a box. Pressing a corresponding key will move to the next box in the direction shown. Numeric values are changed by pressing and holding the ⬆ or ⬇ keys.

At the bottom of Menu is a **YES?** prompt. To store the calibration values permanently (even through power failure), press the ⬆ key. If the ⬇ key is pressed from the **YES?** prompt no changes will be stored and the system will return to NORMAL mode.

TFT32 CALIBRATION MENU
PRESSURE SENSOR INPUT

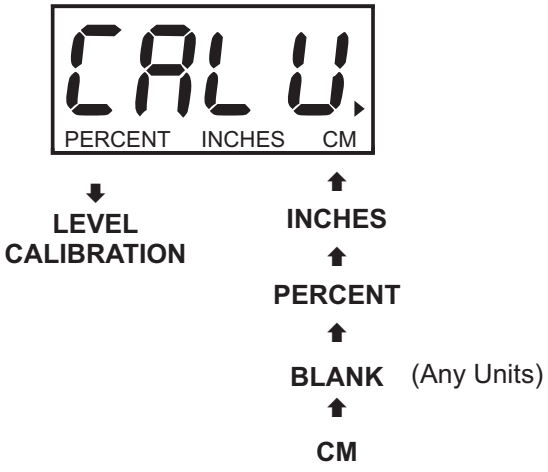


NORMAL MODE

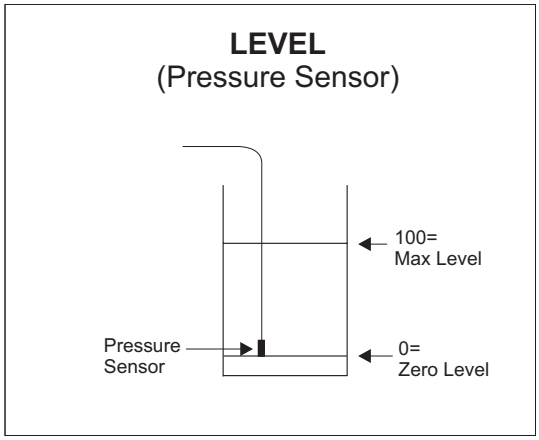


CALIBRATION UNITS SELECTION

Press ⬇ from NORMAL mode, display will show:



OUTPUT SPAN CALIBRATION



The Display will alternate between  **and**  **every 3 seconds.**

100=

1524
1523
1522

0.1
0.2
0.3

Wait for the numeric value and press ⬆ to enter the zero level, or minimum level of the tank. With display on 0 = press ⬇

The Display will alternate between  **and**  **every 3 seconds.**

LO

199.9
199.8
199.7

200.1
200.2
200.3

Wait for the numeric value and press ⬆ to enter the maximum level of the tank. With display on 100 = press ⬇.

LOW LEVEL CALIBRATION (IN-TANK)

The Display will alternate between 

and 

every 3 seconds.

HI

208.9 **209.1**
208.8 **209.2**
208.7 **209.3**

With tank level <30% of maximum level (**100=**) wait for the numeric value and press ⬆ to enter the current tank level.

HIGH LEVEL CALIBRATION (IN-TANK)

The Display will alternate between 

and 

every 3 seconds.

roc 1

798.9 **799.1**
798.8 **799.2**
798.7 **799.3**

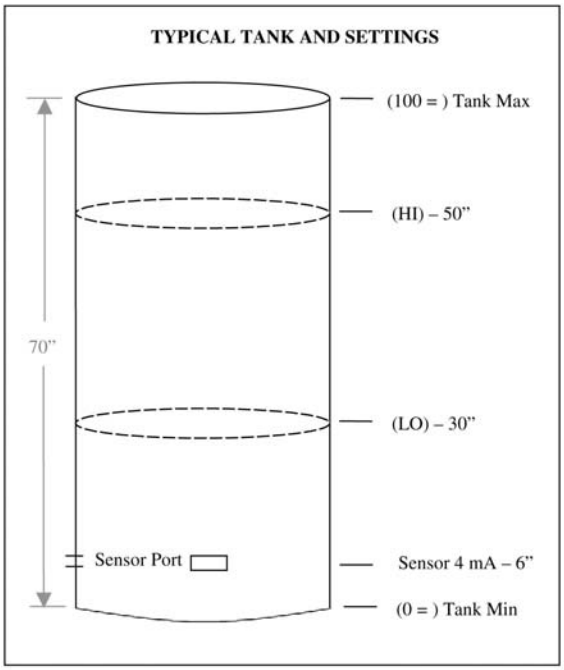
With tank level >70% of maximum level (**100=**) wait for the numeric value and press ⬆ to enter the current tank level.

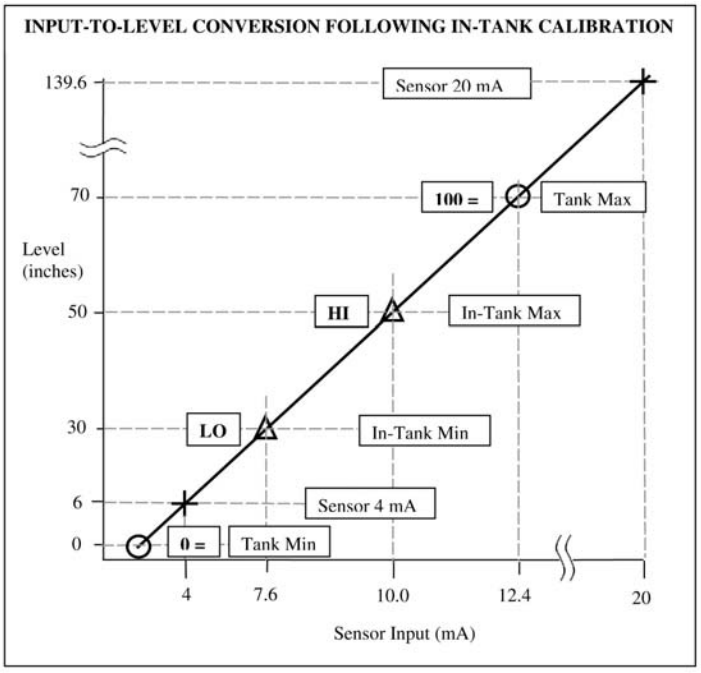
Note: the greater the range between LO and HI levels for this procedure, the better the accuracy of your calibration. (eg: LO at 10% and HI at 90% will produce a more accurate calibration than LO at 40% and HI at 60%).

