

# **USER'S GUIDE**

Installation & Operation  
Instructions

Tank Farm Transmitter  
Model TFT32  
Series 2.2

Ultrasonic Sensor Input (-A-)

Note: This page has been left blank intentionally.

## **INDEX**

Bench Test	4
Connections	4
Keypad System	7
Calibration Menu	8
Calibration Units Selection	9
Min Range Max Range Calibration	10
Relay Calibration	11
Damping	12
Transmitter/Tank Address	12
Baud Rate	13
Output Simulation	13
Store (Save) Calibration	13
Temperature Display	14
Communication Protocol	15
Enclosure Installation	17
Sensor Mounting	18
Error/Warning Messages	21
Troubleshooting	22
Product Return Procedure	26
Fuse Replacement	24
Applications Hotline	25
Warranty	27
Appendix A - Options	28
Appendix B	35
Conversion Guide	36
Specifications	37

*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:**

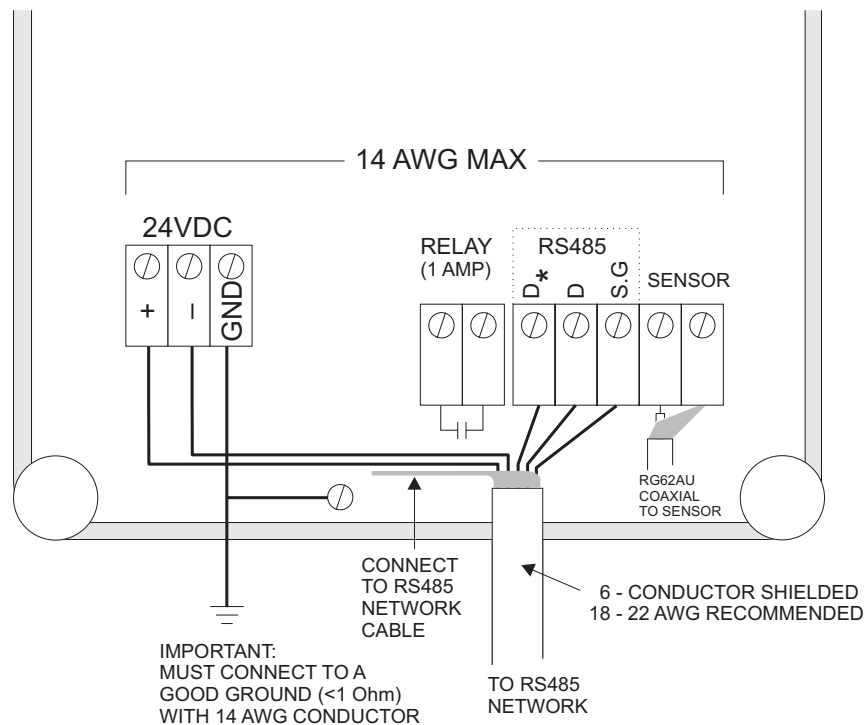
Connect the Ultrasonic Sensor as shown below, then apply Power. When properly connected a soft clicking can be heard from the sensor and figures will show on the LCD display. Test operation of the TFT32 by holding the sensor steadily and aiming at a flat, stable target 12 to 28" (305 to 711 mm) away from the end of the sensor. Allow a few seconds for the TFT32 to lock onto the target before displaying its distance. The TFT32 will now display range in inches or cm.

**CONNECTIONS (ULTRASONIC):**

**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.

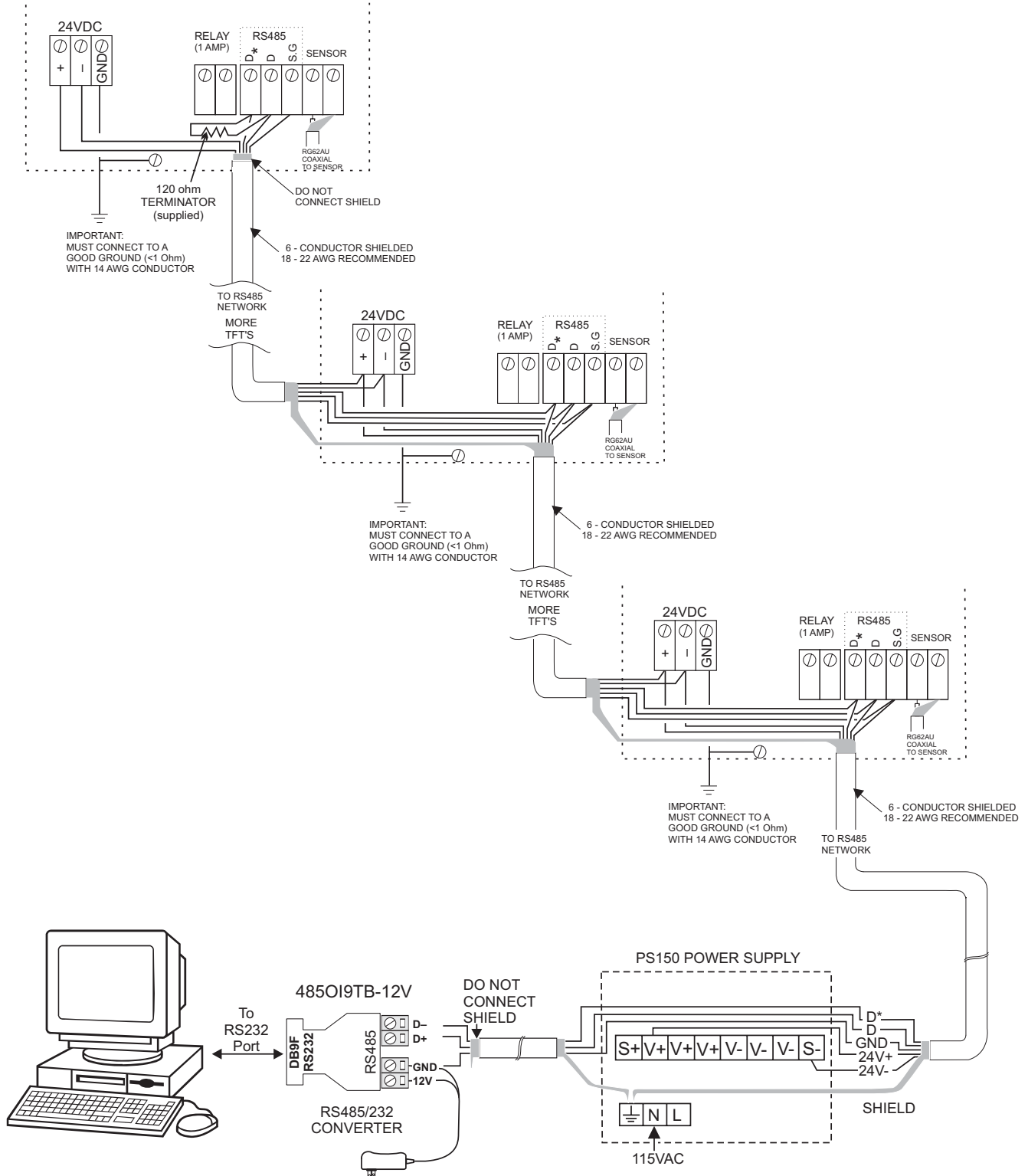
**RS485 NETWORK:** Connections from the RS485 network (other TFT32's and the PC computer) are: Data -(D\*), Data +(D) and signal/shield ground (S.G.)

