

NUTS & VOLTS

M A G A Z I N E



\$3.00

VOL. 13 NO. 9
SEPTEMBER 1992

A National Publication For The Buying And Selling Of Electronic Equipment

In This Issue

3 NEW BUILD-IT-YOURSELF PROJECTS

TELEPHONE HOLD BUTTON
CRYSTAL RADIO RECEIVER
MEMORY TELEPHONE DIALER

VERSATILE FREQUENCY COUNTERS

ELECTRONIC TRADE JOURNALS

PLUS!

SPREAD SPECTRUM SPOTLIGHT
NEWS - VIEWS - REVIEWS
EVENTS CALENDAR
READER TO READER TECH FORUM
NEW PRODUCT NEWS
AND MUCH MORE!

THE NATION'S #1 SHOPPER MAGAZINE FOR ELECTRONICS

HSC's September Specials Means savings for you!



Back by popular demand!

It doesn't take us long to sell out of these popular rechargeable batteries when we get a batch in, so stock up now! These Yuasa NP7-12 rechargeable lead-acid batteries are rated at 12VDC, 7 amp/hours. New, '91 date codes. 2.5" x 4" x 6" with solderless quick-connect tabs.

HSC# 13123

\$14.95 ea.



Speaker of the House

This 10" Subwoofer with Dual Voice Coil is used in Rockford Fosgate speaker systems.

- Poly cone / Foam Suspension
- 64 oz. Magnet • Handles 200 Watts (Peak)

HSC #13166

\$34.95 ea.



Makes Flashlights obsolete!!!

Enjoy hands-free portable lighting with the WORK LIGHT. It's lightweight. It's practical. Can be used with glasses. One year mfr. warranty. Batteries included. Reg \$7.95

HSC# 13354

\$3.95

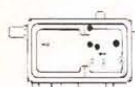
Fabulous price on the latest Disk Controller Technology!!

By now you are probably familiar with the different formats of hard disk drive encoding, such as MFM, RLL, ESDI, etc. You also are probably aware that these types of drives and controllers are becoming obsolete as the IDE interface standard takes over. There are many reasons for the popularity of this interface standard, such as speed, ease of installation, etc. but the main one is price! The drives are made to be intelligent, and that leaves little necessary hardware on the controller, which means savings for you! We are offering a great introductory price on a controller card that will control up to two IDE hard drives, two MFM (standard) floppy drives, and also features two serial ports, a parallel port and a game port...think of the slots you'll save! Hurry, controller cards at this price will sell out quickly!

HSC# HCFIDOE

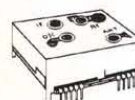
\$19.95

Teeny Tiny Tuner Modules



The unusual item at left is a MITSUMI CRTV9-AC55F 83 Channel Reverse Converter -- the opposite of a tuner -- input IF signal (45.75 MHz) converted to one of 83 CATV signal frequencies (55.25MHz to 547.25MHz) selected by voltage input to varactor diode (3-24VDC). Requires +12,+5VDC-- Pinout, Spec. Sheet & Block Diagram included. Body Measures 3.75"x2"x.75". Useful for Amateur TV? Hams?

HSC #13120 \$14.95



Here is a little module that you won't find anywhere else! This tiny (only 1" x 1.75" x .5") PC mount package is a varactor tuned FM tuner! Made by Toko (Model #TMC103A) for use on an IBM PC FM Subcarrier adaptor board. Uses 8 - 12VDC, tunes from 88.3 to 108.1 MHz from 75 ohm antenna input, has 10.7 MHz IF output with VCO output for control feedback to tuning circuitry. We provide a schematic of a suggested application showing pinout of this module with related tuning circuit.

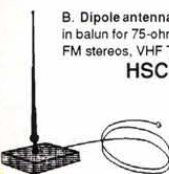
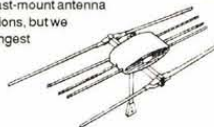
HSC #13101 \$4.95 ea. or 10/\$39.95

Broadcast FM Antennas

A. Winegard SR-8108 Yagi-type FM/VHF Antenna. Small mast-mount antenna appears to have been designed for attic or drop-ceiling applications, but we can't see any reason not to use it outdoors. 22.5" boom, longest element is 67". It was intended for the data receivers we featured in previous ads, but will of course work fine for FM Broadcast reception with your stereo, as well as VHF/TV reception! New with assembly and mounting instructions.

HSC #13086

\$19.95



B. Dipole antenna (not shown). Typical 300-ohm stereo FM-type dipole antenna with built-in balun for 75-ohm coax, plus a six-foot coax cable with F-connectors. Works great with FM stereos, VHF TVs, or the units at right!

HSC #13087

\$1.95ea. or 10/\$15.00

C. FM "Rubber Ducky" Antenna ...18" long with pivot joint on mounting box, 75-ohm coax cable (6 foot) with "F" connector. Could be used in place of "D" above.

HSC #13088

\$4.95

HALTED Electronic Supply

Toll Free (Orders Only) 1-800-4 HALTED (1-800-442-5833)

Retail Stores:

3500 Ryder St., Santa Clara, CA 95051

(408) 732-1573

4837 Amber Ln., Sacramento, CA 95841

(916) 338-2545

6819 Redwood Dr., Cotati, CA 94931

(707) 792-2277

Overstock Specials! Buy Bulk, Save \$\$

Description	HSC #	Each	10 to 49	50 to 99	100 to 500
23 MHz Crystal Oscillator, 4-pin DIP	9539	2.79	2.00	1.00	.80
2N4401 Transistor NPN .6A TO-92	1290	.25	.17	.12	.10
IRF512 Field-Effect Transistor	11296	1.25	1.00	.85	.75
MCR106-6 SCR 400V 4A	2701	.94	.85	.75	.50
1N5243 Zener Diode 13V 500mW	1369	.14	.11	.09	.07
1K 10 Watt Resistor	7874	.25	.20	.18	.15
75 Ohm 5 Watt Resistor	5344	.25	.20	.18	.15
1K DIP Resistor, 16 pin 15 element	1459	.50	.40	.30	.25
100K SIP Resistor, 8 pin 7 element	4594	.19	.17	.15	.11
5 pin DIN Socket, Cable Mount	11640	1.25	1.00	.75	.50
AC Line Cord, 16/3 SJT 6' Grey	11969	2.25	1.50	.95	.75
AC Line Filter, 6 Amp w/ IEC Recept.	7715	4.50	3.00	2.00	1.25
Battery Holder for 4 AA's, wire leads	12706	.79	.70	.50	.40
DIP Relay, 3.8-10VDC, 12 mA cont.	11970	2.49	2.00	1.50	1.00

Attention Hams: MFJ Products 15% Off!

For a limited time, we are offering 15% off on all MFJ Products in stock...this is your chance to complete your ham shack installation or get a beginner's station off the ground! Some items are overstock, some are discontinued, all are new with factory warranty. Prices good only for stock on hand, until September 30. For example:

MFJ-484C Grand Master Memory Keyer...was \$149.95, now just \$125.95

MFJ-1214PC Multimode Controller...was \$149.95, now just \$125.95

MFJ-1278 Multimode Data Controller...was \$279.95, now just \$237.95

MFJ-941E HF Versa Tuner II, up to 300W...was \$109.95, now just \$93.95

MFJ-901B Mini Versa Tuner, up to 200W...was \$59.95, now just \$50.95

MFJ-986 3KW Roller Inductor Antenna Tuner...was \$289.95, now just \$246.95

MFJ-1292 Video Digitizer...was \$199.95, now just \$169.95

MFJ-1274 HF TNC With Tuning Indicator...was \$139.95, now just \$118.95

...and much more, including mikes, loads, switches, keyers, etc.

15% Off! 15% Off! 15% Off! 15% Off!

Discrete Semiconductors - Mix & Match!

FET's:

Part #	Case	Pol.	Volts	Watts	Amps	On-Res.	HSC#	Price
HPWR-4122	TO-3	N-Ch	100V	100W	5A	.3Ω	9837	\$2.50
IRF322	TO-3	N-Ch	400V	40W	2.5A	2.5Ω	11806	\$2.25

MOS-FET's:

Part #	Case	Pol.	Volts	Watts	Amps	On-Res.	HSC#	Price
BUZ42	TO-220	N-Ch	500V	75W	4A	2Ω	11323	\$1.35
BUZ45	TO-3	N-Ch	500V	125W	9.6A	.55Ω	10798	\$4.50
BUZ74	TO-220	N-Ch	500V	40W	2A	.3Ω	11324	\$.95
IRF441	TO-3	N-Ch	450V	125W	8A	.85Ω	11293	\$4.50
IRF512	TO-220	N-Ch	100V	20W	3.5A	.8Ω	11296	\$.75
IRF611	TO-220	N-Ch	150V	20W	2.5A	1.5Ω	11326	\$.75
MTM6N60	TO-3	N-Ch	600V	150W	6A	1.2Ω	11576	\$7.50

Pager Project: You figure it out!

Just in...for those who always wondered how a pager works. For only \$6.95, you get to take one apart and find out! The only thing we have been able to discover about these units is that they are new, use 2 AA cells and operate on a 100.3 MHz subcarrier. Measures 2.5" x 4" x 1". Made by SPANtel, Model 1004. No display, so we think they either beep or have voice announcement. You tell us how they work!!

HSC# 13511 \$6.95 ea. or 10/\$65.00



Popular Rechargeables in Assorted Sizes!



These Gates Cyclon sealed rechargeable lead-acid cells are always in demand at HSC, so don't wait to order if you want some! These cells were removed from multi-cell packs, so the tabs have been soldered, but they have plenty of life! We even learned that you can "rejuvenate" a flat cell by removing the outer metal sleeve and popping out the rubber plug at the top. Just add some distilled water like a car battery! Some of the 24 VDC multi-cell packs are also available.

Type	Size	Rating	Wt.	HSC#	Each	Pack 12
D Cell	2.65" x 1.33"	2V @ 2.5Ah	4 lb	12327	\$2.50	N/A
X Cell	3.16" x 1.73"	2V @ 5Ah	8 lb	13513	\$3.50	\$40.00
J Cell	5.34" x 2.03"	2V @ 12Ah	1.8 lb	13512	\$5.50	\$60.00
BC Cell*	6.78" x 2.55"	2V @ 25Ah	3.5 lb	13514	\$10.00	N/A

*Note: this cell has screw terminals, not tab terminals

Terms: Some quantities limited; all items subject to prior sale. Minimum order: \$10.00 plus shipping. Orders under \$20.00 subject to \$2.00 handling fee, in addition to shipping. All orders shipped FOB Santa Clara, CA (this means you pay freight!) by UPS Surface (no P.O. Boxes) unless otherwise specified, in which case prevailing carrier rate plus \$5.00 handling fee applies. Prepaid orders that don't include shipping charges will be shipped freight COD. There is a \$4.00 UPS charge added to shipping charges for COD shipments. If you have questions about your order, please call Customer Service at (408) 732-1854 M-F 9AM to 5PM PST.



How To Avoid Becoming A Frustrated Power Nerd

Were Windows, OS/2, and Novell written to hog disk space? Do you have more room left in your pocket protector than your hard disk?

Don't run out of disk space and become a frustrated power nerd. CSC has the cost effective solution. A powerful Toshiba disk system with room to expand.

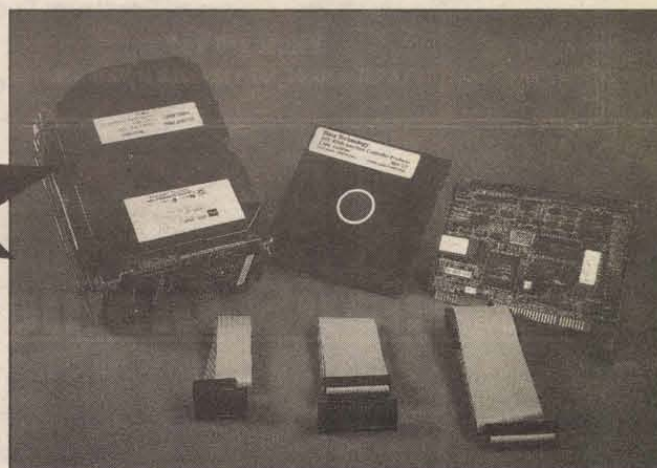
These big brutes scream through spreadsheets and supercharge Windows with the speed of a Ferrari. Enough raw speed to make your power user friends drool with envy.

If you're serious about PC computing, this is your new drive. The 32K cache will unleash the power of your 386 or 486 machine. 650 Megs of capacity leaves room for the good stuff like the new 32-bit Windows NT and OS/2.

Toshiba Drive Kits

- Formatted Capacity
650MB*
- Average Access
16ms
- High Performance
16 Heads
- Incredible ESDI Transfer Rate
15Mbits

\$1095



Complete kits include: Drive, 32K Cache Controller and Cables

Controller Included!

Most dealers charge an extra \$150 for a K-Mart controller that would strangle the performance of this drive. The matching DTC controller CSC offers has a 24Mbit transfer rate and is tuned to complement this high performance drive. It is included free.

Plug 'n Play

To avoid becoming a frustrated power nerd, let the nerds at CSC go to work for you. Just tell us which operating system you're using and we'll rush you a preformatted kit, ready to plug in and play.

*A note about disk capacities:

Many manufacturers and dealers advertise "unformatted" storage capacities. The true formatted capacity is always less. This Toshiba drive stores over 760MB "unformatted" The honest formatted capacity is 650MB.

Brand New!

- One Year Factory Warranty
 - 5 Year Extended Warranty Available
- No Drivers Required** for DOS...Windows 3.1
...OS/2 ...UNIX...Novell...Windows NT

CORPORATE SYSTEMS CENTER

All drives meet or exceed all factory specifications. Although you won't be needing it, every drive includes CSC's fast turnaround 90 day warranty and tech support. CSC also carries a complete line of new and refurbished large capacity drives and controller cards. Call for more information.



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Jack Lemieux

Editor

Larry Lemieux

New Products Editor

Robin Lukasik

Events Calendar Editor

Audrey Lemieux

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Please send all subscription orders, correspondence, UPS, overnight mail and artwork to: 430 Princeland Court, Corona, CA 91719.

The closing date for each issue is the 10th of the prior month, e.g. the closing date for the June issue is May 10th. Ad copy to be typeset by Nuts & Volts should be received one week prior to the closing date.

Call or write for current advertising rates.

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EDITORIAL CONTRIBUTIONS

Nuts & Volts Magazine encourages article submissions and queries.

Send a SASE for a copy of our writers guidelines.

All submissions should be on 5-1/4 or 3-1/2 inch diskettes and include hard copy as well. If return of materials is requested, include a SASE with your submission.

Deadlines should be discussed in advance with the editor but generally all material should be submitted by the 1st of the month for the next month's issue.

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Nuts & Volts Magazine
430 Princeland Court
Corona, CA 91719

Cover Photographed by Warren Bolster
Comsat Hill Satellite Communications Station in Hawaii

Reader Feedback

Dear Nuts & Volts:

I enjoy your magazine and all the different subjects in electronics. But, I would like to see you carry information on Computer Fairs in your subscribers areas.

H. Glenn

We have the most comprehensive events calendar of any monthly publication that we know of. All computer, amateur radio or electronics events that we have information on are listed. The calendar is divided into three regions to help you narrow down your specific area. If you are referring to specific fairs that are not listed, tell the promoters to contact us and we will carry the information.

NV

Dear Nuts & Volts:

Regarding articles on cable scrambling and descrambling, new types of scrambling have come on-line and no magazine has covered the new methods and equipment available to descramble. I would like to see a round up and product review from NV suppliers. I am especially interested in SA & SA-DF.

R. Christian

Dear Nuts & Volts:

You have a good magazine. But, as a career person in Cable TV (20 years), I am depressed by the proliferation of pirate convertors. Here at Coast CATV Supply, we recognize their ads by price (we sell to the legit industry for 1/10th to 1/5th the pirate prices) and by their refusal to sell within their own state. We do work with the FBI to protect our reputation!

R. Roberts

Dear Nuts & Volts:

I think your advertising dealers should be checked out before they are allowed to advertise in Nuts & Volts. A few that I have dealt with suddenly disappear, leaving me holding the bag and not able to get a refund or replacement.

Anonymous

Some have disappeared leaving us holding the bag also. We are fortunate in that it happens less often than you would expect with the large number of advertisers we have. If we can help locate someone who has "vanished" we will gladly do so to help resolve a complaint. The only way we can screen out bad advertisers is to pull the ad when we become aware of a problem.

NV

Dear Editor:

It is good, and I like the newspaper type format. I would like to see more military surplus dealer ads in it, if there are any left. What happened to all the Korean and Vietnam radio gear? Outdated and used in Desert Storm? Fair Radio is the only survivor, most gear has been in stock ten years — WWII.

Aerocom

ATTENTION! Military Surplus Dealers.

Your products are in demand. Call Nuts & Volts at once. (714) 371-8497. We have readers waiting to send you money, but they need an address! (That should do it.)

NV

Dear Editor:

It's great, especially the articles by Don Lancaster! And the Reader-to-Reader problem solving stuff.

C. Santos

Dear Nuts & Volts:

I enjoy your magazine and want ads. I thought your article on Homebrew Power Supplies last month was just excellent.

This month I found a wonderful piece in the want ads on railroad items. Keep up the good work, and I look forward to more "How To" articles.

R. L. Theisen

(Continue on page 93)

HAM GEAR FOR SALE

10

2 METER 5/8 WAVE MAGNET MOUNT 3 DB gain antenna. Rugged fiberglass design Model 9213 \$19.75 each & \$3.00 S&H. Avail. in 220 and 440. A.S.A., P.O. Box 30162, Charlotte, NC 28230 USA. 1-800-722-ANT-1. Dealers Welcome.

FREE ELECTRONICS CATALOG. Quality parts at surplus prices. All new, never used distributor and OEM overstocks. Call IME, 817-561-2244 or write P.O. Box 170415, Arlington, TX 76003.

HAM REPEATERS, 2 meters, 440, prices start at \$300. Call for information. Robert Mitchell KD4PBC, 803-552-0279.

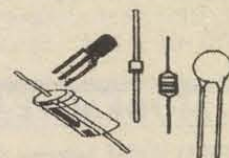
HARD TO find special purpose Integrated Circuits, GaAs FETs. Low cost FM telephone bug & FM Microphone KIT, FM Crystal controlled transmitter chip MC2833. Automatic audio level controller. Low cost Test Equipment. EASY-PC, Schematic and PCB CAD. Free Demo with manual. Send \$5 for shipping and handling deductible from your order. Quick Plot: Plotter Screen Dump Utility program. Call or write for free catalog. C & S Electronics, P.O. Box 2142, Belden Station, Norwalk, CT 06852-2142. Phone/Fax: 203-866-3208.

SIGNS BY BOB. Plastic engraving, name tags, club badges with logos, magnetic signs. W5YI VEC badges, ARRL official engraver. 16041 Brookridge Blvd., Brooksville, FL 34613. 904-596-7086.

FOR SALE: Alinco DJ-160T 2 Mtr. H.T. covers 130-173.995, comes with manual, 1 standard battery & 2 HD batteries. \$300 + shipping. More info on above send SASE to: J.P.J., P.O. Box 518, Whitehouse, FL 32220.

"FERRITE APPLICATIONS," Book, 1992 second printing. Practical, easy to use information about ferrite cores, rods and beads for amateur, technician or experimenter. Identify, understand and apply ferrites. Chokes, transformers, inductors, EMI. \$9.95 postpaid in USA (California add \$0.82 tax). Canada postpaid \$11.00. Includes current 1992 catalog of low cost parts: Ferrite, iron powder cores, much more. Johnson Shop Products, Box 160113, Cupertino, CA 95016. 408-257-8614.

COMMODORE 64 Users. Digicom Packet Modem debugged, wired and tested. Comes with power supply, programmed disk and documents. \$49.00 plus shipping. Crawford Amateur Radio Society, P.O. Box 653, Meadville, PA 16335. Catalogue \$1.00.



100 PIECE GRAB BAG, and flyer of electronic goodies. Send \$2.00 to LYNN JOHNSON, Box 51268, San Jose, CA 95151-1268.

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Write in 42 on Reader Service Card.

Nuts & Volts Magazine/September 1992

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SPECIAL

386-40 64K CACHE WITH CPU - AMI BIOS	\$240
486-33 64K CACHE WITH CPU - AMI BIOS	\$525

HARD DRIVES

21MB IDE AT - 28MS	\$ 99
32MB XT IDE W/CONT	\$119
42MB IDE AT - 28MS	\$190
106MB IDE - 15MS	\$300
130MB IDE - 15MS	\$345
212MB IDE - 15MS	\$520
240MB IDE-8MS	\$625

FLOPPY DRIVES/TAPE BU

1.2MB 5.25"	\$ 55
1.44MB 3.5" W/O Bracket	\$ 53
1.44MB 3.5" W/Bracket	\$ 57
60/120MB Tape Back Up Internal	\$240
125/250MB Tape Back Up Internal	\$295
350/700MB Tape Back Up Internal*	\$795
*Requires TC-02 Controller Card	\$270

CONTROLLER/IO CARDS

16 Bit SCSI H/FDC	\$150
8 Bit SCSI Hard Drive Only	\$ 50
8 Bit SCSI Hard/Floppy	\$ 60
RLL/MFM AT Hard/Floppy 1:1 Inter.	\$50/55
IDEIO H/F + 2 Ser/1 Par/1 Game Port	\$ 28

MODEMS/FAX MODEMS

9600 BAUD HST Robotics V.42	\$550
9600/2400 Int. Fax/Modem - InstaCom	\$ 85
2400 Int. Modem - InstaCom	\$ 45

MISCELLANEOUS

101 Enhanced AT Keyboard	\$ 39
3 Button Serial Mouse	\$ 20
Track Ball	\$ 58
Sound Board	\$119

CASES

Mini Tower w/200 Watt PS	\$ 70
DeskTop w/200 Watt PS	\$ 70
Medium Tower w/200 Watt PS	\$ 95
Full Tower w/250 Watt PS	\$115

MOTHERBOARDS

AT 286-16 W/1MB	\$ 99
386SX-25	\$155
386DX-25	\$200
386-33DX 64K	\$240
386-40DX 64K	\$260
486SX-20	\$330
486DX-33 64K	\$570
486DX-50 64K	\$875

MICE

Logitech Cordless Radio Mouseman	\$99
Logitech Trackman Bus	\$75
Trackman Serial	\$73

MONITORS

12" Monochrome	\$ 85
14" Monochrome Flat Screen	\$ 99
14" VGA Paper White 640X480	\$135
14" VGA Color .41DP 640X480	\$219
14" SVGA Color .28DP 1024X768 Interlaced	\$275
14" SVGA Color .28DP 1024X768 Non-Int.	\$345
Sony 1304	\$595

VIDEO CARDS

VGA 8 Bit 256K	\$ 39
VGA OAK 16 Bit 256K	\$ 35
SVGA Trident 8900C W/1MB	\$ 75
SVGA TSENG Labs 1MB	\$115
Monochrome W/Printer Port	\$ 20
CGA	\$ 20

CHIPS

SIMMS	
1Mx9-80	\$ 33
1Mx9-70	\$ 34
1Mx9-60	\$ 40
4Mx9-70	\$150
4Mx9-60	\$160
256x9-80/100	\$12/10
4Mx8-80	\$140

DRAM	
1Mx1-70/80/100ns	\$5/4.50/4
256x4-80ns	\$5
256x1-80/100ns	\$1.75/1.60
64x4-80ns	\$1.50

CO-PROCESSORS	
287-8/10/12	\$45/75/95
387SX-16/20/25	\$120/145/165
387-25/33	\$175/195

CPU	
386-25/33/40	\$110/130/145
486-50	\$625
486-25/33	\$350/410
486SX-20	\$200

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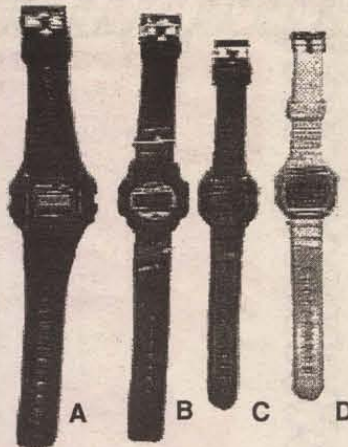
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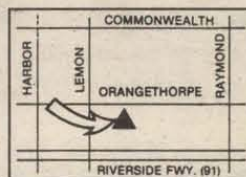
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Nuts & Volts Magazine/September 1992

9

Versatile Frequency Counters

by Gordon West

A portable frequency counter is a must-have field tester when working outside of your shop or ham shack. And there is a lot more that a portable frequency counter can do than just read out the operating frequency of a nearby transmitter.

There are over 15 manufacturers of portable frequency counters. The following three manufacturers offer portable frequency counters in a price category of \$99-\$399:

Optoelectronics
5801 N.E. 14th Avenue
Fort Lauderdale, FL 33334
305-771-2050

Startek International
398 N.E. 38th Street
Fort Lauderdale, FL 33334
305-561-2211

Ramsey Electronics
793 Canning Parkway
Victor, NY 14564
716-924-4560

More expensive portable frequency counters are available from AIE, Anritsu, B & K, Fluke, Marconi, Motorola, Mouser, Sencor, and others. But I have personally tested the portable frequency counters from Opto, Startek, and Ramsey.

The typical portable frequency counter may read out frequencies from 1 MHz to 2,400 MHz for under \$175. If you need a counter that may sniff out intermediate frequencies down to 10 Hz, you'll probably spend a little over \$250 for extended very low frequency operation.

Within the last few years, the top end of how high a frequency counter might read out went from 500 MHz to 1,500 MHz. There is no question why frequency counter manufacturers immediately jumped to the ultra high frequency capabilities—the need for a portable counter at public safety and cellular frequencies between 800 MHz and 900 MHz.

Frequency counter manufacturers have increased the counter's sensitivity to better than 10 millivolts up to about 1,000 MHz, which is just about right for out-in-the-field portable frequency counter use. If you make it any more sensitive than this with

an optional 25 dB pre-amp, your unit will hang up on anything and everything out there, and could give you meaningless cycling numbers. At 10 millivolt typical sensitivity, the modern portable frequency counter will read out the frequency of most 2-way radio equipment out to about 30 or 40 feet away. On low-power sets like cordless telephones and FM wireless microphones, you need to be within about 10 feet to see its transmit frequency.

During our frequency counter testing with both Opto and Startek counters, we found that the little portable antenna selection made a whopping difference on frequency counter performance out in the open. For instance, we wanted to establish the operating frequency of some commercial boats in a local marina. Using a simple telescopic whip, our counters would many times lock up on a nearby paging transmitter on low band, or lock up on a nearby UHF police department transmitter. We knew we were looking for frequencies near 156 MHz.

A quick switch to a 156 MHz pre-tuned rubber duckie antenna, and presto, the interfering signals went away, and we could clearly see the transmitting frequency of the local boats in the marina.

The portable frequency counter is a very wide-band receiver, with no internal pre-selector. Putting on any antenna system specifically cut for a specific

band is one way to "zero in" on the frequencies you are trying to pick up.

Ham radio operators go one step further—they add directional beam antennas to their portable counter, and may use the counter's LCD signal strength bar graph to figure out exactly where the signal is coming in from. With the beam in place, it's typical for the ham operator to count out mobile signals over 100 feet away, and direction-find the transmitting mobile unit by simply following up on beam headings. In-line 20X attenuators can keep the signal strength

bar graph off the peg, and a small frequency counter with the signal strength bar graph makes for a dandy ham radio transmitter hunt accessory.

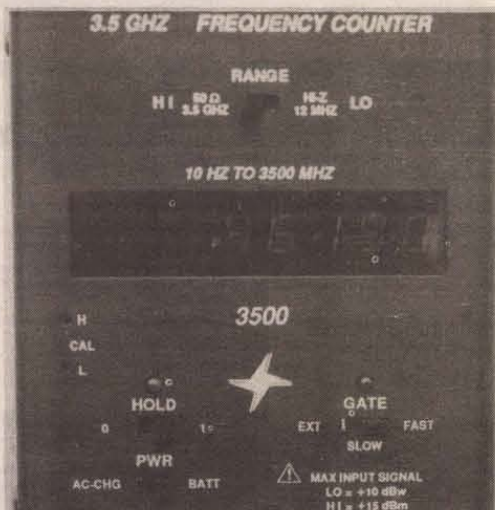
If you plan to use your counter in an area where

there is major RF saturation, you may wish to consider a relatively expensive pre-selector/amplifier add-on. A 20-turn pot with mechanical digital indicator will allow you to peak a 4 MHz wide bandwidth between 10 MHz to 1,000 MHz. You can boost a 4 MHz slice of band by over 30 dB, and attenuate the unwanted portion of the RF spectrum above and below the pass band. Applications could include security sweeps, finding frequencies for communications monitors, law enforcement, transmitter locating, and 2-way radio service.

Your range is dramatically increased by this amplifier/pre-selector. A cordless phone that you could only pick up within 5 feet can now be picked up for 120 feet! A 2-meter handheld might be sniffed out at a quarter mile! I used the Optoelectronics APS-104 active pre-selector/amplifier when working with the local harbor patrol to track down a signal on 156.800 MHz. The stuck carrier was a cinch to track down, once we dialed it in. The closer we got, the less amplification we needed, and it only took us a few minutes to spot an accidentally keyed transmitter.



Optoelectronics readout with signal strength bar graph at bottom of display.



Startek compact LED readout counter.



MFI all-in-one counter & SWR analyzer signal generator.

Portable frequency counters may have two types of digital frequency readouts — light emitting diode, or liquid crystal display. Each has their strong points.

The Startek frequency counters use extremely bright red light-emitting diodes for their frequency readout. The Startek Model 15-BG and 35-BG counters also have a bar graph signal strength indicator. I have operated Startek frequency counters, and they perform well in the lab. They can work off of their own rechargeable batteries, or with 110 volts alternating current with the adapter/charger. The light-emitting diodes are easily seen indoors, and with enough shade provided, you can even make out the red LED's outside.

