Pathfinder™

Instruction Manual for:

PF620 Circuit Tracer Kit

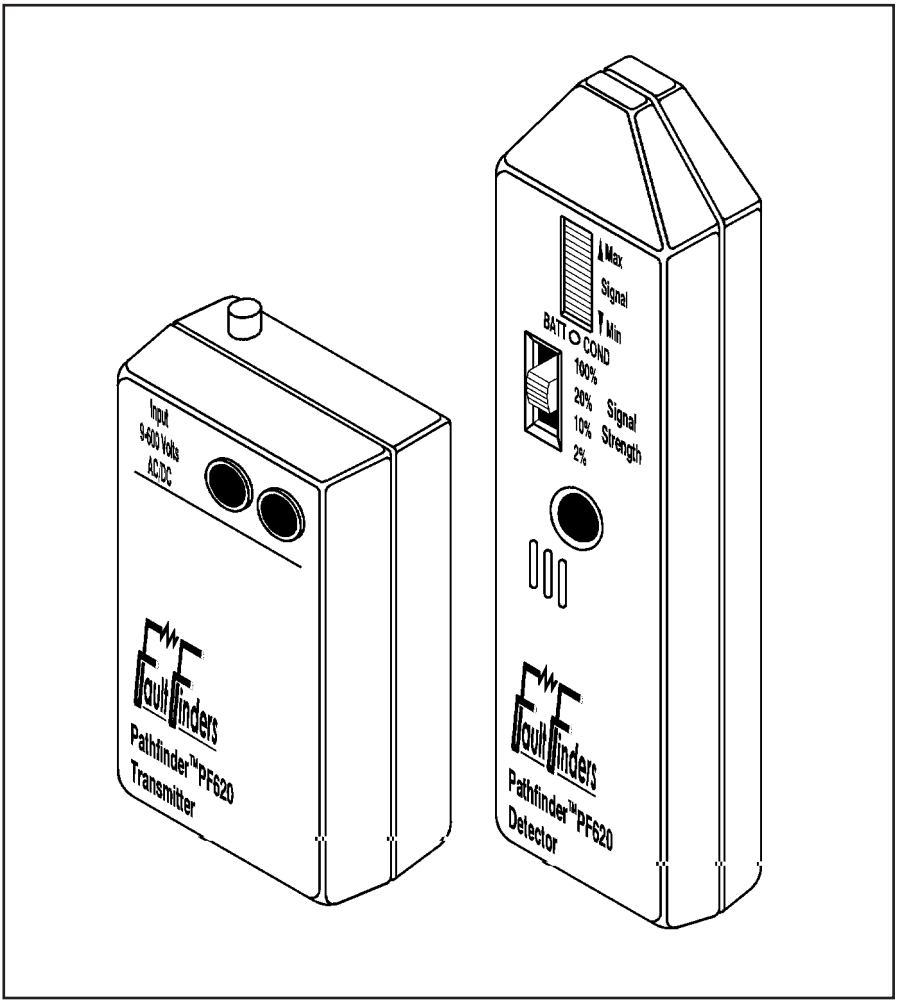


Table of Contents

Many applications of this test device require attachment of electrically energised equipment and/or circuits. Improper or careless use may result in severe electrical shock, injury or death. Before use, read and understand the instruction manual thoroughly. If any questions remain, ***do not proceed with equipment use***, contact the manufacturer.

Printed in Australia

Safety Considerations

CAUTION
Pathfinder™ Circuit Tracer equipment should be used only by properly trained personnel, e.g. construction, installation and maintenance electricians and/or technicians

CAUTION:
Always use Pathfinder™ Circuit Tracer equipment in dry locations as specified in the National Electrical Code, Article 100, Definitions.

CAUTION:
Never connect Pathfinder™ Circuit Tracer equipment to circuits or systems that have voltages in excess of 600 volts.

CAUTION:
Never use the Pathfinder™ Circuit Tracer with a remote ground in patient care areas. Ground currents generated by the Pathfinder™ Circuit Tracer may create a shock hazard for electrically susceptible patients.

CAUTION:
Never connect a battery across an energised circuit or system; doing so could cause the battery to explode.

CAUTION:
Always use insulated alligator clips, wires and jumpers when making circuit connections.

CAUTION:
Never hold or touch the bare portion of an alligator clip, wire or test probe.

CAUTION:
Always make the ground connection first, and remove last, when using clip leads.

CAUTION:
Always test the remote ground system to confirm that its resistance is less than 100 ohms from remote ground to circuit neutral.

CAUTION:
Always check circuits to verify that the "hot", neutral and ground are wired correctly.

CAUTION:
Never disconnect data, computer, cable television or other information systems cables when such systems are up and operating.

CAUTION:
Always disconnect the Pathfinder™ Circuit Tracer when circuit diagnostics are complete.

WARNING:
FAILURE TO COMPLY WITH THE ABOVE MAY CAUSE HAZARDOUS CONDITIONS TO EXIST THAT CAN RESULT IN BODILY HARM OR FATAL ELECTRICAL SHOCK, DAMAGE TO EQUIPMENT AND/OR SYSTEMS CRASH

Introduction

The Pathfinder™ Circuit Tracer kit is an electronic circuit tracing device consisting of a transmitter and a detector.

The Pathfinder™ Circuit Tracer allows the electrician and/or technician to locate, trace and identify "hot" and neutral wires for feeder and branch circuit wiring, breakers, fuses, panel boxes, conduit and short circuits.

The Pathfinder™ Circuit Tracer allows the electrician and/or technician to trace wire runs in ceilings, walls, floors and buried installations.

The Pathfinder™ Circuit Tracer kit is supplied in a wide 9-600 volts AC or DC range. Each kit consists of a transmitter, detector, adaptor cord, instruction manual and carrying case.

Specifications: Pathfinder Model 620

Transmitter

Operating Frequency ..... 4.6 KHZ
Pulse Width ..... 17 mSEC
Repetition Rate 4HZ
Peak Load Current ..... 120 mA
Operating Voltage ..... 9-600 V, AC or DC
Operating Temperature ..... 32°F/0°C to 122°F/50°C
Storage Temperature ..... -40°F/-40°C to 194°F/90°C
Humidity (Operating) ..... 95% RH max.
Size ..... 4.5 in (115mm) x 3.25 in. (83mm) x 1.5 in. (38mm)
Fuse ..... 250V 1/4 AMP 3AG

Detector

Sensing ..... Magnetic
Relative Gain (Normalised to 100)
100% signal
20% signal
10% signal
2% signal
Detection Response
Visual ..... 10 LED Bargraph
Audible ..... 4.6 KHZ chirp 4 times per sec.
Battery Condition indicator ..... Green LED
Operating Temperature ..... 32°F/0°C to 122°F/50°C
Storage Temperature ..... -40°F/-40°C to 194°F/90°C without battery installed
-40°F/-40°C to 122°F/50°C with battery installed
Humidity (Operating) ..... 95% RH max.
Size ..... 7.39 in (188mm) x 2.05 in. (52mm) x 1.115 in. (28mm)
Battery ..... 9 V Alkaline (NEDA No. 1604A) DO NOT USE Carbon Battery
Weight of PF620 Kit ..... 1 lb., 15 oz. (879g)

■ Designed in the U.S.A. Manufactured in Australia

www.faultfinders.biz

Theory of Operation

Hot It Works

The Pathfinder™ Circuit Tracer consists of two compact electronic devices: a transmitter and a detector. The transmitter, when connected to a power source of from 9-600 V AC or DC, generates a 4.6 kHz high frequency current which pulses at approximately 4 pulses/sec. An LED atop the unit blinks at the same rate, indicating that the transmitter is energised and functioning properly. The current the transmitter draws sets up a unique electromagnetic field around the conductor (see Fig. 1), to which the detector is tuned to respond.

Audio/Visual Response

When the detector is placed in proper orientation (see Fig. 2) to the wire or circuit breaker feeding the transmitter, it emits both an audible and visible signal. The detector will respond only to the unique signature of the transmitter by blinking its LEDs and emitting a chirping sound.

Will Not Disrupt Electronic Equipment Operation

Sensitive electronic equipment is not affected by the pulsating, high-frequency, low-ampere current of the transmitter. What's more, the Pathfinder™ Circuit Tracer may be used to trace circuits powering computers or similar devices without turning off or otherwise disrupting the operation of these devices.