**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.



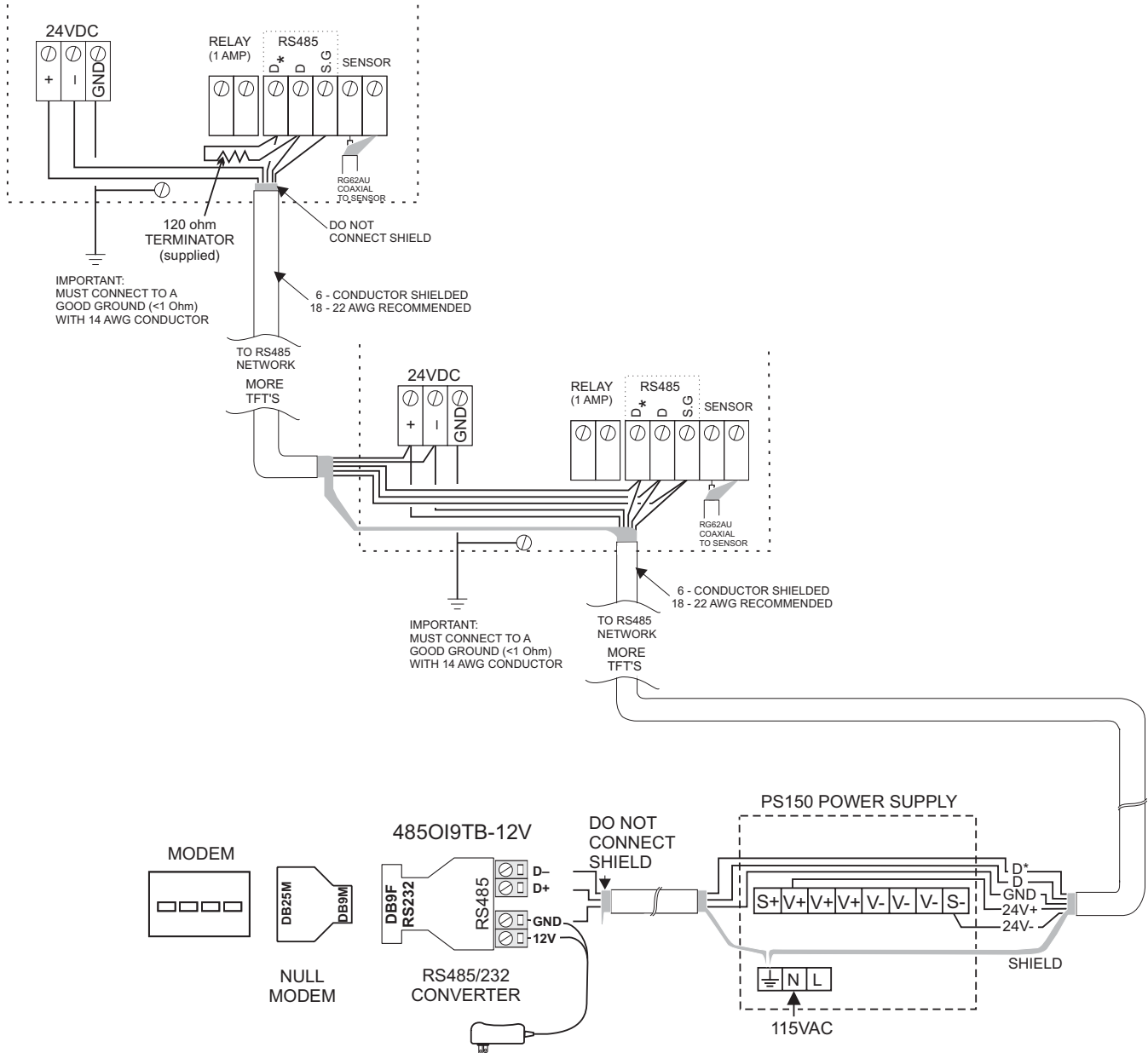
**LOCAL NETWORK CONNECTIONS**

LAST (FURTHEST) TFT IN THE NETWORK



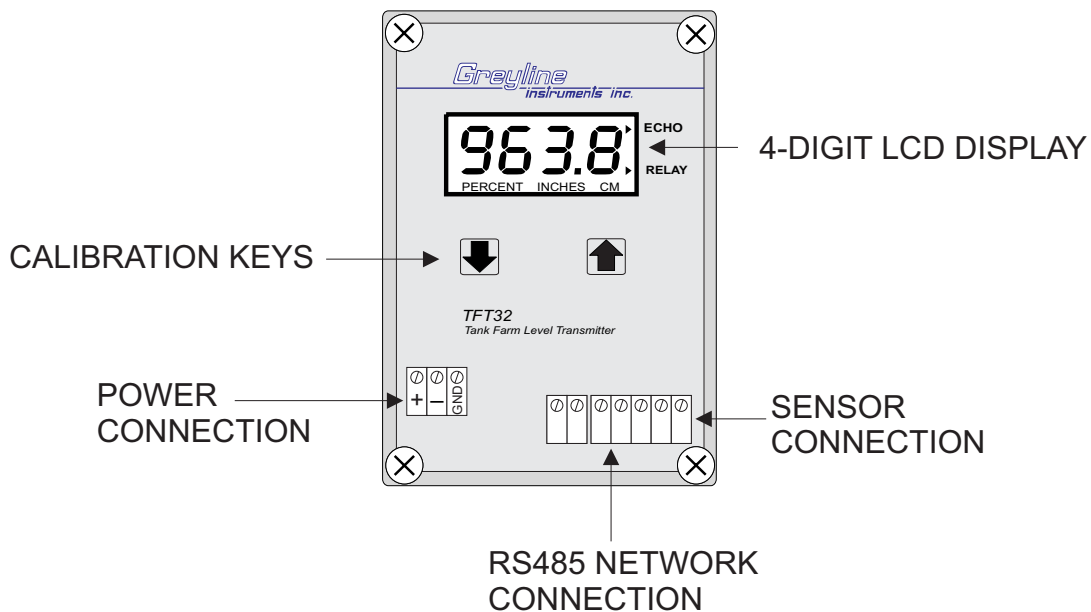
**DIAL-UP LOCATION CONNECTIONS**

LAST (FURTHEST) TFT IN THE NETWORK



**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.



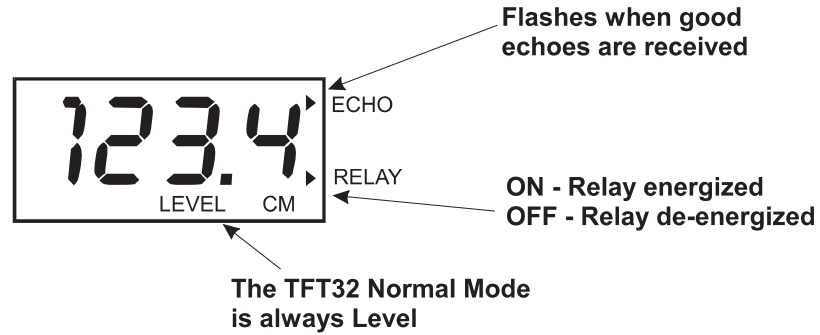
**MENU - FLOW CHART**

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.

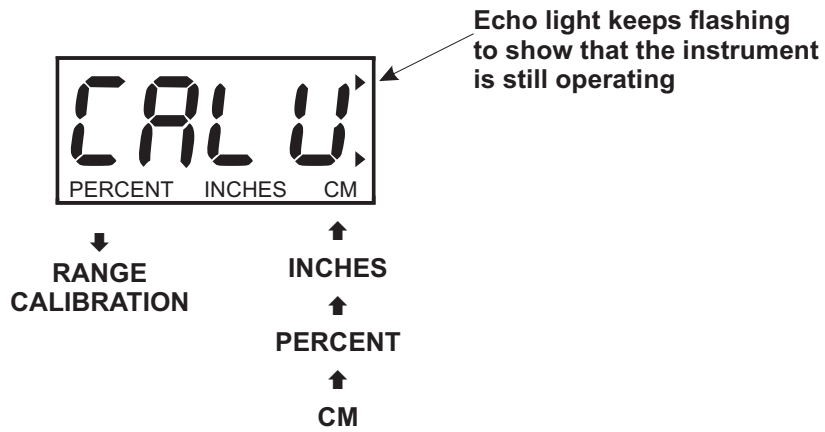


**NORMAL MODE**



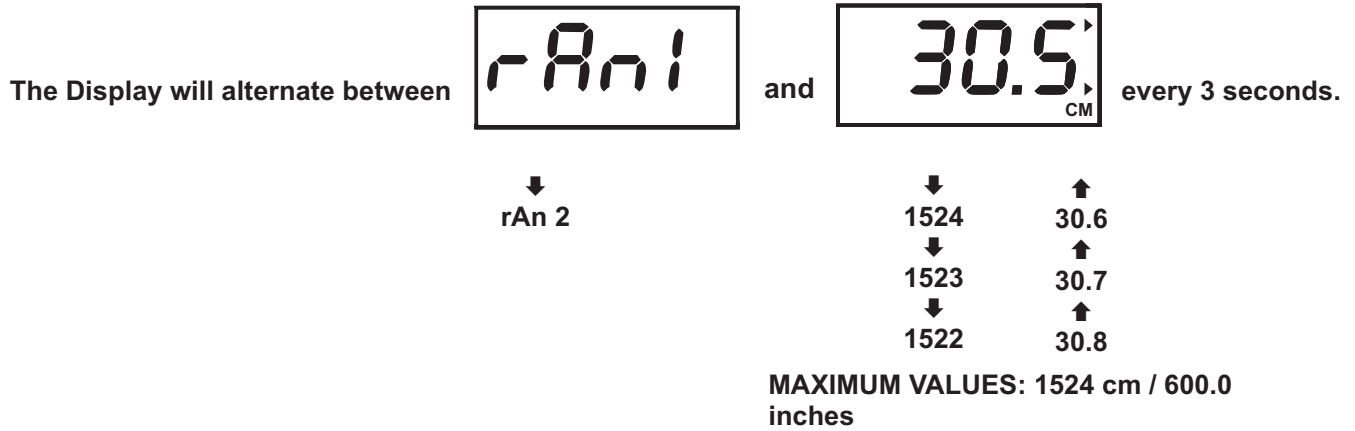
**CALIBRATION UNITS SELECTION**

Press ↓ from NORMAL mode, display will show:



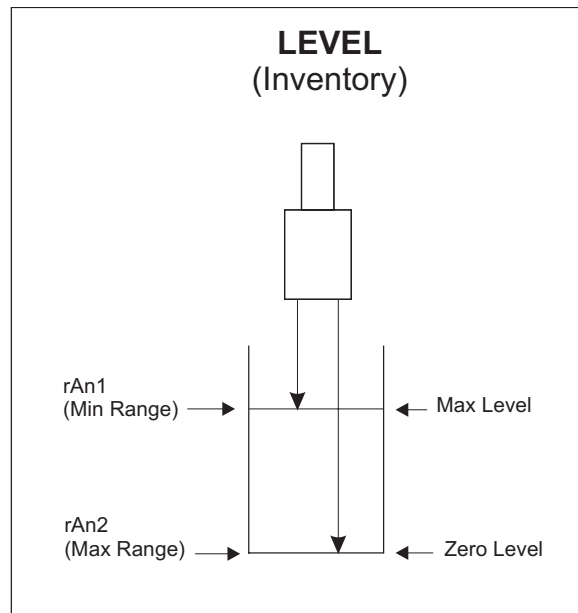
**rAn1 = MIN RANGE CALIBRATION**

Calibrate the distance between the sensor and maximum level.



**rAn2 = MAX RANGE CALIBRATION**

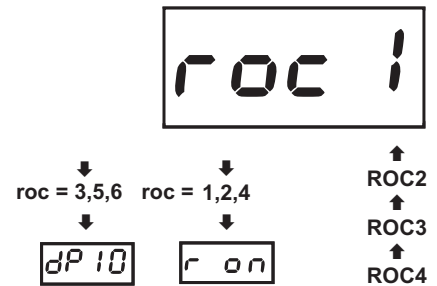
Wait for rAn1 and press ↓ to display rAn2. Now follow the same procedure to calibrate the distance from the Sensor to zero level (Max. Range).



