SNC®

January 2003

Single and Multi-pair Solutions for Controlling AC Induced Voltages and Harmonics on Copper.

Noise Mitigation Catalog

Look Inside For:

The Telecom Problem Solvers

Printed in USA - T0359

Ordering Information

When ordering please have Part Number(s) ready. We encourage you to call our toll-free Hotline (800-558-3325 USA and Canada) or our regular number (920-231-7370) if you have questions or need advice about the use of our products. Our FAX number is 920-231-1090. All products in this catalog are designed and manufactured in the USA.

Contents

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Induction Neutralizing Transformers (INTs)

"The Economical Solution to Induced AC Voltages, Currents or Harmonics"

An INT is a simple, passive device that splices in series with the cable. It is used to mitigate induced AC voltages, currents or harmonics that may be causing noise or equipment malfunctions or damages.

Standard sizes are 2, 6, 12, 25, 50 and 100 pair. Larger pair requirements use multiple configurations of standard sizes. Digital carrier PCM INTs are available for 1, 6, 12, 25 and 50 systems.

The use of neutralizing transformers dates back to before 1914. Today it continues to be one of the most effective means of solving a multitude of equipment malfunctions or damages caused by power line induced AC voltage and currents. In many situations, an INT is the only effective method of getting today's sensitive, high-tech electronic devices to work the way they were designed to work in the real telephone world.

The INT is designed to reduce up to 95 percent of 50/60 Hz common mode or longitudinal voltages that may appear continuously on a telecommunication line or as transients from lightning, mechanical failures or switching operations on the power system.

INTs can provide up to a 30 dBrnc power influence reduction, which can yield similar noise metallic reductions depending on its location in the circuit. An INT works anywhere induced AC voltages or currents are causing noise or equipment malfunctions or damages.

Symptoms/Problems Carrier Systems:

- Regenerators Wiped Out/Blown CO Fuses/Repeater or Line Card Damage
- Digital Carrier Shut Down Due to Lack of Power
- Digital Line Concentrators, Remote Switches or Subscriber Carrier Systems Damaged During Storms and Power Surges
- Steady-state 50/60 Hz Longitudinally Induced Power Line Currents or Voltages on the Carrier's DC Power Feed Path, Which Affects the Power Regulators of the System
- Unexplained Carrier Failure Alarms
- Excessive Bi-polar Violations/Bit Error Rates/Excessive Pulse Slip or Reframing
- Unexplained Component Failure/Damages
- Unexplained or Excessive Automatic Switching to Back-up or Alternate Carrier Systems
- Excessive Protector or Fuse Operations/Unexplained Total Carrier System Failures
- Steady-state AC Induced Voltages or Currents on the Central Office (CO) Terminal Equipment, PBX or Key Equipment, Data Modems, Analog Inter-office or Subscriber Line Carrier Systems.
- Longitudinally Induced AC Voltages or Currents Caused by Switching Surges on Nearby Power Lines or Lightning
- Power Influence (Harmonic Induced AC Voltages or Currents) Levels that May Cause Circuit Noise
- False Rings or Signals/Noisy PBX Trunks
- Equipment Stops Working or Shows Electrical Damage with No Apparent Cause
- Noisy Subscriber Lines, Trunk Lines/Wrong Numbers When Dialing
- Non-digital Carrier Circuits are Noisy or Analog Carrier System Doesn't Function Properly
- Burned up Line Relays/Disconnects/Misdialings/Cutoffs

An INT contains multipair, telephone-type cable core, wound around a laminated steel core. The connected pairs go in and out of the transformer on a metallic basis. For example, tip wire in, through the winding of the transformer and tip wire out, thus providing DC continuity.

An INT placed in a cable facility and provided with an "exciting pair" (primary winding) for exciting current flow, will by transformer action produce an opposing or "180° out of phase" AC voltage that will be induced into the remaining pairs (secondary windings). This one-to-one turns ratio transformer action can cancel or

“neutralize” up to 95% of the induced AC voltage that would normally appear at the end of the facility.

An INT is connected in series with a cable much the same way as a load coil or carrier repeater with the pairs running in and out. It doesn't matter which way they go ("in” may be toward the CO and “out” toward the field, or vice versa). It **IS** important that all pairs including the excitation pair go through the transformer in the same direction. If not, the effectiveness of the INT will be reduced greatly, and it may even cause the INT to turn off.

When treating a cable with INTs, it is best to treat **all** noisy binder groups in the cable. This is to minimize secondary induction, where the influence on the untreated pairs couples back into the treated pairs and negates the original INT treatment. This is particularly true when mitigating “noise” conditions.

The voice frequency INT contains approximately 500 feet of unshielded and unjacketed 26 gauge cable. (The two pair INT contains about 500 feet of 24 gauge four conductor wire.)

Digital Carrier INTs (DINTs) are specially designed for use with digital carrier systems. They have two separate groups of pairs, one for each direction of transmission. The pairs are wound on the same core, but are separated by an electrostatic shield to minimize crosstalk coupling. Although digital carrier signals will pass through a standard INT, the attenuation and crosstalk coupling at the high frequencies of digital carrier systems often make their use impractical. A digital INT, which is specially designed for lower loss and minimum crosstalk coupling, should be used on digital carrier systems.

Digital INTs are available for treating 1, 6, 12, 25 and 50 carrier systems. Additional pairs are provided in the INTs for fault locating and order wire circuits. Digital INTs also work well on metallic voice frequency circuits. These circuits may be intermixed with the high frequency pairs of the carrier system.

The use of DINTs on digital span lines is not a new technology. Normally, DINTs are used to treat steady-state 50/60 Hz longitudinally induced power line currents or voltages on the carrier’s DC power feed path, or as a protection device from power surges and lightning storms.

DINTs are intended for placement on digital span line pairs that serve remote electronic devices such as Digital Line Concentrators, Remote Switches, or Subscriber Carrier Systems. They can also be used effectively on interoffice digital span lines to clear up problems such as excessive repeater loss, blown fuses, and temporary service interruption caused by switching back and forth between the main span line and the spare span line during lightning storms and power surges.

For more information on INTs ask for Application Note T0114.

Neutralizing Transformers Reduce Surge Current

How Carrier Repeaters are Damaged During a Power Fault

Induced voltage from a faulted power line will often damage series circuit components of repeaters in a carrier span line, even though the line is equipped with protectors from line to ground. Because the voltage-to-ground is often too low to operate the protectors, damage occurs to the repeater resistors, thyristors or power supply zeners as longitudinal current flows through the repeater.

For example, on a carrier route with paralleling power for two or three miles, the protectors at each end of the exposure will operate during a power fault. This causes a momentary low longitudinal impedance at each end while reducing the voltage-to-ground at the middle repeater to a level that is insufficient to fire its protectors. Damaging surge current flows through the circuitry of this repeater because the voltage-to-ground is not high enough to operate the repeater’s protectors.

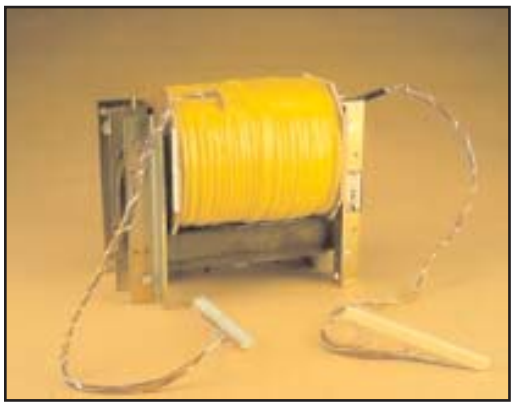
A properly placed Digital Induction Neutralizing Transformer (DINT) reduces the magnitude of surge current, saving repeaters and office fuses and keeping the system operational. By lowering induced AC voltages the neutralizing transformer also raises or lowers carrier powering voltages and reduces bit errors and system shutdown.

INT Standard Designs

Individual INTs are available in standard, off-the-shelf sizes ranging from 2 to 100 pairs. Custom design combinations are available for treating up to 900 pairs. Special designs have been provided for installation up to 3600 pairs. Standard open unit INTs are equipped with 24 inch long tails for in and out wiring, and are terminated in 25 pair 3M MS2 or AT&T #710 splice modules arranged with standard blue, orange, green, etc. color coded cable pair counts. Custom INTs are also available with solderless wire-wrapped type terminals or “quick-connect” punch-on type blocks. Steel, weather-proof enclosures are offered, as are fiberglass enclosures on special request. Models featuring gas tube protection are offered. Also available are 6 to 100 pair INTs in sealed, gel-filled, polyvinyl enclosures equipped with 10 foot long gel-filled cable stubs. These units are intended for direct buried applications.