Fig. 1

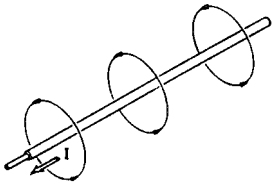
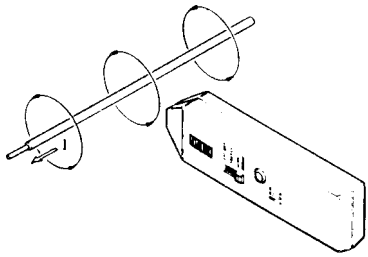


Fig. 2



NOTE:

For maximum signal, Detector sensitivity is strongest when at right angle to the wire and dependent on selector switch position.

100% – maximum sensitivity
20% – medium sensitivity
10% – low sensitivity
2% – minimum sensitivity

In some instances, changing the detector sensitivity will provide better results.

Does Not Inject an RF Signal

Since the transmitter generates its unique signature by drawing a small load current from the power source, its signal can be detected upstream through the feeder panel, through the distribution transformer, ultimately to the power generating station. The strength of the signal will be reduced as it passes through a transformer, varying in inverse proportion to the turns ratio of the transformer.

The transmitter does not inject an RF signal into the line. Consequently, the device's unique signature is contained in the circuit to which it is connected and cannot "stray" throughout the wiring system, the latter being a condition which would make tracing a single circuit difficult.

Single Phase Circuits

Locating Circuit Breaker or Fuse

Adaptor Cord-Clip leads

1. The adaptor cord is provided to connect to the wall plug (see Fig 3a and 3b.). For testing and tracing circuits where test clips are required (see Fig. 4), (e.g. lighting circuits, junction boxes, etc.)

CAUTION:

Never connect Pathfinder™ Circuit Tracer equipment to circuits or systems that have voltages in excess of 600 volts. Connecting the transmitter to voltages higher than the transmitter's range will result in a blown fuse (located inside the transmitter).

NOTE:

Adaptor cords and test leads are not necessarily supplied.

Fig. 3a. Adaptor cord (Aust.)

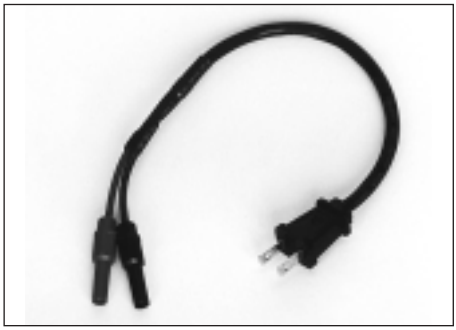


Fig. 3b. Adaptor cord (U.S.A.)

Fig. 4. Test leads

2. When using the transmitter with the test clips first plug into the transmitter, then connect the insulated clip leads to the "hot" and neutral conductors at the remote location (see Fig. 5). When using the transmitter with the adaptor, first plug adaptor into the transmitter then insert the plug into any standard standard outlet up to 600 volts (see Fig. 6).

CAUTION:

- Always use insulated alligator clips, wires and jumpers when making circuit connections.
- Never hold or touch the bare portion of an alligator clip, wire or test prod.
- Always make the neutral (grounded wire) connection first and remove last when using clip leads.

WARNING:

Failure to comply with the above may cause hazardous conditions to exist that can result in bodily harm or fatal electrical shock.

3. Verify that the LED atop the transmitter is blinking, which indicates that the circuit being tested is energised, and that the transmitter is working.

Fig. 5

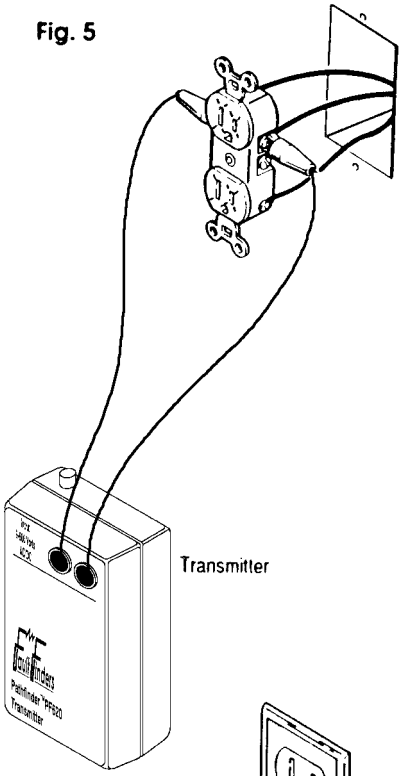
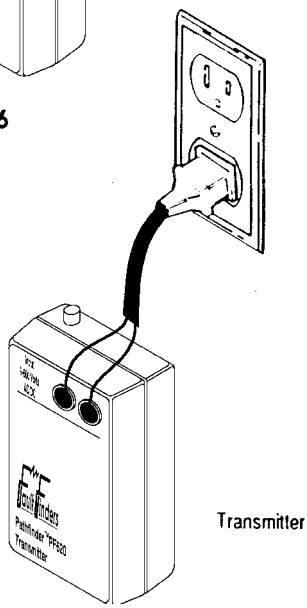


Fig. 6



4. Test the detector (see Fig. 7) by depressing the "ON" button and affirming that the battery is operational. If the green light appears dim or does not light, the battery should be replaced with an alkaline battery.

   Then place the selector switch in the 100% position and hold the detector next to the energised transmitter.

   Once again depressing the "ON" button, check to confirm that the LED display is blinking and that the detector is emitting a chirping sound.

5. You are now ready to locate the circuit breaker or fuse which supplies the circuit you are tracing.

Locating the Correct Circuit Breaker or Fuse Panel

6. Place the selector switch on the detector in the 100% position and slowly wave the unit in front of the panel. The panel door need not be opened for the detector to respond to the signal of the transmitter (see Fig. 8).

7. If the LED display does not blink repeatedly in response to the detector being passed outside the panel, the circuit breaker sought is not in the panel being checked.

8. If some of the LED's in the display begin to blink and a simultaneous chirping sound is heard, the circuit breaker you are tracing is being fed from the panel being scanned. OPEN THE PANEL DOOR.

Fig. 7

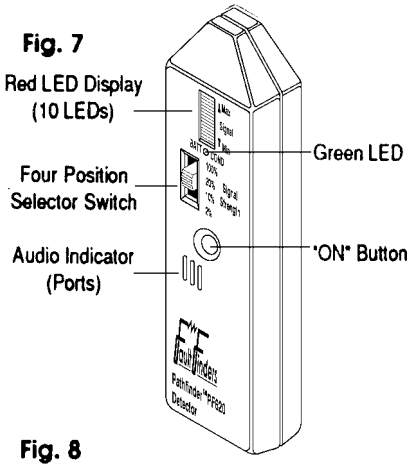
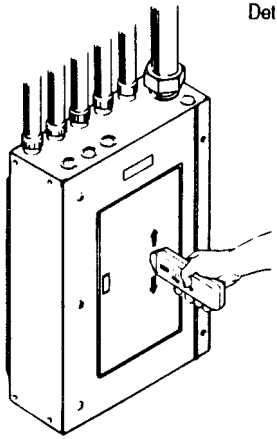


Fig. 8



NOTE:

Electronic noise in the system (as generated by some office machines, computers, SCR motor controllers, and GFI's) may cause some of the LED's to remain lit and result in a continuous noise from the detector. The remaining LED's in the display will blink and the 4.6 KHZ chirp sound will be heard over the noise if the circuit breaker is located in the panel.

Locating the Correct Circuit Breaker or Fuse

9. The detector selector switch must now be reset to 20% and the detector passed slowly and closely over the breakers being checked.

   NOTE:

   The detector must be held in the correct position (see Fig. 10) to ensure the best response to the transmitter.

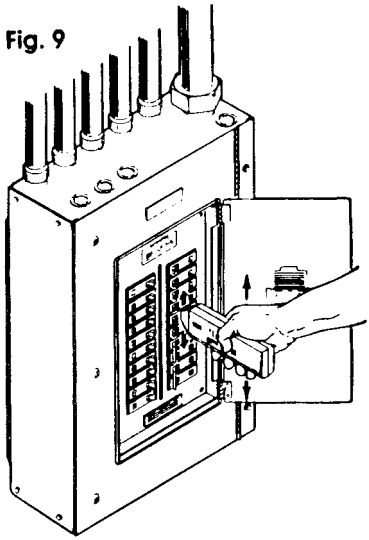
10. As the detector approaches the correct circuit breaker, additional LED's in the display will begin to blink. The intensity of such blinking may vary in the vicinity of several breakers. To find the correct circuit breaker, slowly touch the detector to each circuit breaker and observe the LED display.

