SUPERSNOOP SURVEILLANCE DEVICE

The Saga Concludes

The last three issues of the WSR softened you up for this month's exciting conclusion to an integrated, all-purpose RF device that can be used for anything from a baby monitor, to a listening device, to a high quality surveillance bug for authorized agencies and operatives.

V5N6 gave you the SuperSnoop Microphone; V5N7 presented the SuperSnoop Amplifier; and V5N8 offered the SuperSnoop Transmitter; each in useful, standalone circuits that could find ready uses for many purposes.

Comes now the integrated version of all three super circuits into a unitary system that can be nothing more than a "toy" or conversation piece with which to impress family, friends, and neighbors, to a mother of a listening device as a part of your perimeter security.

The last three issues of the WSR gave all the gory details of each circuit, so I'll dispense with repetition here, and instead get right into the meat 'n taters of the below circuit and explain the features and differences that may exist from the individual circuits.

THE POWER SUPPLY stands out from the three previous projects. Each of the 3 sections in the below circuit are designed to run from regulated+8.5 volts provided from U-2, an adjustable 3-port regulator. (Some parts values will differ from the last 3-mos because of the 8-volt design.) U2 can be the common LM-317T (large TO-220) or the less common LM-317LZ (tiny TO-92). There is no real need for the large LM-317T other than it is commonly available, even from Radio Shack. The tiny LM-317LZ is available from DigiKey and other parts houses.

The power supply is designed to accept a range of input DC and to regulate the output to a fixed, stable +8.5 volts.

Input power can be as simple as two 9-v batteries wired in series as shown. for 18v input, or, via J-3, you can connect a DC Adapter or power supply of any level from 11 to 24 volts or so. Not critical! Current drain is about 15-25 mA. The two 9v batteries permit extended portable operation, since U2 will provide a smooth 8.5v output until the batteries decay to about 5.5v each, or effectively dead! Cool, huh? J3 is a switched 1/8" phone jack that auto-disconnects the internal batteries when an external DC supply is plugged into J3.

HIGH QUALITY MULTI-PURPOSE SURVEILLANCE DEVICE
(continued from Page 1)

Any other differences in this integrated system fall into one of three categories:
1. to accommodate +8v power
2. to accommodate convenience
3. to enhance performance
For example, the SuperSnoop Mic of V5N6 was designed for a nominal 3v, but 8.5v requires different values of some parts. In a word, the SuperSnoop Mic of V5N6 was redesigned for the needs of this month’s integrated project.

There are other differences in the transmitter circuit. Note trimmers VR2 and VR3 that replace the 4.7-k & 330-Ω resistors in last month’s transmitter? You can go with the fixed resistors, if you like, but the trimmers will allow you to optimize the transmitter for best overall operation. VR3 optimizes output power while VR2 optimizes the stability of the oscillator. Once the trimmers are set, you can measure them and use fixed resistors close to the measured values.

The Audio Power Amplifier isn’t appreciably changed from V5N7, but you will note R7 and R8 this month that require a little explaining. You see, U1 puts out a whopper of an audio signal to “deviate” or modulate the oscillator by varying the bias on Varactor diode, D1. But this is an AC signal that can vary from nearly 0 to 3 or 4 volts, RMS, and to 8v, peak-to-peak. The varactor diode might get terribly confused.

R7 and R8 (10-k ea), divide +8.5v in half to apply a DC bias of 4.25v to the cathode of D1. In effect, this sets a baseline of 4.25v above and below which the AC audio modulating signal can vary the diode bias, and thus, the frequency of the oscillator for Frequency Modulation!

C15 is a small capacitor that filters noise from the modulating signal. L1 allows the modulating signal to pass through, but blocks RF from getting out. L2 is only a test point to which a DC or AC voltage can be attached to monitor the bias or signal voltage. Without L2, the touch of a meter could stop oscillations or throw the oscillator off frequency.

C8 and C19 are noise filters for the DC power line. C4, C9, and C10 are noise filters for the audio section. C7, C22, and C23 are brute DC power line filters. J4, a switched phone jack, is offered to allow easy injection of preamplified external signals. You could “pipe” in line-level audio from some other source, thereby bypassing the built-in mic and preamp. This is a convenience feature, and if not desired, leave it out, and eliminate C2b. Connect the (-) side of C2a directly to the top of VR1.