If you run your frequency counters mainly outside, the line of counters from Optoelectronics feature a black-and-white LCD screen that offers maximum contrast in the bright sunlight. In fact, the brighter it is, the easier it is to see the LCD screen.

At nighttime, the Optoelectronics counter with the optional back light BLB-30 factory modification turns the LCD screen into a brilliant nighttime light show. You can see the big, bold numbers and bar graph easily on the back-lit green display. Opto also produces several frequency counters using LED displays, too.

Part of their back-lit circuitry is their unique beep mode. As soon as your Opto unit picks up a signal strong enough to trip the counter, you hear a beep. That's the time to quickly push the hold button. If you're doing some surveillance work, just step outside, look at the frequency, and you know exactly what was transmitting that triggered your digital frequency display.

And how close is your frequency counter "on the money" when it's reading out a frequency? Both Opto and Startek indicate they "burn" the counter oscillator circuits in to insure they are "dead on" when they leave the factory. You can use WWV for any additional calibration you might want to do on your older aging frequency counter.

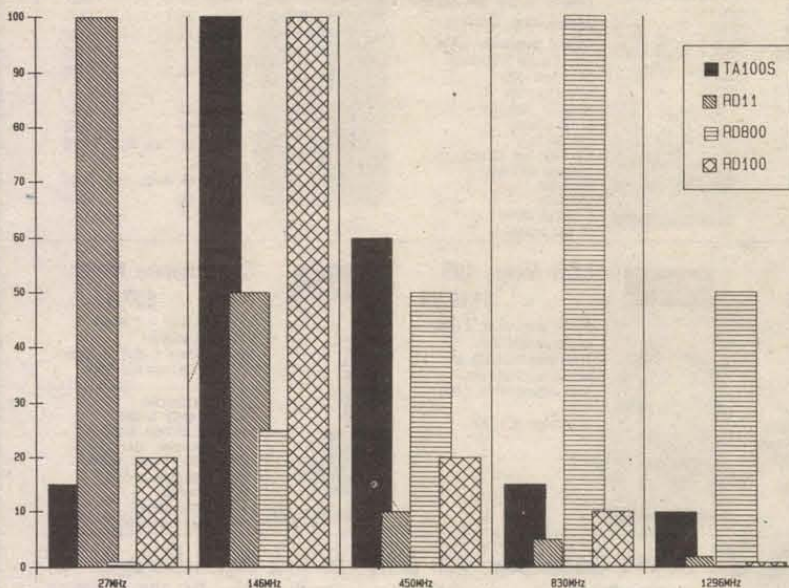
"Most counters use a reference that is a multiple of 1 MHz. Loosely couple the counter reference oscillator to the antenna of a receiver tuned to one of the WWV signals. By listening to the speaker, and observing the S-meter, zero beat the counter's oscillator to WWV," comments Burt Weiner, K6OQK, a commercial broadcast technical specialist. "If the counter time base uses an oddball crystal, such as a color burst crystal, you have no choice but to feed a known accurate signal into the counter. Many counters are only accurate to 1 part per million, or 145 Hz on 2 meters. For example, taking a counter that has been calibrated in a warm shack outside to check a mobile rig in the winter is just asking for trouble," comments Bob Roehrig, K9EUI, of Burkhardt Monitoring Service.

A good point is raised here on frequency counters—find out before you buy the counter what the time base is. Choose a common 1 MHz time base, and calibration will be simple.

An interesting use of frequency counters is the new MFJ 247 SWR analyzer with LCD frequency readout. MFJ has incorporated an Optoelectronics counter in their SWR analyzer device, allowing you an accurate readout of where their little oscillator is transmitting into your antenna system. This lets you see, down to 10 Hz, where your antenna is at resonance.

So which frequency counter is best for you? All of the portable counters that I have tested feature superb USA craftsmanship, and all are backed by a family of experts. Next time you're at a local hamfest or radio store, check out the counters, and see which one has all of those accessories that you might want to get at a later date. Then zero in on a piece of equipment that will let YOU zero in on the radio waves out there just waiting to be picked up. **NV**

Relative Antenna Performance



FREQUENCY COUNTING USING ANTENNAS

Antennas are used with frequency counters to detect and measure RF transmissions at a distance. There are many factors that affect the maximum possible distance. As the relative amount of background RF increases, the maximum distance the counter can be from the source to be counted decreases. In unpopulated areas that have low background levels of RF, distances in excess of 200 feet have been reported using a 5 Watt, 2 meter transmitter. In large metropolitan areas, this distance may decrease to 50 feet or less. Due to this fact, it is impossible to predict exact distances for a given location or set of conditions. This chart gives relative efficiencies for each antenna at several frequencies. Actual distances will depend upon the frequency counter sensitivity.

COURTESY — OPTOELECTRONICS



Opto counter reading out MFJ SWR analyzer.

NEXT MONTH: Gordon discusses the advantages of electronic flux gate heading sensors.

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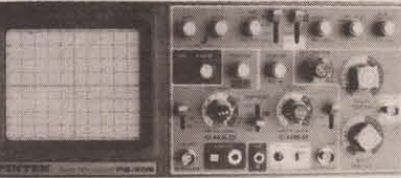
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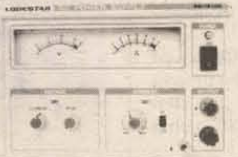
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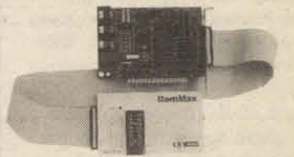
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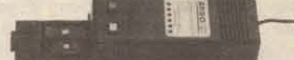
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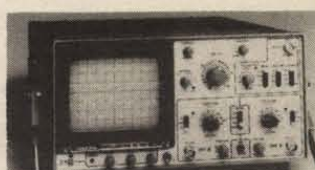
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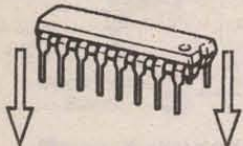
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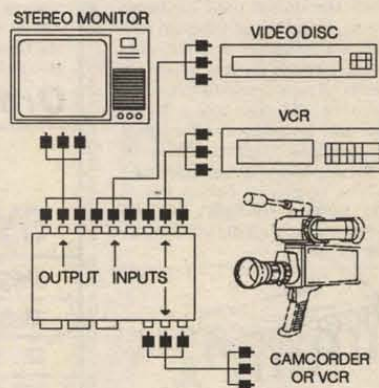
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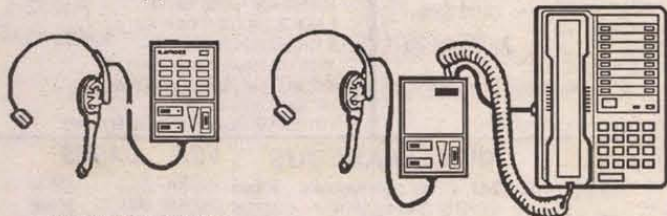
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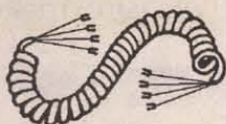


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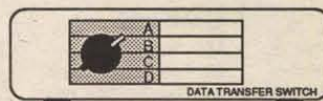
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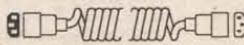
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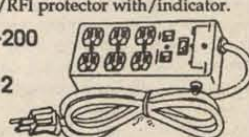
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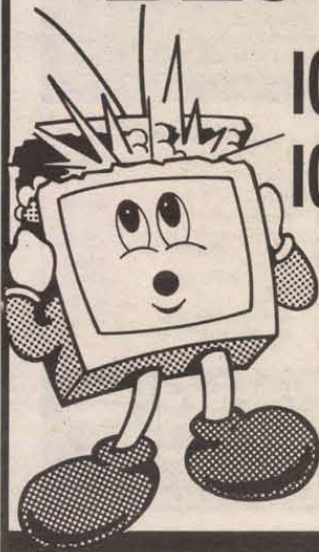
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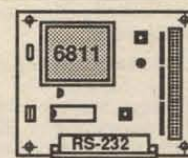
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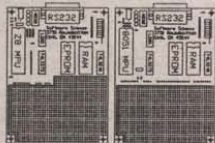
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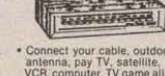


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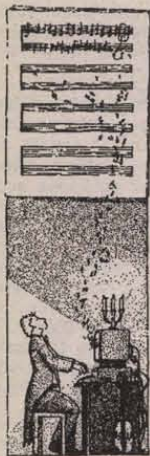
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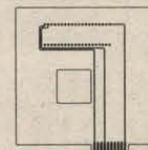
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I'm often asked "What is the best way to learn electronics?" I'll usually answer this one with a new question: "Do you want a well-paying job, or do you *really* want to learn electronics?"

If you simply want an electronics position with an old line Fortune 500 company, the *only* sensible route is a four to six year accredited university program that produces a magic piece of sheepskin that says BSEE or MSEE on it. Plus all of the needed advanced math courses that go with it.

Do note that nearly everyone leaves engineering and then starts up a "real" career twelve to fifteen years after they get their EE degree. Sadly, all the so-called "engineering shortages" trumped up every five years or so are nothing but carefully orchestrated outright lies.

Hey — before you panic, I am a fully degreed and extensively experienced electronics engineer and I am very proud of the fact. And of my track record. I've also made it very much my lifetime commitment, and would not change for the world. It's just that the reality of today's workplace often makes electronic engineering a short term and a largely dead end career.

And it is a severe disservice to tell young people otherwise.

Unless, and this is a humongously big *unless*, you happened to be born with a soldering iron in your cradle. And are forever willing to eat, live, and breathe electronics and computer hardware/software on a total lifestyle basis. Which, of course, means forever forgoing such utter frivolities as

food, clothing, and shelter.

It also helps bunches if you were an undersized or underage wimp who was terrified of girls as a teenager. When even the nerds were constantly stuffing you into trash barrels. The jocks didn't even bother. And gym classes were a stark raving horror.

I strongly feel that trade schools or BSEET degrees are less than a good choice. Most traditional companies tend to draw enormous distinctions between engineers and technicians. Technicians are definitely second rate galley slaves. At least they get treated as such in some corporations.

Very real and very ugly barriers to advancement exist that can mean at least a quarter of a million dollars of lifetime income and benefits. Not to mention a real desk. And chrome trim on your chair. For some individuals at least a part of the time, technician level training can be a sucker bet that should be studiously avoided. In the final analysis, the cost/benefit ratio simply may not be there.

Also note that bunches of excellent electronic and computer products are produced in garages by nondegreed folks who have largely undermined the need for formal training and three piece suits. A university degree of any type is not nearly as important as it was a decade or more back. So long as you focus on very small, unstructured, and nontraditional companies.

What is important is knowing what you're doing and consistently delivering positive and out-the-door results. On the other hand, it definitely takes a few years in a larger company to learn the way the world works. And, Catch 22, chicken and egg, you can't get into the larger company without first earning that magic sheepskin.

Very sadly, many of the traditional opportunities to learn electronics on your own are not nearly as useful as they once seemed. Some high schools have absolutely no electronics courses available. Many community colleges are dropping or scaling back on their offerings. But if you can sign up for any good high school or community college courses, by all means do so.

The military is one obvious place to pick up direct electronics training and benefits which can lead you to more technical education. But that sure as

hell ain't me, so I won't comment any further on this apparent resource.

Scrounging around surplus stores, scoring junk, taking it apart and then rebuilding it remains a great way to first learn electronics. Especially when combined with kits from *Nuts & Volts* advertisers and similar sources.

Heathkit recently dropped many of their kits. But they apparently still continue their educational electronics courses. These are very well done and are quite reasonably priced for what they do deliver. The offerings are an all around good deal.

Heath does have several different catalogs. You have to specifically ask for their industrial education one to get course and self-study info.

Today, ham radio remains the most ethereal shadow of what it once was. But your local ham club can still be a good place to pick up electronic basics and lots of hands-on experience. An important book in your electronics library should definitely be the *Radio Amateur's Handbook*.

I am also laboring under the grave delusion that my *CMOS Cookbook*, *TTL Cookbook*, and *Incredible Secret Money Machine II* should all be an important part of any electronics library.

Computer clubs could also be a big help. But make certain you associate yourself with hackers rather than end user groups. Hackers in that original definition of the term, of course. As creative individuals who'll push the envelope and challenge the limits. On a total lifestyle basis.

I seem to be ending up associated with a group of loosely knit ventures which are starting to look more and more like some medieval guild. Lone artisans who interact and interdepend upon each other. While totally sharing experiences. Which leads me to think that the classic apprenticeship might once again become a superb way to learn electronics.

So, it might be a darn good idea to try and set up a student-mentor or apprentice-guru relationship with an appropriate engineer, teacher, or a science type in your neighborhood. More bluntly, you have to bug the hell out of them. At the very least, you should be able to score some older klunker oscilloscope with this ploy.

Or get rid of one.

Electronics can no longer stand on its own. These days, you absolutely *must* mix electronics with computer hardware and software. There is no point whatsoever in learning one of these without the other.

The newsstand electronic mags are a great way to pick up the electronic fundamentals. Besides *Nuts & Volts*, I can personally recommend lots of others. Such as *Electronics Now* (RE), *Popular Electronics*, *Circuit Cellar*, *Electronics*, *Science Probe* and *Audio Amateur*. Also check out an incredible British pub called *Wireless World*. It is one of the finest electronics magazine anywhere ever.

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Write in 39 on Reader Service Card.

Electronic BBS sources are getting more and more important for picking up electronic information and gaining valuable networking contacts. While I hope you find my very own PSRT on GENIE useful, be sure to check into GENIE's RADIO RoundTable.

To quickly research any electronic, scientific, or computer topic, you use the *Dialog Information Service*.

Dialog has recently offered a new and one-quarter cost late evening rate price structure.

But the Best Way ...

OK. By far your two best and most

cost effective ways to really learn any electronics today is a combination of hands-on personal experience and the aggressive use of all of those free trade journals as information gateways.

It never ceases to amaze me how many people have never even heard of trade journals. Let alone use them. Trade journals are only available to insiders in a tightly targeted industry.

They never appear on newsstands and only rarely advertise. They are strongly advertiser driven, since most subscriptions are free. Besides their technical content, trade journals lead you to bingo card ad responses, data manuals, ap notes, samples, seminar info, specialty bookstores, contacts, catalogs, employment ads, directories, courses, and great heaping bunches more. Most importantly, the trade journals also establish the mainstream vibes and lingo for their target area.

To qualify for a free trade journal subscription, you must already be in the industry. Or else you have to set up your own electronics venture. As my new *Incredible Secret Money Machine II* shows you, this can get set up in a few minutes for a few dollars. Most trade journals have to be rather fussy over just who their comp subscribers are so they can qualify for a special and very cheap *controlled circulation* postal rate. But all that really matters in the end is whether you are genuinely interested in (and a potential buyer of) all their advertiser's products.

You can pick up some trade journal subscription qualification cards at a larger technical library. Or ask for them over the phone or by way of a new PostScript laser printed business letterhead. Or, you can contact their advertising department and request a sample copy and an ad rate card.

You then fill out their qual card, presenting yourself and your venture in as positive a light as possible. And always ask yourself "Who are their advertisers looking for in the way of customers?" Some trade journals are rather easy to qualify for; others are

there were some 45,000 trade journals currently being published.

Once again, trade journals form a high energy and low cost information gateway. One that could be a very effective way to learn and improve your electronic and other skills. Let's look at a few of my favorites ...

E. E. Times

This tabloid newsprint publication is by far the best US electronic trade journal. This is a really fine mix of tech news, emerging developments, component parts, and employment surveys. Such far ranging topics as wavelets, HDTV, fuzzy logic, and new algorithms all do tend to appear here first. Really useful info.

As with most of the trade journals, there's a bingo card that leads you to data sheets, ap notes, seminar info, and even free chip samples. Plus lots of coupons and fax sheets.

There are several "big newsprint" competing offerings. The oldest is the *Electronic News*, who have recently reworked their 1948 editorial layout style into some stunningly fresh 1956 graphics. *Electronic News* tends to emphasize personalities and who is now doing what to whom, especially which CEO's are sleeping with which government contractors, and/or vice versa. While rather stuffy and old line, their classified ads offer good wholesale surplus bargains.

A second competitor is *Electronic Buyer's News*, which tends to address many issues of interest to purchasing agents in Fortune 500 firms. But, once again, the classified ads offer lots of wholesale surplus.

And the *EDN News Edition* is a "Hey look! Me too!" imitator of *E.E. Times* that tries to do all the same things in the exact same way, but it just barely misses in the attempt.

Electronic Design and EDN

These form my number two and number three choices. Two bi-weekly magazines that offer in-depth surveys of component parts and useful tech articles. But note that the stories are provided by their advertisers and often go out of their way

to studiously ignore a competitor's solution or try to shove a point of view down your throat. As long as you factor in the "Why are you telling me this?" both magazines do offer excellent tutorials on current technology trends.

Both magazines also offer detailed annual directories of microprocessors and such, along with industry wide product listings.

ELECTRONIC AND OTHER TRADE JOURNALS

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Circuits Assembly 600 Harrison Street San Francisco, CA 94107 (415) 905-2200	Foodservice Prod. News 104 Fifth Avenue New York, NY 10011 (212) 206-7440	PCIM 2472 Eastman Avenue #33-34 Ventura, CA 93003 (805) 658-0933
Computer Reseller 600 Community Drive Manhasset, NY 11030 (516) 365-4600	HVAC Product News 400 N Michigan Avenue Chicago, IL 60611 (312) 222-2000	Pollution Equipment News 8650 Babcock Blvd Pittsburgh, PA 15237 (412) 364-5366
Design News 44 Cook Street S210 Denver, CO 80206 (303) 388-4511	ID Systems 174 Concord Street Peterborough, NH 03458 (603) 924-9631	Powder & Bulk Solids PO Box 640 Morris Plains, NJ 07950 (201) 292-5100
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EE Times 600 Community Drive Manhasset, NY 11030 (516) 365-4600	Machine Design 1100 Superior Avenue Cleveland, OH 44114 (216) 696-7000	Sensors 174 Concord Street Peterborough, NJ 03458 (603) 924-9631
Electronic Comp. News One Chilton Way Radnor, PA 19089 (215) 964-4345	Measurement & Control 2994 W Liberty Avenue Pittsburgh, PA 15216 (412) 343-9666	Surface Mount Technology 17730 W Peterson Road Libertyville, IL 60048 (312) 362-8711
Electronic Design 611 Route 46 West Hasbrouck, NJ 07604 (201) 393-6060	Microwave Journal 685 Canton Street Norwood, MA 02062 (617) 769-9750	Textile World 29 North Wacker Drive Chicago, IL 60606 (312) 726-2802
EITD 2057-2 Aurora Road Twinsburg, OH 44087 (216) 425-9000	Microwaves & RF 611 Route 46 West Hasbrouck, NJ 07604 (201) 393-6286	Trade Winners PO Box 2868 Vancouver, WA 98668 (206) 694-1765
Electronic News Box 1051 Southeastern, PA 19398 (215) 630-0951	Motion Box 6430 Orange, CA 92613 (714) 974-0200	TypeWorld One Technology Park Drive Westford, MA 01886 (508) 392-2157

Electronic Products and ECN

Both of these cut to the chase. Their emphasis is strictly on new electronic products and who builds them. The *Electronic Products* folks also produce the annual *EEM Master* multi-volume purchasing directory that covers just about everything electronic. They also publish their *IC Master*, which is a similar multi-volume directory and integrated circuits selection guide.

You can sometimes cop a free or bargain *EEM Master*, but pretty near everyone has to pay the going rate on the *IC Master*. The charges usually vary from \$130 to \$174, depending on the time of year. You can also try to get out-of-date copies.

ECN, short for *Electronic Component News* is a larger "throwaway" tabloid. It consists solely of ads for electronic parts and fake editorial material that describes the ads for these

parts. Once again, the bingo cards, coupons, and phone numbers are valuable ways to zero in on mainstream components.

Electronics

At one time several years back, *Electronics* was the best industry trade journal. Fat issues were crammed to the gills with quite well-written and in-depth technical applications stories and detailed tutorial analysis. They literally defined the industry.

Sadly, this mag has been milked as a cash cow and got passed around from corporate takeover to corporate takeover, and is no longer even the remotest imitation of its once great self. The latest attempt is to make it an international survey magazine with an outrageously high and "paid only" subscription price. I would expect it to shortly vanish entirely. Sigh.

**NEXT MONTH:
Don gives us an insider's
look at the great
PostScript language.**

extremely difficult.

After you do qualify for one or two trade journals in any industry, all the others will steal your name from the original mailing lists and actually beg you to subscribe.

The best place to get a complete list of trade journals is on that reference shelf at your library. My favorite here is the *Uhlrich's Periodicals Dictionary*. You might also find the *International Standard Periodicals Dictionary* to be a useful resource. Last time I checked,

The Electronic Industry Telephone Directory

No, this one is not really a trade journal and it is usually very hard to get a current free copy. And it's only published annually. But I find it to be number two on my resource list, right behind my own *Synergetics Names & Numbers* files.

This looks and works like any other phone book, with the usual white and yellow pages. Just about everyone electronic is listed here.

Specialty Electronic Journals

All of those switching mode power supplies, motor controls, and the "big mutha" semiconductors have their own collection of trade journals. I do prefer *PCIM* the best, which once was named *PowerConversion & Intelligent Motion*. The others include *Motion*, *Motor Techniques*, *Motion Control* and *Power Techniques*.

For sensors and such, your two best selections are Carl Helmer's *Sensors* magazine, along with *Measurement and Control*. I have also found the *Pollution Equipment News* throwaway to have useful info here.

For radio frequency and higher electronic design, you might try *RF Circuit Design*, the *Microwave Journal*, *Microwaves and RF*, and *Microwave New Product Digest*.

For printed circuit manufacturing, try *Circuits Assembly*, *Surface Mount Technology*, or *Electronic Packaging & Production*.

For the bar codes and identification stuff, *Automatic ID News*, *ID Systems*, and *Identification Journal*.

For motors, solenoids, actuators, valves, timers, and similar goodies, try *Appliance*, *Appliance Manufacturer*, and *Appliance New Product Digest*.

For really great insider prices on lots of computer products, *Computer Reseller* or *Trade Winners*.

The Other Stuff

My favorite three of the mechanical design magazines are *Design News*, *Machine Design*, and *New Equipment Digest*. The latter includes lots of free sample offerings.

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I do personally subscribe to several hundred trade journals that range the gamut from *Powder and Bulk Solids* to *Fire Engineering* on to *Quick Printing* to *HVAC News* to *TypeWorld* to *Textile World* to *Foodservice Product News*.

That last gem is the world's greatest diet magazine — you just read it before every meal. And try to second guess whether the glop in the bottle is a new dessert topping or an EPA approved grease trap clarifier. This is also the home for all of the world's dumbest blueberry recipes.

By now, you should get the general idea. Industry trade journals are an unbelievably outstanding good deal when properly used as an information gateway. And they are a very good means to learn or later improve your electronics and other skills. For more listings on more trade journals, go to *Uhlricht's* at your local library.

Always keep all your qualification requests fully professional. Never look like a student or a lone individual!

Two Contests

Let's have us two different contests for this month. Just tell what you feel are the seven most important books for learning electronics. If the cover isn't broken on your fifth personal copy, don't even bother to mention it. And tell me why you feel each of the books is essential.

Or else tell me about any obscure trade journal in any off-the-wall field that I have not yet heard about and do not already subscribe to. Better yet, send me an actual copy of the trade journal. Or at least a qual card or a copy of the masthead page.

There will be a dozen of my newly republished *Incredible Secret Money Machine II* book prizes going to the best, along with an all expense paid (FOB Thatcher, AZ) tinaja quest for two going to the very best of all.

Be sure to send all of your written entries directly to me at *Synergetics* per the end blurb, rather than to *Nuts & Volts* editorial.

I have put our *Names & Numbers* together into a pair of sidebars, one for trade journals, and another one for everything else. Be sure to check out these sidebars first before you contact our voice helpline for further info. **NV**

Microcomputer pioneer and guru Don Lancaster is the author of 27 books and countless articles. Don maintains his no-charge tech helpline found at (602) 428-4073, besides offering all of his own books, reprints, and all his consulting services. He also has a free brochure full of his resource secrets waiting for you. Your best calling times are 8-5 on weekdays, Mountain Standard Time.

Don is now the sysop of Genie PSRT, where a special Resource Bin topic has been reserved for *Nuts & Volts* readers. You can call Genie at (800) 638-9636 (voice) for connect info. Or you can reach Don at *Synergetics*, Box 809, Thatcher, AZ 85552.

OTHER MENTIONED RESOURCES

Audio Amateur
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Peterborough, NH 03458
(603) 924-9464

Circuit Cellar Ink
4 Park Street Ste 20
Vernon, CT 06066
(203) 875-2751

Elector Electronics
PO Box 876
Peterborough, NH 03458
(603) 924-9464

Electronics Now
500-B Bi-County Blvd
Farmingdale, NY 11735
(516) 293-3000

Genie
401 N Washington Street
Rockville, MD 20850
(800) 638-9636

HeathKit
PO Box 1288
Benton Harbor, MI 49022
(616) 982-3200

IC Master
645 Stewart Avenue
Garden City, NY 11530
(516) 227-1300

Nuts & Volts
430 Princland Court
Corona, CA 91719
(714) 371-8497

Popular Electronics
500-B Bi-County Blvd
Farmingdale, NY 11735
(516) 293-3000

Radio Amateur's Handbook
225 Main Street
Newington, CT 06111
(203) 666-1541

Science Probe
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COMMODORE 64 Ham Programs. 8 disk sides, over 200 Ham programs, \$16.95. 29¢ stamp gets unusual software catalog of utilities, games, adult and British disks. Home-Spun Software, Box 1064-H, Estero, FL 33928.

IBM, COMMODORE 64/128, AMIGA SOFTWARE. 1000's of Public Domain and Shareware disks. Free large descriptive catalog or \$2.00 for catalog with sample disk (specify computer type). Disks O'Plenty Inc., 8362 Pines Blvd., Suite 270V, Pembroke Pines, FL 33024.

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ENGINEER SOFTWARE, new catalog \$5.00 comes with order forms and scholarship applications. E.S. Singh, guru, 5216 Arboles #5, Houston, TX 77035.

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OSCILLOSCOPES

TEK 465 Scope

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- ◆ Dual trace 5 mV/div to 5 V/div
- ◆ DC to 100 MHz bandwidth
- ◆ Time base A: 0.05 μ sec/div to 0.5 sec/div in 22 steps
- ◆ Time base B: 0.05 μ sec/div to 50 msec/div in 19 steps
- ◆ Portable - weighs 25.3 lbs.

\$795

TEK R561B Scope

- ◆ Rackmount version of model 561B.
- ◆ DC to 10 MHz response
- ◆ Illuminated parallax-free graticule.
- ◆ Ideal for X-Y displays.
- ◆ Requires two plug-ins, from 2- and 3-series for operation.



\$125

HP (MII USM-339) Scope

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HP 201C

High Power Audio Oscillator

- ◆ Covers 20 Hz to 20 kHz in three overlapping ranges with $\pm 1\%$ dial accuracy.
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HP 3205A



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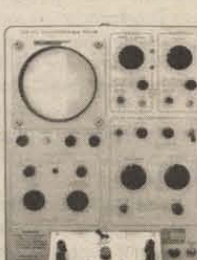
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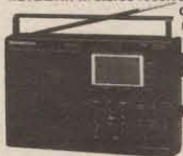
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Build A Telephone Hold Button

For home or business

by Fred Blechman

What? Only six parts — and not even a battery? Is this worth the space for a construction

article in Nuts and Volts?

That could well be your reaction when you look at the simple circuit for the Telephone Hold Button, shown in Figure 1. What isn't obvious is the number of things you can learn from building and using this circuit. Not only that, you'll probably want to build several of these "buttons," perhaps one for every phone in your home or office!

The Telephone Hold Button allows you to put any incoming or outgoing call on "hold," with a red indicator showing the other party is waiting on the line. It works with all phones on that line; hang up one phone and take the call on another. Or just put someone on hold while you leave the phone to get something or someone, and the telephone microphone is muted.

When you pick up the phone on that line, the indicator goes out and the phone operates normally. When the call is completed you won't have to run back to hang up the phone you answered or from which you called. Also, you won't have those times when you FORGET to go back and hang up the phone, leaving the phone line "busy" to callers — until you notice the phone off the hook!

If you're ingenious, you can build this circuit right into existing telephones, using the suggested parts kit, or possibly with parts you have on hand. More on that later.

Telephone Primer

Telephones are everywhere, and pretty much taken for granted. You pick up the handset and you get a dial tone.

You dial a number (usually by pushing buttons) and the other party answers.

When you're finished, you hang up. You never think of the amazing technology behind it all — especially when calling long-distance or internationally.

What started as simply two wires and a battery between two instruments is now an almost incomprehensible conglomeration of wires, relays, amplifiers, undersea cables, fiber-optics, microwave towers, geostationary satellites and "black boxes" of all sorts — always changing, improving, and getting more complex.

But some things remain the same. Your standard phone has at least two wires coming into it, usually red and green. (In multi-phone installations, you have various solid-colored and striped wires.) The green wire carries a positive voltage in relation to the red wire. When the phone is not in use ("on hook") this voltage is about 45 volts direct current (DC), and the current is essentially zero (actually, around 20 microamperes, with the actual value depending on a number of things).

When the receiver is raised "off hook," this voltage drops to about 5 volts DC, and a significant current (about 25 milliamperes, with the actual value depending on several factors) flows through the phone lines. This milliampere current flow signals the central station that your phone is off-hook, and the dial tone is connected to your line. As long as this approximate amount of current flows, the line stays connected.

If you want to keep the line connected ("hold") when you hang up the receiver, you must find some way to keep the current flowing, thus fooling the central station into thinking you're still connected. The Telephone Hold Button does just that.