    If 2 adjacent breakers produce the same signal then switch to 10% to isolate breaker that produces maximum number of pulling lights.

    The circuit breaker which produces the largest array of blinking LED's is the one controlling the circuit being tested. The maximum number of LED's lighting during a specific test may vary, due to differences in circuit breaker design.

    The same procedures apply to locating fuses.

Fig. 9



NOTE:
Not all LED's in the display need to light in order to signal the location of the correct circuit breaker. In some instances it may be necessary to change the selector switch on the detector to any of the four switch positions to locate the correct circuit breaker.

NOTE:
When using the Pathfinder™ Circuit Tracer on a 120/240 V, split-wired circuit with common neutral, the signal may appear on both breakers. Switching the correct breaker off will cause the Pathfinder™ Circuit Tracer's signal to discontinue from both breakers.

11. A final and absolute test in identifying and isolating the correct circuit breaker or fuse without disconnecting the power source is to remove the breaker panel trim, set the detector selector switch to 2% and place the instrument's tip on the wire being fed by the breaker previously identified (see Figs. 9 & 10). The LED display will blink only at the wire (line or neutral) of the circuit being tested. Here again, the detector must be held correctly (see Fig. 11) in order to best sense the magnetic field around the wire.

12. The circuit breaker or fuse, feeding the remote circuit location where the transmitter is connected, should now have been located. A positive method to confirm that the correct circuit breaker has been identified is to trip the identified circuit breaker, and place the detector at breaker location. Detector response will discontinue with only the green battery LED remaining lit.

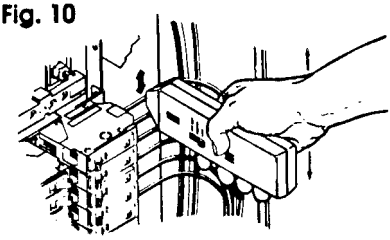
CAUTION:

Do not work on live circuits.
De-energise circuit and confirm circuit is dead with a volt meter.

NOTE: Locating a Neutral Wire in a Breaker Panel

Because the magnetic field induced by the transmitter surrounds both wires of the circuit being tested, the detector may be used to locate the neutral wire of the circuit as well as the "hot" wire. In order to accomplish this, the breaker panel trim must first be removed. Then, set the detector selector switch to 2%, and place the detector tip on the neutral wires in the breaker panel. The display will blink only on the neutral wire of the circuit being located.

Fig. 10



Circuit Breaker

NOTE: Locating a Remote Main Breaker

Because the Pathfinder™ Circuit Tracer signal is induced by a current flow and not an injected RF frequency voltage, the resultant magnetic impulses may be traced back to the source of power. By following the same procedure used to locate a circuit breaker, the detector will identify the remote main circuit breaker feeding the panel in which the test circuit is housed. This can be accomplished even if the main breaker panel is located on another level of the building or in an entirely different structure. Since the signal is being generated on an single phase circuit, it will be detected on only one leg of the main breaker.

EXCEPTION:
When connected to 240V single phase circuits, signal will appear on both legs of the breaker.

Tracing Wires

The magnetic field sensed by the detector is present around both the line and neutral conductors of the circuit being tested. However, since the current flows in opposite directions in each of these wires, the magnetic lines of force also flow in opposite directions.

Consequently, if the "hot" and neutral wires are close together, the magnetic lines of force tend to cancel each other and the detector operating range is greatly reduced (see Fig. 11).

The simplest method of separating current paths is to use a remote ground.

Remote Ground Definition

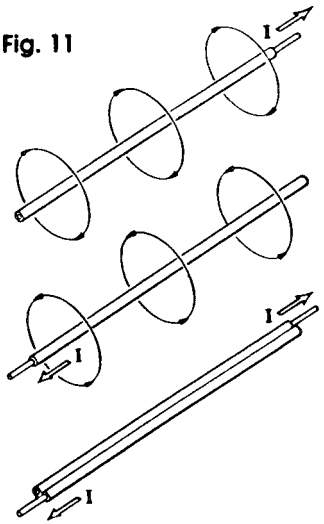
A remote ground provides a current path back to the source of power other than the ground of the circuit being traced.

CAUTION:
Never use the Pathfinder™ Circuit Tracer with a remote ground in patient care areas. Ground currents generated by the Pathfinder™ Circuit Tracer may create a shock hazard for electrically susceptible patients.

Examples of a remote ground could be:

- The reinforcing steel and ground bus in a poured concrete building structure
- Metal door frames
- The T-bars of a suspended ceiling
- Steel beams and posts
- The metallic duct work of HVAC systems
- Steam and hot water heating pipes
- Water pipes

Fig. 11



NOTE:
Under certain conditions it may not be possible to trace the Pathfinder™ transmitter signal along the remote ground path. If the remote ground has multiple paths back to the circuit neutral or common, the signal may appear, to some degree, throughout the entire ground system.

See "Alternate Method" on page 15.

CAUTION:
Always test the remote ground system to ensure that its resistance is less than 100 ohms from remote ground to circuit neutral. Such checking is best accomplished using an ohm meter, measuring the resistance between the remote ground and the neutral conductor of the circuit being traced.

CAUTION:
Always use insulated alligator clips, wire and jumpers when making circuit connections.

Never hold or touch the bare portion of an alligator clip, wire or test prod.

Always make the ground connection first and remove last when using clip leads.

NOTE:
Circuits protected by Ground Fault Circuit interrupters cannot be traced using a remote ground, as the ground current will cause the GFI to trip.

Tracing Wires in Ceilings, Walls, Floors or Conduit

1. Check to ensure that the circuit being traced is within the transmitter's voltage limits. The transmitter is rated for voltages from 9-600 V, AC or DC.

   CAUTION:
   Connecting the transmitter to voltages higher than the transmitter's range will result in a blown fuse (located inside the transmitter).

2. Using a transmitter and adaptor cord connect one insulated clip lead to the chosen remote ground. Connect the transmitter's other insulated clip lead to the "hot" conductor of the circuit to be traced (see Fig. 12).

Fig. 12

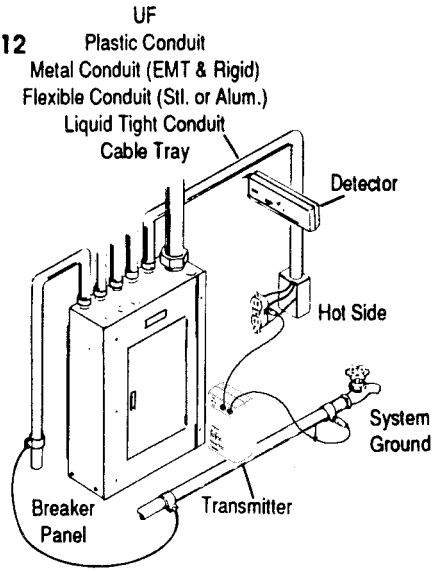
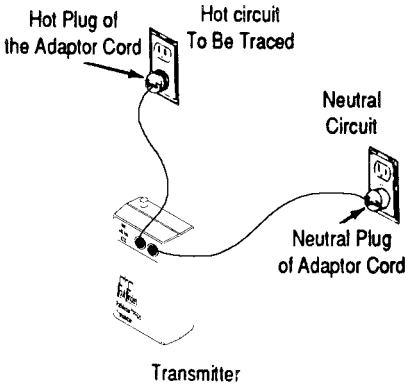


Fig. 13



Note: To assure safe and efficient operation, ground resistance must be less than 100 ohms.

CAUTION:
Always make ground connection first and remove last when using insulated clip leads.

Always use insulated alligator clips, wires and jumpers when making circuit connections.

Never hold or touch the bare portion of an alligator clip, wire or test prod.

Alternative method:

In some cases, it may not be possible to trace a circuit when using a remote ground. To trace, use the neutral wire of a separate circuit, remote from the circuit you are tracing, as ground.

Using the adaptor cord described on page 36 (see Fig. 38) allows quick and easy connection to the hot side of the circuit to be traced and to the neutral of a separate circuit, remote from the circuit you are tracing (see Fig. 13).