INTs Only

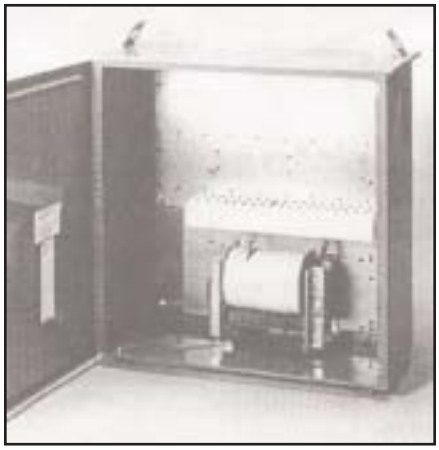
MS2 Splice (pluggable) Modules (3M) — No Enclosure



Size	Part No.
2 Pair	P15577
6 Pair	P15356
12 Pair	P15369
25 Pair	P15301
50 Pair	P15320
100 Pair	P15902

INTs Installed in Steel Enclosure

MS2 Splice (pluggable) Modules (3M)



Size	Part No.	Size	Part No.
2 Pair/B	P15573	100Pair/C	P15770
6 Pair/B	P15579	100 Pair/D	P15606
12 Pair/C	P15584	150 Pair/D	P15739
25 Pair/C	P15730	200 Pair/D	P15705
25 Pair/D	P15595	300 Pair/E	P15768
50 Pair/C	P15759	400 Pair/F	P15772
		900 Pair/H	P15417 †

Letter after Pair is enclosure size. Enclosure sizes are shown on page 5.

† Enclosure Size is 60" x 60" x 16"

Enclosures - Enclosure Sizes are Listed on Page 5

Weatherproof, vented enclosures are made of 14 GA steel, painted inside and out with gray-green enamel. Special fiberglass enclosures are available for corrosive areas. Captive screws secure the gasketed door. Provision is made for padlocking. Watertight strain relief cable entrance bushings are provided for incoming cable stubs. Bushing allows up to two 1.10 inch diameter cables. PCM INTs come with two bushings that will handle 2 inch cable.

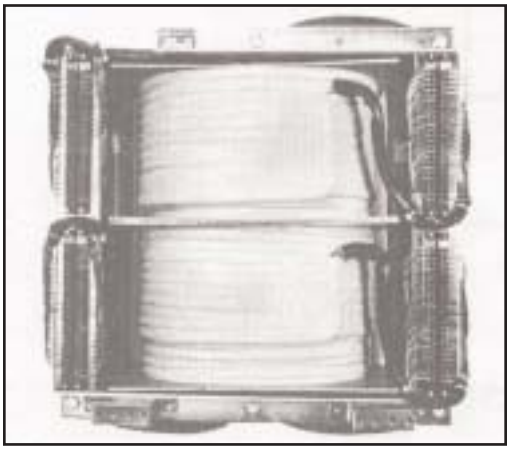
INTs For Direct Burial

Installed in Polyvinyl Enclosure With (1) 10 Foot Stub

Size	Part No.
25 Pair	P15300
50 Pair	P15318
100 Pair	P15904

Digital Carrier INTs Only

MS2 Splice (pluggable) Modules (3M) — No Enclosure



Description	Size	Part No.
1 System	4 Pair	P15610
6 System	14 Pair	P15507
12 System	28 Pair	P15516
25 System	54 Pair	P15463
50 System	104 Pair	P15480

Digital Carrier INTs Installed in Steel Enclosure

MS2 Splice (pluggable) Modules (3M)

Description.	Size	Part No.
1 System	4 Pair/B	P15612
6 System	14 Pair/C	P15618
12 System	28 Pair/C	P15886
12 System	28 Pair/D	P15624
25 System	54 Pair/C	P15888
25 System	54 Pair/D	P15630
50 System	104 Pair/C	P15890
50 System	104 Pair/D	P15636

Letter after Pair is enclosure size. Enclosure sizes are shown on page 5.

Digital Carrier INTs for Direct Burial

Installed in Polyvinyl Enclosure with (1) 10 foot filled, Screened Cable Stub.

Description	Size	Part No.
6 System	14 Pair	P15622
12 System	28 Pair	P15514
25 System	54 Pair	P15462
50 System	104 Pair	P15479

INT Accessories

Part No.	Description
P15098	Pole Mounting Hardware Kit for 20" or 24" wide enclosure
P15102	Pole Mounting Hardware Kit for 30" or 36" wide enclosure
P15099	19" Rack Panel Kit
P15101	23" Rack Panel Kit
P15104	9" high legs for pad mounting a 12" deep enclosure
P15108	2 electrode gas tube for 3 electrode protector holder
21147T4	3 electrode gas tube
P15817	23" Rack Panel Kit for 25 and 50 system Digital INTs.

Enclosure Sizes*

(Enclosure INTs are referenced on pages 3 and 4)

B = 18 x 12 x 6" (45.7 x 30.5 x 15.2 cm)
C = 24 x 24 x 12" (61 x 61 x 30.5 cm)
D = 36 x 30 x 12" (91.4 x 76.2 x 30.5 cm)
E = 42 x 30 x 12" (106.7 x 76.2 x 30.5 cm)
F = 48 x 36 x 12" (121.9 x 91.4 x 30.5 cm)
G = 42 x 60 x 12" (106.7 x 152.4 x 30.5 cm)
H = 60 x 60 x 12" (152.4 x 152.4 x 40.6 cm)
I = 60 x 36 x 12" (152.4 x 91.4 x 30.5 cm)

* Refer to letter after Pair in Size column for enclosure size.

Splice Modules

25 Pair 3M MS2 mods are standard.
AT&T #710 mods are available with 10 day lead time.

Another Time-tested Solution from SNC

Induction Neutralizing Transformers

- Induction Neutralizing Transformers are successful in reducing up to 95 percent of steady-state and fault induced AC Voltages and currents, and in reducing Power Influence up to 30 dBrnc that may be causing noise complaints from customers.
- They have been used since 1914.
- They are a passive device composed of standard, pic insulated, color coded, twisted and transposed cable pairs.

TEN – Super TEN - Igniter

Transformer Exciting Network - "When There's No Pair to Spare!"

When an Induction Neutralizing Transformer (INT) or Glitch Tamer is installed, one of the pairs going through the transformer is normally grounded at the central office and at the station to provide a primary winding or "exciting" pair. The Transformer Exciting Network (TEN) or Super TEN allows the use of a working pair to "turn on" or provide the necessary exciting current path to make the INT function effectively. A TEN, Super TEN, Igniter or HDR can be placed wherever an exciting pair ground is specified. The result? A spare pair is no longer required to be grounded at both ends of a neutralized cable route.

Description	Part No.
TEN	P15688
Glitch Tamer Igniter*	P31069
Super TEN	P15176
Protected Super TEN	P15174
HDR Harmonic Drainage Reactor	P15168
Protected HDR	P15173

*Electrically same as a P15688 TEN

The TEN is a drainage reactor, specially designed for either 50 or 60 Hz. It is easily bridged across one working circuit, thus providing a low impedance path-to-ground for longitudinal power line-induced interfering current to flow. The Super TEN (also known as a Super Drain) is an enhanced version of the TEN, but includes a Harmonic Drainage Reactor (HDR). The HDR portion is designed to be effective in the voice frequency spectrum. The result is that the Super TEN's performance is best where both noise and fundamental frequency harmonic influences are a problem.

Administration of the "exciting circuit" for an INT is simplified with a TEN or Super TEN because they decrease the chance of an INT becoming ineffective if someone accidentally uses the INT's normally grounded exciting pair for another purpose. For single circuit applications, the TEN, Super TEN, Igniter or HDR can be used in conjunction with an SNC Noise Choke.

If the TEN or Super TEN is used alone on a circuit with more than 50 Volts-to-ground, it could saturate and generate noise and/or excessive over-voltage due to resonant conditions. This is not a potential problem when an INT is used in the circuit.

The HDR is also available as a separate item. See page 7 for more HDR information. For more information on the TEN, Super TEN and HDR ask for Application Note T0046.

TEN

Protected Super TEN (Open Wire Applications)

Glitch Tamer Igniter – P31069
UL Listing 100902

Glitch Tamer® Igniter

The Igniter is a drainage reactor, specifically designed for either 50 or 60 Hz. It is easily bridged across one working circuit, thus providing a low impedance path-to-ground for longitudinal power line-induced interfering current flow. One igniter is normally required for each Glitch Tamer Six installation.

See page 9 for more information on the Glitch Tamer Igniter and Glitch Tamer Six.

HDR – Harmonic Drainage Reactor

"Drain Interfering Voltages and Currents to Ground with an HDR!"

The SNC Harmonic Drainage Reactor (HDR) is designed to provide a path-to-ground for induced harmonic interfering AC voltages and currents. If you're seeing symptoms such as noisy subscriber lines, impulse noise, or "hot" or "shocking to the touch" line facilities, or if your Noise Choke or Induction Neutralizing Transformer (INT) does not properly excite at harmonic frequencies, you may need an HDR.

Applications

- Subscriber/Open Wire Lines
- Telemetering/Radio Pickups
- Data Modems/Alarm Circuits
- Induced AC Voltage/Power Influence

HDR

Protected HDR (Open Wire Applications)

Description	Part No.	Approximate. Size
HDR	P15168	3" x 2" x 1 1/2" (7.6 x 5.1 x 3.8 cm)
Protected HDR	P15173	12 1/2" x 3" x 2 5/8" (31.8 x 7.6 x 6.6 cm)

Paralleling electric power lines can induce AC interference voltages and currents onto metallic telecommunication facilities. The result is noise or operational problems to the circuit on these wires. An HDR bridged onto the Tip and Ring wires, with its third wire connected to ground, provides a path-to-ground to drain those longitudinally induced AC interference voltages and currents. This is done while providing negligible loss to the circuit.

