TracXP™ TXP-WRR

Wireless Radio Repeater
Instruction Manual

IMPORTANT: Read and understand contents of this manual prior to operation. Keep these user instructions for reference.

Table of Contents

www.macurco.com 1-877-367-7891 info@macurco.com 1504 W 51st St. Sioux Falls, SD 57105

Chapter 1 Safety Information

1.1 SAFETY INFORMATION – READ BEFORE INSTALLATION AND APPLYING POWER

The following symbols are used in this manual to alert the user of important instrument operating issues:

This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions.

This symbol is intended to alert the user to the presence of dangerous voltage within the instrument enclosure that may be sufficient magnitude to constitute a risk of electric shock.

WARNINGS:

- **Shock Hazard** - Disconnect or turn off power before servicing this instrument.
- **WARNING- EXPLOSION HAZARD**- DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
- Use a properly rated CERTIFIED AC power (mains) cable installed as per local or national codes
- Clean only with a damp cloth without solvents.
- Equipment not used as prescribed within this manual may impair overall safety.

Chapter 2 General Description

2.1 INTRODUCTION

The TXP-WRR Wireless Radio Repeater is designed to complement our TracXP Wireless client / server products and is offered in two distinct models. The TXP-WRR functions as a wireless "Repeater" to send / receive wireless signals on one RF network and then send / receive again on another RF network. The two networks are both 900MHZ and the unit may function as either client or server and are equipped with a Fault relay to indicate an "out of range" server and loss of power.

- TXP-WRR is equipped with two radios assigned to different networks. Signals received on one radio are retransmitted on second
- Standard fail-safe relay warns of "Server Out of Range" and power loss

2.2 RATINGS AND CERTIFICATIONS

ENCLOSURE

Instrument enclosure suitable for Class 1, Division 1 and 2, Groups A, B, C and D

www.macurco.com 1-877-367-7891 info@macurco.com 1504 W 51st St. Sioux Falls, SD 57105

2.3 SYSTEM DESIGN SPECIFICATIONS

DISPLAY
128x64 pixel LCD, LED Backlight for menu navigation and unit setup.

AMBIENT TEMPERATURE RANGE
-40 – 60 degrees C

POWER SUPPLY
10 - 30 VDC at 10 Watts max

2.4 ANTENNNA SELECTION AND INSTALLATION

2.4.1 ANTENNA TRANSMISSION RANGE

The distance radio signals can travel is dependent upon several factors including antenna design, transmitter power and Free-space losses. In order for a wireless link to work, the available system operating margin (TX power - RX Sensitivity + Antenna gains) must exceed the Free-space loss and all other losses in the system. For best RF line-of-site, the combined height of both antennas must exceed the Fresnel zone diameter (see below).

Dist. between antennas	Fresnel zone diameter	Free-space loss (dB)
1000 ft. (300 m)	16 ft. (4.9 m)	81
1 Mile (1.6 km)	32 ft. (9.7 m)	97
5 miles (8 km)	68 ft. (20.7 m)	110
10 miles (16 km)	95 ft. (29 m)	116

Example:
The RF radio modem has the following parameters:

- Maximum RF TX power setting = 30 dBm (1 Watt)
- RF RX sensitivity = -100 dBm (this is a constant)
- Antenna gain (standard equipped dipole) = 2.1dBi x 2 = 4.2dBi

So the system operating margin is 30 - (-100) + 4.2 = 134.2 dBm. This is enough to transmit 10 miles if free-space was the only loss in the system. For this to be the case, the antennas must be mounted with a combined height greater than 95ft above all obstructions (including the ground) to keep the Fresnel zone clear. In practice however, there are many losses in the system besides just free-space and it is recommended there be at least 20dB extra system operating margin.
RF “Rules of Thumb”.

- Doubling the range with good RF “Line of Site” (LOS) requires an increase of 6 dB.
- Doubling the range without good RF LOS requires an increase of 12 dB.

www.macurco.com 1-877-367-7891 info@macurco.com 1504 W 51st St. Sioux Falls, SD 57105

2.4.2 ANTENNA SELECTION AND LOCATION

A site survey using an RF spectrum analyzer and test radios is highly recommended.
The location of the antenna is very important. Ensure the area surrounding the proposed location is clear of objects such as other antennas, trees or power lines which may affect the antenna's performance and efficiency. It is also vital that you ensure the support structure and mounting arrangement is adequate to support the antenna under all anticipated environmental conditions. The choice of appropriate mounting hardware is also important for both minimizing corrosion and maintaining site intermodulation performance.

