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ToneRanger®
Operation Manual

Revised 6/1/2010

Compatible with software 4.00T and higher









Table of Contents

Model TF1ABL Aerial/Buried / Underground Kit

ToneRanger® Applications

ToneRanger® Locates Pair Faults and Shield Faults in Aerial, Buried, and Underground Cable…Pulp, Paper, & PIC.

- **Shield Bonding and Grounding**
  - Corroded open and missing shields and bonds, especially on buried cable
  - Shield-to-Earth Faults
- **Wet Cable Faults**
  - Low or high resistance shorts, crosses, and grounds
  - Wet Splices, especially in direct buried cable
- **Shorts, Crosses, and Grounds,** in aerial or buried cable
- **Splits,** in aerial or buried cable
- **Left-in Drops**
- **Tones through Wet PULP or Paper Cable & positively identifies each pair**

ToneRanger® Features

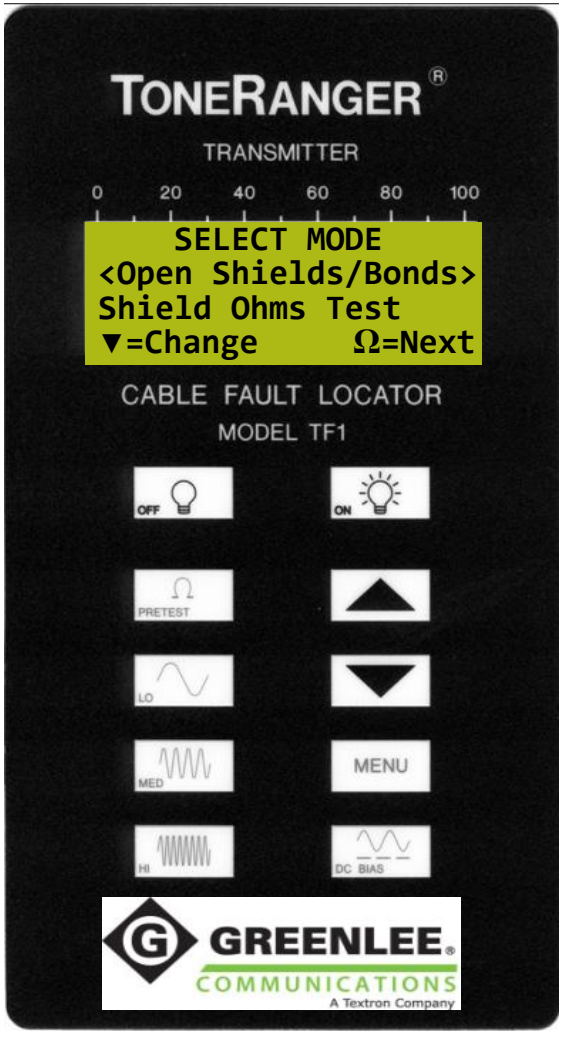
- **Open Bonds, Open Shields** can be pinpoint located
- It can locate **high resistance faults** in wet, flooded, or almost dry splices or sections. The tone will take you to the fault when high voltage sets will not work. It does not create more faults by high voltage burning.
- It can locate **multiple faults** on the same pair. It will locate the lowest resistance fault first, after that fault is repaired, it will then locate the next lowest resistance fault. This can continue until all faults are located.
- The tone can be on while repairing the fault
- It **does not interfere with VDSL** or slow down adjacent DSL lines as occurs with high voltage sets

Safety

- **Personnel Safety** - Most of the time the Transmitter is operated at less than 50V, which requires no precautions. When operating the Transmitter above 50V the craftsperson touching the conductors may feel some sensation and **Ringing Voltage precautions** would apply. With the Transmitter operating at the maximum output of 200V (100V Tip [A] or Ring [B] to Ground) the technician touching one conductor and ground would feel the same sensation as Ringing Voltage.
- **Equipment Safety** - Even with the Transmitter operating at the maximum of 200V, protectors are not activated, and no equipment or DSL modems are damaged.

ToneRanger® Transmitter

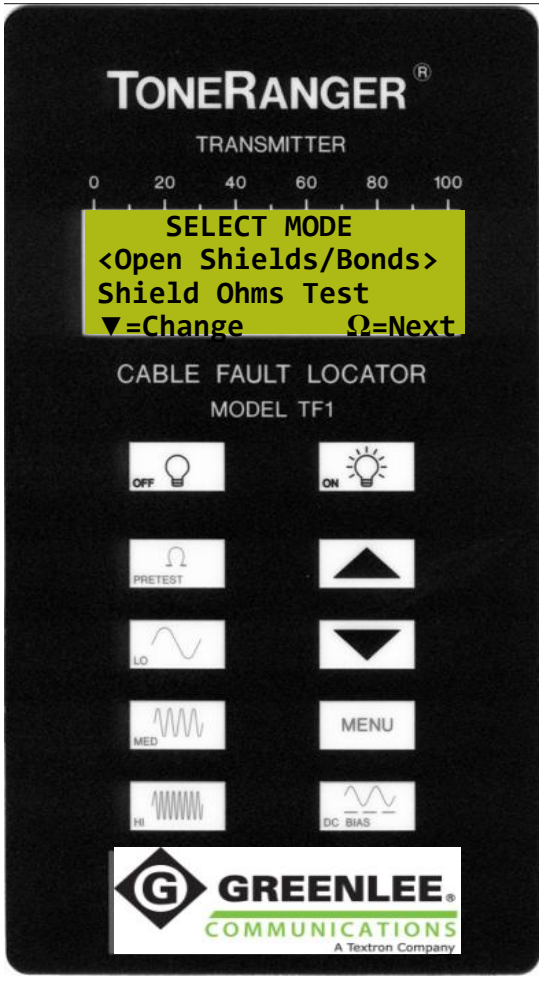
The Transmitter sends a **Locate Tone** on the shield or the pair and simultaneously sends a **pilot tone** over the shield or pair. It also serves as the intelligent computer for all cable test functions, and continuously updates the Receiver with tone current level (Tx value) to verify the fault has not dried out in <Pair Faults - SCG> mode.



ToneRanger® Transmitter Front Panel

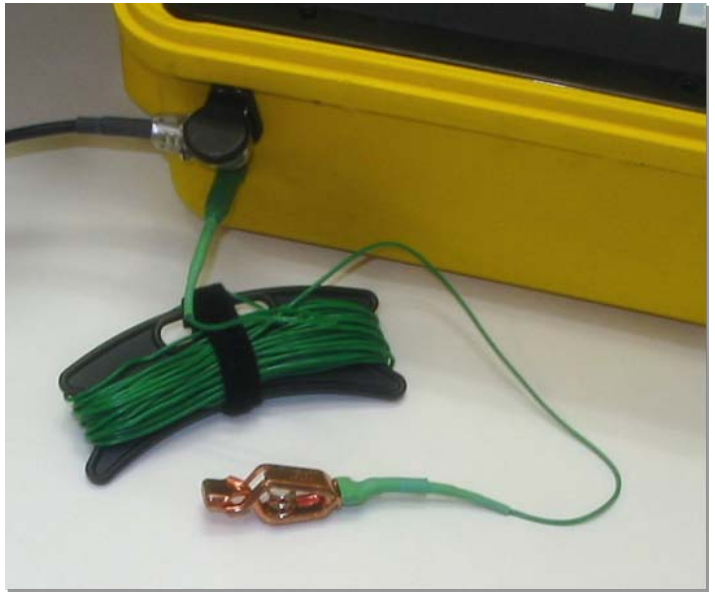
Front Panel Controls

- LCD Display shows Transmitter status, numeric readings, a Bargraph with messages in tone modes, and instructs the technician as to the next step to take.
- **OFF** and **ON** keys control Transmitter power
- **Ω** key advances screens
- **LO**, **MED**, and **HI** keys are used to select tone frequency
- ▲▼ keys are used to navigate within the screens and to adjust output voltage
- **MENU** key displays the battery voltage and technician selectable parameters
- **DC BIAS** key applies low current DC (in addition to Locate Tone) to the pair to punch through galvanic faults



Transmitter Connectors

- **Test Jack** - located on left side of case. Accepts phone plug of the Three Lead Test Cable for shield, pair, and ground connections
- **Ground Jack** - Green Banana Jack located on left side of case. Accepts banana plug of the 30' [10m] Temporary Earth Ground Lead. This jack is internally connected to the Green Test Lead of the Three Lead Test Cable.



Locate Tone Output

- The Transmitter Locate Tone is output across the Red and Black Test Leads, supplied by a center tapped coil (transformer) winding. The center tap is grounded by the technician with the Green Test Lead. The balanced center tapped sine wave output tone minimizes the audibility of tone on adjacent pairs and minimizes the interference with carrier circuits on adjacent pairs.
- The voltage across the pair is normally set below 50V and cannot be increased above 200V, so the maximum voltage on either side to ground is 100V (like ringer voltage). This low tone voltage will not operate protectors to give a false locate at the protector, a common malfunction of arcing tone locators. The ToneRanger® output is current and power limited to prevent arcing or welding at the fault.

DC Bias

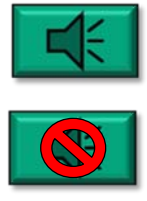
150V DC Superimposed on the Locate Tone

- When a faulted pair is removed from service, the fault in time oxidizes and becomes coated with an insulating oxide layer. Thereafter an Ohms test will show only a light fault.
- When the ToneRanger **DC Bias** key is pressed, a very low current DC voltage is superimposed on the AC Locate Tone to dislodge the oxide layer. This DC can cause high resistance wet faults to draw more AC tone, allowing some faults up to one Megohm to be located. For DC Bias to be effective the output voltage must be increased to 100V or greater.

Pilot Tone & Transmitter Batteries

Pilot tone is sent simplex on the pair in addition to the Fault Locate Tone. It is used by the Receiver to cancel capacitance carry-by of Locate Tone. It is also used to identify the cable when you are past the fault when in <Pair Fault - SCG> mode, and to locate the cable during buried fault locating in <Pair Fault - SCG> or <Open Shields/Bonds> mode.

Pilot Tone

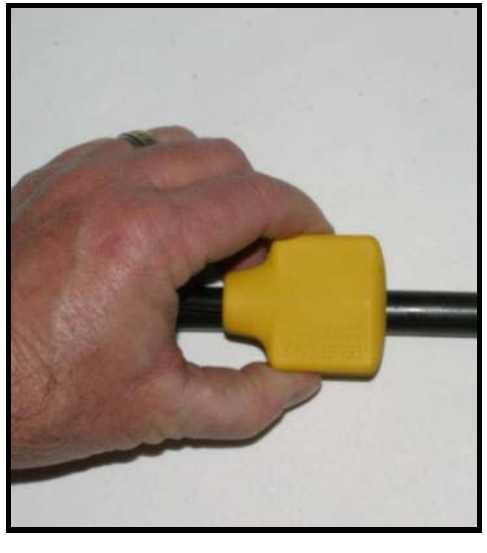


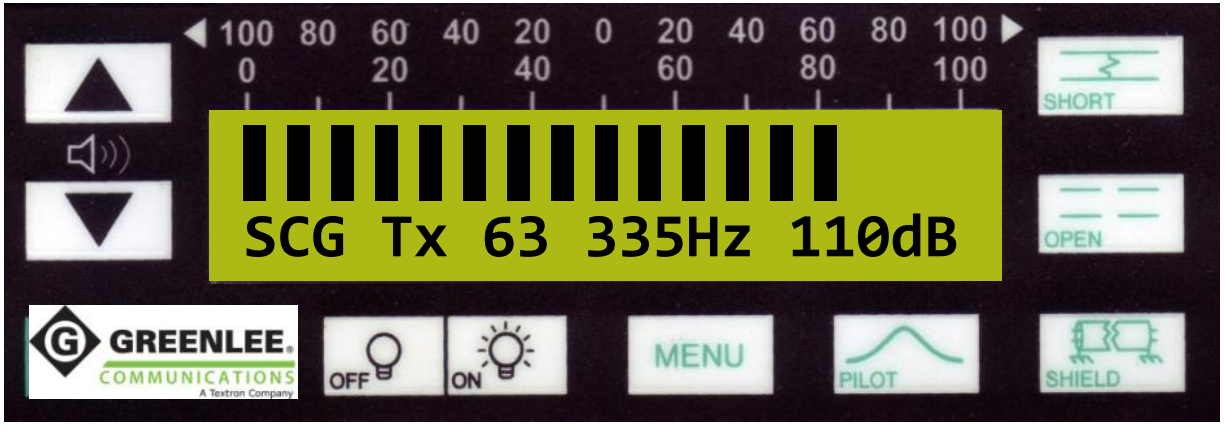
Transmitter batteries

The Transmitter batteries are located under the panel beneath the Receiver. The Transmitter requires 10 Alkaline D-Cells.
A new set of batteries should read 15V.
Replace the batteries when voltage reads below 10V.

ToneRanger® Receiver

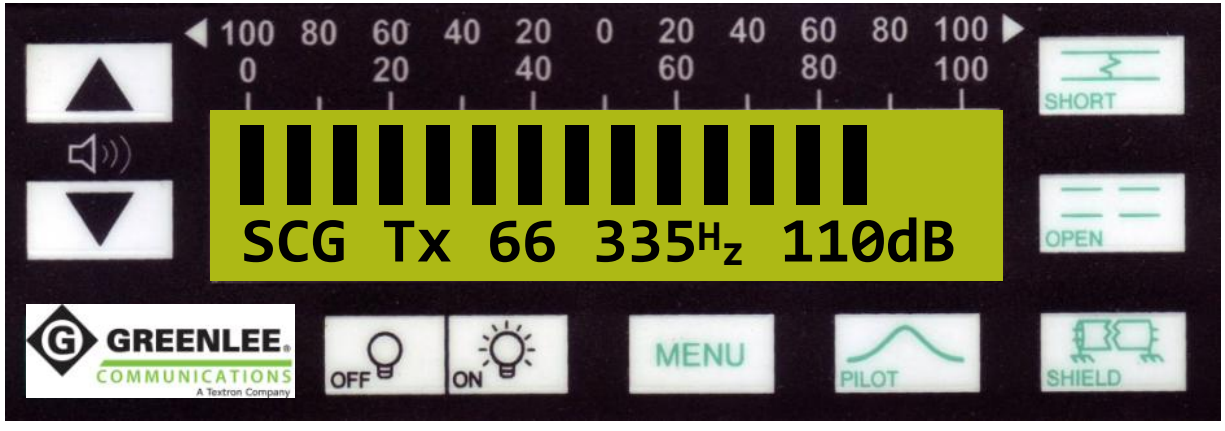
A fault is located by connecting an exploring coil to the Receiver and monitoring the Locate Tone level with the Receiver as the technician walks along the cable. The Receiver amplifies Locate Tone which is magnetically induced into the coil by current flowing on the shield or on the pair. It also receives tone current Tx (transmit) level from the Transmitter via the digital pilot tone when in <Pair Fault – SCG> mode.





ToneRanger® Receiver Front Panel

- LCD Display shows Receiver status, messages, and a Bargraph proportional to received Locate Tone strength
- **OFF** and **ON** keys control power to the Receiver
- ▲▼keys adjust Receiver gain and navigate the Menu
- **SHORT** key is used to match the Receiver to the Transmitter <Pair Fault - SCG> mode or <Pair - ID Tone - PID> mode
- **OPEN** key is used to identify bridged cables over 100’ [30m] long and left-in drops. It is NOT used to locate the end of an open pair.
- **SHIELD** key is used to match the Receiver to the Transmitter <Open Shields/Bonds> mode
- **PILOT** key displays pilot magnitude for identifying cables in a multi-cable environment
- **MENU** key displays battery voltage, and allows technician to select Receiver frequency when pilot is not being received

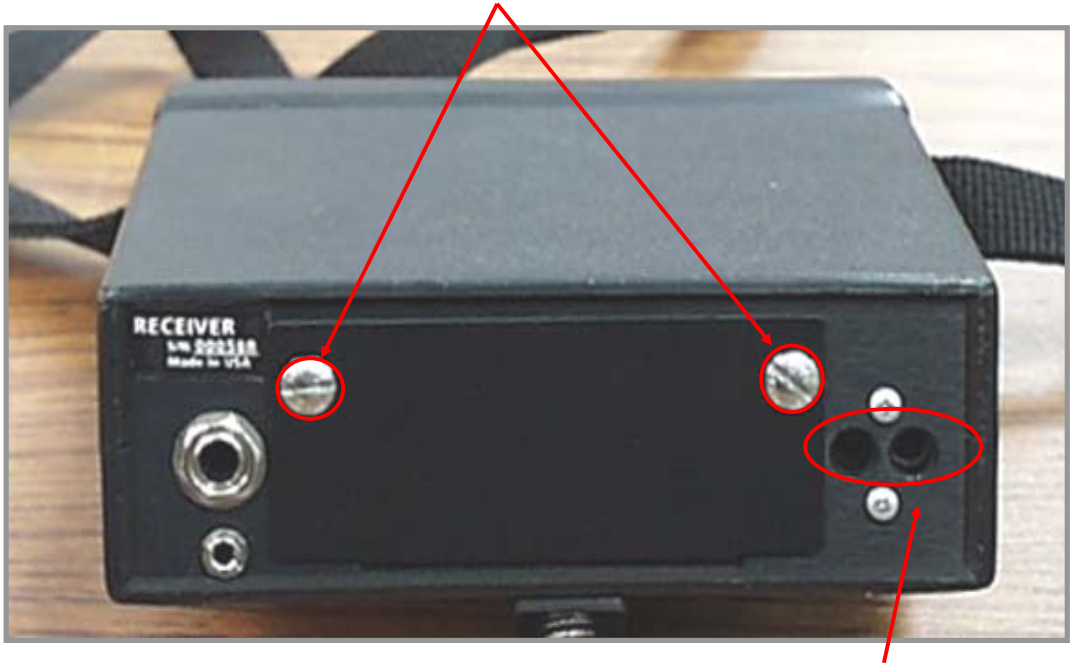


Receiver Connectors & Batteries

- **Input Jack** (Large Jack) - Located on rear panel of case. Accepts phone plug of Handcoil, Lay-Up Stick, Buried Wand, A-Frame, Yellow or Black Pair ID Probe or Receiver Pair Access Cord.
- **Pilot Jack** (Small Jack) - Located on rear panel of case. Accepts secondary miniature plug of Buried Wand. Not connected for other probes.

Receiver Battery Access

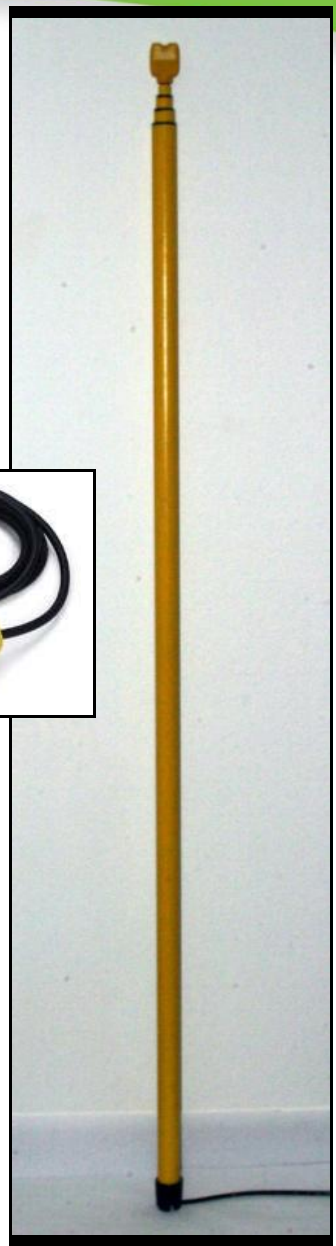
Remove screws to access 8 AA Alkaline cells
~40 hours continuous use on a new set of batteries.
A new set of batteries should read 12V
Replace batteries when voltage reads below 7V.



Connection plug for headset

Handcoils and Lay-up Sticks

- The ToneRanger works best with the Model H1 **Humbucker Handcoil** and the Model L1 **Humbucker Lay-up Stick** supplied with each unit. The Humbucker Coils have a shielded, dual coil design. This unique design eliminates noise caused by external AC Power Influence.
- WE101/103/105 style coils should not be used with the ToneRanger as they are incompatible. They are less sensitive and tend to receive tone past the fault (carry-by) more than the supplied Humbucker Coils and do **not** eliminate noise caused by external AC Power Influence.

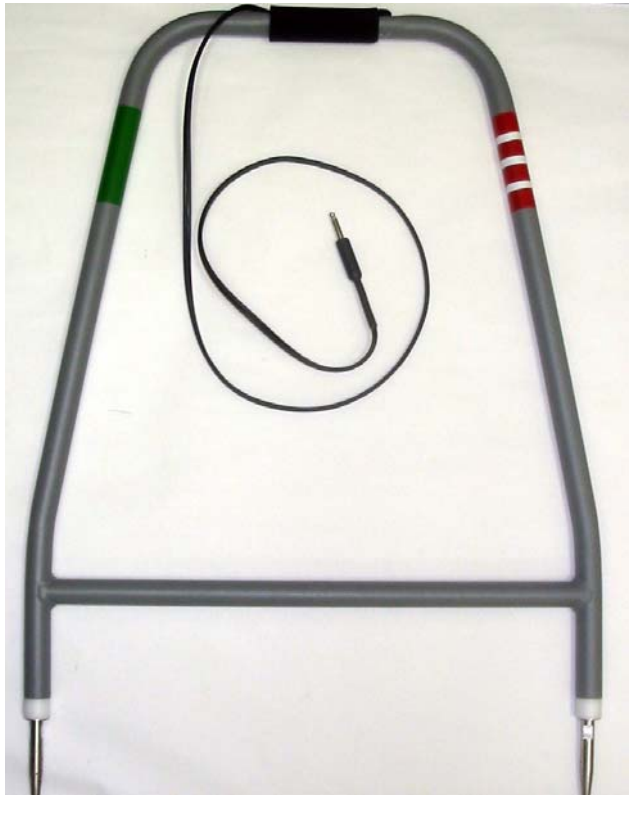


Buried Wand

Pair Faults and Shield-to-Earth Faults in direct buried cables are located with the Model BW1 **Buried Wand**. This wand also has a shielded, dual coil design. This unique design eliminates noise caused by external AC Power Influence. Both the large and small phone plugs must be plugged into the Receiver for proper operation.

A-Frame

- Open or partially open Shields or Bonds are pinpoint located with the **A-Frame** earth contact frame. Cable path, Shield-to-Earth faults and Wet PIC splices are also located with the A-Frame, whose spikes pick up gradient voltages caused by tone current flow through earth resistance.



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ToneRanger®

Pinpoint Locating
Corroded Open Shields
or Missing Bonds
with or without Shield-to-Earth Faults









Open Shields/Bonds vs. Shield-to-Earth Faults

- NOTE: There is a very distinct difference between the two above terms.
- **Open Shields/Bonds** (in the ABSENCE of a Shield-to-Earth Fault)

  Examples:
  - A buried splice where the technician did not place the bullet bonds or the bond strap between them.
  - A buried splice that was not supported properly when the pit was backfilled and a bullet bond pulled out of contact with the cable shield.
  - Water accumulated in a low place in the cable and corrosion has turned the cable shield (turnplate) into powder.
  - Power or lightning has entered the cable and turned the cable shield (turnplate) to powder.
- In all of the above examples there is NO outer SHEATH damage. There is an open shield/bond with NO Shield-to-Earth Fault.
- **Shield-to-Earth Fault** - The outer sheath has been damaged and there is a path from the cable SHIELD to earth ground.

Verify Shield Continuity with a Sidekick® KnockDown Test

Your Ohmmeter **is not accurate** for measuring shield bonding resistance. AC and DC voltages on the cable interfere with the Ohms reading

- The **KnockDown test** can be performed with your Sidekick® DC Voltmeter
- It can be run anywhere on the cable
- It will quickly identify a **solid ground** for the ToneRanger® Green lead
- It will quickly identify and isolate **Open Shields/Bonds**
- It is a great companion for a clamp-on meter

Test Each Section with a Sidekick® KnockDown Test

Set-Up for the KnockDown Test

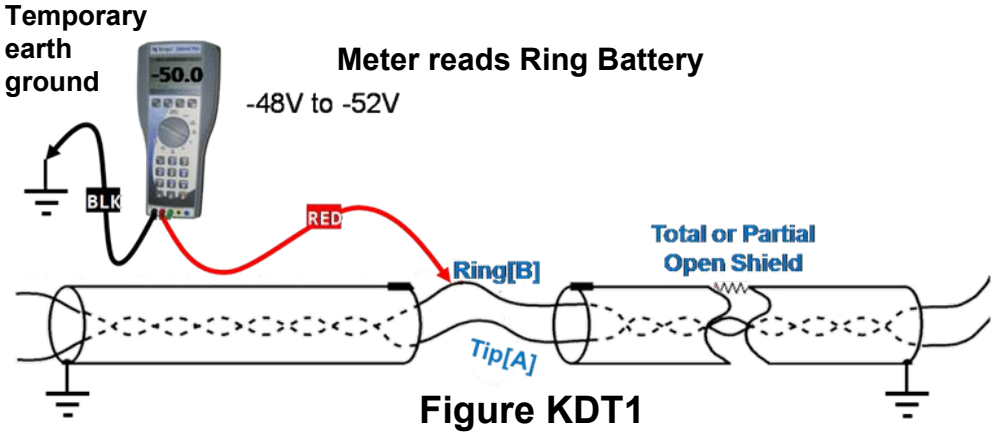


Figure KDT1

- At the Pedestal disconnect the shield bonds
- Connect the Sidekick **Black** Lead to a temporary screwdriver earth ground. Connect nothing else to this ground.
- Connect the **Red** Lead to the Ring side of an idle working pair. The meter will now indicate -48V to -52V Ring Battery.

