Hotliner Application Note

SINGLE NOISE INTERFERENCE XTERMINATOR

SNIX

SUPER SNIX

Printed in USA

Introduction

These instructions are intended for telephone and power company personnel who plan to conduct tests to determine the need for an SNC SNIX (Single Noise Interference Xterminator). The instructions explain the problems that a SNIX can remedy, how to find the proper installation location, and how to install the SNIX. All testing and installation procedures are explained in detail. SNC recommends that you read the entire set of instructions before you begin field testing.

A Message on Safety

SNC Manufacturing Co. is concerned about your safety. Read these instructions carefully. Pay strict attention to all DANGER, WARNING and CAUTION statements. When you see these statements, take heed - your personal safety, the safety of your co-workers, and the safety of your equipment may be at risk.

DANGER: Possibility of personal injury.
CAUTION: Possibility of service interruption.
WARNING: Possibility of equipment damage.

This safety alert symbol is used throughout these instructions to alert you to hazardous situations. When you see this symbol pay strict attention to all safety instructions that follow!

Contents

Printed 10/99
Form No. T0045

1. SYMPTOMS

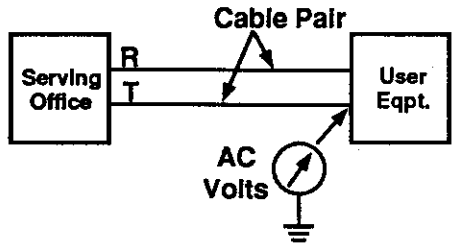
- Induced AC voltages on cable pairs.
- False rings at user's equipment.
- Noisy off-premise extensions.
- Burned or damaged equipment — Station, key system, PBX, signaling gear, data modems, etc.
- Unexplained electronic equipment failure.
- False signals or errors on data circuits.
- Noisy lines.
- "Hot" or "shocking to the touch" line facilities.
- False gas pressure alarms.
- Dialing errors.
- Impulse noise.
- Radio Frequency Interference (RFI) from serving facility.
- Malfunctions — CPE, coin phones, modems, alarm circuits, key systems.
- Faulty operations — security systems.

2. PROBLEMS TREATED

- Susceptibility of terminal equipment to:
  - a.) Commonly encountered, steady-state, 50/60 Hz AC, longitudinally induced power line currents or voltages which impair or disable desired circuit functions.
  - b.) Longitudinally induced surge currents or voltages resulting from power line faults or surges that can cause component failures or damage.
  - c.) Excessive "Power Influence" levels (induced harmonic voltages or currents) that may cause circuit noise.
  - d.) RFI signals induced into serving facilities and entering user's equipment.
- Exposure of personnel to unanticipated, unsafe voltage levels on equipment terminals.

3. TEST PROCEDURES (FINDING THE SOURCE OF THE PROBLEM)

3.01 If you are experiencing any of the above symptoms refer to the tolerances in the literature that came with the terminal equipment or carrier system. The manufacturers know best the inductive tolerances that their equipment can handle. Follow their recommendations closely. If



Idle Circuit
R to Gnd ___ AC Volts
T to Gnd ___ AC Volts

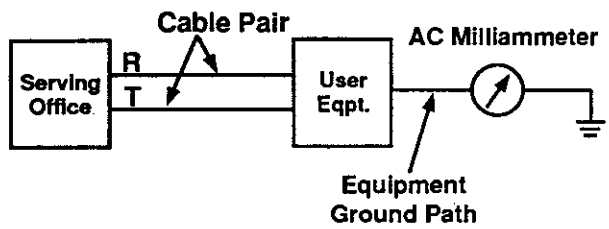
Busy Circuit
R to Gnd ___ AC Volts
T to Gnd ___ AC Volts

Figure 1

tolerance values are given, but no diagnostic procedure is provided, consider the following tests.

(a) If a voltage-to-ground (longitudinal voltage) tolerance value is provided, measure the AC voltage from each wire of the incoming serving facility (cable pair, drop wire, etc.) to an "approved ground" (this might be the existing protector ground). See Figure 1. These measurements should be made with the circuit in the idle (unused) and busy (used) condition. A high impedance AC voltmeter (>100 K Ohms) must be used to avoid "loading" the circuit. If any of these values exceeds about 50% of the equipment's stated voltage-to-ground tolerance value, an SNC SNIX should be considered.

(b) If an interfering longitudinal AC current tolerance value is provided, consider the following the test. Using the manufacturer's circuit schematic, locate the equipment's longitudinal circuit path-to-ground. (This may be a capacitive path.) Place an AC milliammeter in series with this ground path. Read the AC current value in both the busy and idle condition of the circuit. See Figure 2.