The HDR is a relatively light duty reactor that is most effective at the harmonics of 50/60 Hz. Therefore, it is usually used with a Noise Choke, an INT, Glitch Tamer, or to supplement a TEN. Its use as a "stand alone" device is usually limited to draining electrostatic voltages from wire line facilities. An HDR can normally be used on a carrier facility without seriously affecting the carrier signal.

The HDR is available in two configurations. The P15168 has a weather-resistant plastic case and a 36 inch long, jacketed, three conductor, 22 gauge wire lead. The red and green conductors are the Tip and Ring line connections, while the yellow conductor is for the ground connection. Since it contains no protection of its own, the P15168 should only be used where station protectors or other protected equipment is located. The P15173 is an HDR mounted on an anodized aluminum support bar along with a 3 element gas tube protector in a weather-resistant plastic housing. The binding post terminals of the protector provide the point of connection to the line and ground.

Installation Notes

The HDR is connected to the circuit by bridging the tip (Green) and ring (Red) of the HDR across the tip and ring of a cable or wire line facility. The "ground" (Yellow) wire is then connected to a good earth ground, such as a power company multigrounded neutral (MGN) or cold water pipe.

Placed at the far end of a noise choke equipped circuit, the HDR will provide a path for exciting currents to flow through the choke. This "turns on" the choke so it performs properly. The HDR will do the same for an INT or Glitch Tamer if placed at the far end of the INT treated circuit, such as a subscriber line. This is especially true for 50/60 Hz harmonics. The HDR is often used in parallel with a TEN to supplement the TEN's superior fundamental frequency (50/60 Hz) performance.

An HDR placed on an unshielded wire line can effectively drain electrostatic induced voltage-to-ground. It may require more than one HDR spaced along a line, depending on the length and severity of the exposure.

The P15168 is provided with two mounting holes in the plastic case, one at the top and one at the bottom. #8 screws are recommended for mounting. The P15173 is provided with two 7/16 inch mounting holes, one at the top and one at the bottom of the aluminum support bar. For more information ask for Application Note T0046.

HumZapper

"Finally, a Test Set that Takes Noise Out of a Circuit!"

Everything needed in one small package to locate and treat (ZAP) noise and other AC induced voltage problems. Combination plug-in/binding post terminals allow fast hookup of the HumZapper's built-in 6 pair Induction Neutralizing Transformer (INT), Noise Choke, or Transformer Exciting Network (TEN).

To see their effect on a circuit and confirm your solution, the HumZapper is available with a digital multimeter and a variety of test leads. When not in use, the multimeter slips into a convenient storage compartment.

HumZapper… an invaluable time-saving tool, built especially for the professional "Hum Hunter."

Description	Part No.	Size – Inches (cm)
HumZapper with multimeter – 50/60 Hz *	P15117	11" x 12" x 9.5" (28 x 30 x 24)
HumZapper only (no meter) – 50/60 Hz *	P15116	11" x 12" x 9.5" (28 x 30 x 24)
Single Yellow Test Lead 60" – (152.4 cm)	P15129	—
Double Red/Black Test Lead 60" – (152.4 cm)	P15130	—

* The HumZapper comes with four P15130 and two P15129 test leads.

Rental Policy: HumZapper shipped UPS prepaid from SNC. Rental begins on date shipped and ends when received back at SNC. Must be returned prepaid.

Rate: $50 per week.

Li'l Zapper Test Set

With Fanny Pack and 3 Foot Long Test Leads with Alligator Clips

If you've used the SNC Humzapper before you know it's a great tool for quickly finding the best SNC solution for noise on a circuit. Now the new Li'l Zapper's economy price makes it a time-saver every professional telephone person should have.

The Li'l Zapper is a handy test set that comes with its own fanny pack and three foot cords with Butt set-type alligator clips. By simply changing hookups one can;
1.) Readily determine if a noise problem is in the telco cable plant or in the customer premise equipment or wiring;
2.) Confirm the type of solution that would be the most practical and economical, i.e. Noise Choke, HDR, SNIX;
3.) Get some indication of the effect an INT or Glitch Tamer would have on the cable and the approximate location at which it would be most effective.

Li'l Zapper Test Set P31046
Li'l Zapper and Video Combo P31065

The Li'l Zapper Test Set sells for $200. Purchase the Li'l Zapper with a set of the SNC training tapes "AC Induction Problems & Solutions" for $275. That's a $50 savings off the combined price of the two items. The Video Tape Set is Part Number T0301 and alone sells for $125. See Page 25.

Glitch Tamer® Six

"Functions as a 'Mini' INT"

The Glitch Tamer Six is a six-pair device designed to control AC voltage that is causing lost productivity and faulty operation of customer key systems and PBXs. Installed on the customer side of the network interface, the economical Glitch Tamer controls low level Voltages (less than 50 Volts AC) that are causing problems.

Normally requires Glitch Tamer Igniter, TEN or HDR for maximum effectiveness.

Glitch Tamer Six – P31066
UL Listing 100902

Glitch Tamer® Igniter

When a Glitch Tamer Six is installed, one of the pairs going through the Glitch Tamer must be grounded at the central office and at the station to provide a primary winding or "exciting" pair. The Igniter allows the use of a working pair to "turn on" or provide the necessary exciting current path to make the Glitch Tamer function effectively. The result is that a spare pair is no longer required to be grounded at both ends of a neutralized cable route.

The Igniter is a drainage reactor, specifically designed for either 50 or 60 Hz. It is easily bridged across one working circuit, thus providing a low impedance path-to-ground for longitudinal power line-induced interfering current flow. One igniter is normally required for each Glitch Tamer Six installation.

Glitch Tamer Igniter – P31069
UL Listing 100902

Harmonic Drainage Reactor (HDR)

Also used to excite the Glitch Tamer Six, the HDR is similar to the Igniter above, but effective over a range of harmonics in the voice band rather than specifically tuned to 50/60 Hz. The HDR is more effective for excitation when noise is more of a problem than induced AC Voltage.

HDR - P15168

SNIX – Single Noise Interference Xterminator

"When the Noise Must be Mitigated or Reduced Now, You'd Better Have a SNIX on Hand!"

The SNIX is a specially designed filter for single circuit (pair) applications to help suppress common telephone line problems.

Symptoms

- Induced AC Voltage/Power Influence
- Noisy Line/"Rural Line Hum"
- False Rings/Equipment Malfunctions
- Burned or Damaged Equipment – CPE, Key System, PBXs, Data Modems
- Unexplained Electronic Equipment Failure
- False Signals/Errors on Data Circuits
- Dialing Errors/Impulse Noise
- Radio Frequency Interference (RFI)

Applications

- Subscriber Lines/PBX Trunks/OPXs
- Key Systems/Data Modems
- Telemetering/Alarm/Teletype Circuits
- Coin Phones/Radio Pickups
- Ground Start PBX

Weatherproof Model

Basic SNIX P15170
Super SNIX P15674

The SNIX is available in two sizes. The basic SNIX is designed for harmonic frequency attenuation and will handle AC voltages under 30 volts. The Super SNIX is built for 50/60 Hz as well as harmonic frequency attenuation, handling induced AC voltage up to 50 volts (tip or ring to ground). Each SNIX is offered in a weather-resistant housing with two 36 inch long, three-conductor, jacketed, 22 gauge, leads. The three-conductor leads are designated with one as "line" and the other as "eqpt." The green, red and yellow conductors of these 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 unit contains the "drainage" path to the G wire.

Installation Notes

The "line" side of the SNIX is normally directed toward the facility that has the greatest longitudinal AC influence. If the unit is located at a Central Office (CO) or at a station terminal, the "line" side would normally be toward the serving facility (cable, open wire, drop service wire, etc.). If the SNIX is placed in the field, this would usually be toward the station or toward any unshielded portion of the facility. However, due to the ambiguities of power line inductive interference, the opposite orientation might be more effective. SNC recommends installing the SNIX each way to determine the best configuration for your situation. If placed at the customer, the "equipment" side is normally placed toward the customer station equipment.

Whether placed at the CO or station end of a circuit, the SNIX should be placed on the protected side (eqpt.) of the primary telephone station protector. If placed in the cable or line facility it should be protected on both the "line" and "eqpt" sides.

Note: The yellow wire or "G" terminal of the SNIX MUST be connected to a low impedance ground.

Additional Information

The SNIX is UL listed (UL file E100902). For more SNIX information ask for Application Note T0045.