Testing Shield of Incoming Cable

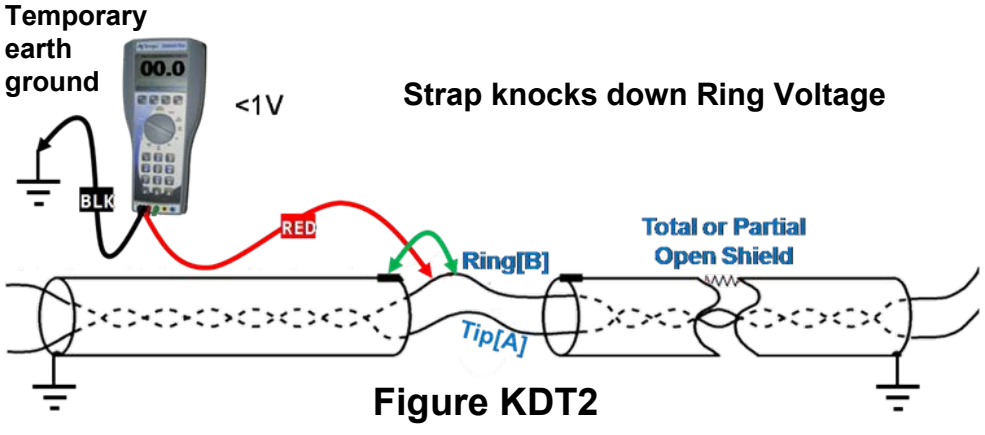


Figure KDT2

- **Touch a strap** from the Ring Battery to the Incoming Shield
- If the shield is **good** it will knock down the Ring Battery to **below 1V**

Verify an Open Shield with a Sidekick® KnockDown Test

Confirm the Field Shield is Open or Partially Open

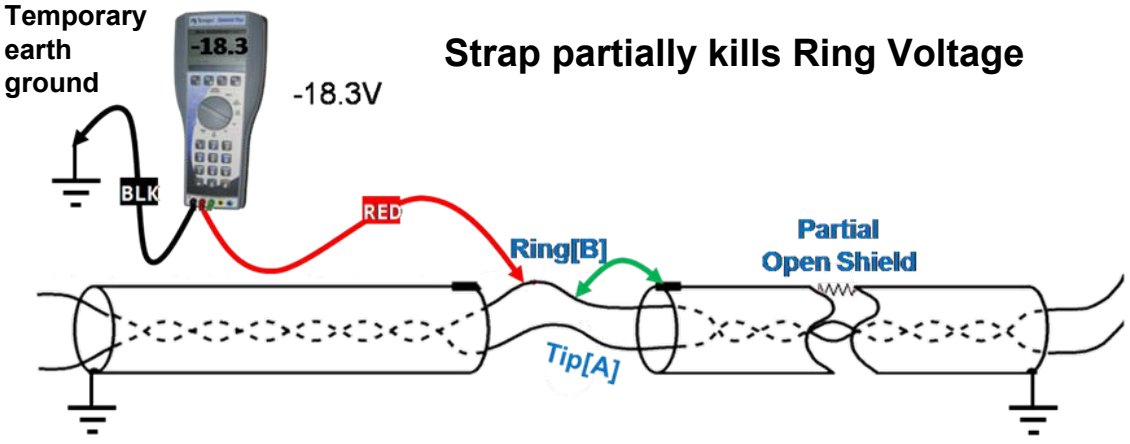


Figure KDT3

- **Touch the strap** from Ring Battery to the Field Shield
- If the Field Shield knocks down the voltage **below 1V** it is **not open**
- If the DC Voltmeter **does not drop** at all, the shield is **wide open**
- If the strap **partially** kills the volts as shown in Figure KDT3, the shield is **partially open or there is a Shield-to-Earth fault**

Isolate an Open Shield with a Sidekick® KnockDown Test

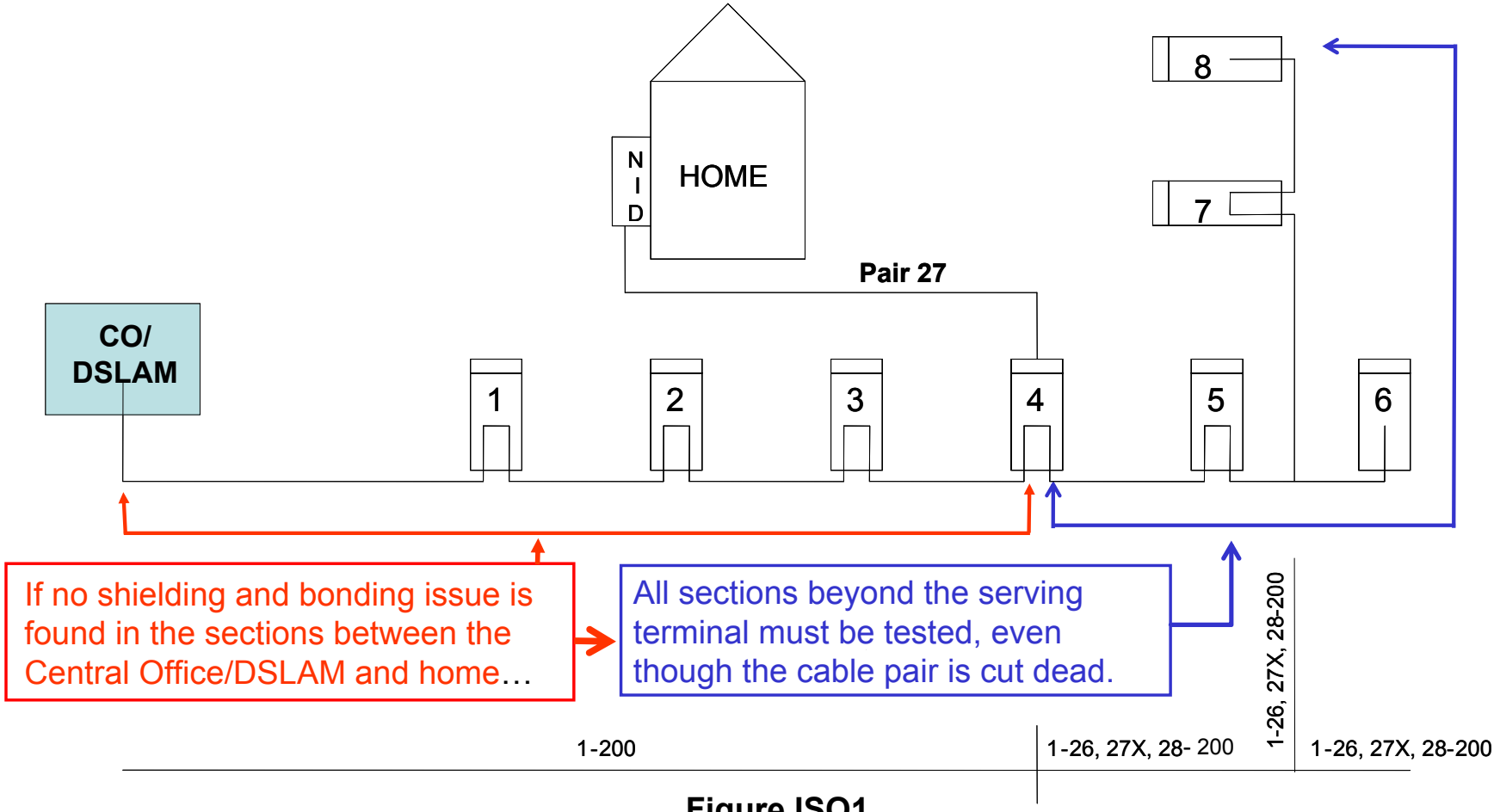


Figure ISO1

Isolate an Open Shield with a Sidekick® KnockDown Test (continued…)

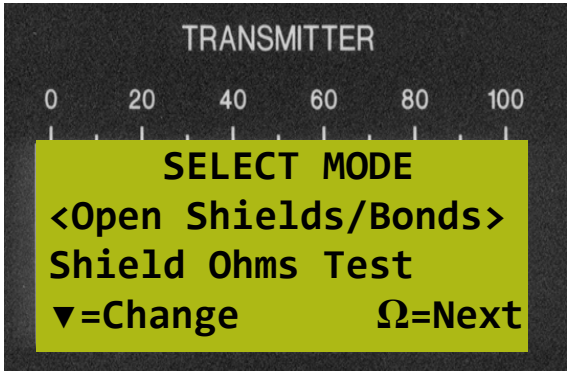
- The KnockDown test is much better than an Ohmmeter for verifying the continuity of a shield because it is difficult to accurately measure resistance over voltage or current
- **To isolate an Open Shield**, each individual cable section must be tested with the KnockDown test independently
- Using the drawing ISO1 on the previous page, **go to Pedestal #1**. Open the bond strap to isolate the incoming and outgoing cable shields. Perform the KnockDown test towards the DSLAM (see Figure KDT2) and then toward Pedestal #2 (see Figure KDT3).

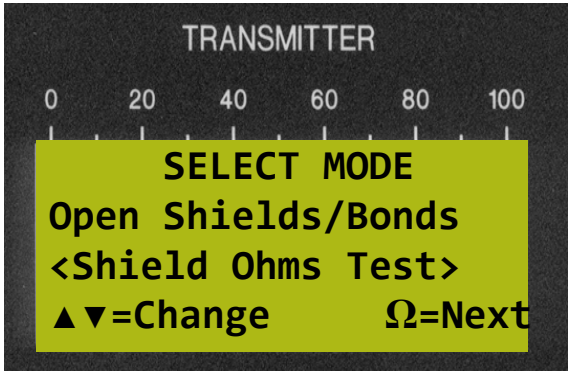
Isolate an Open Shield with a Sidekick® KnockDown Test (…continued)

- If **both cable sections pass** the KnockDown test, **restore the bond strap** and **skip to Pedestal #3**. Repeat the process toward Pedestals #2 and #4.
- Continue testing EVERY cable section until you find a cable section that **fails** the KnockDown test
- **Restore the bond strap** and go to the far end of the section that failed and insure the cable shield was bonded to ground. If bonded, open the bond strap and repeat the KnockDown test to insure the cable section still fails. If it **still fails**, proceed to "Toning Open Shields/Bonds" (see Page 32)

Shield Ohms Test

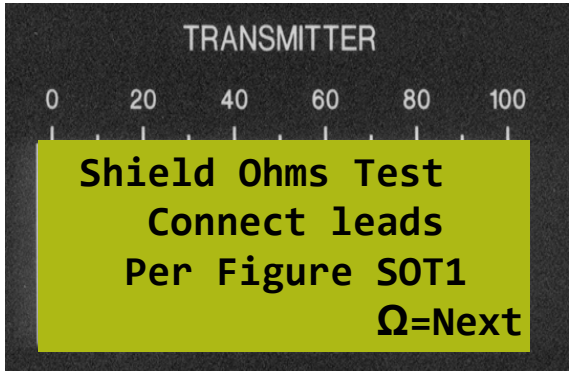
- **If all cable sections pass** the KnockDown test, you must then test each cable section using the ToneRanger **Shield Ohms Test**
- Press the Transmitter **ON** key
- After successful self test, SELECT MODE screen appears
- Use ▲▼keys to select <Shield Ohms Test>, then press **Ω** key





Shield Ohms Test

- Follow screen instructions
- Connect per Figure SOT1
  - Open bond at near end
  - Leave bond on at far end
  - Short and Ground test pair at far end
- Press the **Ω** key



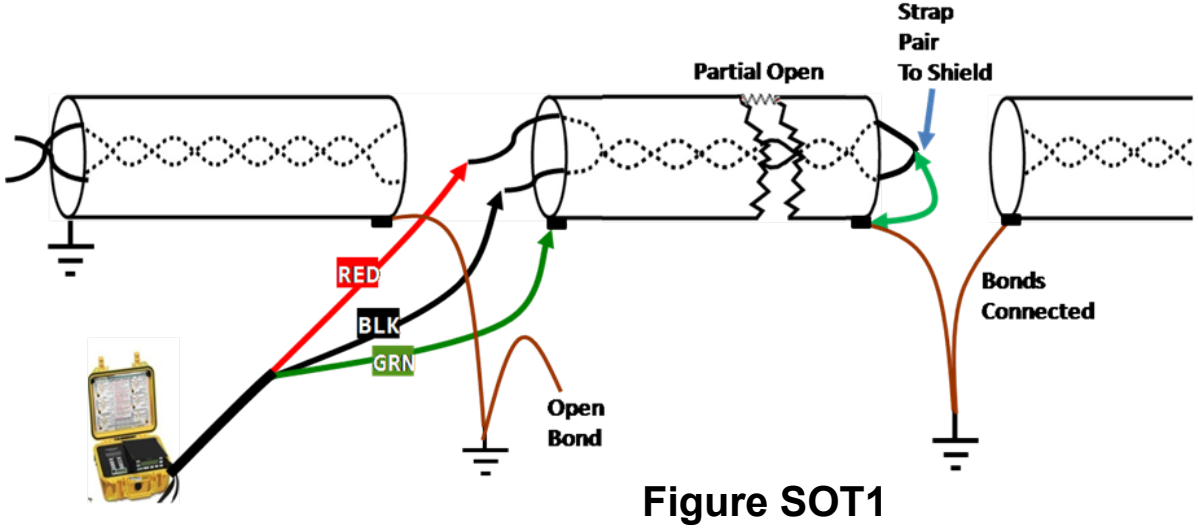
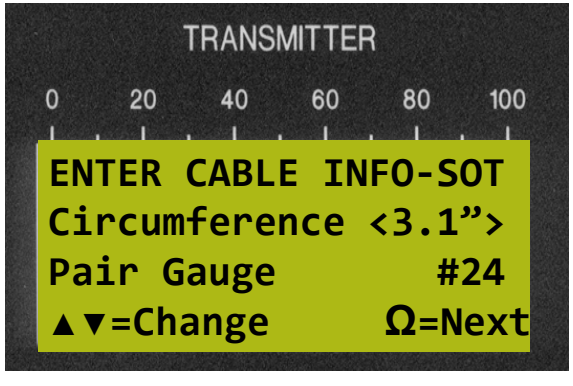


Figure SOT1

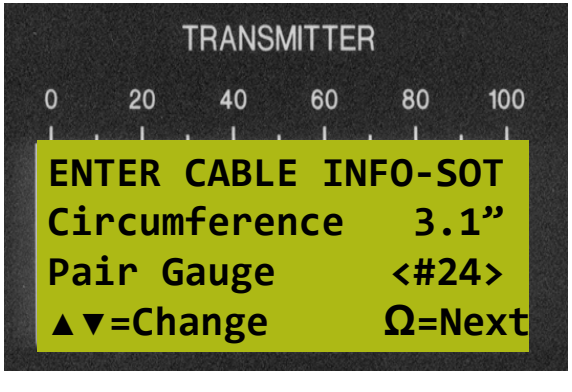
Shield Ohms Test

ENTER CABLE INFO-SOT

- Measure cable circumference as described on Page 36.
- Circumference <3.1”>, enter value, use ▲▼ keys to change value.

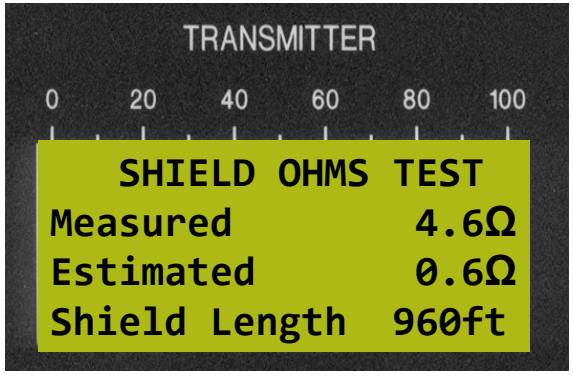


- Pressing the Ω key then highlights Pair Gauge <#24>, use ▲▼ keys to change value.
- Press the Ω key to start the test



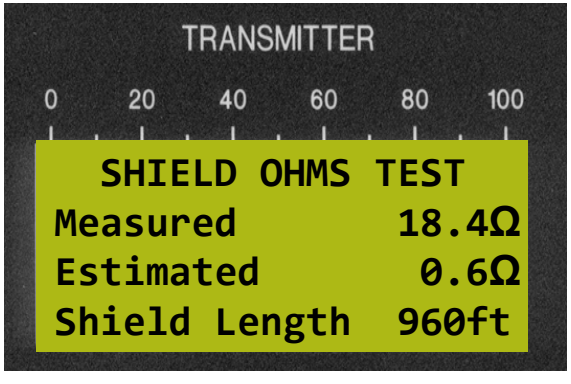
Shield Ohms Test

- **Measured** = actual resistance of the shield under test
- **Estimated** = the resistance that the shield under test should have
  - Measured should not be more than 3 Ohms greater than Estimated or there may be a problem with the shield under test that could cause interference with high speed data transmission
- **Shield Length** = the length of the shield under test

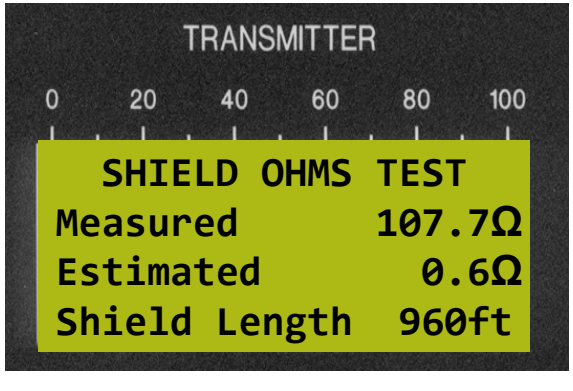


Shield Ohms Test

- Any Corroded Partial Open Shield **<30Ω will "pass" the KnockDown test**, yet could cause interference with high speed data transmission



- The ToneRanger cannot consistently locate Open Shields of <100Ω with the A-Frame
- The ToneRanger can consistently locate Open Shields measuring down to 1Ω with a Handcoil



Preparation For Toning an Open or Partially Open Shield

Leave Far End Cable Shield Bonded!

Remove Bonded Drops

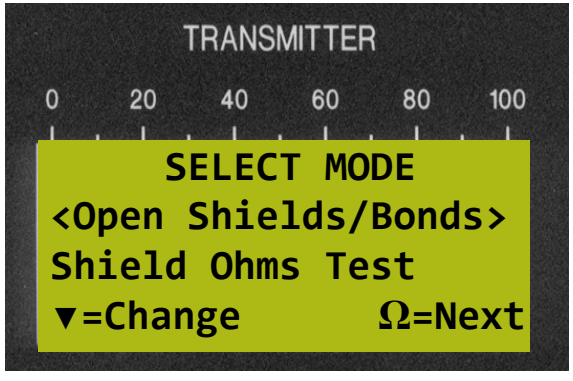
- If there are **low Ohm** bonded drops or laterals in the isolated OPEN SHIELD section, they may need to be lifted before the Open Shield can be located
- To locate the grounding drop, send MED fault Locate Tone on the cable shield with the ToneRanger Transmitter (connected per Figure OSB1 on Page 35) and follow tone to the grounded drops with the Receiver and Buried Wand
- You must open every grounded drop between the Transmitter and the Open Shield. When you lift the last grounded drop before the Open Shield, tone will no longer be heard via the Buried Wand.
- Now you can locate the Open Shield with the A-Frame

The ToneRanger® is a Precise Open Shield & Open Bond Locator

- A tone is sent on the shield by the Transmitter and received via the Receiver with an A-Frame or Handcoil
- The Receiver's audio Locate Tone signal and visual Bargraph is traced to the location of the fault where the tone stops
- Open Shields/Bonds can be toned in either direction

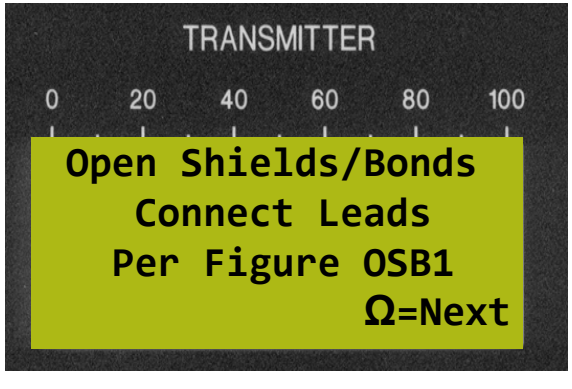
Open Shields/Bonds

- Press the Transmitter **ON** key
- After Self Test completes, SELECT MODE screen appears
- <Open Shields/Bonds> is already selected
- Press the **Ω** key



Connect leads per Figure OSB1 on next page

- **Green** lead to Ground
  - First Choice = a Shield Ground which passed the KnockDown test as shown in Figure OSB1
  - Second Choice = a MGN (Multi-Ground Neutral)
  - Third Choice = a screwdriver in the Earth (a Temporary Earth Ground)
- **Red** lead to Open/Partial Open Shield
- **Black** lead is isolated (not connected)



Open Shields/Bonds

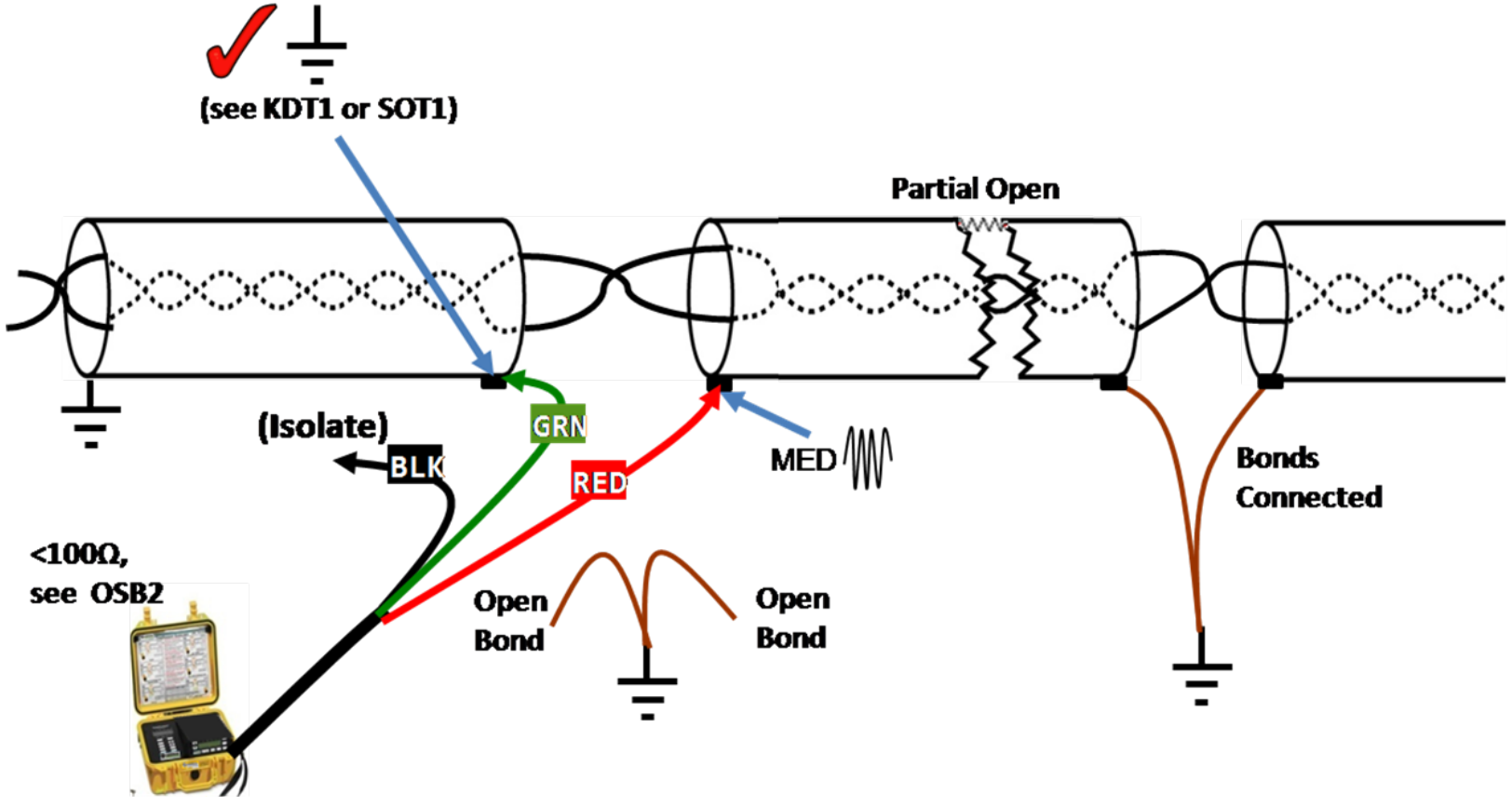
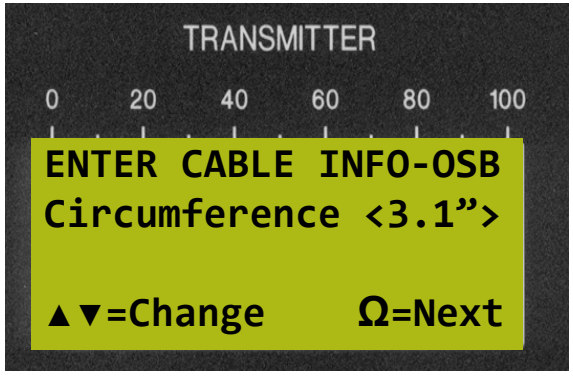


Figure OSB1

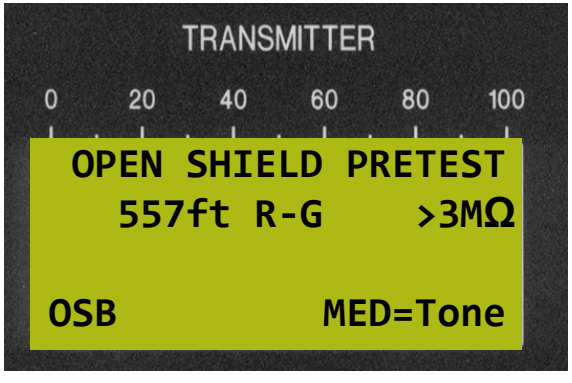
Open Shields/Bonds

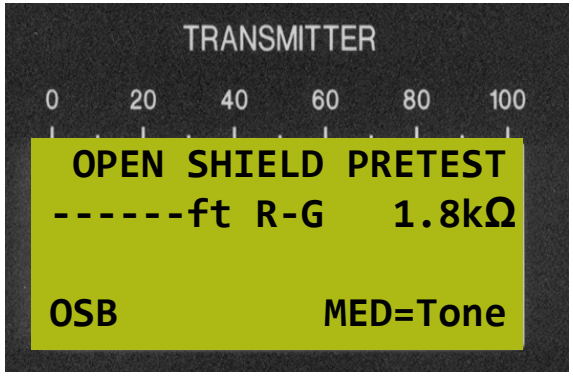
- After connecting per Figure OSB1, press the Ω key
- Measure cable circumference
  - Wrap a piece of wire around the outer sheath of the cable under test
  - Trim the wire to the circumference of the cable
  - Straighten this wire and measure cable circumference using the ruler on the bottom inside of the “Transmitter Quick Guide”
- Enter cable circumference. Use ▲▼ key to change value
- Press the Ω key



Open Shield Pretest

- The **557ft R-G length** indicated is the estimated distance to a totally Open Shield. The >3MΩ here represents a totally open shield.
  - Warning: This estimated distance can be off by +/-30%. Use the ToneRanger tone to pinpoint locate!
  - The ToneRanger will not give you distance to a partially Open Shield measuring less than 3kΩ, in which case the length will dash -------- out.
- The **R-G 1.8kΩ Ohms** measurement indicates the resistance through the Open Shield or to Ground (a Shield-to-Earth fault).
  - If R-G is <100Ω the corroded partial open shield is not usually locatable with the A-Frame, but may be locatable with the Handcoil down to 1Ω.
  - If R-G is ≥100Ω the A-Frame or Handcoil can be used.

