TankScan | Powered by AquaPhoenix

TSM1000 Series Tank Monitor

Micro-Impulse Radar (MIR)

Product Manual

tankscan.com

NOTICE

This manual must be thoroughly read before installing, using, or maintaining the TSM1000 Tank Level Monitor. Your personal safety along with the safe operation and use of the TSM1000 Monitor depends on a thorough understanding of this manual and the monitor. For questions and technical assistance, please contact technical support for customer assistance at:

TankScan Technical Support

877-847-7226

NOTICE

Battery Pack Information

Two different *TankScan* battery packs could be used with the TSM1000, depending on the model version. Each battery pack contains 2 'D' cell batteries and may contain up to 4.5g of lithium per cell. Use caution to prevent thermal, electrical, or mechanical damage to the battery pack.

Do not drop the batteries, as this may damage the battery pack, even if physical damage is not present. If dropped, dispose of the Battery Pack in accordance with local guidelines.

Any spare battery packs must be stored in a clean, dry area. Storage temperature should not exceed 30°C (86°F). The ATEK battery packs have a 10 year storage life, losing about 2% of their charge per year.

Shipping Information

The TSM1000 Monitor was shipped with the battery pack installed, but not connected. *TanksScan* battery packs comply with U.S. Department of Transportation regulations and also comply with International Air Transport Association (IATA) regulations. When returning previously installed monitors, however, do not return the battery pack. Dispose of in accordance with local guidelines.

⚠ WARNING

Explosions could result in death or serious injury

The battery pack may not be changed in an environment where an explosive atmosphere is present. If explosive atmosphere is present, the monitor must be removed from the tank and brought to a non-hazardous environment to change the battery pack.

The operating atmosphere must be consistent with the monitor's hazardous location certifications.
Installation of the monitor must be in accordance with local, national, and international standards and practices.

Intrinsically safe monitors must be installed in accordance with intrinsically safe field practices.

The TSM1000 housing is made of dissipative material to prevent electrostatic charge build-up and possibility of an explosion in explosive atmospheres. The housing should be grounded when installed on non-metallic tanks.

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury

The atmosphere surrounding the monitor must be consistent with monitor's specifications and hazardous location certifications.

Monitor must be installed by qualified personnel.

Monitor must be installed in accordance with appropriate standards.

Monitor must only be used as specified. Otherwise, the protection provided by the equipment may be impaired.

⚠ WARNING / AVERTISSEMENT

DO NOT REMOVE COVER WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT.

NE PAS OUVRIR EN CAS DE PRESENCE D'ATMOSPHERE EXPLOSIVE

The electronics within the housing is ESD sensitive. When removing the cover, personnel must ensure that they have discharged themselves.

Securely hand tighten the cover on the housing after installing or performing maintenance.

SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

LA SUBSTITUTION DES COMPOSANTS PEUT NUIRE À LA SÉCURITÉ INTRINSÈQUE

⚠ CAUTION

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

This device must accept any interference received, including interference that may cause undesired operation.

This device must be installed to ensure a minimum antenna separation distance of 20cm (8in) from all persons. Changes or modifications to the monitor not approved by *TankScan* could void the user's authority to operate the equipment.

Introduction

Transmitter Overview

The TankScan TSM1000 monitor provides remote level monitoring of deployed tanks, totes, and containers up to 40' tall. Industry-leading radio technologies, 2.4Ghz RF or 4G LTE Cat M cellular, and Micro-Impulse Radar (MIR) technologies are fully integrated into the battery-powered device, which can be installed even in locations where power and network connectivity infrastructure are not available. The monitor has a durable weather-proof enclosure and long-life Battery Pack, making this solution ideal for use in a broad range of level sensing applications.

Both the cellular and RF versions are available with hazardous approval certifications and support a variety of other options that make installation and deployment convenient. Global Navigation Satellite System (GNSS) for asset tracking, remote battery packs, and remote antennas are all available.

The *AquaPhoenix* Intelligence Platform (AIP) provides tank level information via TankScan monitors anywhere an Internet connection is available – via computer, tablet, or smart phone. Use TankScan analytics to optimize business decisions around operations and logistics by knowing when a tank is in need of service. Plan fluid deliveries and pick-ups based on the latest information to insure optimal route efficiencies and maximize customer service.

AIP AquaPhoenix Intelligence Platform

Micro-Impulse Radar (MIR) Technology

The TSM1000 uses Micro-Impulse Radar technology to measure the height of fluid in a tank. A radar pulse is sent down the probe wire, reflects off the fluid interface, and is received back at the monitor. The monitor measures this time of flight and, knowing the total tank height, then calculates the height of fluid in the tank, see diagram on page 6.