**RELAY OPERATION CHOICE**

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

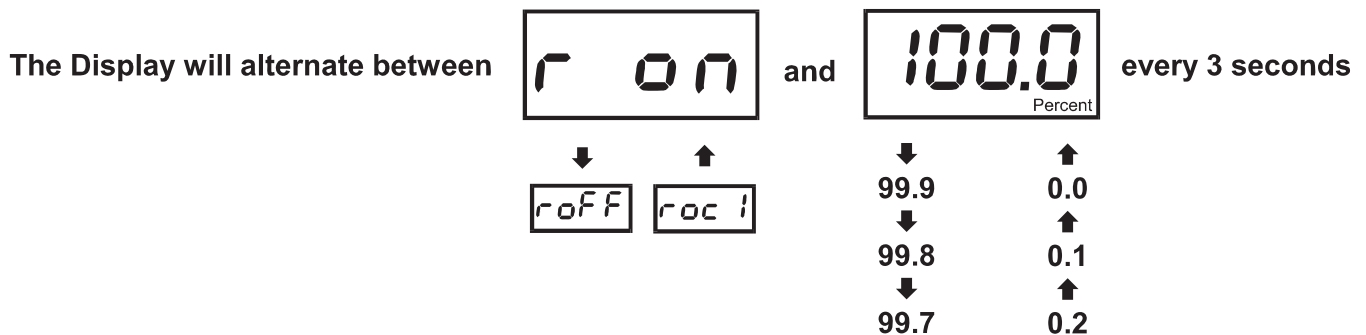
- ROC1 = Level Alarm
- ROC2 = Level + Echo Loss Alarm
- ROC3 = Echo Loss Alarm only
- ROC4 = Temperature Alarm (measured at the Sensor)
- ROC5 = OFF (de-energized) at all times
- ROC6 = ON (energized) at all times



Press **↑** to select the ROC.

**RELAY CALIBRATION**

ROC1 (Level Alarm)



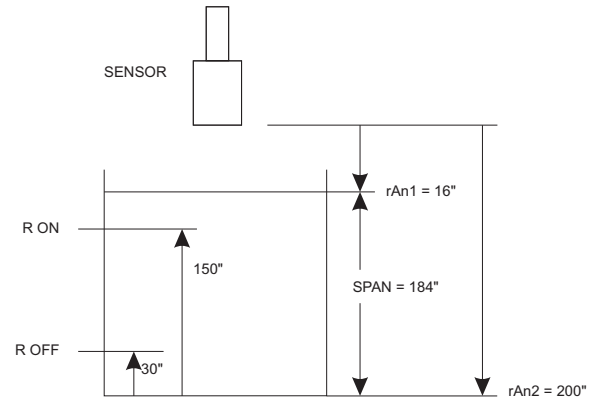
ROC2 (Level + Echo Loss Alarm) - Relay will be energized when the Relay ON set point is reached.  
or if the echo is lost (no echoes for more than 20 seconds).

ROC4 (Temperature Alarm) - Minimum Set Point -40°C (= -40°F)  
- Maximum Set Point 100°C (= 212°F)

NOTE: The Set Points are displayed in percentage of span (LEVEL). Two different Set Points (rON 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 1/2 inch /13 mm level change per second):  
**DP5** or less

Slow Response (turbulence) **DP15**



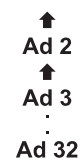
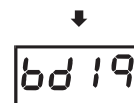
15 SECS.  
MAXIMUM

NOTE: Damping Time (in seconds) is the response time to indicate a new target. Longer Damping Times also reject false targets like agitators, splashing etc.

**TRANSMITTER/TANK ADDRESS**

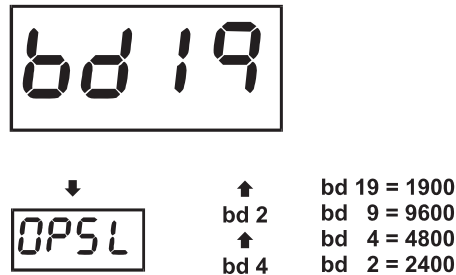
Select transmitter address 1 to 32 taking into consideration the following:

- 1) Each transmitter must have a different address.
- 2) The address number is also the tank position on the page when running the TFS PC software.

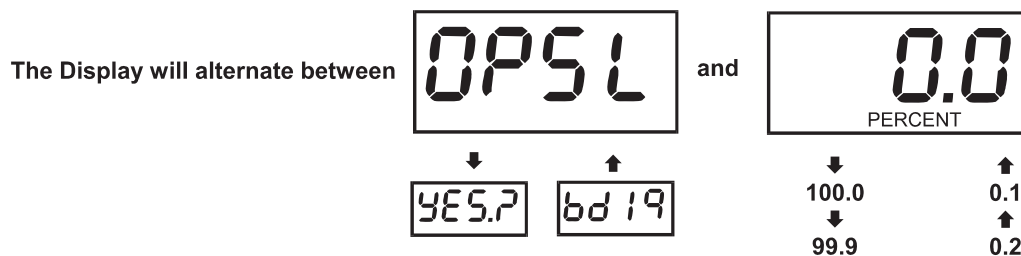


**BAUD RATE**

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

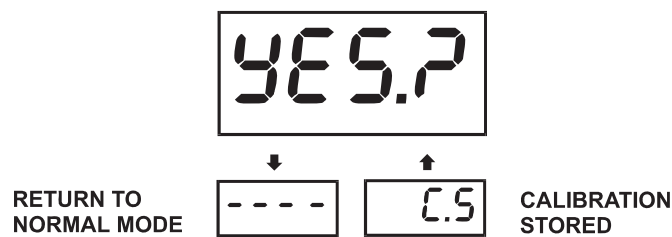


**OUTPUT SIMULATION MODE**



The 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**



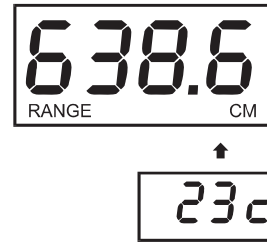
Press **↑** to Store calibration (TFT will display -C.S-). Calibration is stored in non-volatile memory (even through power interruptions).

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

**RANGE DISPLAY**

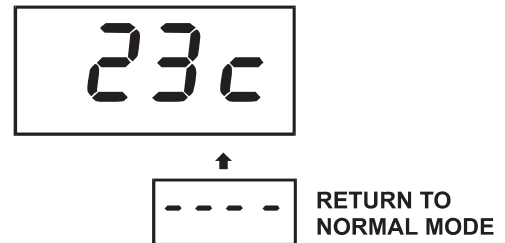
From Normal Mode press **↑**  
Displays distance from the Sensor to Target.  
Use to check measurements during calibration.

(RANGE and UNITS flash.)



**TEMPERATURE DISPLAY**

Displays temperature in degrees Centigrade measured at the Sensor.



**TEMPERATURE LOG**

Displays maximum temperature in degrees Centigrade measured at the Sensor.

From normal Temperature display, Press **↓** then **↑**.





**COMMAND SET**

COMMAND	DEFINITION	COMMAND MESSAGE (Address 1)	TYPICAL RESPONSE
RA	Read all parameters	#%1RA<CR>	*%1RA+959.3000210AA<CR>
RS	Read Span (Max Level)	#%1RS<CR>	*%1RS+999.9000210BF<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:**

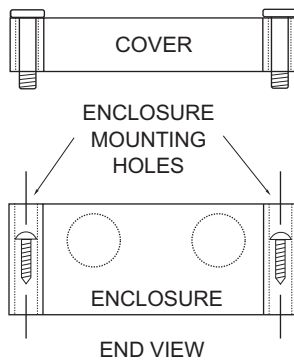
TFT Data: Valid analog Data Range is + 000.0 to + 6550.  
 Values with (-) sign represent error messages

- 100.0 = "Not Ready Please Wait"
- 101.0 = "Echo Loss"
- 102.0 = "Sensor Short"
- 103.0 = "Losing Echo"
- 104.0 = "Sensor Open"
- 105.0 = "Bad/Weak Echo"
- 106.0 = "No Echo in Range"
- 107.0 = "Echo in Deadband"

Units and mode: Always cm and Level.

## ENCLOSURE INSTALLATION

Locate the enclosure within 500 ft (150 m) of the ultrasonic 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

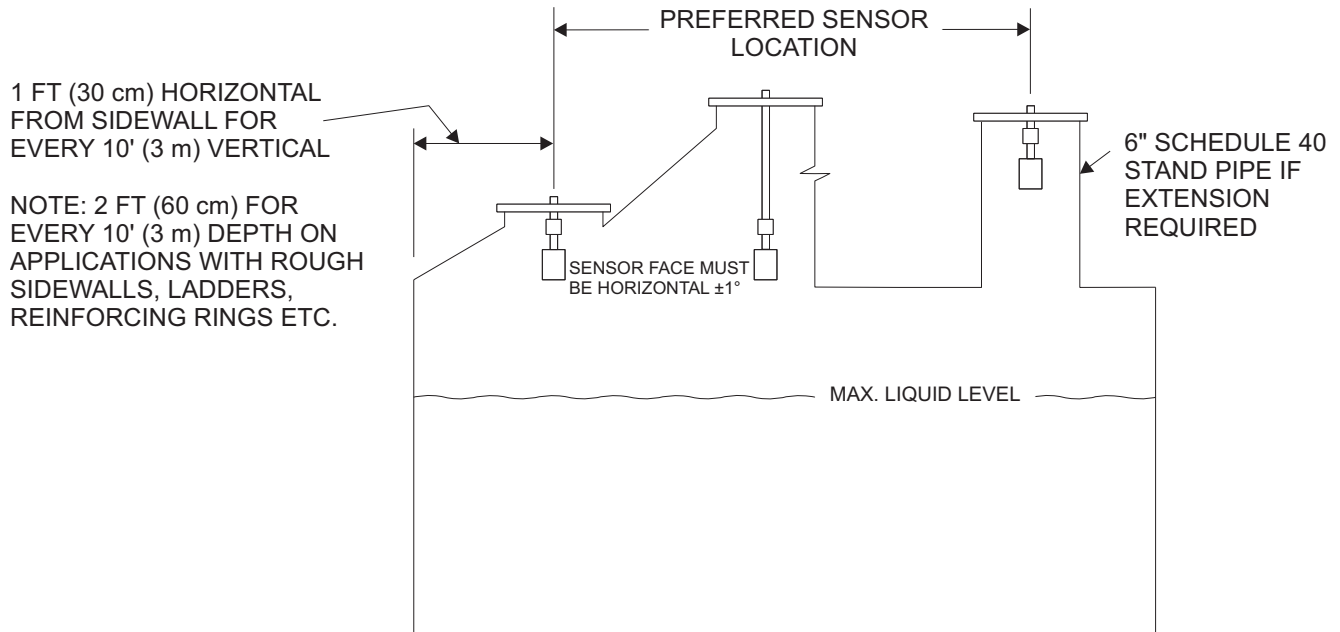
1. Remove enclosure cover.
2. Insert #6 screws through the four enclosure mounting holes to secure enclosure to wall or mounting stand.
3. Replace Cover

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.

