

- A** Cordless Interface
- B** Continuity / Talk LED
- C** Unlock Button
- D** Function Switch
- E** Polarity LEDs
- F** RJ-45 to RJ-11 Adaptor
- G** RJ-45 Jack
- H** Battery Test / Cadence LED
- I** Warble / Pulse Button
- J** Alligator Clips

84-854  
7/03

## ***Introduction:***

*The FOX 2 is the next generation version of Triplet's popular FOX Tone Generator. The FOX 2 incorporates numerous improvements, born from years of experience with the original FOX design, and from working with our customers to provide cable tracing solutions. Many new features like TrueTrace and 120VAC Line Cross protection are time saving and convenient for the user. In addition, unique features of the original FOX design, like the Line Powered Tone Generation mode, are retained. The FOX 2 sets a new standard for cable tracing technology.*

## ***Features:***

- "TrueTrace" - Cadence of tracer tone changes when pair is momentarily shorted, allowing for definite ID of target wire pair*
- Cordless Phone Interface - use a standard cordless phone for hands-free TrueTrace!*
- 3 Methods of Connectivity*
  - RJ-11 plug for tracing Telephone lines*
  - RJ-45 Jack for tracing LAN cables*  
*(trace BNC cables w/ optional RJ-45 to BNC adaptor)*
  - Alligator clips for connection to stripped wires or terminal panels*

- *“Trip-Latch” a unique latch testing technique using “TrueTrace” for testing Alarm Sensors*
- *Overload Protected - 120VAC Line Cross Protection*
- *Overload Warning Beeper - alerts user to potential hazards*
- *Warble/Pulse Tracer Tone - Selectable tone for audible & visual ID using Hound or Hound 2 Probe Inductive Tracer*
- *High Output Tracer Tone*
- *Generates 2 of 6 user selectable Tracer Tones*
- *Internal User Selectable Settings - HI/LO Pitch Shift, Warble/Continuous Tracer Tone, On/Off Audio Pilot Tone, On/Off Cadence Shift*
- *Tone/Battery LED - indicates that Tracer Tone is on and battery is OK*
- *Audio Pilot Tone - confirms the Tracer Toner signal*
- *Visual & Audible Continuity Test*
- *Red/Green Telephone Line Polarity LEDs - also indicates AC/RING Signal*
- *Supplies “Talk Power” to allow communicating between handsets (talksets) or powering a telephone*
- *Line powered in Tone Mode*
- *Built in Telephone Ringer*
- *“Power Latch” - prevents accidental turn-ons*
- *Magnetic Back - stick the Fox 2 to steel surfaces*
- *Works with either Hound or Hound 2 Probe Inductive Tracer*
- *Powered by standard 9 Volt Battery (not included)*

## **Safety Warnings and Cautions:**

*The FOX 2 is designed to tolerate momentary unintentional application of 120VAC to all of its external connections. A warning beeper sounds when 120VAC is accidentally applied. **The FOX 2 is not designed to be used as a 120VAC detector. Although the FOX 2 will tolerate 120VAC without damage, a shock hazard is present. The user may be injured by electrical shock. The circuitry in the FOX 2 is designed to reduce the possibility of damage to the product, not to guarantee that the user will not be injured.***

- 1) Do not use the FOX 2 as a 120VAC voltage detector.*
- 2) The 120VAC warning beeper will not sound if the battery is dead. Do not rely on the beeper to indicate the presence of dangerous voltages.*
- 3) The 120VAC protection circuit in the FOX 2 uses a light bulb, whose glow can sometimes, but not always, be seen thru the FOX 2's case. Do not rely on this visual indication to determine the presence of dangerous voltages.*
- 4) The FOX 2 is not designed to tolerate accidental application of voltages exceeding 132VAC 60Hz. Applying higher voltages may cause damage to the FOX 2, and may injure the user.*
- 5) The FOX 2 is not designed to indicate any degree of precision in the accidentally applied voltage. That is, when the warning beeper sounds, this does not mean that exactly 120VAC is present. The warning beeper will sound for voltage from approximately 80VAC to 132VAC.*

- 6) *Use care when connecting the FOX 2 to any wire or cable. An unexpected dangerous voltage may be present, which may result in injury to the user.*
- 7) *Potentials applied to any connection of the FOX 2 may appear on other FOX 2 connections. For example, a potential applied to the alligator clips may appear on the RJ-45 jack and the Wireless Interface plug. This could pose a shock hazard to the user, if for example, a LAN cable with 120VAC on it is connected to the FOX 2. The 120VAC may appear on the alligator clips, and shock the user.*
- 8) *The FOX 2 is designed to tolerate accidental application of 120VAC across its alligator clips, across the Wireless Interface plug, and across its RJ-45 jack. However, there is no protection circuitry to protect against the application of 120VAC between the different connections. For example, a 120VAC connection between the Wireless Interface plug and the alligator clips is not protected. Product damage and user injury may result if 120VAC is applied in this manner.*
- 9) *The 8 pins of the RJ-45 jack are separated into 2 groups of 4 pins. The 4 pins are shorted together in each group. The FOX 2 applies its Tracer Tone across these groups. The FOX 2 is protected against the application of 120VAC across these groups. If 120VAC is applied to the RJ-45 jack in a manner that causes the voltage to be applied to the pins within one of the groups, the 120VAC will “see” a dead short. This may result in damage to the product or injury to the user.*

- 10) Use caution when working with telephone lines. They can support dangerous voltages. 50VDC is often present, and 100VAC may be present during ringing. Additionally, telephone lines may support dangerous levels of common mode voltages. In some circumstances, user injury may result.
- 11) Use caution when working with any long unconnected wire or cable. Under some conditions, unconnected wires may "float up" to dangerous potentials, and touching them may result in user injury.