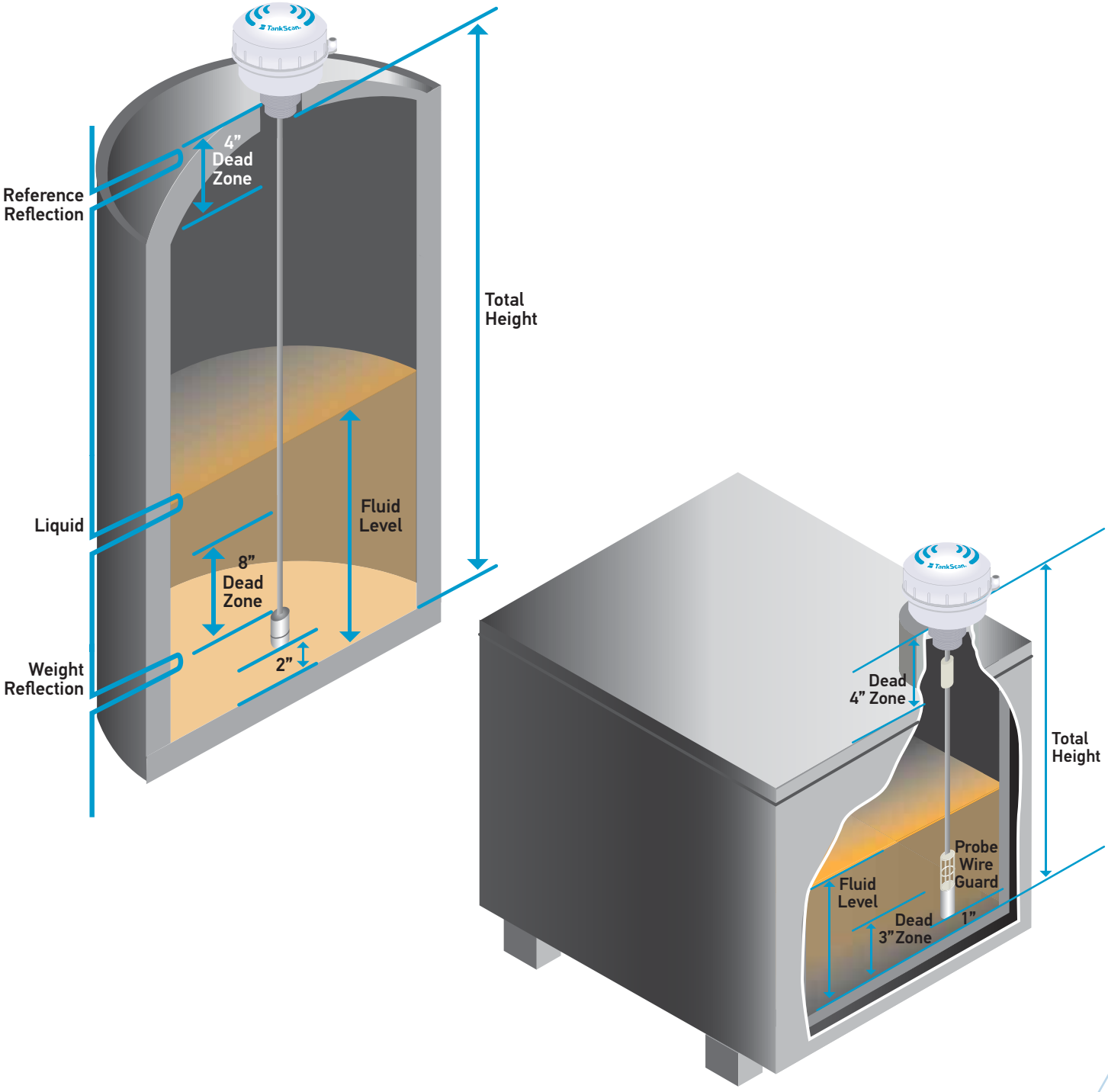
This technology offers several advantages. It is insensitive to the fluid dielectric, since the travel time in air is measured, not the time through the fluid. It is insensitive to temperature variations, since the travel time through the probe wire in air is constant over the air temperature range. It does not require that the tank be perfectly level, as the reflected signal travels along the probe wire and will always return to its source. The only requirements are that the probe wire be free of kinks or nicks and cuts and that the probe wire not contact anything before the fluid. Fluid collecting around kinks or cuts can possibly generate a reflection, along with any surface the probe wire may contact before reaching the fluid.

Due to the nature of the technology, however, there are dead zones at both the top and bottom regions of the tank where a reflection will not be seen. The length of the zones depends on the fluid but are about 4" below the monitor and 8" from the top of the weight at at the end of the probe wire. For shorter tanks, ATEK has developed a Range Extender, which decreases the dead zone at the bottom of the tank to only a couple of inches. Also, the monitor can be mounted on a riser to move the upper dead zone out of the tank.

Product Recycling/Disposal

Recycling and disposal of equipment and packaging should be done in accordance with local and national guidelines and regulations.

The images below show TSM1000 installations which identify proper mounting and dead zone regions for the TSM1000 short and tall tank monitors.



Installation

Equipment Needed

• Tape Measure • Scissors or Cutting Tool • Permanent Marker • Magnet Screwdriver (provided) • 7/16" Allen Wrench (provided)

Connect the Battery Pack and Test the Radio Communication – Before Tank Install

⚠ WARNING / AVERTISSEMENT

DO NOT REMOVE COVER WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT.
NE PAS OUVRIR EN CAS DE PRESENCE D'ATMOSPHERE EXPLOSIVE

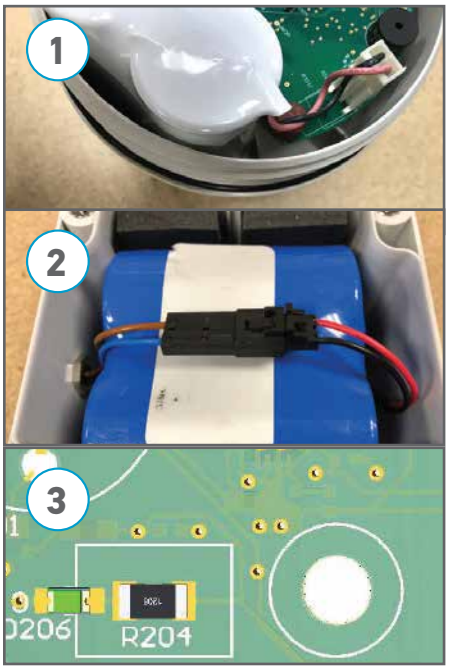
DO NOT INSTALL BATTERY PACK WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT.
NE PAS REMPLACER LES ACCUMULATEURS SI UNE ATMOSPHERE EXPLOSIVE PUET ÊTRE PRÉSENTE

USE ONLY TANKSCAN BATTERIES #TSTRB01000 (NON-HAZARDOUS LOCATION) OR #TSTRB02000 (HAZARDOUS LOCATION) UTILISER UNIQUEMENT DES ACCUMULATEURS TANKSCAN #TSTRB0100 (EMPLACEMENT NON DANGEREUX) OU TANKSCAN #TSTRB02000 (EMPLACEMENT DANGEREUX)

If the TankScan Monitor system includes a gateway, ensure that the gateway is powered up before proceeding.