Likewise, J1 and S1 are convenience features to allow easy connection of an external mic or other low-level audio signal. Leave them out, if you want.

R5a, R5b, and C5 are for the purpose of dividing and filtering the +8.5v line to produce an idealized DC power for the electret mic element. These components are fairly critical for optimal operation and probably should not be changed. If you use a different mic element, then the circuit might need to be altered. You could experiment with the following circuit to determine an ideal combo:

Wire two 10-k trim pots as shown to the right, and a capacitor between them. Sub this circuit for R5a, R5b, and C5. Experiment with settings of the trim pots until ideal settings are found. Start with each pot set to about 6-kΩ and go from there. When an ideal combination is found, measure the pots and sub fixed PMF resistors for the measured values.

CRITICAL STUFF: Well, nothing in the SuperSnooper is terribly critical, with exception of L1, L2, and the electret mic circuit. But, the fine razor’s edge of quality is dependent on the use of the right kinds of parts, especially precision metal film (PMF) resistors and tantalum capacitors where specified. In this light, D1, Q1, and X1 are also fairly important. Review the last three back issues for details on these components.

WRAPPING IT UP: The parts list was made up in 1987 when I designed this circuit, and revised in 1990. Some of the Radio Shack part numbers might not be valid now, but store personnel can guide you to the correct replacements. I verified the most important of the bunch, though. Construct this baby as small or as large as you like, but don’t get into trouble with the darn thing, ok? This sucker works.... ooooodd! Maybe too good. ☺
Every now and then I like to sit down at the computer and write about things I think would be practical and useful to the electronics and scanner hobbyist. I don't write as much as I used to and when I do it's usually about electronic systems relating to amateur rocketry. That's a whole different story.

Anyway, I guess I am sort of the Howard Hughes of electronics in a sense that I usually keep things to myself and nobody can figure out exactly what it is I do. Well what the heck! I guess I will break character here and share with you a hardware upgrade that is simple to build and will make your life easier while scanning the airwaves.

I am talking about an upgrade for the LINKALL display. What the heck's that, you ask? The LINKALL is a small easy to install memory controller board that makes Extended Memory in the PR0-2004/5/6 and maybe other scanners, much easier to use and manage.

**Circuit Description:** Please refer to the schematic as we go through the various circuits. There is not much to this so it should go quick. Let's talk about the address inputs A0-A5. The LINKALL uses these address lines to sort of break up the extended memory in your scanner into smaller usable blocks of memory. The A0-A5 lines from the LINKALL control or address the most significant bits of the extended SRAM memory chip in your scanner. Each discrete address value from the LINKALL is called a Block and is normally displayed using a bank of 4 or 6 LED's depending on your model.

There are 400 channels associated with each Block Value. The 4 bit LINKALL controls 16 Extended Memory Blocks and the 6 bit version controls 64 Blocks. A Block Address from LINKALL enters EPROM U1. This EPROM is the heart of the circuit and acts as a digital code converter. It converts the raw binary data into BCD (B)inary (C)oded (D)ecimal. Code conversion is accomplished using a lookup table method.

The address input to U1 is used to point to a particular memory location in the EPROM that holds the 2 digit BCD equivalent of the address value. The BCD format from U1 representing the raw binary data value uses the upper and lower 4 bits of each output byte to represent the values of 0-9. Therefore we can represent a value from 00-99 with one byte of data; more than we need since the maximum value into the EPROM will be 63 for a 6 bit LINKALL.

The EPROM output goes to U2 and U3, 74LS47 BCD-to-7-segment display decoder/drivers to drive our displays. The displays are 7 seg common anode (CA) type displays with active low drive on each segment. Note that I did not include pin numbers on the schematic, *only signal definitions*, on the schematic diagram in the display part of the circuit. This gives you the option to use any size display you need as long as it is *common anode* type. The resistors limit the current in each segment. The other input to the circuit is the POLARITY input which is used to compensate for LINKALLs that use negative logic to drive it's LED display. Older type LINKALLs use active low drive while the newer Model 4 or 6 use active high drive.

Tying POLARITY and point A to 5 volts makes the display compatible with older type LINKALLs with 4 bits. If your older type LINKALL is a 6 bit model then the POLARITY input gets connected to 5 volts while point A gets grounded. Connecting POLARITY and point A to ground makes the display compatible with the new Model 4 or 6. The remaining inputs are + 5 volts DC main from the scanner and ground. That does it for the circuit description. Simple right?