### **Specifications:**

#### **Telephone Line Polarity Test:**

**Indication:** Green or Red LED lights for Normal or Reversed polarity

**Load:** Approx. 13mA at 50VDC (usually less than off-hook recognition current)

**Protection:** Tolerates momentary 120VAC Line Cross without damage.

#### **Telephone Line Ringer and Visual Ring Indication:**

**Indication:** Red and Green LEDs light simultaneously, Beeper sounds

**Protection:** Tolerates momentary 120VAC Line Cross without damage.

**Tracer Tone (with fresh battery):**

**Waveform:** Differentiated Square Wave

**Level:** Approx. 12Vpp (+5dBu, 600 Ohm) into an open circuit (unterminated cable or telephone line)

Approx. 4Vpp (-20dBm) into a 600 Ohm load (terminated telephone line)

**Frequencies:** 4 frequencies located between 600Hz and 2000Hz, depending on user setting

**Types:** Warble, Continuous, Pulse

**Audio:** Low level pilot tone verifies tracer tone is active

**TrueTrace Cadence:** Slow, approx 2Hz

Fast, approx 7Hz

**TrueTrace Response Time:**

500 milliseconds max at 100 Ohms or less

1 second max at 10K Ohms

**TrueTrace Threshold:** 10K Ohms or less

**Internal Settings:** Warble or Continuous Tracer Tone

Hi or Lo Pitch Tracer Tone

Pilot Tone On or Off

TrueTrace On or Off

**Protection:** Tolerates momentary 120VAC Line Cross without damage.

**Connections:** RJ-45 Jack for connection to LAN cable  
RJ-45 to RJ-11 Adaptor Cable for connection to telephone line  
Color Coded Alligator Clips for connection to stripped wires or terminals  
RJ-11 Plug for connection to Wireless Telephone

**Wireless Telephone Interface:**

Tracer Tone signal is applied to RJ-11 plug for connection to wireless phone base station. Level is approx. -20dBm when connected to the base station. Loop current is not supplied.

**Protection:** Tolerates momentary 120VAC Line Cross without damage.

**Audible Continuity:** Beeper sounds when continuity is established

**Threshold:** Typically 500 to 1000 Ohms w/ new battery

**Open Circuit Voltage:** 10V max.

**Test Current:** 60mA max

**Visual Continuity:** LED lights when continuity is established

**Threshold:** Typically 2K Ohms w/ new 9V battery

**Open Circuit Voltage:** 10V max.

**Test Current:** 30mA max



**Talk Power:**

**Open Circuit Voltage:** 10v max.

**Current (Short Circuit):** 30mA max

**Current with 1K Loop:** Typically 5mA w/ new 9V battery

**120VAC Warning:** When in the OFF / POLARITY mode, the Red and Green Polarity LEDs light simultaneously when 120VAC is present. The 9V battery may or may not be installed. In all modes, the beeper sounds in staccato fashion, i.e. beep-beep-beep-beep etc. The 9V battery must be good for this to work. The applied voltage must not exceed 132VAC 60Hz or damage to the product and user injury may result.

**Power:**

**Battery:** Standard 9V Alkaline Battery

**Battery Life:** Approx. 100 hours continuous in Tone Generator mode

**Telephone Line Powered Operation:** Tone Generator operates without 9V battery installed. Operates from standard telephone line (46 to 53V, 400 to 1800 Ohms) in normal or reverse polarity.

**Dimensions:**

**Case:** 3.75"H x 2.5"W x 1.25"T

**Leads:** Alligator Clips: Typically 10 inches long

**Wireless Interface:** Typically 7 inches long

**RJ-45 to RJ-11 Adaptor:** Typically 10 inches long

**Weight:** Typically 6 ounces including battery

## **Using the FOX 2**

### **Power Latch:**

*The Power Latch feature of the Function switch prevents accidental turn-on of the FOX 2. To apply power to the FOX 2, press the Unlock button down while sliding the Function switch from the OFF / POLARITY position to one of the other switch positions.*

### **Telephone Loop Current and Line Polarity Testing:**

*The polarity of the DC loop current on standard analog telephone lines can be tested. In telephone circuits, the green and red wires are identified as Tip and Ring respectively. Remember, Ring is red. In telephone circuitry, the red wire is negative polarity, not positive. (Note: The Ring just mention has nothing to do with a phone ringing.)*

*The FOX 2 will determine if a line has Loop Current (is "live", i.e. connected to the phone system), and what the polarity of the current is.*

*With the provided RJ-45 / RJ-11 Adaptor cable plugged into the FOX 2, plug the RJ-11 end into the modular telephone jack to be tested. If the line is live and the polarity is correct, the green NORM (Normal) LED will light. If the polarity is backwards, the red REV (Reversed) LED will light. If neither LED lights, the line is "dead".*

*To test polarity using the clip leads, connect the red clip to the Ring wire, and the green lead to the Tip wire. If the line is live and the polarity is correct, the green NORM (Normal) LED will light. If the polarity is backwards, the red REV (Reversed) LED will light. If neither LED lights, the line is "dead".*

**Note:** *On analog phone lines, Reversed polarity seldom causes a problem. Many modular cords and couplers reverse the polarity of the phone line passing through them.*

### **Telephone Ringer:**

*The FOX 2 can be used as a telephone ringer, as long as the 9 volt battery is good. This because the FOX 2's OFF / POLARITY mode will not cause an off-hook condition on most phone systems, which will allow the system to generate a ring signal. With the FOX 2 set to OFF / POLARITY, connect the RJ-11 or the clip leads to the telephone line. Polarity is not important, although the ringer functions a little differently depending on polarity. Either the NORM or the REV LED should light. If one of the LEDs does not light, the line is "dead" and cannot "ring".*

*When the FOX 2 receives a ring signal, it will produce a beeping sound and the NORM and REV LEDs flicker. Due to a time delay in the FOX's circuitry, the FOX usually misses the first ring signal.*

**Note:** *Although the FOX's ringer will not sound when the 9 volt battery is dead, the NORM and REV LEDs will flicker during a ring signal..... even with a dead battery.*

### **Continuity Testing:**

*The FOX 2 has both audible and visual continuity tests. Usually, continuity tests are performed using the red and green clip leads..... although it will also work through the RJ-45 / RJ-11 Adaptor cable. For the greatest degree of safety, use the clip leads.*

*To test for continuity, select the desired mode (either AUDIBLE CONT or VISUAL CONT / TALK) and then connect the clip leads to the circuit to be tested. If there is continuity, either the beeper will sound or the VISUAL CONT / TALK LED will light.*

**Helpful Hints:**

*The FOX 2's 120VAC protection circuitry may prevent the continuity beeper or LED from sounding or lighting if the clip leads are connected to the circuit to be tested before the FOX 2's switch is set to the AUDIBLE CONT or VISUAL CONT / TALK position. To use the FOX 2's continuity testing features, set the switch on the FOX 2 to the AUDIBLE CONT or VISUAL CONT / TALK position before connecting the FOX 2 to the circuit to be tested.*

*If the circuit being tested has AC or DC voltage present, the FOX 2 may not identify continuity correctly.*

**Battery Test:**

*A continuous battery test is performed while in the FOX 2 is in the TRACER TONE mode. If the battery is good, the BATTERY TEST LED will flash. If the battery is weak, the LED will not flash.*

**Helpful Hints:**

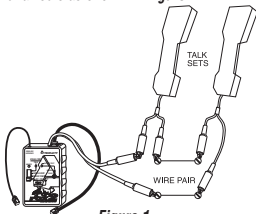
*The FOX 2 will often work in the TRACER TONE mode long after the LED has stopped flashing. However, for the strongest tracer signal, the battery should be replaced soon after the LED stops flashing.*

The *AUDIBLE CONT* mode draws more power than the *TRACER TONE* mode. Because of this, it is sometimes possible for the battery to test OK, and for the *TRACER TONE* mode to work, but for the *AUDIBLE CONT* mode not to work. This happens when the battery is weak, with enough power to operate the *TRACER TONER* mode, but not enough power to operate the *AUDIBLE CONT* mode. This condition is most often seen when a carbon zinc battery is used instead of an alkaline battery. If the *FOX 2* behaves strangely in *Beeper* mode, install a new battery.