Note: If only one value is changed during a calibration then the second calibration point remains the unchanged value from the last calibration (ie. You can perform a single point calibration to improve upon the previous calibration).

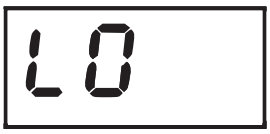
Note: Sensor input difference between HI and LO must be greater than 2mA.

SETUP EXAMPLE: PS11 Sensor in a 70” Tank





LOW LEVEL CALIBRATION (BENCH)

The Display will alternate between 

and 

every 3 seconds.

⬇ **HI**

⬇ **208.9** ⬇ **208.8** ⬇ **208.7**

⬆ **209.1** ⬆ **209.2** ⬆ **209.3**

With sensor input OPEN (sensor not connected) wait for the numeric value and press ⬆ to enter the level of the sensor in the tank. (eg. If sensor will be mounted at a level of 6 inches then **LO** = 6.0 inches)

HIGH LEVEL CALIBRATION (BENCH)

The Display will alternate between 

and 

every 3 seconds.

⬇ **roc 1**

⬇ **798.9** ⬇ **798.8** ⬇ **798.7**

⬆ **799.1** ⬆ **799.2** ⬆ **799.3**

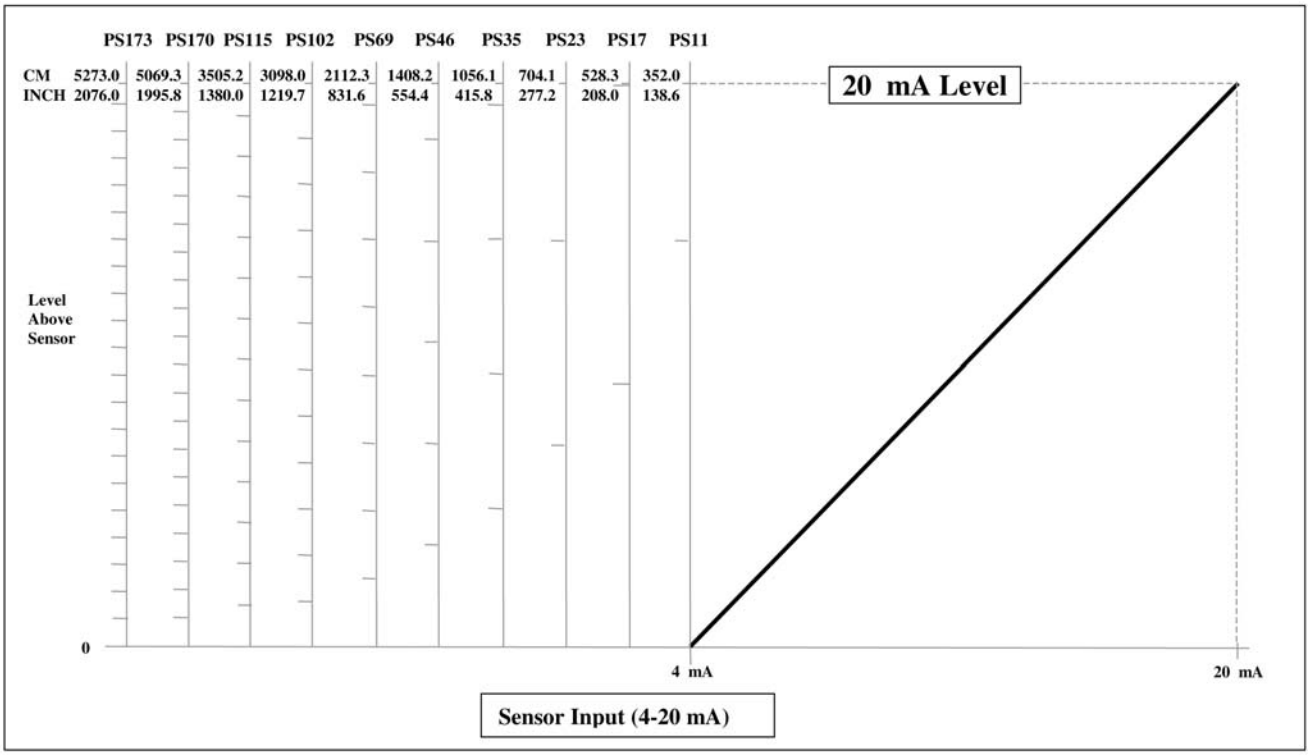
With sensor input OPEN (sensor not connected) wait for the numeric value and press ⬆ to enter the high level:

HI = [20mA Level] + **LO**
Specific Gravity

Where [20mA level] is to be read from the "Pressure Sensor Conversion Chart" (Page 10). The "Specific Gravity" is the specific gravity of your fluid (=1 for water). "**LO**" is the Low Level Calibration value entered above.

Note: See page 12 for samples of bench calibration calculations.

PRESSURE SENSOR CONVERSION CHART (Bench Calibration)



Examples of "Bench Calibration" Calculations

Example 1
- **PS11** sensor
- Specific gravity of tank contents is **1.5**
- Sensor is mounted at a level of **6 inches**
- Calibration units (**CALU**) are in **inches**

LO = 6.0
[20mA Level] = 138.6 inches
HI = [20mA Level] + **LO** = 138.6 + 6.0 = **98.4**
Specific Gravity 1.5

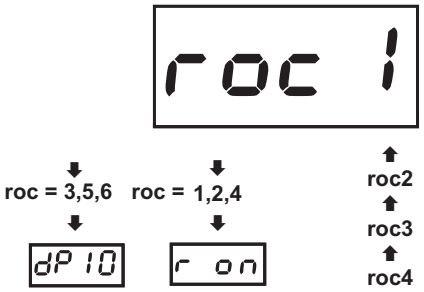
Example 2
- **PS11** sensor
- Specific gravity of tank contents is **1.0**
- Sensor is mounted at a level of **15 cm**
- Calibration units (**CALU**) are in **cm**