**Circuit Construction:** The circuit is not critical since operation is completely static. There is not much room inside your scanner for the display board so you may have to put in a small enclosure and mount it outside the scanner if you're not very creative. You can use point to point wiring or wire wrap techniques.

Follow the schematic carefully and clearly label each wire lead into the display board for connection inside the scanner. If you use the display module with an older type 4 bit LINKALL then connect the POLARITY input to 5 VDC and point A (see schematic) to 5 VDC. (An old style LINKALL is 6 inches long.)

If you use the display module with an older type LINKALL that has been modified to a 6 bit then connect the POLARITY input to 5 VDC and point A (see schematic) to ground. If it is going to be used with the newer Model 4 or 6, then connect POLARITY and point A inputs to ground. (The new type of LINKALL is 4 inches long.) When completed, there should be 8 wires for input to the scanner if you are building the display module for a 6 bit LINKALL; otherwise there will be 6. Make the wires long enough from the display box so that they may be connected inside the scanner. Also protect the integrated circuits from electrostatic discharge when handling. A grounded soldering iron and ESD strap to ground would be ideal when constructing the display board.

**Linkall Upgrade Parts List**

- U1: 2716 (programmed EPROM) see address below for availability
- U2-3: 74LS47
- R1-2: 100-kΩ ¼-w
- R3-16: 220Ω ¼-w
- C1-2: 1 uf/16v (most any type will do)
- DISP1: 7-seg digital display, common anode
- DISP2: 7-seg digital display, common anode
- Wire
- Enclosure
- One 24 pin IC socket
- Two 16 pin IC sockets
- Connectors (as needed/desired)
MOD-30 EVENT COUNTER BACK IN STOCK!

Radio Shack brings back in their 1996 catalog, the electronic counting module that was the heart of my MOD-30 Event Counter in Vol-2 of the Scanner Mod Handbook. RS# 277-302NP @ $16.99. This item had been discontinued for a time, much to the chagrin of our hackers.

RADIO SHACK TOOLKIT

A jeweler screwdriver set #64-1961QW is on sale this month for $7.99. Contains hard to find small Phillips, slot and nut drivers, hex keys, torque bar and a case. Very handy for the completist hacker.

20 MHZ OSCILLOSCOPE FOR $100?

Radio Shack’s 1996 catalog pg 125, sports a 20 MHZ Oscilloscope for $100. The catalog says “available Nov 30, 1995” but as of Jan 1, 1996, the “ProbeScope” still wasn’t in the stores. RS personnel say “anytime now”. Well, this one looks like a real hotdog, so keep an eye out.

Basically, ProbeScope is just a small probe with an LCD display module on its side, but (and get this!), it also plugs into a COMPort on a PC to turn the display into a huge oscilloscope.

ProbeScope comes with Windows and DOS software on disk, probe and cable, to allow a laptop or desktop PC to view waveforms and voltages on the monitor; and to store, and print them. ProbeScope also has a digital voltmeter mode of operation. Soundsccccccc!

Readers will recall from the back issues we were presented Radio Shack’s and AGA Associate’s PC Interface Multimeters (VSN3). Believe me, these kinds of tools are awesome for the shack and shop, so the coming ProbeScope should be no exception. Regular o’scopes start at $500. They’re also big, bulky, and not the easiest instruments to operate.

The ProbeScope should be ideal for many electronics bench needs from audio and stereo up through RF at CB frequencies or thereabouts. Lots of scanner uses and especially digital applications! Maybe even useful in a home-brew spectrum analyzer!! O’scopes have long been priced out of reach of most hobbyists but are standard fare on the serious electronics bench. ProbeScope could open doors for you!

PRO-2006’s & PRO-43’s STILL AVAILABLE!

That’s right! From Canada, where these fine, cellular-capable scanners are still legal. There appears to be no Customs or legal hassles for private mail order deals, according to US scanists who have purchased so far. Prices are great!