Indoor Model

Indoor SNIX P31023
(with 36 inch Jacketed Leads)

SNIX/Super SNIX

Description	Part No.	Approximate. Size
Tube SNIX/36" Jacketed Leads (Weatherproof Model)	P15170	6½" Long x 2½" Dia. (16.5 x 6.3 cm)
Tube Super SNIX (Weatherproof Model)	P15674	10" Long x 2½" Dia. (25.4 x 6.3 cm)
Indoor SNIX/36" Jacketed Leads (Indoor Model)	P31023	4” L x 2.9” W x 1.5” D (10.1 x 7.4 x 3.8 cm)

SNIX Makes Worldwide Connection

A company located in Malaysia was experiencing consistent troubles on their Alternative Voice/Data (AVD) circuit from Penang to their headquarters in Carrolton, Texas, USA. The circuit with the problems is used for daily transmission of huge volumes of production and inventory data.

Each evening in Penang, the circuit is switched to connect Mostek employees in Penang with the Carrolton PBX. However, they routinely experienced excessive error rates in data mode, and the voice mode was too noisy from Carrolton to Penang. Other companies in the same area of Malaysia were experiencing similar problems.

We discovered the four wire circuit was multimode via satellite from the USA to Kuantan, Malaysia, then via several microwave hops to Penang, and finally over a five mile telephone cable. We also found there were multiple problems on the circuit, which confused the diagnosis and complicated the cure.

The solution was to install SNIXs on all send and receive legs. This virtually eliminated two types of interference, greatly reduced a third, and pinpointed the exact nature of the fourth to ease troubleshooting of that problem when it surfaces.

For Assistance or to Order call the toll free SNC Hotline

800-558-3325
(including Canada)

or our regular number 920-231-7370
E-Mail: tel@sncmfg.com

HSR – Harmonic Suppression Reactor

Neutral grounded power line capacitor banks provide a convenient path for power line harmonics, commonly the 9th harmonic (540 Hz in a 60 Hz power system), to couple into communication lines. The result is noise.

The Harmonic Suppression Reactor (HSR) shifts the capacitor bank's resonant frequency and reduces its noise interfering effects. Telephone companies have reported power influence (noise-to-ground) reductions greater than 20 dBrnc after HSR installations at capacitor bank trouble spots.

In fact, it is possible for HSR's to provide greater noise reduction than disconnecting the bank entirely, or "floating" the ground/neutral connection (which can result in a power company safety hazard).

Telephone companies have reported power influence (noise-to-ground) reductions greater than 20 dBrnc after installing HSR's at capacitor bank trouble spots.

Symptoms

- Entire telecommunication route is noisy.
- Noise starts and stops on cable route at specific times.
- One 50/60 Hz harmonic is substantially higher than either adjacent harmonic.
- Power line capacitor banks failing prematurely, or adversely affecting power line operation.
- Excessive or unexplained fused cutouts or blown circuit breaker operation on a distribution power line.

HSR-FT3 Field Test Reactor

The FT-3 test reactor is used for temporary, monitored installation in capacitor bank neutrals to "detune" or determine the optimum location and inductance for permanent HSR installations. The FT-3 contains four, six-position make-before-break tap switches, which provide a total of 36 values of inductance.

Because of the wide inductance range, the number of winding taps, and the necessity of keeping the FT-3 as small and light as possible, it is designed with smaller gauge winding conductors than a permanent HSR. **The FT-3 should never be used in unattended field installations.**

Each FT-3 is furnished with a calibration chart that lists the inductance of each tap setting for that particular FT-3. The HSR-FT3 is available for rent by the week.

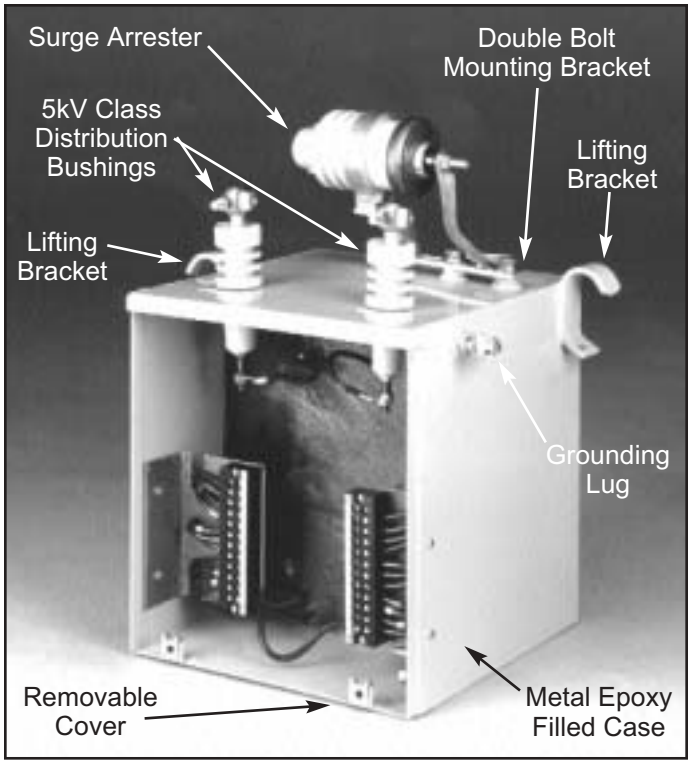
HSR-FT3 Field Test Reactor Part No. P15293

Part No.	Model No.	Additional Description	Size (H" x W" x D")
P15851	HSR-42	Permanent 3 – 42 mHy	$18\frac{1}{8}$" x $21\frac{3}{4}$" x $17\frac{1}{2}$" (46 x 55 x 44 cm)
P15293	HSR FT-3	Test Set 3-85 mHy	20" x 20" x 9" (51 x 51 x 23 cm)
22344T6	HSR 3kV	3 kV Arrester	—
22744T7	—	Mounting Bracket (for dual installations)	—
P31031	HSR-100	Permanent 100 mHy	Tank- 14" dia.x 25" Overall- 20.5" dia. x 31"

For more HSR information ask for Application Note T0142.

HSR Features

- HSR-42 and HSR-100 are enclosed in a metal, epoxy filled case with 5 kV class distribution bushings for field connection. There is a grounding lug on the case.
- The HSR is furnished with an industry standard distribution transformer bracket for double bolt mounting to a utility pole. A special pole mounting bracket is available for twin HSR-42 installations, which are quite common. (Part No. 22744T7)
- A 3 kV class MOV distribution surge arrester is included with each HSR and mounted on top of the HSR case.
- A recessed, removable cover on the front provides access to the terminals on the permanent HSR-42.



Permanent HSR-42 — Part No. P15851

100 mHy HSR

"Swamp Out Major Harmonics"

The 100 mHy HSR (P31031) has sufficient inductance to swamp out major offending harmonics, while at the same time insuring that if properly used it will not put the circuit into resonance at 180 Hz.

HSR Electrical Specifications

Inductor	Inductance Range	DC Resistance at 20° C	Continuous Current Thermal Rating
FT1 Inductor	3 to 20 mhy (ea. tap Approximate. 0.3 mHy)	0.144Ω	21 amps 60 Hz RMS
FT2 Inductor	13 to 85 mhy (ea. tap Approximate. 1.5 mHy)	0.512Ω	11 amps 60 Hz RMS
HSR-FT3 Overall	3 to 85 mHy	Contains FT1 and FT2 inductors within one fiberglass case.	
HSR-42	3.0 mHy to 42.0 mHy	0.014 Ω to 0.04 Ω	50 amps 60 Hz RMS
HSR-100	100 mHy +/- 5%	.025 Ω	50 amps 60 Hz RMS

Ask About Our Upcoming Seminar Schedule - "AC Induction Problems & Solutions"

Call 800-558-3325

Mitigator® Test Set

"The Most Versatile and Accurate Noise Analysis Tool Available Today!"

Locate noise problems quickly and effectively with the Mitigator, a portable, weather-resistant noise test set that measures noise caused by AC-induced harmonics.

The Mitigator offers a variety of test modes for at-a-glance results analysis on its large LCD screen. All tests are selectable from a main menu and are processed and displayed automatically. The Mitigator can store test results in memory for later analysis or output to a serial printer.

In the spectrum mode, the Mitigator allows viewing of the entire harmonic profile within a measured signal. An easy-to-read display of vertical bars, or "smokestack" readout details the level and frequency of the offending frequency, while the peak finder allows the user to move right or left from one spectral peak to the next. Spectrum mode also allows calculation of data into a probability matrix, helping to pinpoint the source of noise.

When used in conjunction with a loop coil the Mitigator allows the user to search for the source of noise without relying on the front panel display. A beep signal will sound with increasing frequency as the loop coil detects noise level increases. This "Geiger Mode" is particularly useful while "hunting" trouble from a moving vehicle.

The "Green Window" test automates probe wire test calculations, providing I*T, C-message noise per mile, and 60 Hz voltage per mile results based on the simple entry of powerline height. The data-logging feature allows storage of data at specified intervals in time, and then sends the results to a serial printer. Three-way power operation includes an AC power pack, internal rechargeable battery and 12-volt lighter interface.

Additional features include a three-level zoom mode for on-screen frequency enlargement, direct access to C-message, 3K flat and 20/F filters, six second spectral updating, 90 dB display, autodialing, and impedance selectable at 600, 900 and bridged (600 or 900) Ohms.