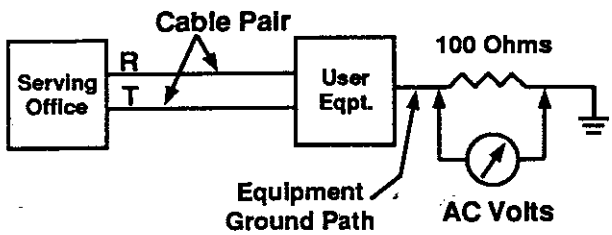


Idle Circuit
___ mA

Busy Circuit
___ mA

Figure 2

If an AC milliammeter is not available for this measurement, an AC voltmeter and a 100 Ohm, 2 watt resistor can be used. Place the 100 Ohm resistor in the circuit's ground path instead of the AC millammeter as mentioned above. See Figure 3. Using an AC voltmeter, measure the voltage drop across the 100 Ohm resistor. Divide the voltmeter reading by 100 and the result is the longitudinal AC current flow through the terminal equipment. Again, this current flow value through the equipment should be determined in both the busy and idle states. If either value exceeds 50% of the equipment's stated tolerance, an SNC SNIX should be seriously considered.



Idle Circuit
___ AC Volts ÷ 100 = ___ mA

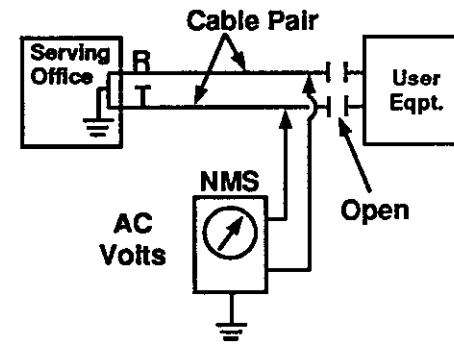
Busy Circuit
___ AC Volts ÷ 100 = ___ mA

Figure 3

(c) If the equipment's circuit balance value is provided and the circuit does not meet its desired noise levels, measure the serving facility's Power Influence (PI) and Circuit Noise (CN). See Figure 4.

Note: PI is measured in dBrnc. PI equals noise-to-ground plus 40 dB (noise-to-ground plus voice message weighting).

(d) These measurements are made using a standard telephone type noise measuring set, such as a Wilcom T136B that displays actual dBrnc, or a Western Electric 3C NMS, which requires 40 dB to be added to the meter reading. The serving facility should be terminated at the central office (or other similar location). This termination may be a dialed up "quiet" or "balanced" termination, if the office is so equipped. It may also be an impedance matching type termination, or just a "short" and "ground" of the pair at the protector frame, as long as it provides a balanced association of the facility with ground at the serving office.



PI = ___ dBrnc
CN = ___ dBrnc
BAL = ___ dB

Figure 4

(e) Circuit Balance = PI – CN
so
PI – Circuit Balance = CN.

If the CN measured above exceeds the maximum desired noise value, little can be done to the user's equipment to improve the condition. However, if the CN meets the desired noise level but the PI minus the equipment's circuit balance is more than the maximum desired noise value, a SNIX can be used to reduce the PI, which will in turn reduce the CN.

Note: This test is not applicable to carrier equipment.

3.02 If there is no equipment manufacturer's data available or if the tolerances are not provided, the following values may be used. These values are not intended to recommend or reject any terminal equipment that will accept more or less than the values given:

- Longitudinally induced AC voltage-to-ground, less than 20–30 VAC.
- Longitudinally induced AC current through the equipment to ground, less than 5 ma AC.
- Power Influence of 80–90 dBrnc is marginal, but less than 80 dBrnc is generally acceptable, assuming the facility balance is greater than 60 dB. However, 80 dBrnc PI is high enough to cause noticeable CN if the equipment balance is less than 60 dB.

4. SOLUTION PRINCIPLES

SNIX

4.01 The SNIX is a broadly tuned, single pair coil and drainage unit. Electrically it contains a longitudinal choke coil and a capacitively coupled, center tapped HDR (Harmonic Drainage Reactor) drainage coil. See Figure 5.