### **Talk Power:**

"Talk Power" can be used as a power source to operate telephone linesman's talksets ("buttsets") when *CO* power is not available. The *VISUAL CONT / TALK* mode is used to supply talk power.

Set the switch on the *FOX 2* to *VISUAL CONT / TALK*, and connect the talksets as shown in **Figure 1**.



**Figure 1**

### ***Cordless Interface:***

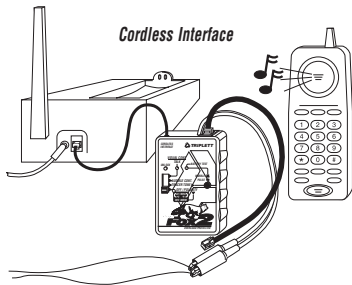
*The FOX 2 's cordless interface allows the tracer tone to be sent to the base station of a cordless telephone. This permits the user to monitor the tone with the cordless handset. Using this feature, the user can identify wires without using a HOUND. In some instances, a HOUND can be difficult to use to identify the target wires. The cordless handset can be a valued test tool in these cases.*

*For example, when attempting to identify a target pair of wires in cramped quarters (like a crawl space), it can be difficult to hold the HOUND, keeping its power button depressed, and grab the suspect wires, and selectively short out the wires, looking for the target pair.*

*Using the cordless interface, the user simply takes the cordless handset with him, and when in position and ready to start shorting out wires, turns on the handset and setting it to maximum volume. He can then set the handset down, and using both hands, begin selectively shorting the suspect wires while listening to the tracer tone through the handset. With the TrueTrace feature in the FOX 2, when the target pair is found and shorted, the cadence of the tracer tone will change.*

*The cordless interface may also be useful in areas where 60Hz Noise from fluorescent lights or other equipment interferes with the performance of a HOUND or other receiver. Cordless phones are usually designed to ignore such interference, and will usually provide a much cleaner tone than obtainable with a HOUND.*

To use the Cordless Interface, simply plug the Cordless Interface's RJ-11 plug into the base station of the cordless phone to be used (see **Figure 2**). A modular extension cord can be used if the cordless base station cannot be positioned next to the FOX 2. Test the setup by setting the FOX 2 to TRACER TONE, and turning on the cordless handset. The tracer tone should be heard clearly in the handset. Momentarily short the clip leads of the FOX 2 together. The cadence of the tracer tone should change. Connect the clip leads to the wires of interest. Proceed to other end of the cable, taking the cordless phone with you, and locate the target wires by momentarily shorting the suspect wires together until the cadence of the tracer tone heard on the handset changes.



**Figure 2**

*If testing sensors on a security system, the user can connect the FOX 2 to the wire pair of interest, proceed to the location of the sensor with the cordless handset, actuate the sensor, and listen for the cadence change on the handset. For example, a door or window can be opened and closed to actuate its magnetic sensor, which is verified by the cadence change.*

**120VAC Warning:**

*The FOX 2 provides an audible warning that 120VAC has been connected to the product. This is intended to provide the user with a warning that an unexpected potentially dangerous voltage is present. This feature works in all test modes. When activated, the FOX 2 begins beeping on and off. **The 9 volt battery must be good for this feature to work.***

*See the **Safety Warnings and Cautions** section for additional information concerning this feature.*

**120VAC Protection:**

*The FOX 2 is 120VAC line cross resistant. This means that in the great majority of cases, the FOX 2 will tolerate the accidental application of 120VAC without damage. This feature works in all modes. The 9 volt battery is not required for this to work.*

*See the **Safety Warnings and Cautions** section for additional information concerning this feature.*



## **Wire Tracing:**

*The FOX 2 has some unique wire tracing features that improve the user's ability to perform a quick and reliable trace. When used in conjunction with the appropriate receiver, like a HOUND or HOUND 2, the FOX 2 can be used to trace and locate wires in cables and in wood frame construction. There are several common test scenarios..... tracing wires through walls or ceilings, tracing wires in multiwire cables or harnesses, and locating breaks in wires. In addition to obvious residential and commercial uses, the FOX and HOUND has also been used on radio towers, in cars, boats, and even submarines.*

## **General Wire Tracing Information:**

- The FOX 2 will not trace "live" AC or DC power wires. It is protected against accidental application of 120VAC ("line cross").*
- The only type of "live" circuit that the FOX 2 will trace is a telephone circuit.*
- The FOX 2's tracer tone will not penetrate electrically conductive materials..... like any kind of metal or wet earth. This means that the HOUND cannot pickup the tone if the target wire is in a metal conduit or is underground. The HOUND will pickup the tone at locations where the target wire emerges from the conduit or the earth.*
- The FOX 2's tracer tone will penetrate wood frame walls and ceilings, and plaster and drywall. Under good conditions, a HOUND can pickup the tone from a foot or more away from the target wire.*

- *The FOX 2's tracer tone will pass through any electrical circuitry connected to the target wire(s). Hence, to identify a specific wire, it will be necessary to disconnect all loads and circuitry from the wire. This includes switches, capacitors, resistors, coils, transformers, lights, motors, etc.*
- *The FOX 2 tracer tone can be shorted out by any loads on the target wire. All loads must be disconnected from the target wire.*

### ***Crosstalk and TrueTrace:***

*Crosstalk is the bleeding of the tracer tone from the target wire onto adjacent wires. This often happens in multiwire cables, or in cable harnesses where many wires are bundled together in close proximity to each other. A tracer tone applied to a target wire or wires may crosstalk onto adjacent wires. Some wires/cables are constructed to reduce the crosstalk, but other wire/cables crosstalk readily. So much crosstalk can occur that the tracer tone on the adjacent wires can be almost as large as the original tone on the target wire. This can make it difficult to identify the target wire with the HOUND or HOUND 2 (Receiver). The traditional method of trying to determine if the tone being received is the original tone, or is crosstalk, is to short out the wires with the tone where the HOUND is being used. If shorting the wires only reduces the tone's level, but does not completely kill it, then the shorted wires have crosstalk on them, and are not the target wires. If shorting the wires completely kills the tone, then its likely that the wires are the target wires. Unfortunately, this is not 100% effective. The FOX 2 uses*

**TrueTrace** .... a test technique which greatly improves the accuracy of the trace. Shorting the target wires together causes the cadence (the speed at which the tracer tone warbles or pulses) of the tracer tone to change, positively identifying the target wire(s).