Remove TankScan Monitor's cover then power up the monitor by connecting the battery pack. (1)

If the monitor came with a remote battery pack, unscrew the four screws on the cover of the remote battery pack housing and connect battery connector to remote battery pack housing connector. Connect female threaded connector of battery cable to connector on remote battery pack housing. Connect male threaded connector of battery cable to connector on monitor housing. (2)



For intrinsically safe monitors:
Note that intrinsically safe versions of the TSM1000 monitors do not have a beeper. Indicator light D206 must be observed. (3) The Monitor will wake up and Indicator D206 will turn on when the monitor begins to take a reading and go off after the data is transmitted. This whole process should take under 3 minutes. If there was an error during this process Indicator D206 will flash for 5 seconds before turning off. If this happens, please contact TankScan Technical Support.

For all other monitors:
The Monitor will wake up and sound a single beep, followed by second single beep, and a final third single beep after data is transmitted. This whole process should take under 3 minutes. If more than 3 single beeps were heard, please contact TankScan Technical Support.

Upon successful transmission of the data, replace cover, then proceed as below.

NOTICE

Note: The cover must remain on when the monitor is moved to a hazardous location.

Verify Mounting Position on the Tank

The tank should be vented to prevent build up of condensation and pressure within the tank environment. Otherwise, this may degrade measurement accuracy.

Remove any equipment from the tank port to be used by the monitor. The TSM1000 can be connected directly to tanks with a 1.5" or 2" NPT threaded opening. There must not be any obstructions in the tank between the tank port opening and bottom of tank.

The TSM1000 must be mounted in a location so probe wire hangs at least 4" from tank walls and 12 " from any inlet port in order to prevent inaccurate level readings.

Install Mounting Riser (if needed)

Depending on the mounting hole size and tank geometry, a port adapter and riser may be required. There is approximately a 4" dead zone beneath the monitor where fluid level cannot be measured. If this will be an issue, then a riser should be installed. Note that risers taller than 3" require the addition of a Probe Wire Guard as well.

Take Tank Measurement

Measure the total tank height from inside bottom of tank to top of tank port and report this measurement to TankScan Technical Support. (3)

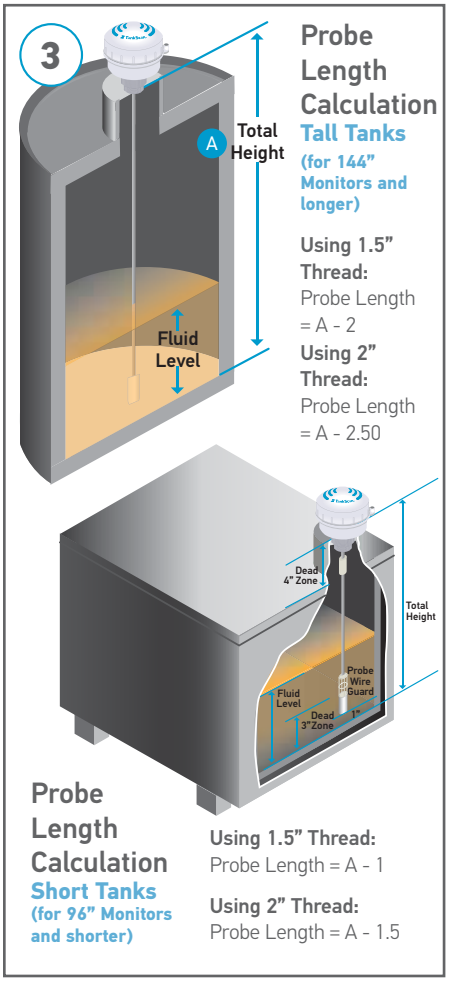
Cut Probe Wire to Length

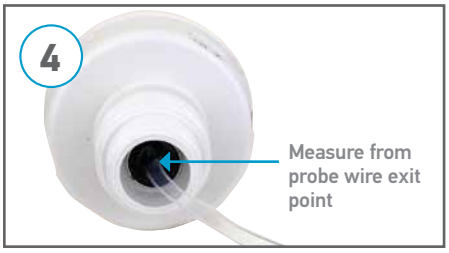
For monitors equipped with MIR Range Extender Skip this step. Determine the probe wire length using Probe Length Calculation diagram (3), then measure probe wire length from the wire exit point (4) and cut wire to calculated length. The probe wire must hang straight and taut for accurate level readings.

Determine if Probe Wire Guard (PWG) is Needed

For monitors installed on risers greater than 3" long, a PWG is recommended to prevent the probe wire from contacting the riser. Install the PWG before proceeding with the next steps. See the Probe Wire Guard Installation Instructions (page 11).

If a PWG was required but not provided as a field-installable kit, contact TankScan Technical Support and order a PWG Field Install Kit before proceeding with the monitor installation.





Attach the Float Assembly and Weight
(144" Monitors and longer)

TSM1000 Monitors with probe wire lengths of 144" and greater are provided with a float assembly which is used to amplify the reflected signal amplitude. Slide the Float Assembly onto the probe wire.