PRO-2006: ≈US$379 (CANS329)
PRO-43: ≈US$360 (CANS499)

Durham Radio, the Canadian supplier says that supplies of the PRO-2006 and PRO-43 may be limited, so early orders are advised. They are not sure if supplies can be replenished. For more info:

DURHAM RADIO
350 Wentworth St. East, Unit 7
Oshawa, Ontario CANADA L1H 7R7
Voice: 905-436-2100
FAX: 905-436-3231
Email: durhamnet.com

FREE S&H (regular ground) until end of January ’96. Fast UPS also available.

ED Note: Foreign shopping is not a complex matter anymore, especially from Canada. You may wish to check with your credit card company in advance to ensure they will honor the transaction, and to verify exchange rates and currency conversion fees, if any.

PRO-2035 CELLULAR MODIFICATION!

They said it couldn’t be done, and they’re right, sort of. You cannot pop the case of a PRO-2035 and clip or add a diode to unleash the cellular bands. They’re not there.

You can, however, yank the microprocessor chip from the Logic/Display/GPU board and replace it with one for the European PRO-2035 for full coverage of the 800 MHz spectrum! Replacing that wretchedly tiny surface mount 100-pin chip is a lot easier said than done, however! But it is "doable"....

The timid and faint of heart have a much more lucrative option, however. Just replace the entire Logic/Display/GPU board with the European version by disconnecting a few cables; removing four screws, etc, and be done with it in a matter of minutes. No sweat!

So where do we get a European CPU or Logic Board for our PRO-2035’s? I should think one likely source to be the equivalent of Tandy’s National Parts Center in Europe, but so far, I’ve been unable to locate that facility. However, there is a hot little company in England making a good name for itself by being up to date and Johnny-on-the-spot with all the latest in scanning and short-wave listening technologies.

Javiation, and its proprietor, Jonathan Clough, have limited quantities of both the CPU and the Logic Board for the complete PRO-2035. Latest known prices are as follows:

GRE-9410 CPU £ 35.00 or
PRO-2035 Logic Board £ 89.00

Javiation is a wide spectrum supplier to the hobby radio market, so visit their WWW homepage and order a catalog:

ED NOTE: I asked Jonathan about delivery and availability. He replied:

"The PRO-2035 is no longer available here in Europe as it did not meet European EMC standards and could not be imported into Europe after the 1st January 1996. Any imported prior to that date can be sold until gone but as far as I am aware RS have not brought any in for 6 months or longer. As such I am not sure how long spares such as CPU’s, (boards), etc will remain available."

ED: I asked Jonathan about the new PRO-2042 and cellular possibilities.

I suspect the ’2042 is the same as the ’2035, ie CPU differences. The PRO-2042 also failed EMC testing so is not approved. I had assumed that RS brought the PRO-2042 out for 2 reasons (at least); one to answer the US critics with regard to PRO-2035 deficiencies and at the same time manufacture to a standard that would comply with European EMC standards. Seems I was wrong. As to whether it will eventually arrive I can’t say.

The only RS "badged" base (scanner) to pass EMC testing is the PRO-2039, and that had to have its BNC socket removed-only antenna socket is via the telescopic one that screws into the top."

CONCLUSION: A European CPU or Logic Board will put cellular in your PRO-2035 without compromise.

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DISPLAY HOOK UP: Always disconnect AC power from the scanner when removing the cover. Observe ESD precautions. You will have to drill a hole through the back of the scanner to feed the wires from the display module to the inside of the scanner. You may even want to add a connector to the back of your scanner and feed the signals through it. This will make things look more professional.

Let's start with the address lines A0-A5 into the display module. Since we will no longer be using the Block display LED's on the front panel of the scanner, this might be a convenient place to remove wires and connect to the A0-A5 inputs. If you are using this display upgrade, you MUST NOT use the original LED's for Block display. It's one or the other. Use info below as your guide. Remove the LED drive wires one at a time from the front panel LED's and connect as follows:

A0 --- to --- LED1 DRIVE ------>>> rightmost Block LED
A1 --- to --- LED2 DRIVE
A2 --- to --- LED3 DRIVE
A3 --- to --- LED4 DRIVE
A4 --- to --- LED5 DRIVE **
A5 --- to --- LED6 DRIVE ** ------>>> leftmost Block LED
** indicates only for 6 bit LINKALL.

NOTE: The key word here is left and rightmost Block LED's. Please don't include the status LED.