Component Descriptions

Although this is a simple circuit, some of the components require further explanation. This will help you to understand how the Telephone Hold

This is the fourth in a series of construction projects primarily for beginners — but useful to all. Although parts and printed circuit boards are available in kit form, with the information in these articles you can build these projects with parts you may already have, or obtain from various suppliers advertised in Nuts & Volts. A schematic, basic theory of operation, construction details, and a complete listing of parts are provided.

Button works. Also, later on I'll tell you how to substitute parts for those specified if you decide to "roll your own" instead of getting the Parts Kit offered.

The light-emitting diode (LED — see Figure 2) has become quite common, replacing the pervasive neon and power-hungry incandescent pilot lights and indicators used years ago. The LED is merely a one-way electronic gate that glows (red is the most common color) when the "anode" has a positive "breakdown" voltage with respect to the "cathode." This is usually a small voltage, as low as 1 volt to start emitting light, so very little power is used. The more current, the brighter the glow.

However, an LED used by itself will "avalanche" — that is, once the breakdown voltage is reached, current will increase and destroy the LED anode/cathode junction unless the current is limited. A resistor is used to limit current, also limiting LED brightness.

LEDs can fail. Too much current (from either too much forward voltage, or too low a value of resistance, or both) can burn out an LED. Also, if you apply too much voltage in reverse (positive on cathode with respect to anode), you can burn out the junction.

The diode (also called "rectifier") used in this circuit (Figure 3) is a one-way electronic gate that does not glow. It allows current to flow in only one direction. When the voltage on the anode is approximately .7 volts higher than the cathode, current flows. (Remember, we're talking current here, not electrons. Current flows from positive to negative — or less positive — and electrons flow in the reverse direction, attracted to positive.) This results in a small voltage drop of about .7 volts across the diode junction.

The SCR (silicon-controlled rectifier), as shown in Figure 4, has three terminals: anode, cathode and

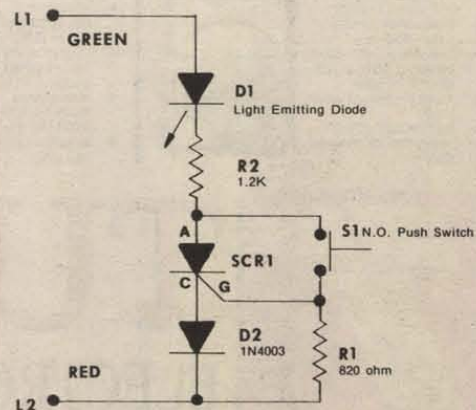


FIGURE 1 — Telephone Hold Button Schematic

TELEPHONE HOLD BUTTON

gate. In order to conduct current, the anode must be positive with respect to the cathode, like any rectifier (diode). However, unlike a regular rectifier, the SCR needs to be "triggered" by a minimum positive voltage at the gate terminal. In effect, positive voltage provides a "latching current" at the gate that unlocks the anode/cathode path, allowing essentially free current flow. Like any diode, there must be a "load" to prevent too much current from flowing, burning out the junction. But there's another feature of an SCR that makes it especially useful: once the trigger voltage is removed, the SCR continues to conduct from anode to cathode unless it is "starved" below a "holding current" threshold. More on this later.

Circuit Description

Looking at Figure 1, you'll see that D1, R2, SCR1 and D2 are all connected in series across the phone line, with the GREEN wire assumed positive. If the phone is on-hook, other than a small "leakage" current, nothing is happening. Why? The SCR has no positive voltage on the gate, so the gate is closed, even though the voltage from GREEN to RED is about 45 volts DC.

When you pick up the phone, it is off-hook and the GREEN to RED voltage is about 5 volts DC. It doesn't matter if you're making a call or receiving one. To put the other party on hold, press the S1 switch. Suddenly the top of R1 forms a voltage divider with R2. The positive voltage at the top of R1 (a ratio of $R1/(R1+R2)$, or $820/2000$) triggers SCR1 into conduction, permitting current to flow through D1, R2, SCR1 and D2. The LED glows slightly. Now when you hang up the phone, the voltage increases to almost 30 volts and the LED glows brightly. Release S1. The LED stays bright and the line is held because sufficient current is flowing through SCR1.

But that's not the end of the circuit action. When any phone on that line is picked up (even an extension) the line voltage drops to 5 volts again, and the LED should turn OFF. At this low voltage, the SCR becomes current-starved and stops conducting. That's exactly what you want. The hold button circuitry is now again dormant, and when you hang up, the line is released.

D2 is used here to protect the circuit from reverse voltage when connected to the phone lines, especial-

ly since the GREEN and RED voltages are sometimes reversed in older phone installations. (The old rotary-dial phones did not care about voltage polarity. Tone-type phones will not work if the phone line polarity is reversed.)

Parts Substitution

As is common with simple circuits, you can substitute components in place of the ones specified in the Parts List. The intention here is to specify parts commonly available from Nuts and Volts advertisers, and those parts used specifically in the Parts Kit offered.

For example, you can use resistors of smaller (1/8 watt) or larger (1 watt or more) power ratings, and they can be made from substances other than carbon. There is nothing very critical about the resistance values, so you don't need to look for expensive 1%-tolerance or even 5%-tolerance resistors. In fact, as mentioned later, one of the resistor values may need to be changed to work with your particular telephone line!

LEDs come in various colors, sizes, and shapes. There is no need for any special LED here, but I suggest you get the common red "jumbo" type (cylindrical, about 3/16-inch diameter with a dome top), since they are the brightest for the lowest cost.

The 1N4003 diode specified in the parts list is a power diode, intended to carry considerable current and withstand significant reverse voltage. It is rated to carry one ampere (1A) of forward current and withstand 200 volts of peak inverse voltage (PIV). Since this is connected essentially across the phone line, and voltage spikes can occur, it's wise not to use a lower-rated reverse voltage diode. However, the current capacity need not be more than 50 milliamperes (ma).

There are many types of SCRs, some capable of carrying very large currents. In this circuit, the specified C106B1 is a common type rated for 6A and 200PIV. Like the diode just described, you only need about a 50ma current capacity in this circuit, but stick with the 200PIV.

The S1 switch can be any sort of normally-open pushbutton type that closes when pressed, and opens when released. The most popular type is the kind with a red button on top, as shown in the Figure 5 pictorial. If you are going to install the Telephone Hold Button circuit inside an existing telephone, you

may need to find a miniature pushbutton switch to fit the space available.

Construction

If you build the EKI Telephone Hold Button Kit offered in the Parts List, it will take about 15 minutes to build. Figure 5 shows the parts mounted on the printed circuit board. Unfortunately, the Pictorial Diagram in the Project Learning Manual that comes with the EKI kit is incorrect; it transposes L1 and L2 locations. Use the Figure 5 shown here.

You do need to be careful about several things. The LED must have its flat side (cathode) placed as shown; D2 must have the colored band (cathode) placed as shown; SCR1 should be facing as shown, so the cathode and anode leads are not reversed. Leads L1 and L2 go to your telephone, as explained later.

If you decide to make your own printed circuit board, the layout is shown in Figure 6. If you are intending to install the hold button circuitry inside an instrument, the printed circuit board (1.6- by 2.0-inches) is probably too big; make your own design, or use perforated board. If you use your own parts, read the CAUTION further on.

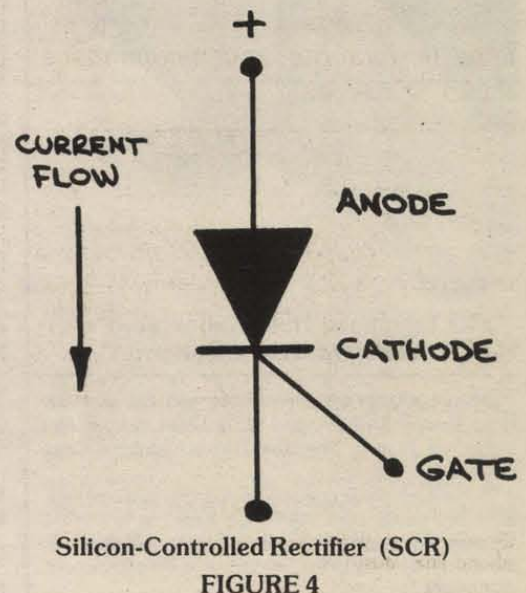
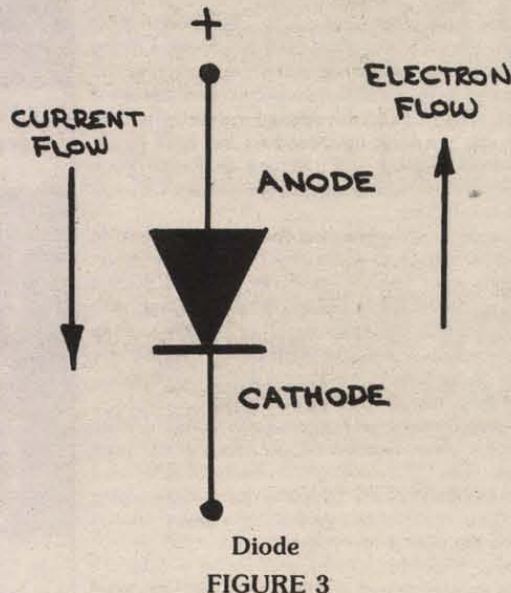
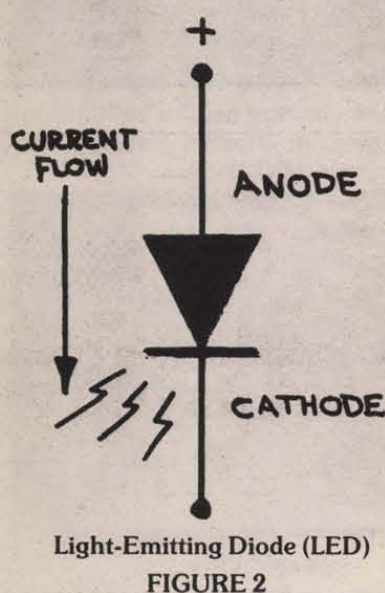
Testing & Troubleshooting

The best way to test the finished unit is to use clip leads to temporarily connect it to the phone line, just as you intend to install it. This way you'll have access to both the high and low phone line voltages.

First you'll need to open up the base of your phone and identify the two wires that come into the base and power your phone. These are normally GREEN (positive) and RED, but can be different colors on multi-line phones. If in doubt, use a voltmeter and look for about 45 volts DC with the phone not in use.

Connect the L1 (GREEN) lead of the Hold Button to the positive voltage terminal of your phone line, and L2 (RED) to the other terminal in your phone. Nothing should happen.

Pick up the phone, listen for the dial tone, then dial your own number. You'll hear a busy signal. Press S1 and the LED will probably glow dimly. Continuing to press S1, hang up the phone. The LED should get much brighter. Let S1 go and the LED should stay on and bright.



TELEPHONE HOLD BUTTON

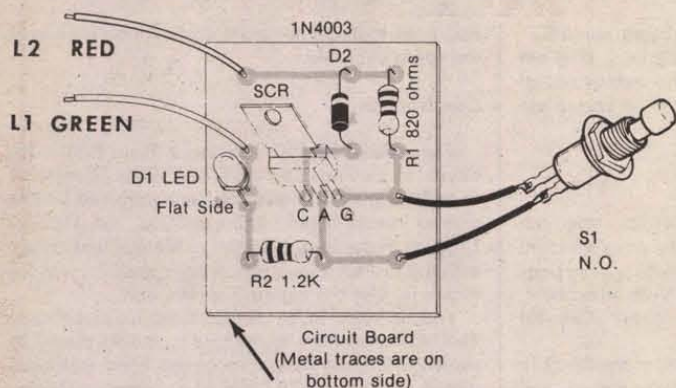


FIGURE 5 — Pictorial. Carefully note orientation of some parts. See text.

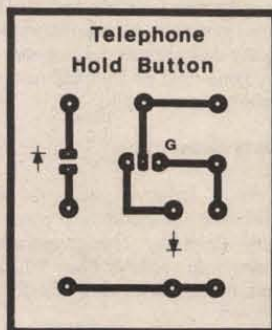


FIGURE 6 — Printed Circuit Board

After a slight delay to be sure the LED stays on, pick up the phone again. You should still hear the busy signal (NOT the dial tone!), and the LED should go completely out.

If the hold button isn't working properly, check the orientation of D1, D2 and SCR1, as described earlier. Make sure all solder connections are good, and no solder "bridges" are shorting connections. If your unit still doesn't work (especially if it's a home-brew job), read the CAUTION that follows later.

Installation

If you build the kit in the Parts List, you'll probably find the printed circuit board too large to put inside a regular telephone. Just plan to have the Telephone Hold Button board alongside the telephone instrument, or mounted to the instrument with double-sided tape. You can be as neat or messy as you please. Just make sure you can easily press the switch and see the LED.



EKI Telephone Hold Button used with standard desk telephone.

Open up your telephone base and connect the Hold Button GREEN and RED wires as just described for Testing. The Hold Button should work as described.

If you like a challenge and are handy, you can wire the parts inside your telephone base, or inside an adapter that your phone can plug into. Make sure the switch and LED are mounted to be convenient and visible.

CAUTION!

Trust me! Build the kit offered in this article, even if you have some parts in your junkbox. At least use the printed circuit board, even if you make your own. Why? Let me tell you what happened to me.

I built three Telephone Hold Buttons, since there are three phone instruments in this house that I frequently pick up and have to put down to go to another instrument in another room. I built the first Hold Button from the EKI kit offered in the Parts List. Worked like a charm! So I decided to build two others from parts I had around. That's when the frustrations started.

After a quick search through my various parts boxes, it seemed I had all but the 820-ohm resistors (what an odd value!) and the SCRs. Since I was hot-to-trot and a Radio Shack store was nearby, I went there. They do not carry 820-ohm resistors of any type, but I got two of their Cat. No. 276-1067 SCRs (identical ratings and similar in appearance to the SCR furnished in the EKI kit).

Scrounging into some old parts boxes I hadn't used in over 20 years, I found two 820-ohm 1/2-watt resistors. Using a 1- by 1.5-inch perforated board, I connected up the parts with point-to-point wiring. It didn't work. I carefully checked the wiring and found I had two SCR leads reversed. My fault, but very easy to do with point-to-point wiring. It seems the simpler the circuit, the less careful you are likely to be.

But it still refused to work when connected to the phone. It acted completely dead. Hmmm. Using my trusty multimeter, I found the GREEN and RED wires on this particular phone line (used with a rotary phone) had the polarity reversed! So I reversed the connection to the Hold Button circuit - and it seemed to work. Then I noticed it refused to reset when the phone was put back on the hook; the LED stayed ON instead of going OFF. Apparently the off-hook voltage was too high to current-starve the SCR, and it kept conducting.

The solution was lowering the value of R1 from 820-ohms to 680- or 470-ohms. This has the effect of stealing some holding current from the SCR (thus cutting off the SCR at a higher off-hook voltage), but still allowing it to trigger when S1 is closed. Since the Radio Shack SCR was not the C106B1 intended for this circuit, it probably has slightly different characteristics. Okay, two down and one to go.

Number 3 was even more trouble. Built just like the home-brew Number 2, it refused to work properly. The LED would go on, but not STAY on. I tried everything I could think of. I checked the wiring thoroughly - okay. I changed R2 to a lower value. I checked the phone line polarity.

Finally, I looked around and found a C106B1 SCR in another as-yet-unbuilt EKI kit, and replaced

the Radio Shack SCR with the EKI SCR. The Hold Button now worked perfectly! Apparently the Radio Shack SCR was so far out of specification that it required too much holding current.

Summary

The Telephone Hold Button is such a handy and inexpensive device that you might want to make one for each of the phone instruments in your home or office. It will save you from going back to hang up a phone when you go to another extension, or - worse - forgetting to go back and leaving the phone line "busy."

But be careful about making home-brew units with junk-box parts. NV

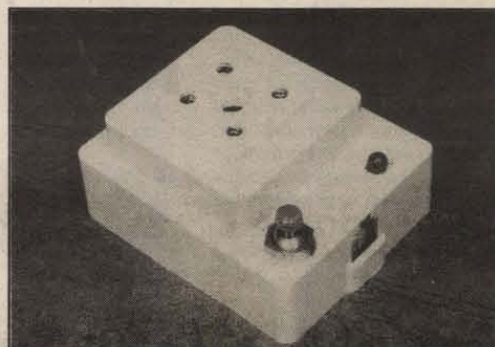
Fred Blechman has written over 500 magazine articles and five books about microcomputers since 1978.

PARTS LIST

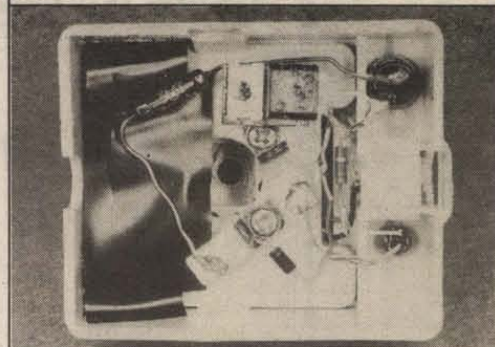
- D1 - Light-emitting diode - see text
- D2 - 1N4003 silicon rectifier - see text
- R1 - 820 ohm 1/2-watt carbon resistor - see text
- R2 - 1.2K ohm 1/2-watt carbon resistor
- S1 - SPST normally-open pushbutton switch
- SCR1 - C106B1 silicon-controlled rectifier - see text

NOTE: The following items are available from EKI, Inc., 16631 Noyes Ave., Irvine, CA 92714. (800) 453-1708 or (714) 833-1314 for Spanish. Add \$1.50 shipping and handling per order. CA residents add 7.25% sales tax.

- #1092BN - Complete parts kit, including printed circuit board - \$5.00
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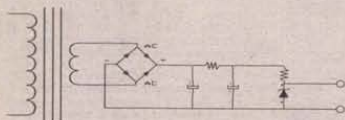
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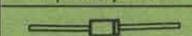
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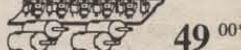
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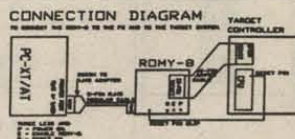
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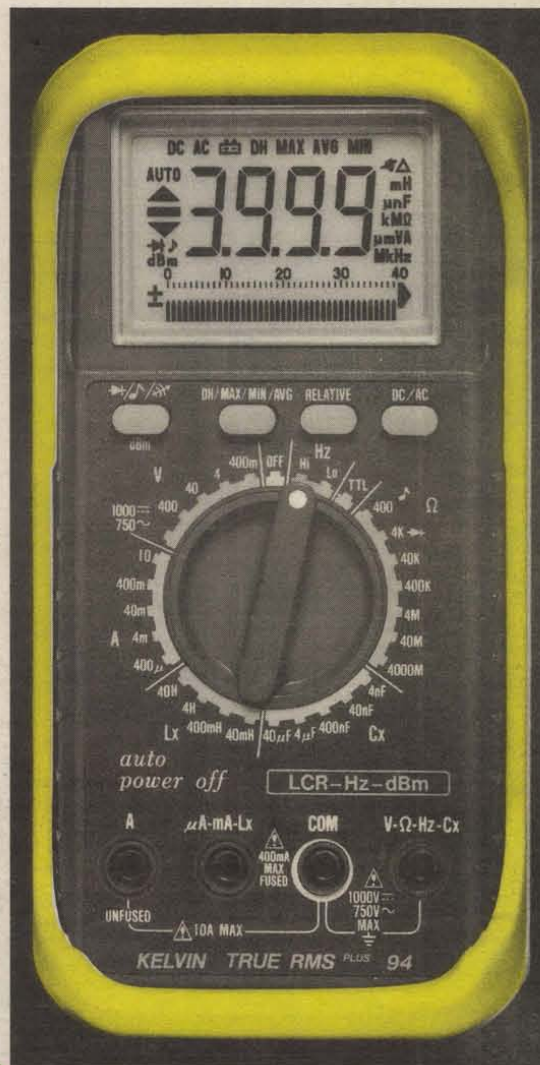
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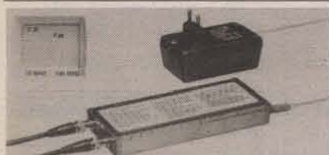
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HP3570A NETWORK analyzer \$1200. HP8334A radiant flux detector \$200. HP8750A storage normalizer \$800. HP59306A relay actuator \$500. HP9872A plotter \$200. 818-352-6619.

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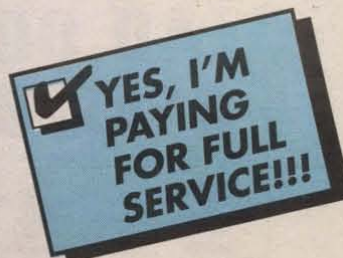
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Tech Forum

This is a **READER TO READER** Column. All questions AND answers will be provided by Nuts & Volts readers and are intended to promote the exchange of ideas and provide assistance for solving problems of a technical nature. All questions submitted are subject to editing and will be published on a space available basis if deemed suitable to the publisher.

QUESTIONS

On ICOM XX9's, the 229 series repeater offset increments in 25 (not 5) KHz steps. The factory says this is in the software in the micro. Is it really? On the 449 series, the receiver is .25/12db from 400-450 MHz, but goes above 450 (450-470 MHz). It drops off to 4-5uV/12db. Any suggestions on these problems would be very much appreciated.

#9921

J. Torgan

I have a model #CXX radio by Commtron and would like to know how to get lower channels (40 below CB Band).

#9922

Charley 3

What is the maximum plate voltage of an 8417 tube?

#9923

J. Harris

I would like to have a design for a Loran 'C' radio receiver. Loran 'C' is a worldwide navigation system which transmits on 100KHz only. The position determination is done by measuring the relative time of receipt of 3 or 4 different stations. A suitable receiver would enable anyone to play with Loran using a PC or similar.

#9924

W. Brown

I own a 1980 or 1981 model HK 3051 Harman/Kardon receiver. It does not have a remote control. Volume is controlled by a large knob attached, I think, to an ordinary pot.

I would like to be able to adjust the receiver's volume by remote control. Does anyone know of a kit or a project I could build that would do this for me? Even a simple remote controlled "mute" button would help.

#9925

B. Wood

Send all questions and answers to: Nuts & Volts Tech Forum, 430 Princeland Ct., Corona, CA 91719 or Fax to (714) 371-3052.

ANSWERS

ANSWER TO #8925 — AUGUST 1992

Adding an audio alert tone to your Optoelectronics handheld frequency counter is a great idea, and a feature I'm surprised is not offered by the manufacturer. Since your counter is constantly "counting" frequencies from the pervasive "background" radio frequency (R) emissions that surround us, you can probably only do this while using the "gate" function on the counter to lock the counter to a signal stronger than the background radiation. If you can follow the schematic or functional block diagram of the counter, you'll find a logic line that goes high (+v) or low when the counter gates and locks a frequency to the display. That same logic state can be used as a trigger for your audio alert device with only a simple connection to the actual circuitry of the counter. Just beware of voiding your warranty, and see if Opto follows your lead. Maybe you'll be collecting royalties eventually.

D. Thorn

ANSWER TO #89217

The scan rates of the original CGA video standard are identical to that of NTSC; 15, 734.26KHz horizontal and 59.94Hz vertical. The scan rates for VGA were increased (ie 31.47KHz horizontal and 70.08Hz vertical) in order to increase the resolution. Two reasons for the increase in cost, of VGA over CGA, are the higher quality CRT and the circuitry for the multiple scanning frequencies.

Monitor manufacturers don't believe that most people are willing to spend the extra money on high(er) quality monitors and then use them to look at relatively low quality NTSC pictures. And since composite NTSC requires more circuitry (including

color and tint controls) to demodulate the NTSC signal into RGB, why should circuitry that is not required for normal computer usage be added to an already more expensive monitor?

If you buy a "video converter" expect to spend \$150. I suggest that you obtain a schematic for your Zenith monitor and clone that circuit. There are companies that make devices to convert NTSC into computer RGB and visa-versa. Three of them are:

Faroudja Laboratories
Sunnyvale, CA
(408) 245-1492

RGB Spectrum
2550 Ninth St., Suite 114
Berkeley, CA 94710
(415) 848-0180

Folsom Research
526 East Bidwell St.
Folsom, CA 95630
(916) 983-1500

G. McLam

EDITOR'S NOTE: An article appeared in the October 1990 issue of Radio Electronics regarding NTSC to RGB conversion.

ANSWER TO #89225 — AUGUST 1992

Designers of the 80286 PC decided to include a battery-backed real-time clock. Since the chip they originally selected (Motorola MC 146818) has "extra" (unused) RAM, it was decided to use this area to store "setup" information.

Newer PC designs employ "chipsets." This is where many ICs are replaced by one custom IC. Chips & Technologies (C&T) is the most popular company providing these chipsets. The C&T IC that is used for storage of CMOS "setup" information is the chip whose name ends with '206 or '306.

G. McLam

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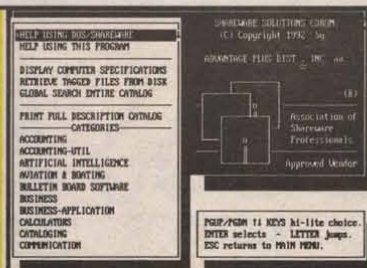
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ANSWER TO #89227 — AUGUST 1992

Here are three ways to hook up your Apple IIc to your spare TV.

1. Simple and Cheap — Hook the composite video cable that goes to your IIc monitor to the camera, or line input on your VCR, and put the VCR in Camera, or Line Input mode.

2. Easy but Expensive — Purchase an Apple IIc RF Modulator from an Apple Authorized Service Center. The adapter hooks to the 15 video connector on the back of your IIc. Even though the IIc is no longer in production, an Apple service center can order you one of them as a service part.

3. Hard to Find, Sort of Cheap — Purchase a third party RF Modulator. These modulators have a composite video in from the cable that goes to your IIc monitor, and a TV (usually VHF ch 3 or 4, or UHF ch 28) output. You want an RF modulator with its own power supply, since you will not be able to power it from the IIc like the one Apple makes.

Note (for options 2 and 3): You may wish to purchase a "Game/TV" selector box if you don't already have one. They come with Nintendo and the like TV video games. This will allow you to flip a switch to change between the TV and the IIc without unscrewing and swapping cables each time. A third party RF modulator may come with a switch box, or it may be built in. You can also have an Apple authorized service center order one of these for you.

A good source for the third party modulator is Radio Shack.

L. Griffin

QUESTION INFORMATION

TO BE CONSIDERED FOR PUBLICATION

All questions should relate to one or more of the following:

- 1) Circuit Design
- 2) Electronic Theory
- 3) Problem Solving
- 4) Other Similar Topics

INFORMATION/RESTRICTIONS

- No questions will be accepted that offer equipment for sale or equipment wanted to buy.
- Selected questions will be printed one time on a space available basis.
- Questions may be subject to editing.

HELPFUL HINTS

- Be brief but include all pertinent information — if no one knows what you're asking, you won't get any response (and we probably won't print it either).
- Write legibly (or type) — if we can't read it, we'll throw it away.
- Include your Name, Address and Phone Number — only your name will be published with the question, but we may need to contact you.

Send all questions and answers to: Nuts & Volts Tech Forum, 430 Princland Ct., Corona, CA 91719 or Fax to (714) 371-3052.

ANSWER INFORMATION

- Include the question number that appears directly below the question you are responding to.
- Payment of \$25 will be sent within three weeks of publication if your answer is printed.
- Only one answer per question will be printed.
- All answers submitted within a reasonable amount of time but NOT published will be forwarded to the reader submitting the question.
- If you do not want your name, address, or phone number available to the reader please so indicate or it will be assumed that you have no objection.
- In the event that more than one person submits the same solution, the choice will be made at the discretion of the publisher.
- Due to space limitations, we can not reprint the original questions with the answer. The question number and the issue it appeared in are printed above the answer.
- Unanswered questions from a past issue may still be responded to.

necessary. This may be as simple as replacing a fuse or fusible resistor. Also, if you did find a shorted pin-driver transistor, test the associated printhead solenoid for a short due to overheating. If the printhead is damaged, I know a good depot repair company that could save you considerable money compared to buying a new head.

T. Young

ANSWER TO #8922 — AUGUST 1992

An excellent metronome circuit that meets your requirements appears in the 12/85 issue of Radio Electronics.

This circuit uses only three inexpensive IC's while providing an adjustable downbeat emphasis and audible and visual outputs. The counting rate can be set from 1 to 200 beats per minute. If 1% resistors and a quality capacitor are used, the calibration will be consistent between units.

K. Bay

(Continued on page 78)

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Nuts & Volts Magazine/September 1992

Home Automation

by Mark Blumenthal

Home Automation... what is it, why is everyone going wild about it, and how can you automate your own home?

In layman's terms, home automation is the control of your home's lights, appliances, audio/video and climate (heating and air) by one or more of the following: Wireless remote control, table-top control centers, voice control, situation control, and pre-scheduled control. An example of control by situation is music playing if someone is in the room, or a light coming on if it is dark AND it is not Thursday.

Home automation offers homeowners excellent benefits including security, convenience, cost effectiveness, safety and energy savings. Save energy by setting back your thermostat while you're asleep or away at work. Schedule your indoor/outdoor lighting, lawn sprinklers and pool filter for maximum energy efficiency. After a hard day at work, enjoy the convenience of wireless remote control of your home. Before retiring to bed shut down all the lights and appliances with the push of a single button. If you hear an intruder at night, flood your home and yard with light with the touch of a button. Enjoy control of remote lighting without the trouble and expense of rewiring. Call home and warm up the Jacuzzi before you arrive.

The 1980's brought us the personal computer boom and the video tape rental boom. Experts are calling home automation the boom of the 90's. Stanley and Tandy's (Radio Shack) sales of home automation products have skyrocketed. Trade magazines in the technical and security arenas are saturated with articles on automation. People love it. Many love the novelty of it all, showing off their automated homes to friends and neighbors. Others love it for the security and energy management. Whatever the case, home automation is hot.