Next slide the weight onto the probe wire such that the wire extends through the entire weight. Tighten the weight clamp using the provided hex wrench. (5)

Adjust the Range Extender (96" Monitors and shorter)

TSM1000 Monitors with probe wire lengths of 96" and less come with a Range Extender pre-installed on the wire. This will decrease the 8" dead zone above the weight to approximately 2" from the bottom of the Range Extender.

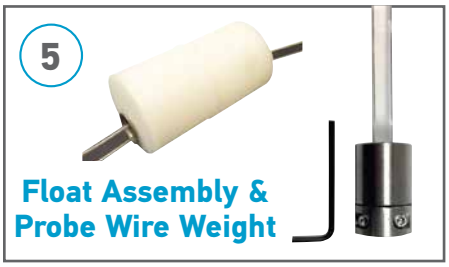
If not done previously, determine the probe wire length using the Probe Length Calculation diagram on the previous page. Measure down from where the wire exits the TSM1000 monitor housing and mark Probe Length location on the wire using a permanent marker. (6)

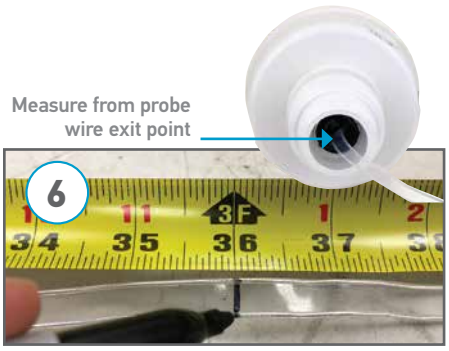
Remove the end of probe wire from the slot at the top of the Range Extender. This is necessary to adjust the wire to the appropriate length. (7)

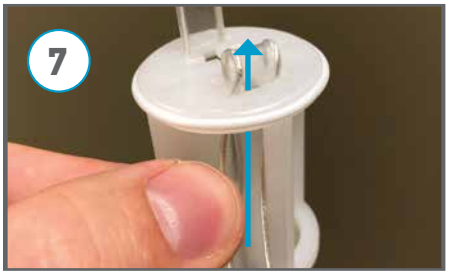
While holding onto the metal of the Extender, pull on the end of the probe wire to feed wire through the Extender until the marked location on the probe wire is at the very bottom of the Extender. (8)

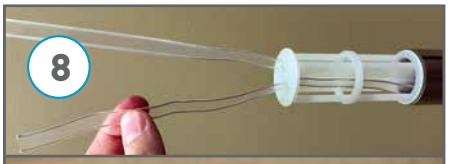
Leave about 3" of probe wire coming out the top of the Extender and cut off the excess. Make sure not to cut probe wire that is between the Extender and TankScan Monitor.

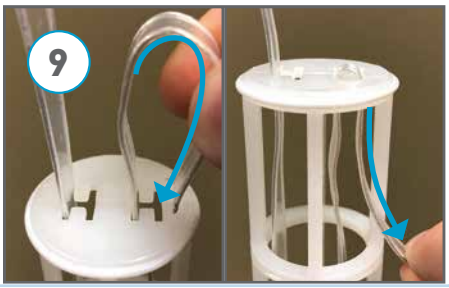
Insert the end of the probe wire into the slot next to where the wire comes out the top of the Extender. Pull wire's end outside of the Extender, until a tight bend is formed at the Extender's top. (9)











Mount the Monitor to the Tank

After the Weight or Range Extender and Probe Wire Guard have been added, the monitor is ready to mount on the tank.

Seal pipe threads of the monitor using product appropriate for this application prior to tightening into tank port.

Lower the probe wire with weight or Range Extender gently through the tank port into the tank. Position the monitor over the tank port and hand tighten until secure.

Test the Installation

Test the monitor by swiping the magnet end of the supplied screwdriver along the cover's rim, above the triangle indicator on the housing base. (10)

For intrinsically safe monitors:

Note that intrinsically safe versions of the TSM1000 monitor do not have a beeper. The cover must remain on in hazardous locations. As there is no audio confirmation, contact TankScan Technical Support to verify a successful report to AIP.

For all other monitors:

The monitor will wake up and sound a single beep, followed by a second single beep after data is transmitted. Cellular monitors (C4 and C5 options) will then go back to sleep. RF monitors (R1 and R2 options) will remain in this test mode for 10 minutes. They will beep and transmit a reading every 30 seconds. After 10 minutes, they will go back to sleep.

Upon successful transmission of the data contact TankScan Technical Support to verify the report was successful and proceed as below.

NOTICE

Contacting TankScan Technical Support must be completed for the monitor to function properly.

Adding a Probe Wire Guard

Any TankScan MIR monitor mounted to a tank riser greater than 3" tall must utilize a Probe Wire Guard (PWG) to prevent its probe wire from contacting interior walls of that riser. PWGs are made of HDPE and O-rings used to hold it together are made of PTFE which are both suitable for use in fuels, oils, and many chemicals. PWGs are designed to fit inside 1.5" NPT pipe fittings and larger.

Probe Wire Guard

Equipment Needed

- Hole punch tool (provided)
- Scissors, snips, or another cutting tool
- Tape measure

PWG Parts

- 2 Probe Wire Guard halves
- 2 O-rings

IMPORTANT: Before proceeding, first identify which accessory is included with monitor.

If Probe Wire Weight is included, then skip the steps referring to the removal and re-installation of the Range Extender.