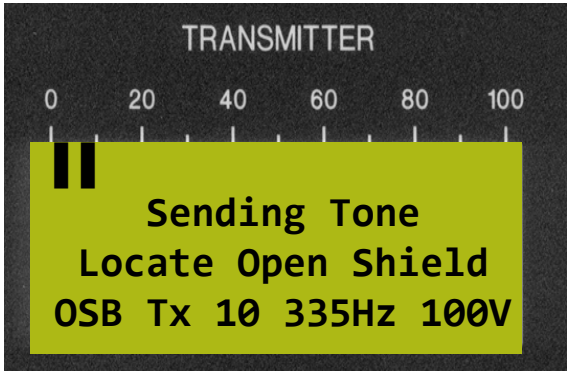




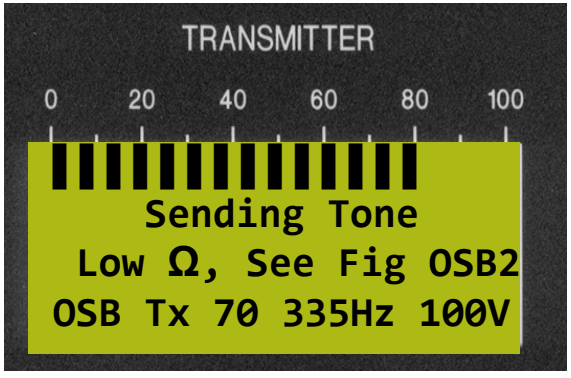
If the R-G length is dashed out you cannot get an estimated distance to the fault, continue toning the fault.

Open Shields/Bonds

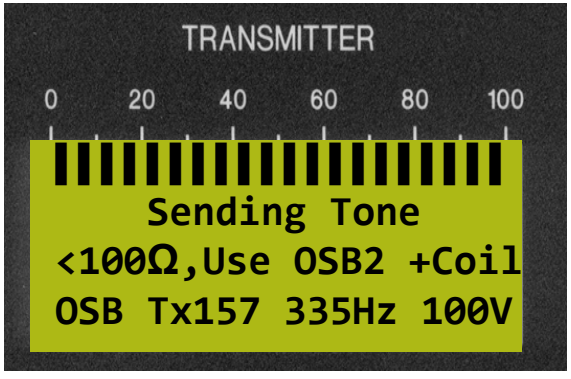
- Press the **MED** key
  - A 335Hz Locate Tone with an output voltage of 100V is being applied to the cable shield
  - Transmitter setup is complete



- If R-G is between 100Ω and 1000Ω, the screen to right will instruct you to connect per Figure OSB2 (see next page), to keep tone within the section. Use Receiver with A-Frame or Handcoil
  - The Bargraph will be zero on a total open shield, the 70 Bargraph indicates resistance on the shield
  - Transmitter setup is complete



- If R-G is <100Ω the screen to right will instruct you to connect per Figure OSB2 (see next page) and use Receiver with Coil (when A-Frame does not receive tone)
  - Transmitter setup is complete



Open Shields/Bonds

Toning a Low Ohm Partial Open Shield

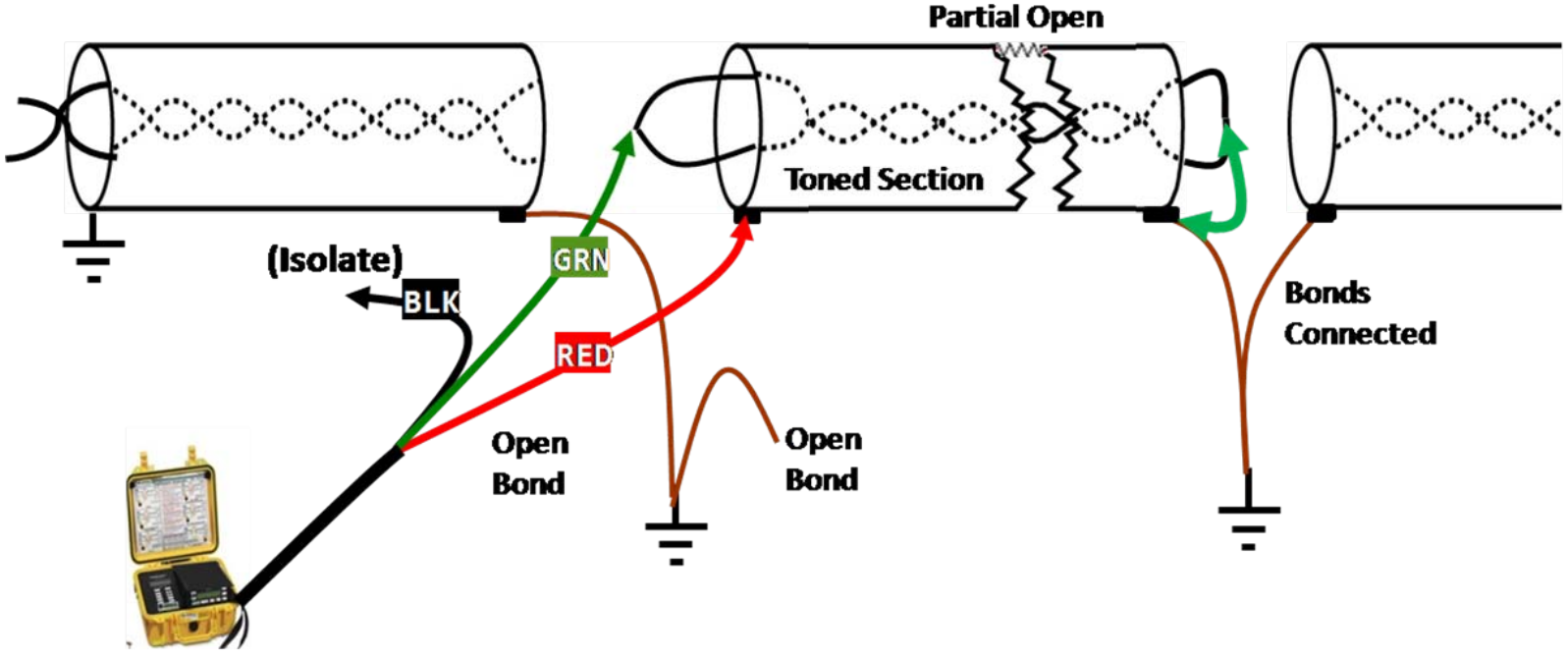
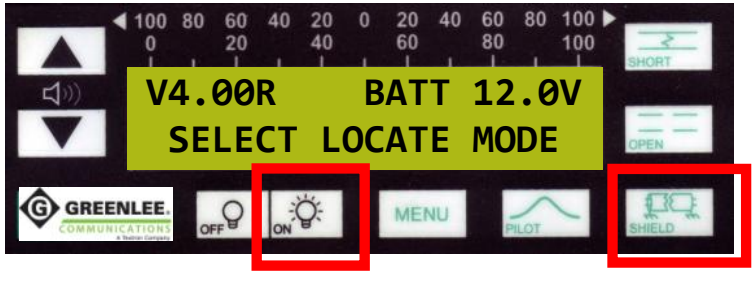


Figure OSB2

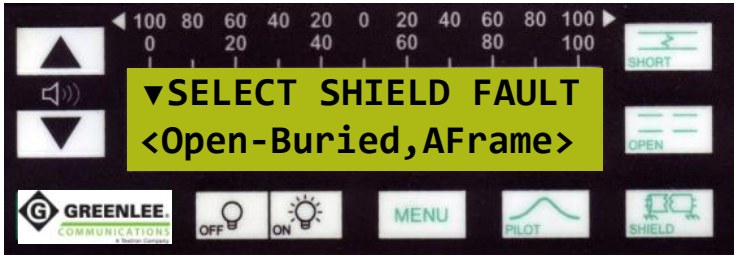
Open Shields/Bonds

Receiver Setup

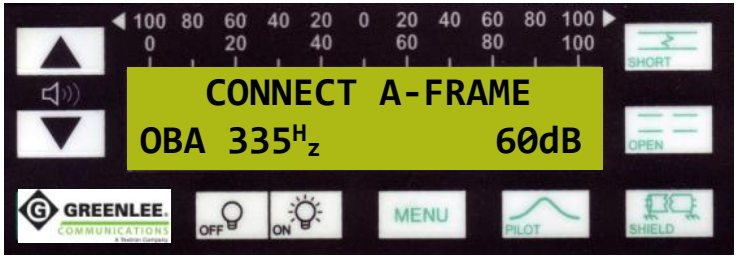
- Press Receiver **ON** key
- After successful self check, SELECT LOCATE MODE screen appears



- Press **SHIELD** key
- Use ▲▼keys to select:
  <Open-Buried,AFrame>
- Press **SHIELD** key again to lock-in the open shield, buried cable, A-Frame toning mode.



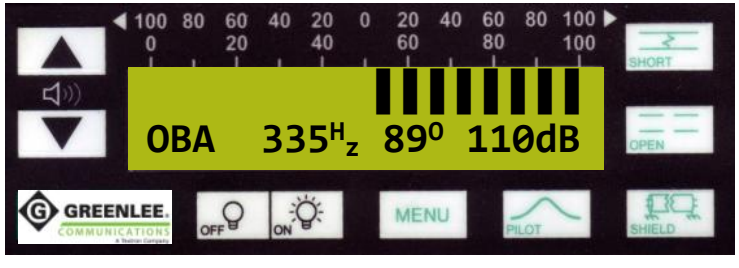
- Connect A-Frame when CONNECT A-FRAME message appears
- The Receiver tests the A-Frame for Open or Shorted conditions and will not let the technician proceed with a defective coil



Open Shields/Bonds

Toning with the Receiver and A-Frame

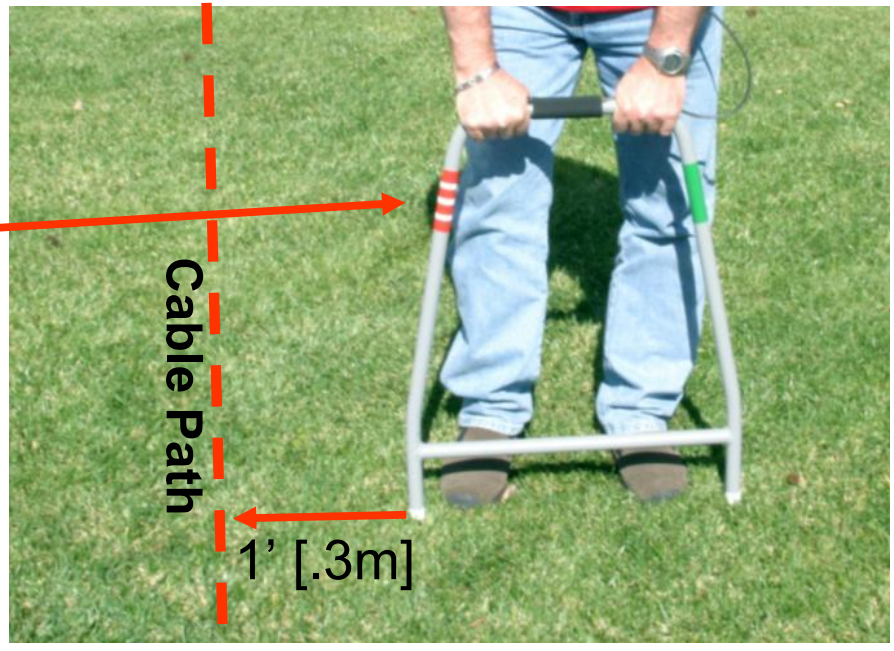
- If the A-Frame tests good, the Receiver defaults to the OBA Receiver Toning Display
- The Receiver will be searching for a tone frequency. It will lock on the same frequency as the Transmitter when tone is received.
- Once the Receiver has locked on a frequency, it can be changed under the **MENU** key or by pressing **ON** to start a new search



Open Shields/Bonds

Toning with the Receiver and an A-Frame

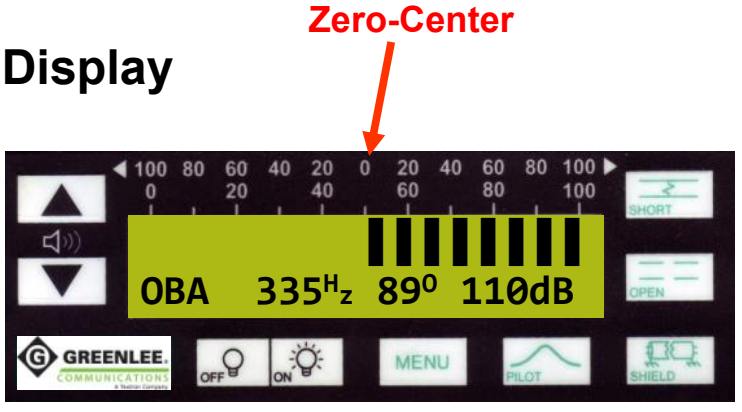
- Locate and mark the cable path with a Cable Locator
- Place the **Receiver** around your neck. The Bargraph will pulse to your left or right.
- Orient **the A-Frame** so the **RED** side is to your **Right**
- Position the **A-Frame** so both spikes are on the same side of the cable path and a line through them is perpendicular to the cable.
- Keep the spike closest to the cable path approximately 1’ [.3m] away from the cable. **The Bargraph will pulse toward the cable.**

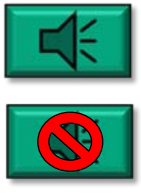


Open Shields/Bonds

Receiver Toning Display

With the A-Frame positioned correctly in the ground, adjust the gain with the ▲▼ keys so Bargraph pulses to **about 80** on the zero-center scale on top

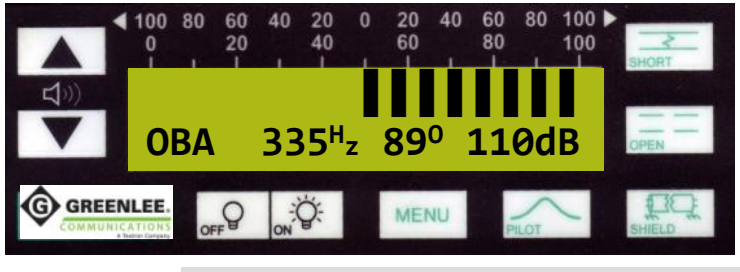


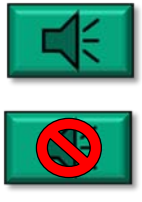


Locate Tone

The Locate tone has four 1 second Hi/Lo tones and a pause every 5th second.

If Receiver gain is saturated (Bargraph off scale), a **Bugling tone** is heard. The Open Shields/Bonds cannot be located until the gain is reduced and Locate Tone is heard.





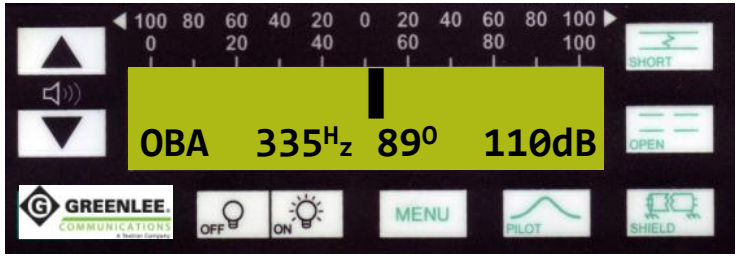
Bugling Tone

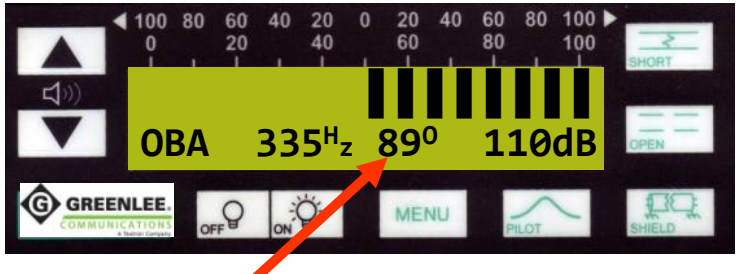
The Bugling tone has 3 Lo tones followed by 3 Hi tones (Lo, Lo, Lo, Hi, Hi, Hi)

Open Shields/Bonds

Receiver Toning Display

- If you cannot hear the tone after increasing Receiver gain to 110dB (maximum gain)
- Increase the Transmitter Volts until the tone is heard by the Receiver.
- Make sure the Transmitter and Receiver are on the same frequency.



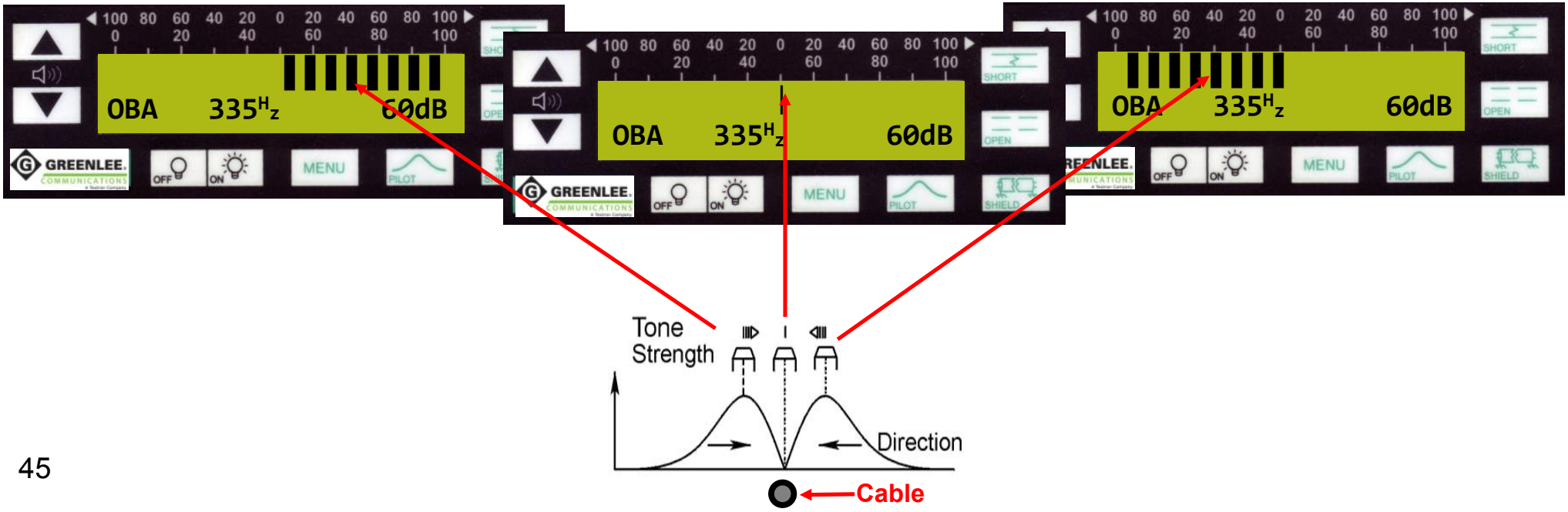


- 45º to 90º means you are approaching an Open Shield fault
- 0º to 45º means you are approaching a Shield-to-Earth fault

Open Shields/Bonds

Locating Cable Path with A-Frame

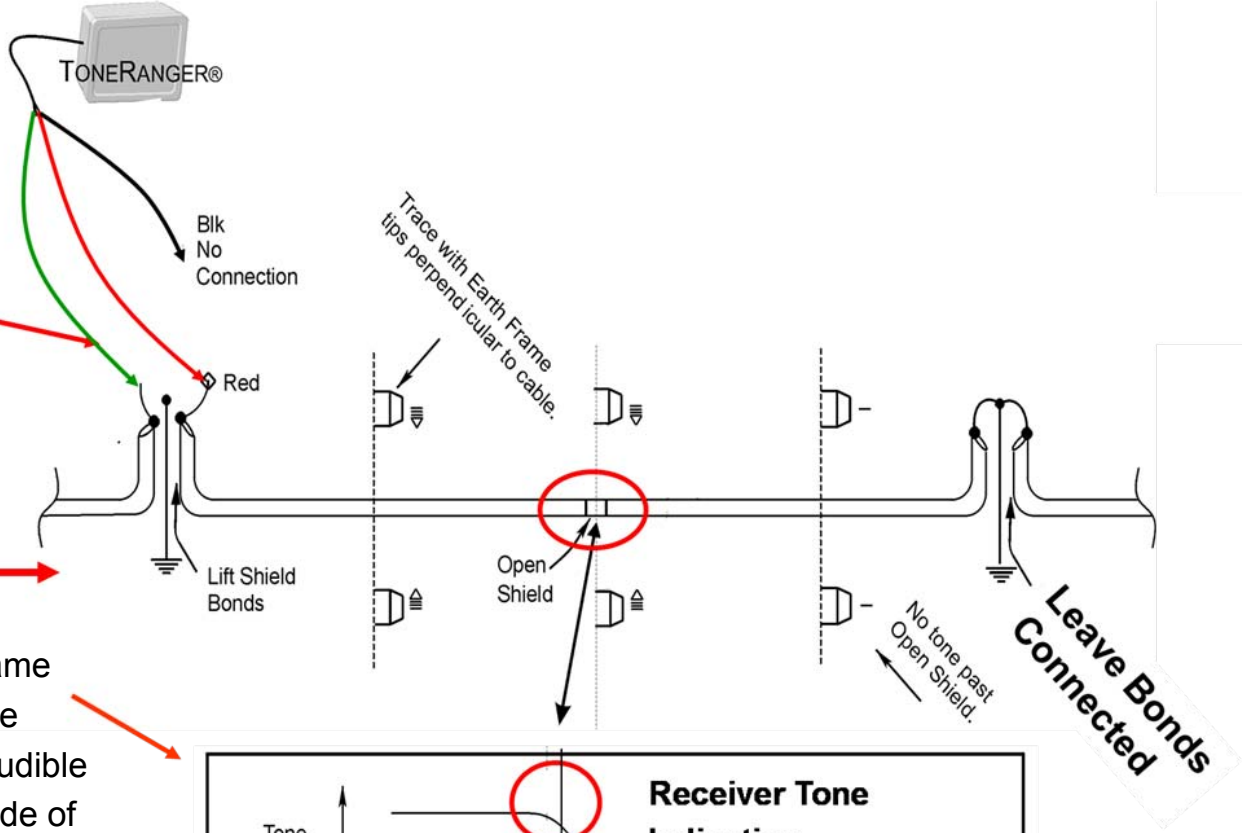
- Position the **A-Frame tips perpendicular** to the cable to see a **Peak** tone on each side of cable and a **Null** directly over the cable
- Orient **the A-Frame** RED to your right, so the Bargraph points toward the cable from the zero-center point
- The A-Frame should be kept perpendicular to the cable and moved across the cable path to locate the cable



Open Shields/Bonds

Connect Green lead to a ground that passes Sidekick KnockDown test. The Shield of the incoming cable is preferred.

Walking direction



Assuming the A-Frame is kept the same distance away from the cable, and the cable remains the same depth, the audible tone and visual Bargraph on either side of the cable will remain relatively constant along the length of the cable with a dramatic drop-off past the open shield.