LO = 15.0
[20mA Level] = 352.0 cm
HI = [20mA Level] + **LO** = 352.0 + 15.0 = **367.0**
Specific Gravity 1.0

RELAY OPERATION CHOICE

The TFT32's Signal Relay can be configured to operate as:

ROC1 = Level Alarm
ROC2 = Level + Signal Loss Alarm
ROC3 = Signal Loss Alarm only
ROC4 = Always ON
ROC5 = OFF (de-energized) at all times

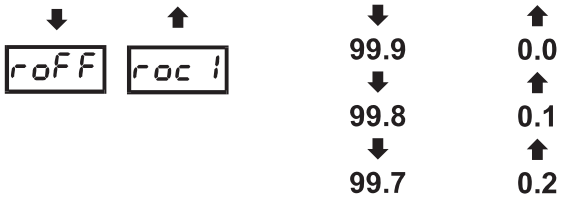


Press ⬆ to select the ROC.

RELAY CALIBRATION

ROC1 (Level Alarm)

The Display will alternate between r on **and** 100.0 Percent **every 3 seconds**

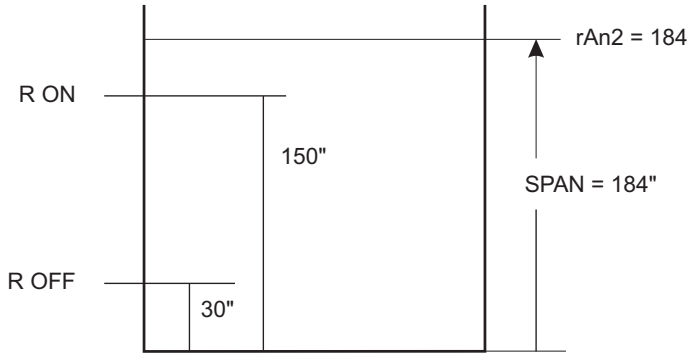


ROC2 (Level + Echo Loss Alarm) - Relay will be energized when the Relay ON set point is reached.
or if the signal is lost (e.g. sensor wires short or open).

NOTE: The Set Points are displayed in percentage of span (LEVEL). Two different Set Points (r on and roFF) allows a Relay "deadband" for Pump Control and to avoid Relay chatter.

Example of Relay Calibration

Span (Max Level) = 184 inches
ron in percent =150/184 = 81.5%
roFF in percent = 30/184 = 16.3%

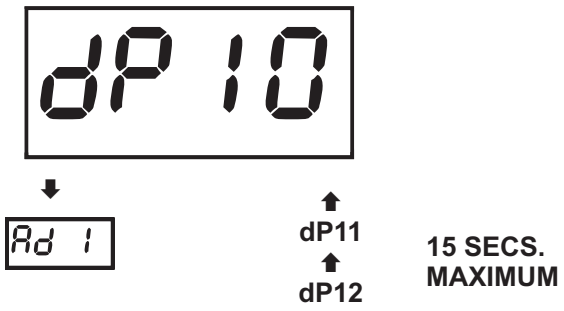


DAMPING

Normal Setting: **dP10**

Fast Response (up to ½ inch /13 mm level change per second): **dP5** or less

Slow Response (turbulence) **dP15**

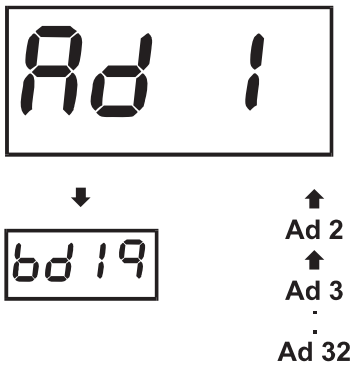


TRANSMITTER/TANK ADDRESS

Select transmitter address 1 to 32 taking into consideration the following:

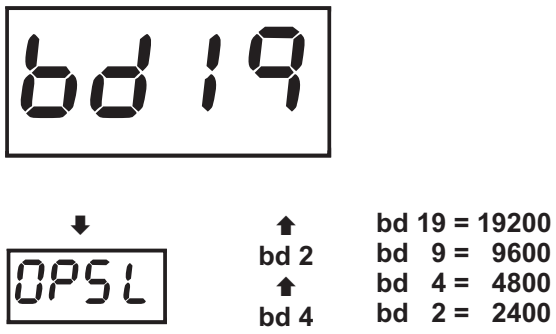
1) Each transmitter must have a different address.

2) The address number is also the tank position on the page when running the **TFS** Tank Farm Supervisor PC software.

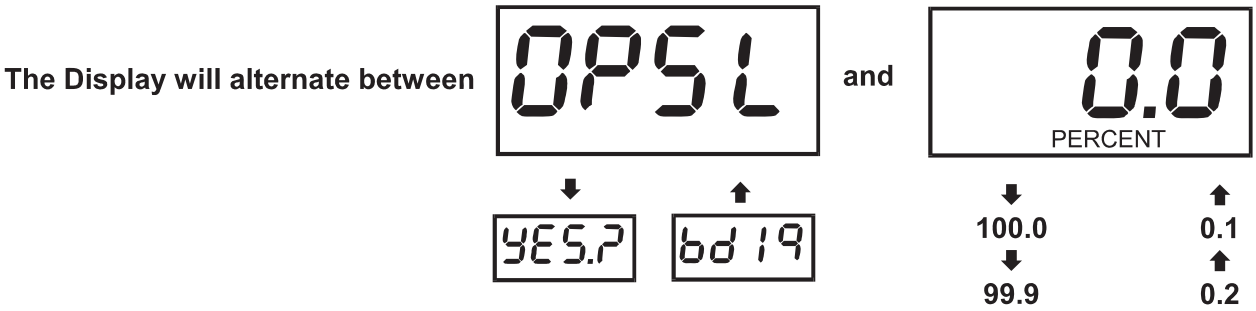


BAUD RATE

Select the highest Baud Rate whenever possible. All Transmitters connected to the network must have the same Baud Rate.