Power Line Carrier Signaling

A Powerline Carrier Signal, or PLC signal, is a home automation command sent over the home's power line to a remote module. For example, the command "Module A3 Off" broadcast over the home's AC electrical system would cause any modules set to code A3 to respond by turning off.

The PLC signal used by X-10 (USA) Inc. is so widely used it has become the "defacto" standard in the home automation industry. Based in New Jersey, X-10 (USA) Inc. is an OEM (Original Equipment Manufacturer) who produces home automation equipment under private labels for Tandy, Stanley, Heath/Zenith, Sears, Leviton and others.

The "X-10 signal" is a 120 KHz 5V burst transmitted at zero crossing AC, as shown in Figure 1.

How It Works

"Controllers" (transmitters) and "Modules" (receivers) are the meat and potatoes of the X-10 home control system. You plug your lamps and appliances into modules and set a unique "address" (id code) for each module. This address consists of a "house code" and a "unit code." House codes can be set to any letter between A and P and unit codes can be set to any number between 1 and 16. Hence an X-10 module can be set to any one of 256 (16 x 16) unique addresses.

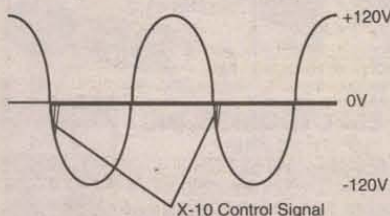


FIGURE 1 - The X-10 Signal

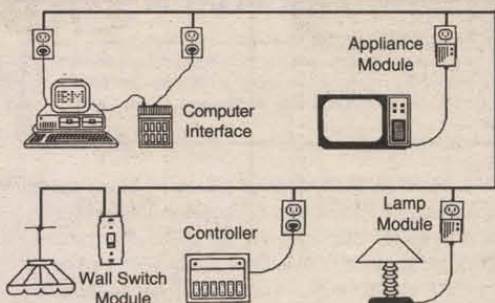


FIGURE 2 - System Diagram

Module types include plug-in, wall switch, wall receptacle and in-line (wired-in). Transmitters also come in several flavors: table-top controllers, in-wall controllers, voice controllers and "schedulers."

A scheduler (also called a timer) is a programmable device used to set up and run a schedule for your X-10 modules. For example, at 7:05 a.m. your scheduler could automatically turn on your stereo, light your way to the bathroom, start the coffee and warm up the curlers.

Figure 2 shows a system diagram with plug-in modules controlling a TV and lamp, a wall switch controlling an overhead light, a table-top transmitter and a scheduler

(computer interface). The modem-sized computer interface allows you to set up a home schedule using your IBM, Mac, Apple or Commodore computer. Once programmed the computer may be used for other purposes or shut off.

System Development

X-10 makes a development module called the TW523 Two-Way Powerline Interface. This plug-in module has an RJ-11 (telephone type) jack with serial data I/O. The module may be interfaced to a custom controller board or a PC, and comes with 12 pages of in-depth technical data. Home Control Concepts (see Sources, below) sells a development package for C-language programmers. Their package is thorough and includes the TW523 module, cable and adaptor, documentation, and development software including C-language libraries for Microsoft and Borland C-compilers. They also sell a nifty PC to Infrared interface.

Sources

Equipment from Radio Shack, Heath Zenith, X-10, Stanley, etc. are all X-10 compatible and can be mixed and matched. Radio Shack sells the X-10 compatible stuff under the label "Plug'n Power." Modules cost about \$15 each. The best source we've found is a San Diego based company called Home Control Concepts (619-693-8887). They are a wholesaler who just recently went "wholesale to the public." They sell modules at about \$8 to \$10 each.

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Motion Detector

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X-10 Development Kit

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Use with PC to Infrared Interface to develop a system which combines home automation and IR control; any X-10 controller can control infrared! With addition of Voice Master Key, voice control of the home becomes possible. Use X-10's Soundwave to give disk/dawn input to your system. Add PC mail card for remote call-in control of X-10!

Requires IBM PC or compat. computer with parallel port and C-language compiler (Microsoft or Borland). Includes TW523 module, adapter, interface cable, development software, demo program & technical info/data. HCC-523K **ONLY \$69!**

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PC to Infrared Interface

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Requires One-For-All remote control (see upper left). Remote has special port which connects to your PC's serial port (using our cable and hardware interface). Use the SendIR program to transmit infrared signals by "pushing buttons" on the remote control. For example type the dos command SendIR TV MUTE to mute the tv, or SendIR VCR REC to start your VCR recording! Call SendIR from DOS batch files, your existing software program, or develop a program from scratch using sample source code.

Complete with cable and hardware interface, development software, sample C-language source code, technical info/data and documentation. Requires One-For-All remote control and IBM PC or compatible computer with serial port. HCC-PCIR **ONLY \$69!**

Stanley Premier Home Control

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Keychain control of anything!

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TRANSMITTER: Tiny keychain transmitter is approx. half the height of a matchbox! Transmitter has two buttons corresponding to channels 1 and 2. Includes two Lithium batteries. Up to 100' range.

RECEIVER: Board level receiver measures approx 3" square! Requires power supply of 8 to 24 VDC or 12 to 18 VAC. Two outputs (channels 1 and 2) can each switch up to 300 mA @ 18 VDC maximum to ground. Directly activate relays, drive bulbs, more.

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12 Vdc	500 ma.	2.1 mm co-ax	negative	DC1X-125	\$4.50
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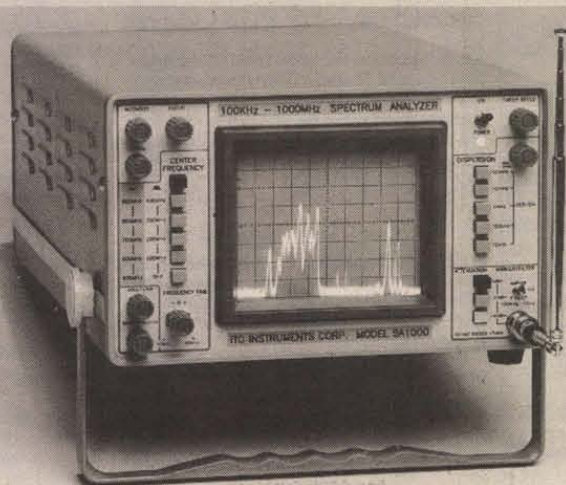
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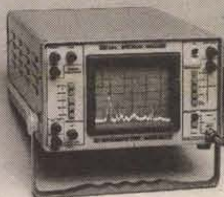
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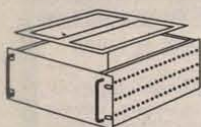
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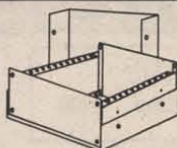
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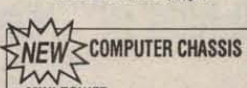
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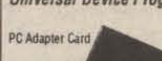
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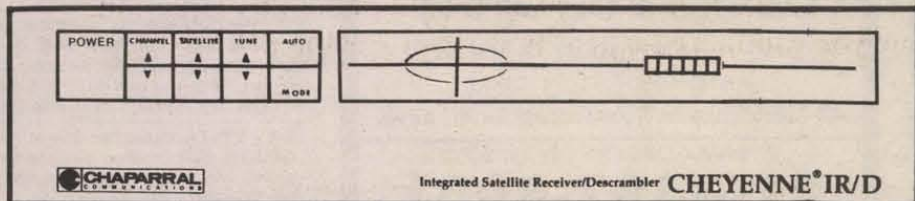
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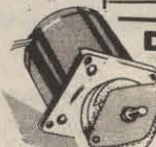
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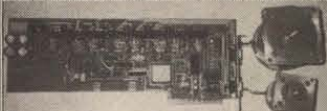
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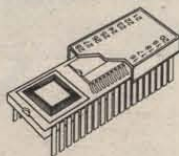
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Nuts & Volts Magazine/September 1992

57

Build This Telephone Memory Dialer

by Steve Sokolowski

Wouldn't it be nice to have up to eight of your most commonly used telephone numbers right at your finger tips? And learn computer programming to boot? With our 8051 Memory Dialer you can do just that. Designed around a single board computer kit available from Suncoast Technologies (70691C), Spring Hill, Florida, the Memory Dialer can be easily programmed to pulse dial any one of eight preprogrammed telephone numbers. Just by lifting up the telephone's handset and pressing a spring return switch that corresponds to the desired number, the 8051 microcontroller chip (the brains of the 70691C), sends out a train of pulses that controls the on/off operation of a normally closed 5 volt relay.

By controlling the percent of make and the percent of break ratio of the RY1 contacts, the telephone's control center (Central Office) is fooled into thinking that a standard rotary type telephone is placing the call; not a computer.

By storing the desired telephone numbers in EPROM memory (making them part of the program itself), Blackouts and AC voltage interruptions due to thunderstorms (a common occurrence in Florida) that will immediately erase all standard computer data, will have no effect on our Memory Dialer. Upon the return of power, the 8051 will reset itself and automatically run the Memory Dialer program stored inside the 2764 EPROM chip. Seeing that the pulsing relay (RY1) of our Memory Dialer is in series with the telephone line, normal dialing from a telephone or emergency dialing (during power failure) can take place without any difficulty.

Seeing that our design uses pulse rather than tone dialing to place calls, our Memory Dialer can be installed easily on either Rotary or Tone Dialing telephone lines.

Basics of Pulse Dialing

Figure 1 shows a device used by telephones worldwide to "pulse out" telephone numbers. It's called a rotary dial. You've seen these before. To dial the number 5, you place your finger in the plastic

wheel (finger wheel) and rotate the dial until your finger's rotation is terminated by the finger stop. When your finger is removed, a spring (now tight by the rotation of the finger wheel) is allowed to return to its resting position. By using a mechanical interface between the finger wheel and the main gear, two relay-like contacts can be controlled (see Figure 2). Figure 3 is a close-up of the two control contacts — one called "Receiver Shorting" and the second called "Pulse Contacts."

The receiver shorting contacts are designed to close as soon as the finger wheel is removed from its resting position. The wires soldered to these points are connected across the telephone's receiver through its coil cord. If not for these shorting contacts, loud 'clicks' generated by the pulsing contacts of the dial can be heard in the receiver. By shorting the receiver element only during the dialing period, these annoying pulses can be virtually eliminated.

The Pulse Contact is the mechanical switch made to create the continuous train of pulses. The number of pulses created depends on how far the finger wheel on the dial was turned. If the desired number is 5, the pulse contacts will open then close five times. If the number were 7, the contacts would open then close seven times. If you dialed the operator (or 0), the pulse contacts would make ten complete open/close cycles.

Figure 4 illustrates the relationship between the opening and closing of the rotary dial's pulsing contacts. Figure 4A shows the pulsating voltage across the telephone line, while Fig. 4B shows the Receiver Shorting contacts. The pulsating voltages created by the opening and closing of the rotary dial's contacts is counted by the Central Office (CO) to determine the number that was dialed. By combining these numbers into a seven or eleven digit telephone number, the mechanical or electronic switching at the CO will then send the RINGING Voltage to the

called telephone. Whether the called telephone is across the street or across the nation, this "pulse counting" and line connection can take place within 7 to 10 seconds.

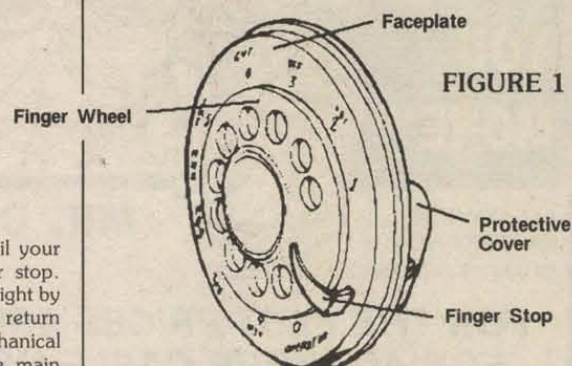


FIGURE 1

The Operation of the Memory Dialer

Now that we have an understanding of how rotary dialing works, it's an easy task to deceive the switching equipment at the CO into thinking that our circuit is a rotary dial and not a relay. By having the 8051 'read' each digit in the desired telephone, and by controlling a timing loop — both using assembly language — we have the makings of the Memory Dialer.

Figure 5 shows the schematic of the 70691C Single Board Computer from Suncoast Technologies. This SBC eliminates the complex wiring of the Address/Data buss of the 8051. Available in kit form, the 70691C eliminates the confusing buss wiring of the microcontroller by using a double sided pre-etched and drilled printed circuit board with plated through holes. Just place the ICs in their correct locations on the board; solder in place. Within a few minutes you have a working computer waiting for the additional interface components to make our Memory Dialer.

Figure 6 illustrates how your 70691C single board computer should look when all components are installed. Note that the design team of Suncoast Technologies was nice enough to include sufficient board space that can be used as a prototype area. It is here where we will install the few additional 'Dialer' components. From this diagram, you can see that with the soldering of only 10 wires to the 8051, your project can be completed within an hour or so.

The schematic of the 70691C interface components can be found in Figure 7. RY1, as mentioned earlier is the 'Pulsing' contact while RY2 simulates the 'receiver shorting' contact. Wire the normally closed contacts of RY1 in series with either the RED or GREEN wiring coming from the telephone line. RY2's normally open contacts are wired in parallel

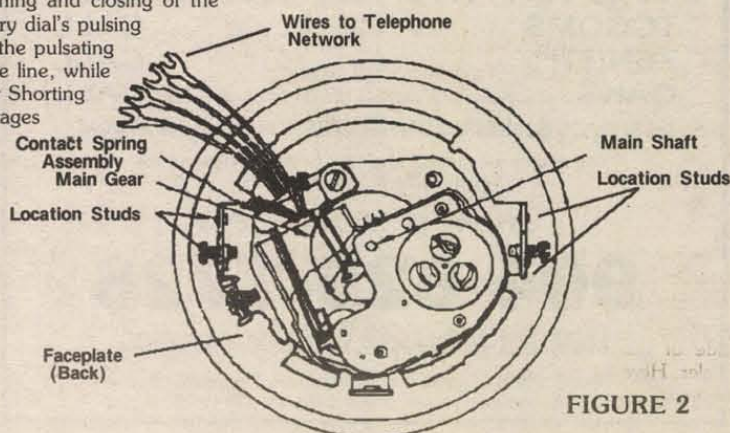


FIGURE 2

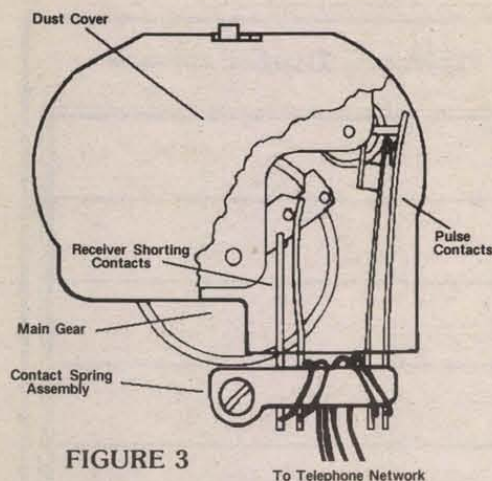


FIGURE 3

(with a 100 to 200 ohm resistor in series) across THE TELEPHONE SIDE of the dial tone line. When the Memory Dialer begins to pulse out the desired telephone number, RY2 connects resistor R4 across the telephone. This resistive loading doesn't eliminate the loud 'clicking' associated with dialing but it does suppress it quite a bit.

Selecting one of the eight available telephone numbers is quite a simple task. There are eight spring return push buttons, each applying a ground to a Port 1 pin (Pins 1 to 8 on the 8051). Depending which pin receives the ground, its associated telephone number will be dialed. The use of a rotary switch is not recommended for this project because the .ASM program stored in EPROM will begin to dial a telephone number approximately 2 seconds after a ground is sensed on any Port 1 pin. If a rotary switch were used, a constant ground would be placed on one of the 8051 pins, thus disrupting the Dialer's program.

The eight push buttons should be mounted in a straight line either in the horizontal or vertical. Each button should be labeled with the name of the person

The Power Supply

Figure 9 is a schematic of a small power supply that can be used with your completed Memory Dialer. With a 12 volt DC (150mA) wall transformer connected across C5, any unwanted ripple can be filtered by this 470uf capacitor. The 7805 (TO-220) is a 5V volt regulator. This IC can deliver a constant 5VDC with a wide variety of input voltages. Under normal use, IC4 will become quite hot to the touch so installing a heatsink makes good sense.

When wired and tested for its 5V output level, take the supply and solder it to the two power connections shown in Figure 6. Before any testing can take place, we must first program our 2764 with the proper telephone numbers.

The Memory Dialer Program

Shown in Listing 1 is the complete .ASM Memory Dialer program. Seeing that each telephone number resides in ROM and that the telephone numbers 'saved' will be different from one user to the next, you must include, assemble and program a 2764 with your individual numbers. It might seem difficult at first but it's quite easy — easy because the needed programming software is given FREE of charge by Suncoast Technologies with each single board computer purchase.

The Editor Program

To start programming our EPROM, you must first load the program (Listing 1) into an Editor or any documentation software that will save the program in ASCII format. When typed in, note lines JJ to SS.

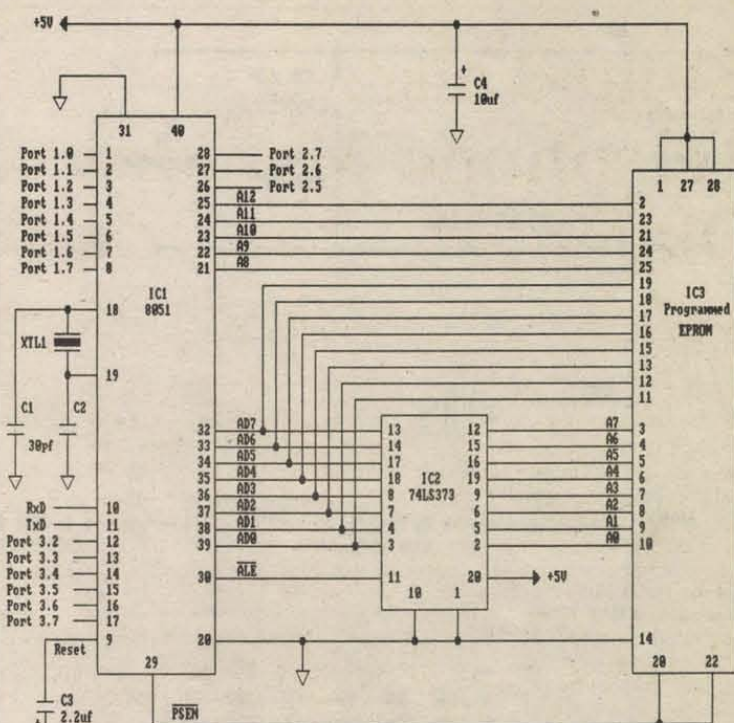
It is here that you will include the desired telephone numbers. The format for these numbers can be: x-xxx-xxx-xxxx or xxx-xxxx or xxxxxxxxxx or xxxxxxxx.

In other words, each telephone number can be included in the program as one would normally write it (555-6787 or 1-800-456-8765). The program will also accept numbers without the (-). Just type 5554654 or 18005557656. Just remember to include the .DB command that is also found on the same line.

A data line for lines JJ to SS can read as follows:

```
JJ:      .DB      "1-800-555-6787"
          .DB      ESC
          LJMP     START
DIAL-2:  LCALL    XSTRING
```

When all eight telephone numbers have been



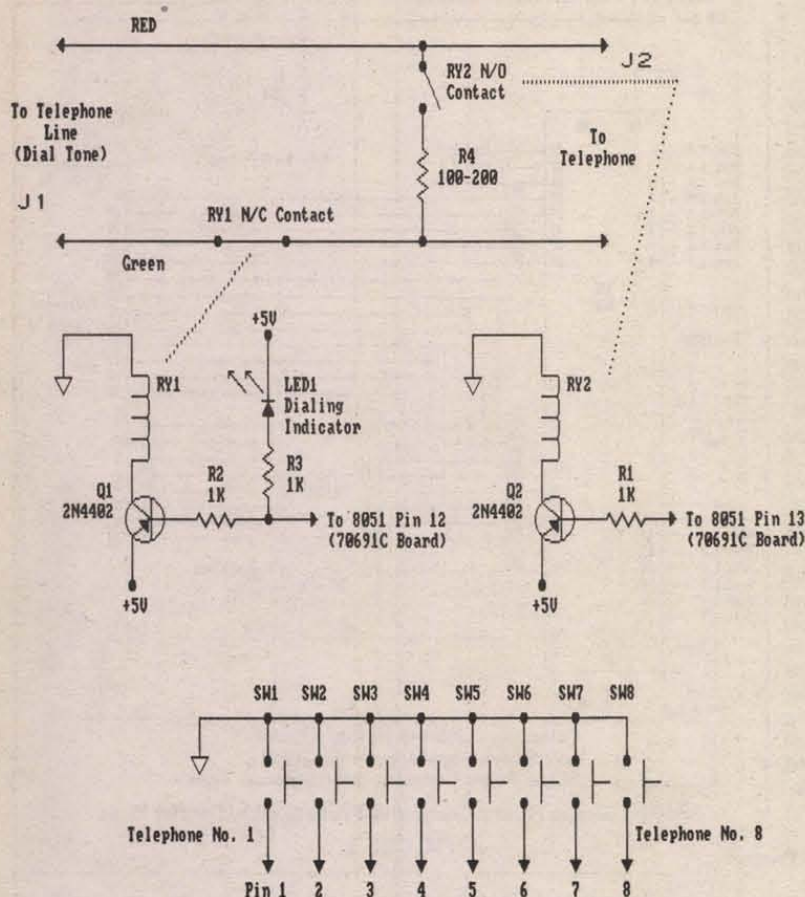


FIGURE 6

To 8051
(70691C Single Board Computer)

With the above test completed, take the modular line cord (designated J1 in the schematic of Figure 7) and insert it into a modular jack supplying dial tone. Take the modular line cord from a desk type telephone and connect it to the Memory Dialer at point J2. Installation is complete.

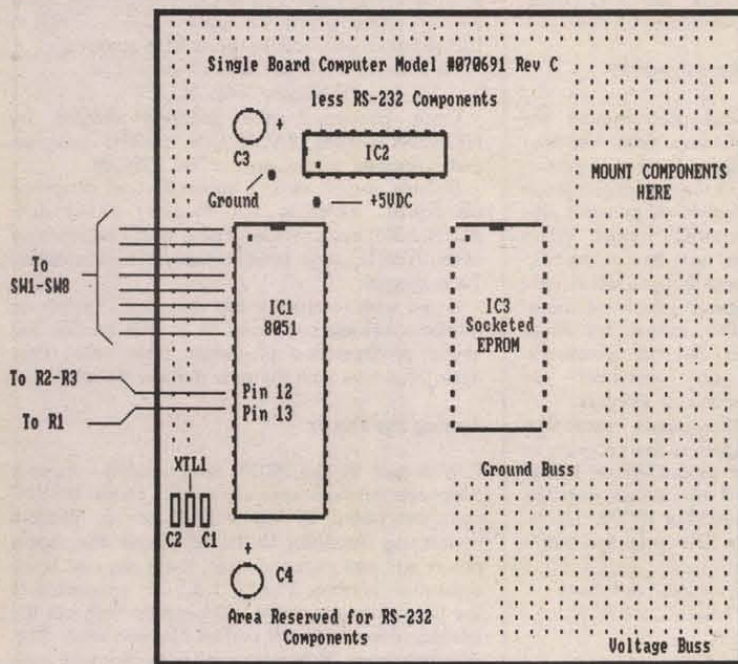


FIGURE 7

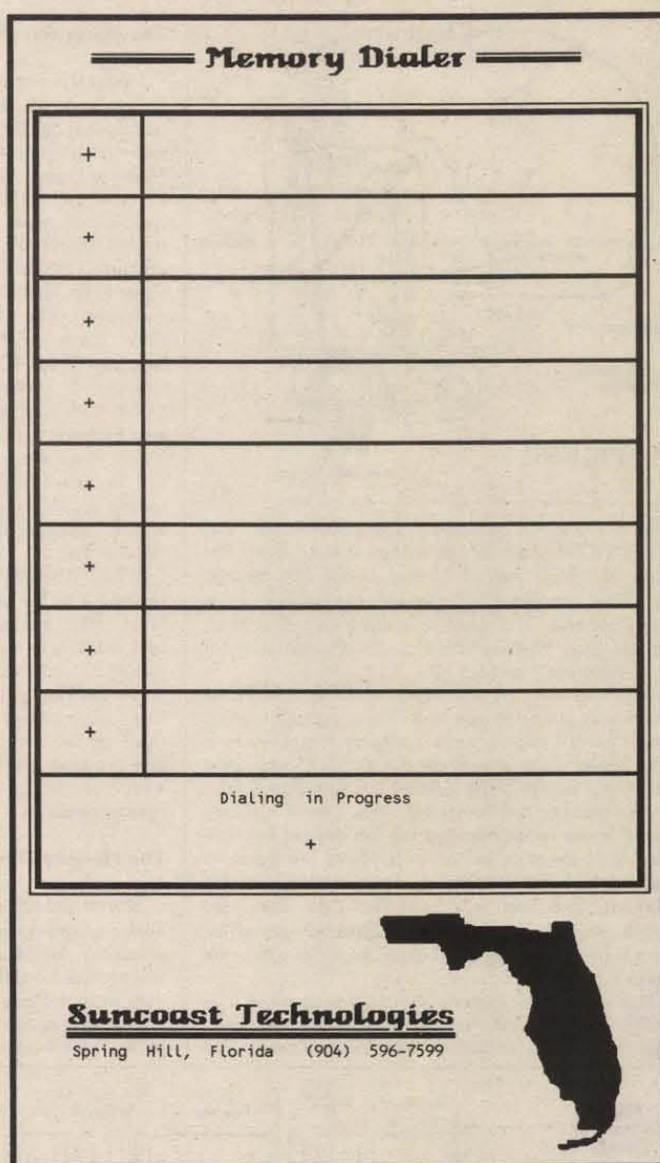


FIGURE 8

To further test out the system, lift the handset of the telephone. If RY1's contacts are closed, standard dial tone should be heard. If not, trace out the series circuit and find where the break is located.