NOTE: LED drive refers to the lead on the LED that is driven by the LINKALL module address output inside your scanner. The other lead on the LED is a common and no connection should be made to it. A way to identify the LED common is physically look at the LED wiring. If you see a common wire bus bridging each LED, these are not the wires to remove and connect to the display module. If you have an ohmmeter you can buzz the wires to the LED's to identify the common.

DO NOT disconnect the drive wire to the STATUS LED; it will be used. The unused LED's can be used for other purposes. Now the last two connections: power and ground inputs. If you have a PRO-2005/6 then you can pick up the main +5v from CN3 Pin 2. If you have a PRO-2004, then you can pick up the +5v from CN504 Pin 5. The +5v connections may have to be spliced into an existing wire. The ground can be picked up from any shielded can or box in the scanner.

If you are installing a new LINKALL and this display you may want to still use the LED's in addition to the digital display. In this case the A0-A5 of the display inputs can be connected in parallel with the address inputs of the SRAM IC you are installing. In other words, the LINKALL will be driving the address inputs of the SRAM IC as well as the address inputs of the Display Upgrade module. The corresponding wiring would be as follows:

<table>
<thead>
<tr>
<th>Display Input</th>
<th>SRAM IC address Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>A11</td>
</tr>
<tr>
<td>A1</td>
<td>A12</td>
</tr>
<tr>
<td>A2</td>
<td>A13</td>
</tr>
<tr>
<td>A3</td>
<td>A14</td>
</tr>
<tr>
<td>A4</td>
<td>A15*</td>
</tr>
<tr>
<td>A5</td>
<td>A16*</td>
</tr>
</tbody>
</table>

* Only apply to a Model 6 LINKALL with 128K x 8 SRAM

OPERATION: If all went well and you wired everything correctly it's time to power up! Due to the increased current demands of the LED display, the internal power transformer may not handle this to well. You may want to use an external 12 VDC 1A power pack compatible with the scanner in place of directly plugging your scanner into the AC outlet. Plug in your power pack and connect it to the DC input of your scanner.

Turn the scanner power on. Switch the LINKALL into manual mode and reset to the Home Block or Block 0. A zero should be
displayed. Next, increment the Blocks one by one to see if the numbers on the display make sense. If so, you’re done. If not, well, 
START BUZZIN!!! If the numbers appear to 
count down then the POLARITY signal is 
wired wrong. If it is connected to ground then 
connect it to 5 VDC. If it is connected to +5v 
then connect it to ground. If things still look 
funny then ensure point A is connected 
correctly. This should cure all problems. If no 
display appears, then check the +5v input 
and connections to and from the decoder 
IC’s. Check that the anodes of the 7 seg. 
displays are wired to +5v.

CONCLUSION: All sources for parts and info 
are included at the end of this article. If you 
have any problems, give me a call or drop me 
a few lines via e-mail. I wish you success 
with your display upgrade.

If you have an EPROM programmer, I will 
send you the binary of the U1 converter code. 
Otherwise, the chip is available per below.

LINKALL INFORMATION & RESOURCES

U1 Converter: $8.00 (includes US S&H) 
Money Orders only please. Any Questions 
you may have I will gladly help.

William Manganaro 
15 Tulip Court 
Moriches, NY 11955-1901 
Phone: 516-878-8697 (after 7 PM EST) 
E-mail: 73510.2374@compuserve.com 
Compuserve: 73510.2374

Scanner Modification Services & LINKALL 
Information; Send for catalog of services.

Mark Persson 
1369 Lombardy Blvd. 
Bay Shore, NY 11706

All Parts for project.

DigiKey Corp. 
701 Brooks Ave. South 
P.O. Box 677 
 Thief River Falls, MN 56710-0677 
(800) 344-4539

ADMIN NOTES FROM CINDY

Some wondered what happened to your last 
two issues for 1995. In a nut shell, we’ve 
had a few health and other crises that threw 
us into a real tailspin. As I have told some on 
the phone we don’t guarantee that any issue 
will come out on a specific day of the month, 
but we do guarantee 5 issues for a half-year 
sub, 10 issues for a one-year sub, and 20 
issues for a 2-year sub. FYI:

VSN8 was mailed on 12/8/95 
VSN9 expected mailing on 1/17/96. 
VSN10 expected mailing on 1/31/96

to those of you who have expressed well 
wishes, Thank you very much. Your 
understanding and patience is 
appreciated. We apologize for the 
delays, and for any inconvenience this 
may have caused.