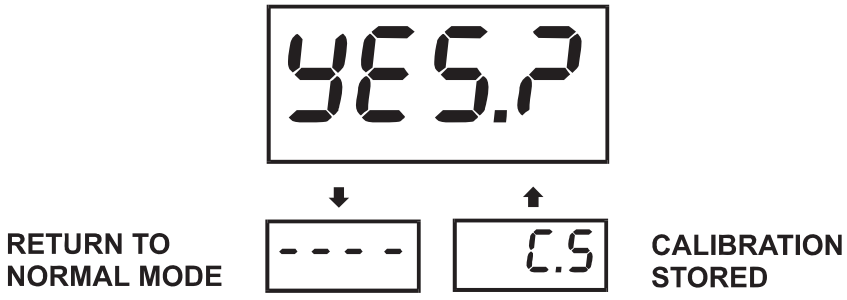


OUTPUT SIMULATION MODE



Output Simulation controls the RS485 serial output, digital display and signal relay. Use it to test Transmitter Communication to the remote PC running TFS software and to test Relay set-points. Simulation values are in percentage of Span.

TO STORE (SAVE) CALIBRATION

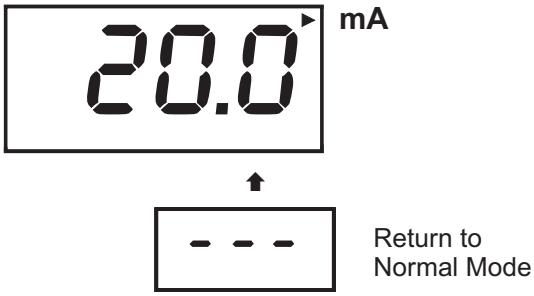


Press ⬆ to Store calibration (TFT will display **-C.S-**).
Calibration is stored in non-volatile memory (even through power interruptions).

Press ⬇ to return to NORMAL mode *without* storing any changes.

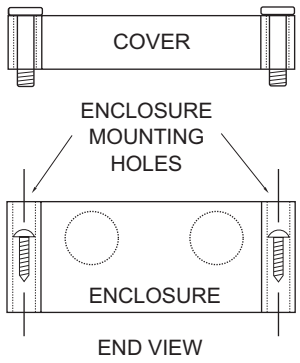
mA DISPLAY

From Normal Mode press ⬆
Displays mA input signal as received from pressure sensor or 4-20mA transmitter.



ENCLOSURE INSTALLATION

Locate the enclosure within 10,000 ft (3,000 m) of the pressure sensor. It can be wall mounted with four mounting screws (supplied) or panel mounted with Option PM Panel Mounting Kit from Greyline Instruments. Avoid mounting the enclosure in direct sunlight to protect the electronics from damage due to overheating and condensation. Seal conduit entries to prevent moisture from entering enclosure.



NEMA4X (IP66) WITH CLEAR COVER

1. Remove enclosure cover.

2. Insert #6 screws through the four enclosure mounting holes to secure enclosure to wall or mounting stand.

3. Replace Cover

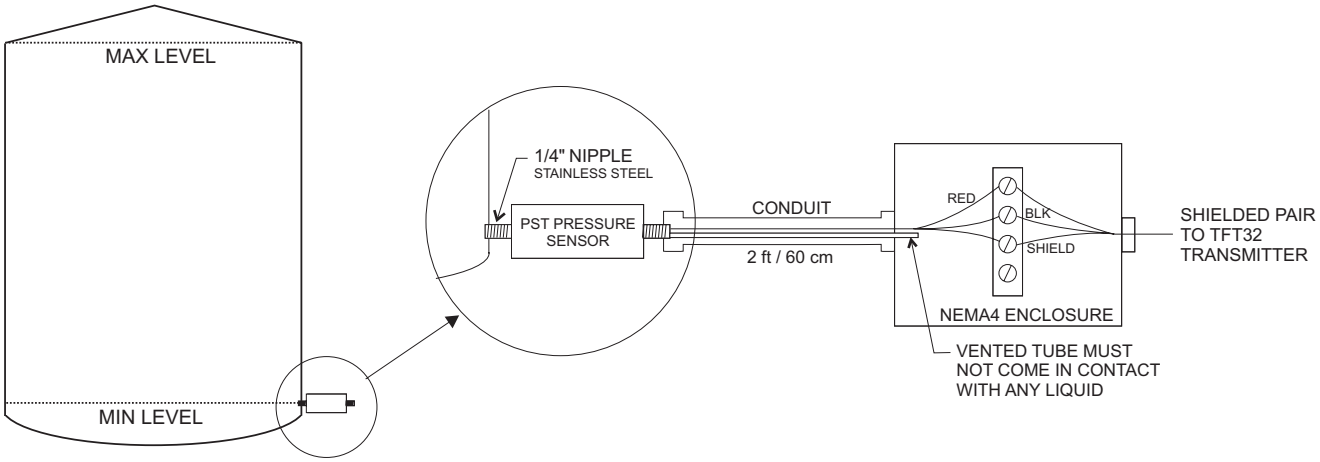
An additional conduit hole can be cut in the end of the enclosure if required. Use a hole saw or Greenlee-type hole cutter to cut the required holes.

Note:

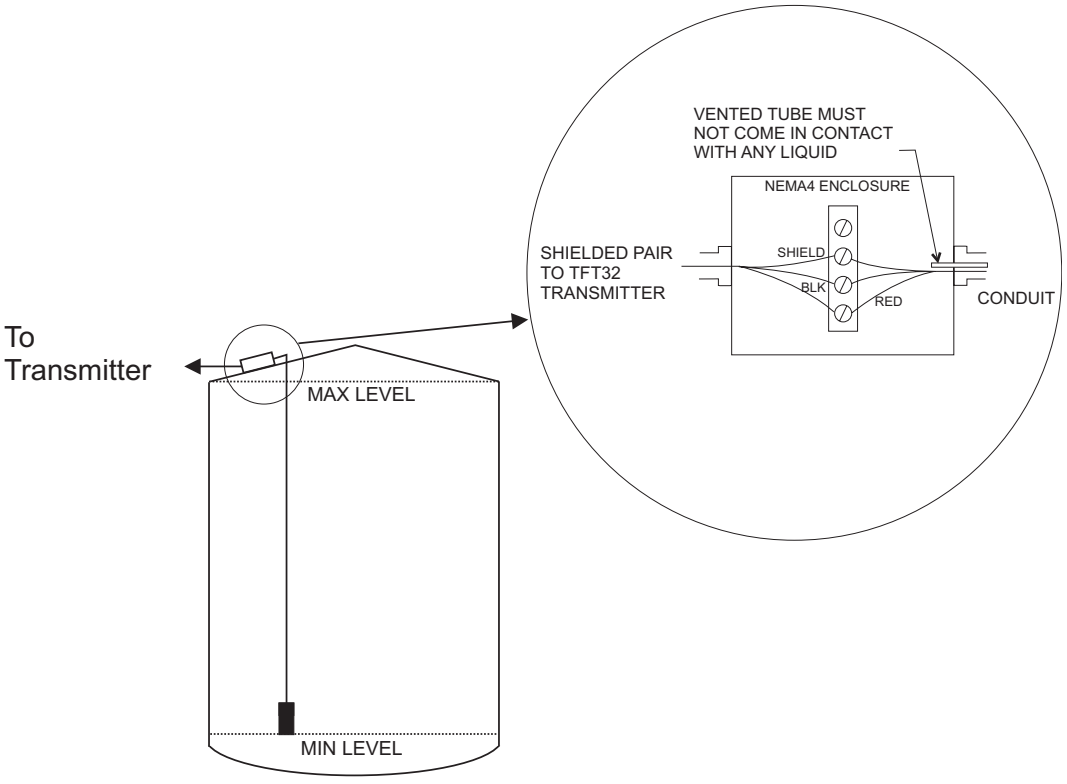
1 This non-metallic enclosure does not automatically provide grounding between conduit connections. Grounding must be provided as part of the installation. Ground in accordance with the requirements of the National Electrical Code. System grounding is provided by connecting grounding wires from all conduit entries to the steel mounting plate or another point which provides continuity.

2 Water tight “O” ring seals must be used if cable strain-reliefs are used.

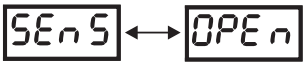
PST THREADED PRESSURE SENSOR INSTALLATION



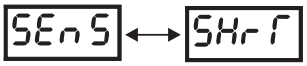
SUBMERSIBLE PRESSURE SENSOR INSTALLATION



ERROR / WARNING MESSAGES



Instrument has detected Sensor connections/cable open or signal from sensor is too low (0.25mA)



Instrument has detected Sensor connections/cable short or signal from sensor is too high (23.0mA)

Illegal Span:
Distance between **0=** and **100=** must be greater than 2"(5cm).
Distance for **100=** (Max Level) must be greater than **0=** (Min Level).

Indicates that the TFT32 has experienced electrical interference strong enough to corrupt the memory. The TFT32 must be reset and recalibrated.
Reset Procedure 1: Reset will clear all memory. TFT32 will need recalibration after this procedure: Press and Hold ⬇ and ⬆ until the TFT32 displays **- - - -**.

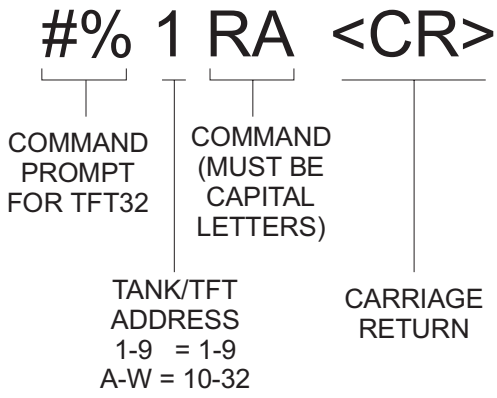
TFT32 COMMUNICATION PROTOCOL

Greyline TFS Tank Farm Supervisor software manages communications with TFT32 Transmitters *automatically*. The following Communication Protocol information is supplied for programmers who are *not using* the Greyline TFS Tank Farm Supervisor program. Programmers can create their own drivers to address TFT32 Transmitters through other software programs on PC computers or PLC's.

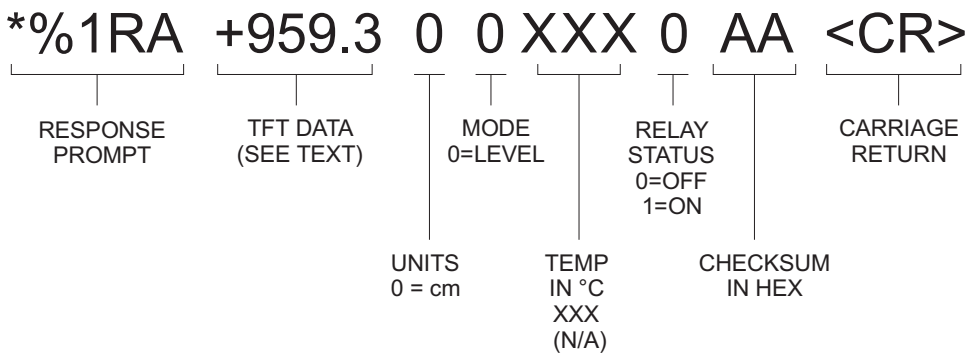
The TFT32 uses an ASCII format command/response protocol. The TFT transmits an answer only when polled with a valid command and address. The Host computer always initiates the command/response sequence.