Most 900MHZ installations utilize locally mounted dipole antennas. However, there are also Yagi and Fiberglass 8dBi Collinear antennas available.

2.4.3 WATER-PROOFING ANTENNA CONNECTIONS

Water-proof all outdoor coax connectors using a three layer sealing process of initial layer of adhesive PVC tape, followed by a second layer of self-vulcanizing weather-proofing tape such as 3M 23 with a final layer of adhesive PVC tape.

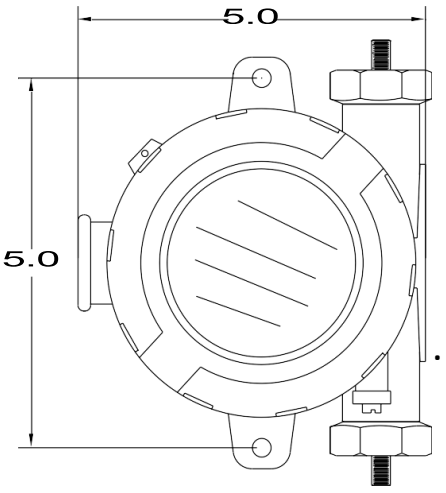
2.4.4 SYSTEM GROUNDING

Direct grounding of the TXP-WRR enclosure via a good electrical connection to a well-designed grounding system is essential. This will protect your system, reduce damage that can occur during lightning strikes and reduce noise.

Chapter 3 Installation Instructions

3.1 MOUNTING THE ENCLOSURE

The TXP-WRR standard enclosure is a cast aluminum explosion-proof (NEMA 7) enclosure as shown in Figure 3-1.



¾" NPFT HUBS
(3 places)
TXP-WRR with 2 Antenna
Fittings in 2 hubs
.3" Mounting Holes (2 places)

Figure 3-1 TXP-WRR Explosion Proof Enclosure

www.macurco.com 1-877-367-7891 info@macurco.com 1504 W 51st St. Sioux Falls, SD 57105

WARNING: Qualified personnel should perform the installation according to applicable electrical codes, regulations and safety standards. Ensure correct cabling and sealing fitting practices are implemented. Install the ST-97 to a wall or bracket using the predrilled mounting flanges with I.D. 0.25 on 5 inch centers (Figure 3-1). If conduit is rigid and able to support the weight of the TXP-WRR, the mounting bolts may be omitted.

3.2 TXP-WRR DISPLAY ASSEMBLY

Modular design simplifies the installation of the TXP-WRR. A top Display Assembly is mounted with captive thumbscrews and is easily removed to access field-wiring terminals.

3.3 I/O POWER SUPPLY BOARD

The bottom I/O Power Supply board generates voltages needed for LCD, relays, and radios. 10-30VDC must be applied to TB2 in order to power the TXP-WRR.

CAUTION: Alarm relays have dry contacts and power must be supplied from an external source. If this power source exceeds 3 amps users should consider fusing relay wiring with 3 amp fuses. Contacts are rated for RESISTIVE loads! Inductive loads, such as contactor coils or motors, may cause contact arcing, which shortens life and emits RFI into the sensor signals. Use appropriate arcing snubbers and MOV's across inductive loads and keep wiring away from signal wires.

Relay terminals are labeled NO (normally open), NC (normally closed) and COM (common). These designators correspond to the shelf, or de-energized, state of the relays.

AC or DC power supplies to relays on the Power Supply/Relay PCB must be the same for each relay. Example: 24VDC should not be the power switched by one relay and 115VAC by others.

The K5 Relay is a failsafe relay. This relay will remain energized unless there is a loss of communication with the server or a loss of power to the unit. Power to the TB3 terminals may be tied to the 10-30VDC from TB2 to ensure common power and ground.