CE-232 SALE PRICE EXTENDED

Speaking of inconvenience, our sale on the 
CE-232 Scanner/Computer Interface 
expired on 12/31/95, but many of you 
might have not had the opportunity to 
buy since our last few issues were late. 
Sooooo... if you still want to make the 
purchase, I am taking the liberty of 
extending the sale price of $149.95 until 
January 31, 1996. (Please don’t tell Bill) 
Just send your order to my attention or if 
you place an order by phone, ask for me 
and I will extend the sale price for you....our special readers!

Again, thanks to all our subscribers for 
your continued loyalty, well wishes, and 
for having your subscriber number handy 
when you call!

Cindy Cheek, Admin

MODIFICATION WORK

Many of you have inquired about 
COMMrtronics Engineering and Bill 
Cheek performing modification work to 
your scanner. At the time we were 
overwhelmed with repairs, mods, and a 
host of other work and could not take on 
any more. However, we are happy to 
report that we can now perform some 
technical services again. We have 
discontinued repair work, but can 
modify clean, neat and basically 
analogue radios. Estimated costs for 
most commonly requested mods include:

* Restore Cellular base and handheld scanners, 
  (restorable models only) ea: $ 50.00
* MOD 16a: 6,400, 12,800 or 25,600 memory 
  channels w/6 switches, ea: $250.00
* MOD 16: 1,600, 3,200 or 6,400 memory channels 
  w/4 switches, ea: $175.00
* Install CE-232 internal to your radio, ea: $100.00
* Install CE-232 in external metal box 
  (you wire scanner), ea: $100.00
* 2nd & additional scanners wired/tested at same time 
  for CE-232, ea: $ 85.00
* Return UPS-ground Shipping & Handling 
  for base scanners, ea: $ 15.00
* Return UPS-ground Shipping & Handling 
  for handheld scanners, ea: $ 10.00

If you are interested in other 
modifications not listed above, please 
inquire. In all cases, if you would like us 
to perform “magic” on your radio, you 
can contact us by any of the several ways 
shown at the top of Page 1.

FROM THE READERS:

WEATHER FAX ON A FAX MACHINE?

From: Bob Senkmajer, Algonac, MI

Dear Bill: Would there be any simple 
way to print shortwave FAX weather 
images on my Samsung FAX machine? 
I have a Yaesu 8800 radio with line level 
audio output. Could it feed tones into 
one of the 4-color phone wires in my 
house? Is my subscription run out yet for 
the WSR - renew immediately if so.

ED REPLY: Cindy sez your sub is good 
through VSN10 (next issue). Good 
question on the use of the fax machine 
with radio fax signals. I doubt that it 
would be easy or intuitive, but the way I 
would approach it would be to prepare 
a phone-line pair with an RJ-11 plug on 
the end to connect to the fax. The other 
end should be fed with the secondary of 
an audio isolation transformer, (RS 275- 
1374). Take a sample of the receiver’s 
audio output and feed it into the primary 
of the transformer. (I think you will need 
amplified audio, not line level.)

Residential phone lines are 2-wire, so if 
you think you have 4-
wires, one pair is Line 1 
(usually red & green) 
and the other pair is 
Line 2 (yellow & black). 
Traditional 4-wire flat 
phone cable for two 
lines uses the middle 
two wires for Line 1 and 
the outer two wires for 
Line 2. This applies to 
the RJ-11 modular jacks 
and plugs, too. The above diagram 
shows the pinout of a female jack:

Then make sure a fax signal is on the 
radio and mess around with starting the 
fax machine. That’s where you’re on 
your own, because I don’t use that kind 
of a fax and don’t have the foggiest idea 
of what it takes to manual start and stop 
receive fax sessions.

If you are going to mess around with fax 
and phone lines much, I’d recommend 
Radio Shack’s Phone Line Tester, 43- 
104 that takes the guesswork out of line 
polarity, showing: correct, reverse, or 
not operational. The Radio Shack book, 
INSTALLING TELEPHONES, 62-1060 is 
full of good information, too, and is 
highly suggested for wannabe 
phreakers, line specialists, and radioists 
who need to tap phone stuff.