## SENSOR MOUNTING LOCATION



## SENSOR MOUNTING

Each sensor is equipped with a  $\frac{3}{4}$  inch "isolation coupling" which MUST be used in your installation. A threaded nipple or length of conduit may be used to position the sensor at the desired height.

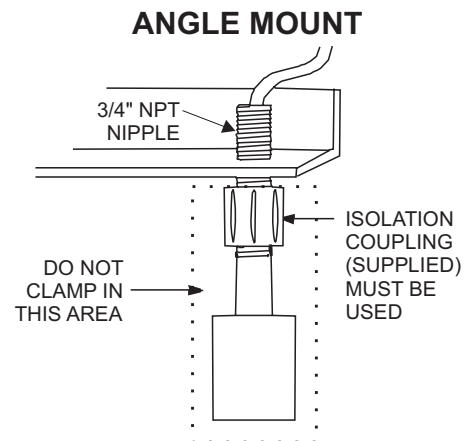
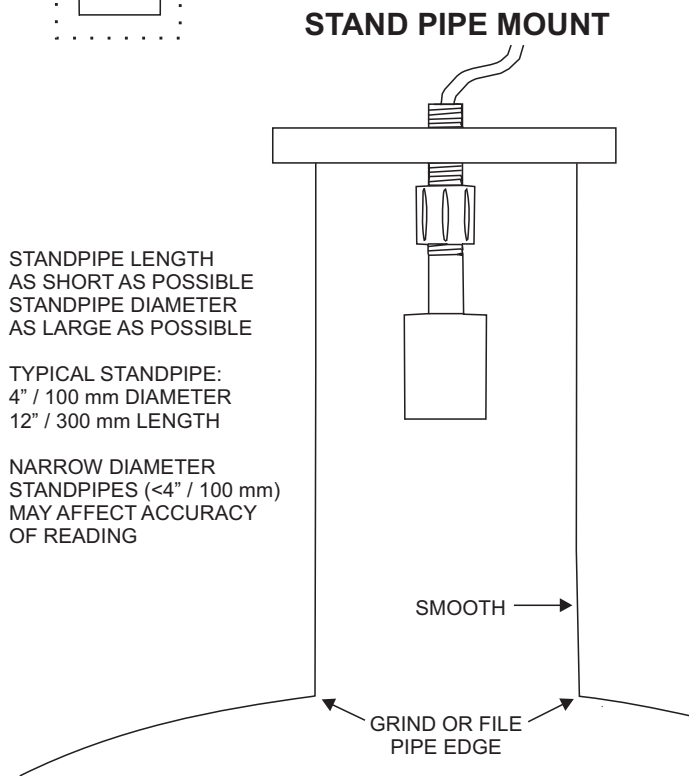
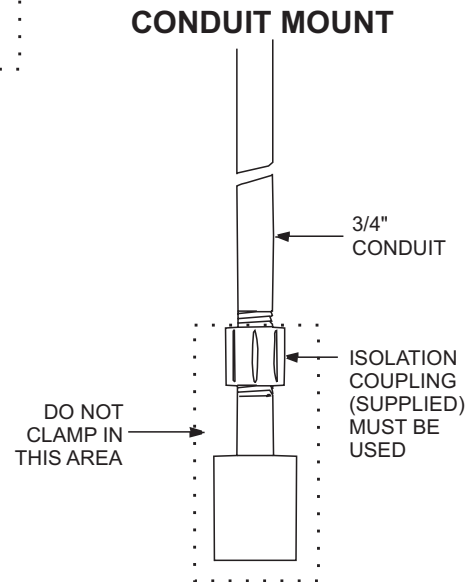
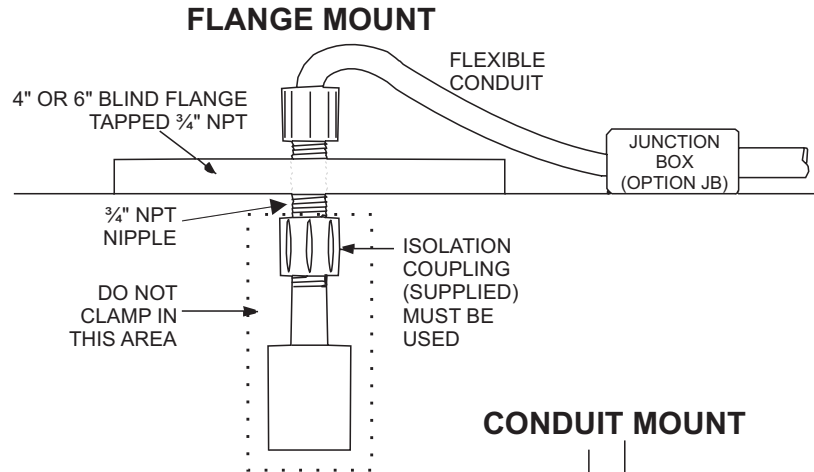
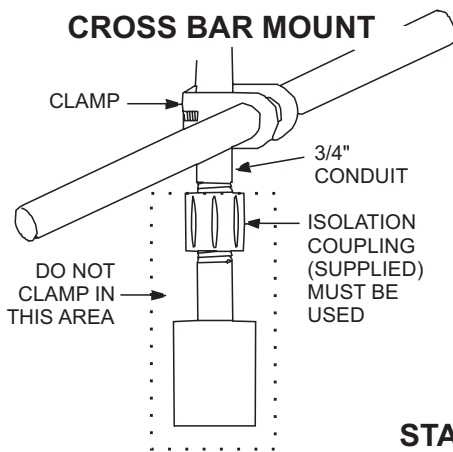
The sensor should be hand-tightened (like a light bulb) by turning the sensor stem only. DO NOT use a wrench and do not over tighten. DO NOT clamp the sensor below the isolation coupling.

The standard PZ32T Sensor must be mounted 12" / 30.48 cm or more above the maximum liquid level. (Optional PZ12 sensor must be 8" / 20.3 cm above maximum level and optional PZ52T sensor must be 16" / 610 mm above maximum level.)

**SENSOR MOUNTING**

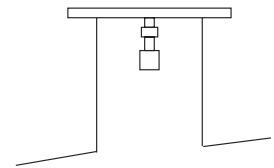
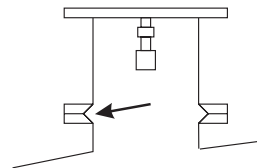
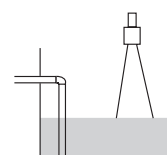
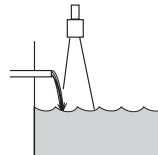
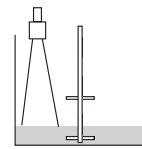
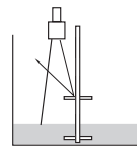
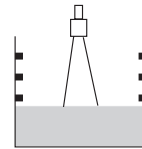
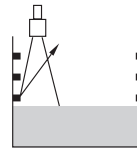
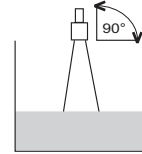
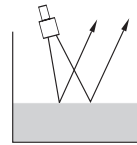
Notes:

1. Use the 3/4" NPT "Isolation Coupling" supplied and *hand tighten* only. Do not clamp sensor body or stem.
2. Locate the sensor 1 ft (30 cm) from the sidewall or obstruction for every 10 ft (3 m) depth.
3. Do not mount in direct sunlight.
4. Extend sensor cable up to 500 ft (150 m) with RG62AU coaxial only.



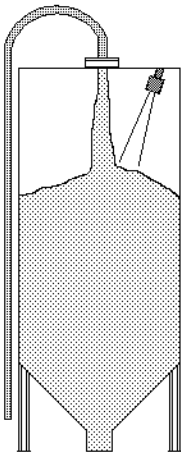
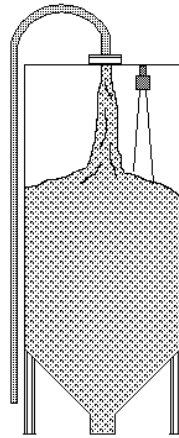
**BAD**

**GOOD**



**SOLIDS AND POWDERS**

SENSOR MOUNTED AWAY FROM MATERIAL PATH. COARSE SOLIDS WILL USUALLY RETURN AN ECHO EVEN IF AT AN ANGLE



FINE POWDERS MAY NEED SENSOR TILTED NORMAL TO SURFACE TO OBTAIN GOOD ECHOES

**ERROR/WARNING MESSAGES**

SEnS ↔ OPE n

Instrument has detected Sensor connections/cable open.

SEnS ↔ SHrT

Instrument has detected Sensor connections/cable short.

23.C

The dot before the C in temperature reading indicates temperature compensation fault. Check sensor connections.

no ↔ ECHO

No valid echoes for 10 seconds.

ECHO ↔ LOSS

No valid echoes for 20 seconds. See Troubleshooting (F).

bAdE or nEor or 123.4

ECHO INDICATOR  
INTERMITTANT

Indicates that echoes from the target are weak or liquid surface is highly turbulent. See Troubleshooting (A,C,F)

Err. → bAd → SPAn

Illegal Span. Distance between rAn1 and rAn2 must be greater than 2"(5cm). Also distance for rAn2 (Max Range) must be greater than rAn1 (Min range).

ECHO → in → dEAd → bAnd

Indicates that the target is above the calibrated maximum level (too close to the Sensor).

-or-

Over Range indicates target is further than the calibrated Maximum Range.

EEEE

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 - - - .

SFX.X

Always displayed at power-up (x.x indicates Software version).

Otherwise indicates instrument has reset automatically. See Troubleshooting (C,D,E).