Example of command/response sequence:
Command: #%1RA<CR>
Response: *%1RA+959.3000210AA<CR>

COMMAND STRUCTURE:



RESPONSE STRUCTURE:



COMMAND SET

COMMAND	DEFINITION	COMMAND MESSAGE (Address 1)	TYPICAL RESPONSE
RA	Read all parameters	#%1RA<CR>	*%1RA+959.300XXX0AA<CR>
RS	Read Span (Max Level)	#%1RS<CR>	*%1RS+999.900XXX0BF<CR>
NBxx	New Baud Rate xx = 00 = 38400 01 = 19200 02 = 9600 03 = 4800 04 = 2400	#%1NBxx<CR> (TFT will change to new Baud Rate only after reset)	*%1NB02
RR	Remote Reset	#%1RR<CR>	*1RR
!RR	Broadcast Reset	#%!RR<CR> (All units in the Network will reset)	(No Response)

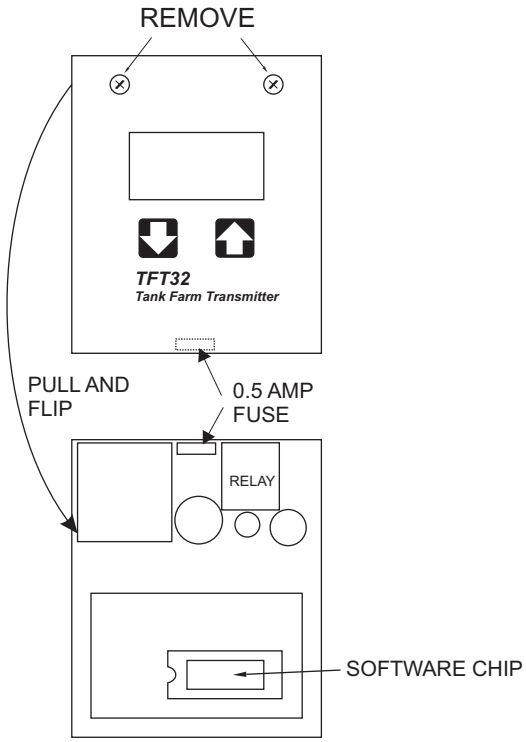
TFT RESPONSE:

TFT Data: Valid analog Data Range is + 000.0 to + 6550.
Values with (-) sign represent error messages

- 100.0 = “Not Ready Please Wait”
- 101.0 = “Signal Lost”
- 102.0 = “Sensor Short”
- 103.0 = N/A
- 104.0 = “Sensor Open”
- 105.0 = N/A
- 106.0 = N/A
- 107.0 = N/A

Units and mode: Always cm and Level.

FUSE REPLACEMENT



1. Disconnect Power
2. Remove 2 top screws
3. Pull and flip chassis
4. Remove 0.5 amp fuse with long nose pliers
5. Install new fuse
   (Replacement Greyline Part #1/2 Amp PCC))

APPLICATIONS HOTLINE

For applications assistance, advice or information on any Greyline Instrument contact your Sales Representative, write to Greyline or phone the Applications Hotline below:

United States:	Tel: 315-788-9500	Fax: 315-764-0419
Canada:	Tel: 613-938-8956	Fax: 613-938-4857
Toll Free:	888-473-9546	
Email:	info@greyline.com	
Web Site:	www.greyline.com	

Greyline Instruments Inc.

Canada
16456 Sixsmith Drive
Long Sault, Ont. K0C 1P0

USA:
105 Water Street
Massena, NY 13662

PRODUCT RETURN PROCEDURE

Instruments may be returned to Greyline for service or warranty repair.

1 Obtain an RMA Number from Greyline -
Before shipping a product to the factory please contact Greyline by telephone, fax or email to obtain an RMA number (Returned Merchandise Authorization). This ensures fast service and correct billing or credit.

When you contact Greyline please have the following information available:

1. Model number / Software Version
2. Serial number
3. Date of Purchase
4. Reason for return (description of fault or modification required)
5. Your name, company name, address and phone number

2 Clean the Sensor/Product -
Important: unclean products will not be serviced and will be returned to the sender at their expense.

1. Rinse sensor and cable to remove debris.

2. If the sensor has been exposed to sewage, immerse both sensor and cable in a solution of 1 part household bleach (Javex, Clorox etc.) to 20 parts water for 5 minutes. Important: do not immerse open end of sensor cable.

3. Dry with paper towels and pack sensor and cable in a sealed plastic bag.

4. Wipe the outside of the enclosure to remove dirt or deposits.

5. Return to Greyline for service.

3 Ship to Greyline -
After obtaining an RMA number please ship the product to the appropriate address below:

Canadian and International Customers:	*USA Customers:*
Greyline Instruments Inc. 16456 Sixsmith Drive Long Sault, Ont. K0C 1P0	Greyline Instruments Inc. 105 Water Street Massena, NY 13662
RMA#	RMA#

LIMITED WARRANTY

Greyline Instruments warrants, to the original purchaser, its products to be free from defects in material and workmanship for a period of one year from date of invoice. Greyline will replace or repair, free of charge, any Greyline product if it has been proven to be defective within the warranty period. This warranty does not cover any expenses incurred in the removal and re-installation of the product.

If a product manufactured by Greyline should prove defective within the first year, return it freight prepaid to Greyline Instruments along with a copy of your invoice.

This warranty does not cover damages due to improper installation or handling, acts of nature, or unauthorized service. Modifications to or tampering with any part shall void this warranty. This warranty does not cover any equipment used in connection with the product or consequential damages due to a defect in the product.