Mitigator Test Set - P31103 (60 Hz)
P31110 (50 Hz)

Mitigator® Accessories

- 120VAC Power Pak - Part No. P31112
- Cigarette Lighter Adapter - Part No. P31113
- Loop Coil - Part No. P31114
- Current Probe, 0-10 amps AC - Part No. P31115

Features

- Harmonic Noise Analysis
- 60 Hz Harmonic Table
- "Green Window" (Probe Wire) Test
- Spectral Update Time of 6 Seconds
- Peak Finder
- Weather Resistant Case
- Auto Dial (DTMF)
- Selectable Impedance
  600Ω, 900Ω and Bridged (600Ω or 900Ω)
- Zoom Mode
- Continuous On-line Help
- Direct Access to Filters
- Standard Noise Measurement Features
- 90dB On-screen Display
- Analysis Mode
- Data Logging
- Serial Printer Port
- 3 Filters - C-Message, 3K Flat and 20/F
- Geiger Mode
- Automatic Shut-off

14

Transmission Test Set

Designed for Rugged Use in the Outside Plant World

The Model 2 Transmission Test Set is a must-have tool for the outside plant professional. Conveniently and accurately measure line loss, noise, power influence and line current. Included with the Test Set are two 9 volt batteries, instruction manual and the following test leads: 48” test leads with insulated screw-on alligator clip; lead modular to modular; and lead assembly, modular to alligator clip.

Model 2 Transmission Test Set
Part No. P31131

Specifications

Circuit Loss
Range: -40 dBm to +I dBm extended to 10 dB by switch.
Frequency Response: 60 Hz to 10 kHz

Circuit Noise
Range: 0-31 dBrnc extended ± 10dB by switch.
Frequency Response: “C” message

Power Influence
Range: 60-91 dBrnc extended ± 10dB by switch.
Frequency Response: “C” message
Line Holding: Active 20-30 mA.

Line Current
Range: 0-100 mADC.
Input Resistance: 430 Ohms ±2%.

Volt-Ohmmeter

DC volts
Range: 15V, 60V, 300V
AC Volts
Range: 60V, 300V
Frequency Response: 60Hz to 10kHz.
Ohms
Range: RX1K, RX10K
Polarity: Switch selectable.

The Terminator

Switchable Termination; Longitudinal Current Measurement; Dial Through Provisions

The Terminator will provide a balanced termination on telecommunications lines. Used in conjunction with a loop tester with circuit noise measuring capability (see Model 2 above) or similar testing device, the Terminator allows the technician to determine the magnitude of the longitudinal balance and the direction of the unbalance.

Dimensions: 5-1/2”W x 2”H x 3”D

The Terminator
Part Number P31130

Noise Chokes – Common Mode Transformers

"The Voice or Radio Frequency Interference Solution!"

Increasing power line harmonic and radio frequency interference (RFI) means more noise in your communication system. These induced noise frequencies can also lead to signaling problems and equipment malfunctions. Equipment damages often occur from induced longitudinal currents associated with power surges or lightning. Longitudinal Noise Chokes effectively suppress these problems, especially when they are caused by equipment unbalances resulting from age, deterioration, or a highly susceptible electronic design.

Noise Chokes are single circuit devices which are generally placed at the equipment end of a circuit – either the central office, PBX, or where special service equipment is located. When used effectively, Noise Chokes can improve circuit balance and suppress currents acting on sensitive equipment.

Basic Noise Chokes

Each choke has a copper flux band formed around the coil to prevent cross talk when mounted close to each other, as in a central office. By grounding the flux band, the choke also becomes an effective Radio Interference Filter. The 70 series choke is the equivalent of a Transcom NSC 2 choke. Chokes are installed in the same manner as "load coils," i.e. Tip and Ring in and Tip and Ring out. Either side may be used as the "in" or "out."

Noise Chokes are an economical solution to noise frequency interference and contribute to quieter, more reliable operation of your communication system.

Applications

- Subscriber Lines/PBX Trunks/OPXs
- Duplex (DX), Simplex (SX) Signaling Circuits
- Voice Frequency Interoffice Trunks
- Dial Long Line Circuits
- Four Wire FXs
- Data Modems/Answering Machines
- Alarm/Telemetering Circuits
- Data Circuits/Radio Pickups
- Key Equipment Lines

Noise on DID Trunks

Longitudinal chokes require a certain level of current in order to be effective in mitigating longitudinal voltages and current. When dealing with these unwanted voltages and currents it is important to remember that current is always highest at the central office and lowest at the far end of the cable. The result of this AC current profile is that chokes are rarely effective at the customer location (there is not enough current at the customer location to excite the choke and make it work).

However, in the case of DID trunks (battery is applied at the customer location) there is a low impedance at both the customer end and at the central office. This low impedance at the customer location increases longitudinal current to a sufficient level to excite the choke, thus reducing noise on the circuit at the customer location.

Individual Chokes

70 Volt Chokes (NSC-2)

Part No.	Description
P15083	w/wire wrap pins (70W)
P15047	w/30" (76.2 cm) long unshielded leads (70L)
P15069	w/30" (76.2 cm) long shielded leads (70S)
P15043	in plastic enclosure with 36" (76.2 cm) long jacketed leads (70C)

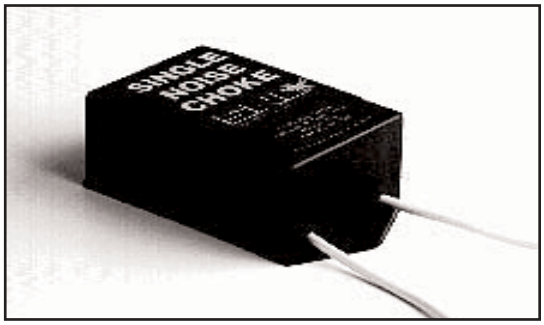
Basic Noise Chokes

Relay Rack Chokes

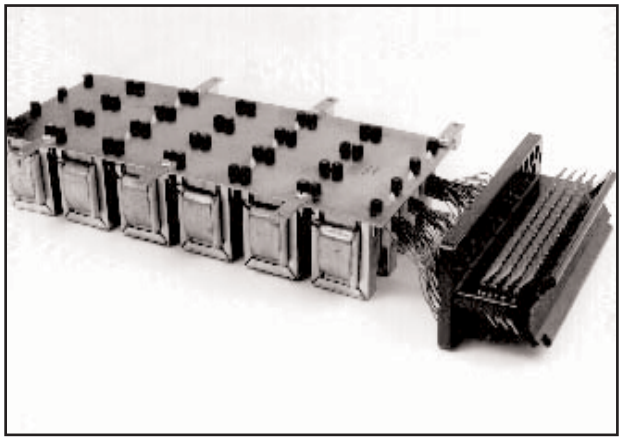
Prewired to (2) two (RJ21) 50 pin connectors – (1) male, (1) female

19" (48.3 cm) Rack Panel

Part No.	Description
P15049	(12) 70L on a 3½" (8.9 cm) panel



Encapsulated Weatherproof 70L Choke (P15043)



19" Relay Rack Model - P15049

For Assistance or to Order call the toll free SNC Hotline

800-558-3325

(including Canada)

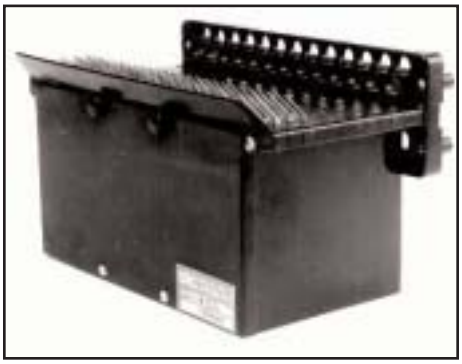
or our regular number 920-231-7370
E-Mail: tel@sncmfg.com

Main Frame Chokes

Prewired to 8" (20.3 cm) wire wrap terminal block

Main Frame Choke Models

Part No.	Description
P15063	(12) 70L on a 8" (20.3 cm) deep plate
P15066	(24) 70L on a 15" (38.1 cm) deep plate
P15046	(12) 70L metal encased **"dense pak"**

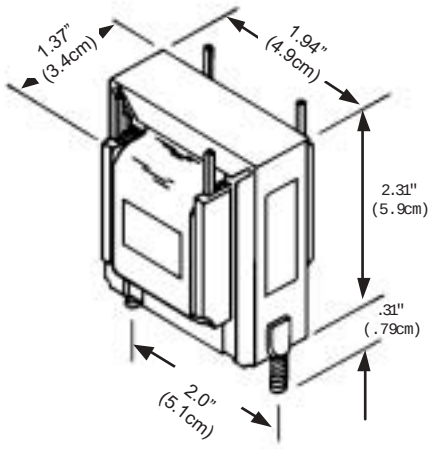


Dense-Pak — Mounts on end of frame, or can be screwed to wall.