Range Extender

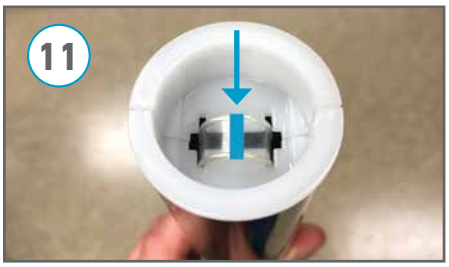
Probe Wire Weight

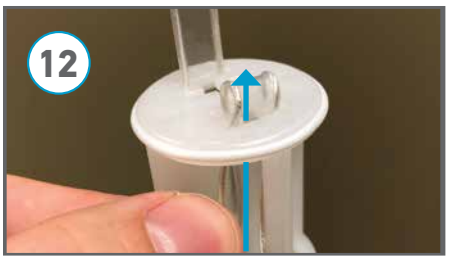
Remove Range Extender (if included)

Clean off and dry probe wire exposed at bottom of Range Extender. Mark bottom center of probe wire with a marker. (11) Marked location ensures Range Extender is returned to original position on probe wire.

Remove end of probe wire from slot at top of Extender. (12)

Pull probe wire completely through Extender and set aside for installation later.





Install Probe Wire Guard

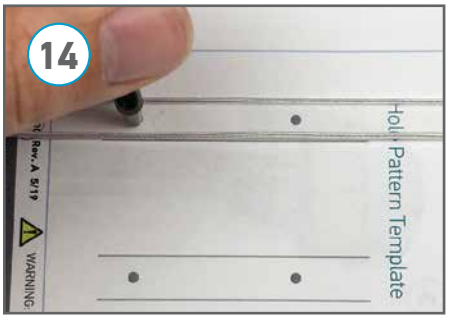
Before installing a PWG read these instructions thoroughly. Two 5/64" diameter holes need to be made in center of probe wire to use as PWG mounting holes. A hole punch tool is included with PWG kit and a hole pattern template and dimensional drawing is provided at end of this guide. For questions contact TankScan Technical Support.

Measure height of tank riser from top of tank to top of riser. (13)

From bottom of MIR Monitor, measure distance obtained in previous step along monitor base's pipe threads and probe wire to locate bottom PWG mounting hole. (13)

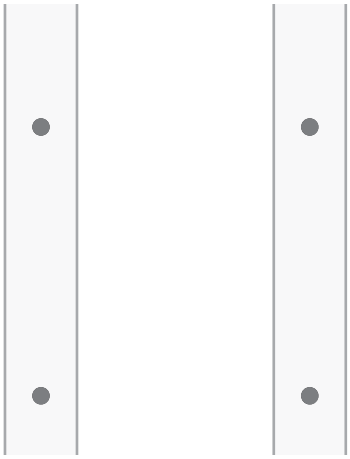
Place probe wire on top of hole pattern template (shown below) while supported underneath by firm flat surface. Using hole punch tool make two PWG mounting holes at locations provided by template's dots. Press hole punch tool firmly and twist to make holes in wire. (14)

Caution: Do not nick wire strands along edges of probe wire or remove insulation covering them. Holes are to be centered in web material between wire strands.

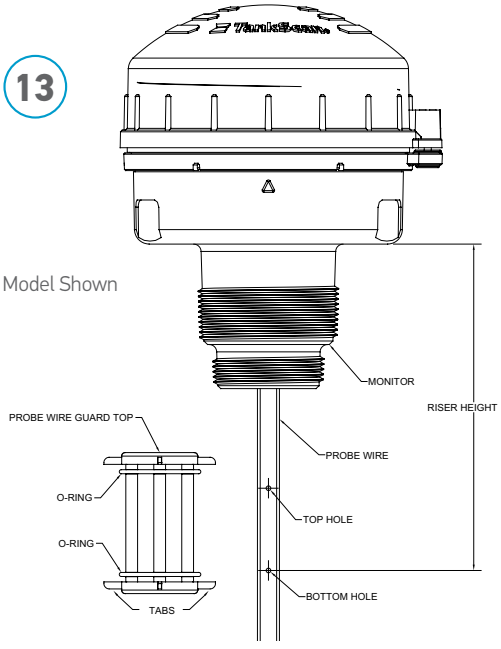


Hole Pattern Template

14



13



TSM1000 Model Shown

Press together both PWG halves through mounting holes from previous step making PWG end with tabs closest to monitor.

Slide O-rings along probe wire and over PWG until seated in indents at both ends of PWG. (15)

For 1.5" NPT risers only, remove PWG tabs with a cutting tool, see model drawing on previous page.

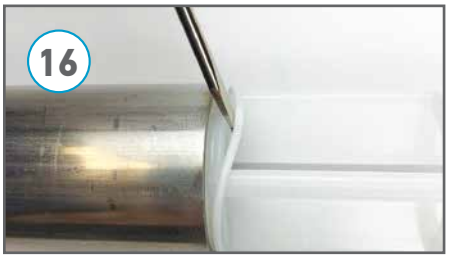
Probe Wire Guard is now installed.

If TankScan Range Extender was removed to install Probe Wire Guard, the following must be performed to reinstall Extender.

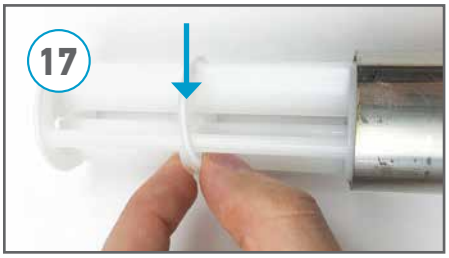
Range Extender

Install Range Extender

On Range Extender, remove O-ring just above metal weight from its groove. (16)



Reposition O-ring into O-ring groove on first rung so metal weight can slide freely. (17)



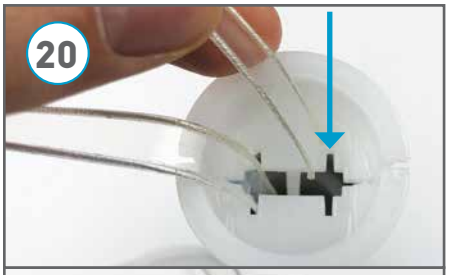
Insert probe wire into outermost slot on top of Extender. (18)

Feed probe wire into Extender until it reaches bottom of Extender.