**FIELD TROUBLESHOOTING**

SYMPTOMS

Level Display

- Full scale
- zero
- erratic - random
- higher than actual
- fluctuating

CHECK

- A
- B
- C
- D
- E

**ECHO LOSS** prompt- flashing

F

Calibration Non-Linear

H

EEEE - memory corruption

I

SYMPTOMS FAULTS

SOLUTIONS

*Unit "See's" Wrong Target Due To:*

- A,C,D,F - sensor not aimed correctly
- A,D,F - dust/dirt buildup on sensor
- A,D,F - condensation on sensor

- Clean *carefully* (do not scratch sensor face)
- Lower sensor
- insulate sensor mounting location
- Increase **MIRG** (CALIBRATION menu) by 1-3" / 2.5-7.5 cm
- wipe sensor face and body with Rain-X
- Lower Sensor below stand pipe intrusion

- A,D - sensor mounting stand pipe too long/ too narrow
- dirty/- gasket intruding

- D,E - agitator, strong turbulence
- C - material filling through sensor beam

- Increase Damping
- Increase Damping

*Unit Picks-Up Acoustic Interference Due To:*

- A,C - noise from high pressure fill
- A,D - sensor coupling over tightened
- A,D - sensor coupling not used
- C - other ultrasonic sensor in close proximity

- Install submerged fill pipe
- Hand tighten only (like a light bulb)
- Use isolation coupling supplied
- Separate Sensors

*Electrical Interference:*

- C - Sensor cable connections reversed
- C,D - through Sensor cable
- C - Sensor cable and/or junction not insulated
- C,D - through RS485 network cable

- Use properly *grounded* metal conduit
- Use metal Junction Box
- Use shielded twisted pair

- |       |   |   |
|-------|---|---|
| C,D   | - wiring or installation close to variable speed drive or inverter              | - Follow VSD manufacturer's instructions for Drive grounding wiring and shielding |
| C,D,E | - AC/Chassis Ground missing on instrument power connections                     | - Install adequate Ground   |
| I     | - Relay sparking produces EMI interference                                      | - Use snubber across secondary Relay contacts<br>- Do not exceed 1 ampere load    |
| I     | - Instrument installed in the same panel with high voltage/large motor controls | - relocate or use metal enclosure   |

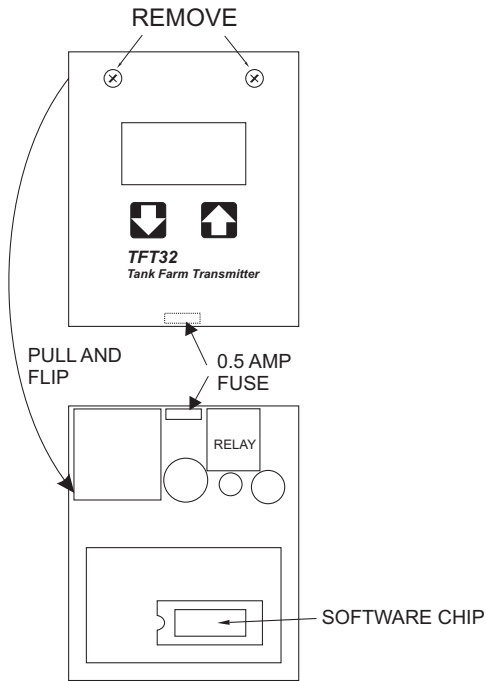
*Wiring Problems Due to Sensor Cable:*

- |     |  |  |
|-----|--|--|
| C,F | - open circuit                               | - check connections/continuity (8850 to 12700 ohms max./-30°C to +70°C ) |
| F   | - short circuit                              | - check connections/continuity (8850 ohms min.)                          |
| F   | - too long (max. 500 ft, 150 m)              |  |
| C   | - bundled/run in conduit with power cable    |  |
| C   | - sensor ground shorted to conduit/enclosure | - insulate   |
| A   | - extended with wrong type of wire           | - Use only RG62AU coaxial  |
| C   | - close to high voltage/large motors         |  |

*Non-Linearity Due To:*

- |     |                                 |  |
|-----|---------------------------------|--|
| H   | - Vapour                        | - calibrate in-situ                                |
| B,H | - zero not set accurately       | - recalibrate                                      |
| H   | - full scale not set accurately | - Note: Minimum Range must be $\geq 12''$ (30.5cm) |

**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](mailto:info@greyline.com)  
Web Site: [www.greyline.com](http://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:*

Greyline Instruments Inc.  
16456 Sixsmith Drive  
Long Sault, Ont. K0C 1P0

RMA#

*USA  
Customers:*

Greyline Instruments Inc.  
204 150th Avenue  
Madeira Beach, FL 33708

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.

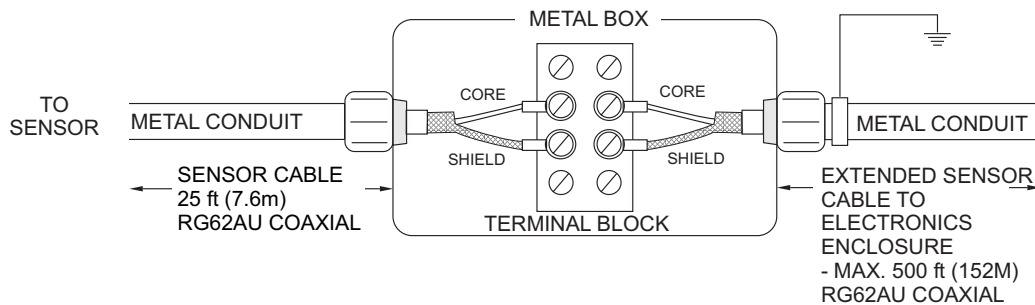
**APPENDIX A - OPTIONS and ACCESSORIES**

- XC - Extra Sensor Cable up to 500 ft (152 m) length
- JB - Sensor Cable Junction Box
- ISB - Intrinsic Safety Barrier for Sensor and Cable installation in hazardous-rated locations (factory-installed option/larger enclosure used)
- 12VDC - 12VDC Power Input (factory-installed option)
- PM2 - Enclosure Panel Mount
- PS150 - Network Power Supply
- 485OICR - RS232/485 Converter

**EXTRA SENSOR CABLE  
(ACCESSORY XC)**

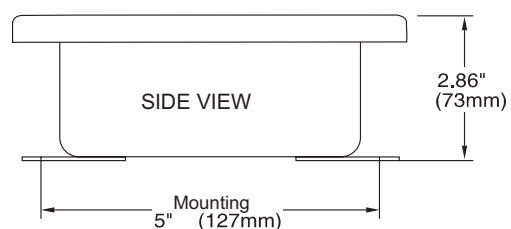
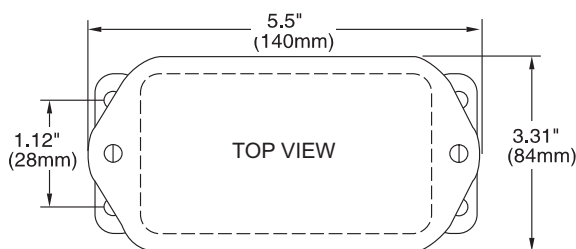
Each Greyline TFT32 includes 25 ft. (7.6 m) or 50 ft. (15 m) continuous RG62AU coaxial Sensor Cable. Additional RG62AU coaxial cable and Cable Junction Box (Option JB) may be spliced and extended up to 500 ft (152 m) as required during installation. No adjustment is required when the sensor cable is extended or shortened. Use only RG62AU (or RG62U) coaxial cable which is available from Greyline Instruments or your local distributor. Nominal impedance of RG62AU cable is 93 ohms.

Extended sensor cable must be installed in metal conduit to prevent interference. Do not use BNC coaxial connectors (TV cable type). Recommended installation with a metal junction box is illustrated below:



**SENSOR CABLE JUNCTION BOX  
(ACCESSORY JB)**

**DIMENSIONS  
OPTION JB - JUNCTION BOX**



**SENSOR INTRINSIC SAFETY - OPTION ISB**

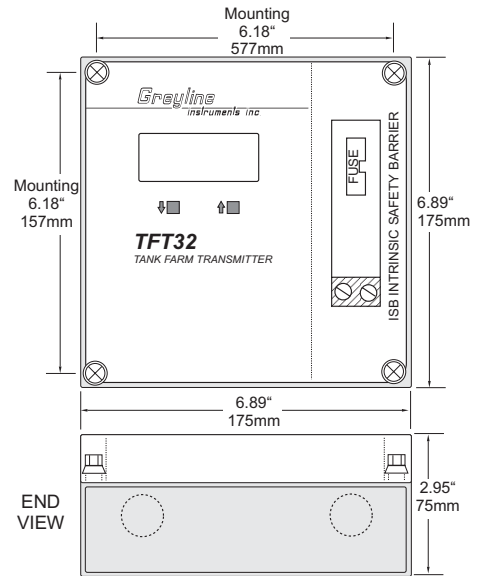
When connected through an Intrinsic Safety Barrier, the Greyline PZ32T-A and PZ32TE-A and PZ52T sensors are CSA certified for installation in a hazardous location rated:

- Class I, Groups C,D
- Class II, Groups E,F and G
- Class III

Intrinsic Safety Barriers must be ordered with the Greyline instrument and are supplied mounted in the Greyline instrument enclosure. A larger enclosure is used.

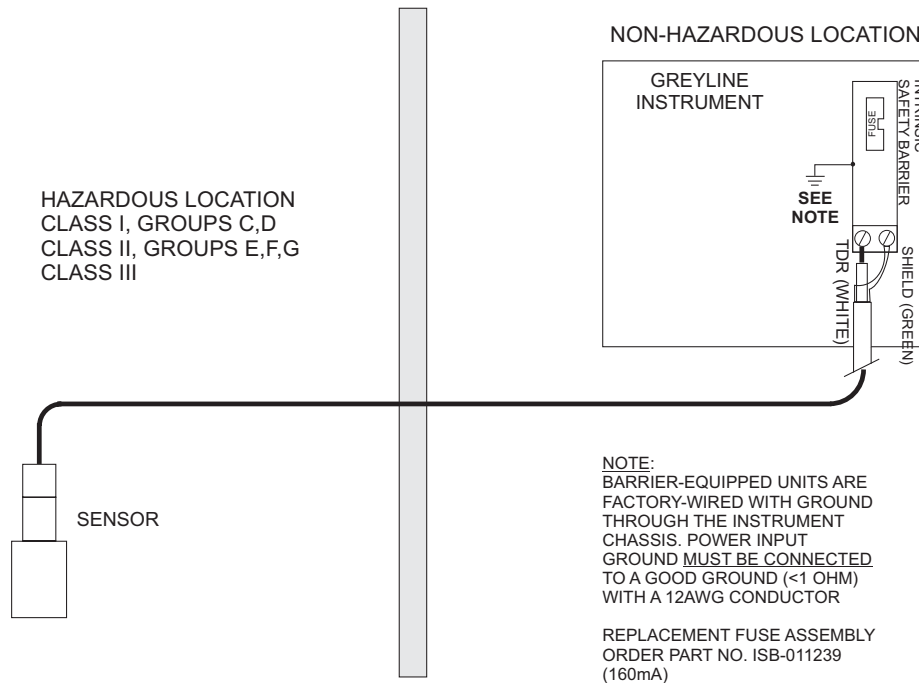
Replacement barrier fuses (Part No. ISB-011239) may be purchased separately.