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SURGE & SPIKE PROTECTION

From: Brian O'Brien, Sterling Heights, MI
Bill, I've called your BBS a couple of times and per your request for suggestions for articles, I have a strong desire to understand voltage protection or surge protection. What device is it and how does it work? Thanks

ED REPLY: 'Nuther good question. You're really asking about protection against voltage surges, transients or spikes, and EMI/RFI, and it would take a book to do such subjects real justice. In fact, there are entire books! I may do a future article, but let the basics suffice for now. Surge, transient, and EMI are predictable, but let the basics suffice for now. Surge, transient, and EMI are predictable, but let the basics suffice for now. 

A surge is a "slow" but "lengthy" increase or rise in line voltage. Note how the lights momentarily dim when you turn on a powerful motor in your house? That's a dip, but a surge is much the same thing, except opposite. Surges last anywhere from a few milliseconds to a second or more, and can be 10%-100% of the normal line voltage. Surges are dangerous to all electronic equipment and difficult to prevent or protect. Surges are usually caused by accidents or heavy industrial machinery in the neighborhood, but solar and geomagnetic disturbances can also cause them.

Transients or spikes are extremely short, picoseconds to microseconds in duration, and very high in strength, sometimes several thousand volts or more! You cannot perceive transients like sometimes with surges. They come and go without your ever knowing it. Transients are caused by distant and nearby lightning strokes; certain kinds of heavy machinery; arc welders; and there are unknown causes. Transients are not especially dangerous because almost all electronic equipment has some protection, enough to minimize the effects, but transients can rip through solid state equipment and wreak havoc.

Radio Frequency Interference and Electromagnetic Interference is more or less continuous; rarely dangerous; usually manmade; and typically causes annoying performance in radio receivers. Special techniques are required to eliminate it, both at the source as well as at the receiving end.

Most variety and hardware stores sell 6-outlet "surge and spike protectors" and I suppose these work, especially for spikes. Unless you're willing to go to great expense and trouble, surge protection is elusive and uncertain. Read all the fine print on any such protectors you buy. 

Transient and spike protection is cheaply and readily available in the above mentioned 6-outlet strips and in a variety of other forms. Just a called line cord will knock a transient from dangerous to tolerable levels. Capacitors across the lines can shut spikes to safe levels. A special kind of zener diode called a metal oxide varistor (MOV) is a very effective guard against spikes. MOI's are being replaced by apparently even more effective devices called TransSorb or transient voltage suppressors (TVS). There are several ways to install TVS, one shown in MOD-11 in Vol-1 of my Scanner Mod Handbook. Since TVS's come designed for a specific operating voltage, you have to be sure to order the right kind for the desired circuit. Protection for a secondary circuit of a 117-vac power transformer that steps the voltage down to 12-vac before converting it to DC, would look something like this, using a single TVS: 

AC POWER SUPPLY PROTECTION

The above TVS, for most base scanners should be rated at about 20-volts breakdown. The DiGiKey part number would be P6KE20CAGICT-ND and costs under a buck in low quantities.

Filters to prevent RFI/EMI emissions are available from DiGiKey, but most electronic equipment is fairly well filtered already. The 6-outlet protector strips mentioned above pretty well stop EMI/RFI from entering or leaving through the power lines.

Surge protection is tough and we'll save that for another time, but again, the 6-outlet strips may help a lot.

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CONFIDENTIAL SUBSCRIPTION ORDER: Please Print Clearly!

NAME: 
STREET: 
CITY: STATE: ZIP: 
Work Ph: ( ) Career or 
Home Ph: ( ) Profession 
TYPE OF SCANNERS >> 
& Other Radios >> 
METHOD OF Check Cash M.O. Visa MastCard COD (+ $8.50) 
PAYMENT >> [ ] [ ] [ ] [ ] [ ] Amount Enclosed $ 
Credit Card 
Acct No: >> [ ] [ ] [ ] [ ] [ ] Amount Charged $ 
Name of Issuing Bank 
Signature Required (for credit card purchases) 
X 
What else to tell us? 
US FUNDS PAYABLE TO: COMMtronics Engineering
ROLL YOUR OWN COMPUTERS?
From: Anthony Heneghan, Marion, HI
Dear Bill: I am very interested in the roll your own computer. A detailed article would be best for those who want to get on with it. A detailed article is my first choice, and a series of articles would be my second choice.