With the wall transformer of the Memory Dialer plugged in, lift the handset of the telephone and press one of the dialers' push buttons. After a second or so, LED1 will begin to flash and you will hear the familiar sound of faint clicks in the receiver. The desired telephone number is being dialed. When dialing is complete, it's now up to the Central Office to complete the call and connect you with the called party. NV

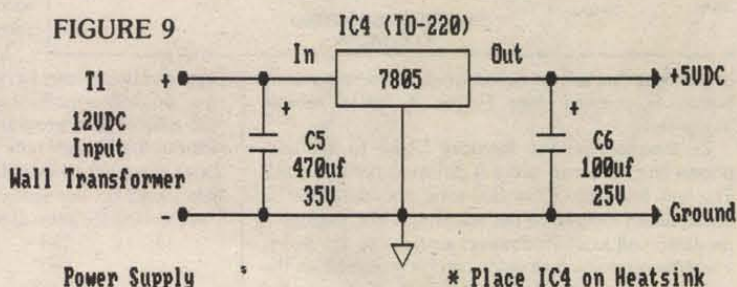


FIGURE 9

Also available Pre-Assembled
(less Wall Transformer)

PARTS LIST FOR THE MEMORY DIALER

R1 R2 R3 1000 ohm 1/4W Resistor
R4 100 to 200 1W or 2W Resistor

C1 C2 30pf Disk Capacitors
C3 2.2uf 16V Electrolytic Capacitor
C4 10uf 16V Electrolytic Capacitor
C5 470uf 35V Electrolytic Capacitor
C6 100uf 25V Electrolytic Capacitor

Q1 Q2 2N4402 Transistor
LED1 Standard Red LED
RY1 5V Relay SPDT (use N/C contacts only)
RY2 5V Relay SPST

IC1 8051AH
IC2 74LS373
IC3 Programmed EPROM (2764)
IC4 7805 5V Voltage Regulator

XTL1 11.059200MHz Crystal
J1 Telephone Line Cord with Modular Connector
J2 Telephone Modular Connector — Female
SW1 to SW8 Spring Return Push Buttons

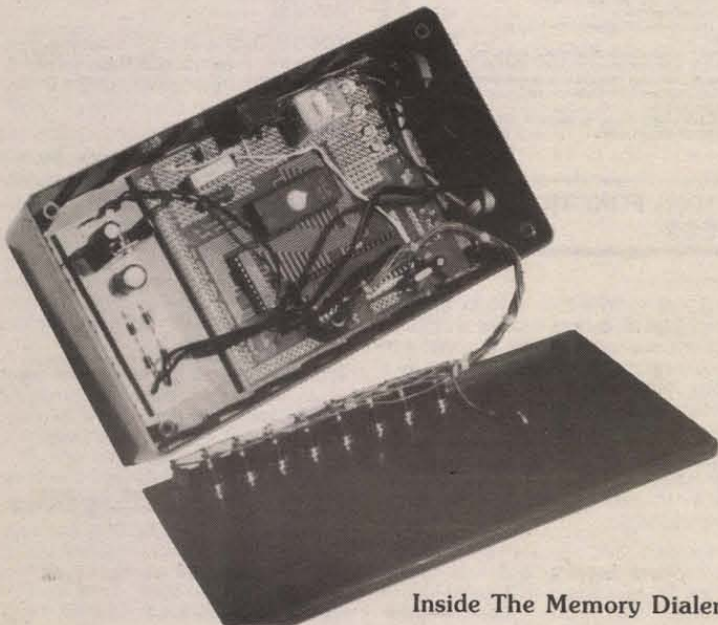
The 70691C Single Board Computer can be purchased for:

Tested/Assembled.....\$34.00
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Inside The Memory Dialer

EIGHT NUMBER TELEPHONE DIALER

```
ORG h'0000
.EQU ESC,h'1B
MOV PSW,h'0
MOV SCON,h'5A
MOV TMOD,h'10
MOV TCON,h'54
SETB TR1
START: CLR A
MOV P1,#d'255
SETB P3.2
SETB P3.3
LP1: MOV A,P1
CJNE A,#d'255,HOLD
SJMPLP1
HOLD: MOV R5,#d'50
LCALL DELAY
AA: CJNE A,#d'254,BB
LJMP DIAL_1
BB: CJNE A,#d'253,CC
LJMP DIAL_2
CC: CJNE A,#d'251,DD
LJMP DIAL_3
DD: CJNE A,#d'247,EE
LJMP DIAL_4
EE: CJNE A,#d'239,FF
LJMP DIAL_5
FF: CJNE A,#d'223,GG
LJMP DIAL_6
GG: CJNE A,#d'191,HH
LJMP DIAL_7
HH: CJNE A,#d'127,II
LJMP DIAL_8
II: LJMP START
```

DIAL_1: LCALL XSTRING

Place first tel. # in line JJ

; Format "x-xxx-xxx-xxxx OR
"xxx-xxxx"

```
JJ: .DB "1-800-555-1234"
.DB ESC
LJMP START
DIAL_2: LCALL XSTRING
```

Place second # in line KK

```
KK: .DB "555-1204"
.DB ESC
LJMP START
DIAL_3: LCALL XSTRING
```

Place third # in line LL

```
LL: .DB "555-4565"
.DB ESC
LJMP START
DIAL_4: LCALL XSTRING
```

Place fourth # in line MM

```
MM: .DB "1-904-555-5966"
.DB ESC
LCALL START
DIAL_5: LCALL XSTRING
```

Place fifth # in line NN

```
NN: .DB "1-800-555-5654"
.DB ESC
LCALL START
DIAL_6: LCALL XSTRING
```

Place sixth # in line PP

```
PP: .DB "123-4567"
.DB ESC
LCALL START
DIAL_7: LCALL XSTRING
```

Place seventh # in line QQ

```
QQ: .DB "765-4321"
.DB ESC
LCALL START
DIAL_8: LCALL XSTRING
```

Place eighth # in line SS

```
SS: .DB "468-4687"
.DB ESC
LCALL START
```

Read Each Number

```
XSTRING: CLR P3.3
POP DPH
POP DPL
XSTR_1: CLR A
MOV A,@A+DPTR
XSTR_2: LJMP CONVERT
```

Pulse out number

```
DIAL: CLR P3.2
MOV R5,#d'2
LCALL DELAY
SETB P3.2
MOV R5,#d'2
LCALL DELAY
DJNZ R0,DIAL
MOV R5,#d'15
LCALL DELAY
NEXT: INC DPTR
CLR A
MOV A,@A+DPTR
CJNE A,#ESC,XSTR_2
MOV A,#1
JMP @A+DPTR
```

Jump to read next digit

CONVERT:

Convert Port1 ASCII character
to decimal number & store in R0

```
CJNE A,#1',DIGIT_1
LJMP NEXT
DIGIT_1: CJNE A,#1',DIGIT_2
MOV R0,#d'1
DIGIT_2: CJNE A,#2',DIGIT_3
MOV R0,#d'2
DIGIT_3: CJNE A,#3',DIGIT_4
MOV R0,#d'3
DIGIT_4: CJNE A,#4',DIGIT_5
MOV R0,#d'4
DIGIT_5: CJNE A,#5',DIGIT_6
MOV R0,#d'5
DIGIT_6: CJNE A,#6',DIGIT_7
MOV R0,#d'6
DIGIT_7: CJNE A,#7',DIGIT_8
MOV R0,#d'7
DIGIT_8: CJNE A,#8',DIGIT_9
MOV R0,#d'8
DIGIT_9: CJNE A,#9',DIGIT_0
MOV R0,#d'9
DIGIT_0: CJNE A,#0',RETURN
MOV R0,#d'10
RETURN: LJMP DIAL
END: SJMP END
```

Delay loop for Pulse Train

```
DELAY: NOP
LOOP1: DJNZ R5,LOOP2
RET
LOOP2: MOV R6,#d'240
LOOP3: MOV R7,#d'90
DJNZ R7,
DJNZ R6,LOOP3
LJMP LOOP1
.END
```


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September 1992 **63**

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TOCOM 5503VIP/5507 \$239.95, SA 8580 only \$239.95, Jerrold Impulse \$239.95. All units come with a remote and have a 90 warranty. Call 615-658-6557. Sold as a 2nd unit only for full subscribers. You must get permission from your cable company before installing.

TURN-ON KITS for SA, Jerrold, Zenith, Pioneer, and Tocom. Call for best prices on one or a quantity. 407-852-9576.

SCIENTIFIC ATLANTA Model 8580 converter/descrambler turned on w/new remote \$210, wholesale price. Works on all Scientific Atlanta systems. Universal Cable Brokers. Ask for Phil, 404-740-0711.

WANTED: FOR DIC converters, Tri-Bi upgrade boards. These are custom made small size circuits that will allow DIC converters to operate on Tri-Bi systems. Wish to purchase in large volume. Communications Resident, 8826 Sweetwater Ct., Charlotte, NC 28227.

CONVERTERS: SA 8511 \$75, SA 8529 \$80, Stargate \$80. **ADD-ON DESCAMBLERS:** New Digital Dynamite TNT for all Jerrold systems \$140, TVT-Gold \$70, New digital Pioneer for all Pioneer systems \$140, New digital SA for all Scientific Atlanta systems \$125, Zenith SSAVI with flashing \$140. **COMBINATION UNITS:** Zenith ST1600 \$230, SA 8580 + \$240, Starcom 7 \$265, **TEST AIDS:** Tocom \$16, Zenith \$20. **MANY MODELS NOT LISTED!** Please call for more information on additional models and Dealer Discounts. We won't be undersold! 30-day money back. Accept MC/Visa/Amx. 800-334-8475.

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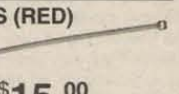


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TEST AIDS!!! Best quality test aids available. Starcom 7 (Impulse) super test module \$49.95, Starcom 6 test chip \$39.95, Tocom test chips \$12.00 each in 10 lot only. Zenith test's all (hot new program) only \$39.95, SA 8580 \$39.95, SA 8590 (all models) \$59.95. Tools: Impulse and Star 6 opener only \$35.00 each. Call 615-658-6557, Fax orders 615-658-6493. 90 day warranty on all test aids. Sold as a test aid only.

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CABLE TEST CHIPS S-A 8550, S-A 8500 310, 311, 320, 321 (specify) \$33.95. S-A 8580/338 \$69.95. S-A 8570xxx or 8590xxx \$79.95. TOCOM 5503/07 VIP \$33.95. ZENITH ZF-1 \$33.95. STARCOM 6 \$33.95. STARCOM 7 \$49.95. **TELECODE, P.O. Box 6426-NV, Yuma, AZ 85366-6426.**

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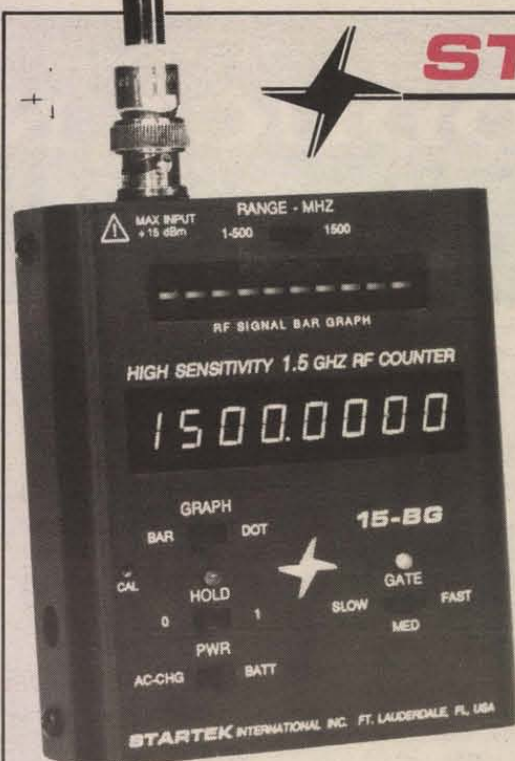
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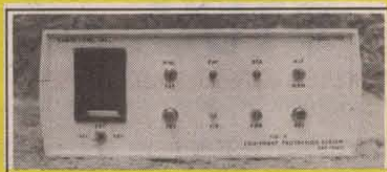
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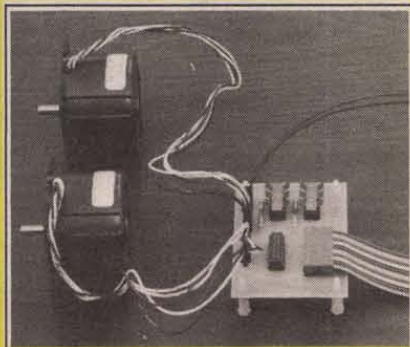
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Various models are available for amateur radio and two-way communications equipment, satellite receiving systems, computer and data processing equipment, well pump motors and air conditioning compressors.

For additional information, contact

RABUN LABS, INC.
P.O. Box 790, Dept. NV
Clayton, GA 30525
800-788-1824

STEPPER MOTOR CONTROL SYSTEM FOR COMPUTERS



MAS Electronics is offering the CSTEP#2 Stepper Motor Control System for PC compatible computers and the Commodore 64 & 128.

The CSTEP#2 System consists of a 3.75 by 2.75 inch printed circuit interface/driver board, an interface cable, and demonstration software. The interface/driver board will operate two (5) to (24) VDC stepper motors with up to 1.5 Amps per phase drive current. The interface cable plugs into the standard parallel port of any PC compati-

ble computer. The demonstration software allows operation of the motors in full or half steps, with options for single stepping, variable speed continuous rotation, directional control, and motion of a given number of steps, all through a user-friendly, menu-driven program. The software will run on any PC compatible computer. Software and interface cables are also available for the user port on Commodore 64 and 128 computers.

One advantage of the CSTEP#2 System is its ease of set-up and use. With the CSTEP#2 System, a personal/laptop computer, one or two motors, and a DC power supply, a motion control demonstration can be set up and running in under five minutes. Anyone can use the CSTEP#2 System to experiment and develop applications for stepper motors. For portable applications with a laptop computer, the DC power supply can be a battery pack. The CSTEP#2 System makes it simple to interface stepper motors to personal computers and apply digital motion control.

The CSTEP#2 System for 5 to 24 VDC motors is retail priced around \$90 including software and interface cable. Stepper motors are also available at discount prices.

Further questions or dealer inquiries should be directed to:

MAS ELECTRONICS
931 Lincoln Road, Dept. NV
Birdsboro, PA 19508-1801
(215) 582-4864

OPTICAL VOICE LINK

Industrial Fiber Optics is offering the Optical Voice Link Kit. It is an introduction to the marvels, mysteries, and science of light transmission in optical fiber.



Once assembled this kit has a transmitter module for converting voice signals into light that is coupled into the optical fiber. The receiver module collects the light from the fiber and converts it to audio signals that can be heard from the speaker. No prior experience with fiber optics is needed to use or build this kit.

This kit was specifically designed for a variety of educational, commercial, and industrial applications. The kit includes: printed wiring boards, switches, electronics, microphone, 8 ohm speaker, 10 feet of plastic fiber cable, tutorial guide, and step-by-step assembly instructions. No special tools or training is necessary. The Optical Voice Link operates from two 9 volt batteries, requires no additional components and can be

extended up to 200 feet. It is available in assembled and unassembled form. For pricing and/or further details, contact

INDUSTRIAL FIBER OPTICS
P.O. Box 3576, Dept. NV
Scottsdale, AZ 85271
602-731-8459

COAXIAL ASSEMBLIES



Nemal Electronics International is offering a line of EMI/RFI suppressed coaxial and multiconductor cable assemblies. The coaxial assemblies are available in 50 and 75 ohm versions with either type N, BNC or UHF connectors,

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By selecting the appropriate material, number, and placement of ferrite beads, the assemblies offer optimum performance over the desired frequency range. A section of heat shrink tubing covers each bead group to maintain exact position and insure mechanical integrity. Hot stamped labels are also available in assorted colors printed per customer requirements. The assemblies are 100% tested for continuity and dielectric withstand voltage. Certified test data is available at an additional cost.

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PHONE: 305-899-0900 FAX: 305-895-8178
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Programming is via a TTL compatible, parallel BCD data bus. Dimensions are 2.52" H x 5.57" W x 7.45" L. Weight is 2.6 pounds.

To get more details, contact

APRIL INSTRUMENT
P.O. Box 62046, Dept. NV
Sunnyvale, CA 94088
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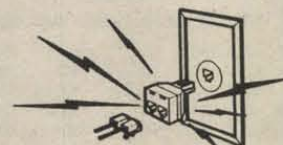
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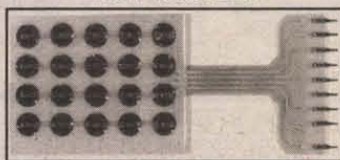
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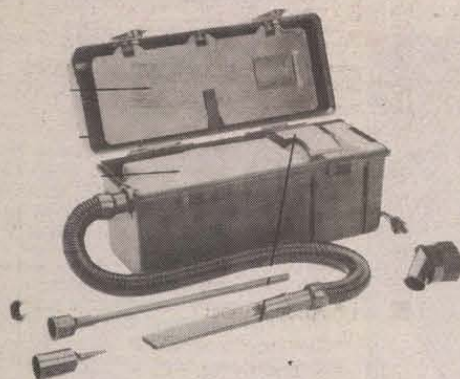
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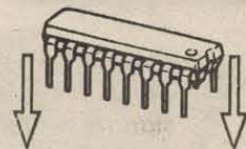
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Build A Compact, Five-Part Crystal Receiver

by Phil Anderson, WØXI

Can you imagine building a radio kit with just five parts and actually receiving any signals at all? While we know the ancients did it with a coil, headset, a hunk of galena and a cat whisker, it just doesn't seem natural today. After all, we live in the age of compact discs, complex integrated circuits and high definition television! But if you build the little AM radio featured in Figure 2, you'll be very surprised at the volume received and the quality of the audio, characteristic of crystal sets. And you won't need any batteries!

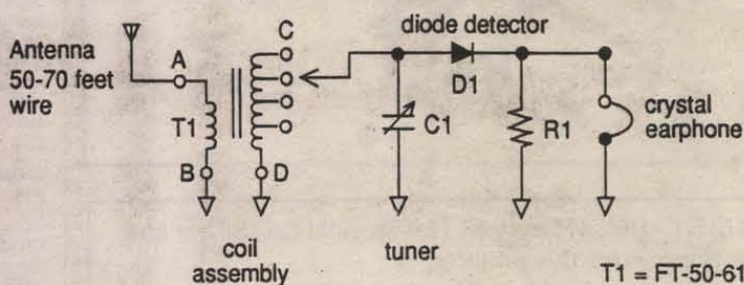
Crystal Sets were the rage in the early 1920s when AM broadcasting began. A check at my local library indicated that there were over 200 articles published on radio broadcasting from 1922 through 1924. During that same period dozens of "HOW TO" articles appeared in old favorites such as *Popular Science* and *Popular Mechanics*. I recall one article wherein the hobbyist made his capacitors by alternating layers of metal-clad gum wrappers with matchbook covers! Today parts are a bit easier to find!

As with all crystal sets, if you live in an area of a number of strong stations, you may hear them all at once. This particular design is pretty good at separating stations. I found that I could tune the entire AM broadcast band from 550 to 1600 Kilohertz. I could separate two distant stations easily and listen to either one with comfortable volume, one at 560 KHz and the other at 610 'COUNTRY.' Just imagine, listening to 'country' on a five piece crystal set. Does that beat all!

The Project

While all crystal sets use just a handful of parts, this set is also compact yet still tunes the AM broadcast band. It consists of a toroid coil assembly, a compression style capacitor, a diode detector, a resistor and an earphone. By utilizing a toroid for the coil assembly instead of the traditional air-wound coil, the set is dramatically reduced in size. Air wound coils are typically 2 inches in diameter and up to four inches in length. An equivalent coil wound on a toroid is the size of a wedding ring. The parts bill of material for the receiver is listed in Figure 1 and

FIGURE 2. A Toroidal Crystal Set, WØXI

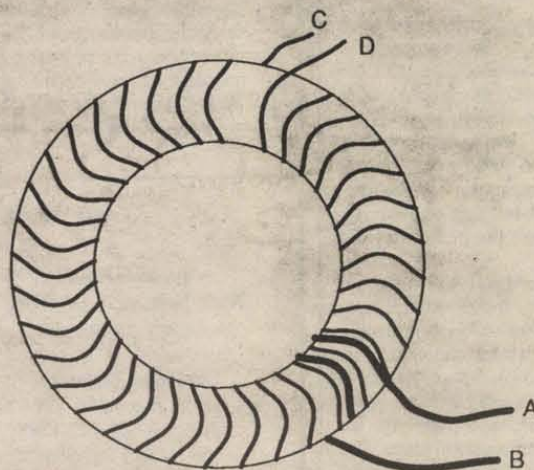


the schematic is shown in Figure 2.

A toroid is a donut shaped solid, a name that comes from geometry. Toroids are sometimes called cores too, since the core material is often used with various sizes of toroids. The number of turns of wire, the size of the toroid and its core material determine the inductance of a coil wound on a toroid. Toroids are molded from various materials such as powdered iron or ferrites. These materials determine its useful frequency range. For the broadcast band a ferrite mix # 61 is suitable. You'll note in the bill of material that the toroid is listed as a FT-50-61. FT and 61 denote that the core is made of ferrite material 61. The 50 indicates that the outside diameter of the core is one-half inch. A listing of readily available powdered iron and ferrite cores can be found in the ARRL Handbook. Formulas are included to de-

termine the number of turns required for a given inductance, size and mix of

FIGURE 3. The Toroid Coil Assembly, FT-50-61 Core



NOTES:

1. Coil C-D, 45 turns of #30 AWG
2. Coil A-B, 3-1/2 turns of #24 insulated wire, wound on top of coil C-D
3. Core is an FT-50-61

© WØXI, 1992

core.

The tuned circuit and antenna pick-up coils are wound together on the toroid, or core, as shown in Figure 3. The coils are wound by looping the wire through the center for the core.

Every crystal set must have a variable capacitor to match the tuned circuit coil. The mate for our coil in this case is the compression capacitor shown in Figure 4. This capacitor type achieves a wide picofarad tuning range, 75 to 300 Pf, by utilizing alternating layers of mica and metal. The capacitance is changed by squeezing the plates closer together, thereby increasing capacitance. Traditional crystal sets utilize a large air-variable capacitor with shaft suitable for attaching a knob.

The remaining parts of the set are the diode detector, a resistor and the earphone. Again, as with other sets, a germanium diode, such as a 1N34, is used to promote weak signal detection. A hot-carrier RF diode, such as the 1N6263, works equally well.

A word about the earphone is in order. These earphones are often referred to as crystal earphones. The AC impedance is high, around 10,000 ohms at 1,000 Hertz. While they work well in the circuit of Figure 1, some audio distortion occurs at the higher frequencies. This occurs because the RC time constant of the 100K resistor in combination with the capacitance of the earphone is somewhat longer than ideal. The distortion can be reduced by decreasing the value of the load resistor. Reducing the resistor, however, will lower the volume heard and the selectivity of the set. The distortion can be reduced to essentially zero if the capacitance of the circuit is changed to about .001 ufd. However, a one or two-transistor amplifier would

then be needed to isolate the earphone's capacitance from the detector and to boost the signal to a good listening level.

A caution is also in order here. Radio Shack and others carry several versions of small earphones, usually white and equivalent to Radio Shack Cat. No. 33-175. THESE ARE NOT THE RIGHT EARPHONES. These are 8-ohm and intended for portable transistor radio and cassette operation. The crystal earphones are labeled 'HIGH IMPEDANCE,' are larger and usually cream colored.

Operation of the Set

The set works well only if a good antenna, such as a longwire, and a ground are used. I receive strong signals by running out 35 feet or more. Sometimes, with weather bad, I'll run the wire down the hallway upstairs. My spouse really likes this because the vacuum picks up the wire nicely! Presently I have two antennas thrust out the upstairs window, one strung south and one east, both about 70 feet in length. The wire is Radio Shack part number 278-1329. I've grounded my sets by attaching a wire to the ground lug on the back of my stereo. You will not hear a thing unless you attach that ground!

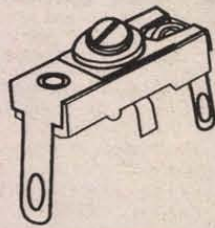
Tuning of the compression cap is easy and actually works quite well. The first time I tried one in place of the old style bulky air-variable cap I was surprised. Four turns of the screw head cover the range of the cap and tunes most of the AM broadcast band. It is easy to turn slowly enough to tune a desired station.

The PC Board for the Toroidal Crystal Set

The art for a pc board is shown in Figure 5. Because the compression cap has large leads that cannot be fed through the board, the layout is designed to accept all components on the solder side. This would normally be unusual for an electronic circuit of any size and complexity, but the method works well for this application. Let's trace through the pc board from left to right.

The antenna terminal is at the upper left. Hole 'A' is for the positive side of the antenna pickup coil wound on the toroid. The single dot shown to the right indicates the placement of the .5 inch toroid. Two large pads are located below the coil, and these are for mounting the compression cap. The three in-line holes at the upper right are for soldering to an earphone. The center hole corresponds to the tip of the earphone plug and the outside hole is for the earphone ground return. The diode mounts in holes 1-2, with the cathode at hole 2. The remaining part, the 100K ohm resistor

FIGURE 4.
Compression Capacitor



mounts in holes 3-4.

If you etch this board and then build

the project, it is suggested that the diode and resistor be soldered in first. Then add the coil, followed by the compression cap. In addition, I've found it handy to solder a wire at the antenna jack that has a clip on the other end. The clip can then be easily attached to various antennas. Also the leads from the crystal earphone can be cut, stripped and soldered at the earphone jack holes, upper right.

Since the circuit has so few components, it is nearly as easy to solder it together on a solder-type breadboard. If you don't wish to etch a pc board or order one, this would be the next best step. Good luck and have fun! NV

FIGURE 5. PC = 2" X 1.4" © WØXI 1992

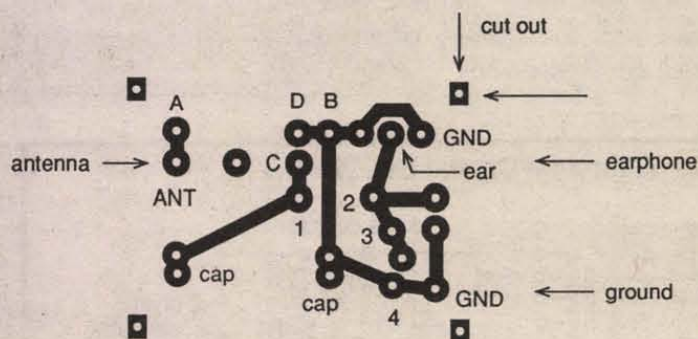


FIGURE 1. Bill of Materials, The Toroidal Crystal Set and Parts Sources for this project.

- (1) Toroid, FT-50-61 type, source, Amidon or Palomar Engineers,
- 4 feet of #30 AWG wire for the coils, Radio Shack # 278-502
- 2 feet of #24 AWG hookup wire, solid or stranded,
- (1) compression style capacitor, 75-300 Pf F.W. Capacitors # A4207/OX or equivalent
- (1) 1N34 or 1N6263 diode, Radio Shack.
- (1) 100K ohm resistor, alternatively, 47K resistor or 100K pot, holes are in the board for the pot,
- (1) crystal earphone, Mouser part # 25CR035 or equivalent or Audio Accessories Cat. No. 30-5303.
- (1) perf board or pc board, home made, use your layout or ours, not critical, or I have boards and parts available.
- 70 feet of antenna wire or other antenna, Radio Shack # 278-1329

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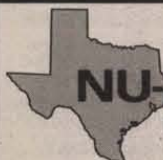
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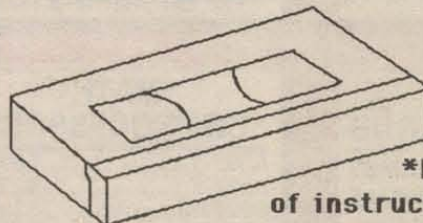
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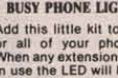
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ANSWER TO #8923 — AUGUST 1992

Using a 720K 3/5 inch floppy drive in an IBM PC or PC/XT compatible computer is simple. First, there are two restrictions: 1) You must be using MS DOS, not PC DOS and 2) the drive should not be connected as the A: drive unless 720K drives are directly supported in the ROM BIOS. To inform DOS that drive B: is a 720K floppy, set the DIP switches for two drives and add the following line to your CONFIG.SYS file:

```
drivparm = /d:1 /f:2
```

The "/d:1" parameter is the zero-based physical drive number for drive B:, and "/f:2" specifies the 720K form factor. A form factor of 2 is the default for DRIVPARM, but I generally prefer to specify the drive type explicitly.

DRIVPARM is usually preferable to the DRIVER.SYS device driver because it modifies an existing drive's parameters rather than creating a new logical drive with the next available letter (D: in this case). You also save a little memory. Use DRIVER.SYS when you really need a second logical drive, for example to COPY or XCOPY files between two floppy disks of the same size.

I have successfully used DRIVPARM with MS DOS versions 3.2, 4.01 and 5.0. For some reason, Big Blue removed this command from PC DOS, and you must use the DRIVER.SYS device driver as described in Maserang's question.

I recommend not installing a 720K drive as the A: drive in systems without ROM BIOS support because you may have trouble booting from a floppy in some versions of DOS, something you will need to do sooner or later.

I cannot recreate the write-protect sense failure with my hardware, but if the problem persists, it may be due to a faulty write-protect switch or bad drive cable (-WRITE PROTECT is on pin 28). It may also somehow be related to XT class machines ignoring the -DISK CHANGE signal on pin 34. Perhaps Maserang's only checks -WRITE PROTECT when it detects a disk change.

E. Neely

ANSWER TO #89210 — AUGUST 1992

Your homemade splitter is probably not providing adequate isolation. As a result, the impedance load on the line is swamping your source. Video monitors should never be connected in parallel. The proper method of connecting several monitors to one source is to connect them in series (daisy-chain) and terminate the final monitor only, with a 75 ohm resistor to ground.

If you still experience problems, you can build a super-simple circuit using the Maxim 457 video-driver chip. This IC accepts a video signal and produces two isolated 75 ohm video sources. As each output is an isolated source, these outputs can be cascaded without altering the original impedance.

K. Bay

ANSWER TO #7923 — JULY 1992

I am unfamiliar with any hardware for converting PAL to NTSC. However, I ran across an ad in the July '92 issue of "NASA Tech Briefs" (pg. 44) for Colorado Video, Inc. that may interest you.

This company specifically advertises a "Video Mirror" that does with NTSC color video exactly the Right/Left reverse you requested. The ad indicates that they sell other "unique video instrumentation."

Contact information is: Box 928, Boulder, CO 80306, voice 303-530-9580, fax 303-530-9569.

B. Mork

ANSWER TO #6921 — JUNE 1992

If your interference stops when you shut off the VGA monitor, then try the following: First, if the TV picture is shaking, make sure the TV/monitor separation is at least 5 feet because the TV may be picking up the magnetic fields of the monitor's sweep coils. Then try putting a large ferrite bead (Radio Shack #273-105) around the video and then power cable as close to the monitor's chassis as possible. It is much more likely that your interference is due to the PC, which is proven by still having interference when the monitor is off. If this is the case, please contact me c/o Nuts & Volts.

T. Young

Send all questions and answers to: Nuts & Volts Tech Forum, 430 Princeland Ct., Corona, CA 91719 or Fax to (714) 371-3052.

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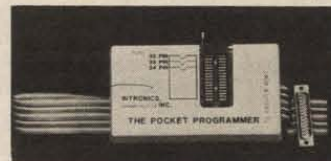
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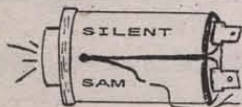
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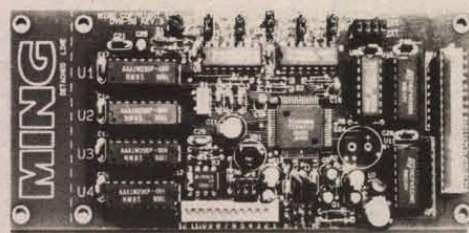
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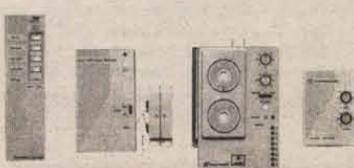
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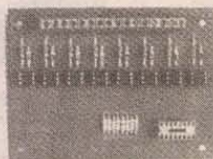
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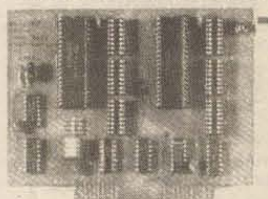
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CABLE CONNECTORS. Factory distributor Belden, Alpha, Times, Amphenol Kings. Cablewave offers quantity discounts. Belden 9913 \$55 100 ft., PL259 Amphenol 25/\$22.50. Shipping \$4. Nema, 12240 N.E. 14th Ave., N. Miami, FL 33161. 305-899-0900. SASE for price list, complete catalog free with order.

WANTED/SELL MARINE ELECTRONICS: radars, sounders, radios, Ioran, GPS, etc. Call Ronald 508-281-1017.

ELECTRONIC ASSEMBLY MACHINERY. We buy and sell assembly machinery including solder machines and board cleaners, insertion machines and lead formers. Petlock Inc., Cucamonga, CA. 714-944-5300.

GIANT SOLAR PANELS \$44.00 EACH! Excellent Prices/Solar Equipment, Accessories. Free Information/SASE, Catalog \$3.00 To: Pak Rat Electronics, P.O. Box 690073, Houston, TX 77269. 713-893-0312.