Intrinsic Safety Barrier Specifications: Certified, rated 13.8V max, 95ohms min (Stahl Model 9001/02-133-150-10)

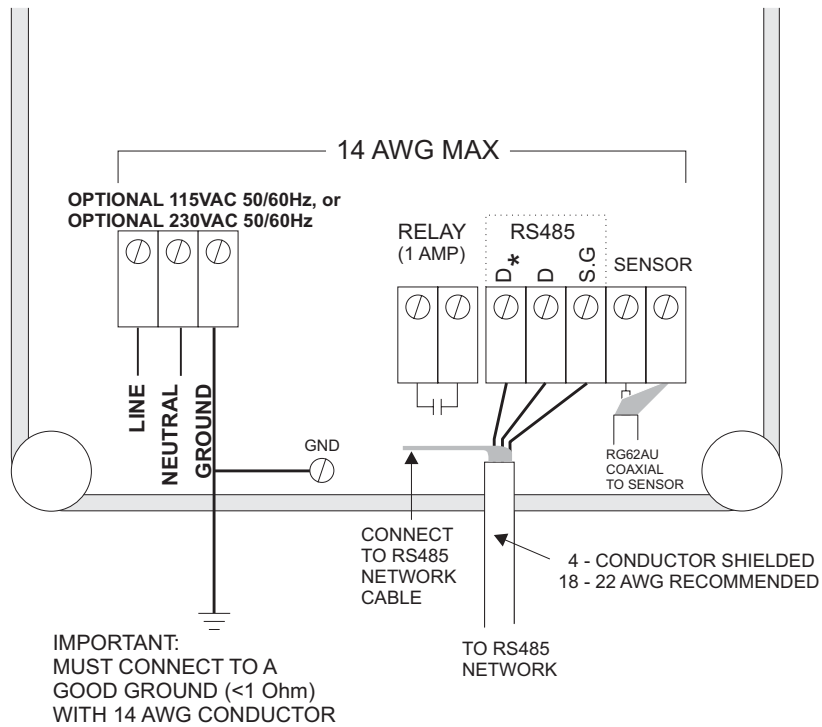


**ELECTRONICS ENCLOSURE**

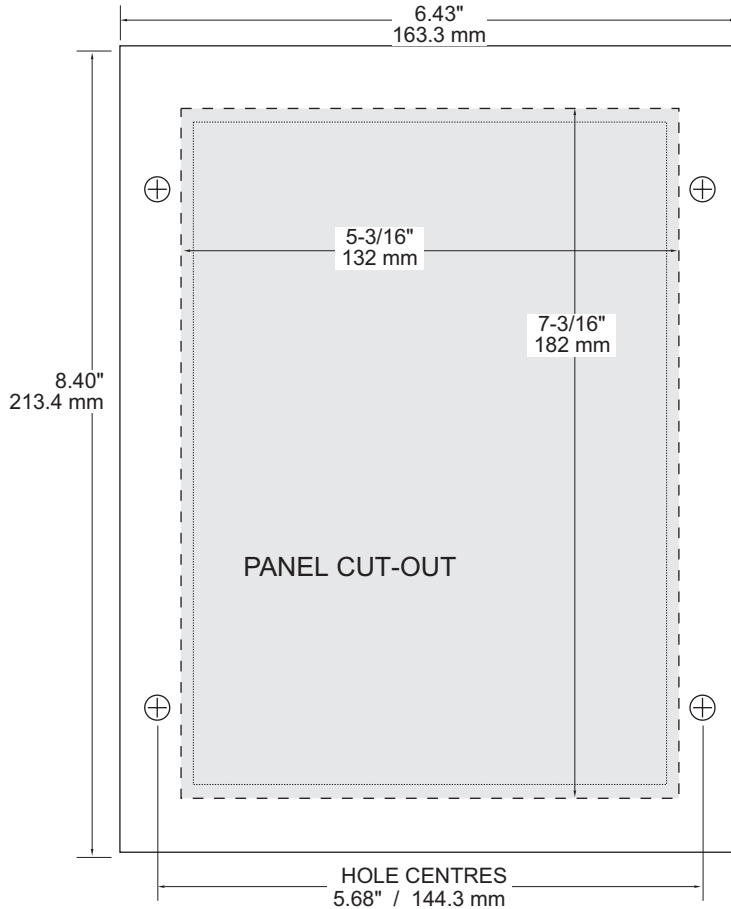
**CONNECTIONS (Stahl Model 9001/02-133-150-10)**



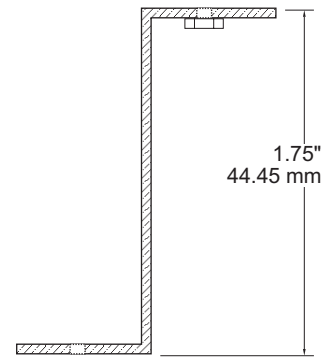
**CONNECTIONS - OPTIONAL 115VAC or 230VAC Power Input**



**Option PM2 Enclosure Panel Mount**



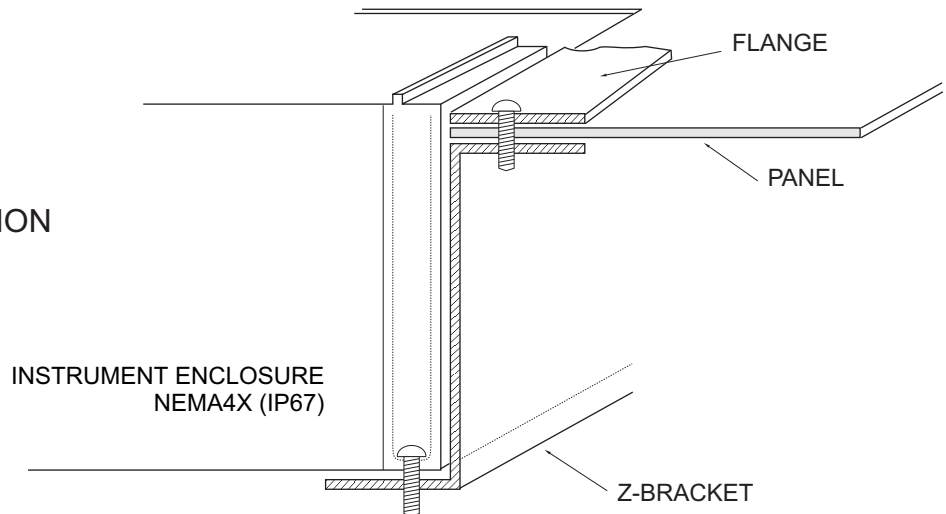
**INSTRUCTIONS**  
Mark Panel using Flange as a Template.  
Cut Panel outside the line.



**Z-BRACKET**  
QTY 2 INCLUDED WITH  
MOUNTING SCREWS

**FLANGE**  
QTY 1 INCLUDED  
MATERIAL: 0.062 ALUMINUM  
FINISH: CLEAR IRIDITE

**INSTALLATION**



**ENCLOSURE SUNSCREEN - OPTION SCR**

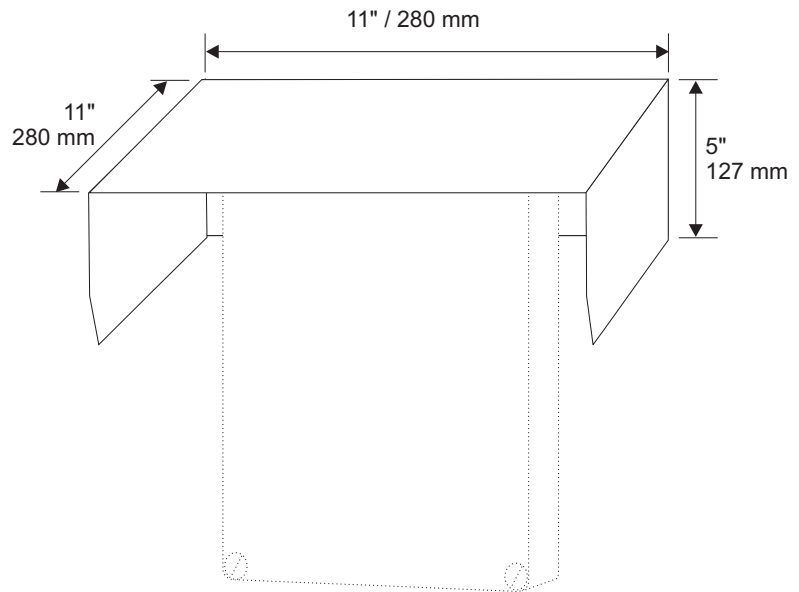
Do not mount instrument electronics in direct sunlight. Overheating will reduce the life of electronic components and condensate may form during the heat/cool cycles and cause electrical shorts.

**Note:**

Exposure to direct sunlight can cause overheating and moisture condensation which will reduce the operating life of electronics.

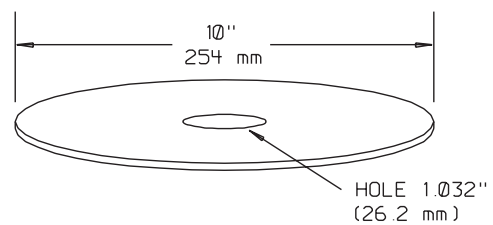
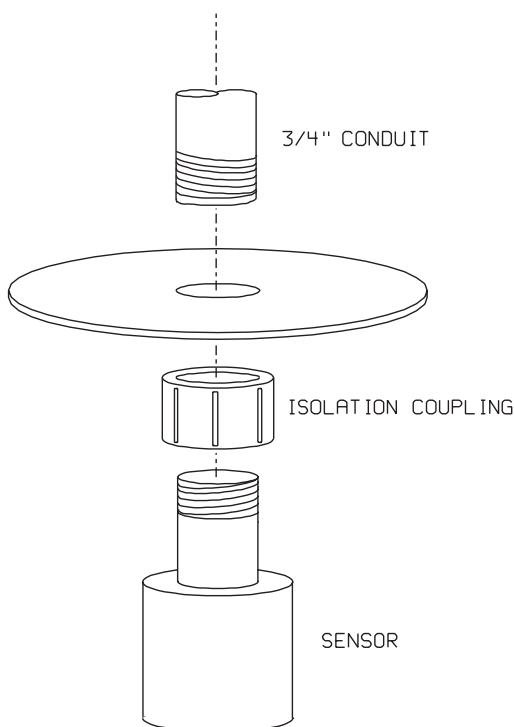
Protect Instruments from direct sunlight with this iridite finished aluminum sun screen (Greyline Option SCR).