Also: An extension cord may be used in conjunction with this adaptor cord to increase the effective distance over which the adaptor can be used.

4. If the LED atop the transmitter blinks, a proper connection has been achieved. If it does not blink, either the "hot" line is not energised or you have failed to select a low-resistance ground.

5. Test the detector (see Fig. 14) by depressing the "ON" button and affirming that the battery is operational. If the green light appears dim or does not light, the battery should be replaced with an alkaline battery.

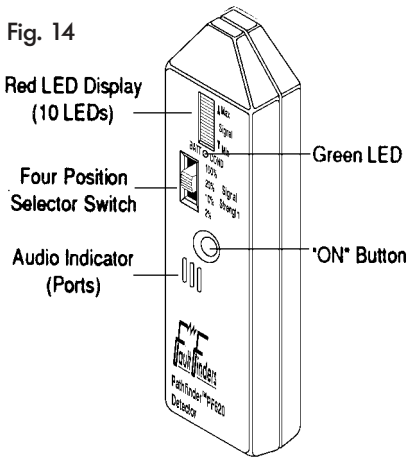
   Then place the selector switch in the 100% position and hold the detector next to the energised transmitter.

   Once again, depressing the "ON" button, check to confirm that the LED displays is blinking and that the detector is emitting a chirping sound (see Fig. 14).

6. Proceed to trace the circuit. When tracing a wire in a ceiling, wall or floor, turn the detector's selector switch to 100%. If the wire being traced is in a bundle, the selector switch may be set at either the 20% or 10% or 2% position. Once the appropriate selector setting is established, you are ready to trace the wire.

7. It is advisable to rotate the detector when following a wire. Since response of the detector is dependent upon the angle of the detector tip to the wire being followed, developing a methodical search pattern will produce more effective results.

Fig. 14



8. The detector range, under best conditions, extends to approximately 5 feet from the wire being traced when the selector switch is set at 100%.

   NOTE:
   It may be possible to trace NM cable by connecting the transmitter directly to the circuit.

Tracing Underground Wires

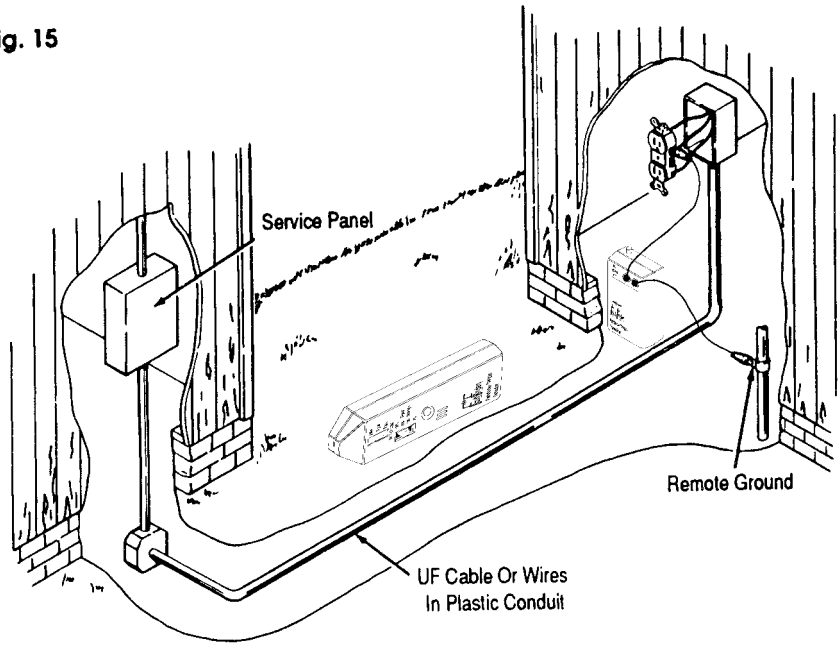
The Pathfinder™ Circuit Tracer may also be used to follow buried cables to a maximum underground distance of approximately five feet. The procedure is similar to that for locating concealed wires.

1. Check to ensure that the voltage you are tracing is from 9 to 600 volts, AC or DC.

   CAUTION:
   Connecting the transmitter to voltages higher than the transmitter's range will result in a blown fuse (located inside the transmitter).

2. Using the transmitter, connect one insulated clip lead to the chosen remote ground. Connect the transmitter's other insulated clip lead to the "hot" conductor of the circuit to the traced (see Fig. 15).

Fig. 15



Alternative Method:

In some cases, it may not be possible to trace a circuit when using a remote ground. To trace, use neutral wire of a separate circuit, remote from circuit you are tracing, as the return circuit.

CAUTION:

Always make ground connection first and remove last when using insulated clip leads.

Always use insulated alligator clips, wires and jumpers when making circuit connections.

Never hold or touch the bare portion of an alligator clip, wire or test prod.

3. If the LED atop the transmitter blinks, a proper connection has been achieved. If it does not blink, either the "hot" line is not energised or you have failed to select a low-resistance ground.

4. Test the detector (see Fig. 16) by depressing the "ON" button and affirming that the battery is operational. If the green light appears dim or does not light, the battery should be replaced with an alkaline battery.

   Then place the selector switch in the 100% position and hold the detector next to the energised transmitter.

   Once again, depressing the "ON" button, check to confirm that the LED display is blinking and that the detector is emitting a chirping sound.

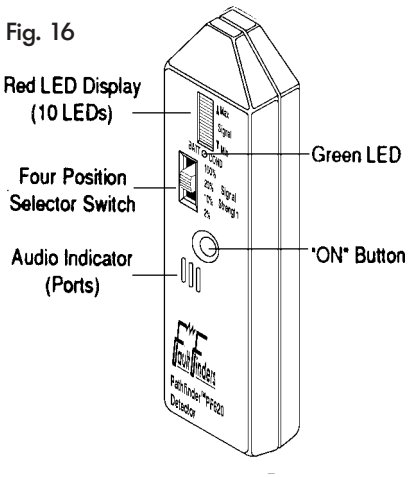
5. Proceed to trace the underground wire. Set the detector selector switch to 100%. Holding the detector parallel with the ground and in line with the underground wire to be traced, scan the area until the underground wire is located.

6. It is advisable to rotate the detector when following a wire. Since response of the detector is dependent upon the angle of the detector tip to the wire being followed, developing a methodical search pattern will produce more effective results, If necessary, switch to one of the sensitivity settings marked 10% or 20% until path of wire is determined.

NOTE:

The detector range extends to approximately 5 feet from the wire being traced when the selector switch is set to 100% and the separation between the hot and return (neutral) conductors is 5 feet or greater.

Fig. 16



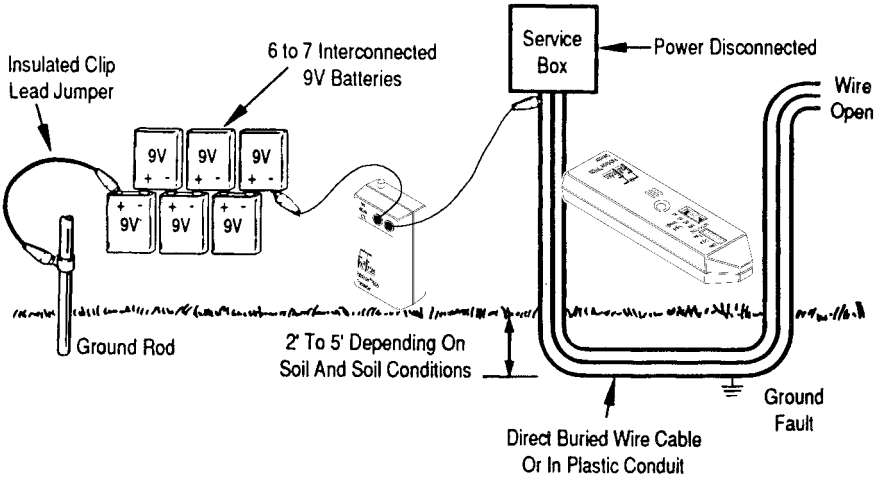
Locating High and Low Resistance Insulation Leakage in Buried Cable

Poor or deteriorating insulation on buried power wire, telephone cable and coax cable may cause voltage loss or introduction of noise or other interference on the affected circuit.