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RADIO ASTRONOMY. For information: Write "Society of Amateur Radio Astronomers," Vincent Caracci, 247 N. Linden St., Massapequa, NY 11758.

WILSON SURPLUS — Computer, Electronic, Test, Shop, Office, etc. R.W. Wilson, Lancaster, CA. 805-942-2692 24 hr.

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CHOKES. 3MH at 2.5 ANP. 10 lot \$22.50, 20 lot \$40, 50 lot \$87.50 plus shipping. Northwest Electronics, 2509 West 11th, Eugene, OR 97402. 503-485-3016.

ELECTRONICS LIQUIDATION: Cable converters, ham items, books, testers, components, tubes, software, hardware. For latest listing of lists SASE to: Richard and Rose's Radio Mart, P.O. Box 691443, Tulsa, OK 74169.

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Nuts & Volts Magazine/September 1992

85

Spread Spectrum Spotlight

by Randy Roberts

What Spread Spectrum Does

The use of these special pseudo noise codes in spread spectrum (SS) communications makes signals appear wide band and noise-like. It is this very characteristic that makes SS signals possess the quality of Low Probability of Intercept. SS signals are hard to detect on narrow band equipment because the signal's energy is spread over a bandwidth of maybe 100 times the information bandwidth.

The spread of energy over a wide band, or lower spectral power density, makes SS signals less likely to interfere with narrowband communications. Narrow band communications, conversely, cause little to no interference to SS systems because the correlation receiver effectively integrates over a very wide bandwidth to recover an SS signal. The correlator then "spreads"

out a narrow band interferer over the receiver's total detection bandwidth. The total integrated signal density or SNR at the correlator's input determines whether there will be interference or not. All SS systems have a threshold or tolerance level of interference beyond which useful communication ceases. This tolerance or threshold is related to the SS processing gain. Processing gain is essentially the ratio of the RF bandwidth to the information bandwidth.

A typical commercial direct sequence radio might have a processing gain of 11 to 16 dB, depending on data rate. It can tolerate total jammer power levels of from 0 to 5 dB stronger than the desired signal. Yes, the system can work at negative SNR in the RF bandwidth. Because of the processing gain of the receiver's corre-

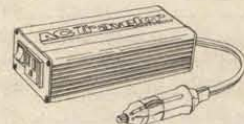
lator, the system functions at positive SNR on the baseband data.

Besides being hard to intercept and jam, spread spectrum signals are hard to exploit or spoof. Signal exploitation is the ability of an enemy (or a non-network member) to listen in to a network and use information from the network without being a valid network member or participant. Spoofing is the act of falsely or maliciously introducing misleading or false traffic or messages to a network. SS signals also are naturally more secure than narrow-band radio communications. Thus SS signals can be made to have any degree of message privacy that is desired. Messages can also be cryptographically encoded to any level of secrecy desired. The very nature of SS allows military or intelligence levels of privacy and security to be had with minimal complexity. While these characteristics may not be very important to everyday business and LAN (local area network) needs, these features are important to understand. **NV** Next month we'll discuss opportunities in spread spectrum communications.

Randy Roberts has over 27 years experience in communications, electronics and Spread Spectrum system design. He is currently the owner of RF/Spread Spectrum, an independent consulting, product development, publishing, strategic planning and training company. He is also publisher of the monthly newsletter "Spread Spectrum Scene." His address is P.O. Box 2199, El Granada, CA 94018-2199. He can be reached at 415-726-6235 or by FAX at 415-726-0118.

ATTENTION DEALERS! New parts and components from Far East. Large stock available for immediate delivery. Audio, video, telephone, computer parts, wholesale quantities/prices, bulk/packaged. Ask for flyer. Telephone 619-586-7610. La Paz Electronics, Box 261095, San Diego, CA 92196.

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CLOSING SHOP. Marine 2-way electronics Furno Benmar replacement chassis. Test equipment, Radio's complete 44 mc Motorola system 150 W Base. Kenwood 820VFO820 \$550. SASE, Box 21608, Concord, CA 94521.

BATTERY PACK Discharger. Reclaim lost power in NiCd battery packs. Eliminate the "NiCd memory effect." Small, solid state and easy to use. Do it yourself and save money! Only \$15.95! RSF & Co., 20806 NE 26th Pl., Redmond, WA 98053.

ODDS AND Ends sale. Switched-on S.A. 8500s \$120. Two TBD-3 combo units; one with Viewstar converter, one with Panasonic, \$150 and \$136 respectively. Pioneer 611UCE, Zenith ST 1000, Hitachi C-1000-3 raw addressable \$96 each. New S.A. 8595 11-button test unit \$425. Sold and serviced by former Scientific Atlanta production engineer. Buying S.A. 8600s. 21st Century Electronics, 404-448-1396.

D.C. ACE Electronics, Inc. NEW! Charge your BP-83, 84, 85 in your BC-35, with our charger adaptor. Only \$15 each. Insert battery into adaptor, drop into BC-35. Packs for Icom: BP-8 1400 MAH drop in charge \$45. BP-7 700 MAH drop in charge \$39. BP-5 500 MAH drop in or wall charge \$35. Packs for Yaesu: Super FNB-4 \$43. FNB-12s \$43. FNB-17/10 \$32. FNB-14 \$43. FNB-2 600 MAH \$19.95. Many other complete packs available. Inserts at low prices. Current specials: Gates 4AH D \$4 each. Panasonic 6V 3.2 AH Gel Cell \$5 each. Energizer Alkaline AA \$30 per 100. Sanyo N 600 AA \$1.50 each. New HOT item, solar panel 15 volt 70 MA 1 watt, aluminum frame, \$29. Call or write for catalog. Orders add \$4 shipping, Illinois residents add 6.5% tax. Visa/Mastercard/COD/checks. D.C. Ace Electronics, Inc., P.O. Box 364, Lincolnshire, IL 60069. 708-634-3337. We want your business!

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ELECTRONIC PARTS, tools and miscellaneous electronics for sale. Send \$2.00 for 50 page limited edition catalog. USA only. Bigelow Electronics, Box 125, Bluffton, OH 45817.

NINTENDO 72 PIN GAME CONNECTORS. Other misc. parts and test units at later date. Janell's Electronics, Rt 1 Box 281, Clayton, OK 74536. Phone 918-569-4650.

FM EXCITERS. PLL technology on 3x5 PCB, 12VDC, 88-108 MHz. Meets FCC broadcast specs. \$189.95. For info send SASE to: JT Communications, 579 N.E. 44th Ave., Ocala, FL 32671. 904-236-0744.

COOPER REPLACEMENT Tips for 8200 soldering gun. 1 + 50¢ each. 1,000 + 38¢. SMI, 3135 E. 14th St., Brownsville, TX 78520. Phone #: 512-982-0077, FAX #: 512-982-0081.

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SCIENTIFIC ATLANTA	1-3	4 or more
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Events Calendar

WESTERN REGION

SEPTEMBER 5

CA - PLEASANTON — California Computer Show & Sale. **LOCATION:** Alameda County Fairgrounds, 4501 Pleasanton Ave. **HOURS:** 10am-4pm. **ADMISSION:** \$6; Labor Day Special — \$3 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

CA - VENTURA — MarketPro Computer Show & Sale. **LOCATION:** Ventura County Fairgrounds Commercial Bldg., Ventura Ave. **HOURS:** 10am-5pm. **ADMISSION:** \$6. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

CA - SANTEE — Ham & Computerfest. **SPONSOR:** Amateur Radio Club of El Cajon. **LOCATION:** Santee Drive-in, 10990 N. Woodside. **OPENS:** Appx. 6:30am, rain or shine. **ADMISSION:** 50¢. **TALK-IN:** 1147.675/075, 146.52. **FEATURES:** E - F/R. **DEALER INFO:** \$6/vehicle. **CONTACT:** N6RGM Sonny 619-444-6532; WA6MHZ Pat 619-561-0052; ARCEC, Box 50, El Cajon CA 92020.

SEPTEMBER 6

CA - CONCORD — MarketPro Computer Show & Sale. **LOCATION:** Sheraton Hotel, 45 John Glen Dr (Exit 680 No. fr Hwy 24). **HOURS:** 10am-5pm. **ADMISSION:** \$6. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

CA - LIVERMORE — Ham Radio and Electronics Swap Meet. **SPONSOR:** Livermore Amateur Radio Club. **LOCATION:** Los Positas College, N of I-580 at Airway Blvd. exit. **HOURS:** 7am-12noon, rain or shine. **ADMISSION:** Free. **TALK-IN:** 147.045+ fr west, 145.350- fr east. **FEATURES:** H - E - F/R. **DEALER INFO:** 2-car selling space \$10. **CONTACT:** Gil, WU7R, 415-462-5055 eves.

SEPTEMBER 12

CA - HAYWARD — MarketPro Computer Show & Sale. **LOCATION:** Centennial Hall, 22292 Foothill Blvd. (I-580 to Hwy 238. **HOURS:** 10am-5pm. **ADMISSION:** \$6. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

CA - SAN JOSE — California Computer Show & Sale. **LOCATION:** Santa Clara County Fairgrounds, 344 Tully Rd. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

CA - LOS ALTOS HILLS — Foothill College Amateur Radio Flea Market. **LOCATION:** Hwy 280, exit El Monte Rd West. **HOURS:** 6:30am. **ADMISSION:** Free. **TALK-IN:** 145.27(-) or 224.36 Rptr. **FEATURES:** H - E - F/R. **DEALER INFO:** \$10 (two spaces). **CONTACT:** 408-734-4453, Sunnyvale VEC, P.O. Box 60307, Sunnyvale, CA 94088-0307. Exam info: 408-255-9000.

CA - RANCHO CUCAMONGA — Carnival Electronics Faire (formerly General Dynamics Swapmeet). **LOCATION:** 11530 6th St. **FEATURES:** E - H.

CA - ANAHEIM — California Computer Show & Sale. **LOCATION:** Anaheim Stadium, 2000 S. State College Blvd. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

SEPTEMBER 13

CA - SANTA ROSA — MarketPro Computer Show & Sale. **LOCATION:** Sonoma County Fairgrounds, 1350 Bennett Valley Rd (exit Hwy 12 E off Hwy 101). **HOURS:** 10am-5pm. **ADMISSION:** \$6. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

CA - SAN DIEGO — MarketPro Computer Show & Sale. **LOCATION:** Scottish Rite Center, 1895 Camino Del Rio So. (Exit Mission Center off I-8). **HOURS:** 10am-5pm. **ADMISSION:** \$6. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

SEPTEMBER 19

CA - OAKLAND — California Computer Show & Sale. **LOCATION:** Oakland Coliseum, 1880 and Hegenberger Rd. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

CA - NORTHBRIDGE — California Computer Show & Sale. **LOCATION:** California State University, North Campus, 18000 Devonshire Blvd. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

CA - WHITTIER — Amateur Radio & Electronics Swapmeet. **SPONSOR:** California Microwave Relay Assn & Rio Hondo ARC. **LOCATION:** Rio Hondo College, 3600 Workman Mill Road (fr 605 N exit Rose Hills Rd E, N on Workman Mill Rd; 605 S exit Peck Rd E, S on Workman Mill). **HOURS:** 7-11am. **TALK-IN:** 146.175+ , 223.620-, 445.925-, PL 100. **FEATURES:** E - H. **DEALER INFO:**

Sellers' Permits sold at gate by Hugh Headlee, N6SAY. **CONTACT:** Mike Wulfestieg, N6RHZ, 714-537-4230.

CA - SANTEE — Ham & Computerfest. **SPONSOR:** Amateur Radio Club of El Cajon. **LOCATION:** Santee Drive-in, 10990 N. Woodside. **OPENS:** Appx. 6:30am, rain or shine. **ADMISSION:** 50¢. **TALK-IN:** 1147.675/075, 146.52. **FEATURES:** E - F/R. **DEALER INFO:** \$6/vehicle. **CONTACT:** N6RGM Sonny 619-444-6532; WA6MHZ Pat 619-561-0052; ARCEC, Box 50, El Cajon CA 92020.

SEPTEMBER 19-20

OR - MILTON-FREEWATER — 46th Annual W7DP Hamfest. **SPONSOR:** Walla Walla Valley Amateur Radio Club. **LOCATION:** Community Building. **HOURS:** 8am-5pm. **ADMISSION:** Free. **TALK-IN:** 147.28/88. **FEATURES:** CB - DP - E - EX (Sat) - FM - F/R - H - Demos - ARRL Section Mtg - XYL Activities. **DEALER INFO:** Tables \$5 (radio gear only). **CONTACT:** Carl Elsner, N7PVW, 223 W. Chestnut, Walla Walla WA 99362; 509-522-1270.

SEPTEMBER 20

CA - VALLEJO — MarketPro Computer Show & Sale. **LOCATION:** Solano County Fairgrounds, 900 Fairgrounds Dr. (Exit Hwy 37 off I-80). **HOURS:** 10am-5pm. **ADMISSION:** \$6. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

CA - LANCASTER — MarketPro Computer Show & Sale. **LOCATION:** Antelope Valley Fairgrounds, 155 E. Avenue 1 (I-5 No. to Hwy 14). **HOURS:** 10am-5pm. **ADMISSION:** \$6. **FEATURES:** C. **CONTACT:** MarketPro Computer Shows.*

CA - GLENDALE — California Computer Show & Sale. **LOCATION:** Glendale Civic Auditorium, 1401 N. Verdugo Rd. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

AZ - PHOENIX — Computer & Electronic Parking Lot Swap Meet. **SPONSOR:** Electronic Mat's & Computers. **LOCATION:** 3102 W. Thomas Rd. **HOURS:** 8am-3pm. **ADMISSION:** Free. **FEATURES:** C - E - FP. **DEALER INFO:** Spaces \$10 (prereg.). **CONTACT:** Bud 602-272-3200.

SEPTEMBER 26

WA - KENT — AM Computer Swap Meet. **LOCATION:** Kent Commons Exhibition Hall, 525 4th Ave North. **HOURS:** 9am-5pm. **ADMISSION:** \$4, under 13 free w/adult. **FEATURES:** C - FP - DP. Technical Assistance. **DEALER INFO:** Spaces include table and chairs. **CONTACT:** 24-Hr Hotline 206-874-8711.

OR - NEWPORT — Ham Fair. **SPONSOR:** Tillamook Lincoln County Amateur Radio Clubs. **LOCATION:** Lincoln County Fairgrounds. **HOURS:** 9am-3pm. **ADMISSION:** \$5 door, no adv. **TALK-IN:** 146.52, 145.37, 147.22. **FEATURES:** CB - DP - EX (10am) - H - FM - RV-H (55) - RV-S (53). **DEALER INFO:** Tables: \$10 commercial, \$6 amateur. Available at 7am. **CONTACT:** Sam Dornig KATEAT, 304 NE Dornig St., Waldport OR 97394; 503-547-3371.

CA - SEBASTOPOLE — 10th Annual Ham Radio Flea Market. **SPONSOR:** Sonoma County Radio Amateurs Inc. **LOCATION:** Holy Ghost Hall, 7960 Mill Station Rd, just off Hwy 116 N of Sebastopol. **HOURS:** 8am-2pm. **ADMISSION:** Free. **TALK-IN:** 146.13/73. **FEATURES:** DP - FM - FP - F/R - Auction (11:30am) - Radio clinic. **DEALER INFO:** Indoor or outdoor flea market spaces \$10. 7am set-up. **CONTACT:** SCRA, Box 116, Santa Rosa CA 95402.

CA - SAN FRANCISCO — California Computer Show & Sale. **LOCATION:** Cow Palace, corner of Geneva and Santos. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

CA - COSTA MESA — California Computer Show & Sale. **LOCATION:** Orange County Fairgrounds, 88 Fair Dr. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

SEPTEMBER 27

CO - LONGMONT — Barcrest - Amateur Radio, Electronics and Computer Swap Meet. **SPONSOR:** Boulder Amateur Radio Club. **LOCATION:** Boulder County Fairgrounds, Exhibition Bldg, Nelson & Haver Rds. **OPENS:** 8am. **ADMISSION:** \$3. **FEATURES:** C - DP - E - EX - FP - F/R - H - S - Campsites nearby. **DEALER INFO:** Tables \$7, chairs avail. Adv res by 9-19. to 303-530-2903. Setup 7am. **CONTACT:** Barcrest, 1103 S Gay Dr, Longmont CO 80501.

CA - SANTA ANA — ACP Computer Swap Meet. **SPONSOR:** Advanced Computer Products. **LOCATION:** 1310 E. Edinger. **HOURS:** 8am-2pm, rain or shine. **ADMISSION:** Free. **FEATURES:** C - E - FP. **DEALER INFO:** All spaces \$50 in advance. **CONTACT:** Mary Russo - 714-558-8813.

OCTOBER 3

CA - HANFORD — Hams and Hackers Swap Meet &

T-Hunt. **SPONSOR:** Kings Amateur Radio Club. **LOCATION:** Hanford Fraternal Hall, 10th Avenue & Florida. **HOURS:** 8am-3pm. **ADMISSION:** Free. **TALK-IN:** 145.11, 147.33 (PL100), 224.82 (PL100), 441.900 (PL88.5). **FEATURES:** C - DP - E - F/R (Tri-Tip BBQ) - H - T-Hunt (10am, \$5 charge). **DEALER INFO:** \$5 sellers' fee). **CONTACT:** Scott, KC6HYE 209-582-3513 or Rick WB6VEZ 209-945-2266/209-583-9377. KARC, POB 548, Armona CA 93202.

CA - SAN JOSE — California Computer Show & Sale. **LOCATION:** Santa Clara County Fairgrounds, 344 Tully Rd. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

CA - ANAHEIM — California Computer Show & Sale. **LOCATION:** Anaheim Stadium, 2000 S. State College Blvd. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

CA - SANTEE — Ham & Computerfest. **SPONSOR:** Amateur Radio Club of El Cajon. **LOCATION:** Santee Drive-in, 10990 N. Woodside. **OPENS:** Appx. 6:30am, rain or shine. **ADMISSION:** 50¢. **TALK-IN:** 1147.675/075, 146.52. **FEATURES:** E - F/R. **DEALER INFO:** \$6/vehicle. **CONTACT:** N6RGM Sonny 619-444-6532; WA6MHZ Pat 619-561-0052; ARCEC, Box 50, El Cajon CA 92020.

OCTOBER 4

CA - LIVERMORE — Ham Radio and Electronics Swap Meet. **SPONSOR:** Livermore Amateur Radio Club. **LOCATION:** Los Positas College, N of I-580 at Airway Blvd. exit. **HOURS:** 7am-12noon, rain or shine. **ADMISSION:** Free. **TALK-IN:** 147.045+ fr west, 145.350- fr east. **FEATURES:** H - E - F/R. **DEALER INFO:** 2-car selling space \$10. **CONTACT:** Gil, WU7R, 415-462-5055 eves.

CA - BURBANK — California Computer Show & Sale. **LOCATION:** Burbank Airport Hilton Convention Center, 2500 Hollywood Way. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

OCTOBER 10

WA - BREMERTON — Hamfest and Electronics Swapmeet. **SPONSOR:** North Kitsap Amateur Radio Club. **LOCATION:** Kitsap County Fairgrounds, President's Hall, NW corner & Neils Nelson Rds. **HOURS:** 9am-4pm. **ADMISSION:** \$4, no adv, under 12 free. **TALK-IN:** 145.31. **FEATURES:** CB - E - H. **DEALER INFO:** Postmark before 9-1: Tables \$12, half tables \$8. Commercial \$25. Door: \$15 & \$10. Setup 4-10pm Fri, 6-9am Sat. **CONTACT:** Mat Amis, AA7PL, 2196 California Ave. E, Port Orchard WA 98366; 206-871-7099.

CA - SAN FRANCISCO — California Computer Show & Sale. **LOCATION:** Cow Palace, corner of Geneva and Santos. **HOURS:** 10am-4pm. **ADMISSION:** \$6 - \$1 off with copy of this ad; under 12 free. **FEATURES:** C - DP. **CONTACT:** California Computer Show/RJL.*

CA - OCEANSIDE — Swap Meet - Special Section for Ham Radio, Electronics & Computers. **SPONSOR:** Palomar Ham Radio Club. **LOCATION:** Oceanside Drive-In, 3480 Mission Ave. **HOURS:** 6:30am-3:30pm. **ADMISSION:** 50¢. **FEATURES:** C - E - H. **DEALER INFO:** \$13 per space. 6am setup. **CONTACT:** 619-757-5286 vendors.

CENTRAL REGION

SEPTEMBER 3-4

TX - CORPUS CHRISTI — 1st Annual Computer Showcase by the Sea. **LOCATION:** Corpus Christi Convention Center, Shoreline & Brewster. **HOURS:** 8am-5pm Thur, 8am-3pm Fri. **FEATURES:** C - Regional trade show for consumers and business professionals. **DEALER INFO:** Move-In 12:01-8pm Wed.; Move-Out 3-9pm Fri. **CONTACT:** Ask Network Enterprise, 3636 S. Alameda #102, Corpus Christi TX 78411. Tel. 512-887-1886, Fax 512-854-0662.

SEPTEMBER 5

KS - TOPEKA — 3rd Annual 'EST 92 Hamfest. **SPONSOR:** North East Kansas Amateur Radio Club. **LOCATION:** Kansas ExpoCenter, Agricultural Hall, SW of 17th & Topeka Ave. **HOURS:** 9am-4pm. **ADMISSION:** \$5 adv (SASE), \$6 door, under 10 free w/adult. **TALK-IN:** 146.955/355. **FEATURES:** C - DP - EX - FM - H - S. **DEALER INFO:** 150+ tables \$8 adv, \$10 door. Includes 1 adm. Electric available. Setup 5-11pm Fri, 7-9am Sat. **CONTACT:** Rob Nall WV0S, 5707 SW 28th Terr., Topeka KS 66614.

SEPTEMBER 6

CO - COLORADO SPRINGS — Computer Fair & Flea Market. **SPONSOR:** R and L Computer. **LOCATION:** Holiday Inn, 3125 Sinton Rd. **HOURS:** 9:30am-2:30pm. **ADMISSION:** Free. **FEATURES:** C. **DEALER INFO:** 8:30am setup. **CONTACT:** 303-666-0878.

IA - BURLINGTON — Burlington Hamfest '92. **SPONSOR:** Iowa-Illinois Amateur Radio Club. **LOCATION:** Iowa National Guard Armory, Summer Street Rd (across fr the Airport. **HOURS:** 7:30am-3pm. **ADMISSION:** \$4, under 12 free w/adult. **TALK-IN:** 146.79/19. **FEATURES:** C - E - F - FM - F/R - H - T - EX (br photo ID &

The Events Calendar is a free service limited to electronic events, published on a space available basis. Please include a contact phone number. While we strive for accuracy in our Calendar we cannot be responsible for errors or cancellations. Items must be received by the 10th of the month prior to your event. Send to: **EVENTS CALENDAR, Nuts & Volts Magazine, 430 Princland Court, Corona, CA 91719, Phone 714-371-8497, FAX 714-371-3052.** Complimentary issues are available upon request. Include flyer, estimated attendance and street address for UPS shipment. The information contained in this column is for the use of the readers of Nuts & Volts and may not be republished without the written permission of T&L Publications, Inc.

license copy) - Flights in AES's Starship airplane mobile. **DEALER INFO:** Tailgating \$3, inside \$6 (td AC power). Admission extra. **CONTACT:** Chuck Gysi, N2DUP, PO Box 974, Burlington IA 52601-0974; 319-752-3000.

IN - INDIANAPOLIS — Central Indiana Hamfest & Computerfair. **LOCATION:** Indiana State Fairgrounds, East Pavilion building. **HOURS:** 8am-4pm. **ADMISSION:** \$3 adv by (8-25), \$4 door, under 12 free w/adult. **FEATURES:** CB - DP - EX - FP - F/R - All indoors. **DEALER INFO:** Spaces w/8' tables \$10 ea; spaces w/o tables \$5 ea. **CONTACT:** Leo Doyle, PO Box 20158, Indianapolis, IN 46220. 317-251-9833 or 317-352-0136.

SEPTEMBER 12

CO - DENVER — Computer Fair & Flea Market. **SPONSOR:** R and L Computer. **LOCATION:** Holiday Inn, 4849 Bannock. **HOURS:** 9:30am-2:30pm. **ADMISSION:** Free. **FEATURES:** C. **DEALER INFO:** Tables \$10 ea. 8:30am setup. **CONTACT:** 303-666-0878.

IL - GLEN ELLYN — 40th Annual W9DXCC DX Convention. **LOCATION:** Glen Ellyn Holiday Inn, 1250 Roosevelt Rd. **HOURS:** 9am-9pm. **ADMISSION:** \$32.50 program/banquet (by 9-4), \$35.50 thereafter (spouse/friend \$22.50). **FEATURES:** DP - Programs: DX Contesting, DXpeditions, Digital Signal Processing - CW DX Contest - Banquet (Speaker: Gordon West WB6NOA). **CONTACT:** WF9K, 4965 Castaway Lane, Barrington IL 60010.

IN - FORT WAYNE — Summit City Hamfest. **SPONSOR:** Fort Wayne Radio Club. **LOCATION:** Allen County Fairgrounds, 4 mi N of I-69 on Carroll Rd at State Route 3. **HOURS:** 8am-3pm. **ADMISSION:** \$3 adv, \$5 door, under 12 free. **TALK-IN:** 146.16/-76, 449.875/444.875. **FEATURES:** CB - DP - FM - FP - F/R - H - T - ATV demo. **DEALER INFO:** Tailgate \$7; open air building with table, chair \$10 (reserve in adv, incl 1 admission); setup 6am Sat. **CONTACT:** SASE to Frank Jaworski K1FJ, POB 15127, Ft Wayne IN 46815; 219-485-2634.

IN - LAPORTE — LaPorte Fall Hamfest. **SPONSOR:** LaPorte Amateur Radio Club. **LOCATION:** LaPorte County Fairgrounds, State Route 42 West. **CONTACT:** Tom Lewis, KA9ZUM, 219-362-6848.

OH - AKRON — Akron Area Computer Fair & Sale. **LOCATION:** Tadmor Shrine Temple, 3000 Krebs Dr. I-77 Exit 120 Arlington Rd S, right on Jarvis, right on Krebs. **HOURS:** 10am-3pm. **ADMISSION:** \$5 (\$4 with copy of this ad, limit 2). Additional \$1 off after 1pm. **FEATURES:** C - FP - All indoors. **DEALER INFO:** 60 tables. **CONTACT:** Computer Fair America.*

SEPTEMBER 13

IL - JOLIET — 8th Annual Hamfest and Computer Fair. **SPONSOR:** Bolingbrook Amateur Radio Society. **LOCATION:** Inwood Recreation Center, 3000 W Jefferson St (Rt 52). **HOURS:** Gates 6am, Gym 8am. **ADMISSION:** \$4 adv, \$5 gate. **TALK-IN:** 147.33/93, 224.54-1.6, 146.82/22. **FEATURES:** C - DP - EX (9am-noon) - F/R - H - RV-S - T. **DEALER INFO:** Reserved indoor tables: dealer \$10, flea market \$6. Paved parking lot. Setup 6-8pm Sat, 5am Sun. **CONTACT:** 708-759-7005. Adv tickets, SASE to BARS, POB 1009, Bolingbrook IL 60440.

MI - SOUTHAUGE — Computer Trade Show. **LOCATION:** Southgate Civic Center, 14700 Dix-Toledo Hwy. **HOURS:** 10am-4pm. **ADMISSION:** Adults \$4; Seniors & Students w/ID \$3; under 12 free w/adult. One Year Pass \$50, seniors \$40. **FEATURES:** C - DP. **CONTACT:** Computers & You*.

OH - FINDLAY — The 50th Findlay Hamfest. **SPONSOR:** Findlay Radio Club. **LOCATION:** Hancock County Fairgrounds, East Sandusky at Fishlock. **ADMISSION:** \$4 adv, \$5 gate. **FEATURES:** DP - H - FM. **DEALER INFO:** First table \$12 (incl 1 adm), \$8 ea additional table. **CONTACT:** SASE to FRC tickets (or FRC Tables), PO Box 587, Findlay OH 45839; 419-423-1440.

SEPTEMBER 19-20

IL - PEORIA — Peoria Superfest - Ham Radio and Computer Fair. **SPONSOR:** Peoria Area Amateur Radio Club. **LOCATION:** Exposition Gardens, Northmoor and University. **HOURS:** 6am-4:30 Sat, 6am-3pm Sun. **ADMISSION:** \$5 adv (w/2stubs), \$5 gate (w/1stub). **TALK-IN:**

EVENTS CALENDAR

146.76/16. **FEATURES:** C - CB - DP - E - EX - F - FM - FP - F/R - H - RV-H (nominal chg). **DEALER INFO:** Tables \$10. Setup 2-9pm Fri, 6am-8am (indoor) Sat. **CONTACT:** Peoria Area Amateur Radio Club, PO Box 3508, Peoria IL 61612. Ans. Mach.: 309-685-6698.

SEPTEMBER 20

IL - GLEN ELLYN — Computer Central. **LOCATION:** College of DuPage, Physical Education Bldg. Main Arena, Park Blvd. & College Rd. **HOURS:** 9:30am - 3pm. **ADMISSION:** Adults \$6, 8-12 \$2, under 8 free. **FEATURES:** C - FP - AC. **CONTACT:** Dealer/general info 708-940-7547.

MI - MT. CLEMENS — 20th Annual L'Anse Creuse Swap & Shop. **SPONSOR:** L'Anse Creuse Amateur Radio Club. **LOCATION:** L'Anse Creuse High School, I-94 Exit 236 to Metro Pkwy East, left on Crocker, right on Reimold to last school. **HOURS:** 8am-2pm. **ADMISSION:** \$3 adv (by 9-8), \$4 door. **TALK-IN:** 147.08/68, 146.52. **FEATURES:** E - EX (11am - Don WA8IVZ 313-294-1567) - FM - F/R - H - T. **DEALER INFO:** Tables \$10, tailgating \$4. **CONTACT:** SASE to Jerry Luh KA8QBC, 313-651-7387, 732 Brookwood Lane, Rochester Hills MI 48309.