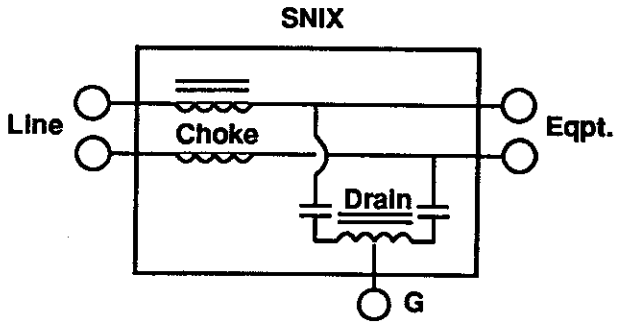


Figure 5

4.02 This drainage coil is associated with the equipment "Eqpt" side of the choke. A ground on the center tap of the coil provides an electrically balanced path for longitudinal AC currents to flow. These AC currents excite the SNIX as they flow through the choke portion, making it appear high impedance to the longitudinal AC currents. The result is a lower longitudinal AC influence on the "eqpt" side of the SNIX and the facility or equipment that is connected to that side of the SNIX.

Super SNIX

4.03 A Super SNIX is a combination noise choke and dual drainage unit, configured to take advantage of the unique properties of both the HDR and TEN. The broad voice-frequency noise drainage capabilities of the HDR and the more effective fundamental frequency drainage of the TEN make the Super SNIX equally effective at both noise and induced voltage reduction. See Figure 6.

Note: The drainage portion of the SNIX and the Super SNIX are available as separate units. They are known as an HDR (Harmonic Drainage Reactor) and as a TEN (Transformer Exciting Network). Call SNC's Toll Free Hotline 800-558-3325 for information on these products as well as noise chokes.

4.04 The SNIX will limit longitudinal AC voltages-to-ground up to 30 volts AC. The

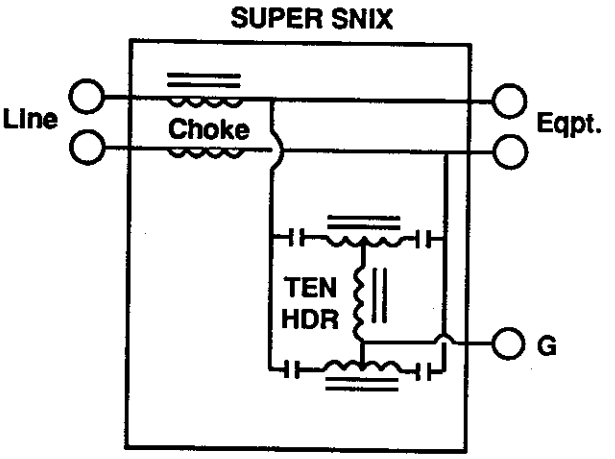


Figure 6

Super SNIX will suppress up to 50 volts AC. Voltages above these values may cause the SNIXs to saturate, which can increase the AC voltage or generate noise on the circuit.

4.05 All SNIX and Super SNIXs have a copper flux band around the choke portion that is internally connected to the ground conductor lead or terminal. This makes SNIXs very effective at reducing RFI (Radio Frequency Interference) that may be entering longitudinally on the cable pair.

5. INSTALLATION NOTES

5.01 The SNIX is available in a variety of "hook-up" arrangements. Regular and Super SNIXs are offered with two, 36 inch long, three conductor, jacketed, 22 gauge, "inside/outside wire" leads. The two, three conductor leads are designated as "line" and "eqpt." The green, red, and yellow conductors of these leads represent T1, R1 and ground (G) on the "line" lead, and T,R, and G on the "eqpt" lead. (The G is common to the "line" and "eqpt" leads. The "eqpt" side of the SNIXs contains the drainage path to the G wire.

5.02 The regular SNIX is also offered with two modular RJ45 8 position telephone line jacks. One jack is designated as "line" and the other as "eqpt." The "eqpt" side contains the drainage path. Six conductors are connected through from "line" to "eqpt." However, the T and R of the SNIX are wired in series with the number 3 and 4 pins of the jacks. The ground path of the SNIX is connected to the number 5 pin of the jacks and also to a "G" screw terminal. An external low impedance ground connection must be made to this terminal or the number 5 pin for the SNIX to perform properly. See Figure 9.