Open Shields/Bonds

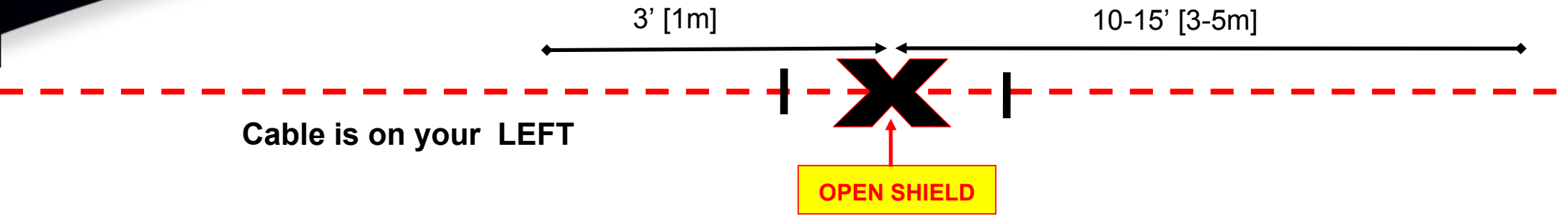
Pinpoint Locate

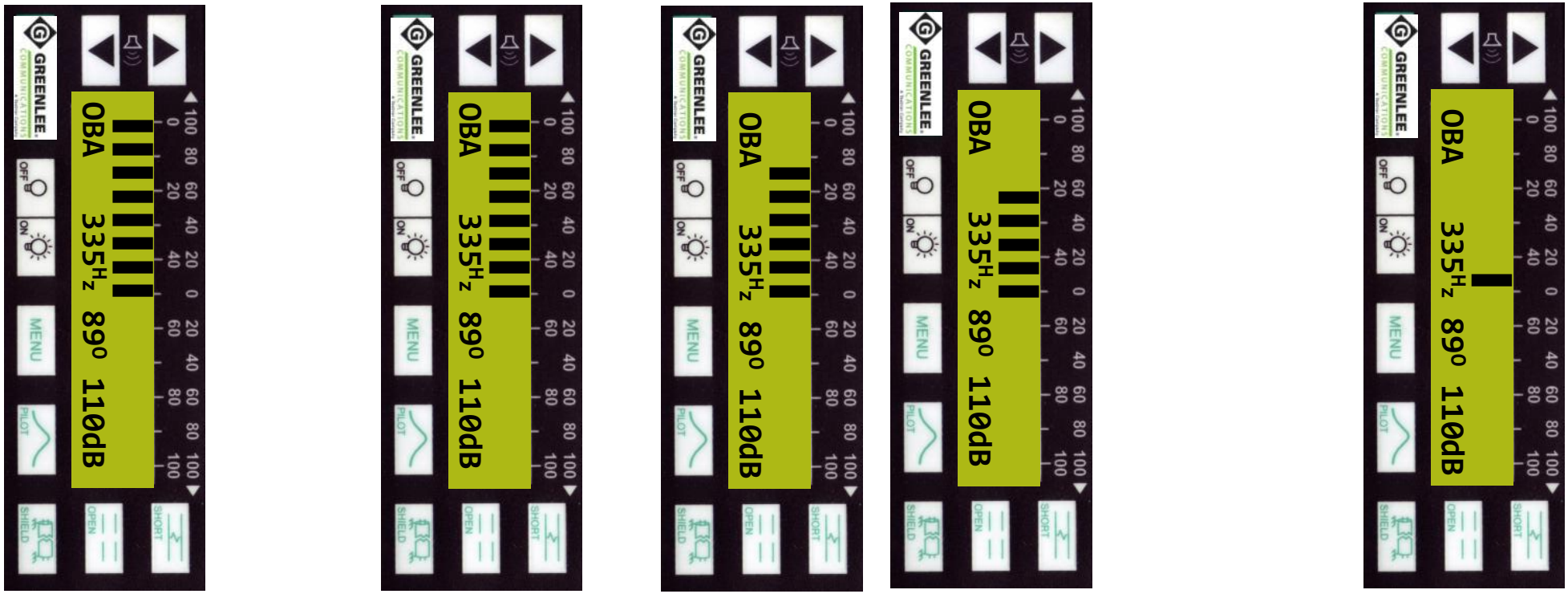
Tone level on either side of the cable will **remain relatively constant** along the cable length. The pinpoint location of the Open Shield is where the tone has dropped to **70% of the level before the Open Shield**

Example:

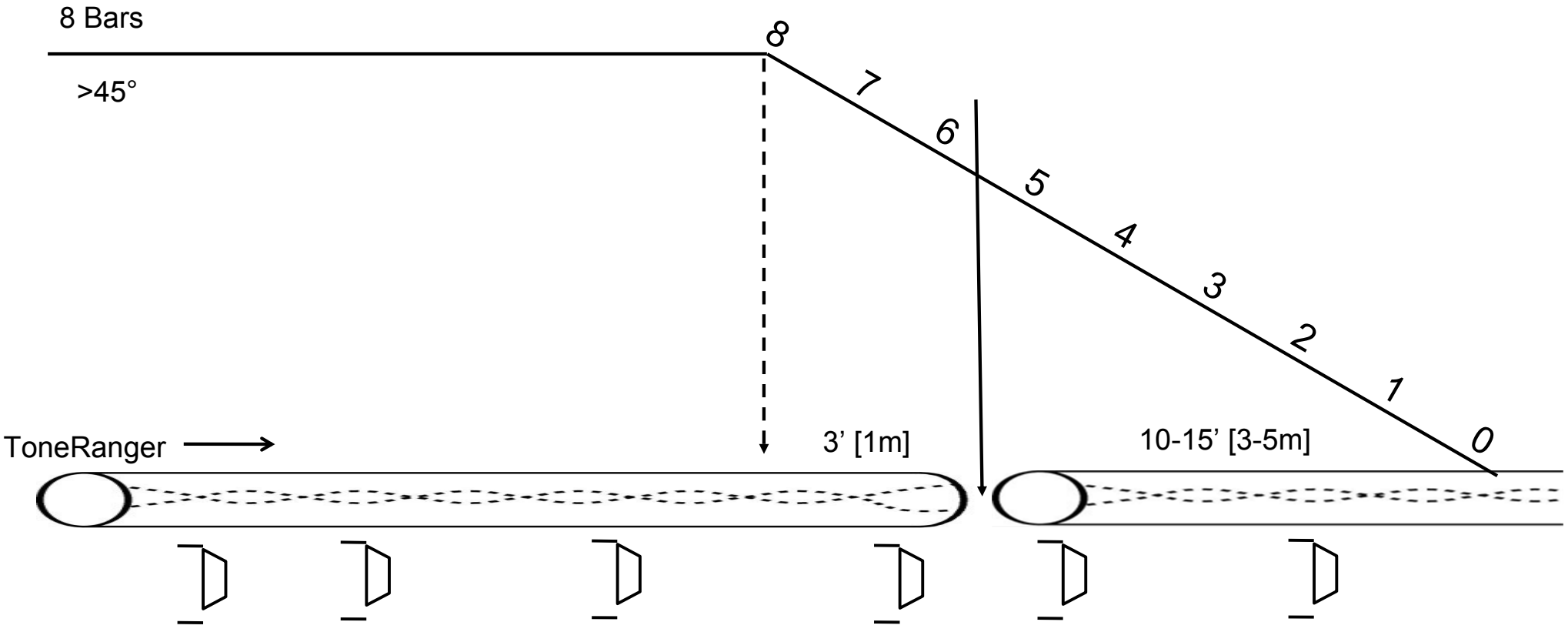
- The tone will begin dropping approximately 3’ [1m] before the Open Shield and drop completely away 10-15’ [3-5m] beyond the Open Shield (depending on the cable depth)
- If the Receiver gain were adjusted for a Bargraph of 8 bars, 5.6 bars would be the 70% point (70% of 8 bars is 5.6 bars). Mark the spot where you have 6 bars and the spot where you have 5 bars. Dig between the 2 marks.

Locating Open Shields/Bonds





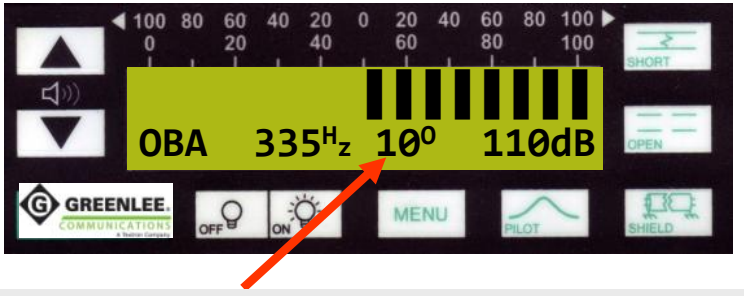
Toning a Clean Open Shield



Open Shields/Bonds

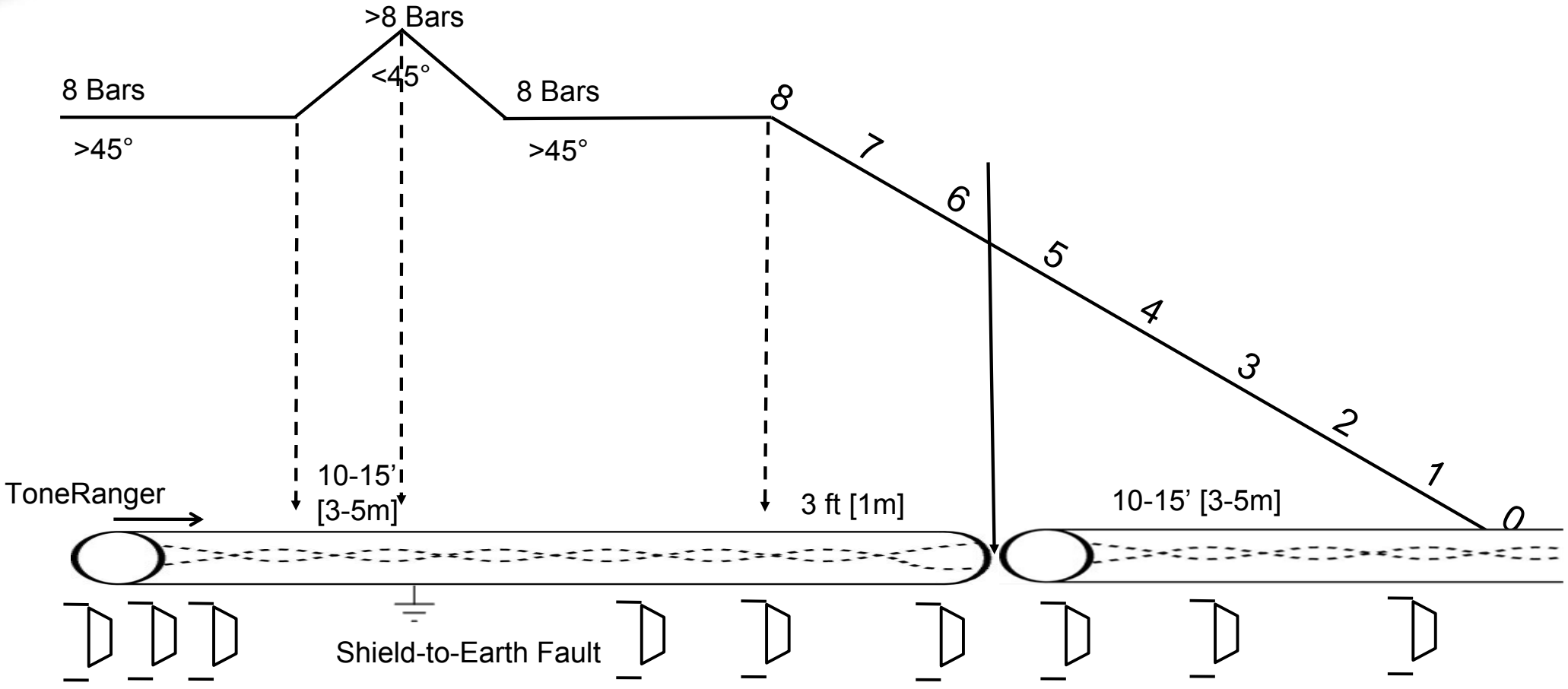
Receiver Toning Display

- A high Ohm **Shield-to-Earth fault** along the way (angle below 45º) will not interfere with locating the Open Shield
- Just continue past it, the angle will go back above 45º
- Tone will go away just beyond the Open Shield



- 0º to 45º means you are approaching a Shield-to-Earth fault

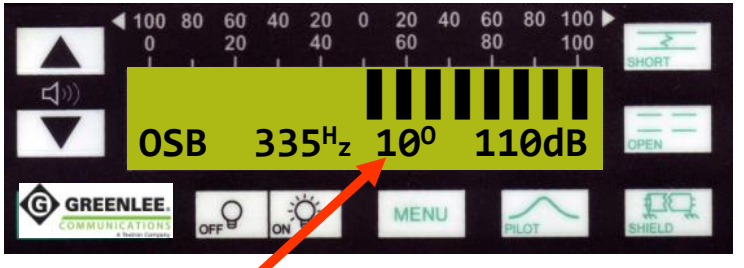
Toning an Open Shield Preceded by a Shield-to-Earth Fault



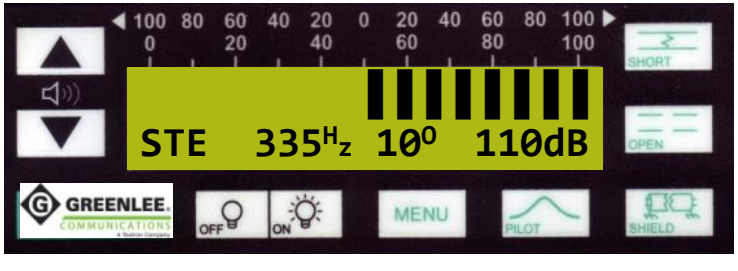
Open Shields/Bonds

Shield-to-Earth Fault

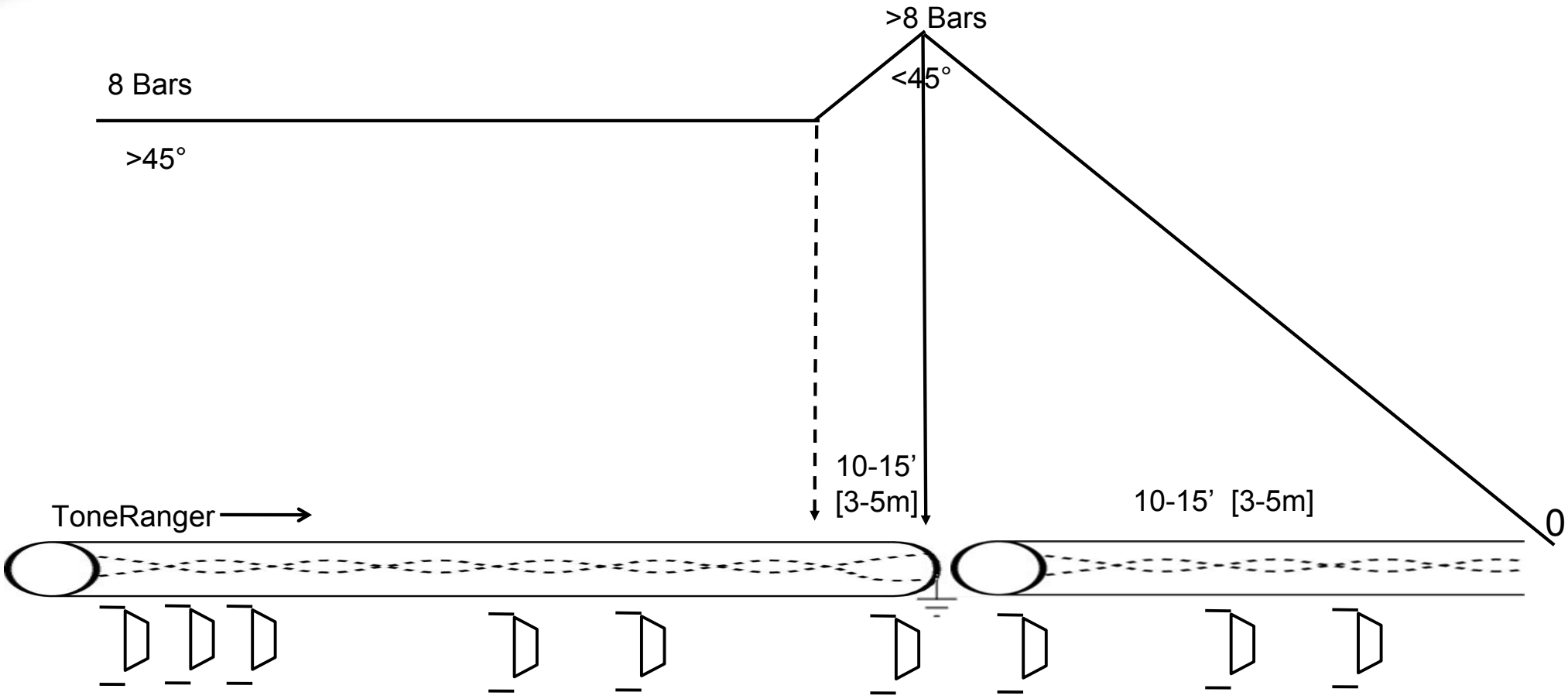
- A **Shield-to-Earth fault** can be at the same location as the Open Shield
- This is indicated when the tone goes away beyond the Shield-to-Earth fault, and tone with an angle above 45º does not come back
- **Mark the spot of the Shield-to-Earth fault as your Open Shield locate.**



- 0º to 45º means you are approaching a Shield-to-Earth fault



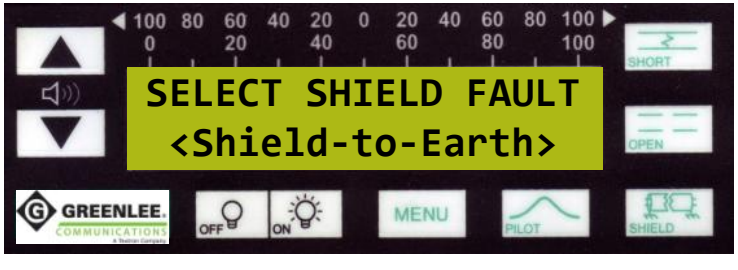
Toning an Open Shield and a Shield-to-Earth Fault at the Same Location

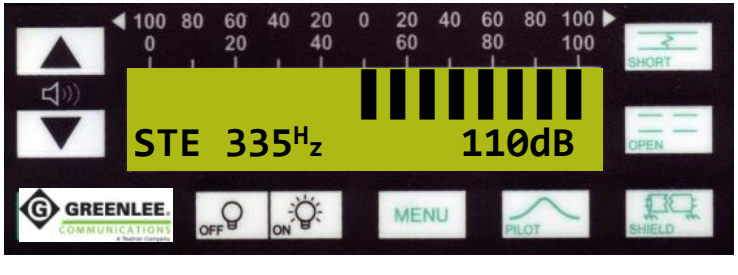


Pinpoint Locating a Shield-to-Earth Fault

At the Same Location as an Open Shield

- This procedure assumes you already have the Transmitter set up for toning Open Shields/Bonds, and the Receiver set to: <Open-Buried,Aframe>
- Press the Receiver **SHIELD** key
- Use ▲▼ keys to highlight **<Shield-to-Earth>**
- Press the Receiver **SHIELD** key again
- The Shield-to-Earth Fault Locating screen will appear

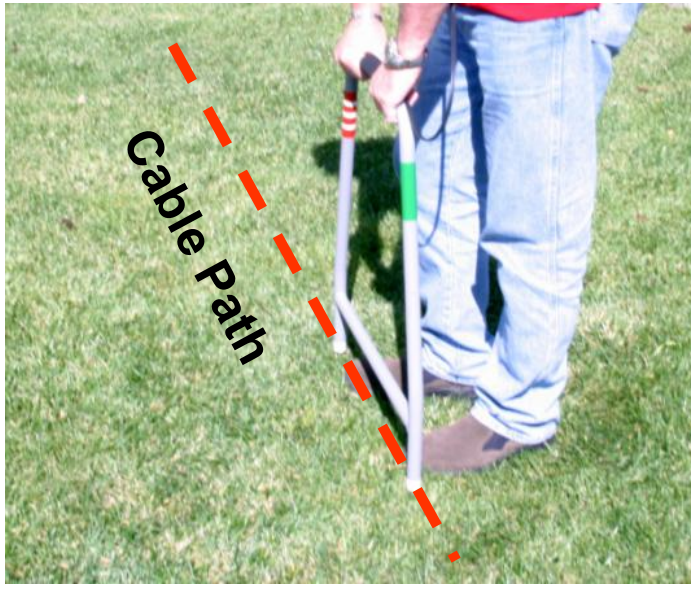


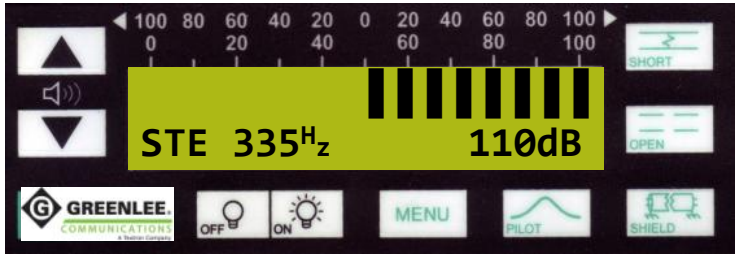


Pinpoint Locating a Shield-to-Earth Fault

At the Same Location as an Open Shield

- Place the A-Frame parallel to the cable with the spikes directly over the cable path
- The Bargraph will now pulse toward the Shield-to-Earth Fault, null directly over the fault, and will reverse direction as the fault is passed
- Adjust Receiver gain to put the Bargraph on scale

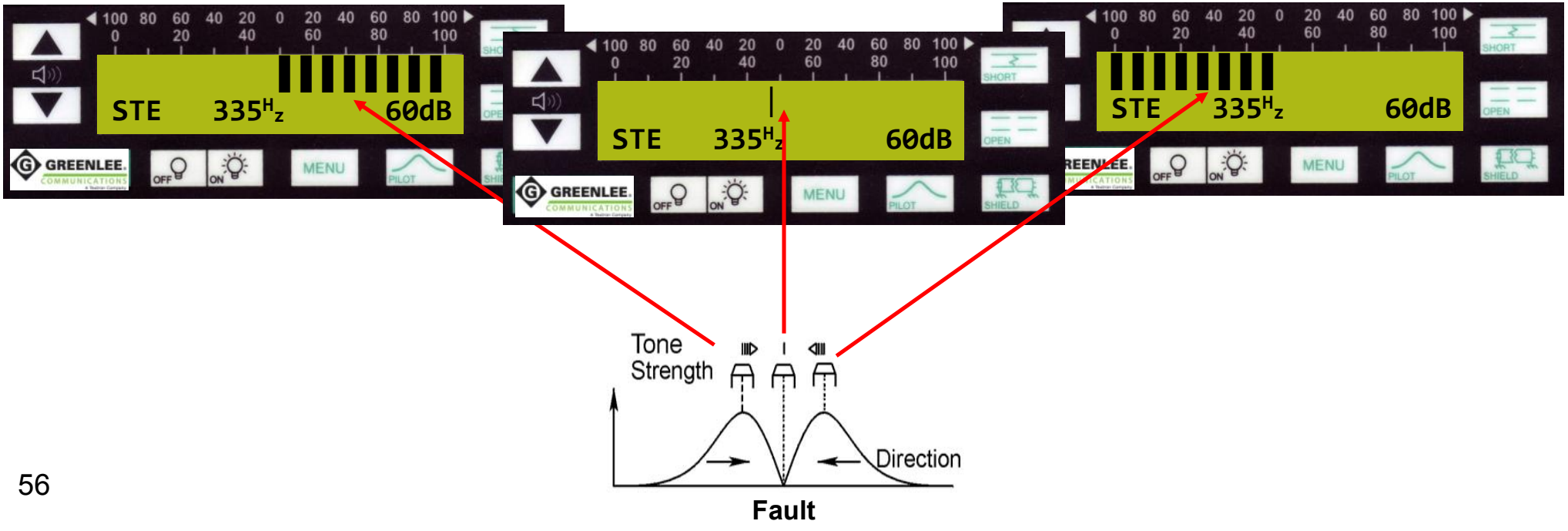




Shield-to-Earth Fault

Pinpoint Locating the Fault

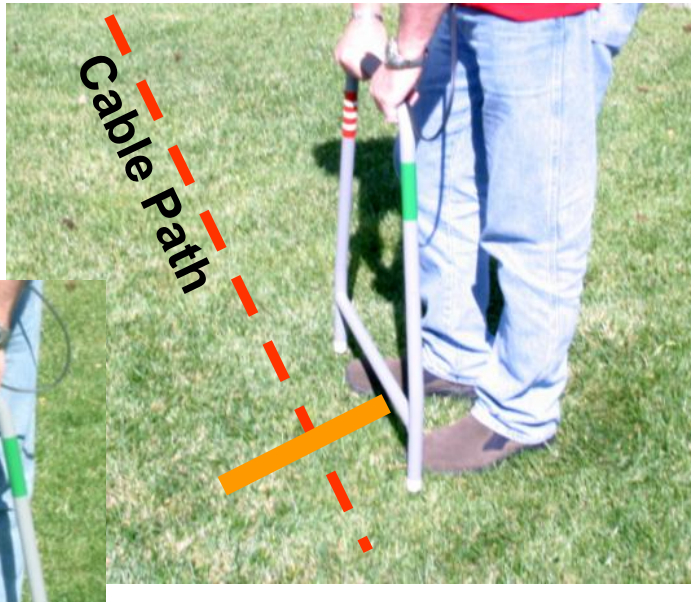
- Position the **A-Frame tips parallel** to the cable to see a **peak** tone on each side of the Shield-to-Earth Fault and a **null** directly over the fault
- Orient the A-Frame RED to your right, so the Bargraph points toward the Shield-to-Earth Fault from the zero-center point
- Move the A-Frame along the cable path to locate the Shield-to-Earth Fault



Pinpoint Locating a Shield-to-Earth Fault

Mark the Spot to Dig

- Moving along the cable with the A-Frame parallel, where the Bargraph reverses, mark a line at the center of the A-Frame and perpendicular to it

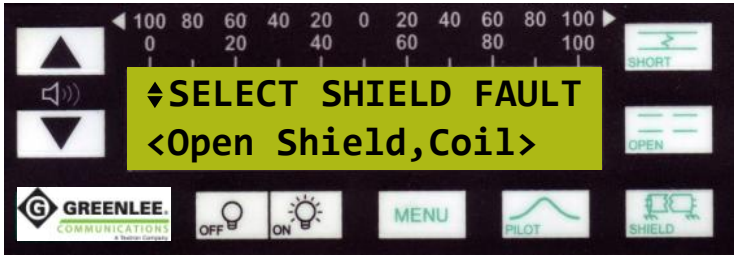


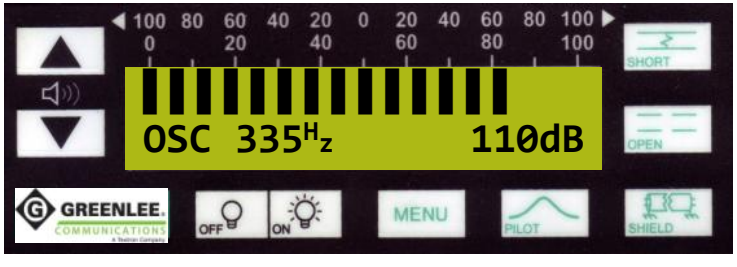
- Turn the A-Frame parallel to the mark, move the A-Frame along the mark until it the Bargraph reverses.
- Make another mark at the center of and perpendicular to the A-Frame.
- Dig where the 2 marks cross

Confirm Open Shield Location

This Procedure will also Locate an Aerial Open Shield

- After the cable is exposed and before opening the splice or sheath, confirm the fault location with a **Humbucker Handcoil**
- Unplug A-Frame, Press **SHIELD** key. Use ▲▼ keys to highlight <Open Shield,Coil>. Press **SHIELD** key again. When the screen instructs you to do so, plug in the **Humbucker Handcoil.**
- The Receiver tests the Coil for Open or Shorted conditions and will not let the technician proceed with a defective coil
- If the Coil tests good, the Receiver defaults to the OSC Screen
- Go back near the Transmitter and calibrate the Receiver again with the Handcoil on the cable. The visual Bargraph now pulses from the left to the right of the display.
- **Do not put your hand on the cable**, only the Handcoil
- **Confirm the Open Shield location** with the Handcoil





CAUTION: When toning an Open Shield in Coil mode only, do not touch the back panel of the Receiver as it may ground out the tone!