OH - TOLEDO — Computer Festival. **LOCATION:** Masonic Great Hall, 4645 Heatherdowns Blvd. **HOURS:** 10am-4pm. **ADMISSION:** \$4, Seniors \$3, under 12 free. **FEATURES:** C - DP - F/R. **DEALER INFO:** 1-4 ft. tables, draped & covered \$35, 5 or more \$30 ea. Setup 7:30-9:45am. **CONTACT:** Computer Support Services, PO Box 1350, Taylor MI 48180; 313-295-2237.

SEPTEMBER 26

TX - BELTON — Ham Expo '92. **SPONSOR:** Temple Amateur Radio Club. **LOCATION:** Bell County Expo Center, Exit 292 off I-35 towards the Dome. **HOURS:** 8am-3pm. **ADMISSION:** Free. **TALK-IN:** 146.82 repeater. **FEATURES:** DP - E - EX (1pm) - FM - F/R - H - T. Test station - Demos. **DEALER INFO:** 8-ft table or tailgate \$8 adv (by 9-19), \$10 door. Add'l tables \$4 adv, \$5 door. Electric \$2. 6-8am set-up. **CONTACT:** Mike WASEQ, 817-773-4768, Temple ARC, 2014 S. 53rd, Temple TX 76504.

IN - WARSAW — 2nd Annual Warsaw Hamfest. **SPONSOR:** American Red Cross Amateur Radio Club of Warsaw. **LOCATION:** National Guard Armory, Ind 15 N to Co Rd 350 N, go east, across tracks. **HOURS:** 8am-2pm. **ADMISSION:** \$3.50 adv, \$4 door. **TALK-IN:** 146.985 or 442.55. **FEATURES:** CB - EX - F - FM - F/R - H. **DEALER INFO:** Tables \$5, tailgating free with admission. **CONTACT:** John Sparks KA9QWV, 219-269-5817; Harold Dunn KA9TUQ, 219-269-9652; Paul Van Dyke KB9AVO, 219-457-5432.

MI - JACKSON — Computer Trade Show. **LOCATION:** Jackson Catholic Middle School, 915 Cooper St. **HOURS:** 10am-3pm. **ADMISSION:** Adults \$4; Seniors \$3; Students w/ID \$3; under 12 free w/adult. One Year Pass \$50, seniors \$40. **FEATURES:** C - DP - F/R - Demos - Video Seminars. **CONTACT:** Computers & You*.

SEPTEMBER 26-27

IL - GRAYSLAKE — Radio Expo '92, Annual Hamfest & Computer Show. **SPONSOR:** Chicago FM Club. **LOCATION:** Lake County Fairgrounds, US 45 & 120. **HOURS:** 6am-5pm Sat, 6am-3pm Sun, rain or shine. **ADMISSION:** \$5 adv (SASE by 9-12), \$6 gate. **TALK-IN:** 146.76/16, PL 107.2. **FEATURES:** C - CB - DP - E - EX - FM - F/R - H - RV-H. **CONTACT:** CFMC, POB 1532, Evanston IL 60204.

KS - WICHITA — 1992 Kansas State ARRL Convention. **SPONSOR:** Wichita Amateur Radio Club. **NEW LOCATION:** Ramada Hotel at Broadway Place, 400 W. Douglas. **FEATURES:** CB - H. **DEALER INFO:** Tables \$10, Electric \$10. Setup: 4:30-7pm Fri; 7-9am Sat. Security. **CONTACT:** Len Warren N0QHZ, 6233 Millsboro, Wichita KS 67219-1637; 316-744-1930.

SEPTEMBER 27

CO - LONGMONT — BARFEST - Amateur Radio, Electronics and Computer Swap Meet. **SPONSOR:** Boulder Amateur Radio Club. **LOCATION:** Boulder County Fairgrounds, Exhibition Building, Nelson & Hover Rds. **HOURS:** 8am-4pm. **ADMISSION:** \$3. **FEATURES:** C - DP - E - EX - FM - F/R - H - S - Speakers - Campsites & shopping nearby. **DEALER INFO:** Tables \$7 (chairs avail.) 7am setup. **CONTACT:** Advance table or exam reservations by Sept. 19 to 303-530-2903. Mail to 1103 S. Gay Dr., Longmont CO 80501.

MO - O'FALLON — 8th Annual Swapfest. **SPONSOR:** St. Peters Amateur Radio Club. **LOCATION:** O'Fallon Civic Center Park, I-70 Exit #217, N on Main St. to N & W RR tracks, left on Civic Park Dr., one blk N of tracks. **HOURS:** 7am-1pm. **ADMISSION:** \$1. **TALK-IN:** 145.41 repeater. **FEATURES:** DP - F/R - H - Camping - Picnic tables. **DEALER INFO:** Flea market space \$1. **CONTACT:** Walt Franzer WX0C, 314 Pegasus Trl, St. Peters MO 63376; 314-278-1993.

MI - MADISON HEIGHTS — Computer Trade Show. **LOCATION:** United Food and Commercial Workers Hall, 876 Horace Brown Dr. **HOURS:** 10am-4pm. **ADMISSION:** Adults \$4; Seniors & Students \$3; under 12 free w/adult. One Year Pass \$50, seniors \$40. **FEATURES:** C - DP - FP. **CONTACT:** Computers & You*.

OH - BEREA — 1992 Cleveland Hamfest & Computer Show. **LOCATION:** Cuyahoga County Fairgrounds. **HOURS:** 8am-4pm. **TALK-IN:** Mobile Check-in on

146.73 repeater, 6am to 12 noon. **FEATURES:** C - CB - DP - E - EX - F - FM - H - T - Sat nite dinner - Non-ham activities. **DEALER INFO:** If it rains, some inside space will be available for outside flea market. Overnight parking available. **CONTACT:** Marion Hill, WA8GZC, c/o Cleveland Hamfest Assn., PO Box 81252, Cleveland OH 44181-0252 or call 216-238-1152.

OCTOBER 3

IN - INDIANAPOLIS — Indianapolis Computer Fair. **LOCATION:** Quality Inn East, 3525 N. Shadeland Ave. (near Pendleton & I-465). **HOURS:** 10am-4pm. **ADMISSION:** \$3, under 12 free. **FEATURES:** C - DP. **DEALER INFO:** No charge for User Group setups. **CONTACT:** Ben Yanto, AGI Computer Fairs.*

OCTOBER 4

CO - COLORADO SPRINGS — Computer Fair & Flea Market. **SPONSOR:** R and L Computer. **LOCATION:** Holiday Inn, 3125 Sinton Rd. **HOURS:** 9:30am-2:30pm. **ADMISSION:** Free. **FEATURES:** C. **DEALER INFO:** 8:30am setup. **CONTACT:** 303-666-0878.

IL - MUNDELEIN — Lake County Computer Show. **LOCATION:** Mundelein Holiday Inn, corner of Rts 83 & 45. **HOURS:** 9:30am-3pm. **ADMISSION:** Adults \$6, 8-12 \$2. **FEATURES:** C - FP. **CONTACT:** 708-680-7262.

IN - VALPARAISO — Northwest Indiana Hamfest and Computer Fair. **SPONSOR:** Porter County Amateur Radio Club. **LOCATION:** Porter County Fairgrounds, Rt 49, 1 mi S of Rt 30. **OPENS:** 7am. **ADMISSION:** \$4 (adv available), under 12 free. **TALK-IN:** 146.775/175 or 52. **FEATURES:** C - CB - DP - E - EX - F/R - H - Camping. **DEALER INFO:** Indoors, outdoors. Table chairs and elec indoors only. **CONTACT:** Kevin N9IAA, 219-462-4681 or SASE to PCARC, POB 1782, Valparaiso IN 46384.

MI - ANN ARBOR — Colossal Computer Sale. **SPONSOR:** Jewish Community Center of Washtenaw County. **LOCATION:** Washtenaw Community College, Job Skills and Campus Events Bldg, East Huron River Dr. **HOURS:** 9:30am-4pm. **ADMISSION:** \$3. **FEATURES:** C (new & used) - F/R - Tax deductible donations of used equipment welcome. **DEALER INFO:** Tables \$30. **CONTACT:** 313-971-9009.

MI - SOUTHFIELD — Computer Festival. **LOCATION:** Southfield Pavilion, 26000 Evergreen Rd. **HOURS:** 10am-4pm. **ADMISSION:** \$4, Seniors & Students \$3, under 12 free. **FEATURES:** C - CB - DP - F/R. **DEALER INFO:** 1-4 ft. draped & covered tables \$35, 5 or more \$30 ea. Corporate booths \$155 ea. Setup 7:30-9:45am. **CONTACT:** Computer Support Services, PO Box 1350, Taylor MI 48180; 313-295-2237.

OH - ASHLAND — Ashland Area Hamfest. **SPONSOR:** Ashland Area Amateur Radio Club. **LOCATION:** Ashland County Fairgrounds, Baney Rd & Claremont Ave (use Claremont entrance). **HOURS:** 8am-3pm. **ADMISSION:** \$3. **TALK-IN:** 147.105/705. **FEATURES:** DP - EX (Pre-register) - H - All indoors - Crafts - QSL cards checked for DXCC. **DEALER INFO:** Tables \$5. **CONTACT:** Eric Webner KA8FAN, 435 Snader Ave., Ashland OH 44805, 419-281-4459 or Jim Gribben N8AXD, 434 Snader Ave., Ashland OH 44805, 419-281-7361 after 6pm.

OH - SPRINGFIELD — 10th Annual Hamfest & Computer Expo. **SPONSOR:** Independent Radio Association. **LOCATION:** Clark County Fairgrounds, I-70 Exit 59, N on Rt. 41 1/4 mi. **HOURS:** 8am-3pm. **ADMISSION:** \$4 adv (by 9-20), \$5 door. **TALK-IN:** 145.45(-) & 224.26(+). **FEATURES:** C - CB - DP - H - F/R - All indoors. **DEALER INFO:** Tables \$8 adv, \$10 door. **CONTACT:** 513-325-2053 tickets, 513-323-1499 general. Independent Radio Assn, POB 523, Springfield OH 45501.

OH - COLUMBUS — Columbus Computer Fair. **LOCATION:** Radisson Hotel North, 4900 Sinclair Rd (just off I-70). **HOURS:** 10am-4pm. **ADMISSION:** \$3, under 12 free. **FEATURES:** C - DP. **CONTACT:** Ben Yanto, AGI Computer Fairs.*

OCTOBER 10

CO - DENVER — Computer Fair & Flea Market. **SPONSOR:** R and L Computer. **LOCATION:** Holiday Inn, 4849 Bannock. **HOURS:** 9:30am-2:30pm. **ADMISSION:** Free. **FEATURES:** C. **DEALER INFO:** Tables \$10 ea. 8:30am setup. **CONTACT:** 303-666-0878.

OCTOBER 10-11

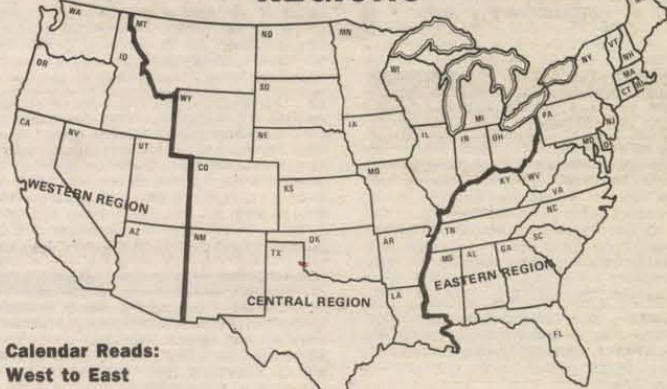
TX - EL PASO — Annual International Hamfiesta. **LOCATION:** Texas National Guard Bldg, 9100 Gateway Blvd North. **HOURS:** 8am-5pm Sat, 8am-3pm Sun. **ADMISSION:** \$5 adv, \$6 door. **TALK-IN:** 146.88. **DEALER INFO:** Tables \$5. **FEATURES:** C - EX - H - S. **CONTACT:** Clay Emert K5TRW, PO Box 31628, El Paso TX 79931; 915-859-5502.

EASTERN REGION

SEPTEMBER 5

NY - MIDDLETOWN — Orange County Computer Fair & Sale. **LOCATION:** Orange County Fairgrounds Arena, I-84 Exit 4E - Rt 17 Exit 122, Middletown Rd. **HOURS:** 10am-3pm. **ADMISSION:** \$5. **FEATURES:** C. **DEALER INFO:** 150 tables, 1500+ expected attendance. 8am setup. **CONTACT:** Tri-State Fairs.*

REGIONS



Calendar Reads:
West to East
North to South

FEATURES KEY

AC	— Air-conditioned
B	— Banquet
C	— Computers
CB	— Commercial Booths
DP	— Door Prizes
E	— Electronics
EX	— FCC exams
F	— Forums
FM	— Flea Market
FP	— Free Parking
F/R	— Food & Refreshments
H	— Amateur Radio
RV-H	— RV Parking w/hookups
RV-S	— RV Parking Self-contained
S	— Seminars
T	— Tailgating

COMPUTER SHOW PROMOTER INFO

AGI Computer Fair - 317-293-9665
AM Northwest - 206-874-8711
California Computer S & S, Richard James - 800-533-7220 - BBS 800-340-9370
CMA Computer Shows - 804-272-1570
Computer Central - 708-940-7547
Computer Fair America, P. Trapp - 607-369-2796 - 800-272-2796
Computers & You, R. Nagy - 313-283-1754
FL Mason Computer Show - 916-725-0228
KGP Computer Show - 800-631-0062
MarketPro Computer Sh - 415-388-8893
PC Fest Computer Show - 407-746-4414
R & L Computer Fair & FM - 303-666-0878
Tri-State Fairs - 201-533-1991

SEPTEMBER 6

MA - NEW BEDFORD — Electronic Flea Market. **LOCATION:** Sunshine Plaza (Fr Rt 195 E take 140 N, fr Rt 24 take 140 S to Hathaway Rd. At end of ramp make left thru Light Plaza, left after light. **HOURS:** 9am-3:30pm. **ADMISSION:** \$1. **TALK-IN:** 146.52. **FEATURES:** C - F/R - H - Audio - Test Equipment. **DEALER INFO:** Inside spaces \$10, tailgating \$8 - one admission included. **CONTACT:** Ken Rapoza, K1NSX, 19 Golf St., Fairhaven MA 02719; 508-993-3993.

CT - WINDSOR LOCKS — Hartford Area Computer Fair. **LOCATION:** Windsor Court Conference Center, I-91 at Exit 41. **HOURS:** 10am-3:30pm. **ADMISSION:** \$5, \$1 off with copy of this ad. **FEATURES:** C. **DEALER INFO:** 150 tables. **CONTACT:** Wayne Cogan, Tri-State Fairs NE*.

SEPTEMBER 7

NJ - SECAUCUS — Meadowlands Computer Fair & Sale. **LOCATION:** Meadowlands Hilton Hotel, off Rt. 3, Meadowlands Pkwy. **HOURS:** 9am-4:30pm. **ADMISSION:** \$6 (\$5 after 1pm). **FEATURES:** C. **DEALER INFO:** 250 tables, 7am setup. **CONTACT:** Tri-State Fairs.*

SEPTEMBER 12

NY - BALLSTON SPA — 6th Annual Ballston Spa Hamfest. **SPONSOR:** Saratoga County R.A.C.E.S. Assn. **LOCATION:** All under cover at County Fairgrounds, Interstate Rt 87 to Exit 12, follow orange & white signs. **HOURS:** 7am-5pm rain or shine. **ADMISSION:** \$4/person (incl 1 tailgate spot). **TALK-IN:** 146.40/147.00, 147.84/24. **FEATURES:** E - EX - F/R - H - Limited RV-H Fri (\$15 + tax) - Dealer Info: Tables \$5. First come first served. Early bird setup Fri 7-8:30 pm. **CONTACT:** N2FEP, PO Box 41, Rock City Falls NY 12863.

MA - ANDOVER — PC Fest Computer Show & Sale. **LOCATION:** Rolling Green Hotel. **STATUS:** Has been CANCELLED.

PA - ALLENTOWN — Allentown Area Computer Fair & Sale. **LOCATION:** Days Inn, 1151 Bulldog Dr (Intersection of Rts 22 & 309). **HOURS:** 10am-4pm. **ADMISSION:** \$5 (\$4 with copy of this ad, limit 2). Additional \$1 off after 1pm. **FEATURES:** AC - C - All indoors. **DEALER INFO:** 100 tables. **CONTACT:** Computer Fair America.*

PA - UNIONTOWN — 43rd Annual Gabfest. **SPONSOR:** Uniontown Amateur Radio Club. **LOCATION:** Club Grounds, Old Pittsburgh Rd, just off Rt 51 & 119 by-pass. **TALK-IN:** 147.045/645, 145.17/144.57. **FEATURES:** DP - F/R - H - Free coffee until 11am. **DEALER INFO:** Free Swap & Shop set-up with registration. **CONTACT:** UARC co John Cermak WB3DDO, PO Box 433, Republic PA 15475; 412-246-2870.

GA - STATESBORO — Statesboro Hamfest '92. **SPONSOR:** Statesboro Amateur Radio Society. **LOCATION:** Kiwanis Fairgrounds, Hwy 67 N of I-16 & Hwy 46.

HOURS: 8am-4:30pm. **ADMISSION:** \$3. **TALK-IN:** 147.105/705, WB4CJB Ellie or KC4BHX Richard - Fri nite GASSB Net 3.975. **FEATURES:** EX (9am, walk-in, bring original & copy of license) - FP - F/R - H - RV-S - T - ATV Demo - Take it or leave it table. **CONTACT:** Rick Franks N4XTP, PO Box 402, Brooklet, GA 30415; 912-842-2744.

SEPTEMBER 13

NY - CORNING — Corning Computer Fair & Sale. **LOCATION:** Corning Hilton Inn, Denison Pkwy E (Rt 17). **HOURS:** 10am-3pm. **ADMISSION:** \$5 (\$4 with copy of this ad, limit 2). Additional \$1 off after 1pm. **FEATURES:** AC - C - All indoors. **DEALER INFO:** 60 tables. **CONTACT:** Computer Fair America.*

MA - FOXBORO — PC Fest Computer Show & Sale. **LOCATION:** Demetri's Convention Center. **HOURS:** 10am-4pm. **ADMISSION:** \$7, under 10 free. **FEATURES:** C. **CONTACT:** PC Fest Computer Shows.*

MA - SOUTH DARTMOUTH — 5th Annual Hamfest & Flea Market. **SPONSOR:** South Eastern Mass Amateur Radio Assn. **LOCATION:** Club Grounds, 54 Donald St. **HOURS:** 8am-3pm. **ADMISSION:** \$2. **TALK-IN:** 147.00/60, 145.49/144.89. **FEATURES:** CB - E - FM - H. **DEALER INFO:** Table space \$8 adv, \$10 door. **CONTACT:** Michael Enos, PO Box 79064, North Dartmouth, MA 02747.

PA - BUTLER — 15th Annual Hamfest. **SPONSOR:** Butler County Amateur Radio Association. **LOCATION:** Butler County Farm Show Grounds at Roe Airport. **HOURS:** 9am-4pm. **ADMISSION:** \$1, under 12 free. **TALK-IN:** Mobile check-in till noon 146.52 simplex. Directions 147.96/36. **FEATURES:** CB - H - FM - Overnight camping - Fly-in (Butler-Roe airport) 122.7 Mhz, 80/100 AV gas avail. **DEALER INFO:** Free outside flea market; indoor space \$10 per 8ft table. **CONTACT:** WA3BVQ, RD 5 Box 8815, Slippery Rock, PA 16057 (vendors).

PA - WILLOW GROVE — Starware Computer Fair & Jamoree has been RESCHEDULED to September 20th. See announcement on that date.

CT - NEW HAVEN — PC Fest Computer Show & Sale. **LOCATION:** New Haven Coliseum. **STATUS:** Has been CANCELLED.

DE - NEW CASTLE — Wilmington Area Computer Fair & Sale. **LOCATION:** Nur Temple, Rt 13 So. of the airport. **HOURS:** 9:30am-4pm. **ADMISSION:** \$5. **FEATURES:** C. **DEALER INFO:** 140 tables, 1500 expected attendance. 8am setup. **CONTACT:** Tri-State Fairs.*

VA - TYSONS CORNER — CMA Computer Show. **LOCATION:** Westpark Hotel, Leesburg Pike (DC Capital Beltway). **HOURS:** 9:30am-4pm. **ADMISSION:** \$5, under 12 free. **FEATURES:** C. **DEALER INFO:** 6-ft table \$50 incl electricity. 7:30am setup. **CONTACT:** CMA Shows.*

EVENTS CALENDAR

SEPTEMBER 19

VT - BERLIN — 4th Annual Fall Foliage Hamfest and Fleamarket. **SPONSOR:** Central Vermont Amateur Radio Association. **LOCATION:** National Guard Armory (inside), 189 Exit 7, turn left at 3rd set of lights. **HOURS:** 8am-3pm. **ADMISSION:** \$2. **TALK-IN:** 146.625/180 Rptr. **FEATURES:** CB - DP - EX (1pm) - F/R - H - T. **DEALER INFO:** Tailgating \$4, Tables (provided inside) \$6 adv, \$8 door. **CONTACT:** Tom Girardi, WA1YNU, PO Box 53, Plainfield VT 05667; 802-426-3789.

NY - HAMBURG — 2nd Annual Buffalo Hamfest and Computer Show. **SPONSOR:** Rochester Amateur Radio Association. **LOCATION:** Erie County Fairgrounds, Rt 62 - South Park Ave. **HOURS:** 6am-4pm. **Flea Market:** 8:30am-4pm. **Commercial:** \$5, no adv, under 12 free. **Parking:** \$1. **TALK-IN:** 147.69/09. **FEATURES:** C - CB - DP - E - FM - H - Handicapped parking. **DEALER INFO:** Flea Market space \$5 plus admission. **CONTACT:** Buffalo Hamfest, 300 White Spruce Blvd., Rochester, NY 14623. Phone: 716-424-7184.

NJ - WAYNE — North Jersey Computer Show. **LOCATION:** William Paterson College Recreation Center, near I-80, Rt 23, Rt 46. **HOURS:** 10am-4pm. **FEATURES:** C - All indoors. **DEALER INFO:** 400 tables. **CONTACT:** KGP Computer Show*.

SEPTEMBER 20

VA - VIRGINIA BEACH — 17th Annual Virginia Beach Hamfest & Computer Fair. **SPONSOR:** Tidewater Radio Conventions Inc. **LOCATION:** Virginia Beach Pavilion and Convention Center. **HOURS:** 9am-5pm Sat, 9am-4pm Sun. **ADMISSION:** \$5 adv, \$6 door (good both days). **FEATURES:** AC - C - F - Outdoor FM - F - H - Speaker: Gordon West, WB6NOA. **CONTACT:** Tickets/info: Manny Steiner, K4DOR, 3512 Olympia Lane, Virginia Beach VA 23452, 804-340-6105. Exhibitors: Lewis Steingold, W4BLO, 804-486-3800.

SEPTEMBER 20

NY - OLD WESTBURY — Hamfest. **SPONSOR:** Long Island Mobile ARC. **LOCATION:** New York Institute of Technology, Rt 25A. **HOURS:** 9am-4pm. **ADMISSION:** \$5 gate, \$10 exhibitors. **TALK-IN:** 146.25/85. **FEATURES:** F/R - VHF tune-up clinic. **CONTACT:** Neil Hartman W2VZ 516-462-5549.

MA - CAMBRIDGE — Tailgate Electronics, Computer and Amateur Radio Flea Market. **SPONSOR:** MIT Electronics Research Society, the MIT Radio Society and the Harvard Wireless Club. **LOCATION:** Albany and Main St. **HOURS:** 9am-2pm, rain or shine. **ADMISSION:** \$2. **TALK-IN:** 1146.52, 449.725/444.725 - PL 2A. **FEATURES:** C - E - H. **DEALER INFO:** Room for 400 sellers. \$5 adv (before the 5th), \$8 gate (includes 1 admission). 7am setup. **CONTACT:** W1GSL, PO Box 82 MIT BR., Cambridge MA 02139; 617-253-3776.

CT - WATERBURY — PC Fest Computer Show & Sale. **LOCATION:** New Waterbury Center. **HOURS:** 10am-4pm. **ADMISSION:** \$7, under 10 free. **FEATURES:** C. **CONTACT:** PC Fest Computer Shows*.

PA - BEACH HAVEN — 2nd Annual Hamfest, Computer & Electronic Fleamarket. **SPONSOR:** Columbia-Montour Amateur Radio Club. **LOCATION:** Beach Haven Carnival Grounds, Rt 11 near Susquehanna Steam Electric Plant (N of Berwick). **HOURS:** 8am-2. **ADMISSION:** \$3, XYL and under 16 free. **TALK-IN:** 147.225 or 146.52. **FEATURES:** C - DP - E - FM - F/R (Breakfast 6am, lunch) - H - T. **DEALER INFO:** Tailgating \$1 per 8-ft space plus adm. **CONTACT:** Dave WC3A 717-752-6851 or Fred WB2YTA 717-356-7113.

PA - WILLOW GROVE — Starware Computer Fair & Jamoree. **LOCATION:** Fiesta Inn, Rt 611 S. 1/4 mile past PA Turnpike exit #27. **HOURS:** 9:30am-3:30pm. **FEATURES:** C - AC - DP - FP. **CONTACT:** StarWare Productions 800-523-0702.

NJ - SOMERSET — Somerset Computer Fair & Sale. **LOCATION:** Ukrainian Center Exhibit Hall, Davidson Ave. **HOURS:** 10am-4pm. **FEATURES:** C. **DEALER INFO:** 150 tables, 1500 expected attendance. 8am setup. **CONTACT:** Tri-State Fairs*.

NJ - PENNSAUKEN — 44th Annual Hamfest/Computer Show. **SPONSOR:** South Jersey Radio Assn. **LOCATION:** Pennsauken High School Parking Lot, Lytton Rd & Remington Ave., off US Rt 130 & SR 73. **HOURS:** 8am-3pm rain or shine. **ADMISSION:** \$4 adv, \$5 gate. **TALK-IN:** 145.29 (600). **FEATURES:** C - DP - E - EX (all classes, 9:30am reg) - FM - F/R - H - T. **DEALER INFO:** 8-ft tailgate space \$5 plus adm. **CONTACT:** SASE to Alan Sherman, KE2VX, 222 Park Ave., Atco NJ 08004; 609-768-8380 after 7:30pm.

NJ - PENNSAUKEN — PC Fest Computer Show & Sale. **LOCATION:** Metro Expo Center. **STATUS:** Has been cancelled.

SEPTEMBER 26

NY - HORSEHEADS — 17th Annual Elmira Ham/Computer Show. **SPONSOR:** Elmira Amateur Radio Assn. **LOCATION:** Chemung County Fairgrounds, Grand Central Ave & Fairview. **HOURS:** 6am-4pm. **ADMISSION:** \$3 adv, \$4 door, 10 & under free. **TALK-IN:** 147.96/33, 444.20. **FEATURES:** C - CB - DP - E - EX (9am) - FM - F/R - H - RV-H (\$8) - T. **DEALER INFO:** Free Flea Market (Ham/Elec). **CONTACT:** Exams: Bill 607-962-1134. Vendors: Jay 607-733-0761. Tickets: SASE to Dave Lewis, 465, Cr 13, Van Etten NY 14889; 607-589-7230.

SEPTEMBER 26-27

NJ - CHERRY HILL — Cherry Hill Computer Fair & Sale. **LOCATION:** Garden State Park Racetrack, Rt 70 (opposite Holiday Inn). **HOURS:** 10am-4pm Sat, 10am-3pm Sun. **ADMISSION:** Sat \$6, Sun \$5 or \$9 both days. **FEATURES:** C. **DEALER INFO:** 350 tables, 4000 per day attendance. 7:30am setup. **CONTACT:** Tri-State Fairs*.

KY - LOUISVILLE — 22nd Annual Greater Louisville Hamfest & Computer Show/ARRL Great Lakes Div. Conv. **SPONSOR:** Greater Louisville Hamfest Assn & KY-IN PC Users Group. **LOCATION:** Commonwealth Convention Center, 4th & Jefferson Sts., all indoors. **ADMISSION:** \$6 adv with SASE, \$8 door. **FEATURES:** AC - C - CB - E - EX - F - FM - H - Belle of Louisville Cruise (\$20). **DEALER INFO:** Adv flea market spaces \$12, chairs \$150, tables \$6. Friday setup. **CONTACT:** P.O. Box 34444-N, Louisville KY 40232-4444; 502-551-4118.

SEPTEMBER 27

NY - YONKERS — Electronic Flea Market. **SPONSOR:** Metro 70cm Network. **LOCATION:** Lincoln High School, Kneeland Ave. **HOURS:** 9am-3pm, rain or shine. **ADMISSION:** \$4, XYL and under 12 free. **TALK-IN:** 1440.425 445.425, PL 1567 Hz, 146.91/31T, 223.76/222.16T PL 67.0. **FEATURES:** C - DP - H - DP - E - FP - EX - F/R - EX - Free frequency checks - Free coffee. **DEALER INFO:** \$15 1st table, \$10 ea add'l. In adv., \$20 door. Your table at \$1.80/ft (min. \$10, in adv), 7am setup. **CONTACT:** Otto Suplicki, WB2SLQ, 914-969-1053.

FL - NEW PORT RICHEY — Annual Pasco County Hamfest. **SPONSOR:** Suncoast Amateur Radio Club. **LOCATION:** New Port Richey Recreation Center, 6630 Van Buren (US19 to Main St, E 1 1/2 mi to Van Buren, turn left). **HOURS:** 9am-4. **ADMISSION:** \$5. **TALK-IN:** 145.35 or 147.15. **FEATURES:** EX (W5YI) - H. **CONTACT:** Tim, WD8MVU, 813-848-0353.