Seal conduit entries with caulking compound to further reduce moisture condensation.



**SENSOR SUNSCREEN - OPTION PZS**

INSTALLATION

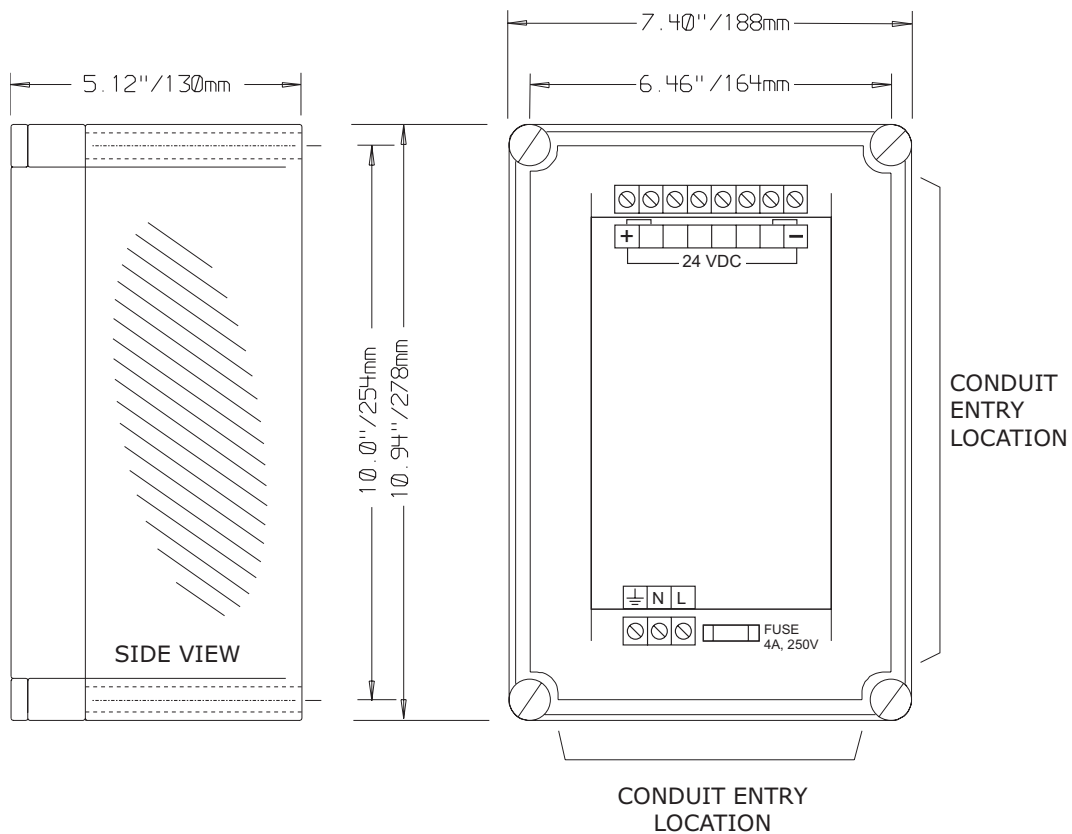


**MATERIAL :**  
1/16" ANODIZED ALUMINUM

**NOTE :**  
USE WHEN SENSOR IS INSTALLED IN DIRECT SUNLIGHT.

**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  
PS150EI: 2A maximum
- Fuse:** 4A, 250V
- Operating Temperature:** 32 to 122°F (0 to 50°C)
- Storage Temperature:** -13 to 185°F 9-25 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)

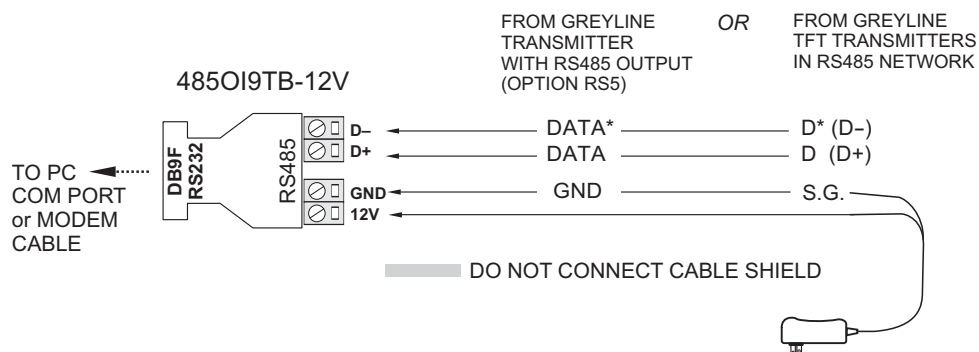
**MODEL 485OICR**  
**RS232/RS485 Converter**

Converts RS485 signals from Greyline Transmitters to RS232 for connection to a PC Computer or Modem.

- DB25 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 38.4 K baud



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.



## APPENDIX B - APPLICATIONS BACKGROUND

Conditions in the tank where the ultrasonic sensor is installed can affect the performance, range and accuracy of the system. The following notes are for general reference. Contact Greyline Instruments or your local representative for specific information on your application.

**FOAM** - Solid or dense surfaces such as a smooth liquid surface will give the best echoes in an ultrasonic level measuring system. Foam acts as a sound insulator and may eliminate, or reduce the strength of an echo. Measurement range may be reduced in a system where foam is present. Ultrasonics are not recommended where thick dense foam is continually present. Intermittent thin layers of light foam (1/8 in. or less) can generally be disregarded. Use a stilling well in open channel applications.

**LIQUIDS** - The TFT32 is ideal to monitor tank liquid level or inventory. Caustic, corrosive or very viscous liquids can be monitored without contacting the liquid.

**SOLIDS** - The TFT32 will measure most granular material and powders as well as liquids. Powders will not generally provide the same echo strength as liquids. Therefore maximum expected range should be reduced to approximately 20 feet (6 m) for powders. There are many exceptions to this rule and installation of a test system is recommended when in doubt.

**DUST** - Any obstructions to the sound will affect performance of the system. In silos where heavy concentrations of dust are expected ultrasonics may not work. Where moderate dust is encountered care should be taken to mount the sensor in a position where dust accumulation will be minimized and where the sensor can be cleaned if necessary. You can use alternate sensors for high dust applications and order the TFT32 configured for 4-20mA signal input.

**SENSOR TEMPERATURE** - The standard sensor model PZ32T supplied with each Level Indicating Transmitter includes a built-in temperature sensor. The TFT32 automatically compensates for temperature fluctuations to retain high accuracy. Note the operating temperature ranges listed in the product specifications section. Do not exceed the sensor temperature ratings or damage may occur.

**ELECTRONICS TEMPERATURE** - Note operating temperature ranges listed in the product specifications. Temperatures higher than the maximum shown can reduce the operating life of the electronics. Moisture condensation from those temperatures below the range shown can also damage electronics components. **DO NOT** mount in direct sunlight.

**NOISE** - Because the TFT32 sensor operates at high sound frequency, regular process noise or vibration will not affect the system. Ultrasonic Sensors installed in close proximity to one another in the same tank may "cross-talk" and should be relocated.

**VAPOUR** - May affect operation. Severe vapour stratification can cause false echoes. Variable vapour cannot be compensated. Consult Greyline Instruments for recommendations.

**CHEMICAL COMPATIBILITY** - The TFT32 Ultrasonic Sensor is constructed of very durable materials with broad compatibilities. Tank contents should be checked for their compatibility with PVC. An all-teflon sensor is available for corrosive applications.

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
FOOT <sup>2</sup>	METER <sup>2</sup>	0.0929

VOLUME CALCULATION FOR ROUND TANKS:  $3.142 \times R^2 \times H$   
 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

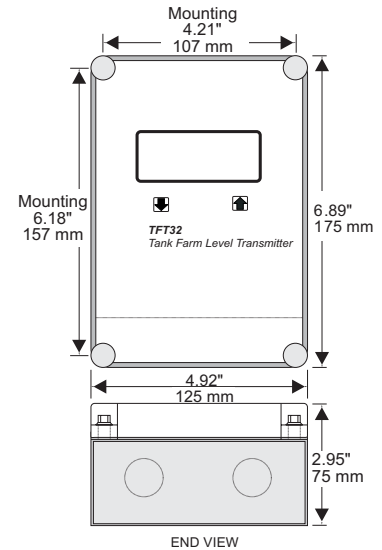
**Output:** RS485

**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:** -13 to 140°F (-25 to 60°C)  
(Electronics)



**Standard Sensor PZ32T**

**Maximum Range:** 32 ft. (10 m)

**Deadband (blinking):** Programmable, minimum 12" (305mm)

**Beam Angle:** 8°

**Operating Frequency:** 42 KHz

**Exposed Materials:** PVC and Teflon

**Operating Temperature:** - 40° to 150°F (-40° to 65°C)

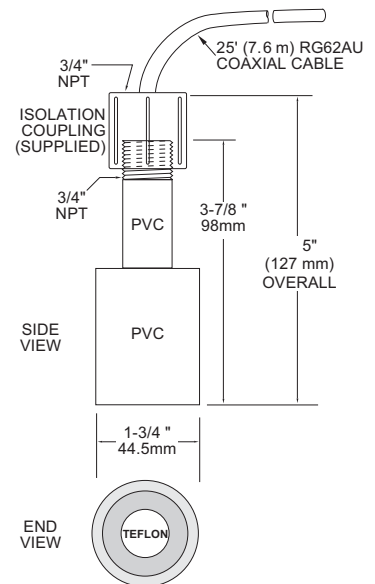
**Operating Pressure:** 20 psi (1.35 Bar) maximum