Confirm the Open Shield Locate with the Handcoil Before Opening the Cable

- The Tone is present on the cable at this point indicating the Open Shield is toward the field
- The Open Shield was in a splice that was exposed about 2' [.6m] toward the field from his right knee

Handcoil on the cable

After digging 2-4' [.6-1.3m] to the field and exposing a splice case, Locate Tone was present on the Central Office side of the splice

The Locate Tone was NOT present on the field side of the splice case indicating the open shield was in the splice case

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Tone Locating Pair Faults









Tone Locating Pair Faults

Check List For Success

- Follow normal Pair Qualification, Troubleshooting, and Isolation procedures using a SIDEKICK, or other test set
- **Isolate** the faulted pair at the Transmitter Access Point, and **remove subscriber (CPE)** equipment at the customer premises
- **Pre-locate** the fault using any Resistance Bridge or TDR to measure the approximate **distance** to the fault.
- Position the Transmitter at a Central Office, cross-connect box, or terminal, to **"Tone Toward the Subscriber"**
- Place the Transmitter **10' [3m]** from any cable to be toned. This will prevent an error due to Transmitter RF when calibrating the reference gain of the Receiver
- In **Buried Cable** place the Transmitter **30' [10m]** away from the cable to be toned so that faults near the Access Point can be located
- Use the shielded noise canceling **Humbucker Coils** with the ToneRanger

Maximum Ohms Table

Fault [Falla]	Aerial Max.	Buried [Subt] Max.	Depth [Bajo] Max.
Short [Corto]	50k Ω	20k Ω	1½ ft. [.5m]
Cross [Cruzado]	100k Ω	20k Ω	2½ ft. [.8m]
Ground [Tierra]	100k Ω	50k Ω	5 ft. [1.5m]
Split [Transpuesto]	Strap	Strap	3 ft. [1m]
Wet Splice [Humedo]	100k Ω	100k Ω	5 ft. [1.5m]

Always Tone Away From the Central Office

Position the Transmitter at a Central Office, cross-connect box, or terminal, to **"Tone Toward the Subscriber"**

Verify a Good Ground with a Sidekick® KnockDown Test

Set-Up for the KnockDown Test

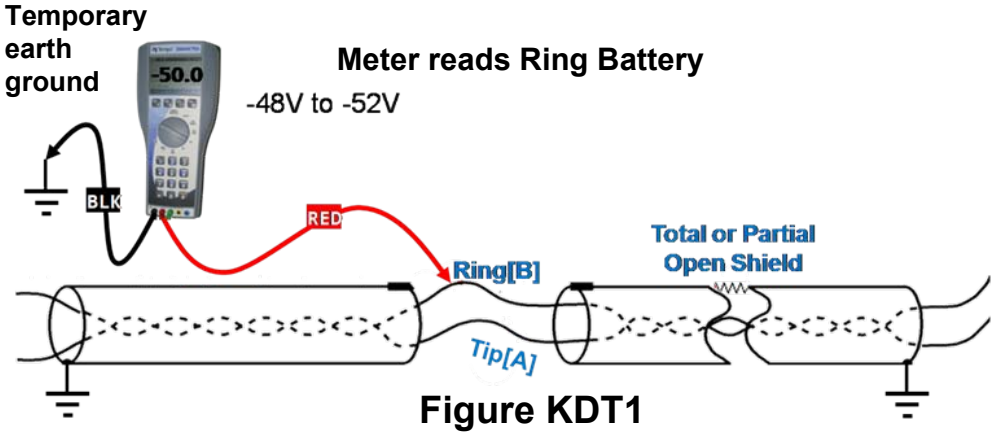


Figure KDT1

- At the Pedestal disconnect the shield bonds
- Connect the Sidekick **Black** Lead to a temporary screwdriver earth ground. Connect nothing else to this ground.
- Connect the **Red** Lead to the Ring side of an idle working pair. The meter will now indicate -48V to -52V Ring Battery.

Testing Shield of Incoming Cable

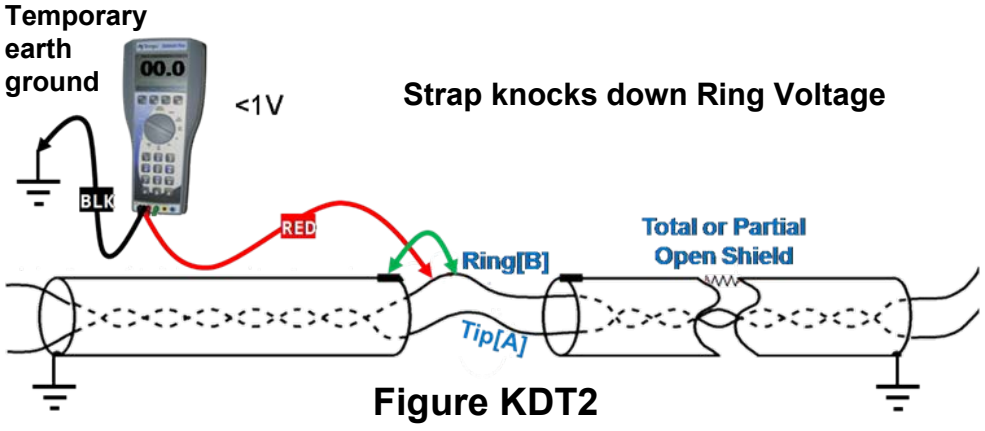


Figure KDT2

- **Touch a strap** from the Ring Battery to the Incoming Shield
- If the shield ground is **good** it will knock down the Ring Battery to **below 1V**

Connect Leads & Ground Transmitter

Plug test leads into the transmitter

Connect Test Leads on the Faulted Pair

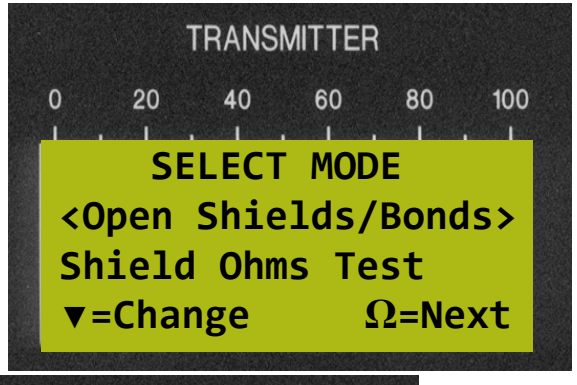
RED to **RING [B]**
BLACK to **TIP [A]**
GREEN to ⏚

Always Ground the Transmitter

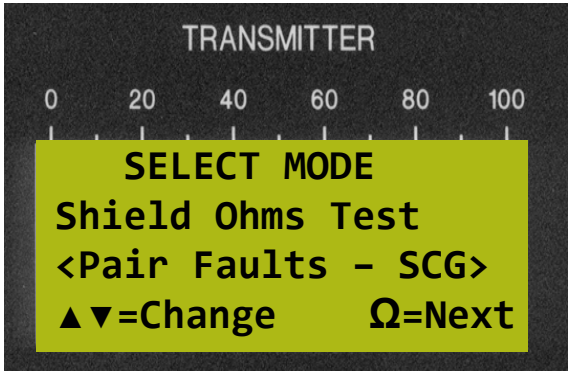
- Connect the **Green Test Lead** to the **Cable Shield** that has passed the Sidekick KnockDown Test in Aerial or Buried Cable as the first choice
  - **You must have a good ground or the PRETEST lengths and Ohms will not be correct**
  - Should you NOT have a solid ground, change to a Temporary Earth Ground
- **In Buried Cable**, keep the Transmitter and Temporary Earth Ground 30’ [10m] away from the cable being toned so you can locate a fault near the Access Point

Tone Locating Pair Faults

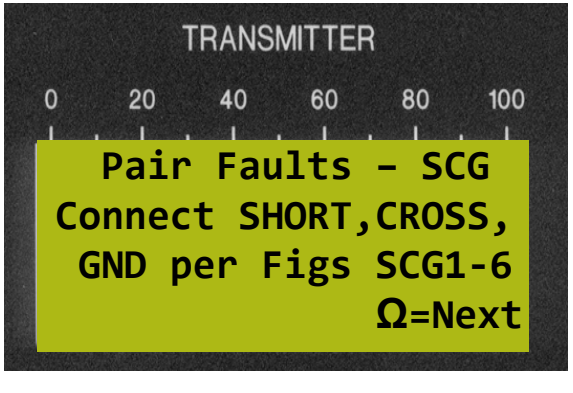
- Press Transmitter **ON** key
- After Self Test completes, SELECT MODE screen appears



- Use up or down arrow key to select **<Pair Faults – SCG>**
  (SCG = Shorts, Crosses, Grounds)
- Press the **Ω** key



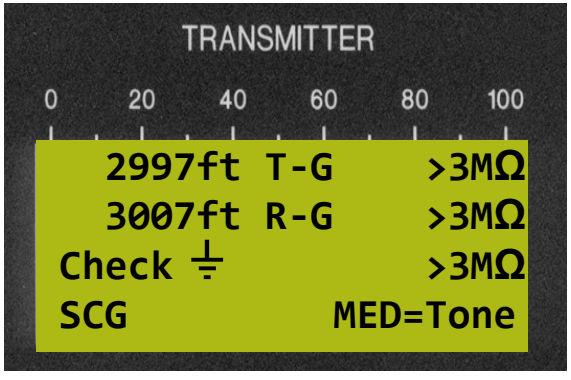
- Connect per Figures SCG1-6
- Press the **Ω** key to open the Pair Faults PRETEST screen



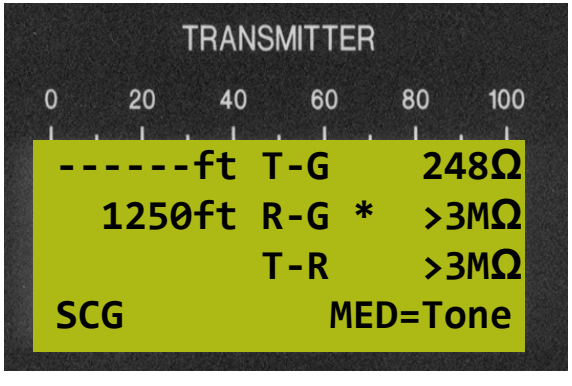
Tone Locating Pair Faults

Pair Faults PRETEST Screens

- **Check** ⏚ (Ground) on the display indicates you do not have a good Ground.
- **Check CPE** will appear when Customer Premise Equipment must be removed.
- **Check** ⏚ or **Check CPE** may appear when locating wet faults. You should find a good Ground before proceeding. The Length and Ohms indications require a good Ground to be correct.
- If **Check** ⏚ will not go away, proceed to tone locate the fault, as the indication may be in the gray zone not black or white.



- In this screen dashes (- - - -ft) indicate a **low Ohm fault** where capacitance length cannot be measured.
- **Anytime a display appears with dashes, proceed to tone locate the low resistance fault.**

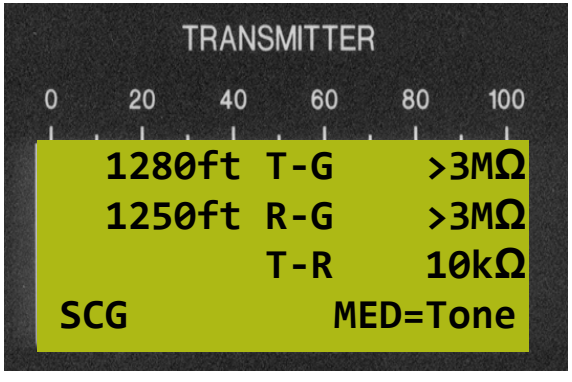


- In this screen for both length and Ohms, a * means the reading has some inaccuracy
- **It is OK to Proceed** as normal.
- The Ohms measurements on this screen are the values used to consult the **Maximum Ohms Table** (see next page) or in the lid of ToneRanger

Tone Locating Pair Faults

Analyzing a Typical Short

Capacitance length of each conductor indicates the pair **is Balanced** (nearly equal). **This is NOT the distance to the fault.**



T-R Ohms indicates a **10k Ohm Short**

Maximum Ohms Table

Fault	Aerial Max.	Buried Max.	Depth Max.
Short	**50k Ohms**	**20k Ohms**	**1½ ft. [.5m]**
Cross	100k Ohms	20k Ohms	2½ ft. [.8m]
Ground	100k Ohms	50k Ohms	5 ft. [1.5m]
Split	Strapped	Strapped	3 ft. [1m]
Wet Splice	100k Ohms	100k Ohms	5 ft. [1.5m]

The **10k** Ohms **Short** is within Aerial & Buried Range

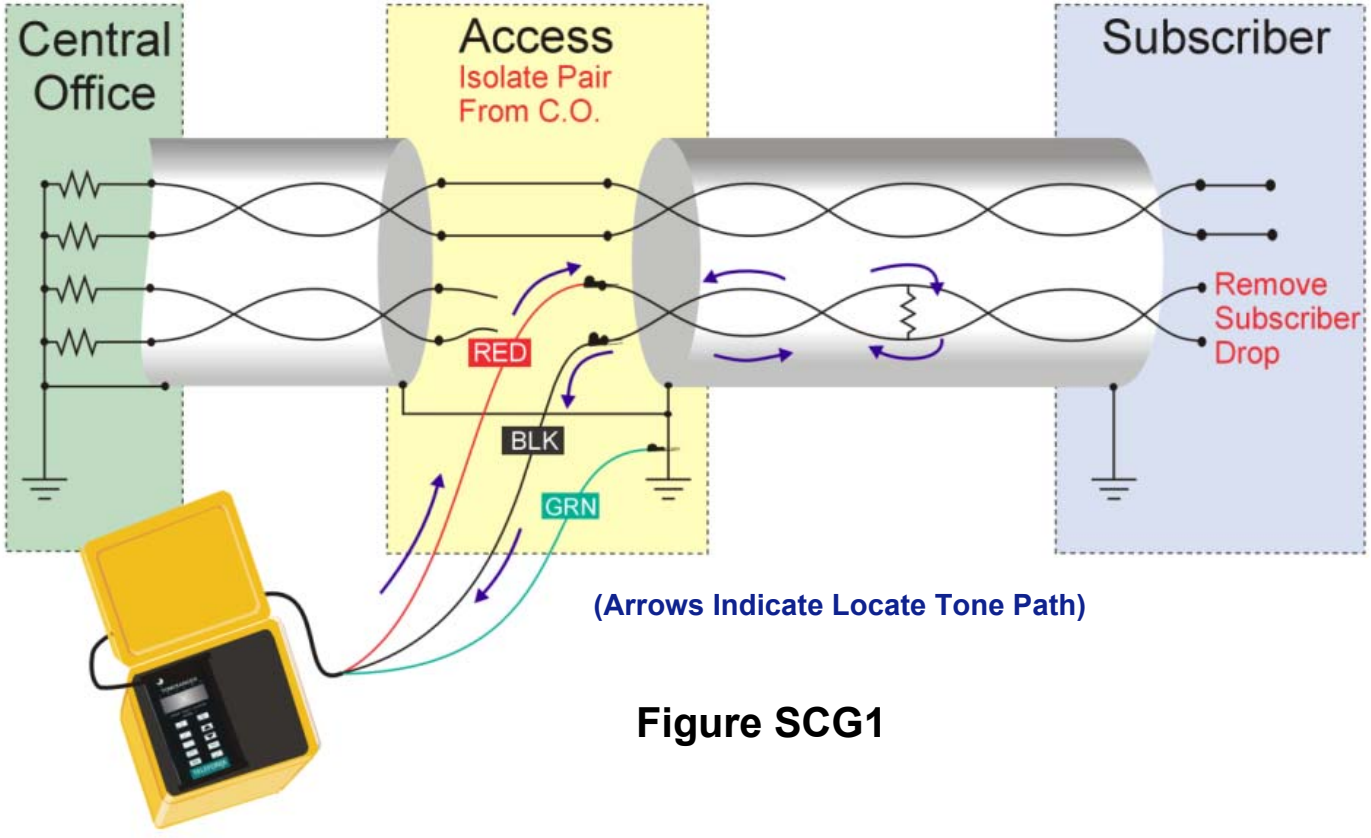
When the fault is in range, press **MED** to tone it

Tone Locating Pair Faults

Connecting to Tone Locate a Short

Toning A **Short**

Shorts produce a weaker tone than a Cross or Ground, but can still be located. Toning toward the Subscriber, the Locate Tone will stop at the fault.



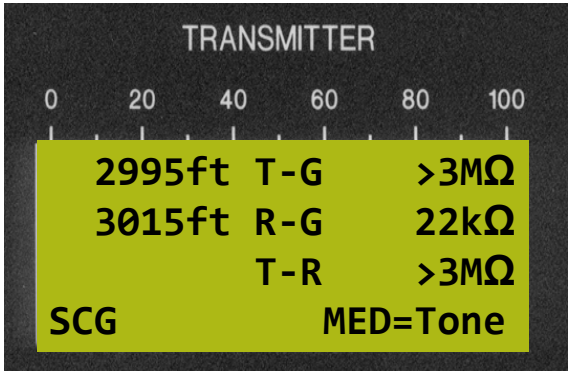
(Arrows Indicate Locate Tone Path)

Figure SCG1

Tone Locating Pair Faults

Analyzing a Typical Cross to a Working Pair

- The working pair is grounded at the Central Office providing a return path to the ToneRanger Ground lead.
- Capacitance lengths **are Balanced** (nearly equal) 2995' and 3015'. **This is NOT the distance to the fault.**



R-G Ohms indicates a **22k Ohm Cross.**

The 22k Ohm Cross is within the Aerial Fault Range

Maximum Ohms Table

Fault	Aerial Max.	Buried Max.	Depth Max.
Short	50k Ohms	20k Ohms	1½ ft. [.5m]
Cross	100k Ohms	20k Ohms	2½ ft. [.8m]
Ground	100k Ohms	50k Ohms	5 ft. [1.5m]
Split	Strapped	Strapped	3 ft. [1m]
Wet Splice	100k Ohms	100k Ohms	5 ft. [1.5m]

The 22k Ohm Cross is out of the Buried Fault Range, but keep going. It may come down when the DC BIAS is turned on.

NOTE: Out-of-range faults sometimes can be brought within the Locatable Fault Range with DC Bias

Tone Locating Pair Faults

Connecting to Tone Locate a Typical Cross to a Working Pair

Toning a CROSS to a Working Pair

The Central Office ground provides a return path to the ground lead of the ToneRanger.

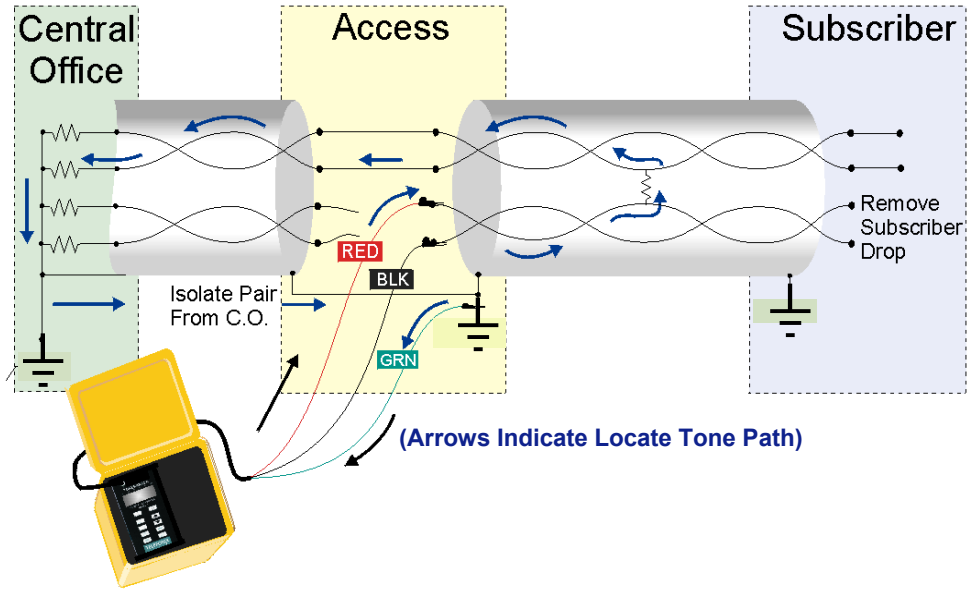


Figure SCG2

Toning a WET CROSS to a Working Pair

When toning toward the Subscriber, the Locate Tone will stop at the fault.

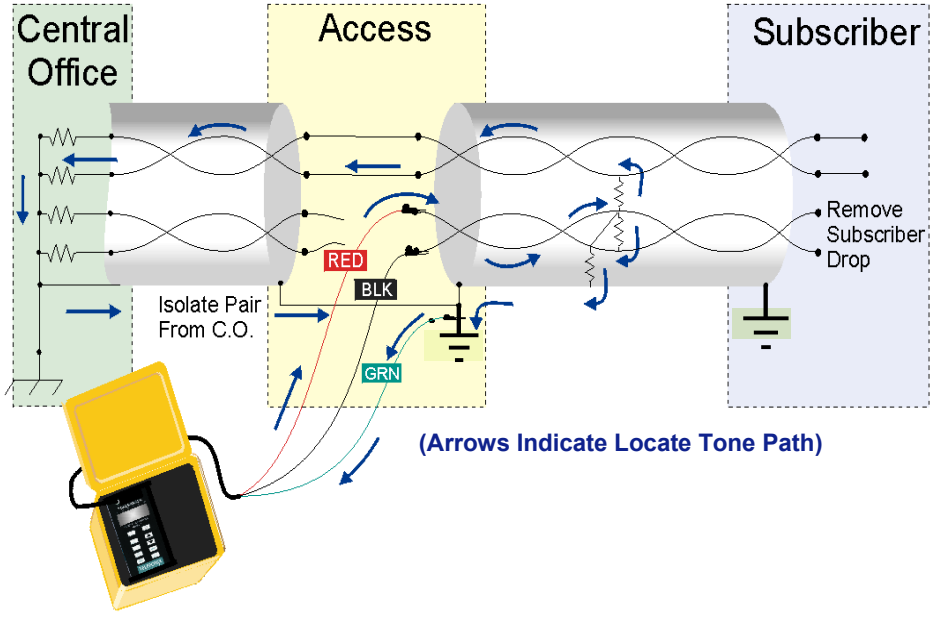
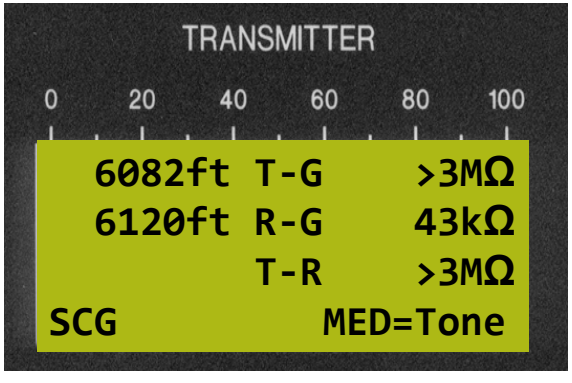


Figure SCG3

Tone Locating Pair Faults

Analyzing a Typical Ground

Capacitance length indicates the pair **is Balanced** (nearly equal) **This is NOT the distance to the fault**



R-G Ohms indicates a **43k Ohm Ground.**

Maximum Ohms Table

Fault	Aerial Max.	Buried Max.	Depth Max.
Short	50k Ohms	20k Ohms	1½ ft. [.5m]
Cross	100k Ohms	20k Ohms	2½ ft. [.8m]
Ground	**100k Ohms**	**50k Ohms**	**5 ft. [1.5m]**
Split	Strapped	Strapped	3 ft. [1m]
Wet Splice	100k Ohms	100k Ohms	5 ft. [1.5m

The 43k Ohm Ground is within the Aerial Fault Range

The 43k Ohm Ground is within the Buried Fault Range.

Tone Locating Pair Faults

Connecting to Tone Locate a Typical Ground

Toning a **Ground**

Toning toward the Subscriber the Locate Tone will stop at the fault.

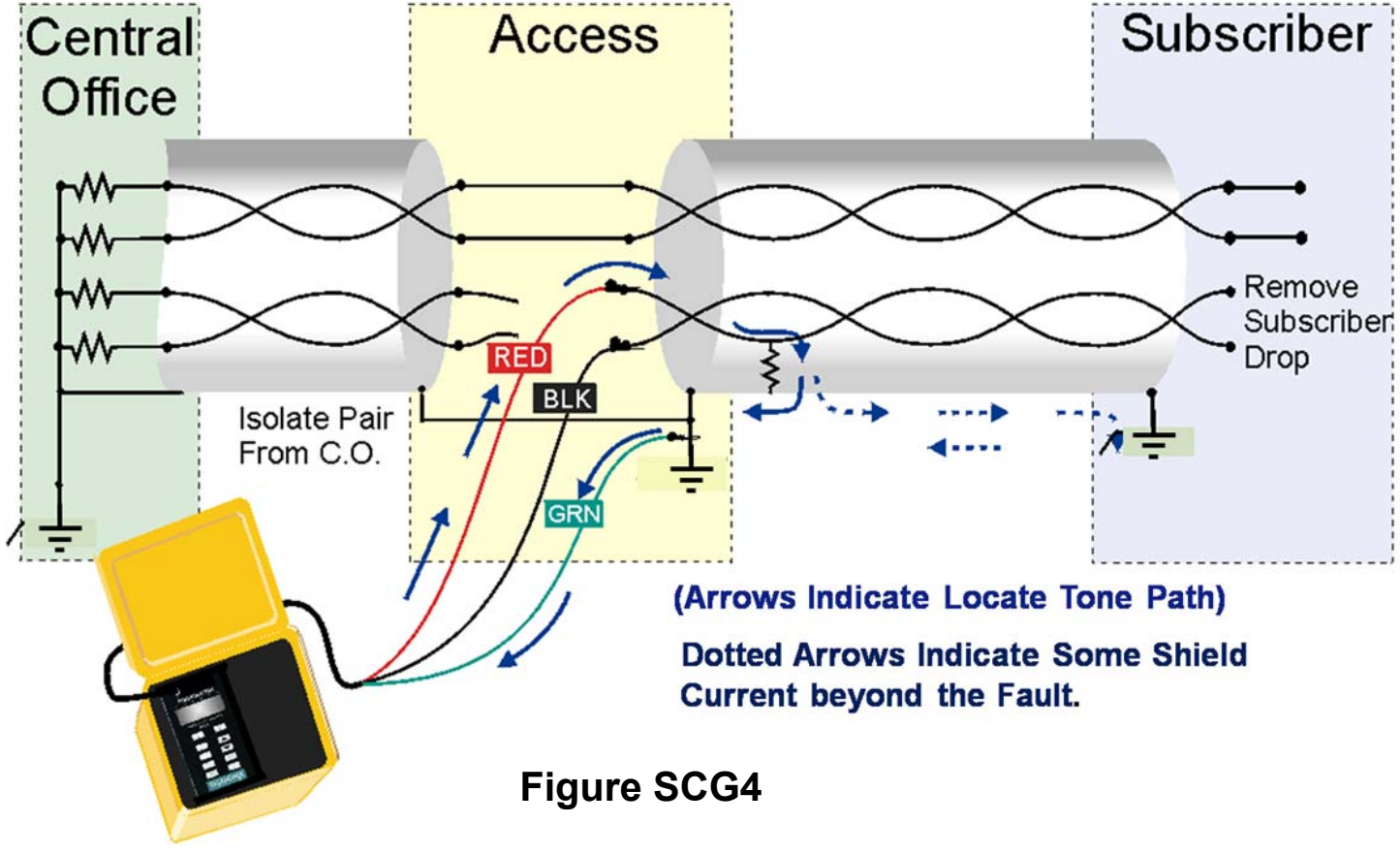
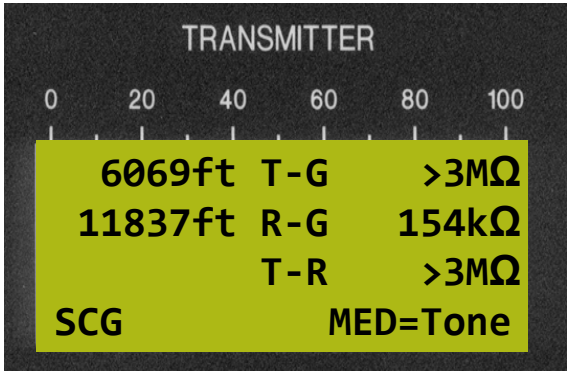


Figure SCG4

Tone Locating Pair Faults

Analyzing a Typical Cross to a Non-Working Pair

Capacitance length indicates the pair **is unbalanced. Expect the unbalance to be a cross to a non-working pair(s).**

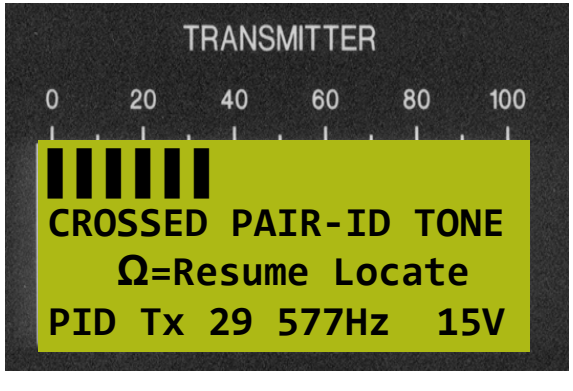


R-G Ohms indicates the unbalance **is not** a one sided open. The 154k Ohms is an AC Ohms indication and will not be the same as your DC Ohmmeter until the pairs you are crossed with are identified and grounded.