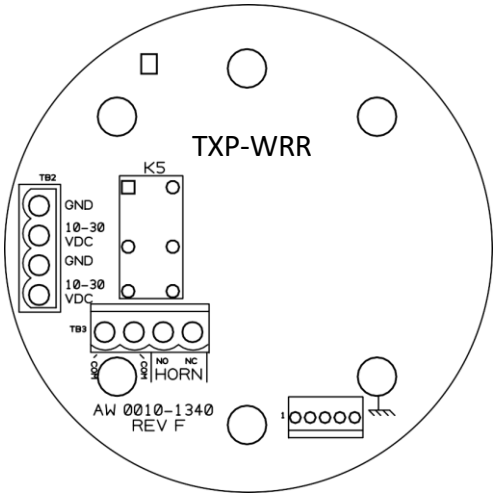


Figure 3-3 I/O Power Supply Board

www.macurco.com 1-877-367-7891 info@macurco.com 1504 W 51st St. Sioux Falls, SD 57105

3.4 RF BRIDGE BOARD

The RF Bridge Board is installed piggy backed to the Display Assembly for easy access to the Port two radio module. The TXP-WRR RF Bridge Board contains connections for the 900MHz Radio Module which can be used for Port 2 radio communication.

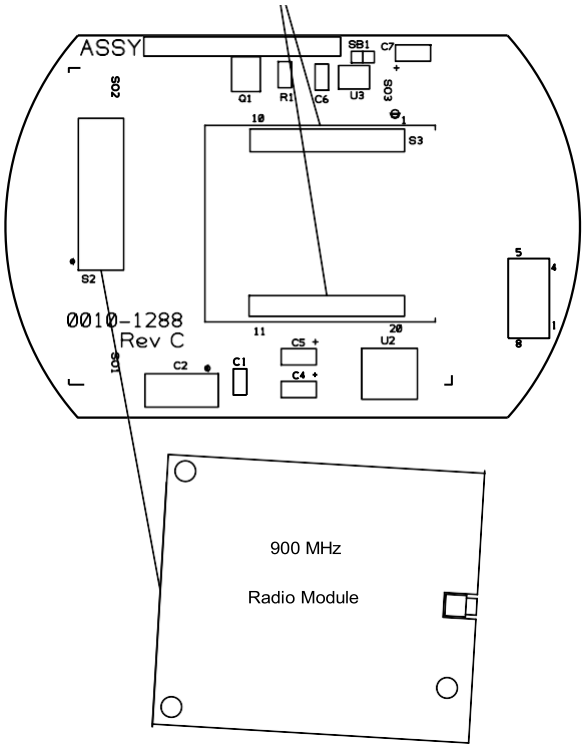


Figure 3-4 TXP-WRR Bridge Board Showing Radio Module Connections

Chapter 4 System Configuration

4.1 MENUS DATABASE CONFIGURATION

All TXP-WRR configuration variables are stored in its non-volatile menu database. Upon installation, many menu items will contain default values from the factory and require changes to better match a user's particular application. Menus may be configured from the magnetic keypad in just a few minutes per channel. The configuration menus trees are shown in Figure 4-1 and the description follows.

www.macurco.com 1-877-367-7891 info@macurco.com 1504 W 51st St. Sioux Falls, SD 57105