70 Volt Noise Choke

- DC loop resistance @ 25°C 45 ohms ± 10%
- Resistance unbalance @ 25°C 0.8 ohm Max.
- Insertion loss @ 1.0 kHz. 0.5 dB Max.
- DC loop current 240 mA Max.
- Longitudinal voltage @ 60 Hz.* 70 VRMS per side

* Approximately 10% less voltage at 50 Hz.



70 Volt Noise Choke Dimensions

Choke Accessories

Part No.	Description
P15189	19 x 3½" (48.3 x 8.9 cm) rack panel, predrilled for 14 chokes
P15190	19 x 5¼" (48.3 x 13.3 cm) rack panel, predrilled for 22 chokes
P15191	23 x 3" (58.4 x 7.6 cm) rack panel, predrilled for 16 chokes
P15192	23 x 5" (58.4 x 12.7 cm) rack panel, predrilled for 28 chokes
P15172	70C E/W 3 element gas tube protector (pole mount)

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Call 800-558-3325

RID – Radio Interference Damper

"Reduces annoying AM, CB and Ham Radio Frequency Interference (RFI) on your telephone"

RFI occurs in the vicinity of a radio station transmitter tower. Generally, the telephone wire acts as an antenna that picks up the radio signal. The signal is then demodulated (changed to audio frequency) by non-linear components such as varistors, transistors, and diodes in the telephone set.

Ungrounded Modular RIDs

Here are the frequencies that are most often the source of problems on phone systems:

- AM Radio (.5 to 1.5 Megahertz)
- CB & Amateur Radio (3 to 30 Megahertz)
- CB & Plastic Sealing Equip. (26 to 60 Megahertz)
- FM, Air & Business Band Radio (80 to 150 Megahertz)
- Welding Noise (500 Hz to 150 Mhz)

Part No.	Description
P31048	AM Handset RID 0.5–3 mHz
P31049	AM Single Line RID 0.5-3 mHz
P31050	AM Two Line RID 0.5–3 mHz
P31051	CB/HAM Handset RID 3–30 mHz
P31052	CB/HAM Single Line RID 3–30 mHz
P31053	CB/HAM Two Line RID 3–30 mHz
P31058	FM Single Line RID 100 mHz
P31060	AM Hardwired RID 0.5–3 mHz
P31061	CB/HAM Hardwired RID 3–30 mHz

UL Listing 100902

First Things First – The Basics

Before you go and buy a bunch of RIDs, there are some basic things you should do first to try to get rid of the RFI without using RIDs. After you do the basics, the RID will probably fix what is left over.

The nice thing about these RIDs is that they are modular, and only take a second to plug in to the phone in many cases. On some jobs, you may need the RIDs at the KSU also - they can't all be easy (see the diagrams on pages 20 and 22).

- #1 – Ground the spare pairs at the frame.
- Ground the spare pairs in any house cables you are using - this includes cables running between buildings.
- Remove unused cables from the frame - if you are having RF problems, prewires will often cause problems by acting like an antenna. Try a longer or shorter mounting cord or handset cord – simply retuning the antenna to a different length will often help.
- Before ordering RIDs, find out where the RFI is entering the system – through the CO lines, station cables or handset cords.
- Before ordering RIDs, find out the frequency of the station you are hearing. This is very important – what works for one frequency won't do anything for another! Ask the customer what station it is – often he'll know only too well. Be careful of broadcast stations that are simulcasting on AM and FM, it gets confusing (call the station to check).

AM AND FM BROADCASTING STATIONS

This is the most often encountered form of RFI. Luckily, it's pretty easy to fix.

Headsets

Headsets seem to have a real affinity for picking up AM or FM radio stations. You can be sure that you need one of our Handset Cord RIDs if you hear the RFI on the headset, but not the handset – this is the most common scenario. Every brand of headset seems to be equally susceptible to the RFI. Just plug a handset RID into the handset jack on the phone, and plug the headset adapter box into it. We are at a 100% success rate with this problem.

If the phone or console has two jacks for handsets (like for training), be sure nothing is plugged into the second jack as it can

Ungrounded Modular RIDs

also pick up the RFI – even if you don't hear it on that handset or headset. If you need to have both jacks used, you may need a RID for each handset/headset.

Our RIDs have modular jacks, and cover both the transmit and receive pair. We do not have a "327 plug" (2 prong) version available for operator's headsets, but "327 to modular" adapters are available at most telephone supply houses.

Handsets

A high percentage of RFI problems come in through the handset cord. There are two ways in which you can tell there is RFI coming in through the handset cord. First, move around with the handset, or bunch up the handset cord so that it is very short (3 or 4 inches). If the RFI gets louder or softer our Handset Cord RID should help. **Make sure you know whether it's AM or FM RFI!**

Second, if the telephone has a monitor or speakerphone, listen for the RFI through the speaker. If you don't hear any, it must be coming in through the handset cord. Occasionally, making the handset cord longer or shorter will solve your problem by "retuning" the antenna.

CO Lines, Modems, Pay Phones, Station Cables

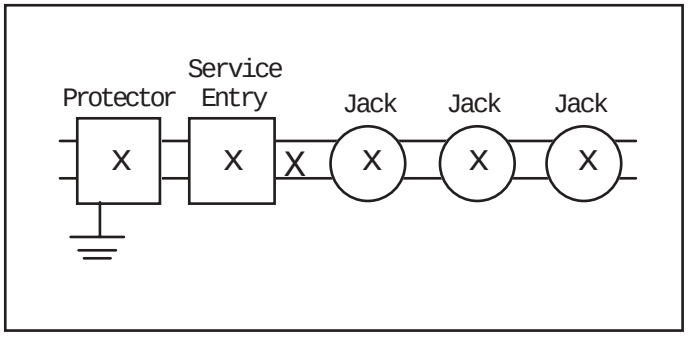
If you hear RF on the CO lines at the NI with a Butt Set, you have to get rid of it there before you go any further. Modems, fax machines, pay phones and other single line devices may be more prone to RFI than other equipment (like headsets are more susceptible than handsets). This is due to the internal design of the device. RFI can cause false triggering of answering machines, corruption of fax and modem data and irregular function of special features on electronic telephones (all of these symptoms can also be caused by high or low loop current on the telephone line which can be corrected by a Loop Current Attenuator).

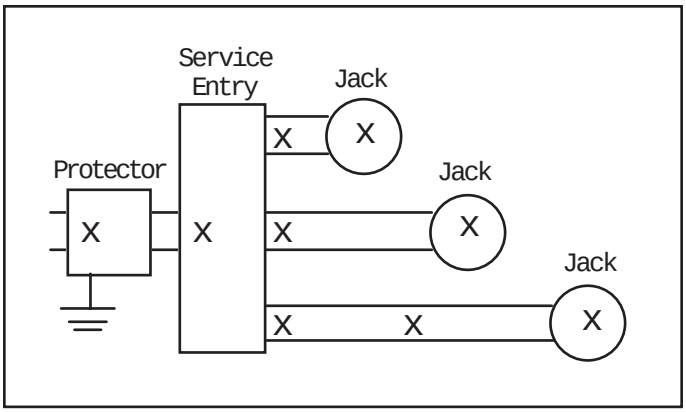
It is possible that as a result of poor design or component failure, a telephone device can be the cause of interference. This device may continue to operate even with a malfunction that causes interference to other devices on the line! For this reason, it is important to "simplify" your diagnosis by putting a phone at the KSU (or NI) and stripping the system or line down as far as possible. Replace the cards or punch down the cables one by one until the trouble reappears (standard troubleshooting procedures for system problems).

If you have another device of the same type you can try swapping them with each other to see if the trouble follows. For maximum interference rejection, make sure your system ground is of the highest possible quality. Proper telephone installations establish system ground at either the Protector Box or Service Entry. Grounds other than known-to-be conductive cold water pipe, building frame ground or driven ground rods should be considered suspicious. Good grounding goes a long way toward shielding your telephone wiring from intruding RFI. An upgrade in system ground at some sites can eliminate telephone RFI. At other sites, a better ground can reduce interference noticeably, requiring less work and/or fewer RIDs.

Installation Diagrams

X indicates location in system where RID may be placed.





Hard Wire Installation

You should also look for signs of deterioration of the system wiring, including corroded wires, poor mechanical or electrical connections, moisture, breakdown of insulation on wires and cables, and stretched or damaged cables. Also check for staples driven through the telephone cables. Staples can cause wires to cross, creating an imbalance which upsets the wires designed-in interference rejection.

Beware of speaker or thermostat wire, mic cable or anything other than telephone cable. Old style Red/Green/Yellow/Black "Jake" has no real twists to it, so it has no inherent interference rejection. Sometimes (rarely) picking other than a normal pair, like R/B or G/Y will help a little, both for RFI and crosstalk problems. A radio station prewired their own building for

telephones using shielded audio cable right under their transmitter tower. Because there were no twists in the cable like telephone wire, every phone had loud RFI that was impossible to eliminate. You get best rejection with Level 5 computer type cable, because of the high number of twists per foot. Shielded phone cable seldom helps.

