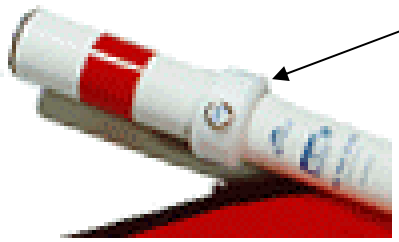
TOPIC #8 AC Hot Stick

Description:
The AC Hot Stick consists of a high sensitivity AC amplifier for the frequency range below 100 Hz. The special logarithmic amplifier is capable of receiving AC signals over a very wide amplitude range. Such signals emanating from an unshielded, voltage carrying surface, are made audible and visible as a warning.

The warning signals (Audible beeps and LED flashes) will increase as the signal amplitude increases. This allows for quick identification of the signal source.



Turning the plastic ring at the front - referred to as the **Mode Switch** – turns the unit on and off and provides 3 sensitivity settings. Each of the 4 settings clicks into position. A small magnet in the ring actuates magnetic reed switches inside the plastic pipe.

Specifications:
Signal indication – Audible beep and visual LED. Beep rate will increase or decrease with proximity to conductor
Frequency Range – AC Voltages 20 Hz to 100 Hz
Self-Test – Built in, 3 second self test after turn on.

Sensitivity Settings:

High Sensitivity – Allows the detection of AC from the greatest distance.

Low Sensitivity – The overall sensitivity is reduced allowing for detection of the signal source.

Front Focused Mode – This setting allows for pinpointing at a source. A small sensor in the front is shielded from signals coming from the sides. This makes the unit directional and reduces the influence of high voltage wires overhead.

Self – Test

The unit will perform a complete self-test circuit immediately after turn-on. The self-test will produce a low frequency oscillator for 3 seconds simulating power line signals. This provides a separate test signal to the input. Rapid beeping indicates proper operation of the set.

The self-test will also check the batteries. If insufficient battery power is present the unit will beep continuously and cannot be used.

Notes:

- The unit is splash water – proof and intrinsically safe for operation in potentially explosive atmospheres.
- The unit does not require a warm up period and is operational 10 seconds after turn-on.

Operation:

1. Hold the AC Hot Stick by the grip at the lanyard end. The red striped area in the front indicates the sensing section.
2. Turn the unit on by rotating the ring of the mode switch in the direction of the arrow to the **High Sensitivity** setting. **Always start with the High Sensitivity setting.**
3. Allow the unit to complete the self-test cycle. (At least 3 seconds – look for beeping and flashing light). **Do not use if there is no beeping, no flashing light, or if the unit emits a steady tone or if the unit chirps and/or goes through a self test when tapped.**
4. After self-test has stopped, move the AC Hot Stick around slowly.
5. Continue to use the **High Sensitivity** setting until the general location and direction of unshielded AC voltage is determined.
6. As the AC Hot Stick is brought closer to exposed AC, the unit will start to beep and the LED to flash.
7. Beeping and LED flash will become more rapid as the sensing section is brought closer to the source. (The unit may beep occasionally even when no AC is around. This is normal and frequently occurs while the stick is in motion. Electrostatic charges or other fields can cause this. Hold unit still while checking)
8. Once AC has been detected and the AC Hot Stick beeps rapidly, select the **Low Sensitivity** or **Front Focused Mode** as needed to pinpoint the source.

Sensitivity/Range:

The detection range/sensitivity will be different depending on a number of factors:

1. The AC Voltage signal amplitude, which is present, will affect the distance at which the first warning will occur. The higher the voltage, the earlier the warning
2. The physical size of the conductor, length, height of voltage carrying material will affect the distance at which the first warning will occur. (I.E. a car contacting AC will be detected much earlier than a short piece of wire)
3. The height of the Hot Stick above the ground as well as the height of the signal source will affect the distance between the AC source and point of first warning indicated on the Hot Stick. The higher the Hot Stick is held above the ground, the further it will "see," the wider its horizon will be. The range of a Hot Stick lying on the ground is very limited. The same holds true for wires strung in the air compared to wires lying on the ground. Wires high above the ground will be noticed from a much greater distance than wires on the ground.
4. Shielding: If AC conductors are fully enclosed in grounded metal shielding, they are safe and will generate no indication on the Hot Stick, unless they radiate strong magnetic AC fields. (I.E. transformers, ballasts for fluorescent lights)
   Metal doors or plates may prevent AC from emanating however if the metal parts are in contact or very close to an AC source the Hot Stick will indicate the presence of AC potential.
   Some shielding is also provided through wet leaves, brush and trees. They will reduce the range however if a tree or water puddle is on AC potential, the Hot Stick will give proper warning from a safe distance.