On a power line if testing indicates which line may be affected, the Pathfinder™ may pinpoint the exact location underground of the high or low resistance fault. Pathfinder™ can also be used to locate the point where shielded cable and coax cable shield has leakage to ground.

Fig. 17

Power Cable Leakage



By using 9 volt batteries interconnected (as shown in Figure 17, page 18) to produce 45-54 volts, the signal from the Pathfinder™ transmitter can be injected on an unenergised power cable that has been disconnected at the end furthest from the point where transmitter is connected (See Figure 17, page 18). At the point where the cable has a high or low resistance leakage to ground the signal picked up by the detector will suddenly disappear or significantly decrease.

By using the interconnected batteries with the transmitter connected to the shield of a cable or coax with the far end disconnected, a leakage of the shield to ground can be detected. DC voltages of 45 to 60 volts is recommended and can be supplied from 6-7 interconnected 9 volt batteries.

NOTE:
In all tracing for wire or shield leakage it is important that a good ground rod connection be made. If the flashing light on the transmitter does not blink when connections are made form ground rod though batteries and transmitter to the connection on the wire or shield you may have:

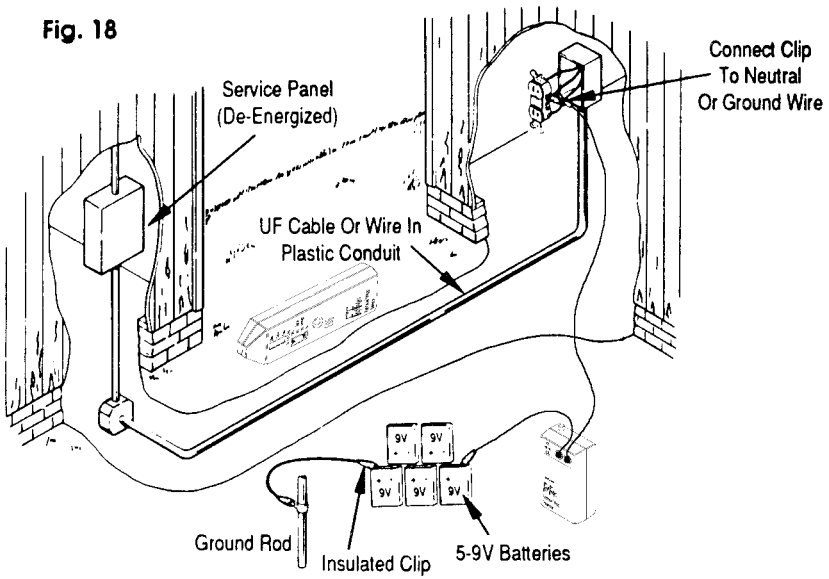
1. A poor ground connection. Try moistening the ground around the ground rod.
2. No leakage of wire or shield to ground or a very high resistance leak that can not be detected.

Tracing Unpowered Buried Wire (Direct Burial or Wire In Plastic Conduit)

On pages 16 and 17 of the operators manual, several methods of tracing buried AC powered cable are shown. In some situations the tracing can be more accurate by disconnecting the AC power source and using DC power. In many cases using battery DC power overcomes the effects of soil mineralisation, moisture content, line length, etc. In most cases using higher battery voltage improves operation significantly.

An easy method of obtaining higher voltage for tracing unpowered buried cable is to interconnect four or five 9 volt alkaline batteries in series to produce 36 to 45 volts to power the Pathfinder™ transmitter. The snap on contacts on the batteries (NEDA No. 1604A Alkaline) allows the batteries to be snapped together to produce this higher voltage (see Figure 18).

Fig. 18



CAUTION:
Never connect batteries into energised circuit or system, doing so could cause battery to explode.

CAUTION:
Always use insulated alligator clips, wires and jumpers when making circuit connections.

NOTE:
The Pathfinder™ will not trace a wire or cable that is an open circuit since there is no complete electrical circuit path.

Locating Shorts to Ground

1. Check to ensure that the circuit being traced is within the transmitter's voltage limits. (The transmitter is rated for voltages from 9-600 V, AC or DC)

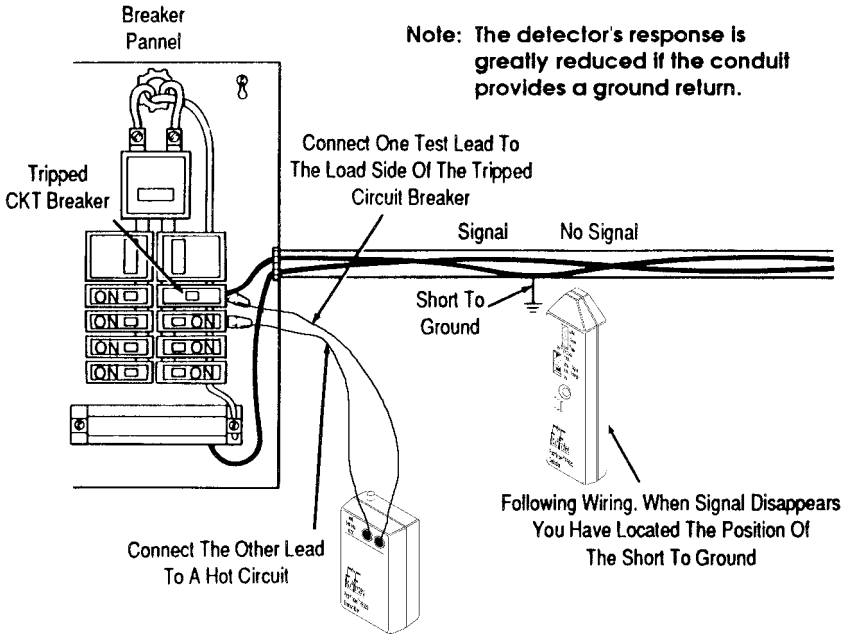
   CAUTION:
   Connecting the transmitter to voltages higher than the transmitter's range will result in a blown fuse (located inside the transmitter).

2. After identifying the tripped circuit breaker and verifying that the circuit breaker is "off", connect one of the transmitter adaptor cord/clip leads to the de-energised "hot" leg of the shorted circuit. Connect the other insulated clip lead to the load side of an adjacent, energised circuit breaker (see Fig. 19).

CAUTION:
Always use insulated alligator clips, wire and jumpers when making circuit connections.

Never hold or touch the bare portion of an alligator clip, wire or test prod.

Fig. 19



3. Confirm that the transmitter LED is now blinking. This indicates that current is flowing from the adjacent breaker through the transmitter, going through the shorted line to ground at the point of the short circuit.

   By using the detector and following the procedure for locating wires in walls, you may trace the shorted line away from the panel towards the point of the short to ground. The signal will disappear when the location of the short is found.

   There are many circumstances under which a short circuit may occur. And the procedure to be followed in locating such shorts may vary slightly in each circumstance. If the short to ground is in the metallic conduit or to a metallic surface that is parallel to the circuit conductors, tracing may be difficult and the detector response greatly reduced, as the conduit or metallic surface may provide the ground return back to the panel box.

Locating Dead Circuits

The Pathfinder™ Circuit Tracer may be effective in locating the panel source of a de-energised dead circuit.

CAUTION:

Never use the Pathfinder™ Circuit Tracer with a remote ground in patient care areas. Ground currents generated by the Pathfinder™ Circuit Tracer may create a shock hazard for electrically susceptible patients.

Since the circuit does not have power in such instances, it can be concluded that the "hot" leg is disconnected or that the circuit breaker has either tripped or been switched off. The neutral line, if it is connected at the panel, may be used to locate the panel which houses the breaker controlling the affected circuit.

1. Determine that the voltage you are tracing is from 9-600 V, AC or DC.

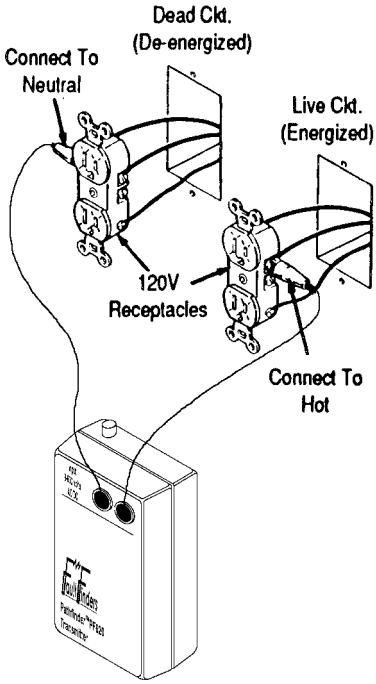
   CAUTION:

   Connecting the transmitter to voltages higher than the transmitter's range will result in a blown fuse (located inside the transmitter).