Crossed Non-working pairs must be grounded to prevent tone carry-by

How To Identify Crossed Non-working Pairs using the Transmitter Pair ID Tone

- Instead of pressing the **MED** key as the above screen instructs, press and **HOLD** the **MED** key until 577Hz tone appears on the screen.
- **Use any tone probe to identify the crossed pairs**. At a minimum check all vacant pairs in the 25 pair complement. Or at a cross connect, connect a buttset across each pair to identify each cross.
- **Short and ground** any vacant/non-working pairs the faulted pair is crossed with.
- Press and release the **Ω** key to resume the Pair Fault Locate Mode.

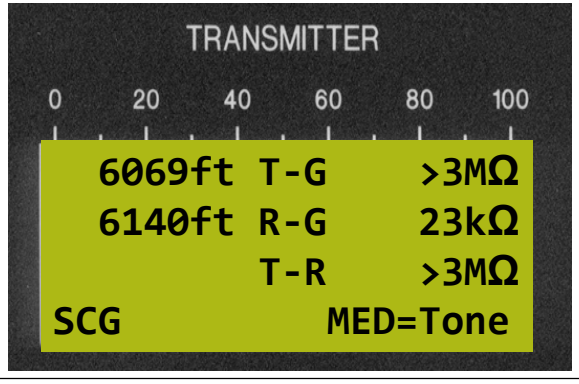


Tone Locating Pair Faults

Analyzing a Cross to a Non-working Pair

After Crossed Non-working Pair(s) Identified And Grounded

Capacitance lengths are now nearly equal. The Pair is **now balanced.**



R-G Ohms has come down from the 154k Ohms to **23k Ohms** since the capacitance of the crossed pair(s) has been cancelled (grounded) out.

The 23k Ohm **Cross** is within the Aerial Fault Range

Maximum Ohms Table

Fault	Aerial Max.	Buried Max.	Depth Max.
Short	50k Ohms	20k Ohms	1½ ft. [.5m]
Cross	**100k Ohms**	**20k Ohms**	**2½ ft. [.8m]**
Ground	100k Ohms	50k Ohms	5 ft. [1.5m]
Split	Strapped	Strapped	3 ft. [1m]
Wet Splice	100k Ohms	100k Ohms	5 ft. [1.5m]

The 23k Ohm **Cross** is out of the Buried Fault Range, but keep going. It may come down when the DC BIAS is turned on.

Tone Locating Pair Faults

Connecting to Tone Locate a Cross to a Non-working Pair

When toning a Cross to a non-working pair **not grounded**, the Locate Tone may carry-by on the capacitance of the non-working pair.

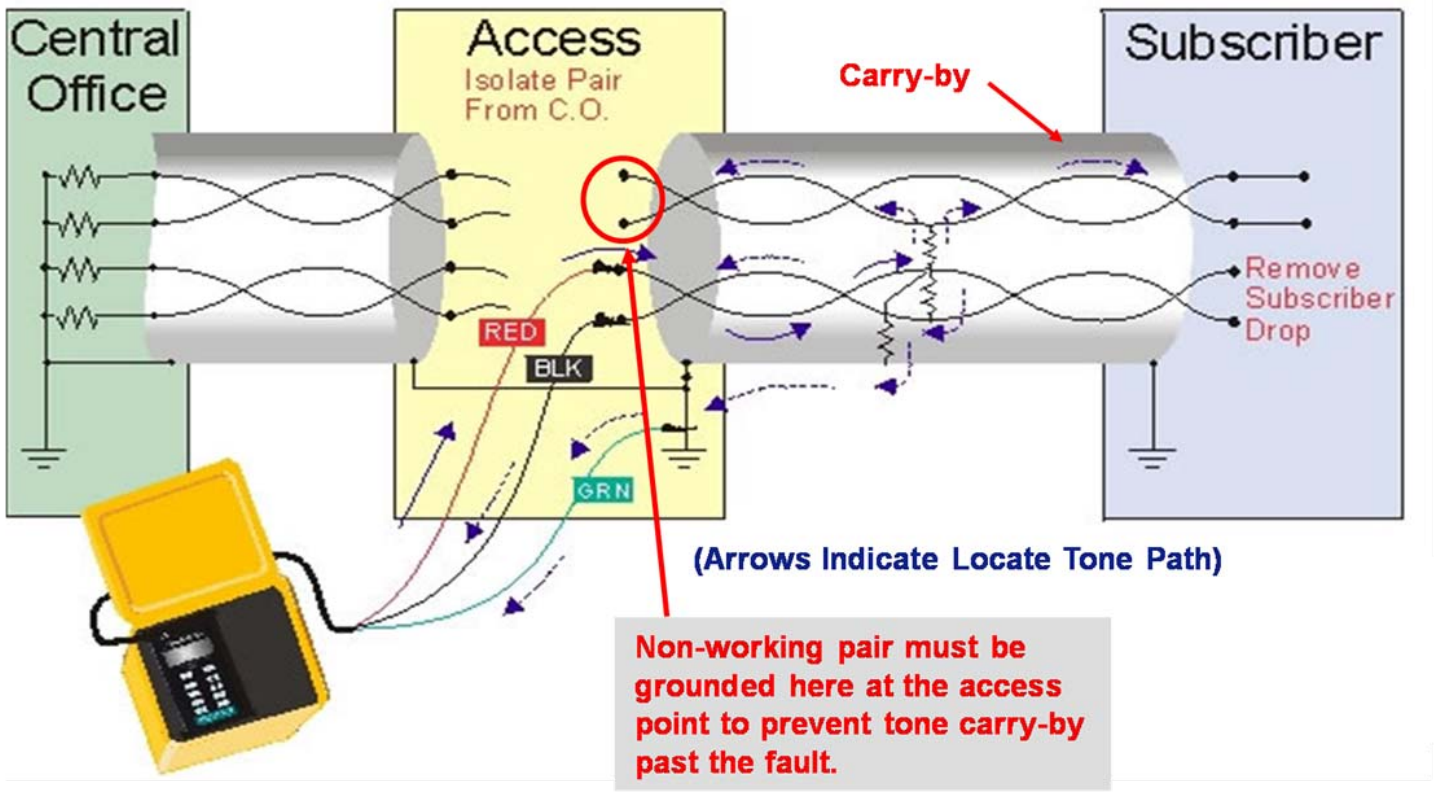


Figure SCG5

Tone Locating Pair Faults

Connecting to Tone Locate a Cross to a Non-working Pair

After Crossed Non-working Pair is Identified & Grounded

Toning a Cross to a non-working pair after identifying & grounding.

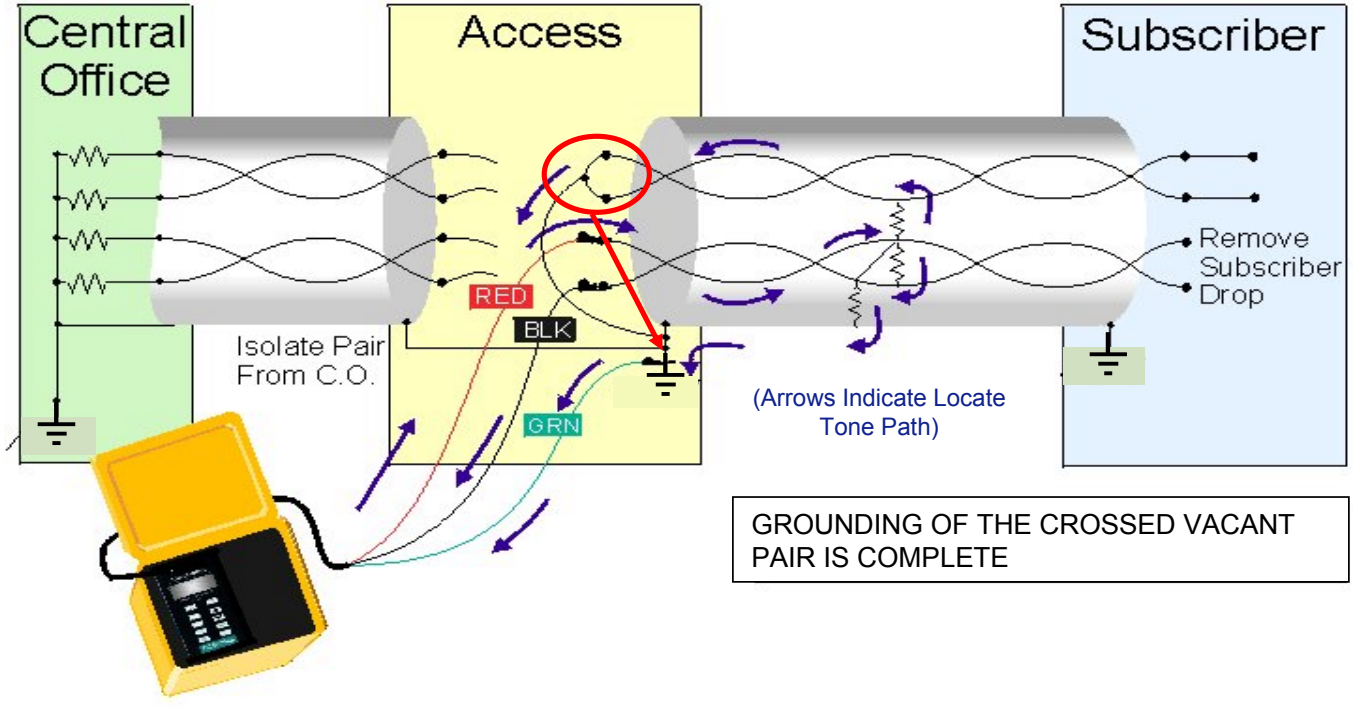
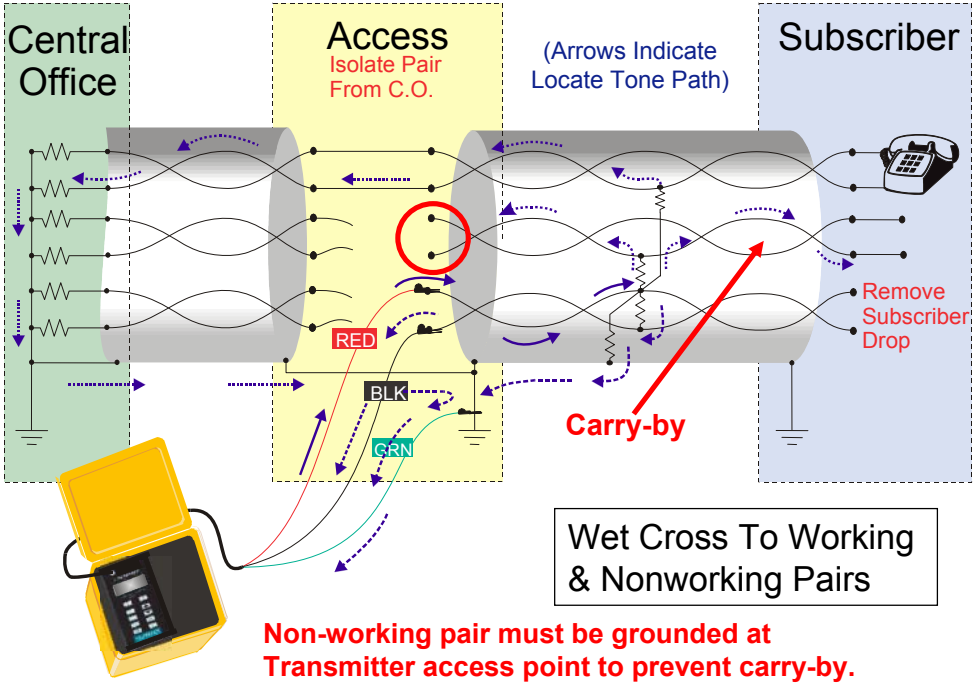


Figure SCG6

Tone Locating Pair Faults

Connecting to Tone Locate a Wet PIC Splice or a Wet PULP Fault

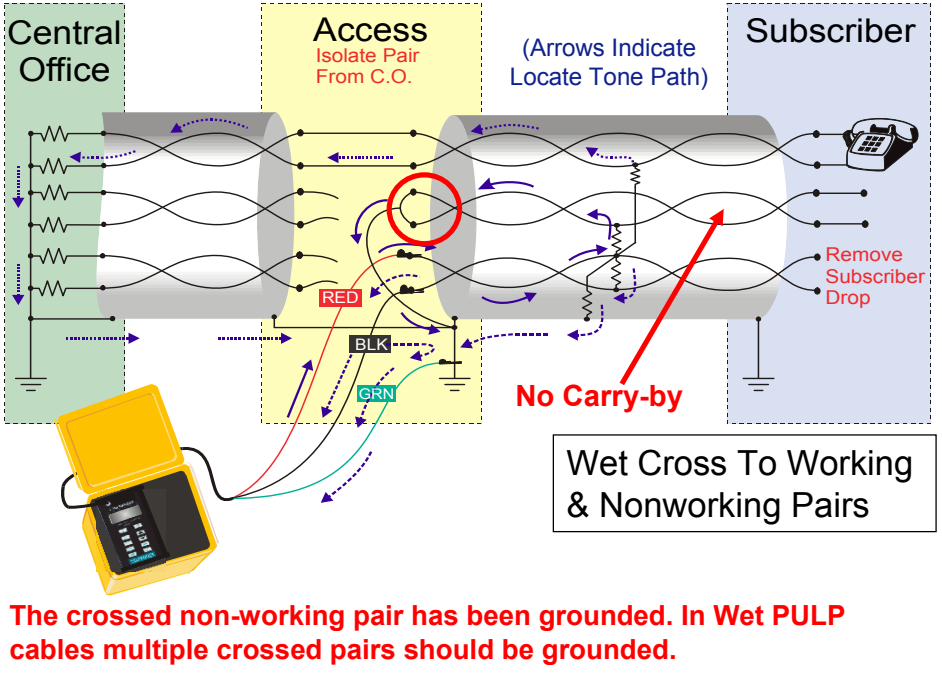
In a Wet Splice you may simultaneously have a Short, crossed working and nonworking pair(s), and a Ground as shown.



Non-working pair must be grounded at Transmitter access point to prevent carry-by.

Figure SCG7

In a Wet PULP Fault many adjacent pairs are crossed with the toned pair. To reduce carry-by, bunch several adjacent pairs involved in the wet and ground to the Transmitter Green ground lead.



The crossed non-working pair has been grounded. In Wet PULP cables multiple crossed pairs should be grounded.

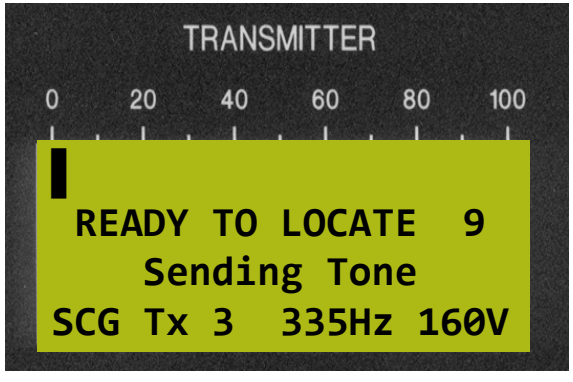
Figure SCG8

Tone Locating Pair Faults

- Once the ToneRanger is Connected to the Faulted Pair per Figures SCG1-6
- Press the **MED** key
- Follow the Toning Display messages until “READY TO LOCATE” appears

Line 3 may instruct the technician to:

- **Raise Volts to up Tx**
  (Tx is the amount of tone current through the fault)
- **Try DC Bias**
  (To reduce the resistance to within range)
- **Try lower frequency**
  (For more range distance)
- **Shorten the pair**
  (Pair is too long to locate fault)

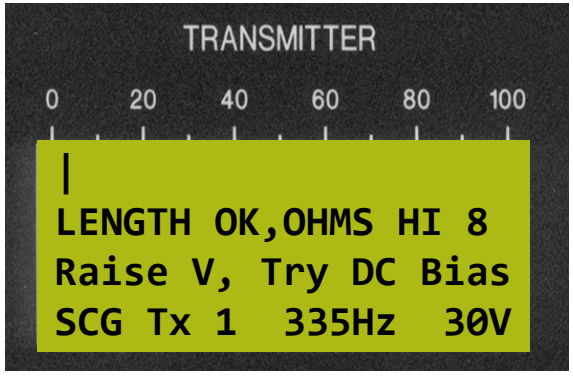


- The “READY TO LOCATE” Display will appear when the voltage has been raised until the Tx is 3 or higher.
- Tx numbers between 3 and 100 can be toned in aerial cable and between 20 and 100 in buried cable.
- If the Bargraph and Tx go above 100 as on a solid short, cross, or ground, reduce tone voltage just enough to get the Tx below 100 on the Bargraph.

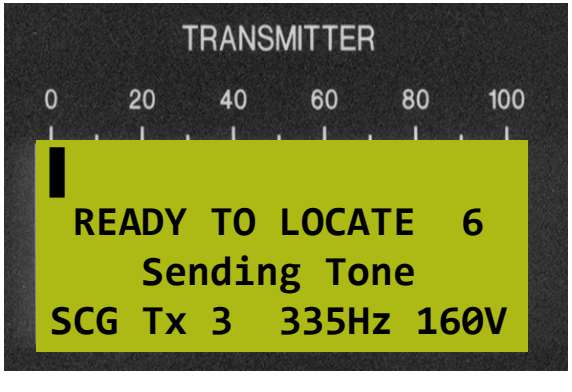
Tone Locating Pair Faults

Follow The Toning Display Messages

- Output Voltage is at 30V, but Tx is below 3, raise the output voltage with the ▲ key



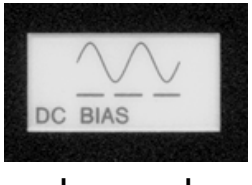
- At 160V the “READY TO LOCATE” Display appears (Tx is now 3)

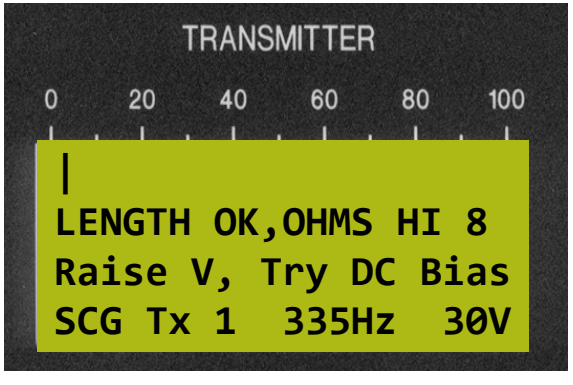


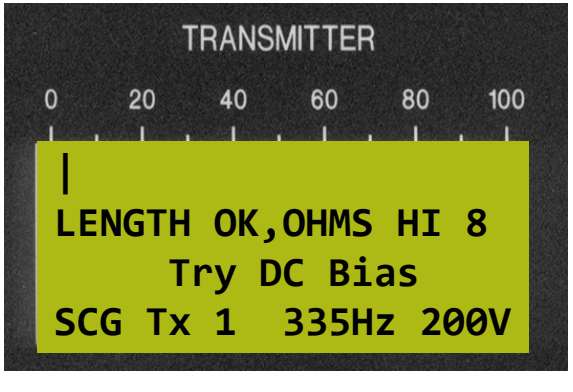
Tone Locating Pair Faults

Follow The Toning Display Messages

- Raise the output voltage to obtain a Tx of 3 or greater. A Tx >20 is best for buried faults.
- The output voltage has been raised to the maximum (200V) and the Tx is still not 3 or greater
- Press **DC Bias**







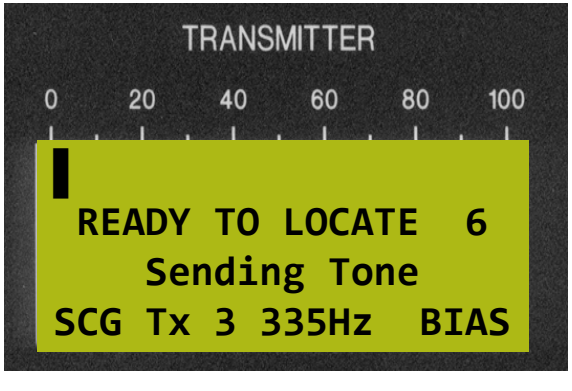
When a high resistance fault will not produce adequate tone for tracing, the DC BIAS will dislodge any insulating oxide layer present to bring faults **up to 1M Ohm** down into the Locatable Fault Range, especially in PIC cable.

Tone Locating Pair Faults

Use DC Bias Feature for Out of Range Faults

Wait a few minutes to see if the Length Ratio number comes down and the Tx number comes up.

In a couple of minutes the “READY TO LOCATE” Display may appear when the Tx reaches 3.



The “READY TO LOCATE” Display has appeared.

Watch it a few minutes to see if the Tx stays stable. Once the Tx is stable, start the Receiver.

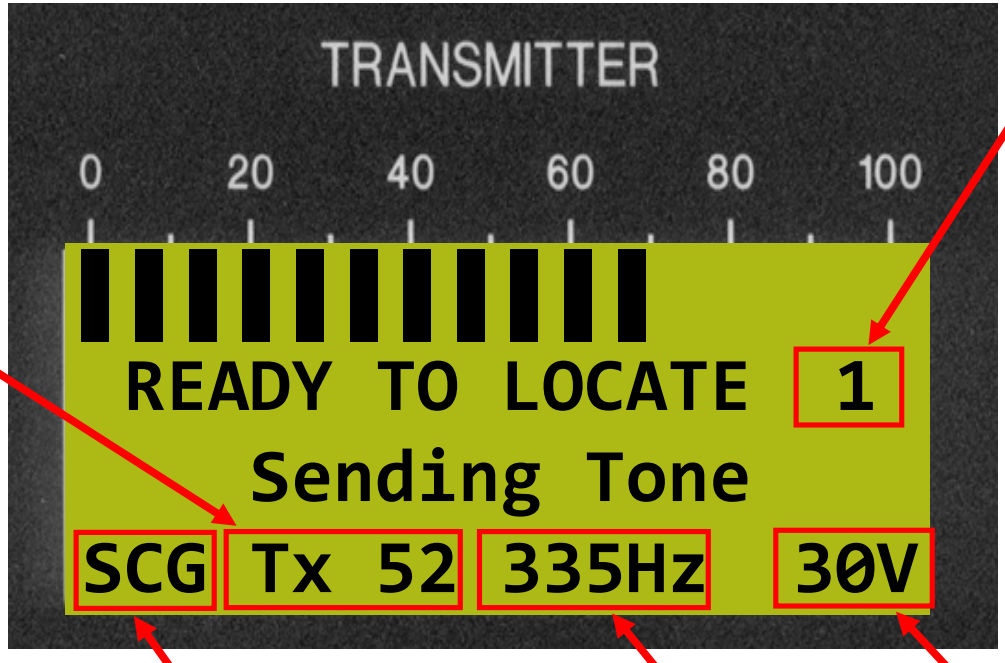
As long as the Tx number and Bargraph are increasing the insulating oxide coating of the fault is being dislodged, and the resistance of the fault is going down.

Leave the DC BIAS on while locating the fault

Tone Locating Pair Faults

Transmitter - READY TO LOCATE

- **Tx** number is the amount of Transmitter **output tone current** through the fault displayed on the Transmitter Bargraph scale with 100 being full scale
- Any Tx of 3 to 100 (20 to 100 for buried cable) can be toned
- If Tx goes to 0, the fault has cleared.



This Length Ratio number indicates the likelihood of tone carry-by. Chance for a successful locate is excellent when length ratio is 1, under 10 is good, the lower the better.