Warnings and Dangers:

1. Use extreme caution at all times when approaching areas where live voltage may be present, while trying to detect live voltage, and in taking action after detecting live voltage.
2. Firefighters must be aware of sudden reapplication of AC voltage after high-tension wires have been disconnected through safety/fusing circuits. These automatic retries are computer programmed and will attempt to reconnect the AC voltage after a short circuit.
3. Downed wires should always be treated as if they were voltage carrying.
4. The AC Hot Stick **does not** detect or warn of hazards from DC voltage. (Subways, car batteries)
5. The AC Hot Stick must also be used with extreme caution in areas where multiple live voltages may be present. In such situations, care must be taken, especially in front focused or low sensitivity mode to avoid inadvertent contact with one source while pinpointing another source.
6. Keep a safety distance of at least 9 feet from all unguarded live parts suspected of voltages in excess of 601 Volts.

7. In Front Focused mode the unit will pick up signals mainly from the front tip end. **Do not use this mode when starting a search.** The sensitivity is greatly reduced.
8. Do not contact conductors with the unit.
9. Do not place unit in liquid.

Typical Use:

1. Site Assessment – Moving the AC Hot Stick sideways and up and down and moving slowly forward observing the LED and listening for audible warning. If a warning signal is noted, hold still. If the signal persists, try to determine the direction from where the signal originates by an increase in the warning signal.
2. Vehicular Accidents – When a vehicle has struck a pole, transformer, building, traffic light or unknown structure, the AC Hot Stick should be used to verify that the vehicle, guy wires, fences or other sections around the vehicle are not voltage carrying.
3. Swimming Pools – Use the AC Hot Stick to verify that no AC potential exists prior to removing the victim from the pool.
4. Night searches – The AC Hot Stick can be used during the night, especially when severe wind or ice storms may have damaged trees and power lines presenting a potential electrocution hazard.
5. Building Collapse – The site can be checked out for the presence of AC voltage prior to rescue operations.
6. Fires – AC disconnect can be verified.

Batteries:

- 4 standard AA Alkaline batteries power the AC Hot Stick.
- Battery life under typical usage is 1 year
- Battery life under continuous usage is 300 hours

Low Battery Indicator:

When the battery voltage drops below 4.8 Volts, the AC Hot Stick will emit a constant tone until the batteries are fully exhausted.

Replacing the batteries:

1. Place the AC Hot Stick flat on the table
2. Unscrew the knurled lanyard screw. The gray end cap contains the audible warning device is spring-loaded and may push out as the screw is removed.
3. Note the polarity and location of the batteries.
4. Lift up the front of the Hot Stick and allow the batteries to slide out.
5. Slide 4 fresh AA Alkaline batteries into position. Do not drop the batteries in, as the terminals are soft.
6. Replace the end cap and tighten the lanyard screw.
7. Check operation. If self-test does not work or continuous tone is heard, recheck the direction of the batteries. Tap the unit lightly while in front focused mode to check for good battery contact. Unit should not chirp or go through self-test when tapped.

Troubleshooting:

	Problem	Cause	Remedy
1	Keeps beeping	AC near by	Move Hot Stick away from AC source
2	Unit chirps or goes through self-test when tapped	Poor battery contact	1. Clean battery terminals 2. Change batteries 3. Return for service
3	Steady Tone	Low batteries One battery reversed	1. Change batteries 2. Check polarity
4	Slow self-test or low sensitivity	Water inside housing	1. Remove end cap and batteries and store in warm, dry area for 48 hours.
5	No sound or LED light after turn-on	1. Run down batteries 2. Batteries installed incorrectly 3. Unit defective	1. Change batteries 2. Reinstall batteries, observe polarity 3. Return for service
6	LED light on but no tone (or vice versa)	1. Circuit failure 2. Bad contact 3. Defective beeper	Return for service
7	Unit turns on in "Off" position	Strong magnet near mode switch	Normal, move AC Hot Stick

When using the AC Hot Stick always follow these guidelines:

1. **Always start using the High Sensitivity setting**
2. **Observe the function of LED and audible warning during the 3-second self-test.**
3. **Always treat all wires as voltage carrying.**

The AC Hot Stick is issued to all Engine Companies, Ladder Companies and Heavy Rescues.