2. Using a transmitter, with clip leads, connect one of the insulated clip leads to the neutral (grounded) side of the dead (de-energised) circuit to be traced. Connect the transmitter's other insulated clip lead to the "hot" side of an energised circuit (see Fig. 20).

3. If the transmitter LED begins to blink, the neutral wire is connected and the circuit may be traced. Use the procedures for "TRACING WIRES" (see page 13) and "LOCATING CIRCUIT BREAKER OR FUSE" (see page 10) to find the panel source of the dead circuit. Be sure that you follow the neutral wire in the circuit being traced, and not the "hot" side of the circuit breaker being used to energise the transmitter.

Fig.20



Locating Dead Circuits – Alternate Method

1. Use a transmitter with adaptor cord.
2. Connect a separate insulated clip lead from a remote ground to a 9 volt or greater battery. Connect one of the insulated clip leads to the battery. Connect the transmitter's other insulated clip lead to the neutral wire of the dead (de-energised) circuit (see Fig. 21).

CAUTION:
Never connect a battery into an energised circuit or system; doing so could cause battery to explode.

CAUTION:
Always use insulated alligator clips, wires and jumpers when making circuit connections. Never hold or touch the bare portion of an alligator clip, wire or test prod.

NOTE:
Pathfinder™ transmitters are not polarity sensitive. The battery may be connected either polarity.

3. If the transmitter LED begins to blink, the neutral wire is connected and the circuit may be traced. Use the procedures for "TRACING WIRES" (see page 13) and "LOCATING CIRCUIT BREAKER OR FUSE" (see page 10) to find the panel source of the dead circuit.

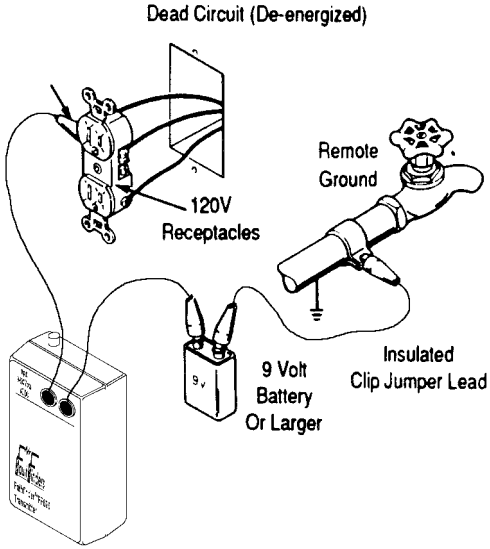


Fig. 21

Three Phase Circuits

The Pathfinder™ Circuit Tracer can be used to locate circuit breaker panels and identify circuit breakers on both Delta ("Δ") and Wye ("Y") 3-phase systems.

Transmitter Selection for System Voltage

3-Phase-System voltage

120/208 Volt Wye ("Y"), grounded (see Fig. 22)

240 Volt Delta ("Δ"), grounded or ungrounded leg (see Fig. 23).

CAUTION:
High leg to ground voltage is greater than the other 2 legs to ground voltage.

277/480 Volt Wye ("Y"), grounded (see Fig. 25); use transmitter phase to ground/neutral and phase to phase.

480 Volt Delta ("Δ"), grounded or ungrounded (see Fig. 26); use transmitter phase to phase or phase to ground if grounded system.

480 Volt Delta ("Δ"), 1 phase centre tap grounded (see Fig. 27); use transmitter on low legs to ground, on phase to phase or high leg to ground.

CAUTION:
High leg to ground voltage is greater than the other 2 legs to ground voltage.

Fig. 22

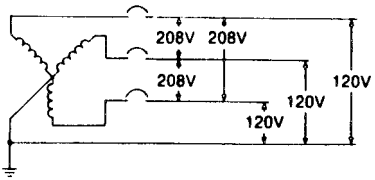


Fig. 23

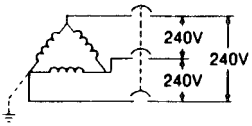


Fig. 24

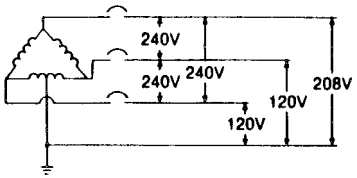


Fig. 25

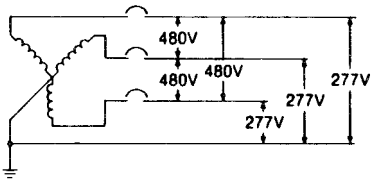


Fig. 26

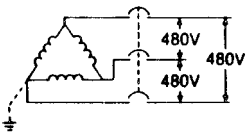
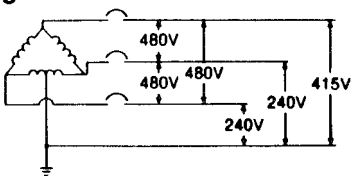


Fig. 27



Locating the Correct Circuit Breaker or Fuse Panel

CAUTION:
Never connect the Pathfinder™ Circuit Tracer to circuits or systems that have voltages in excess of 600 V.

CAUTION:
Connecting the transmitter to voltages higher than the transmitter's range will result in a blown fuse (located inside the transmitter).

1. Connect the transmitter to the circuit you desire to trace by using the insulated clip lead adaptor cord. Connect one of the insulated clip leads to one of the phase legs, connect the other insulated clip lead to one of the two remaining phase legs. (See Fig. 28 and 29.)

Fig. 28

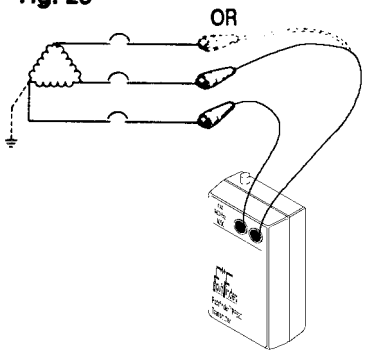
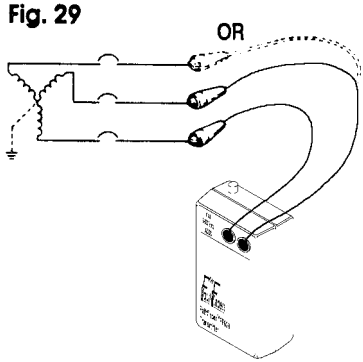
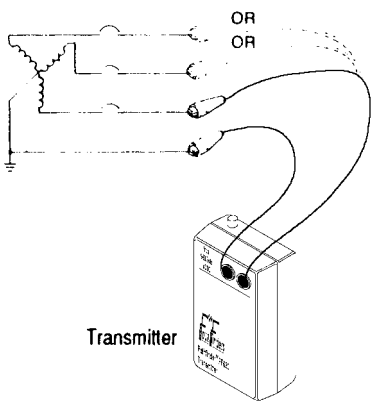


Fig. 29



Three phase circuit breakers supplying 277/480 volt, grounded Wye ("Y") systems can be located using the transmitter. This is accomplished by connecting the transmitter between one of the phase legs and circuit ground or neutral (see Fig. 30).

Fig. 30



Detector

2. Test the detector (see Fig. 31) by depressing the "ON" button and affirming that the battery is operational.

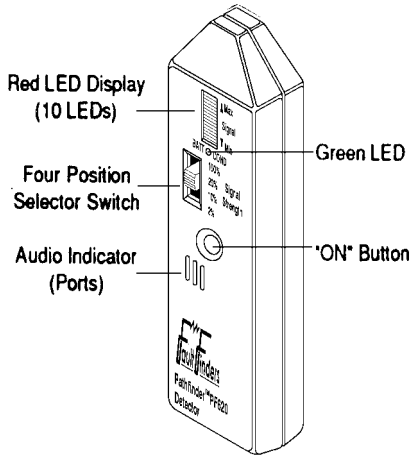
   If the green light appears dim or does not light, the battery should be replaced with an alkaline battery.

   Then place the selector switch in the 100% position and hold the detector next to the energised transmitter.

   Once again depressing the "ON" button, check to confirm that the LED display is blinking and that the detector is emitting a chirping sound.