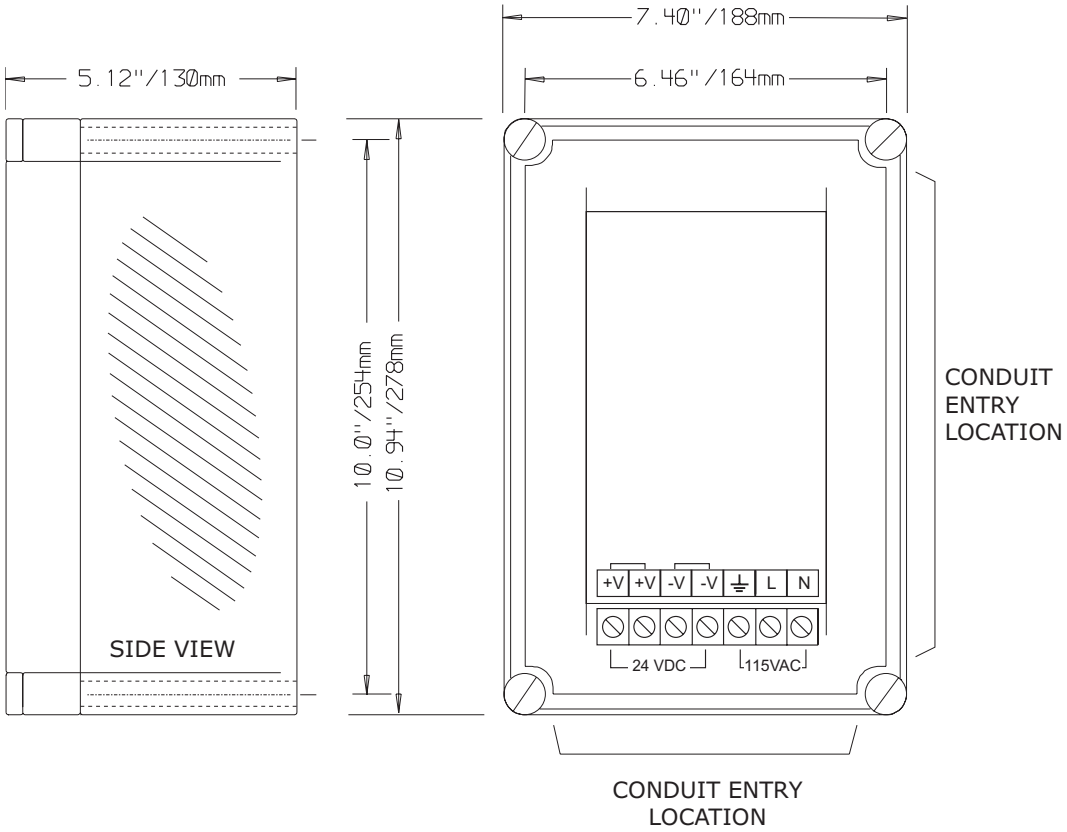
All implied warranties are limited to the duration of this warranty. This is the complete warranty by Greyline and no other warranty is valid against Greyline. Some states do not allow limitations on how long an implied warranty lasts or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Greyline Instruments Inc.

PS150 POWER SUPPLY

150 Watt Power Supply for TFT32 Tank Farm System
Powers up to 32 Greyline TFT32 Transmitters + 6 RB12 Relay Boards



SPECIFICATIONS PS150 POWER SUPPLY

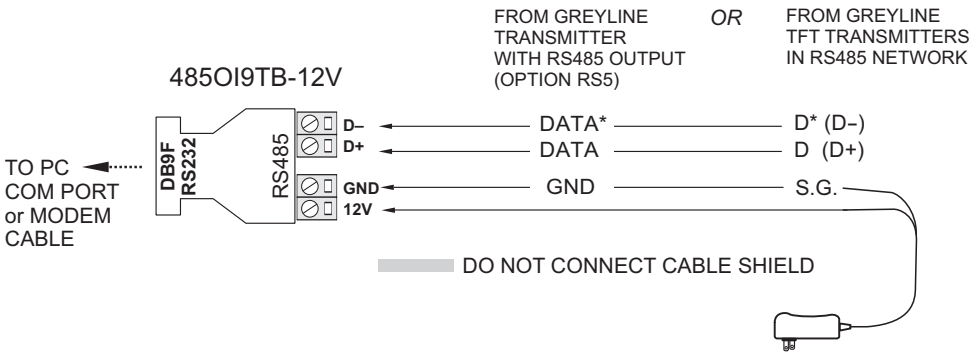
Power Input:	PS150-AI: 90-132VAC, 47-63Hz
	PS150-EI: 180-264VAC, 47-63Hz
AC Input Current:	PS150-AI: 4A maximum
	PS150-EI: 2A maximum
Fuse:	4A, 250V
Operating Temperature:	32 to 122°F (0 to 50°C)
Storage Temperature:	-13 to 185°F (-25 to 85°C)
Enclosure:	Watertight, dust tight NEMA4X (IP 66) fiberglass
Safety Approvals:	UL 1950
	CSA 22.2 1402C Level 3
	TUV EN 60950 (IEC 950)

MODEL 485OI9TB-24V
RS232/RS485 Converter

Converts RS485 signals from a TFT32 Transmitter to RS232 for connection to a PC Computer or Modem.

- DB9 RS232 Connector plugs directly into your computer's COM port
- Optically isolates and protects your computer's RS232 port
- Terminal block for RS485 connections
- Operates from 2400 up to 19.2K baud
- Terminal connections are provided for RS485 D-, D+, 24V and GND

Terminal connections are provided for RS485 Data – (D*), Data + (D),and RS485 power and ground. The RS485 side of the converter is internally biased and terminated to operate with a RS485 network of up to 32 devices.

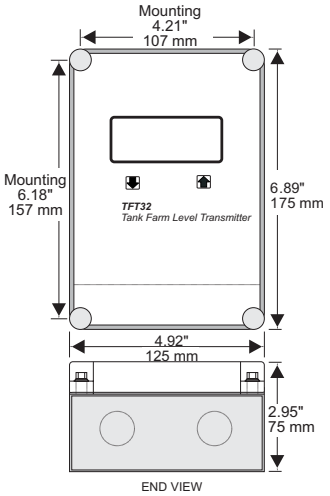


CONVERSION GUIDE		
FROM	TO	MULTIPLY BY
US GALLONS	CUBIC FEET	0.1337
US GALLONS	IMPERIAL GALS	0.8327
US GALLONS	LITRES	3.785
US GALLONS	CUBIC METERS	0.003785
LITRES/SEC	GPM	15.85
LITRES	CUBIC METERS	0.001
BARRELS	US GALLONS	42
BARRELS	IMPERIAL GALS	34.9726
BARRELS	LITRES	158.9886
INCHES	MM	25.4
DEGREES F	DEGREES C	(°F-32) x 0.556
POUNDS	KILOGRAMS	0.453
PSI	BAR	0.0676
FOOT²	METER²	0.0929
PSIG	FEET (H_20)	2.31
PSIG	METER (H_20)	0.70
PSIG	BAR	0.0666