Toning Mode

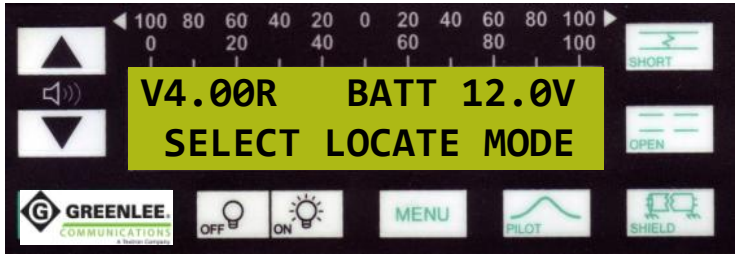
Toning Frequency

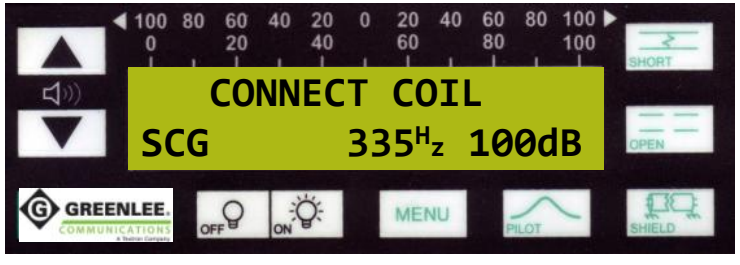
Transmitter Output Voltage

Tone Locating Pair Faults

Receiver Set Up

- Press Receiver **ON** key
- When SELECT LOCATE MODE appears press the **SHORT** key
- Connect Coil (Humbucker Lay-up Stick, Humbucker Handcoil, or Buried Wand). The Receiver tests the coils and will not let the locate continue with a “shorted” or “open” coil.
- If the connected coil tests good, the Receiver defaults to the screen on the next page

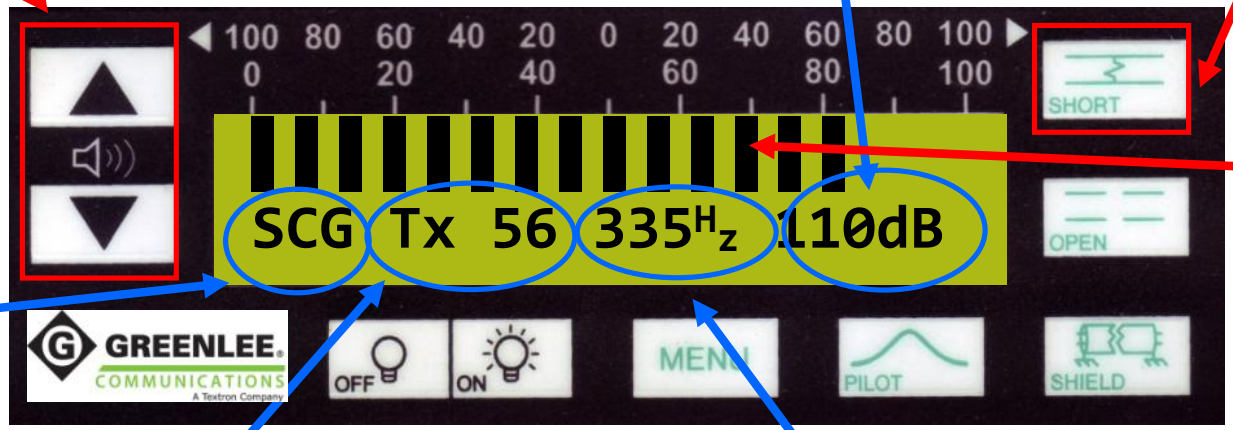




Tone Locating Pair Faults

Receiver Front Display (with coil on/over cable)

▲▼ keys adjust the Receiver gain
Press and Hold the key to increase/decrease gain in **1dB** steps
Press and Release the key to increase/decrease gain in **10dB** steps



SHORT - for shorts, crosses grounds, splits, and wet splices.

The Bargraph is a visual representation of the Audible Tone

Indicator for "Locate Mode" selected (SCG=shorts, crosses, grounds & splits)

Amount of current (tone) through the fault. Any Tx of 3 (20 for buried) to 100 can be toned.

Locate Tone frequency picked up from Transmitter

Tone Locating Pair Faults

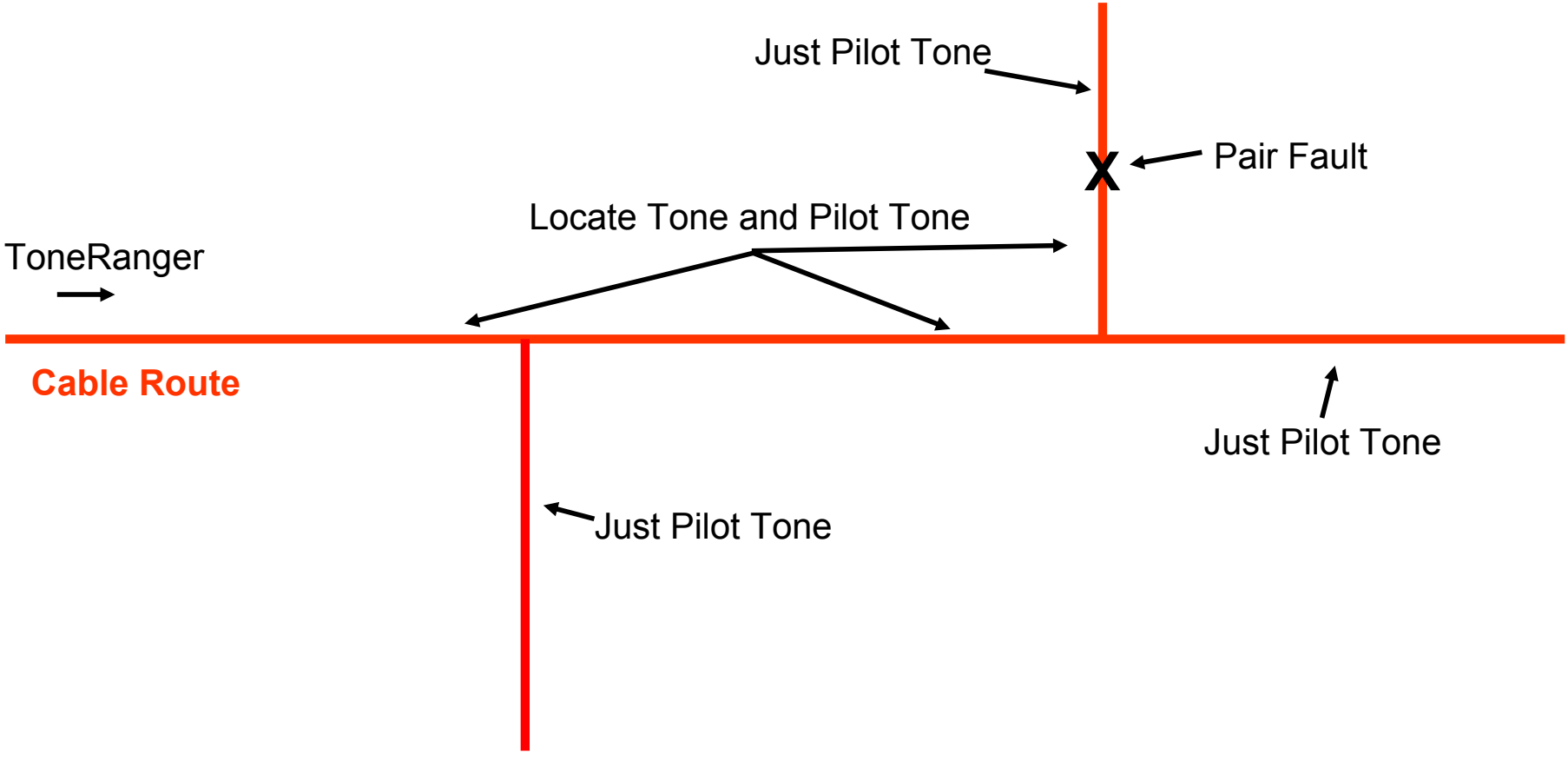
Pilot Tone

In addition to the 335Hz Locate Tone
the Transmitter is also outputting a 9kHz Pilot Tone

- The Tx output level of the Transmitter is encoded in the Pilot Tone
- The Receiver not only receives the Locate Tone but also receives and decodes the Pilot Tone and displays this data as the Tx number on the Receiver screen
  - The technician knows if he is coiling the correct cable, if the pair is still faulted, if the Transmitter is still running and connected to the pair
  - If the fault comes clear, the Transmitter Tx will fall to 0, meaning there is no tone flowing into a fault, and this will be reflected on the Receiver
  - If the technician sees a Tx value of 3 or more on the Receiver screen but does not hear Fault Locate Tone, he knows he is on the correct cable, the pair is still faulted, and he is beyond the fault location
  - If the technician sees the Tx value decreasing on the Receiver, this is a strong indication the fault is drying out and the time left to locate is growing short

Tone Locating Pair Faults

- **Pilot Tone only** is heard on the cable past the fault and on laterals containing the faulted pair.
- **Both Locate Tone and Pilot Tone** are heard on the cable from the Transmitter to the fault.

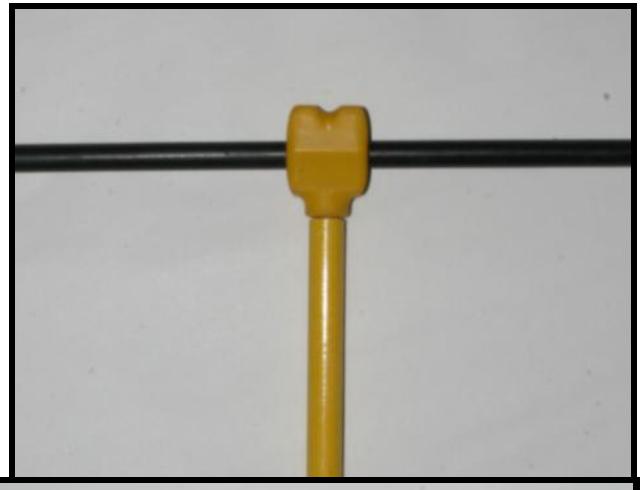


Tone Locating Pair Faults

Listen For A Clear Locate Tone

Calibrate Tone

- Briefly position coil on the cable and listen for tone
- To check for tone with buried wand, position above the cable path about 30’ [10m] away from Transmitter and adjust gain to hear tone.



Learn The Sound Of The Locate Tone

- There are four Hi/Lo pulses, and then a pause every fifth second.
- The Receiver Bargraph is a visual representation of the tone you hear.
- If you cannot distinguish whether you are hearing tone or noise, with the coil on the cable, turn the Transmitter off and listen for noise.

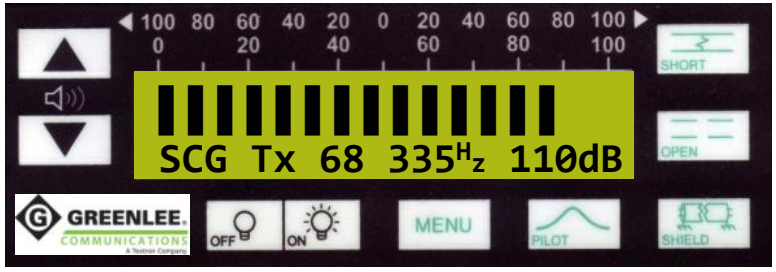
Locate Tone

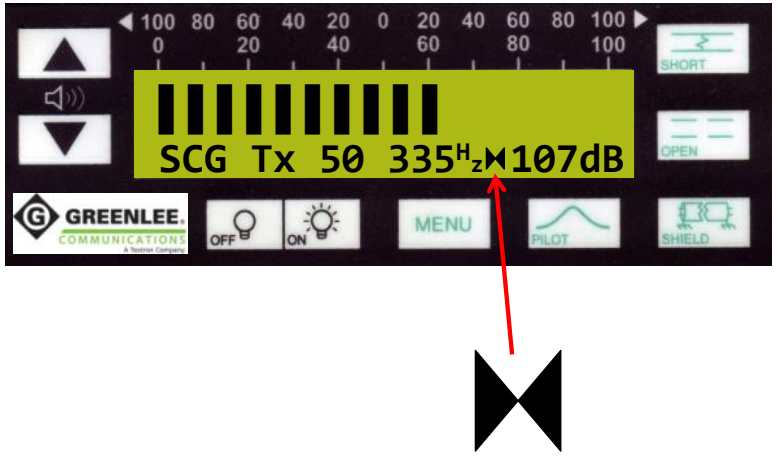
Noise

Tone Locating Pair Faults

Calibrate & Flag the Receiver for Peak Tone

- With the coil on the cable and receiving tone, move the coil slowly to find peak tone.
- Adjust the gain with the ▲▼ keys so the Bargraph pulses to about 50.
  - Press and release the ▲▼ keys to move the dB gain by 10.
  - Press and hold ▲▼ keys to move the dB gain in steps of 1. Only 3 dB was required.
- **Flag⋈ the dB gain** for future reference by pressing the **SHORT** key and **holding it** for one second. The flag makes it easy to find the calibrated gain later.





Tone Locating Pair Faults

Calibrate & Flag the Receiver for Peak Tone

- **After calibrating** and flagging the Receiver with the coil on peak tone, **do not raise the gain** or you may be greatly amplifying a small amount of Locate Tone carry-by past the fault
- The Receiver is a very high gain unit and each 10 dB of gain greatly increases the sensitivity to tones
- Remember the Locate Tone has **4 Hi/Lo pulses and a pause every 5th second** and noise does not

Tone Locating Pair Faults

Listen for a Clear Locate Tone

Learn the Sound of Noise – (Interference from nearby electrical power)

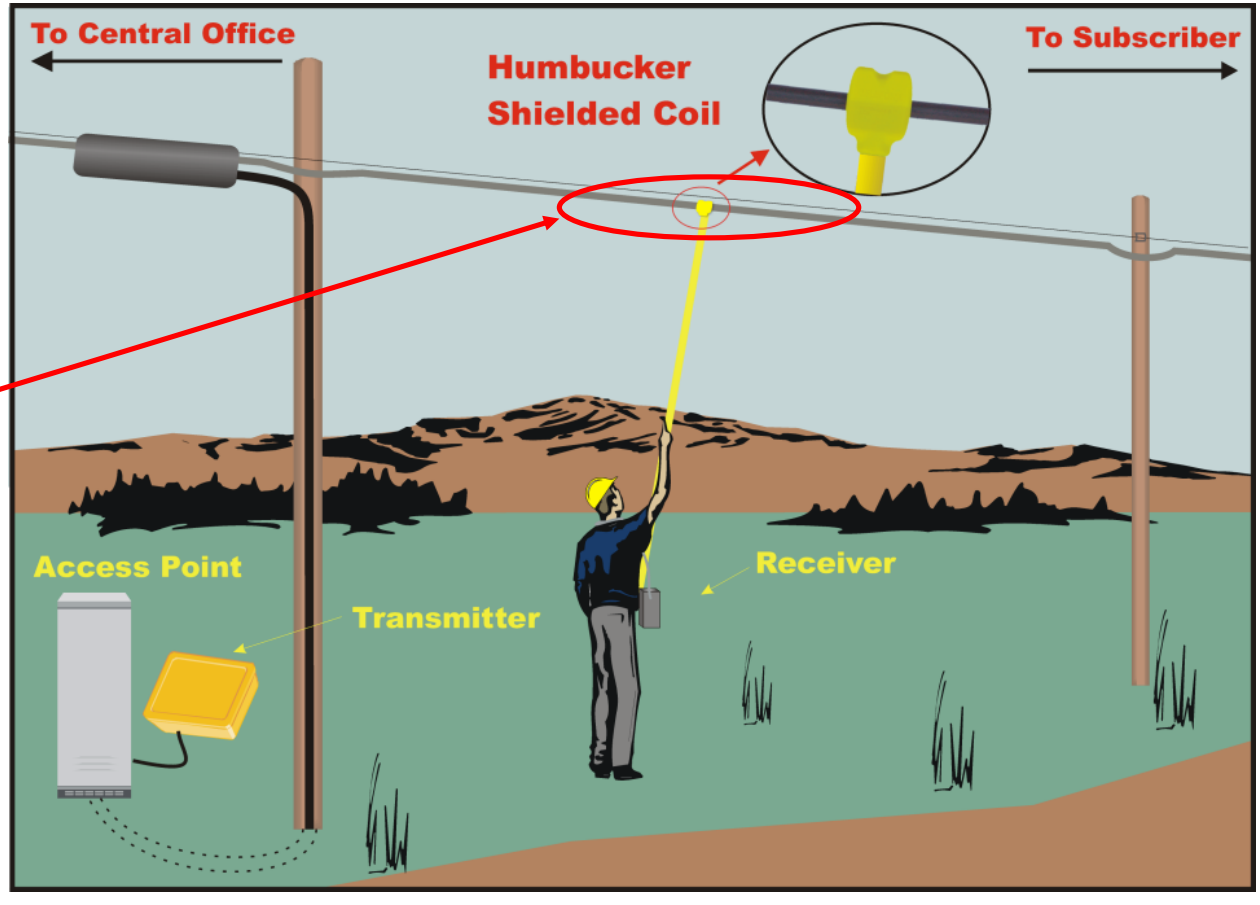
- When **noise** is interfering with the Tone, **the sound will be erratic** and you will not hear the four Hi/Lo pulses and then the pause. The Bargraph will be displayed and jump erratically.
- When strong noise is present the Tx number on the display will change and Tx - - will appear intermittently
- If Tx is not displayed, Pilot Tone is not being received. When Locate Tone can be heard, some faults can be located without receiving the Pilot Tone.
- **Do not mistake Noise for the Locate Tone. If you calibrate on Noise and try to locate the fault, the noise tone will carry-by past the fault.**

Tone Locating Pair Faults

Listen for a Clear Locate Tone

Aerial Cable Fault Locating

To calibrate the Receiver, search about a 3' [1m] section for Peak Tone



Tone Locating Pair Faults

Listen for a Clear Locate Tone

Dealing with Noise

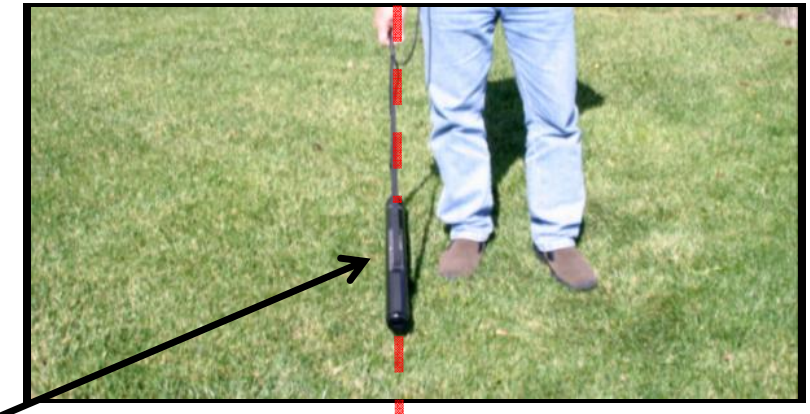
Once you have identified a noise situation go back to the Transmitter and **turn the voltage up** to try to hear tone above the noise level.

- **Watch the Tx number** to see that it is stable and not going down indicating the fault is drying out.
- In high noise areas you must use the **Humbucker Coils** for greater success. They are shielded to suppress noise.

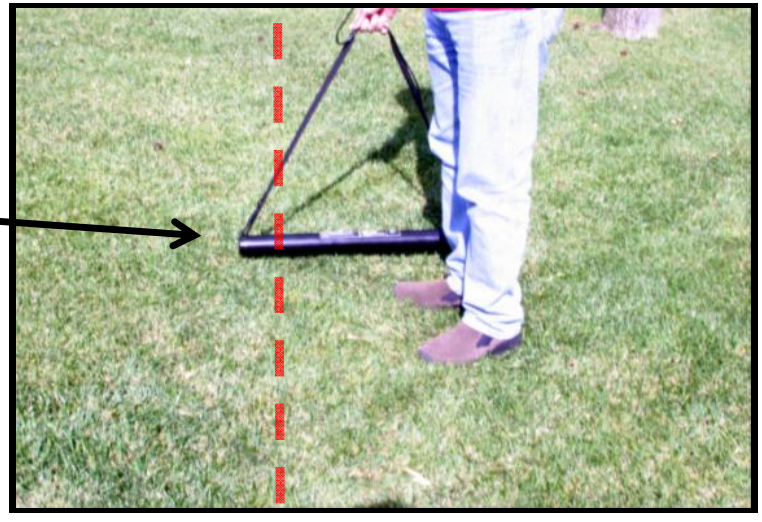
Tone Locating Pair Faults

Toning With the Buried Wand

Press the Receiver **ON** key. When the SELECT LOCATE MODE screen appears, press the **SHORT** key. Plug both leads of the buried wand into the back of the Receiver. The Receiver tests the coil and will not let the locate continue with a “shorted” or “open” coil.



- Start with the Buried Wand parallel to and directly over the cable and just above the ground. Look for a peak tone
- A stronger Locate Tone will usually be received with the Buried Wand positioned perpendicular to the cable with one end or the other directly over the cable, but you may not receive the Pilot Tone. The cable path can also be located in this position.
- A **peak tone** will be heard with one end or the other directly over the cable with a **null** when the Buried Wand is perpendicular and centered over the cable path.



Tone Locating Pair Faults

Toning With the Buried Wand

Tone level on either side of the cable **will remain relatively constant** along the cable path. The precise location of the Pair Fault is where the tone has dropped **to 70% of the level before the fault**

Example:

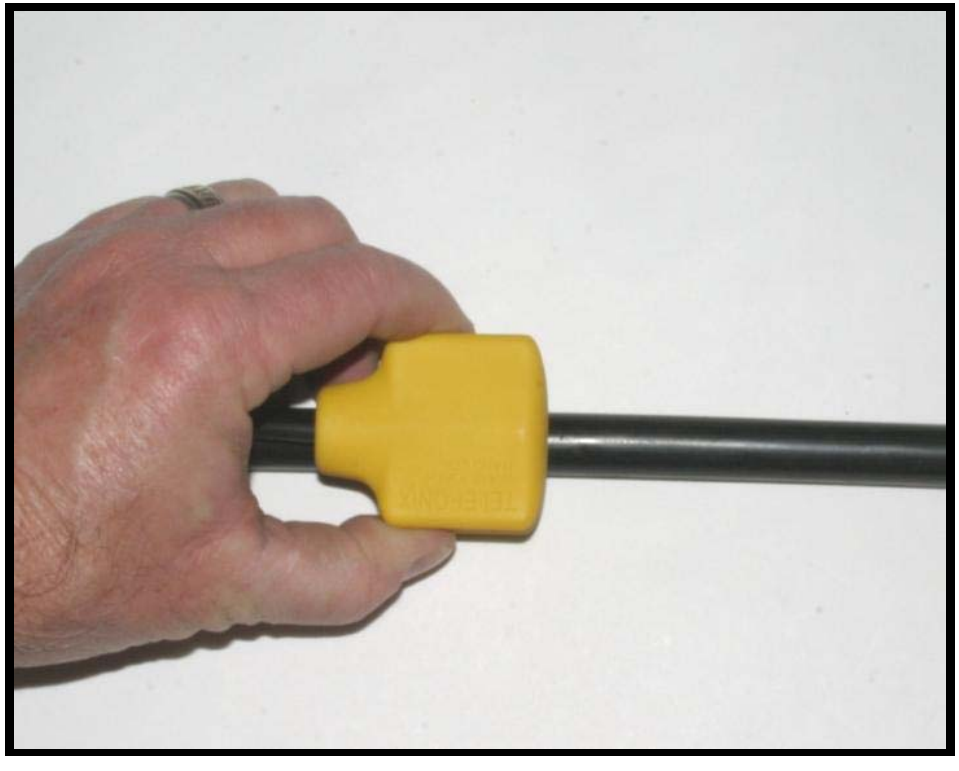
- The tone will begin dropping approximately 3' [1m] before the Pair Fault and drop completely away 10-15' [3-5m] beyond the Pair Fault (depending on the cable depth)
- If the Receiver gain were adjusted for a Bargraph of 8 bars, 5.6 bars would be the 70% point (70% of 8 bars is 5.6 bars). Mark the spot where you have 6 bars and the spot where you have 5 bars. Dig between the 2 marks.
- **The one exception is a wet splice**. The Locate Tone will **peak** (get louder) directly over a wet splice and then drop completely away beyond the Pair Fault.

Tone Locating Pair Faults

Confirm the Fault Location with Handcoil

Before Opening the Splice or Sheath

Confirm Both Aerial and Buried Faults with the Handcoil



Locating Splits and Re-splits

- Get a pre-locate of the split with a TDR.
- Connect Transmitter as described below (see Figure SPLIT, next page)
  - Identify all 4 conductors of the split pairs at the far access and short them all together.
  - Connect Transmitter across either pair.
- Press **ON** and tone the split pair as a short at 30V, **MED** tone.
- Calibrate Receiver on the cable. You are toning a Short.
- Tone will rise by a factor of 3 to 1 when you pass the splice containing the split. Split pairs give a louder tone like that of toning a cross.
- Continuing down the cable, when you pass the re-split (if there is one) tone will return to that of a Short.

Locating Splits and Re-splits

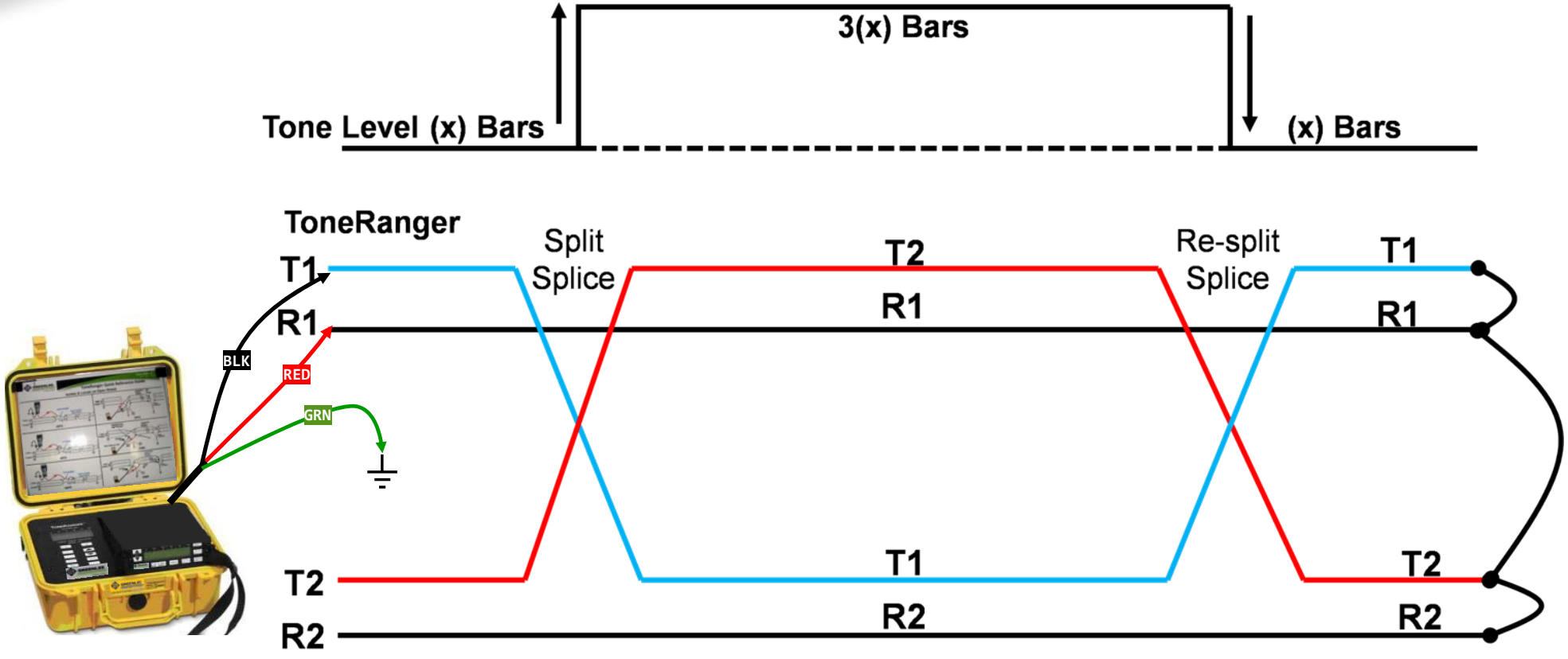


Figure SPLIT

Identifying Bridged Tap Cables and Left-In Drops

This method allows tone identification of a bridged cable in a manhole that contains multiple bridged splices. Bridged Cables can be identified where the bridged pair is **>100' [30m] long**. This method also can identify Left-In Drops >30' [10m] long.