**Helpful Hint:** If the suspect wires are longer than they need to be, the user may not need to strip the wire to bare metal in order to activate the TrueTrace feature. Select a pair of suspect wires. While listening with a HOUND or a cordless phone (see Cordless Interface), use a pair of wire cutters (diagonal cutters usually work best) to slowly apply pressure to the wires. The metal jaws of the cutters will bite through the insulation of the wires as pressure is applied, shorting out the wires and causing the cadence of the tone to change. The pressure can then be released, or the ends of the wires trimmed off.

When the FOX 2 is initially set to the TRACER TONE mode, it may come on with either fast or slow cadence.

### **60Hz Noise and Pulse Tone:**

Although the FOX 2 is not affected by 60Hz Noise, its typical for the HOUND, HOUND 2, or other receivers to pickup and amplify the noise. It usually sounds like a humming or buzzing sound coming from the speaker of the receiver. The noise is usually at its worst around fluorescent lights. The HOUND 2, and other receivers, have a signal strength indicator LED that aids in finding the FOX tone in areas where the background acoustic noise level is so high that the speaker cannot be heard. When the speaker cannot be heard, the HOUND

2's visual signal strength LED aids in finding the tracer tone. The HOUND 2's LED lights more brightly as the HOUND 2 nears a signal source. Unfortunately, the HOUND 2, and most other receivers, cannot differentiate between a 60Hz Noise source and the actual tracer tone. The FOX and most other tone generators generate a continuous or warble tracer tone. Unfortunately, the LED indicator on the HOUND 2, and most other receivers, cannot tell the difference between such tones and 60Hz Noise. Both signals cause the LED to light continuously. Consequently, when the user is unable to hear the speaker, he is not certain whether the LED is indicating 60Hz Noise or actual tracer tone. In addition to a continuous tone and a warble tone, the FOX 2 can generate a **Pulse** tone. Instead of simply lighting the LED on the HOUND 2, the Pulse tone causes the LED to flash, helping differentiate the actual tone from 60Hz Noise (which causes the LED to light continuously).

### **Wire Tracing, Identification, and Open Faults:**

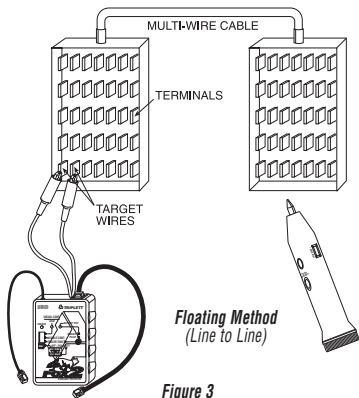
The uses of the FOX 2 Tracer Tone mode can usually be divided into three categories..... tracing, identification, and locating open faults.

### **Wire Tracing Methods:**

There are two basic wire tracing methods..... "floating" and "grounded".

In the **floating method** (also called Line to Line), the tracer tone is applied to two wires (a pair) in the cable or wire harness to be tested. (see **Figure 3**) For example, the FOX 2's red clip is connect to one wire and the green clip is con-

ected to the other wire. This method is often used on telephone, intercom, or alarm wires. The floating method tends to cancel out some of the tracer tone, so a HOUND or HOUND 2 usually works best when the user has access to the wires, and can place the HOUND or HOUND 2 right against the wires. This method identifies the wires as a pair. It will not identify which wire is connected to the FOX 2's green clip or which wire is connected to the red clip.



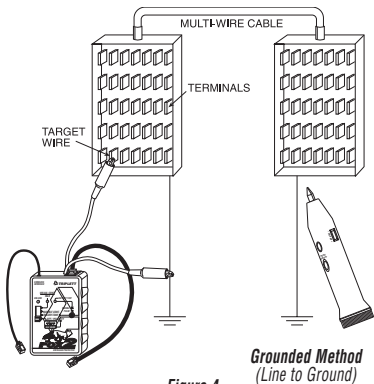
**Floating Method**  
(Line to Line)

**Figure 3**

*For positive identification of the pair, momentarily short the pair to active the TrueTrace feature. If this is the target pair, the cadence of the tracer tone will change.*

*In the **grounded method** (also called Line to Ground), one clip of the FOX 2 (either the red or green) is connected to earth ground or a “fake ground”, and the other clip is connected to the target wire. The target wire can be one wire of a pair or a multiwire cable. (see **Figure 4**) This method creates the strongest tracer tone, and is often used when wires are traced through walls or ceiling. It is also useful for identifying a specific wire within a bundle of wires. If connection to a true ground is not available, a large metal object can be used as a fake ground. For example, a large metal desk or a metal file cabinet can be used. When tracing wires in a car, trailer, or RV, etc. the metal frame or body can be used as a ground. When tracing wires in a boat (that is in the water) with a wood or fiberglass glass hull, any piece of metal that comes in contact with the water can be used as a ground. Simply connect one clip of the FOX 2 to the ground or fake ground, and the other clip to the target wire.*

*TrueTrace can be used in conjunction with the grounded method of tracing if the ground that is used at the FOX 2 location is also available at the end location of the wires. Simply short each suspect wire to the ground while listening for a cadence change with a HOUND or HOUND 2. If water is used as the fake ground, it usually is not conductive enough to activate TrueTrace.*



**Figure 4**

**Grounded Method**  
(Line to Ground)

**Helpful Hints:**

*Extension pieces of wire, or long clip leads, can be used to connect the FOX 2 to a ground or fake ground. The extension wire can be hundreds of feet long if necessary.*

*To test a fake ground to see if it can be used for wire tracing, connect one clip from the FOX 2 to the candidate object (like a metal desk) and the other clip of the FOX 2 to the target wire. Hold a HOUND or HOUND 2 near the object. A "good"*

*fake ground will not radiate much tracer tone. The tracer tone should be much stronger on the FOX 2's other clip. If it is not, the target wire may be shorted to ground, or the fake ground may not be adequate. Generally, the larger the object used as the fake ground, the better it works.*

*If the target wire is somehow connected to ground, this will greatly reduce or kill the tracer tone.*