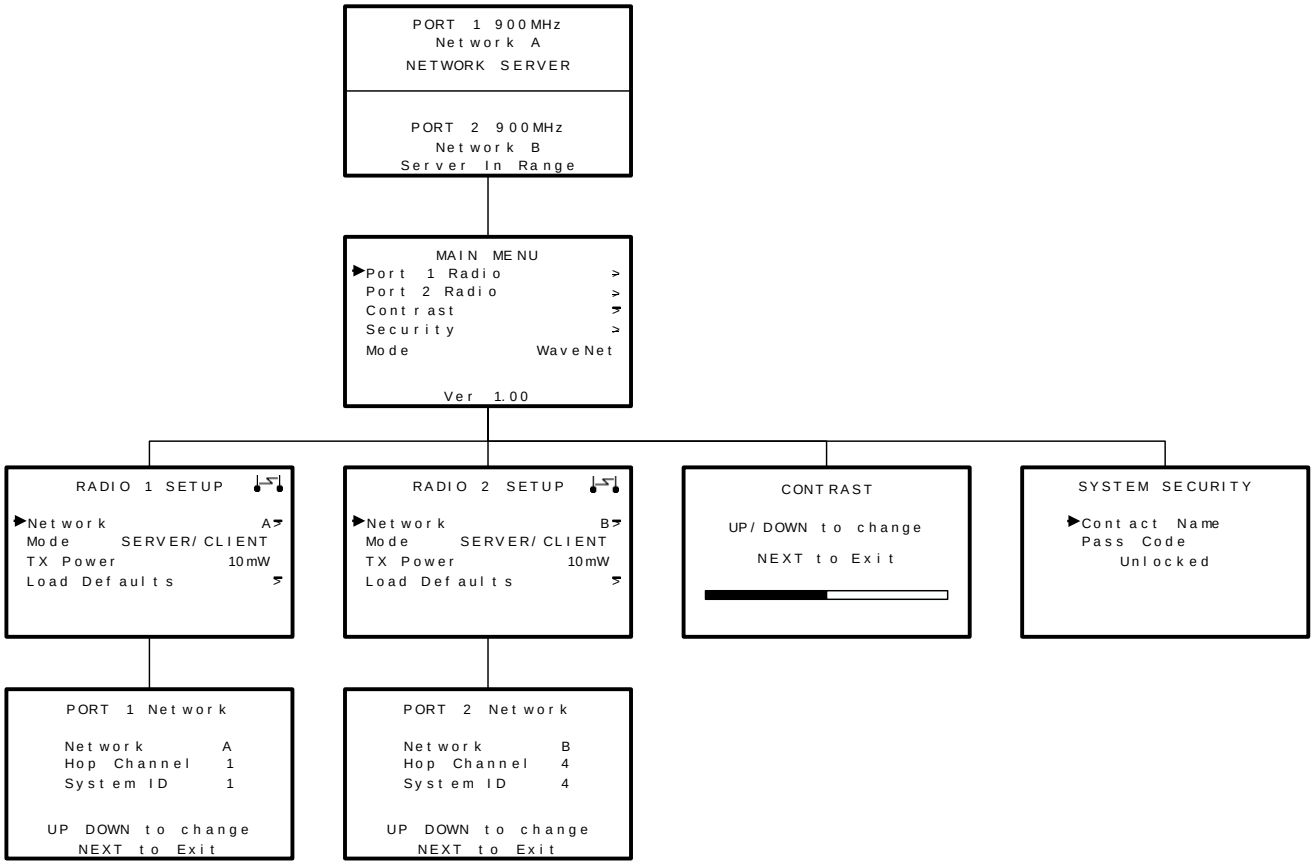


Figure 4-1 TXP-WRR Menu Tree

4.2 MAIN MENU

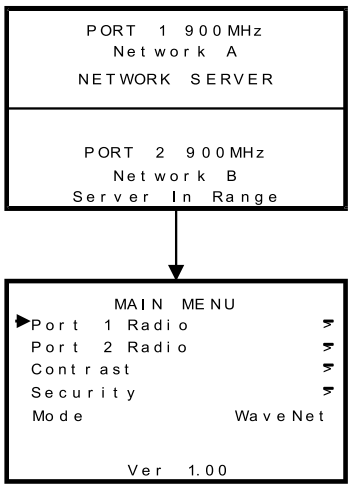


Figure 4-3 TXP-WRR Main Menu

4.3 PORT 1 RADIO AND PORT 2 RADIO

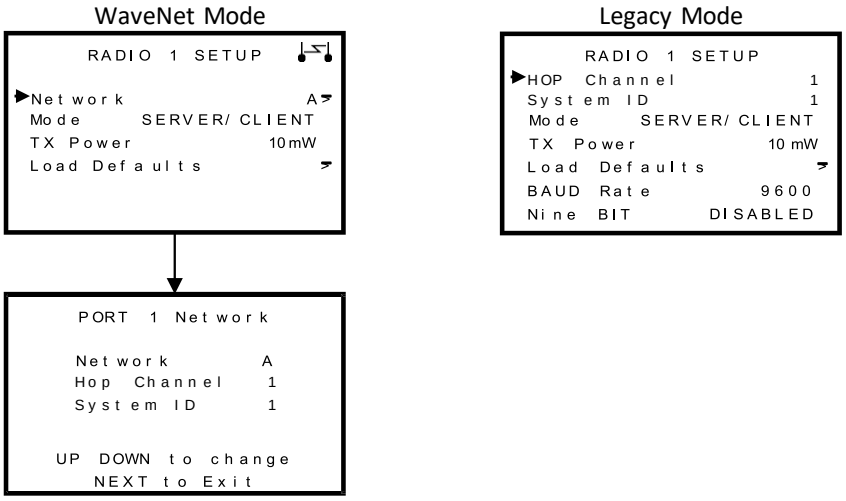


Figure 4-4 Radio Menus

4.3.1 NETWORK MODE

Note: Only one TracXP device may be configured as the **Server** per network.