Slide metal weight up Extender for better access, then using your fingers to pinch sides of probe wire, insert end of wire into slot at bottom of Extender. Make sure there are no twists in wire. (19)

Pull approximately 10" of probe wire through bottom of Extender or until location marked in the previous removal step becomes visible (if mark was made)

Insert end of probe wire into other slot on bottom of Extender and feed wire through until wire's end reaches top of Extender. Insert end of probe wire through innermost slot at top of Extender. Make sure there are no twists in wire. (20)



Slide metal weight back to bottom and reposition O-ring back to O-ring groove just above metal weight to lock weight in place. (21)

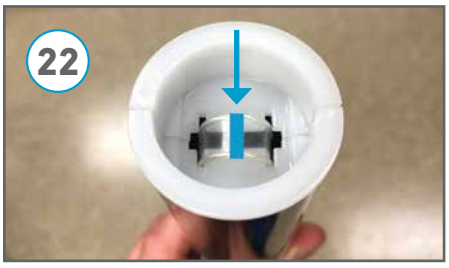
NOTE: If monitor has never been installed and probe wire never cut to length, proceed with the "Adjust the Range Extender" section on page 9 and skip the remaining steps below.

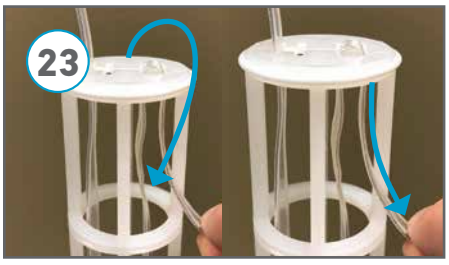
Pull wire through slot at top until marked location is tightly centered with no loop at the bottom. (22) Adjust as needed.

Insert end of probe wire into outermost slot. Pull wire's end outside of Extender until tight bend is formed at Extender top being careful to make sure marked location remains in place. (23)

Make sure wire is taut throughout Extender.

Monitor is now ready to be re-installed on tank. Remember to lower probe wire with Extender **gently** through tank port into tank.





Adding a Remote Battery Pack

A remote battery pack is available as an option for Monitors of 240" or greater lengths. This allows the battery pack to be mounted at ground level, so a lift is not required to access the monitor when battery packs need to be replaced.

Using a screwdriver, unscrew the four screws on the cover of the Remote Battery Pack and remove the cover

Connect the battery pack cable to the connector inside the enclosure. (24)

Reinstall the cover by tightening the four screws

Connect the cable to the connectors on the outside of the remote battery pack enclosure and monitor housing. (25)

Mount the Remote Battery Pack so that it is easily reachable from the ground and orient the enclosure so cable exits towards the ground.

For metal tanks: press magnetic back side of enclosure to tank wall.

For plastic/poly tanks: Apply hook and loop fastener strips to magnet face of Remote Battery Pack enclosure by removing peel-off liner and pressing each strip onto enclosure. Next, peel off remaining two liners exposing adhesive and press enclosure to tank wall.

Remote Battery Pack

Hazardous Location Remote Battery Packs

The Remote Battery Pack is not available for use with cellular hazardous location monitor models.

Capacitance of all unearthed metallic parts of the Tank Level Monitor enclosure, Remote Battery Pack enclosure and cable shall not exceed a 3pF maximum capacitance limit for the EPL Ga, Group IIA. When installed in an EPL Ga environment, the end user shall carry out a risk assessment to ensure that the possibility of the enclosure M8 connectors and the cable producing a potentially incendive spark is negligible based on the following capacitance measurements:
- Maximum capacitance measured across Remote Battery Pack enclosure M8 connector: 3.8 pF
- Maximum capacitance measured across Remote Battery Pack cable M8 connector: 3.7pF
-Maximum capacitance measured across the Tank Level Monitor enclosure M8 connector: 6.5 pF

Adding a Remote Cellular Antenna

For locations where cell coverage is poor (typically if the monitor is installed within a building) a remote cellular antenna is an option. The remote antenna is available in 10ft or 20ft cable lengths. (26)

Remote cellular antenna is not approved for use in hazardous locations.

Service and Troubleshooting

Replacing Battery Packs

Ordinary Location Battery Pack Replacement

⚠ WARNING / AVERTISSEMENT

EXPLOSION HAZARD. DO NOT REPLACE BATTERY PACK WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT. If necessary, remove monitor from tank and take to unclassified/non-hazardous area before removing enclosure cover.

NE PAS REMPLACER LES ACCUMULATEURS SI UNE ATMOSPHERE EXPLOSIVE PUET ÊTRE PRÉSENTE.

⚠ WARNING

USE ONLY BATTERY PACKS PROVIDE BY TANKSCAN - PART #TSTRB01000. Use of other batteries will impair protection provided by the equipment.

UTILISER UNIQUEMENT DES ACCUMULATEURS TANKSCAN #TSTRB01000.

NOTICE

For questions or problems contact TankScan Technical Support at: **887-847-226 or tankscansupport@aquaphoenixsci.com**

Ensure monitor is not in an environment with an explosive atmosphere.

Unscrew enclosure cover. Disconnect battery pack cable from printed circuit board and remove used battery pack.