### **Telephone Wires:**

*The floating method is usually used to locate a pair of wires in a telephone junction block. If the wires are already terminated into a modular telephone jack, simply plug the FOX 2 into the jack (using the RJ-45 to RJ-11 Adapter). This method works with the phone line connected or disconnected from the wires going to the telephone company. A stronger trace is usually obtained if the wires are not connected to the telephone company.*

*If the wires are not connected to the telephone company, the grounded method can be used to trace telephone wires through a wall or ceiling. Use the green and red clips to connect to the phone line and ground.*

*To identify the wires, if using the floating method, momentarily short the target wires together to active TrueTrace, and listen for the cadence change. If it changes, you've found the target pair. If no change occurs, keep searching.*

*To identify the wires, if using the grounded method, momentarily short the target wire to ground to active TrueTrace, and listen for the cadence change. If it changes, you've found*



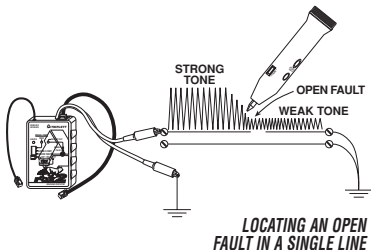
*the target wire. If no change occurs, keep searching. This will not work if a fake ground is being used. An actual ground is required to activate TrueTrace.*

*An "Open Fault" may involve either one or both wires of a telephone wire pair. Finding the open will only work if there are no other faults (like a short to earth ground) in the pair.*

*If the pair is "live", disconnect the pair from the incoming telephone line before trying to locate the open. Short the wires together at the far end and connect the shorted wires to a good earth ground (a fake ground may not work well). At the other end of the wires, connect one of the clips of the FOX 2 to a good earth ground. Experimentally connect the other clip of the FOX 2 to one wire and then the other, while listening to the tracer tone on this clip with a HOUND or HOUND 2. If the level of the tracer tone drops significantly when the clip is connected to one of the wires, this wire is probably OK and the other wire is open. That is, the open wire is the one that doesn't drop the level of the tracer tone. If neither wire drops the level of the tracer tone, they are probably both open (or a good ground has not been used).*

*Leave the clip connected to the wire or wires that do not "load down" the tracer tone. (see **Figure 5**) Using a HOUND or HOUND 2, follow the path of the wires by finding the strongest signal. An abrupt drop in the tracer tone level will occur at the point of the open. Keep in mind, however, if tracing unseen wires in the wall or ceiling, that the wires may pass behind a metal object (like a furnace duct) that prevents the HOUND or HOUND 2 from picking up the tracer signal, or*

*the wires may diverge from the path of the receiver. Before assuming that the open has been located, try finding the signal nearby or in an adjacent attached wall or ceiling. Also keep in mind that it may not be possible to find the open in all situations, because of the number variables involved.*



**Figure 5**

### **Helpful Hints:**

*A "live" telephone line prevents TrueTrace from working correctly. To get TrueTrace to work on a "live" telephone line, the FOX 2 must be connected in Reverse polarity.*

*A pair of wires with an "open" may allow the tracer tone to appear at the far end of the pair, despite the open fault. In this situation, TrueTrace will not work, even though it is applied to the target pair.*

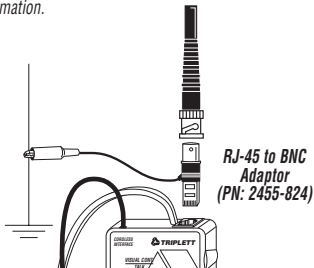
*Do not insert a telephone modular plug (RJ-11) directly into the jack (RJ-45) on the FOX 2. Doing so can damage the jack, resulting in reduced capability when using the FOX 2 to trace LAN cables. Always use the provided RJ-45 to RJ-11 Adapter to trace or test polarity of telephone wires terminated into a modular jack or plug.*

*If attempting to trace a telephone wire terminated in a modular jack, but not connected to the telephone company, through a wall or ceiling, insert the FOX 2's RJ-11 into the jack, and then connect either the red or green clip lead to a ground or fake ground. This will boost the tracer tone, and may provide an adequate trace. The strongest trace will be obtained when using the grounded method and the clips (as described above), but if the hint works, the user won't have to open the modular jack housing to gain access to the wires.*

### **Coaxial Cable:**

*Coaxial cable, like that used for cable TV, satellite TV, closed circuit TV, early LAN systems, etc. is often connected to other cables through splitters, combiners, or amplifiers. In order to trace the cable, it must be disconnected from these "loads". Since coaxial cable is self-shielding, the floating method usually does not work well when tracing the cable. It can be done, but the HOUND or HOUND 2 must be held very close to the end of the cable to pick up any signal. To apply a floating signal to a coax, connect one clip of the FOX 2 to the center conductor of the coax, and the other clip to the shield of the coax.*

The grounded method often works better for tracing coaxial cables. Connect one clip of the FOX 2 to a ground or fake ground, and the other clip to the shield of the coax. This method will cause the coax to radiate enough tracer tone to trace the coax thru drywall. An optional RJ-45 to BNC adaptor is available for this purpose (see **Figure 6**). The adaptor has its own ground clip, so its not necessary to use either of the FOX 2 clips. See the Accessories section for additional information.



**Figure 6**

To identify the coax, if using the floating method, momentarily short the shield and center conductor together to active TrueTrace, and listen for the cadence change. If it changes, you've found the target coax. If no change occurs, keep searching.

*To identify the coax, if using the grounded method, momentarily short the shield to ground to activate TrueTrace, and listen for the cadence change. If it changes, you've found the target coax. If no change occurs, keep searching. This will not work if a fake ground is being used. An actual ground is required to activate TrueTrace.*

**Note:** *It is not unusual for the loose turn-able part of a coaxial connector to have poor electrical contact to the cable shield until it is screwed on to its mating connector. Consequently, TrueTrace may not activate if this part of the connector is contacted.*

*Because of the way that coax is constructed, it is not possible to find an open in the center conductor. It is possible to find an open in the shield, if the shield is not shorted to the center conductor or ground. Connect the center conductor of the coax to earth ground. Connect the shield and center conductor at the far end of the coax to earth ground. Connect one clip of the FOX 2 to an earth ground. Experimentally connect the other clip of the FOX 2 to the shield of the coax, while listening to the tracer tone on this clip with a HOUND or HOUND 2. If the level of the tracer tone drops significantly when the clip is connected to the shield, the shield is probably grounded and can't be traced to the open.*