TracXP devices utilize the **Network ID** setting to assign up to 26 unique hopping patterns. To simplify system setup, **Network ID** is entered using letter designators "A" through "Z" where A = [Hop Channel 1, System ID 1] and Z = [Hop Channel 26, System ID 26]. A TXP-WTA will not indicate Server In-Range status or communicate with any TXP-WTA, TXP-WRR and/or TXP-WAR operating on a different **Network ID**. This feature allows multiple TracXP wireless systems to be located within range of each other without interference.

Networks M through Z are encrypted networks. When one of these networks is selected the data will be encrypted via proprietary methods to ensure that only devices on that network, which hold the encryption key, will be able to decipher the data being transmitted.

IMPORTANT! If an encrypted network is selected, both radios must be set to different encrypted networks. The TXP-WRR does no protocol conversion therefore encrypted data coming in /out on one network will still be encrypted on the other.

IMPORTANT! Explore what frequencies are appropriate for the final location of any wireless system.

4.3.2 TX POWER

www.macurco.com 1-877-367-7891 info@macurco.com 1504 W 51st St. Sioux Falls, SD 57105

Note: ***TX Power*** menu settings are available to improve communications reliability by increasing the power of wireless broadcasts.

TX Power may be set for 10mW, 200mW, 400mW and 1W (EIRP based upon a 2 dBi antenna). The maximum **TX Power** setting is 30db (1 watt), and each time TX power is reduced by half, antenna transmit power is reduced by 3dB.

4.3.3 BAUD RATE

This setting allows the user to set the data rate of the communication port. The options include **9600, 19200, 38400, 57600 and 115200.**

4.4 CONTRAST MENU

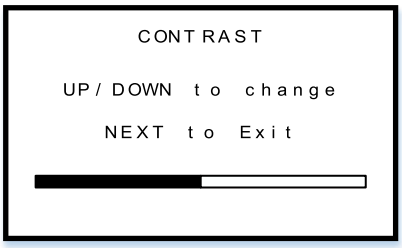


Figure 4-5 Contrast Menu

The Contrast Menu allows the user to adjust the LCD contrast for ambient lighting conditions and user preference. Swipe the UP key to darken the display contrast. Swipe the DOWN key to lighten the display contrast.

4.5 SYSTEM SECURITY MENU

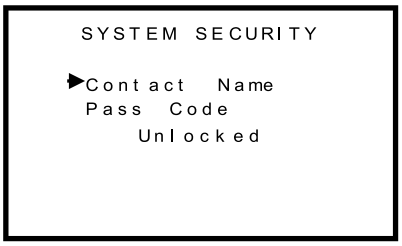


Figure 4-6 Security Menu

The System Security Menu allows locking of all configuration variables by requiring a 4-digit Pass Code prior to altering menus. Contact Info is a 15 character ASCII field available for displaying a phone # or name of personnel in possession of the Pass Code. Lost Pass Codes may be recovered by entering the locked System Security Menu, and holding the UP key for 5 seconds, at which time the 4-digit Pass Code will appear at the bottom of the screen.

4.6 RADIO MODE

WaveNet Mode should be selected when using the TXP-WRR within a TracXP Wireless System

www.macurco.com 1-877-367-7891 info@macurco.com 1504 W 51st St. Sioux Falls, SD 57105

which utilizes the TXP-WCR as the server. In some installations, it may be desirable to make the TXP-WRR the server. If its location is more central to all radios in the network or is in range of units that are out of range of other nodes.