3. You are now ready to locate the circuit breaker or fuse which supplies the circuit you are tracing.

Fig. 31



Locating Circuit Breaker or Fuse

Refer to single phase instructions "Locating Circuit Breaker or Fuse" (see page 8), except for noted differences listed below:

NOTE:

If the transmitter is connected from phase to phase, two sections of a 3-phase circuit breaker may respond with nearly equal intensity on the detector. If the transmitter is connected phase to phase, the signal will be detected on two legs of the main breaker. If the transmitter is connected phase to neutral or ground, the signal will be detected on only one leg of the main breaker.

Tracing Wires

As explained earlier, the magnetic field sensed by the detector is present around both the line and neutral conductors of the circuit being tested. The same holds true for 3-phase systems, providing the transmitter is connected phase to phase or phase to neutral. Since the current flows in opposite directions in 2 of the conductors, the magnetic lines of force also flow in opposite directions. Consequently, if the phase to phase or phase to neutral conductors are close together, the magnetic lines of force tend to cancel each other and the detector operating range is greatly reduced (see Fig. 32).

Separation of Current Paths

The simplest method of separating current paths is to use a remote ground.

Remote Ground Definition

Refer to "Remote Ground Definition" (see page 13).

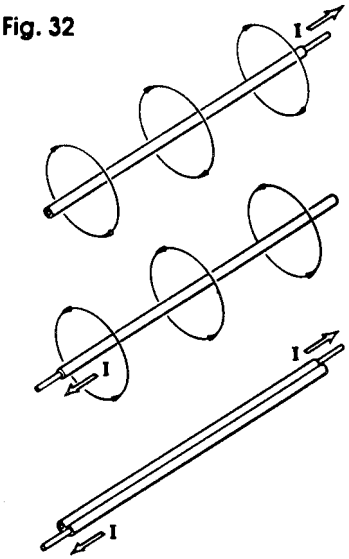
Tracing Grounded 3-Phase Wiring Systems in Ceilings, Walls, Floors or Conduit

Refer to single phase instructions (see page 14).

Tracing Buried 3-Phase Cables

Refer to single phase instructions (see page 16).

Fig. 32



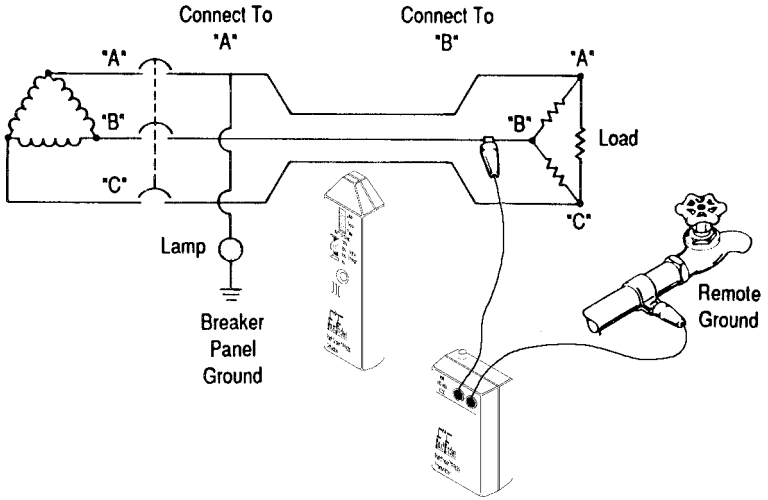
Tracing Ungrounded 3-Phase Systems

1. Connect a lamp from phase "A" to ground at the breaker panel (see Fig. 33).
2. At the load, connect one of the adaptor cord insulated test leads from the PF620 Transmitter to a remote ground.

   Connect the transmitter's other (adaptor Cord) insulated test lead to phase "B" or "C" (see Fig. 33). The LED atop the transmitter will then blink.
3. If the LED atop the transmitter does not blink, you have failed to make a complete circuit.

   NOTE:
   The lamp provides current limiting should a ground fault occur in the return path for the Pathfinder™ Circuit Tracer's signal. Lamp voltage should be equal to or greater than the system voltage and rated at 50 to 100 watts.
4. Detector use: Refer to page 15, steps 5 through 8.

Fig. 33



Locating Ground Faults in Underground 3-Phase Systems

1. Identify which phase has the ground fault using a voltmeter or a ground fault indicator "lamp bank" (see Fig. 34).

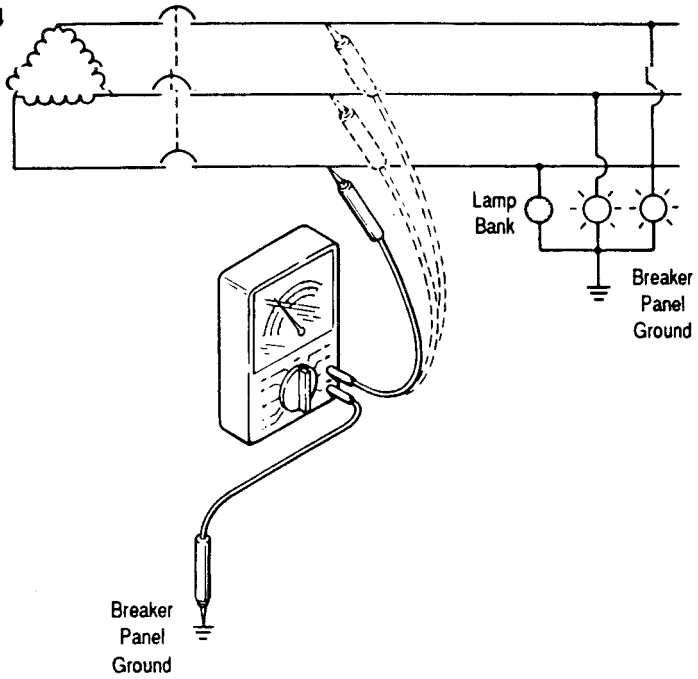
   The phase with the ground fault will read low or zero volts with a voltmeter.

   The lamp connected to the phase with the ground fault will dimly glow or not light. The two remaining lamps will glow brighter when the ground fault is present.

CAUTION:
Lamp voltage must be equal to or greater than the system voltage.

CAUTION:
Always use insulated alligator clips, wires and jumpers when making circuit connections. Always make the ground connection first and remove last.

Fig. 34



2. Connect an insulated clip lead from ground to a 9 volt or greater battery. Connect one of the test leads from the transmitter to the other battery terminal. Connect the transmitter's other test lead to the phase conductor that has the ground fault (see Fig. 35).

   CAUTION:
   Never connect a battery across an energised circuit; doing so could cause the battery to explode.

3. Remove the fault indicator lamp from the phase with the ground fault, if lamps are used.

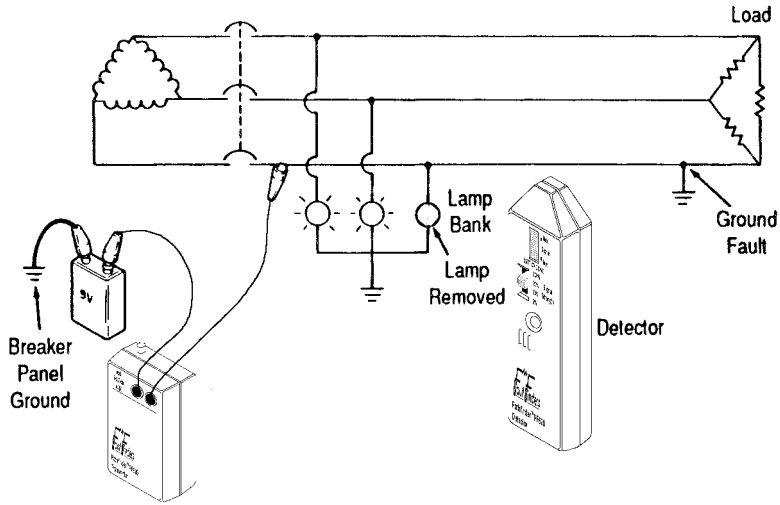
4. If the LED atop the transmitter blinks, a proper connection has been achieved and the ground fault can be located.

5. Detector use: Refer to page 22, "Locating Shorts to Ground".

   CAUTION:
   Always disconnect all clip leads, jumper wires and batteries from the circuit before you make any repairs to the circuit.