Transmitter Setup

- **Measure a pre-locate distance** to the Bridged Tap/Left-In Drop with a TDR
- Turn **ON** Transmitter
- Select **<Pair Faults – SCG>**
- Connect Transmitter to the pair as to tone a **SHORT** (see Figure SCG1 in Quick Guide in the lid). Pair will test clean.
- Select **MED** tone. Increase Volts with ▲▼ keys to **200V, ignore messages**.

Identifying Bridged Tap Cables and Left-In Drops

Receiver Setup

- Go to the manhole or a bridge splice or terminal near the pre-locate distance.
- Turn **ON** Receiver,
- Press **OPEN** on Receiver. This mode traces tone capacitance current in the pair. It will NOT locate the end of an open pair.
- Plug in the **Handcoil or Lay-up Stick**
- Adjust Receiver gain using ▲▼ keys to **120dB**
- Listen for tone on the bridged cables near that pre-locate distance. Remember to explore at least 3' [1m] of each cable. If locating a Left-In Drop, test each nearby drop with the coil.
- Continue testing bridged cables/drops until tone is heard. Adjust gain if necessary to keep the Bargraph on scale, at 80. Tone will be louder on the main cable, but focus on the bridged cables.
- Once the gain is set on scale the bridged cable with strongest tone is the bridged cable containing the pair being toned. Drops are easily identified as the only one with tone.

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Pair ID Toning Through a Wet Pulp or Paper Section

This Application requires the purchase of a Pair ID Hardware Kit (PIDH)

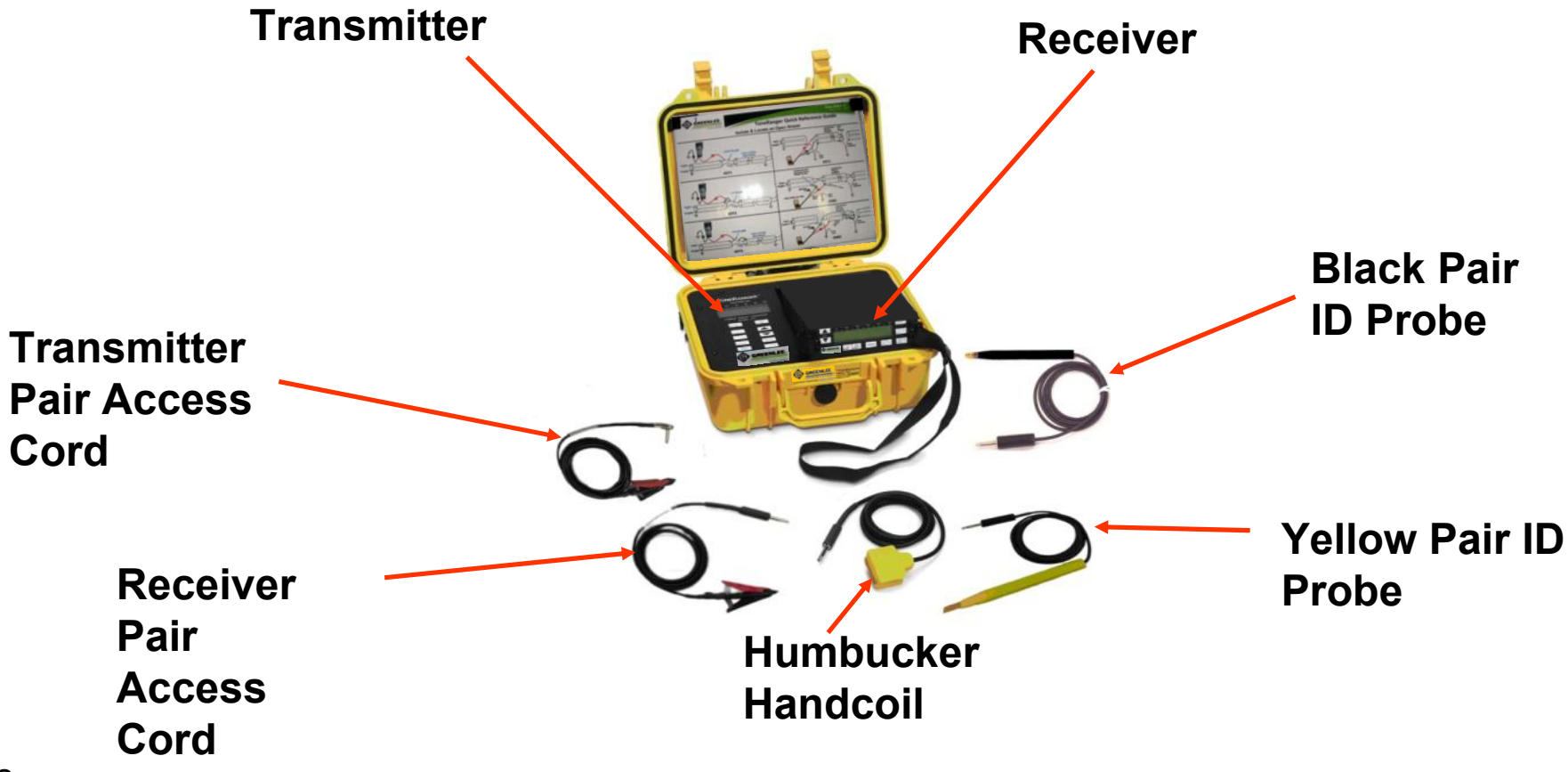








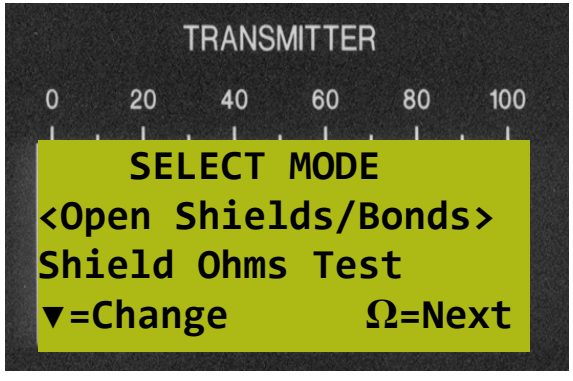
ToneRanger® Model TF1AP



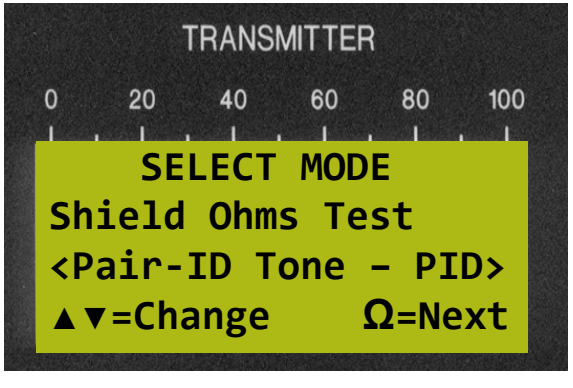
Pair ID Toning

Transmitter Connections

- Press Transmitter **ON** key, the SELECT MODE screen will appear



- Use ▲▼ keys to select **<Pair-ID Tone - PID>**
- Press the **Ω** key



Pair ID Toning
Transmitter Connections

- Plug the Transmitter Pair Access Cord into the Transmitter Test Jack
- Connect the Transmitter Pair Access Clip per Photo PID1

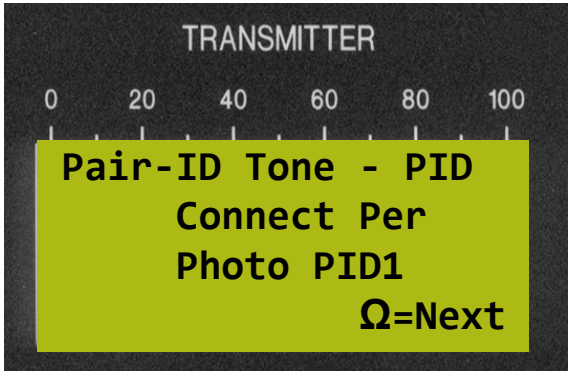


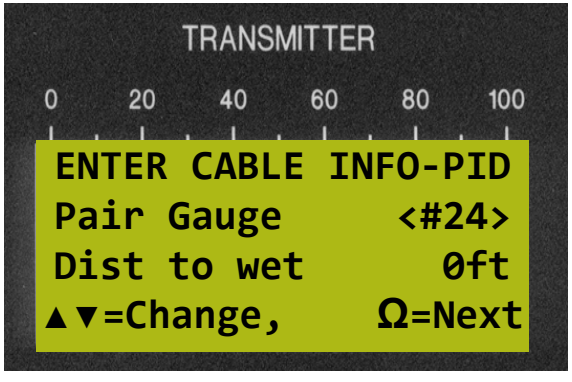
Photo PID1

Pair ID Toning

Transmitter Connections

The technician connecting the Transmitter to the cable pair to send tone can greatly affect the time it takes the other technician to ID the pair. The Tone should be connected to an outside layer interstitial/marker pair or an outside layer pair in a specific color binder and this information relayed to the other technician. This greatly enhances the ability to ID the pair quickly and therefore calibrate the Receiver Gain for the ensuing Pair ID process.

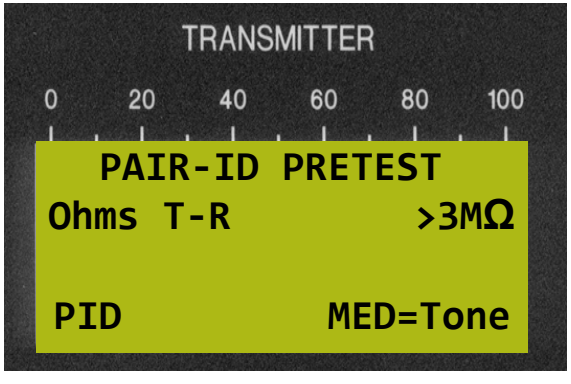
- Enter Cable Info
  Pair Gauge – Use ▲▼ keys to change value
- Press the **Ω** key
- **Dist to Wet** – Use ▲▼ keys to change value. This is the estimated distance from the Transmitter to the location the cable is wet.



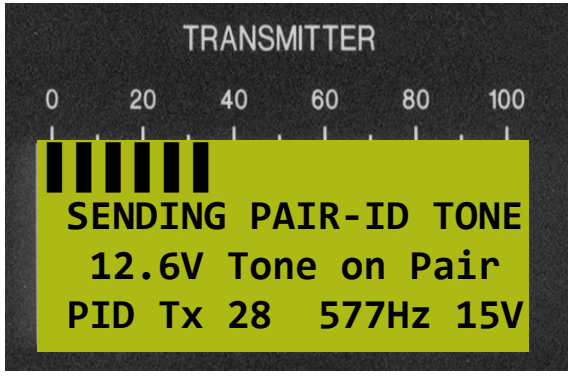
Pair ID Toning

PAIR-ID PRETEST

- Press the **Ω** key
- Ohms T-R = The resistance of any faults on the pair
- Press the **MED** key



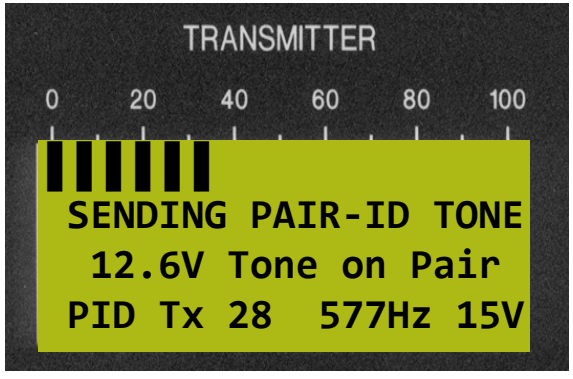
- SENDING PAIR-ID TONE screen
- The bottom line indicates the Transmitter is sending a 577Hz Pair ID Tone with an output voltage of 15V. The voltage is is not changeable.
- **12.6V Tone on Pair** is the Pair-ID Tone Voltage getting through the wet to the repair splice beyond the wet and indicates whether or not the Pair-ID Tone can be picked up with the Yellow Pair ID Probe.



Pair ID Toning

SENDING PAIR-ID TONE

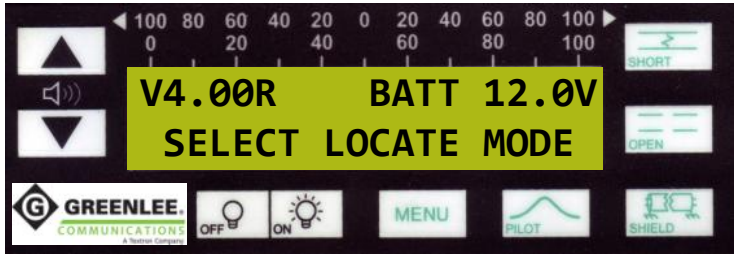
- A Tone Voltage of <0.5V can probably not be picked up with the Yellow Pair ID Probe. Save these pairs until the end of the Pair ID process and use the Receiver Pair Access Cord to identify these pairs.
- The greater the Pair-ID Tone Voltage above 0.5V, the louder the Pair-ID Tone will be at the repair splice beyond the wet using the Yellow Pair ID Probe.

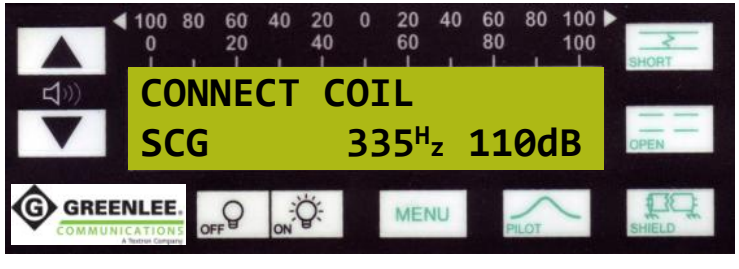


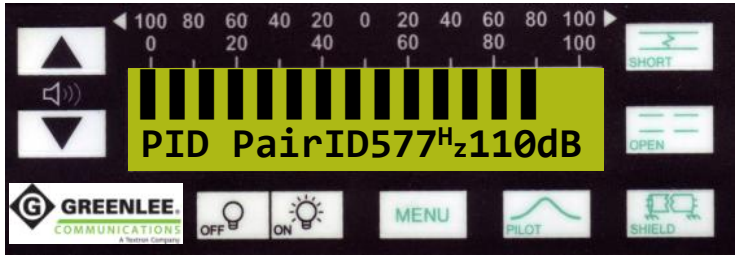
Pair-ID Toning

Receiver Connections

- Press the Receiver **ON** key
- After successful self check, SELECT LOCATE MODE screen appears
- Press **SHORT** key
- Connect the Green Ground Clip of the Yellow Pair ID Probe to the cable shield of the wet cable
- Connect the Yellow Pair ID Probe to the Receiver when CONNECT COIL message appears
- The Receiver tests the Yellow Pair ID Probe for Open or Shorted conditions and will not let the technician proceed with a defective probe
- If the Yellow Pair ID Probe tests good the Receiver defaults to the PID Pair-ID screen

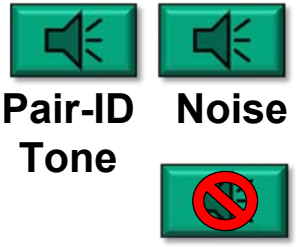




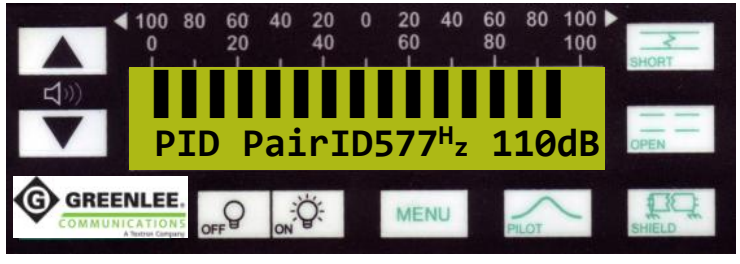


Pair-ID Toning

Identifying the Pair (continued…)



- Explore the cable pairs in the vicinity of where the technician at the Transmitter indicated he had applied the Tone.
- Lay the side of the probe tip against each pair, keeping the tip outside the twist as shown in Photo PID2
- If the Tone is not heard, use the ▲ key to increase the Receiver Gain until the Tone is heard
- You will hear the Tone throughout the cable, but when you get close to the Pair the Tone is on, the Tone will get much louder. You may identify 3 or more pairs on which you hear the Tone the loudest.
- Adjust the Receiver gain to a setting where the Bargraph is pulsing to about 80 on the bottom scale



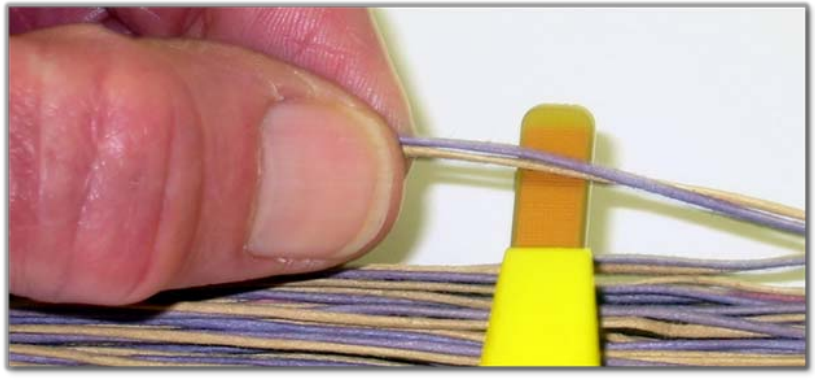


Photo PID2

Pair ID Toning

Identifying the Pair (…continued)

- Insert the tip of the Yellow Pair ID Probe between Tip and Ring (inside the twist) of each of these pairs as shown in Photo PID3
- When you place the tip of the Yellow Pair ID Probe between the Tip and Ring of the pair the Tone is on, the [Hi-Lo/Hi-Lo/Hi-Lo] Tone will immediately change to a [Lo-Lo-Lo/Hi-Hi-Hi] Tone. This is referred to as a "**Bugling Tone**". This happens because the Receiver is saturated with much more signal with the Yellow Pair ID Probe between Tip and Ring of the Toned Pair as opposed to laying across Tip and Ring.
- **WARNING –**The Yellow Pair ID Probe MUST be moved slowly and methodically when toning pairs. This Probe is EXTREMELY sensitive, and the least little bounce or movement causes sounds to be emitted from the Receiver which can easily be confused with the Tone.

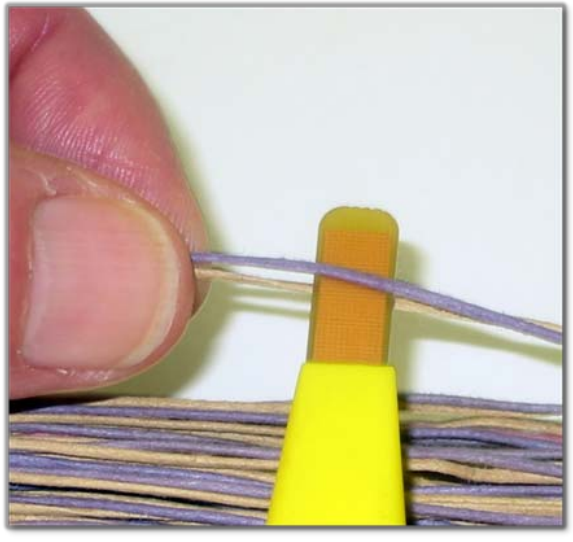
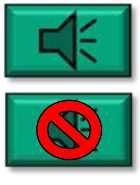


Photo PID3

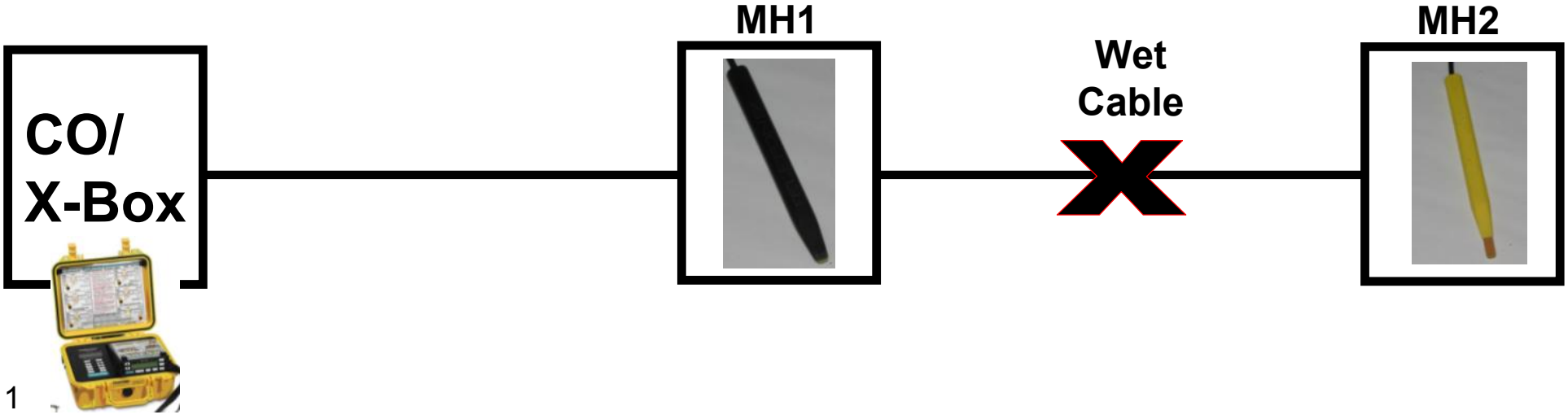


Bugling Tone

Pair ID Toning
Restore Special/Critical Circuits First

Locate the Transmitter at the Central Office or X-Box. Send Pair-ID Tone on all special/critical circuits. The technician at the repair splice before the wet will use the **Black** Pair ID Probe to identify the pair. The technician at the repair splice beyond the wet will use the **Yellow** Pair ID Probe to identify the pair.

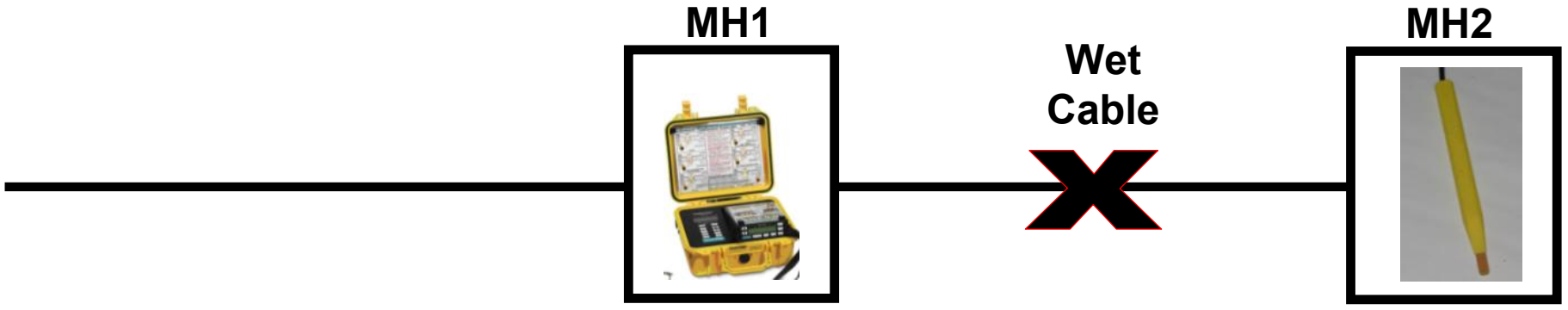
For this application two Receivers will be required.



Pair ID Toning

Identifying Remaining Pairs

Once all the special/critical circuits have been restored, move the Transmitter to the repair splice before the wet to apply Pair ID Tone to the remaining unidentified pairs. The technician at the repair splice beyond the wet will use the **Yellow** Pair ID Probe to identify the pairs.



Pair ID Toning

Using the Receiver Pair Access Cord

- Once all pairs have been identified that can be identified at the repair splice beyond the wet section with the Yellow Pair ID Tone Probe, it is then necessary to use the Receiver Pair Access Cord to make a physical connection to the remaining pairs for identification.
- Unplug the Yellow Pair ID Probe from the Receiver and connect the Receiver Pair Access Cord.

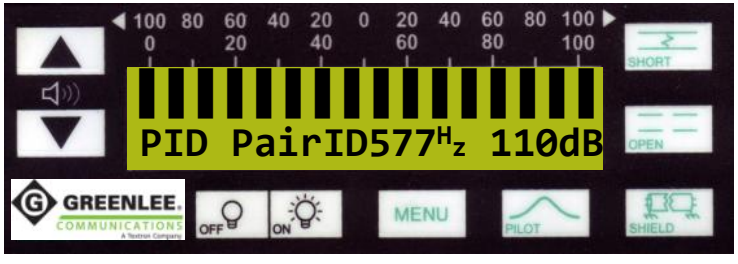


Photo PID1

Pair ID Toning

Using the Receiver Pair Access Cord

- Adjust the Receiver Gain to 110dB. If Tone is not heard on several pairs increase the Gain until Tone is heard. If Receiver Tone is Bugling on more than one pair, decrease the Receiver Gain until the Tone Bugles on one AND ONLY one pair.
- Once the Receiver Gain has been adjusted as above, continue toning the remaining pairs and connecting across Tip and Ring of the remaining unidentified pairs with the Receiver Pair Access Clip. When a connection is made to the pair the Transmitter is toning, the Receiver Tone will Bugle.

Technical Support

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Follow voice prompts to Technical Support