

Tips & Techniques: Telephone Line Measures



Telephone lines can vary greatly from location to location, even within the same building. There are certain simple readings that can be taken that can be helpful in determining these varying operating conditions, conditions which can greatly impact the function of communications devices using the telephone line.

Tools Needed

- Digital Multimeter (DMM) capable of reading VDC, VAC, and mA

Line Voltage

An idle (on-hook) loop start analog telephone line will carry DC voltage on the two wires (TIP and RING). Typical Central Office (CO) lines run around 48 VDC; typical internal phone system (PBX) lines run around either 48 VDC or 24 VDC.

1. Disconnect all phones from the telephone line.
2. Set DMM to VDC scale.
3. Connect meter leads directly across TIP and RING wires and measure voltage. This is your line voltage.
4. Connect RED meter lead to one wire and BLACK meter lead to earth ground; measure voltage. Repeat on the other wire.
 - TIP will read positive a few volts.
 - RING will read a negative voltage, either 48 VDC or 24 VDC depending on the line voltage measured in Step 3.

Loop Current

An analog telephone line will supply a certain amount of current to the telephone equipment. K-Tech K-Phones (ET501x, ET1001x) and Plus Models (ET201x, ET1201x) require at least 30 mA for proper function; K-Tech SUREphones (ET901x, ET1901x) do not have a minimum loop current requirement, though a functioning line will still carry some current.

1. Disconnect all phones from the telephone line.
2. Set DMM to read mA.
3. Connect meter leads to telephone line wires and measure loop current.

AC Interference

AC interference on telephone lines can show up several ways. This interference is introduced to the system when the telephone wiring is run close to wiring carrying AC voltage. In elevators, this is most likely to occur in the controller and the traveler. Static, buzzing, and popping on the line during conversation is a good indicator that there is a problem, but is not always present. K-Tech phones will show additional symptoms including false activations, memory loss, and misdialing.

To eliminate or reduce AC interference you must run the telephone line on a shielded, twisted pair in the traveler. The shield should be continuous from the elevator through the controller, and grounded to a **true earth ground**



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at one end only. This directs the induced AC current to ground, rather than into the communications equipment. (See *Tips & Techniques: AC Inductance and K-Tech Emergency Speakerphones* for more information)

1. Disconnect all phones from the telephone line.
2. Set DMM to VAC scale.
3. Connect meter leads directly across TIP and RING wires and monitor voltage. Ideally, this voltage should be 0 VAC. Monitor this voltage and watch for spikes. These could occur when car panel buttons are pushed, when the car runs, when the doors open or close, when other cars in the building move, etc.
4. Connect RED meter lead to one wire and BLACK meter lead to earth ground. Again, monitor the voltage; repeat on the other wire. AC interference could be on only one of the pair.

Line Polarity

K-Tech K-Phones (ET501x, ET1001x) and Plus Models (ET201x, ET1201x) are polarity sensitive and must be connected properly to function. The terminal strip for connecting the telephone line wires are marked - Tip is positive, Ring is negative in reference to each other. K-Tech SUREphones (ET901x, ET1901x) are not polarity sensitive.

1. Disconnect all phones from the telephone line.
2. Set DMM to VDC scale.
3. Connect meter leads to telephone line wires and measure voltage. If the reading is a negative value, reverse your lead connections.
4. When reading a positive voltage on your DMM, the RED lead is connected to TIP, the BLACK lead to RING.
5. Connect these wires to the appropriate terminals on the speakerphone.

Ring Voltage

When the telephone line rings, it supplies an AC signal to the phone over the top of the DC line voltage. K-Tech phones will respond to this voltage and automatically answer the incoming call.

1. Disconnect all phones from the telephone line.
2. Set DMM to VAC scale.
3. Connect meter leads to telephone line wires.
4. Place a call to the telephone line being measured.
5. You will see the AC voltage turn on and off in time with the ring cadence (typically 2 seconds on, 4 seconds off). This voltage is typically between 60 and 120 VAC.

Shut Off Signal

Central Office (CO) telephone lines and some internal phone system (PBX) lines will provide a shut-off signal after the called party hangs up. This signal, also known as a Called Party Control (CPC) signal, is a momentary (500 ms) "open" on the telephone line. K-Tech speakerphones will automatically shut off when they receive this signal from the line.

1. Set DMM to VDC scale.
2. Connect meter leads to telephone line wires.
3. Activate the K-Tech speakerphone and monitor the phone line voltage. You will see the on-hook voltage (typically 48 or 24 VDC) drop to around 15 VDC. Approximately 10 seconds after the operator hangs up, you should see the line voltage quickly drop to 0 VDC and return to the on-hook voltage.

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The included documents have been designed to provide helpful hints, further explanation, and solutions to common product issues. If you are unable to find an answer or a solution within these documents, please feel free to contact K-Tech Customer Service by e-mail at support@ktechonline.com or by telephone at 1-800-993-9399 or (860) 489-9399 for further assistance.



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