   NOTE:
   In Fig. 35 below – make sure breaker is open and lamp in fault circuit has been removed before connecting Pathfinder™.

Fig. 35



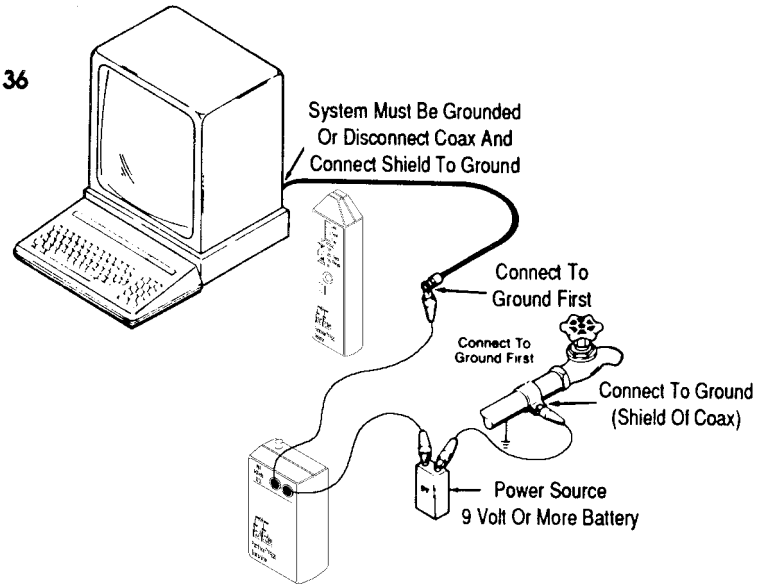
Tracing Computer Coax Cable

CAUTION:
Never disconnect data, computer, cable television or other information systems cable when such systems are up and operating.

1. The transmitter test leads may be used to trace computer coax cable.
2. Disconnect one end of the COAX from the equipment and verify that the far end of the COAX is grounded. This may be confirmed by measuring for continuity between the COAX shield and the remote ground with a VOM.
3. Connect an insulated clip lead from the remote ground to a 9-volt or greater battery. Connect one insulated clip lead from the transmitter with adaptor to the battery terminal. Connect the other lead from the transmitter to the shield of the COAX to be traced (see Fig. 36).
4. Verify that the LED atop the transmitter is blinking, which indicates that the circuit being tested is energised, and that the transmitter is working.

   NOTE:
   One end of the cable to be traced must be connected to ground, either through equipment ground or shield to ground.
5. Test the detector by depressing the "ON" button and affirming that the battery is operational. If the green light appears dim or does not light, the battery should be replaced with an alkaline battery.

Fig. 36



6. Then place the selector switch in the 100% position and hold the detector next to the energised transmitter.
7. Once again depressing the "ON" button, check to confirm that the LED display is blinking and that the detector is emitting a chirping sound.
8. Proceed to trace the circuit.
9. Set the detector's selector switch to 100% and begin tracing the COAX. It is advisable to rotate the detector when following the COAX. Since response of the detector is dependent upon the angle of the detector tip to the COAX being followed, use of a methodical search pattern will produce more effective results.
10. The detector range, under best conditions, extends to approximately 5 feet from the wire being traced when the selector switch is set at 100%.

CAUTION:
Never disconnect data, computer, cable television or other information systems cable when these systems are up and operating.

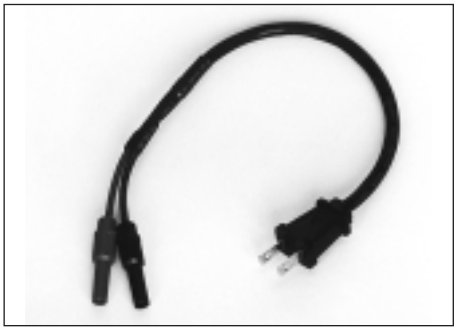
NOTE:
It is impossible to trace circuits through an uninterruptable power source (UPS), but circuits may be traced on either side of this device.

Accessory

Adaptor Cord and Test Clip Leads

These are available from Fault Finders. One set is included in the kit.

Adaptor cord (Aust.)



Adaptor cord (U.S.A.)

Test leads

Adaptor Cord – Plug Leads

An adaptor cord can be constructed that allows very quick and easy connection to 120 volt, 15 or 20 amp receptacle circuits to trace the circuit wiring using the Pathfinder™ (see Fig. 38).

Materials:

Two lengths of No. 18 AWG test lead wire polarised connector (NEMA 1-15R) or 3 wire plugs (NMA 5-15R), two 2 wire polarised plugs (NEMA 1-15P) or 3 wire plugs (NEMA 5-15P).

Assembly

Connect the hot blade of one plug to the hot side of the connector using one of the test lead wires (see fig. 38).

Connect the neutral blade of the other plug to the neutral side of the connector using the other test lead (see Fig. 38).

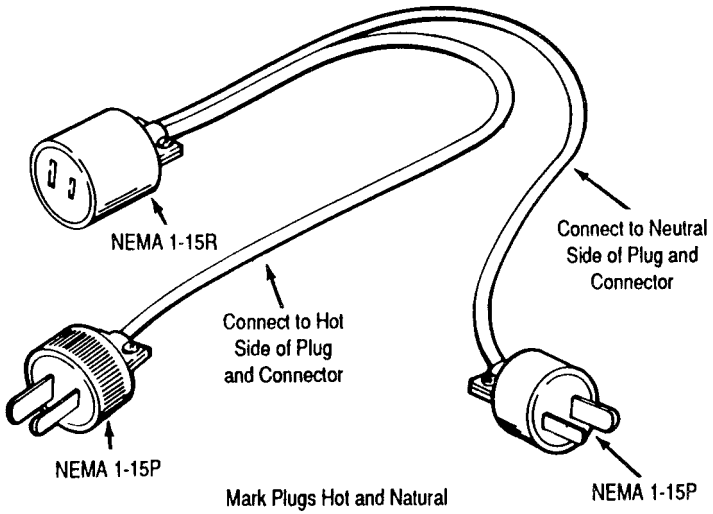
Mark both plugs with their respective identification, (hot and neutral).

CAUTION:

Always connect adaptor cord plugs (hot and neutral) first and the Pathfinder™ transmitter last.

Always disconnect the Pathfinder™ transmitter first and the adaptor cord plugs last.

Fig. 38



Trouble Shooting

Should the Pathfinder™ Circuit Tracer fail to operate properly, use the following examples as a trouble shooting guide:

Problem:
The transmitter is connected to a circuit to be tested but the transmitter LED does not blink.

Solution:
a) The circuit is not energised. Use a voltage tester to confirm circuit is live.

b) Transmitter fuse has blown. Replace with standard 250V 1/4A 3AG (fast-acting) fuse (located inside transmitter).

c) Connect to adequate ground.

d) If tracing a dead circuit, the dead wire is open. If wire is not connected, the Pathfinder™ Circuit Tracer should not be used.

Problem:
When pushing the detector "ON/OFF" switch, you discover that the green battery light is either dim or does not light.

Solution:
Replace battery with an alkaline battery.

Problem:
When attempting to locate a circuit breaker in a panel, a few of the LEDs on the detector remain on, without blinking, and the detector emits a slight buzz.

Solution:
Electronic noise in the system (as generated by some office machines, computers, SCR motor controllers and GFI's) may cause some of the LEDs to remain lit. But when the transmitter signal is sensed by the detector, the remaining LEDs in the display will begin to blink and the normal audible signal will be heard. The electronic noise in the system will have little effect on the operation of the Pathfinder™ Circuit Tracer.

Problem:
Detector gives erratic response after being stored in sub-zero temperatures.

Solution:
Allow detector to warm up before use, approximately 15 to 30 minutes.

Pathfinder Circuit Tracer Limited Warranty

The Pathfinder™ System's transmitter and detector are warranted under normal use against defects in material and workmanship for two years from date of purchase.

Any instrument found defective within the warranty period should be returned (with a copy of the original purchase order, reciept or invoice), transportation charges prepaid. The instrument will be repaired, adjusted or replaced at Co's option, without charge to the purchaser.

This warranty does not cover expendable items such as batteries, fuses or adaptor cord-clip leads. If the defect has been caused by either misuse or abnormal operating conditions, or the 24-month warranty has expired, the purchaser will be billed $50.00 for the repair plus parts and return freight costs.

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