*If the level of the tracer tone doesn't drop much, leave the clip connected to shield. Using a HOUND or HOUND 2, follow the path of the coax by finding the strongest signal. An abrupt drop in the tracer tone level will occur at the point of the open. Keep in mind, however, if tracing unseen coaxes*

*in the wall or ceiling, that the wires may pass behind a metal object (like a furnace duct) that prevents the HOUND or HOUND 2 from picking up the tracer signal, or the coaxes may diverge from the path of the receiver. Before assuming that the open has been located, try finding the signal nearby or in an adjacent attached wall or ceiling. Also keep in mind that it may not be possible to find the open in all situations, because of the number variables involved.*

### **Power Wires:**

*The FOX 2 cannot trace or identify “live” power wires. To use a FOX 2 to trace a power wire, power must be removed from the wire, and all loads must be removed from the wire. This may be as simple as turning the circuit breaker off, and turning off all of the loads.*

*NM-B (Non-Metallic wires, sometimes called “Romex”) can be traced by putting one clip of the FOX 2 on the ground or neutral, and the other clip on the hot wire. **If the FOX 2 starts beeping, remove it from the wires immediately. The wires are live!** Remove the power source. Trace the wires using a HOUND or HOUND 2 in the usual manner. If the target wires are in a metal conduit, they cannot be traced until they emerge from the conduit.*

*To identify the wires, momentarily short the target wires together to active TrueTrace, and listen for the cadence change. If it changes, you’ve found the target pair. If no change occurs, keep searching. **Warning, take care not to short together live wires!** If this is a possibility, the user may wish to use a light bulb to activate TrueTrace. Simply connect a*

120VAC incandescent bulb (any wattage) across the wires. If it lights, the line is live, if the cadence changes, the target wire has been located, if nothing happens, keep searching.

An adapter with a standard lightbulb base and clip leads can be purchased at your local hardware store.

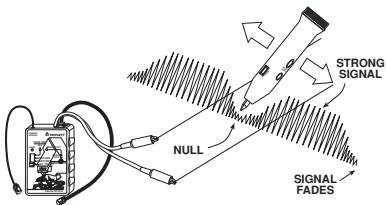
### **Resistance Heating Wires:**

The FOX 2 and a HOUND or HOUND 2 can be used to trace the path of a resistance heating wire in a plaster wall or ceiling. This is usually performed to find an open in the wire. It is best if the user is familiar with resistance heating techniques, particularly in regard to the typical patterns used for the wire path. The wire is usually in a serpentine pattern, with the wire spacing and orientation varying depending on the amount of heat needed in different areas of the room.

Finding the open can be a challenge. Several techniques can be, and should be, used.

It helps if the user performs a few experiments before trying to find the open. (see **Figure 7**) Attach a few pieces of wire (any kind) more than several feet long to each clip of the FOX 2. Lay the wires out on a non-conducting surface (a wood floor with no metal in the vicinity..... nails are OK, but make sure there's no metal furnace duct below the floor) parallel to each other, about 4" apart. Using a HOUND or HOUND 2, trace along one of the wires, in normal fashion, noting how the tracer tone becomes stronger as the wire is approached. Now trace along the other wire, noting that it behaves just like the previous wire. Now, slowly move the HOUND or HOUND 2 from one wire to the other wire. Notice

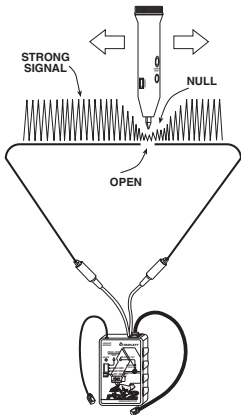
that at approximately the midpoint between the wires, the tracer tone becomes very weak. This is the "null point"..... the place where the signal from one wire cancels the signal from the other wire. Notice how this null differs from simple loss of signal..... that is, there's a very narrow zone where the null occurs, and the signal gets stronger quite rapidly on either side of the null. By waving the HOUND or HOUND 2 back and forth while slowly moving along the length of the wire, the path of the null point can be followed between the wires. These wires can be thought of as being on either side of the open fault..... so by using this technique, it will be possible to localize the area in which the fault occurs.



**Figure 7**

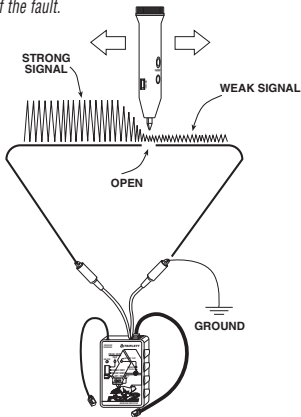


Reposition the test wires so that they are inline with each other, with a small gap between them ( $1/16''$  to  $1/8''$ ). (see **Figure 8**) Again, trace along the length of the wire and note how a null point occurs at the gap. This technique can be used to find the open fairly precisely, if the spacing of the wires and the location of the open lends its to this approach.



**Figure 8**

Now, attach one of the clips and the wire attached to it to a good earth ground. (see Figure 9) The HOUND or HOUND 2 should pickup very little signal from the grounded wire. Move the HOUND or HOUND 2 along the length of the wire and note how a strong signal is picked up on one side of the open fault, and very little signal is picked up on the other side of the fault.



**Figure 9**

*For the most accurate simulation, lay out a serpentine pattern on the floor similar to that in a ceiling, and try to locate an open using the nulling and the grounding technique. Have an assistant position the open fault while you are out of the room, and then cover the wire with cardboard, newspaper, plywood, etc..... and see if you can find the open. You'll probably find that the open is sometimes found in the wrong place. Notice what wire configuration causes this to happen and experiment with the nulling and grounding techniques to see if a method can be figured out that will work in these situations.*

*To test the actual resistance heating circuit, disconnect the ends of the heating wires from the power source. This can usually be done at the thermostat that controls the room. Attach the clips of the FOX 2 to the wires (one clip to each wire) and use the nulling and grounding techniques discussed above, and any other methods learned from your experiments, to find the open fault.*

### **Cars:**

*Wires can be traced in cars or similar metal bodied vehicles using the grounded method. The metal body of the car acts as a ground, and as a shield. This means that, compared to tracing in a wood frame structure, it will be necessary to place the HOUND or HOUND 2 closer to the target wire to pick up a tracer tone.*

*Connect one clip of the FOX 2 to the metal chassis of the car, and the other clip to the wire to be traced. As in other applications, the far end of the wire must be disconnected from*

*any loads or any other wires, or the tracer tone will be shorted out, or it will migrate into other wires. Because wires adjacent to the target wire will often act as shields, and because the wires in cars are often bundled together into harnesses, it may be difficult to follow the target wire through the harness. Try to locate the wire as it emerges from the harness.*