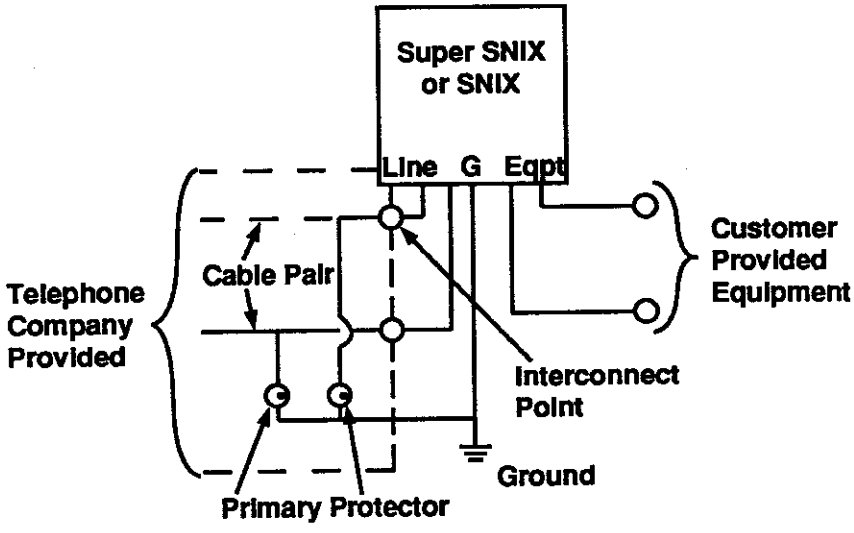


Figure 7

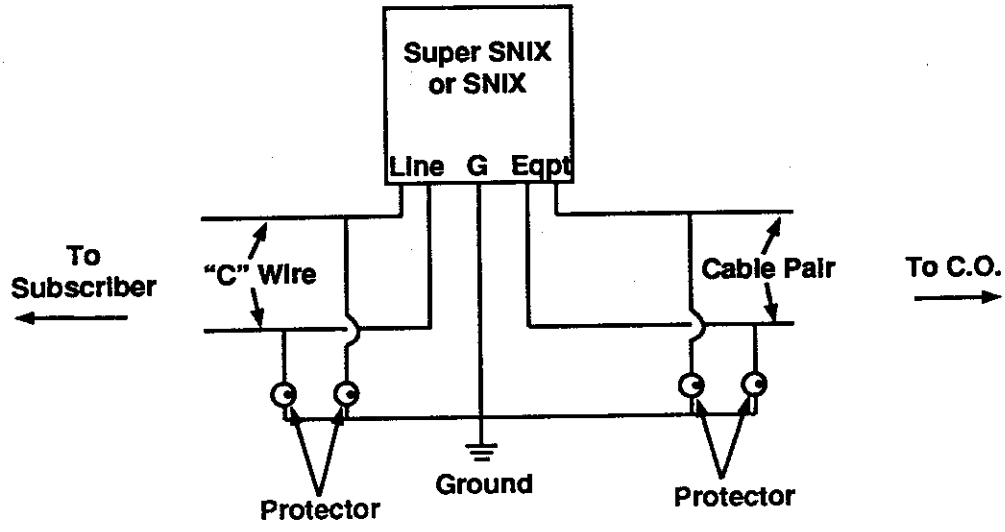


Figure 8

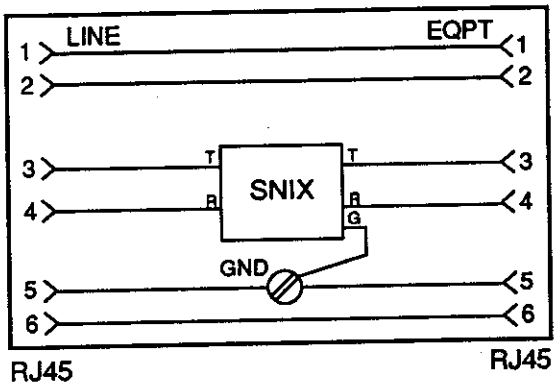
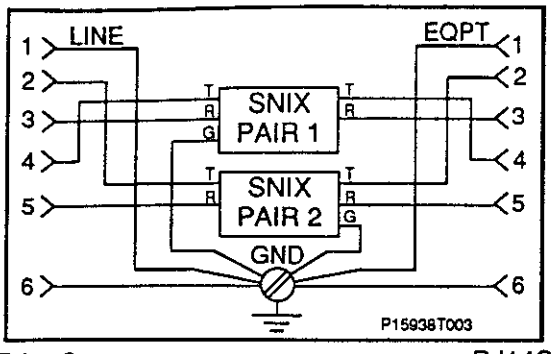


Figure 9: Regular Jack Model SNIX

5.03 A two pair duplex SNIX designed for indoor use is offered with two RJ14C modular telephone line jacks. One jack is designated as the "line" and the other as "eqpt." T and R of the SNIX Pair 1 are wired to pins 3 and 4 of the jacks. T and R of Pair 2 are wired to pins 2 and 5. The ground path of each SNIX is connected to a "G" screw terminal, as are the conductors for pins 1 and 6. An external low impedance ground connection must be made to this ground terminal or pins 1 or 6 for the SNIX to perform properly. See Figure 10.