VOLUME CALCULATION FOR ROUND TANKS: 3.142 x R² x H
R = TANK RADIUS (½ TANK DIAMETER)
H = TANK HEIGHT

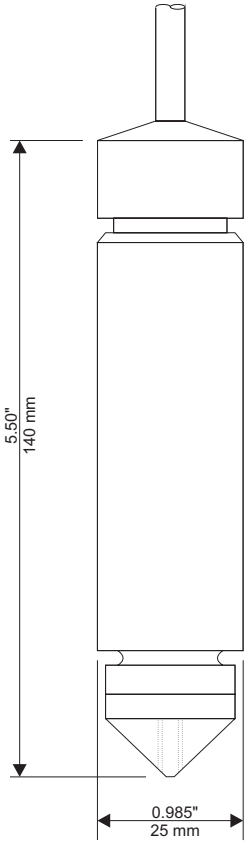
SPECIFICATIONS:

Electronics Enclosure: NEMA4X (IP 67), watertight and dust tight, fiberglass with clear, shatterproof Lexan cover
Accuracy: 0.25% F.S., Repeatability: 0.1% F.S., Linearity: 0.1%F.S.
Display: ¾" / 19mm high, 4 digit LCD
Programming: 2-button Menu selection. Calibration parameters are permanent when Stored (even through power interruptions)
Power Input: 24VDC, 120mA max., 2.9 W (max.)
Optional: 100-130VAC 50/60 Hz, (4.2 W max.)
Optional: 200-260VAC 50/60 Hz, (4.8 W max.)
Fuse: internal, rated 1A
Output: Isolated RS485
Signal Relay: Qty 1, rated 120/240 VAC or 24VDC, 1 ampere
Temperature Compensation: Automatic, temperature probe built in to level Sensor
Electrical/Surge Protection: Sensor, RS485 and power input
Operating Temperature: (Electronics) -13 to 140°F (-25 to 60°C)



SUBMERSIBLE PRESSURE SENSOR

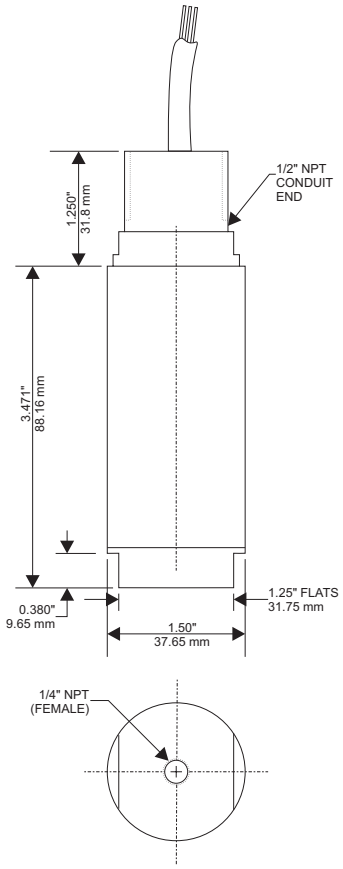
Wetted Materials: 303 Stainless steel body with uPVC nose cone
Accuracy: ±0.25% FSO (RSS) includes non-linearity, hysteresis and non-repeatability
Long term stability: 0.1% / 12 months
Operating Temperature: - 13°F to 212°F (-25°C to 100°C)
Compensated Temperature: 14°F to 176°F (-10°C to 80°C)
Output: 4-20mA 2-wire Transmitter
Load Impedance: 1000 ohms max at 24VDC
Proof Pressure: 1.5 times full scale pressure range (or URL)
Burst Pressure: 3 times full scale pressure range (or URL)
Cable: Polyurethane jacketed 4-core with vent tube and strain wire - rated IP68
Connection: RED = +, BLUE = –, WHITE = SHIELD



MODEL	*MEASUREMENT RANGE*	*CABLE LENGTH*
PS11S	5 PSIG (11.55 ft) / 0.3 bar (3.15 m)	20 ft / 0.6 m
PS17S	7.5 PSIG (17.33 ft) / 0.5 bar (5.25 m)	23 ft / 7 m
PS23S	10 PSIG (23.10 ft) / 0.67 bar (7.04 m)	30 ft / 9 m
PS35S	15 PSIG (34.65 ft) / 1.0 bar (10.50 m)	40 ft / 12 m
PS46S	20 PSIG (46.20 ft) / 1.3 bar (13.65 m)	55 ft / 17 m
PS69S	30 PSIG (69.30 ft) / 2.0 bar (21.00 m)	75 ft / 23 m
PS102S	44 PSIG (101.64 ft) / 3.0 bar (31.50 m)	105 ft/ 32 m
PS170S	72 PSIG (166.32 ft) / 5.0 bar (52.50 m)	174 ft / 53 m

THREADED CONNECTION PRESSURE SENSOR

Wetted Materials: 316 and 15-5 PH Stainless steel
Enclosure Material: 316 stainless steel
Accuracy: ±0.25% FSO (RSS) includes non-linearity, hysteresis and non-repeatability
Operating Temperature: -20°F to 190°F (-29°C to 88°C)
Compensated Temperature: 0°F to 180°F (-18° to 82°C)
Output: 4-20mA 2-wire Transmitter
Load Impedance: 600 ohms max at 24VDC
Proof Pressure: 2 times full scale pressure range (or URL)
Burst Pressure: 5 times full scale pressure range (or URL)
Pressure Response: Less than 5 ms to 90%
Pressure Connection: 1/4" NPT (Female)
Electrical Cable: 2' (0.6 m) long molded polyrethane jacket, 6-conductor with breather tube
Connection: RED = +, BLACK = –, SHIELD = SHIELD



Model	*Measurement Range*
PS11T	5 PSIG (11.55 ft) / 0.3 bar (3.15 m)
PS17T	7.5 PSIG (17.33 ft) / 0.5 bar (5.25 m)
PS23T	10 PSIG (23.10 ft) / 0.67 bar (7.04 m)
PS35T	15 PSIG (34.65 ft) / 1.0 bar (10.50 m)
PS46T	20 PSIG (46.20 ft) / 1.3 bar (13.65 m)
PS69T	30 PSIG (69.30 ft) / 2.0 bar (21.00 m)
PS115T	50 PSIG (115.50 / 3.45 bar (36.23 m)
PS173T	75 PSIG (173.25 / 5.2 bar (54.60 m)