Refer to Pages 20 and 22 for illustrations of the placement of RIDs. An X marks each point that you could try a RID, based on the type of system you're working on. Shortening the length of the antenna (station cable) by putting RIDs in the middle of the cable run is not always easy, but can be quite effective. Occasionally you'll need RIDs on both handset and line cords, but not often. As at some AM & FM radio stations, you may need to cascade RIDs together to get both offending frequencies.

CB AND HAM RADIO

CB radio interference is hands down the hardest form of RFI to get rid of, because you will hardly ever hear the problem while you're trying to fix it. It is most frequently seen at customers that are close to highways with a lot of truck traffic. Truckers have taken to using CB radios with power amplifiers that take the legal 5 watts of power and brings it up to 500 or 1000 watts of power. Many AM radio stations broadcast at 250 to 1000 watts, so you can guess how much interference potential these CB radios have.

Normally the interference is only heard for 30 seconds or so while the truck is driving by. In the worst cases a trucker will stop by the side of the road right near your customer and carry on a long conversation. In major cities you will often hear cab drivers as they pass by (they use the same power amplifiers to talk between themselves). In the worst cases these rigs are powerful enough to lock up the phone system or cause it to reset.

The first thing to determine is whether the RFI is coming in before or after the phone system. If all of the phones are affected, and it is occurring on both the handset and speakerphones, then it's a pretty good indication that it's coming in through the phone lines.

If, more likely, there are only a few phones that hear the RFI (most often closest to the highway), you will want to find out whether it is heard over both the handset and the speakerphone, or just the handset. If they only hear it on the handset that's a pretty good indication that the handset cord is picking up the RFI, and our CB Radio Handset RID will take care of the problem.

If the RFI is heard on both the speakerphone and the handset, then the station cable is probably picking up the radio signal. Ground the spare pairs at the frame. If the system uses one or two pairs for the phones use our 1 Line or 2 Line CB Radio RID at the back of the telephone. Sometimes running a new station cable from a different direction, of a different length, will "retune" the cable away from the CB frequency. You may need to put a jack in the middle of the cable for a RID, or possibly at the frame.

If you have access to a trucker with a power amplifier, that is the quickest way to fix this problem because he can sit out front and talk while you try different approaches to the problem. Generally, it's a long involved process to cure CB interference. This is because it almost never is doing it while you're there, so you must make a change and wait to see if it's fixed, over and over again. Ham radio, or a CB radio base station is often easier to track down. Often you can see a big antenna nearby that may be the offender (but don't jump to conclusions too fast!). If you can get the cooperation of the guy with the radio, at least to broadcast while you're trying to fix the problem, you're going to be ahead of the game.

There doesn't seem to be any brand of system immune to this, either analog or digital. In general, digital systems pick up the RFI at the phone through the handset cord, since that is analog, and the information coming down the base cord is digitized (usually quite immune to RFI at this point). Remember - every digital system is analog going in and analog going out, so there's not that much difference from an analog system. If you don't cover all the pairs in the station cable it's possible the RFI will go around the RID on the unprotected pairs and induce back into the voice pair after the RID (even more likely at FM frequencies). You also may need to break up the station cable in the middle and put in a RID, or put it at the frame. Nothing is very logical about RFI, especially CB!

RF TYPE PLASTIC SEALING EQUIPMENT

Companies that manufacture plastic and vinyl notebooks and similar products often use machines that produce the heat to "weld" the plastic parts together by RFI. This fairly high frequency, when put in the proximity of the plastic, causes enough heat to melt the nasty parts together.

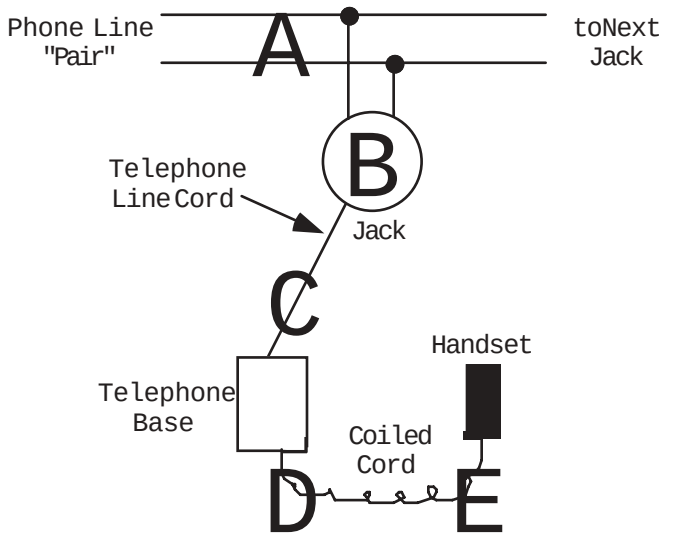
This RFI usually shows up as a tone heard on the telephones whenever the machine is operated. If there is more than one machine (and there usually are), you can hear a chorus of tones all day long on the phones at this type of plant. 1 A2 key systems aren't normally susceptible to this, but we have seen it on all type of electronic key systems and PBXs.

Most people have tried running shielded wire, only to find that the problem is as bad or worse as with regular wire. **Never leave the shields ungrounded - always ground them at the frame - if you do use shielded wire!** The shield acts like an antenna, bringing the RFI back to the frame (66 blocks), and spreading the RFI throughout the whole system (even with the shields grounded at the frame). Running Level 5 cable would be a better idea, since it will reject inductive interference due to the high number of twists per foot. Obviously, you should try to run the cables as far away from the machines as possible. **Make sure you ground the spare pairs on the cables at the frame. Disconnect any unused cables from the frame – you can't have any prewires In this kind of environment. THIS ONE STEP WILL CURE MAYBE 20% OF RF PROBLEMS, DOING NOTHING ELSE!!** Make sure there is a good ground, and ground the system as per the

manufacturer. Make sure the cover is on the phone system. We tried putting up a grounded metal plate behind the KSU at one customer, but it didn't seem to do much good. Make sure the customer closes all of the maintenance covers on his machines, and that they are correctly grounded. Leaving the covers off those machines really makes things worse.

After you've taken care of the basics you can try our Sealing Equipment RIDs. They're available in a modular version for the handset that plugs right into the phone, and the handset cord plugs into it. It's also available in a 2 pair modular line cord version, which would work on a two line phone or system phone that used one or two pairs. You may need one or the other. You may also need the line cord version at the KSU end (you may need to put a jack at the frame). The RID at the KSU end would prevent RF from coming down the station cable and being spread throughout the KSU.

Digital systems are also susceptible to this interference, usually picked up by the handset cords and fed into the analog portions of the telephone set.

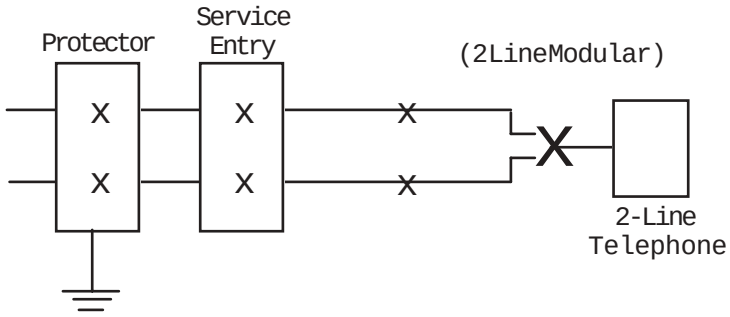


A RID breaking up the line in loop series wiring.
B RID at the phone jack
C RID at line input to telephone. Best site for your first RID. Blocks interference to telephone when line cord intercepts RFI.
D Handset RID blocking interference to the telephone base when coiled cord intercepts RFI.
E Handset RID blocking interference to telephone handset when coiled cord intercepts RFI.

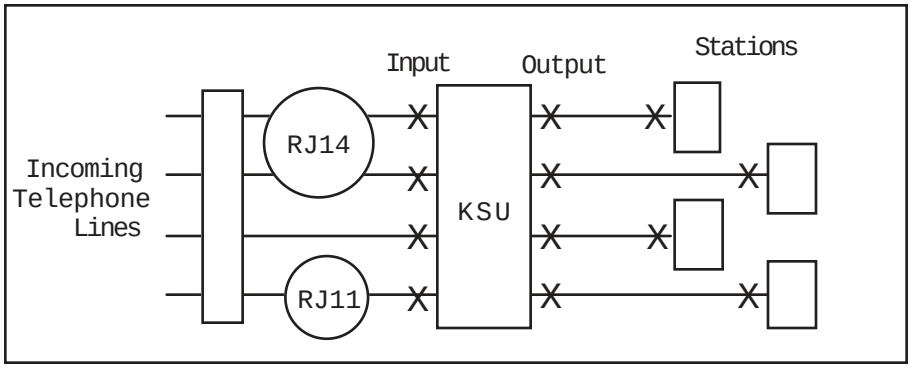
WELDING NOISE

Welding noise is another hard one to get rid of, but it can be done! The same basic cable installation rules apply as with the RF Sealing Equipment.

Make sure that any unused cables or prewires are removed from the frame. If they remain bundled with the working cables, ground all of the pairs after removing them from the frame. Spare cables will act like antennas, picking up the welding interference and inducing it into the other cables.