*Use the TrueTrace feature to identify the target wire. Short the suspect wires to the metal chassis to activate TrueTrace, and listen for the cadence change. If more than one wire causes the cadence to change, the wires are somehow connected together, either through a short or through a load (like a light bulb, a switch, a motor, etc.).*

*Find an open fault by tracing along the wire until the tracer tone drops dramatically in level. Shorting the far end of the open wire to chassis ground may help. If the wire is bundled in a harness, it may be difficult, if not impossible to locate the open without unbundling the harness. In these cases, it is sometimes more expedient to run a new wire to replace the open wire.*

### **Boats:**

*Wiring tracing on metal hulled boats is similar to tracing wires in cars (see above).*

*If tracing wires in a boat with a non-conductive hull (wood or fiberglass) that is in the water, the grounded method can be used, but the water will act as the ground. Attach one clip of the FOX 2 to a metal object that is in contact with the*

*water, and the other clip to the wire to be traced. If necessary, attach an extension wire to the FOX 2 so that the clip will reach the “grounded” metal object. If there is no grounded metal object, simply drop the extension wire overboard into the water.*

*If tracing wires in a boat that is out of the water, attach one clip of the FOX to the metal trailer frame, or to a grounded metal object. As before, an extension wire can be used if necessary.*

*Water is generally not conductive enough to activate the TrueTrace feature. If the boat is reasonably small, an extension wire can be attached to the grounded clip and run to the far end of the suspect wire. Short the extension wire to the suspect wire to see if TrueTrace activates.*

### **LAN Cables:**

*Ethernet LAN cables may be traced with the FOX 2. Simply plug the LAN cable into the RJ-45 jack on the FOX 2. If necessary, use a LAN jumper cable to connect between the FOX 2 and a wall jack.*

*An adaptor is available that will allow the RJ-45 jack on the FOX 2 to connect to a coax based LAN with BNC connectors. See preceding information on Coaxial cables.*

***Do not connect the FOX 2 to a live LAN!*** *This will not damage the FOX 2, but it may “crash” the LAN.*

*Due to their construction, LAN cables tend to suppress the tracer tone field. It is often necessary to get close to the*

*cable with the HOUND or HOUND 2 to locate or trace it. To increase the tracer tone strength, connect either clip of the FOX 2 to a ground while the target cable is connected to the RJ-45 jack. However, when using this grounded technique, the tracer tone strength may be so dramatically increased that the tone will crosstalk onto adjacent cables, making the path of the target cable difficult to differentiate from the path of the other LAN cables. This is especially true if the LAN cables are bundled together, which promotes crosstalk.*

*To identify the LAN cable, pair 4/5 must be momentarily shorted to active TrueTrace. These are the center 2 pins on an RJ-45 connector. These can be shorted out with a small wire..... or a special user constructed plug/jack made for this purpose.*

*Specialized LAN testers, like the Triplet PairMaster or WireMaster XR-5 and XR-2 can easily identify LAN cable faults. These faults are usually right at the RJ-45 connectors. If an open fault is identified in the LAN cable, make sure that the open is in one of the active pairs. In a typical 568A/B CAT 5 LAN, only pairs 3/6 and 4/5 are used. Pairs 1/2 and 7/8 are not used. Opens in these pairs will not affect the performance of the LAN.*

*To find an open fault in a LAN cable, first check the RJ-45 connectors on the ends of the cable. If these are OK, some special test cables, or a Break Out Box (BOB) is necessary to find the open along the path of the cable. First, trace the path of the cable using the pre-described methods. Then insert a BOB, or use a special cable to connect the clips of*

the FOX 2 to the LAN cable. Connect 7 of the LAN wires together, leaving the open faulted wire as the 8th wire. Connect the 7 wires to one clip of the FOX 2, and connect this clip to earth ground. Connect the open faulted wire to the other clip of the FOX 2. Trace along the path of the cable (which has already been located) with a HOUND or HOUND 2, listening for a sudden drop in the tone level. When this drop is found, note its position. Continue tracing along the path of the cable. If the tone level stays low, the point at which the level dropped is probably the location of the open fault. If the level comes back up, there was probably an unseen obstruction that caused the level to drop. Continue tracing along the cable until the "true" open is found.

### **Alarm / Security Wires:**

*Alarm and security wires can be traced like other wires.*

*The FOX 2's TrueTrace feature and a Hound, Hound 2, or a cordless telephone makes testing enclosed magnetic switches easy. Simply connect the FOX 2's clips to the target wire pair at the alarm control panel, and set the FOX 2 to TRACER TONE. Then, simply open and close the protected opening, or use a test magnet, to actuate the sensor. With the Hound, Hound 2, or cordless telephone, listen for the cadence to change. If it changes, you've identified the proper wire, and verified that the sensor is working.*

*If there is an EOL resistor on the line, it may be necessary to remove it for TrueTrace to work. To find out if the EOL needs to be removed, turn on the FOX 2, set it to TRACER TONE, and connect its clips to the wires. While listening to the*

*FOX 2's pilot tone, short the clips together several times, noting whether the cadence changes. If it does, the EOL can be left on the line. If the cadence does not change, the EOL must be removed.*

*The TrueTrace feature doubles as a unique latch tester, enabling a feature called Trip-Latch. Unlike many latch testers, which require the user to be near the latch tester to determine if the circuit being tested has sent a "pulse", Trip-Latch allows the user to be near the alarm sensor, in its installed location, and determine if the sensor is sending a pulse to the alarm control panel. This feature works with sensors that have N.O. (Normally Open) or N.C. (Normally Closed) outputs, but the pulse output must last for 1 second or more. The use of a Hound, Hound 2, or cordless telephone is required.*

*If testing a N.O. contact, a Hound, Hound 2, or cordless telephone may be used. If testing a N.C. contact, a cordless telephone must be used.*

*To understand how this feature works, a few simple experiments are suggested. Turn on the FOX 2, setting it to TRACER TONE. Using a Hound, Hound 2, or a cordless telephone, listen to the cadence of the Tone..... or if the audio pilot tone is activated, simply listen to the FOX 2 itself. Short the clip leads together for about 1 second. Notice how the FOX 2's cadence changes. When the clips are shorted together, the cadence changes almost immediately, and stays at its new cadence when the clips are unshorted. Hence, in a N.O. circuit, in response to a momentary short, the cadence changes*



*permanently..... i.e. a momentary closure in a N.O. circuit causes the cadence to "latch" to a new speed.*