5.04 Five regular SNIX models are offered for CO main frame mounting in 4, 6, 8, 10 and 12 pair sizes.



RJ14C RJ14C

Figure 10: Duplex Jack Model SNIX

5.05 A four pair SNIX with a quickconnect (punch down) terminal block is available.

Note: It is very important that the yellow wire of a lead model or the "G" terminal of the jack models is connected to a low impedance ground.

5.06 The enclosures of the tube SNIXs are weather resistant, however their internal electrical components are not designed for the "electrically exposed" environment. When placed at the central office (CO) or station end of a circuit they should be placed behind or on the protected side of the primary telephone station protector. If placed in the cable or line facility they should be protected on both the "line" and "eqpt" sides.

5.07 The "line" terminals of a SNIX are normally connected to the facility that has the greatest longitudinal AC influence. If the SNIX is located at a CO or station terminal, the "line" terminals would normally be toward the serving facility (cable, open wire, drop service wire, etc.). If it is placed in the cable plant, the "line" terminals would be toward the CO. However, due to the uncertainties of power line inductive interference, the opposite installation might be more effective. SNC suggests installing the SNIX both ways to find the most effective setup.

5.08 A typical end user or station application is shown in Figure 7. Figure 8 shows a "C" wire/cable application. (Note the necessary protectors on both the line and equipment sides.)

6. ADDITIONAL INFORMATION

6.01 Circuits with a direct current path-to-ground, such as "ground start" PBX trunks, tend to saturate the choke portion of the SNIX or Super SNIX during trunk seizure. This makes the SNIX less effective. Conversion to "loop start" or similar changes in the circuitry may be necessary.

6.02 The use of SNIXs on grounded ringer party lines may cause cross ring problems. The Super SNIX may affect harmonic ringing at ringer frequencies near 50 to 60 Hz.

6.03 Problems affecting multiple lines might benefit more by applying an SNC Telecom Line Conditioner (TLC). The TLC can perform effectively with higher induced voltages than the SNIX and is more economical when treating more than 12 pairs.

7. ELECTRICAL CHARACTERISTICS

7.01 The regular and Super SNIX have 45 Ohms maximum DC loop resistance ± 10 percent. Maximum insertion loss is 0.5 dB @ 1kHz. The duplex SNIX has 85 Ohms DC loop resistance.

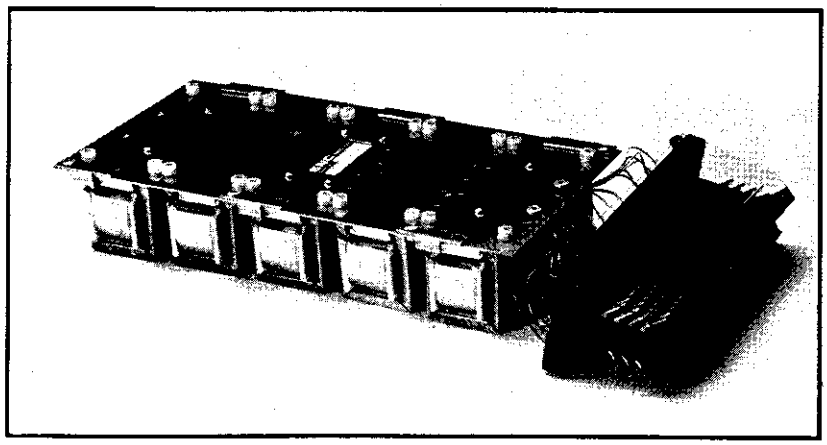


Figure 11: Main Frame Mounted SNIX

Figure 12: SNIX/Super SNIX In Plastic Tube

Contact SNC Manufacturing Co. for further information on these quality Noise Solution products:

- Induction Neutralizing Transformer (INT)
- Digital Induction Neutralizing Transformer (DINT)
- Single Noise Interference Xterminator (SNIX)
- Noise Chokes
- Transformer Exciting Network (TEN)
- Harmonic Drainage Reactor (HDR)
- Glitch Tamer
- Telecom Line Conditioner (TLC)
- Harmonic Suppression Reactor (HSR)
- HumZapper
- Li'l Zapper

For further information or for technical support call 800-558-3325 – or visit – www.sncmfg.com

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