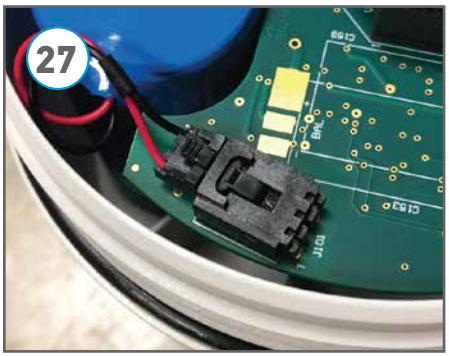
Insert new battery pack and reconnect battery pack cable. (27) Use of any battery pack other than TSTRB01000 will impair protections provided by the equipment.

Re-install cover. Ensure battery pack's wiring is not pinched when cover is re-installed.

Test monitor by swiping magnet end of supplied screwdriver along the cover's rim above the triangle indicator on housing base until a beep is heard. (28) The monitor will wake up and sound a single beep, followed by a second single beep after data is transmitted. Cellular monitors will then go back to sleep. RF monitors will remain in this test mode for 10 minutes. They will beep and transmit a reading every 30 seconds. After 10 minutes, they will go back to sleep.

Verify with TankScan Technical Support that the Monitor reported successfully to AIP.

Reinstall monitor on tank, if previously removed.



Do not send used batteries to TankScan. Dispose of them in accordance with local guidelines and regulations.

Intrinsically Safe Battery Pack Replacement

⚠ WARNING / AVERTISSEMENT

EXPLOSION HAZARD. DO NOT REPLACE BATTERY PACK WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT.

NE PAS REMPLACER LES ACCUMULATEURS SI UNE ATMOSPHERE EXPLOSIVE PUET ÊTRE PRÉSENTE.

If necessary, remove monitor from tank and take to unclassified/non-hazardous area before removing enclosure cover.

⚠ WARNING / AVERTISSEMENT

USE ONLY TANKSCAN BATTERY PACK #TSTRB02000.

UTILISER UNIQUEMENT DES ACCUMULATEURS ATEK #TSTRB02000.

⚠ WARNING / AVERTISSEMENT

DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT.

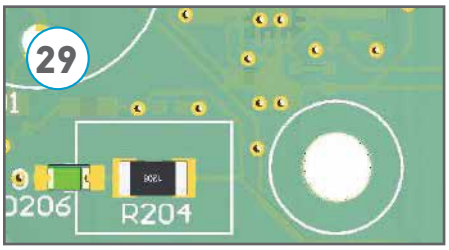
NE PAS OUVRIR EN CAS DE PRESENCE D'ATMOSPHERE EXPLOSIVE.

Ensure monitor is in a non-explosive atmosphere. If needed, remove monitor from the tank and move it to a non-explosive environment.

Unscrew enclosure cover. Disconnect battery pack cable from printed circuit board and remove used battery pack.

Insert new battery pack and reconnect battery pack cable. Use only *TankScan* battery pack - part # TSTRB02000.

After reconnecting battery pack cable a test LED will light. (29) The monitor will wake up and Indicator D206 will turn on when the monitor begins to take a reading and go off after the data is transmitted. This whole process should take under 3 minutes. If there was an error during this process Indicator D206 will flash for 5 seconds before turning off. If this happens, please contact TankScan Technical Support.



Re-install cover. Ensure battery pack cable wiring is not pinched when cover is re-installed.

Reinstall monitor on tank.

Do not send used batteries to TankScan. Dispose of them in accordance with local guidelines and regulations.

Remote Battery Pack Battery Replacement

⚠ WARNING / AVERTISSEMENT

EXPLOSION HAZARD. DO NOT REPLACE BATTERY PACK WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT. IF NECESSARY, DISCONNECT THE BATTERY PACK HOUSING AND MOVE TO A NON-HAZARDOUS LOCATION BEFORE OPENING THE COVER.

NE PAS REMPLACER LES ACCUMULATEURS SI UNE ATMOSPHERE EXPLOSIVE PUET ÊTRE PRÉSENTE.

The instrinsically safe version of the remote battery pack may be disconnected from the cabling and moved to a safe location to remove the cover and replace the batteries.

Using a screwdriver, unscrew the four screws on the cover of the remote battery pack and remove the cover

Disconnect the battery pack cable from the remote battery pack enclosure connector and remove the used battery pack.

Do not send used batteries to TankScan. Dispose of them in accordance with local guidelines and regulations.

Insert new battery pack into the remote battery pack enclosure. Connect battery pack cable to connector in the battery pack enclosure. (30)

Reinstall cover by tightening the four screws.

Remote Battery Pack

Maintenance

Outside of the accessories in this operating manual, there are no user replaceable parts. For other service and repair contact TankScan Technical Support.

Cleaning

If probe wire needs cleaning, clean with a damp cloth.

Housing may be cleaned with a damp cloth.

⚠ WARNING / AVERTISSEMENT

POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS. SURFACE SHOULD BE CLEANED WITH A DAMP CLOTH.

DANGER POTENTIEL DE CHARGES ELECTROSTATIQUES - VOIR INSTRUCTIONS. LA SURFACE DOIT ETRE NETTOYEE AVEC UN CHIFFON HUMIDE

Troubleshooting Guide

SYMPTOMS	CAUSE/ACTION
The Level Reading Does Not Match the Level in the Tank	Monitor has not been adjusted for mounting offset. Contact TankScan Technical Support.
No Level Reading	Liquid is in the upper dead zone. Error in the level measurement so value not reported.
Level Spikes (full)	Probe wire has intermittent contact with riser.
Level Spikes (empty)	Liquid level encroaches into upper or lower dead zones. Reflection is weak and on the edge of detection.
Level Reading is Always Full	The tank is full. There is something touching the wire at the top of the tank.
Level Reading is Always Empty	Tank is empty. Liquid is in the lower dead zone and weight reflection is being returned. Weak signal reflection from the liquid.
Level Reading is Always the Same	Probe wire is dirty or cut or contacting something in tank.
Level Fluctuations (small)	Normal behavior due to temperature variations. Fluid is turbulent.
Battery Pack Draining Fast	Frequent measurement and/or reporting intervals For optimal battery pack life cellular units should not report more than twice per day. Moisture inside housing or remote battery pack causing battery pack terminals to corrode.
No Reports From the Monitor	Poor cellular connection. Gateway not powered or problem with Ethernet connection. Battery pack is dead.