*Similarly, an N.C. circuit can be simulated by shorting the FOX 2's clips together and keeping them shorted. Then momentarily, greater than 1 second, un-short and then re-short the clips. The cadence will change when the clips are re-shortened. Hence, in a N.C. circuit, in response to a momentary open, the cadence changes permanently..... i.e. a momentary open in a N.C. circuit causes the cadence to "latch" to a new speed.*

*To use Trip-Latch, go to a location when the wires to the alarm sensor can be accessed (usually at a junction box or at the alarm control panel), and temporarily disconnect the N.O. or N.C. wire(s) from the control panel. Leave the power to the sensor connected. Connect the clips of the FOX 2 to the disconnected sensor wire(s), or, on sensors with a common connection between the power and the contacts, connect one clip of the FOX 2 to the COM and one clip to the N.O. or N.C. wire. Go to the installed location of the sensor. If the circuit is N.O., using a Hound or Hound 2, locate FOX 2's signal near the sensor, and then trip the sensor, noting whether the cadence of the signal changes. Alternately, if the situation permits it, use a cordless telephone to listen to the FOX 2, and trip the sensor, listening for the cadence to change.*

*If testing a N.C. sensor, a cordless telephone must be used.*

### **Miscellaneous Multiwire Cables:**

*Some general principles are important to keep in mind when locating and tracing wires and cables.*

*Any wire with a signal on it, which runs parallel to another wire or wires tends to couple its signal to the other wires. The closer the wires are together, and the longer the parallel run, the more signal that is coupled. This situation occurs in multiwire cables, and when cables are bundled together when installed.*

*Luckily, if the other wires are low impedance (they have loads on them), the coupled signal will be lower in level. So, in general its best to disconnect the cable being traced from its loads, leaving other paralleling cables still connected to their loads. If the other cables do not have loads (like when they are being installed), it helps to temporarily connect one end of the cable to earth ground, so that they do not interfere with the trace.*

*The loading effect can also be used when trying to locate an open fault in a wire in a multiwire cable. By leaving the loads on the unfaulted wires, the tracer tone will be reduced in level on the unfaulted wires, and make locating the open easier. In fact, if the other wires are unconnected, it helps to temporarily connect them to earth ground, so that they suppress the effect of the coupled signals. It may also help to connect the far end of the open faulted wire to earth ground. Doing this will produce the most distinct change in tracer tone level when the HOUND or HOUND 2 passes over the location of the open.*

## Setting the FOX 2's Options:

Figure 10 shows a diagram of the locations of the internal options jumpers.

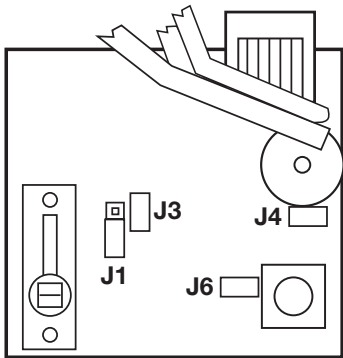


Figure 10

## ***Here's what the jumpers do:***

### ***J1: Turns the TrueTrace feature on and off***

*In some cases, the user may find that TrueTrace doesn't behave as desired. TrueTrace is on when the jumper is in the DOWN position, and off when the jumper is in the UP position.*

### ***J3: Sets the pitch range of the Tracer Tone***

*With the jumper in place, the pitch is low. With the jumper removed, the pitch is high. The user may select whichever pitch is most pleasing. Some receivers (inductive amplifiers) work better with a particular pitch setting. The high pitch setting produces a more piercing tracing tone, which may be useful in locations with a lot of acoustic noise.*

### ***J4: Turns the Pilot Tone on and off***

*The FOX 2 generates a pilot tone in the TRACER TONE mode. This is a low volume tone that sounds like the TRACER TONE. It is often helpful to the user, in some cases eliminating the need for a HOUND or HOUND 2. It also reminds the user that the FOX 2 is on and operating. Some users may find the pilot tone annoying, or may find it inappropriate for the test situation (like in a quiet office or a library). Removing J4 turns the pilot tone off.*

**J6: Changes WARBLE tone to CONTINUOUS tone.**  
*Remove J6 to change from WARBLE to CONTINUOUS tone. This is helpful if someone else is also using a "toner" that is set to WARBLE in the vicinity. By setting your FOX 2 to CONTINUOUS, you can differentiate between your tone and the other tone.*

**Fox 2 Accessories:**

<i>The Fox 2</i>	<i>3382</i>
<i>The Hound</i>	<i>3390</i>
<i>The Hound 2 Probe</i>	<i>3236</i>
<i>F&amp;H Carrying Case</i>	<i>10-3983</i>
<i>Universal Carrying Case</i>	<i>10-4275</i>
<i>RJ-11 to RJ-45 Adaptor</i>	<i>79-797</i>
<i>RJ-45 to BNC Adaptor</i>	<i>2455-824</i>

## **ONE YEAR LIMITED WARRANTY**

*The Triplett Corporation warrants instruments and test equipment manufactured by it to be free from defective material or workmanship and agrees to repair or replace such products which, under normal use and service, disclose the defect to be the fault of our manufacturing, with no charge within one year of the date of original purchase for parts and labor. If we are unable to repair or replace the product, we will make a refund of the purchase price. Consult the Instruction Manual for instructions regarding the proper use and servicing of instruments and test equipment. Our obligation under this warranty is limited to repairing, replacing, or making refund on any instrument or test equipment which proves to be defective within one year from the date of original purchase.*

*This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way so as, in our sole judgment, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence, accident or which have had the serial numbers altered, defaced, or removed. Accessories, including batteries and fuses, not of our manufacture used with this product are not covered by this warranty.*

*To register a claim under the provisions of this warranty, return the instrument or test equipment to Triplett Corporation, Service Department, One Triplett Drive, Bluffton, Ohio 45817, transportation prepaid. Upon our inspection of the product, we will advise you as to the disposition of your claim.*

*ALL WARRANTIES IMPLIED BY LAW ARE HEREBY LIMITED TO A PERIOD OF ONE YEAR FROM DATE OF PURCHASE, AND THE PROVISIONS OF THE WARRANTY ARE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES EXPRESSED OR IMPLIED.*

*The purchaser agrees to assume all liability for any damages and bodily injury which may result from the use or misuse of the product by the purchaser, his employees, or others, and the remedies provided for in this warranty are expressly in lieu of any other liability Triplett Corporation may have, including incidental or consequential damages.*

*Some states (USA ONLY) do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. No representative of Triplett Corporation or any other person is authorized to extend the liability of Triplett Corporation in connection with the sale of its products beyond the terms hereof.*

*Triplett Corporation reserves the right to discontinue models at any time, or change specifications, price or design, without notice and without incurring any obligation.*

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