**Mounting:** ¾" NPT (PVC isolation coupling supplied)

**Sensor Cable:** RG62AU coaxial, 25 ft. (7.6 m) standard length

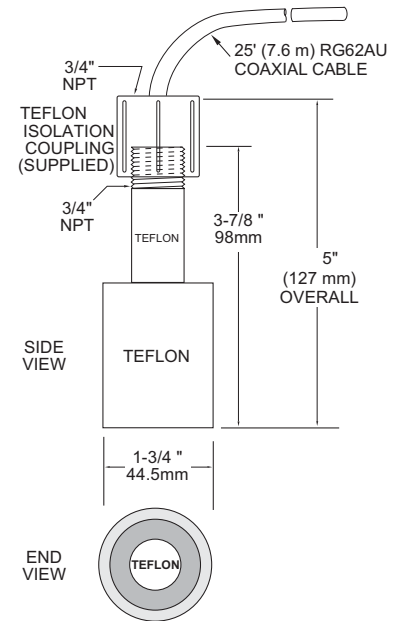
**Maximum Cable Length:** 500 ft. (152 m) RG62AU coaxial

**Hazardous Rating:** with optional Intrinsic Safety Barrier:  
CSA, Class I,II,III, Div. I,II, Groups C,D,E,F,G



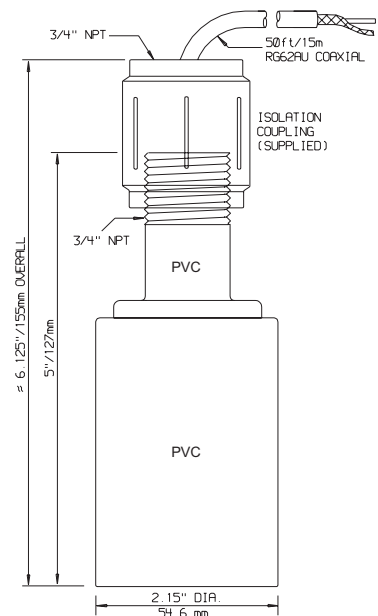
**Optional Sensor PZ32TE**

- Maximum Range:** 32 ft. (10m)
- Deadband (blinking):** Programmable, minimum 12" (305 mm)
- Beam Angle:** 8°
- Operating Frequency:** 42 KHz
- Exposed Materials:** Teflon
- Operating Temperature:** -40° to 170°F (-40° to 76°C)
- Operating Pressure:** 20 psi (1.35 Bar) maximum
- Mounting:** 3/4" NPT (Teflon or Polypropylene isolation coupling supplied)
- Sensor Cable:** RG62AU coaxial, 25 ft. (7.6 m) standard length
- Maximum Cable Length:** 500 ft. (152 m) RG62AU coaxial
- Hazardous Rating:** with optional Intrinsic Safety Barrier: CSA, Class I,II,III, Div. I,II, Groups C,D,E,F,G,



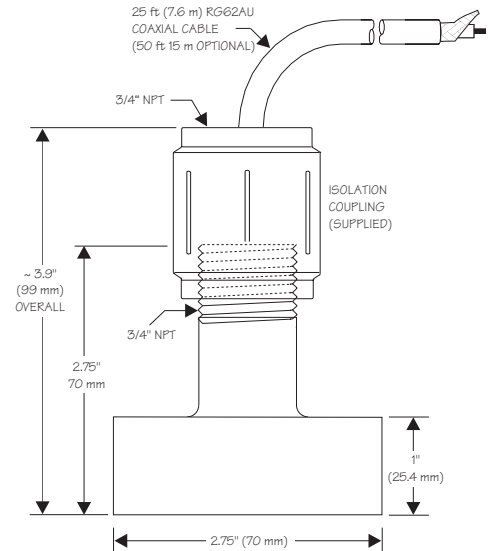
**Optional PZ52T**

- Maximum Range:** 50 ft. (15.6 m)
- Minimum Range (Deadband):** 16 in. (406 mm)
- Operating Frequency:** 40 KHz
- Beam Angle:** 8°
- Temperature Compensation:** Automatic, continuous
- Operating Temperature:** -40 to 150°F (-40 to 65°C)
- Max. Operating Pressure:** 20 psi (1.35 Bar)
- Sensor Face:** Teflon
- Sensor Housing:** PVC
- Sensor Mounting:** 3/4" NPT (Isolation Coupling supplied)
- Sensor Cable:** 50 ft. (15 m) continuous
- Maximum Cable Length:** 500 ft. (150 m)
- Hazardous Rating:** CSA rated Intrinsically Safe Class I, Groups C,D, Class II, Groups E,F,G with Optional Intrinsic Safety Barrier.  
Note: Max Range reduced to 32 ft (10 m) with ISB option



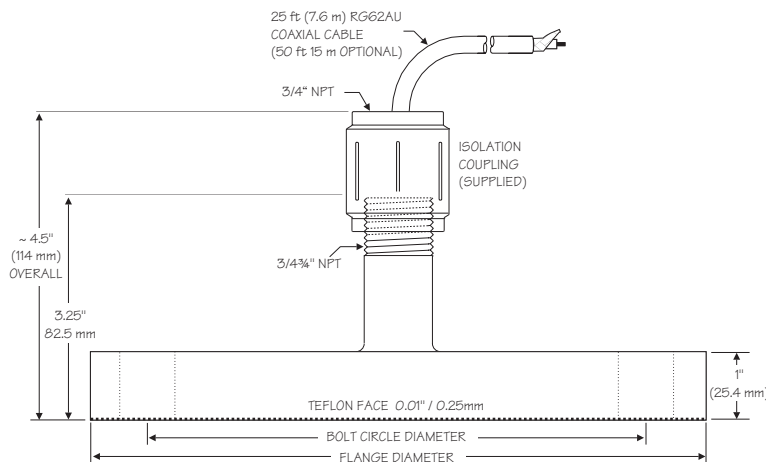
**Optional PZ12**

- Maximum Range:** 12 ft (3.66 m)
- Minimum Range (Deadband):** 8" (203.2 mm)
- Operating Frequency:** 92 KHz
- Beam Angle:** 8°
- Operating Temperature:** -40° to 150° (-40° to 65°C)
- Temperature Compensation:** Automatic, continuous
- Max. Operating Pressure:** 20 psi (1.35 bar)
- Sensor Face:** PVC
- Sensor Body:** PVC
- Mounting:** 3/4" NPT
- Cable Length:** 25 ft. (7.6 m) continuous RG62AU coaxial. Optional 50 ft. (15 m) continuous
- Max. Cable Length:** 500 ft. (152 m) RG62AU coaxial (splice)
- Hazardous Rating:** CSA rated Intrinsically Safe Class I, Groups C,D, Class II, Groups E,F,G with Optional Intrinsic Safety Barrier.



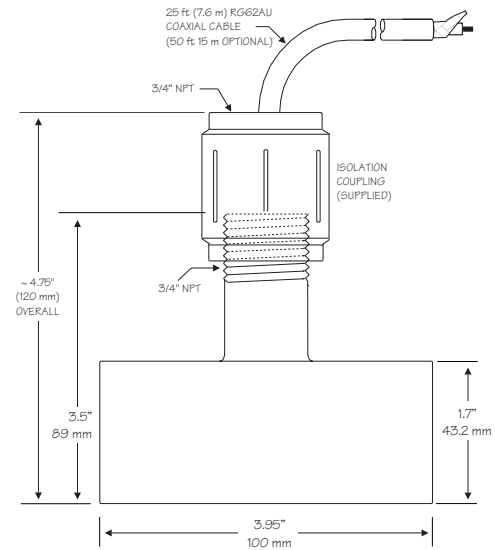
**Optional PZ12T\_F**

- Maximum Range:** 12 ft (3.66 m)
- Minimum Range (Deadband):** 8"(203.2 mm)
- Operating Frequency:** 92 KHz
- Beam Angle:** 8°
- Operating Temperature:** -40° to 150° (-40° to 65°C)
- Temperature Compensation:** Automatic, continuous
- Max. Operating Pressure:** 20 psi (1.35 bar)
- Sensor Face:** Teflon
- Sensor Body:** CPVC
- Mounting:** 3/4" NPT
- Cable Length:** 25 ft. (7.6 m) continuous RG62AU coaxial. Optional 50 ft. (15 m) continuous
- Max. Cable Length:** 500 ft. (152 m) RG62AU coaxial (splice)
- Hazardous Rating:** CSA rated Intrinsically Safe Class I, Groups C,D, Class II, Groups E,F,G with optional Intrinsic Safety Barrier.



**Optional PZ34**

- Maximum Range:** 32 ft. (10 m)
- Minimum Range (Deadband):** 16" (406.4 mm)
- Operating Frequency:** 46 KHz
- Beam Angle:** 8°
- Temperature Compensation:** Automatic, continuous
- Operating Temperature:** -40° to 150°F (-40° to 65°C)
- Maximum Operating Pressure:** 20 psi (1.35 Bar)
- Exposed Materials:** PVC
- Sensor Mounting:** 3/4" NPT
- Maximum Cable Length:** 500 ft (152 m)
- Optional Hazardous Rating:** CSA rated Intrinsically Safe Class I, Groups C,D, Class II, Groups E,F,G with optional Intrinsic Safety Barrier.  
**Note:** Max Range reduced to 25 ft (7.8 m) with ISB option.



**Optional PZ34T\_F**

- Maximum Range:** 32 ft. (10 m)
- Minimum Range (Deadband):** 16" (406.4 mm)
- Operating Frequency:** 46 KHz
- Beam Angle:** 8°
- Temperature Compensation:** Automatic, continuous
- Operating Temperature:** -40° to 150°F (-40° to 65°C)
- Maximum Operating Pressure:** 20 psi (1.35 Bar)
- Sensor Face:** Teflon
- Sensor Body:** PVC (not exposed to tank contents)
- Cable Length:** 25 ft. (7.6 m) continuous RG62AU coaxial Optional 50 ft. (15 m) continuous
- Maximum Cable Length:** 500 ft (152 m) RG62AU coaxial (splice)
- Hazardous Rating:** CSA rated Intrinsically Safe Class I, Groups C,D, Class II, Groups E,F,G with optional Intrinsic Safety Barrier.