Specifications

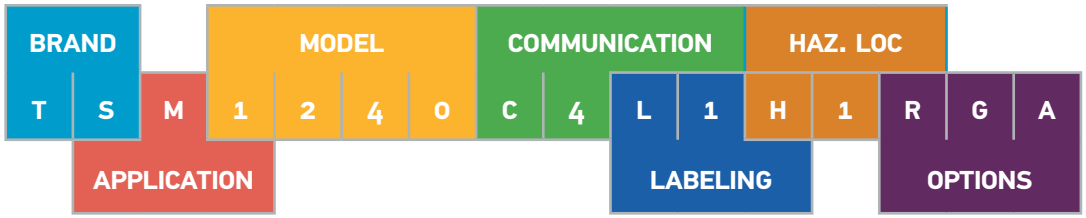
SPECIFICATION	TSM1000	TSM1000T
Measurement Range	60", 96"	144", 240", 300", 360", 420", 480"
Sensor Technology	Micro-Impulse Radar (MIR)	
Accuracy @ 25C	+/- 5mm	+/- 0.3% of Probe wire Length
Output	GPS location on 60" and 96" Transmits ID, Level Data, Temperature, Battery Voltage	
Radio Communication	2.4GHz RF or 4G LTE Cat M Cellular	
2.4GHz Rf Range	1000ft Line of Sight	
Power Requirements	*TankScan* Battery Pack	
Housing	PBT/Polycarbonate Blend, UV resistant, Static Dissipative Indoor/Outdoor Use, Weatherproof, Non-corrosive, IP66	
Probe Wire	304V SS with FEP insulation	
Probe Wire Weight	316 SS	
Epoxy Seal	Masterbond EP41S-5	
Process Seal	20 psi	
Operating Temperature	-30°F to 140°F	
Humidity	0% to 90% non-condensing	
Pollution Degree	3	
Maximum altitude	2000m	
Mounting	1.5" or 2" NPT	
Weight	1.11 lbs + probe wire	
Approvals	FCC Part 15B, IC Battery: UL1642, UN 38.3	

Specifications

SPECIFICATION	TSM1000	TSM1000T
Hazardous Approvals	Ex ia IIA T4 Ga Class I Division 1, Groups D, T4 Class 1, Zone 0, AEx ia IIA T4 Ga ETL20104027387X	
Standards	**Explosive Atmospheres – Part 0:** Equipment – General Requirements [UL 60079-0:2019 Ed.7+R:15Apr2020] **Explosive Atmospheres - Part 11:** Equipment Protection by Intrinsic Safety "i" [UL 60079-11:2013 Ed.6+R:28Mar2014] **Explosive Atmospheres — Part 0:** Equipment – General Requirements [CSA C22.2#60079-0:2019 Ed.4] **Explosive Atmospheres - Part 11:** Equipment Protection By Intrinsic Safety "i" [CSA C22.2#60079-11:2014 Ed.2] **Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1:** GeneralRequirements [UL 61010-1:2012 Ed.3+R:29Apr2016] **Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1:** General Requirements [CSA C22.2#61010-1-12:2012 Ed.3+U1]	
Product Warranty	1 Year Excluding Battery pack	

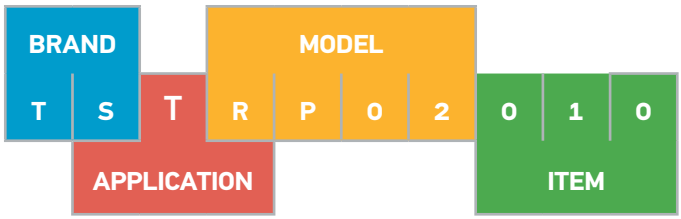
Ordering Information

Tank Monitor



BRAND	
TS	TankScan
APPLICATION	
M	MIR
Model	
1XXX	1000 series, XXX = probe length 60", 96", 144", 240", 300" 360", 420", 480"
COMMUNICATION	
R1	Xbee Zigbee 2.4GHz, TSM8 compatible
R2	Xbee, Zigbee 2.4GHz, not TSM8 compatible
C4	VZW LTE CAT M
C5	AT&T LTE CAT M
LABELING	
L1	AAT Standard
HAZARDOUS LOCATION	
H0	Unclassified
H1	CID1/Ex ia
H3	Ordinary Location
OPTION	
R	Remote Battery Pack (only 240" tanks and above)
G	Global Positioning (only 60" and 96" tanks with cellular)
A	Remote Cellular Antenna (only 60" and 96" tanks with cellular)

Accessories



BRAND	
TS	TankScan
APPLICATION	
T	Tank Monitor
Model	
RB01	Replacement Battery Pack, Ord Location
RB02	Replacement Battery Pack, Ex ia
RP00	Remote Battery Pack Unclassified
RP01	Remote Battery Pack CID1/Ex ia
RP03	Remote Battery Pack Ordinary Location
EA01	Remote Cellular Antenna
ITEM	
000	Used for RB, PK, FT
nnn	Used for RP, EA Cable length in feet

Other Accessories:

TS0298 Probe Wire Guard Kit
TSF0001 Floating Target

 WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

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