From: George Kupraszewicz, Detroit, MI
Dear Mr. Cheek, In response to your article on "speaking of computers: Roll your own?" in VSN7 in the WSR, I would like to see and read several articles written on the subject. This includes on where to get the computer together otherwise than from Radio Slick and Computer Town. The articles should include where to get service manuals and other computer information. Thank you.

ED REPLY: To Anthony & George: Turns out, this IS a popular topic! I have some other material to churn out first. But if you want a head start, I wrote a 4-part series on building and upgrading computers for "Monitoring Times", Nov, Dec, Jan, & Feb issues. After I get the fallout from that series, I'll spruce it up for the WSR here.

WHINES-GRIPE-ACCUSATIONS
From: David Corwin, Greenport, NY, Bill,
Thanks for the return of the balance of my subscription to the WSR. You asked why I was not satisfied. Well! I am trying to figure out whether you are all hype or there is some substance to any of your claims. I have not read any of your books so I will reserve judgment. I must again say I am disappointed in the World Scanner Report. I have seen one other rather long message on the Internet that pretty much articulated my complaints.

The two issues I received had virtually nothing of value except schematics of a listening device that was cloaked in secrecy. The premise was that the microphone and amplifier circuit was going to be tied in to a scanner at some point in a later issue. Similar circuits have been published in Popular Electronics. Nothing new here. The story reputed to have been written by a woman about her husband's devotion to RF monitoring-so what. There just wasn't anything there. The schematics of the circuits could not be followed because of the poor quality of the reproduction. You have got to be kidding about the World Scanner Report and its value. The latest issue of Monitoring Times had modifications to restore two scanners. This is supposed to be your forte. I will look forward to the issue you are sending at no cost maybe it will change my mind.

ED REPLY: I doubt this issue will change your mind and I am not inclined to try, because I am from a very unique school of two-way people. One-way people "diodes" turn me off. I don't want their patronage. I can't afford it! Accusations, attitudes, and sniping can go somewhere else, where proprietors build the cost of fiddles and shrinks into their prices to cover the "cost".

I will address some of your potshots for the benefit of our loyal 2-way readers who are supportive of what we do and why we do it. First, value...it's in the eye of the beholder. The WSR has value for many people, but if you see none, keep your money. I don't want it. I can't please all the people all the time; just some people some of the time.

The articles by Janet Cravens were of general interest, perhaps none to some, but clearly appealing to the waves of many of our subscribers. I never guarantee each article to please everyone. Some people liked Mrs. Cravens articles, but those who didn't, certainly understood that not everything in every issue is supposed be of special interest.

The reproduction of our schematics is always of readable quality. It's possible the post office destroys some copies, and perhaps our quality control drops off once in a while and escapes attention. We are always happy to replace inferior or postal-damaged issues. Notable that you didn't ask...

What you saw on the Internet was from a rabble-rousing trouble-maker, green with envy of my accomplishments and position in the community. He shoots in the blind with no concern for truth or for what is fair and right. He is a 32nd Degree Snobball who would welcome you for an ally. The poor fellow's demeanor is utterly without merit.

My "listening device" has never appeared in print anywhere, and there is nothing close to it in terms of quality that has ever been published, as far as I am aware. Thanks to the LAW, "restoring" scanners is a thing of the past. There is only a handful, anyway, that ever had cellular possibilities, and they have ALL been covered in the press, most here. Cellular hacking is gone and this IS NOT a cellular-hack newsletter, anyway.

Whether I am hype or substance is something to which I never make claim or allusion. Others decide that for themselves. You are welcome to make your own judgment.

WHAT DOES THE FUTURE HOLD?
Professor Peabody returns next issue with a series of interesting hacks and improvements. A couple of mods for the PRO-26 are in the offing. Maybe the PRO-62. We will continue with the series of Technical Descriptions of the PRO-2004/5/6 and PRO-2035/2042 series. But folks, I gotta tell ya, scanners mods and hacks are becoming fewer and farther between. We've pushed the envelope about as far as it can go.

I don't mean for that to sound sinister; it's not. But it does mean that the focus and the slant of the WSR has to take a little change of course. Scanning and all of radio, for that matter, are on the brink of change. Hobby Radio is changing. But there is excitement in the wind. More on that soon. TIME TO RENEW?