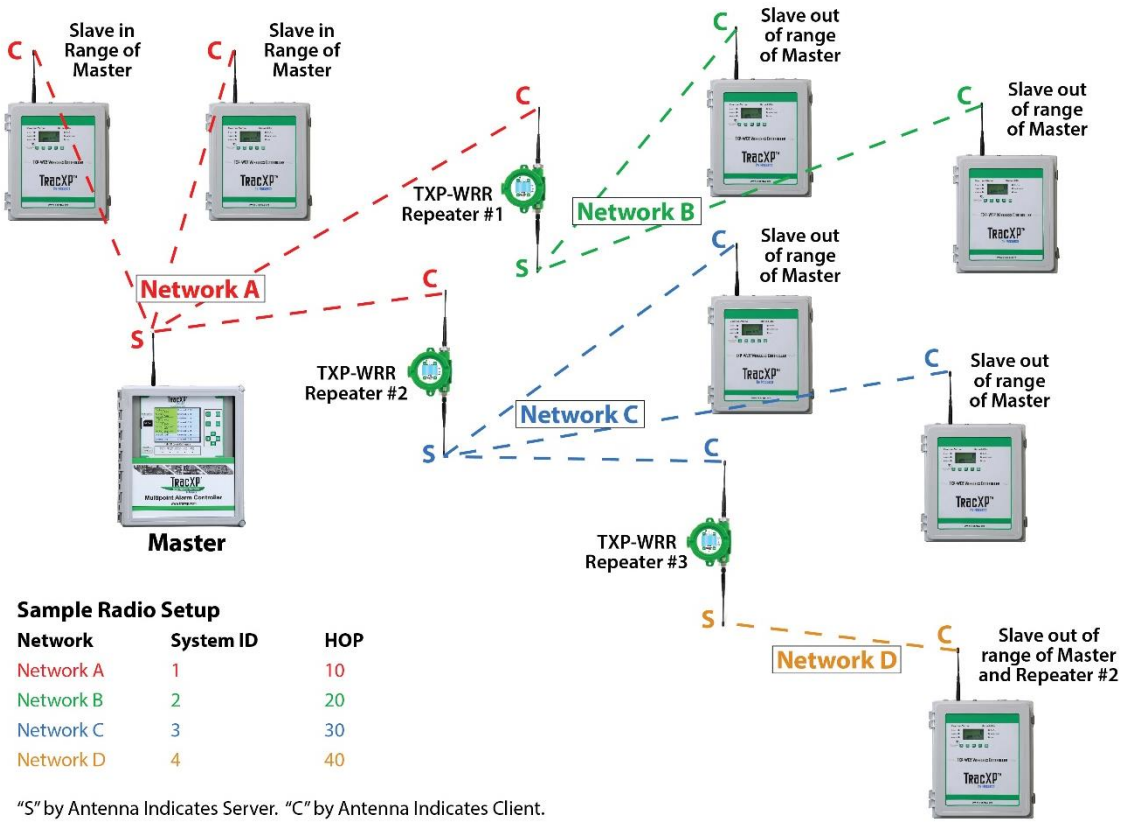


Figure 4-7 Example TXP-WRR Configuration

Figure 4-7 shows a number of scenarios in which the TXP-WRR may be used. All four networks in this figure are being polled over Modbus from a single Master unit utilizing wireless Modbus.

Network A is attempting to get information from seven other controllers. From the top left of the diagram, the first two controllers are within range and are utilizing the wireless Modbus protocol. The next two are out of range of the Master, so an TXP-WRR is being used to "Bridge" the units to the Master. In this instance the TXP-WRR has one radio configured as a client on the Master's network (Network A), and the second radio configured as a Server on Network B. Now, the Master's Modbus queries reach across Network A, pass through the TXP-WRR out to the out-of-range clients on Network B and back to the Master.

Repeater #2 works in the same way as Repeater #1 utilizing Network C, and using a second repeater (Repeater #3) to even further expand the reach to a remote Slave unit over Network E.

www.macurco.com 1-877-367-7891 info@macurco.com 1504 W 51st St. Sioux Falls, SD 57105

Chapter 5 Macurco Gas Detection Product limited warranty

Macurco warrants the TXP-WRR will be free from defective materials and workmanship for a period of two (2) years from the date of manufacture, provided it is maintained and used in accordance with Macurco instructions and/or recommendations. If any component becomes defective during the warranty period, it will be replaced or repaired free of charge, if the unit is returned in accordance with the instructions below. This warranty does not apply to units that have been altered or had repair attempted, or that have been subjected to abuse, accidental or otherwise. The above warranty is in lieu of all other express warranties, obligations, or liabilities. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE LIMITED TO A PERIOD OF TWO (2) YEARS FROM THE PURCHASE DATE. Macurco shall not be liable for any incidental or consequential damages for breach of this or any other warranty, express or implied, arising out of or related to the use of said gas detector. The manufacturer or its agent's liability shall be limited to replacement or repair as set forth above. Buyer's sole and exclusive remedies are the return of the goods and repayment of the price, or repair and replacement of non-conforming goods or parts.

Macurco Inc.

1504 W 51st Street
Sioux Falls, SD 57105

Technical Support Contact Information

Phone: 1-844-325-3050
Fax: 1-605-951-9616
Email: support@tracxp.com
Website: www.tracxp.com/support/

General Contact Information

Phone : 1-877-367-7891
Fax : 1-605-951-9616
Email: info@tracxp.com
Website: www.tracxp.com

Rev – 1.0
Issue Date: 7-12-2024
Document No: 34-2900-0000-1