Welding noise seems to be picked up by the handset cord in many cases. The cure has been to use three of our handset RIDs cascaded together - the AM, FM and CB, which will notch out a huge portion of the RF spectrum. You know that you need the HANDSET versions of the RIDs if you can move around with the handset and the noise gets louder or softer. Welding noise is RF spread throughout the radio spectrum. We are batting 100% at getting rid of it, but it's expensive since you have to use three RIDs on the affected phones. This seems to work as close as 8 feet from the welder! This applies to all kinds of phone systems, both analog and digital.



Proper RID selection for the input (telephone line) side of the KSU depends on wiring configurations. When RJ-11 jacks supply single phone lines, use single line RIDs. When RJ-14 jacks supply two lines, use 2-Line RIDs. If the system is fed by RJ-21 blocks, use Hard Wire RIDs on each incoming line. 2-Line RIDs are compatible with the station side of electronic key phone systems and PBXs, since individual stations are typically fed with 2 pairs from the KSU.

TLC – Telecom Line Conditioner

The Telecom Line Conditioner (TLC) contains a Super TEN (Transformer Exciting Network) and an Induction Neutralizing Transformer (INT) in one convenient package. The TLC can immediately suppress up to 95 percent of the steady-state or transient 50/60 Hz power line induced AC voltages and currents that occur below the threshold of the telephone company provided “primary” protector. These excessive voltages can cause a number of equipment problems.

6 and 25 pair TLC

Symptoms

- False rings or signaling malfunctions
- Unexplained electronic equipment failure or damage
- Unsafe AC voltages on the line terminals
- Excessive “secondary” protector operations which randomly shut the system down and cut off conversations
- Occasionally can’t call out or receive calls

Applications

- PBX Trunks/OPXs/Key System Lines
- Data Modems/Alarm Circuits
- Telemetering Circuits/Video Pairs

Part No.	Description	Size in Inches
P15634	6 Pair	13 x 12 x 7.5 (33 x 31 x 19 cm)
P15648	25 Pair	18 x 12 x 7.5 (46 x 31 x 19 cm)

The TLC may be the solution to these problems, and will correct them without disrupting the circuit’s operation. With a TLC, there is no protector to clamp to ground that will shut the circuit down!

The TLC is capable of suppressing up to 30 dBrnc power influence levels (induced harmonic voltages and currents) which can yield similar circuit noise reductions. Impulse noise on data circuits that cause errors can also be substantially reduced with a TLC. They are very simple devices, with no power or maintenance requirement, are extremely reliable, provide DC continuity, and are easy to install. More than 500,000 telephone, railroad and power company communication and signaling circuits around the world have used this technology to keep their lines operating efficiently.

TLCs are available for treating 6 and 25 pairs and are terminated with standard jacketed telephone cable. The first pair is wired to the Super TEN, which is a specially designed drainage reactor tuned to 50/60 Hz and the harmonics of 50/60 Hz.

The TLC is UL listed (UL file E100902). For more TLC information ask for Application Note T0044.

Ask About Our Upcoming Seminar Schedule - “AC Induction Problems & Solutions”

Call 800-558-3325

SNC CBT for Stray Voltage Mitigation

Increase Neutral Return Current on 15 and 25kV Single Phase Lines

This highly efficient Current Balancing Transformer (CBT) equalizes phase and neutral current to mitigate electromagnetic fields (EMF) and stray voltage or
currents within selected grounding points of a multi-grounded neutral distribution power line. Nearly all of the phase current is forced to flow back through the neutral conductor by means of the highly coupled 1:1 transformer. Field tests with a 30KW/240 Volt load indicate 95+% of all phase current flows in the power line neutral conductor.

This single phase transformer must be installed by a power utility on a pole for a primary distribution feeder single phase load tap to limit stray currents at the transformer neutral grounding point. It is designed for rural primary lines feeding dairy operations to correct the effects of stray voltage.

The CBT allows **only** those currents flowing to the farm on the primary to return on the neutral. Current from any other source is rejected. If current does not enter through the CBT primary winding it cannot return through the neutral winding.

Features/Benefits

- "Cow Contact" voltage reduction of 7 to 1 or higher is common, often to less than 1/10 of a volt!
- Neutrals remain safely connected in accordance with the National Electrical Safety Code (NESC Rule 97B).
- Completely passive device - no electronic components to fail.
- Automatic Line Powered Neutral Line Shorting Switch Available.
- 60 Day money back guarantee if units do not return 98% of the current on the neutral.

15kV Technical Data **15 kV CBT - Part No. P31111**

- Single Phase, 15 kV Two Wire Service
- Rated to 7 Ampere, 60Hz, 55°C Rise
- Series Impedance: 0.044 Ohms at 75°C Under Balanced Loading
- Weight: 180 lbs. (82 kg)

25kV Technical Data **25 kV CBT - Part No. P31121**

- Single Phase, 25kV Two wire service
- Rated to 7 Ampere, 14.4 kV, 60Hz, 25kV Class, 1:1 turns ratio.
- Series Impedance: .0194 Ohms @ 75°C Under balanced load.
- Certified to withstand 5000A rms, 1 cycle duration
- Dielectric withstand: Primary Winding 150 kV BIL, and 50kVrms, 1 minute.
  Secondary Winding 30K BIK and 10KVrms, 1 minute.
- Short circuit withstand: 5000A rms, 1 cycle duration
- Weight: 370 lbs. (168kg)

AC Induction Videotape Training

The SNC Videotape Series provides a solid understanding of the effects of AC Induction on communication lines. You'll learn practical techniques for locating, identifying and reducing the main cause of noise on telephone lines… Power Line Interference. Learn how to: Reduce 50/60 Hz Voltage and Current; Reduce Power Influence and Circuit Noise; Reduce Service and Equipment Problems on Digital Lines; Reduce Service & Equipment Problems Caused by Power Surges; Reduce Voltages on Electronic Test Lines; Use HSRs, Noise Chokes, SNIXs and TENs.

Presented by Larry Webber, these tapes are a condensed version of the famous SNC Powerline Interference Seminars. Though not as comprehensive as the seminars, the tapes offer a convenient way to get acquainted with many of the problems (and solutions) that noise mitigation specialists are forced to deal with. Easy-to-understand graphics are used to provide a clear and thorough understanding of the material. Testing and measuring techniques are discussed, as well as actual cases and ultimate solutions to specific problems.

Larry Webber spent 31 years with New England Telephone (NYNEX)… 20 years as Inductive Coordination Electrical Protection and Noise Mitigation Field Engineer. He was responsible for 350 exchange areas in Maine, New Hampshire and Vermont and helped pioneer the use of neutralizing transformers on toll analog and carrier systems.

Included with the videotapes is a Guidebook that includes all the graphics presented in the video. The Guidebook is a handy note-taking tool as well as a convenient reference source for the material covered.

The entire 5 ½ hour training course is offered in DVD format. Order Part Number T0301.

Order the Li'l Zapper Test Set together with the training DVDs. See Page 8 for Li'l Zapper details. Order Part Number P31065.

AC Induction Problems & Solutions Seminar

Learn How to Locate, Identify and Reduce the Main Cause of Noise and Voltage Interference Problems on Telecom Lines… Power Line Interference

Today's telecommunications equipment is increasingly sensitive to noise, AC induced voltages, RFI and lightning, which makes knowing all the economical and practical methods of solving these problems a high priority. The SNC four day comprehensive course reviews the principles of AC induction and how it affects metallic telecommunications facilities. You'll learn the fastest and most efficient ways to solve problems because most of the class time is devoted to real world "how-to" tips.

You'll learn how to troubleshoot and effectively use test equipment… how to analyze specific test readings and data… and the effects that AC induction, harmonics, lightning, transients, spikes and surges have on telephone pairs and the AC power line. Attendees are encouraged to bring specific test data (voltage to ground, current, noise, power influence, etc.) so that our instructors can help pinpoint your specific problem and provide you with a real solution.

Program

On the first three days (Tuesday through Thursday) class runs from 8:00 a.m. to 5:00 p.m. Class ends at noon on Friday. Course fee includes three (3) dinners, three (3) lunches, coffee breaks and course materials. The class stays together for most meals, which helps stimulate interaction and sharing of ideas… one of the keys to the success of the program.

Who Should Attend

The course will benefit anyone involved in the engineering, maintenance or manufacture of metallic cable facilities or the telecommunications equipment connected to them. Our attendees range from staff level engineering to central office and field personnel… from telcos, railroads, power utilities, consulting firms, interconnects, equipment manufacturers and public service commissions.

Instructors

The course is taught by well-known professionals who enjoy very successful careers as specialists, not only in solving noise, AC induction and protection problems, but also in training others in their companies about this elusive science. They will share with you their vast experiences, methods and shortcuts. Don't miss this opportunity to learn first-hand from the experts. In these cost-conscious times it's more important than ever to know the most economical and efficient solutions to noise and protection problems.

Seminars are being scheduled soon

Seminar fee is $950 (US$)

Call 800-558-3325 or 920-231-7370 for a current brochure and availability of seats.

Register online at www.sncmfg.com.

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