OCTOBER 3

MA - MARLBOROUGH — Boston Area Computer Show. **LOCATION:** Royal Plaza Trade Center, I-495 Exit #24-B, 1 mile right on Rt 20. **HOURS:** 10am-4pm. **FEATURES:** C. **DEALER INFO:** 500 tables. **CONTACT:** KGP Computer Show*.

NJ - CHERRY HILL — 16th Annual Mid-Atlantic States Conference & Banquet. **SPONSOR:** Mt. Airy VHF Radio Club. **CONTACT:** #10 SASE to VHF Conference, POB 311, Southampton PA 18966.

OCTOBER 3-4

MS - BILOXI — 16th Annual Ham/Swapfest. **SPONSOR:** Mississippi Coast Amateur Radio Assn. **LOCATION:** Mississippi Coast Coliseum/Convention Center. **HOURS:** 7am-5pm Sat, 8am-2pm Sun. **ADMISSION:** \$2. **TALK-IN:** 146.730/130, 147.375/975. **FEATURES:** EX - DP - FP - RV-H (\$10/night) - H. **DEALER INFO:** Swap tables \$15/wknd, in adv only. To Ken Burton, K1SLV, 106 Sherwood Cir, Ocean Springs MS 39564; 601-872-1804. **CONTACT:** Ernie Orman, W5OXA, 15625 Little Joe Rd, Biloxi MS 39532, 601-392-2816.

OCTOBER 4

MA - SPRINGFIELD — Springfield Computer Fair. **LOCATION:** Springfield Civic Center, I-91 North to Exit 6, I-91 South to Exit 7. **HOURS:** 10am-3:30pm. **ADMISSION:** \$5, \$1 off with copy of this ad. **FEATURES:** C. **DEALER INFO:** 150 tables. **CONTACT:** Wayne Cogan, Tri-State Fairs NE*.

MA - NEW BEDFORD — Electronic Flea Market. **LOCATION:** Sunshine Plaza (Fr Rt 195 E take 140 N, fr Rt 24 take 140 S to Hathaway Rd. At end of ramp make left turn Light Plaza, left after light. **HOURS:** 9am-3:30pm. **ADMISSION:** \$1. **TALK-IN:** 146.52. **FEATURES:** C - F/R - H - Audio - Test Equipment. **DEALER INFO:** Inside spaces \$10, tailgating \$8 - one admission included. **CONTACT:** Ken Rapoza, K1NSX, 19 Golf St, Fairhaven MA 02719; 508-993-3993.

NJ - CHERRY HILL — Pack Rats Hamarama '92. **SPONSOR:** Mt. Airy VHF Radio Club. **LOCATION:** Garden State Park, Rt 70 & Cornell Ave. **HOURS:** 7am-4pm, rain or shine. **ADMISSION:** \$4 plus \$1 parking. **TALK-IN:** 223.50 & 146.52. **FEATURES:** F/R - H - All outdoors - No overnight parking. **DEALER INFO:** \$8 per 10'x20' space (plus adm & parking), no electric, bring table. **CONTACT:** #10 SASE to Hamarama '92, POB 311, Southampton PA 18966.

PA - MARS — Pittsburgh Computer Fair & Sale. **LOCATION:** Sheraton Northwest (Warrendale), 910 Sheraton Dr. **HOURS:** 10am-4pm. **ADMISSION:** \$5. **FEATURES:** C. **DEALER INFO:** 140 tables, 2000 expected attendance. 8am setup. **CONTACT:** Tri-State Fairs*.

MD - GAITHERSBURG — PC Fest Computer Show & Sale. **LOCATION:** Montgomery County Fairgrounds, fr I-495 take 270 N to Montgomery Village/Fairgrounds exit. **HOURS:** 10am-4pm. **ADMISSION:** \$7, under 10 free. **FEATURES:** C. **CONTACT:** PC Fest Computer Shows*.

OCTOBER 9-10

GA - AUGUSTA — Hamfest. **SPONSOR:** ARC of Augusta. **LOCATION:** Civic Center, 601 7th St. **ADMISSION:** I-20. **HOURS:** 6pm-3pm Fri, 8am-5pm Sat. **FEATURES:** \$4 adv, \$5 door, children 12 and under free. **TALK-IN:** 144.89/145.49. **FEATURES:** CB - EX - F - F/R - F/R. **DEALER INFO:** Tables \$10, set-up 3pm Fri, 6am Sat. **CONTACT:** Paul Murray N4XTD, Burden Lake Rd., Aiken, SC 29803.

OCTOBER 10

NY - BALDWINVILLE — 37th Annual RAGS Hamfest. **SPONSOR:** Radio Amateurs of Greater Syracuse. **NEW LOCATION:** Tricounty Convention Center. **HOURS:** 9am-4pm. **TALK-IN:** 146.31/91. **FEATURES:** C - CB - EX (preregister) - FM - F/R - Tech talks - Contests - Movie Theater. **DEALER INFO:** Set-up 4-10pm Fri, 6:30-8:30am Sat. **CONTACT:** 315-469-0590.

CT - NEW LONDON — Tri-State NE Computer Fair. **LOCATION:** New London Armory, I-95 North Exit 82, I-95 South Exit 83. **HOURS:** 10am-3:30pm. **ADMISSION:** \$5, \$1 off with copy of this ad. **FEATURES:** C. **CONTACT:** Wayne Cogan, Tri-State Fairs NE*.

NJ - TEANECK — BARA Annual Fall Hamfest. **SPONSOR:** Bergen Amateur Radio Association. **LOCATION:** Fairleigh Dickinson University, Rt 4 River Road Exit. **HOURS:** 8am-2pm. **ADMISSION:** \$2, XYLs and harmonics free. **TALK-IN:** 146.1979 & 146.52. **FEATURES:** EX (8-10am) - F/R - H. **DEALER INFO:** Spaces \$10; with power \$20 (preregistration required). **CONTACT:** Jim Joyce, K2Z0, 201-664-6725 (hamfest); Pete Adey K2MHP, 201-796-6622 (exams). No calls after 10pm.

VA - NORFOLK — PC Fest Computer Show & Sale. **LOCATION:** Norfolk Scope Convention Center, Brambleton Ave. and St. Paul's Blvd. **HOURS:** 10am-4pm. **ADMISSION:** \$5, under 10 free. **FEATURES:** C. **CONTACT:** PC Fest Computer Shows*.

OCTOBER 10-11

TN - MEMPHIS — Greater Memphis Amateur Radio & Computer Show. **SPONSOR:** Mid-South Amateur Radio Association. **LOCATION:** Mid-South Fairgrounds. **ADMISSION:** \$5. **TALK-IN:** 146.28/88, 449.00/444.00. **FEATURES:** C - CB - EX - H - FM. **DEALER INFO:** 8 table 20 wknd. **CONTACT:** General: Nita Wofford, N4DON, 2966 Cordell, Memphis TN 38118; 901-363-4971. Vendors: Steve Cheeseman, NX3W, 3290 New Getwell, Memphis TN 38118; 901-368-6781/365-6621.

OCTOBER 11

CT - MERIDEN — Meriden Computer Fair. **LOCATION:** Ramada Inn, I-91 North, Exit 16; I-91 South Exit 83. **HOURS:** 10am-3:30pm. **ADMISSION:** \$5, \$1 off with copy of this ad. **FEATURES:** C. **DEALER INFO:** 150 tables. **CONTACT:** Wayne Cogan, Tri-State Fairs NE*.

NJ - HANOVER — Hanover NJ Computer Fair & Sale. **LOCATION:** Marriott Hotel, Rt 10 East, near Rts 287, 280, 80. **HOURS:** 9:30am-3pm. **ADMISSION:** \$6. **FEATURES:** C. **DEALER INFO:** 160 tables, 2500 expected attendance. 7:30am setup. **CONTACT:** Tri-State Fairs*.

VA - FAIRFAX — Fairfax Computer Show. **SPONSOR:** Patriot Center, George Mason University, Exit #5 off Capital Beltway (I-495), W on Braddock Rd 5 mi. **HOURS:** 10am-3pm. **FEATURES:** C. **DEALER INFO:** 250 tables (\$10 S/C). **CONTACT:** KGP Productions 800-631-0062.

VA - MANASSAS — PC Fest Computer Show & Sale. **LOCATION:** Prince William County Fairgrounds, Rt 234. **HOURS:** 10am-4pm. **ADMISSION:** \$6, under 10 free. **FEATURES:** C. **CONTACT:** PC Fest Computer Shows*.

OCTOBER 12

NY - TARRYTOWN — COLUMBUS DAY — Westchester Computer Fair & Sale. **LOCATION:** Marriott Hotel, 670 White Plains Rd. **HOURS:** 9am-3:30pm. **ADMISSION:** \$5. **FEATURES:** C. **DEALER INFO:** 125 tables, 1500 expected attendance. 7am setup. **CONTACT:** Tri-State Fairs*.

MD - SILVER SPRINGS — COLUMBUS DAY — Capitol Computer Fair & Sale. **LOCATION:** Armory Place, 925 Wayne Ave, 2 blks fr Metro Station. **HOURS:** 10am-3pm. **ADMISSION:** \$4. **FEATURES:** C. **DEALER INFO:** 85 tables, 8am setup. **CONTACT:** Tri-State Fairs*.

OCTOBER 17

NH - NASHUA — Fall Swap & Sell Meet. **SPONSOR:** New England Antique Radio Club. **LOCATION:** Resurrection Center, 449 Broad St. **HOURS:** 8am - 1pm. **ADMISSION:** Early buyer (8-9am) \$5; general (9am-1pm) \$1. **FEATURES:** Antique and collectible radios, TVs, parts, books, etc. **DEALER INFO:** 100 tables. **CONTACT:** NEARC, RR 1 Box 36, Bradford, NH 03221, 603-938-5051 for membership or swap meet info.

PA - WILLOW GROVE — Philadelphia Area Computer Show. **LOCATION:** George Washington Conference Center, PA Turnpike Exit #27, left after toll, just ahead on right. **HOURS:** 10am-4pm. **FEATURES:** C. **DEALER INFO:** 200 tables (\$10 S/C). **CONTACT:** KGP Computer Show*.

VA - TYSONS CORNER — CMA Computer Show. **LOCATION:** Westpark Hotel, Leesburg Pike (DC Capital Beltway). **HOURS:** 9:30am-4pm. **ADMISSION:** \$5, under 12 free. **FEATURES:** C. **DEALER INFO:** 6-ft table \$50 incl electricity. 7:30am setup. **CONTACT:** CMA Shows*.

OCTOBER 18

NY - ALBANY — Albany Computer Fair & Sale. **NEW LOCATION:** New York State Armory, 130 New Scotland Ave. **HOURS:** 10am-4pm. **ADMISSION:** \$5. **FEATURES:** C. **DEALER INFO:** 200 tables, 2000 expected attendance. 8am setup. **CONTACT:** Tri-State Fairs*.

MA - CAMBRIDGE — Tailgate Electronics, Computer and Amateur Radio Flea Market. **SPONSOR:** MIT Elec-

tronics Research Society, the MIT Radio Society and the Harvard Wireless Club. **LOCATION:** Albany and Main St. **HOURS:** 9am-2pm, rain or shine. **ADMISSION:** \$2. **TALK-IN:** 1146.52, 449.725/444.725 - PL 2A. **FEATURES:** C - E - H. **DEALER INFO:** Room for 400 sellers. \$5 adv (before the 5th), \$8 gate (includes 1 admission). 7am setup. **CONTACT:** W1GSL, PO Box 82 MIT BR., Cambridge MA 02139; 617-253-3776.

OCTOBER 1992

OCTOBER 3

CA - Anaheim - California Computer Show & Sale*
CA - Hanford - Kings Amateur Radio Club Swapmeet
CA - San Jose - California Computer Show & Sale*
IN - Indianapolis - AGI's Indianapolis Computer Fair*
IN - Peru - Miami Co ARC, Cass Co ARC, Tioga ARS Hamfest
MA - Marlborough - KGP Computer Show*
NJ - Cherry Hill - Mid-Atlantic State Conference & Banquet

OCTOBER 3-4

MA - Boxborough - New England Division ARRL Convention
MS - Biloxi - Mississippi Coast Amateur Radio Club Hamfest

OCTOBER 4

CA - Burbank - California Computer Show & Sale*
CA - Livermore - Livermore ARC Swap Meet
CO - Colorado Springs - Rand L Computer Fair & Flea Market
IA - West Liberty - Muscatine & Iowa City ARCs Hamfest
IL - Mundelein - Lake County Computer Show
IN - Columbus - AGI's Columbus Computer Fair*
IN - Huntington - Huntington County ARC Hamfest
IN - Valparaiso - Northwest Indiana Hamfest/Computer Fair
MI - New Bedford - Electronic Flea Market
MA - Springfield - Tri-State NE Computer Fair*
MD - Gaithersburg - PC Fest Computer Show*
MI - Ann Arbor - Jewish Comm Ctr Colossal Computer Sale
MI - Southfield - Computer Festival
NJ - Cherry Hill - Mt. Airy VHF Radio Club Hamfest
OH - Ashland - Ashland Area ARC Hamfest
OH - Springfield - Independent Radio Assn Hamfest
PA - Mars - Tri-State Computer Fair*

OCTOBER 8

CA - Oxnard - 3rd Annual Computer Fair

OCTOBER 9-10

GA - Augusta - Amateur Radio Club of Augusta Hamfest

OCTOBER 10

CA - Oceanside - Ham Radio, Electronic & Computer Swap
CA - San Francisco - California Computer Show & Sale*
CO - Denver - R and L Computer Fair & Flea Market
CT - New London - Tri-State NE Computer Fair*
GA - Augusta - Amateur Radio Club of Augusta Hamfest
NJ - Teaneck - Bergen Area Annual Fall Hamfest
NY - Baldwinville - Radio Amateurs of Gtr Syracuse Hamfest
VA - Norfolk - PC Fest Computer Show
WA - Bremerton - North Kitsap Amateur Radio Club Hamfest

OCTOBER 10-11

TN - Memphis - Mid-South Area Hamfest
TX - El Paso - El Paso ARC Annual International Hamfest
MD - College Park - ARRL DXPO-92 Convention

OCTOBER 11

CT - Meriden - Tri-State NE Computer Fair*
MD - Friendship - Columbia Area Hamfest
NJ - Hanover - Tri-State Computer Fair*
NJ - Wall Township - Jersey Shore Amateur Radio Club Hfest
NY - LaGrange - Mt. Beacon Amateur Radio Club Hamfest
VA - Fairfax - KGP Computer Show*
VA - Manassas - PC Fest Computer Show*

OCTOBER 12

MD - Silver Springs - Tri-State Computer Fair*

OCTOBER 17

NJ - Scotch Plains - Tri-County Radio Association Hamfest
PA - Willow Grove - KGP Computer Show*
TN - Gray - 12th Annual Tri-Cities Hamfest
VA - Tysons Corner - CMA Computer Show*
WA - Tacoma - Tacoma Electronics Fleamarket

OCTOBER 17-18

CA - Concord - Pacific Division ARRL Convention
NH - Nashua - New England Antique Radio Club Swap & Sell

OCTOBER 18

CO - Golden - Rocky Mountain ARRL Section Convention
CT - New Haven - PC Fest Computer Show*
IL - Centralia - Centralia Wireless Association Hamfest
IL - Orlando Park - Chicago Area Computer Fair
MA - Cambridge - MIT Electronics, Computer, Radio Flea Mkt
MI - Kalamazoo - Kalamazoo ARC 10th Annual Hamfest
MI - Taylor - Computer Festival
NY - Albany - Tri-State Computer Fair*
NY - Queens - Hall of Science ARC Hamfest
OH - Milan - Firelands Area Hamfest
PA - Bensalem - Penn Wireless Association Hamfest
PA - Harrisburg - PC Fest Computer Show*

OCTOBER 19-20-21

WA - Seattle - Northcon '92 Elec Exhibition & Conference

OCTOBER 24

MA - Springfield - PC Fest Computer Show*
NY - Parsippany - KGP Computer Show*
SC - Sumter - South Carolina State ARRL Convention
WV - Huntington - Museum of Radio & Technology Hamfest

OCTOBER 24-25

FL - West Palm Beach - Palm Beach Repeater Assn Hamfest
TN - Chattanooga - Hamfest Chattanooga Radio & Computer

OCTOBER 25

CA - Fullerton - NOCCC Computer Swap Meet & Fair
IL - Glen Ellyn - Computer Central
NJ - Pennsauken - PC Fest Computer Show*
PA - Dublin - R.F. Hill Amateur Radio Club Hamfest

OCTOBER 30-31 - NOVEMBER 1

OK - Kingston - Texoma Hamarama Association Hamfest

OCTOBER 31

CO - Pueblo - R and L Computer Fair & Flea Market
KY - Franklin - Southern KY ARC Franklinfest '92
MN - St. Paul - 8th Annual Hamfest Minnesota & Cmptr Expo
RI - Warwick - Tri-State NE Computer Fair*

NOVEMBER 1

GA - Lawrenceville - Ham Radio & Computer Expo '92
*See Computer Show Promoter Info Box

#160 MISC. ELECTRONICS FOR SALE cont.

YOU MUST use Amco USA screwdriving bits. Free price list. DSC/nv, Box 24042, Dayton, OH 45424.

SURPLUS ELECTRONICS. Tens of thousands of electronic components: ICs, diodes, capacitors, LEDs, trimmers, potentiometers, transistors, fuses, etc. For sale as lot only \$1900 or best offer. Send for complete list to: Surplus, 3391 S. Kinnickinnic Ave., Milwaukee, WI 53207.

NICAD BATTERIES. 12 volts @ 10 powerful amps! Made by SAFT in U.S.A. have 35 left. Unused, but some look rough. Hand picked as new \$30, new but rough \$10. Plus shipping. Call Web at 803-236-5195.

LABEL YOUR VHS videos on your computer. 50 body and 50 spine labels, white, pin-feed, only \$5.25 plus \$1.75 S&H. 500 of each (1000 total) \$42.50 includes S&H. Check or M.O. No CODs to: G-CAM, P.O. Box 46312, Cincinnati, OH 45246-0312.

BROADCAST AND audio tubes for sale. We have thousands of types of tubes from 12AX7 to 6146B plus industrial types CRTs and obsolete types. We also stock ceramic octal and 9-pin sockets. M/C VISA accepted. Call The New Tube Co., 718-894-2131, PO Box 202, Middle Village, NY 11379.

CADISCO ELECTRONICS buys and sells electronic test equipment. Mil type connectors, industrial electron tubes, waveguide and microwave material. HP, Tek, GR, Wavetek up to five year old models preferred. Nothing older. Send for our latest catalog. FAX 410-685-1723.

CLEARANCE SALE. IC sockets machine tooled, 18 pin, 42 pcs., lot/\$10. 20 pin, 50/\$10. 22 pin, 88 pcs., lot/\$20. 24 pin 50/\$15. 28 pin 50/\$17. 40 pin 50/\$20. 48 pin 50/\$25. Ferrite toroid core 7/8 x 1 7/16 x 3/8" 0.35 each. Ferrite core transformer rejects \$1.50, 10/\$10, \$10 minimum 3/ shipping, plus COD charges on CODs. ECD Electronics, P.O. Box 4565, San Luis, AZ 85349.

5000 MOTOROLA MX portable modules. Make offer. G. Rodgers, 3312 Twining, N. Las Vegas, NV 89030.

SOLAR PANELS. Low cost, high efficiency, Chronar 1' x 3', ideal for boats, RVs, remote sights. Produce 12 watts, 1 amp at 14.5 volts. \$79. Chronar 1' x 1' 4 watt 350 ma for powering radios and recharging \$45. 6" x 12" trickle charger 150 ma \$30. All with 1 year warranty. Tropico Solar, P.O. Box 0861, Miami, FL 33257-0861.

AUXILIARY AIDS for hearing impaired persons. All the auxiliary aids to meet the requirements of the Americans with Disabilities Act (ADA) at reasonable prices. Neck Loops \$20, FM systems for large meeting areas \$200 up. DeVilbiss Development Co., 3056 Hazelton St., Falls Church, VA 22044. Ph. 703-534-1981.

HIGH QUALITY TOOLS AND STAINLESS STEEL HARDWARE. European and American, electronic soldering stations, screwdrivers, nutdrivers, wire cutters, pliers, hex keys, balldrivers, and more! Free catalog. Robert Mink Import-Export, Box 6437V, Fair Haven, NJ 07704. 908-758-8388.

ENVIRONMENTAL CHAMBER programmable controller -100 to 350° F; Digitally controlled water chillers. Weather, environmental, lab & test equipment, transducers, chart recorders, plotters, meters, power supplies, wire, microcomputer boards, digital resistance box 0-10MΩ 1Ω steps, misc. LSASE with interests EDS, Box 502, Columbus, NE 68601.

GORDON WEST RADIO SCHOOL "U"

(UNDER ONE ROOF)

WEEKEND GENERAL CODE CLASS

SATURDAY 9-5, SUNDAY 9-7 PM

Pass the General Class Code and Theory Test at the same time and same hotel as your spouse and friends attend the Gordon West Weekend No-Code License Course. Same time — same hotel — two separate classrooms!! **WOW! ADVANCED CLASS, TOO — NEARBY!**

CHOOSE

SEPT. 26, 27 — LAX/DEL REY
OCT. 10, 11 — ORANGE COUNTY
NOV. 14, 15 — LAX/DEL REY
DEC. 5, 6 — IRVINE

- Pass the General class code test right in class!
- 20 hours of General class code practice and theory review
- Sample test preparation exams, just like the real thing
- Multiple code test-passing opportunities, Sunday p.m.
- Kids welcome — no age restrictions
- Only prerequisite: Code copy at 10 wpm for class entry.

Are you a terminal Tech? Have you tried to pass the General class code test before, on your own? Have you "hit the wall" at 10 wpm, and need help over the plateau? The General class code weekend course, taught by popular instructor "Dit-Dah" Dan, AA6LM, is your answer to the Technician class blues! You will pass the General class code test, in class, Sunday afternoon, while your friends pass THE NEW NO CODE ENTRY LEVEL TECHNICIAN CLASS LICENSE!

The new "no code" license offer no privileges for worldwide communications. You will need the General class ticket, for worldwide voice DX. As 10 meters solar cycle declines, gain voice privileges on 12m, 15m, 17m, 20m, 40m, 75m & 160m!

Build your speed, now, to 8-10 wpm with Gordon West code tapes. This speed is your ticket for class entry, Saturday morning. "Dit-Dah" Dan will do the rest with you! Tune in 144.330, Monday nights, for additional code practice.

- Weekend course includes beverages, snacks, and lunches.
- Saturday night "Operating Session" with Gordon West and no code students.
- You must copy 10 wpm to enter class Saturday A.M.!! Tune in 144.330 Monday nights.
- Course Fee: \$150.
- Special test for disabled, defined 706(15)(A)
- Class space limited for more individual attention!

*Pre-registration is a must! Detach this form and mail your check. You will receive a confirmation, plus pre-study for your weekend course.

*RADIO SCHOOL REGISTRATION — GENERAL CLASS

Name _____ Phone (DAY) _____ (EVE) _____

Address _____ City _____ Zip _____

Please fill out one registration for per person. Make your check payable to:

RADIO SCHOOL, INC., 2414 College Drive, Costa Mesa, CA 92626 (714) 549-5000

For more details, call (714) 434-0666, Radio School Classline

☐ SEPT
☐ OCT ☐ NOV ☐ DEC

Write in 117 on Reader Service Card.

MISCELLANEOUS ELECTRONICS WANTED

170

WANTED: BURROUGHS self scan displays. Please call: Rondo Electronics, 609-397-8899.

BUYING SCIENTIFIC Atlanta 8536s, 8580s, 8590 and 8600. Any quantity. Top \$\$\$ paid. Universal Cable Brokers. Ask for Phil. 404-740-0711.

TELEGRAPH INSTRUMENTS and books relating to same. Stock tickers. Goodman, 636 Grant, Charleston, IL 61920.

RADAR EQUIPMENT wanted, x-band only. RCA CR-101,103 delay lines for AN/UPM11A. Older tube type Raytheon. Sperry Equipment, civilian, military. SHF, POB 10215, Pittsburgh, PA 15232-0215.

ELECTRONIC COMPONENTS Wanted: Capacitors, resistors, diodes, transistors, semiconductors, IC's, relays, conn, LEDs, etc. Military, industrial types needed. Top \$\$\$ paid. For information call/fax/mail your excess component lists. Electronic Material Industries, 10153 1/2 Riverside #194, Toluca Lake, CA 91602. 818-842-5953, FAX 818-845-3613.

TUBES WANTED: 6L6GC, 5881, 6550, 7027, 6CA7, RCA, GE, Sylvania, ECG, or Tung-Sol. 215-767-9097.

BUYING TOCOM, SCIENTIFIC ATLANTA 8536s, 8550s, 8580s, 8590s, and 8600s. JERROLD DPV and DPBB. PIONEERS, all. Any quantity. Top \$\$\$ paid. Contact National Cable Brokers, Plymouth, IN. Phone 219-935-4128.

WANTED: BUY & SELL all types of electron tubes. Harold Bramstedt, C&N Electronics, 6104 Egg Lake Rd., Hugo, MN 55038. 800-421-9397 or 612-429-9397. FAX 612-429-0292.

WANTED: COLLINS Radio Co. trade catalogs and promotional literature from period 1930-1980. Also looking for Rockwell 851S-1 receiver. Jim Stitzinger, 23800 Via Irena, Valencia, CA 91355. 1-805-259-2011.

SIGMA INDUSTRIES, INC.

33 Freeman St., Newark, NJ 07105

201-344-1029 FAX 201-817-8070

All EPROMs are clean socket pulls and must be cleaned and erased.

2716	\$0.65 Ea.	27128	\$1.45 Ea.
2732	\$0.75 Ea.	27128A	\$1.45 Ea.
2732A	\$0.75 Ea.	27256	\$1.90 Ea.
2764	\$0.95 Ea.	27512	\$2.40 Ea.
2764A	\$0.95 Ea.		

NEW! HIGH SPEED CMOS EPROM

Hitachi HM27C256-70NS\$3.75

All DRAMs are clean socket pulls and have full leads.

4164-15	\$0.18 Ea.	41256-15	\$0.60 Ea.
4164-12	\$0.25 Ea.	41256-12	\$0.75 Ea.



AS-IS HARD DISK DRIVES

Tandon 10 Meg TM-252	
MFMT506 5 1/4"	\$12.95
Seagate 20 Meg ST-225	
MFMT506 5 1/4"	\$24.95
Seagate 30 Meg ST-238 MFMT506 5 1/4"	\$34.95

NOTE—All units Complete with Seals intact, Less Face Plate.

NEW SONY HEAD PHONES

Model #MDR-E424	Model #MDR-006	\$3.95
(Ear Piece)	Model #MDR-012	\$7.95
Model #MDR-W05L	Model #MDR-022	\$9.95
New Sony Mini-Stereo Speakers System		
Model #SRS-5 (Pair)		\$4.95

NEW SQUARE EQUIPMENT FANS

115 Vac 3" or 4.7"	\$6.00
12 Vdc 4.7"	\$6.00
12 Vdc 1-5/8" Mini-Fan	\$4.95



NI-CAD BATTERIES WITH SOLDER TABS

Panasonic (#3) 1/3 AA 3.6V 150 Ma/H Date 90' P/N P-01M/L3N15\$0.75 ea.10 Pcs. \$6.65 ea.

NI-CAD BATTERY PACKS W/SOLDER TABS

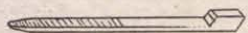
18 Sanyo Sub. "C" 1.2V 1.2 A/H Date 91' Total 21.6V 1.2 A/H Charge Rate: 14-16 Hour P/N 18XKR-SCH\$14.95 ea.
5 GE "C" 1.2V 1.8 A/H Date 90' Total 6V 1.8 A/H Charge Rate: 12-16 Hour P/N EAIC542DO\$7.95 ea.

PS/I MONO 12" VGA PAPER WHITE MONITORS

Brand New 115Vac 50/60Hz P/N PS/I 12" VGA MONO1-5 Pcs. \$59.95 ea.6-10 Pcs. \$54.95 ea.

NSI6550AFN UARTS

With built-in 16 Char. FIFO\$11.95 ea.



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Input: 117 Vac 50/60 Hz
Outputs Available



9 Vdc 200 Ma	\$1.25
9 Vdc 300 Ma	\$1.50
9 Vdc 500 Ma	\$2.50
9 Vdc 680 Ma	\$3.95
9 Vac 2 Amp	\$4.95
12 Vac 1 Amp	\$3.95
12 Vdc 200 Ma	\$1.50
12 Vdc 500 Ma	\$2.50
5 Vac 1 Amp & ±12 Vdc 250Ma	\$4.95

★ Quantity Pricing Available ★

12" COLOR CGA MONITORS

Tandy Model CM-5\$75.00
Demo units working & tested with 60 Day Guaranty.



EQUIPMENT LINE CORDS

18/3 6 ft. Instrument End	\$1.50
18/3 6 ft. Stripped Ends	\$1.00

NEW 1.2 MEG 5 1/4"

HALF HEIGHT FLOPPY DISK DRIVE

Manf: YE-DATA P/N YD-380 / 62X0790
Black Face Plate Only!\$49.95

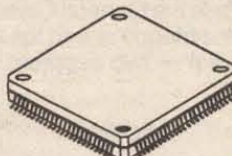
NEW TANDY ENHANCED 101 KEYBOARDS



4 Ft. Coil Cord with 6 Pin Male Mini-DIN connector\$34.95

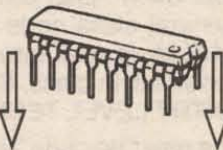
WANTED: TUBE type audio Hi-Fi, Fisher, McIntosh, Marantz, etc. George Schwarz, 18504 Arrowhead, Cleveland, OH 44119. 216-486-6489.

WANTED: INFORMATION on HP27209 IEEE488 (GP-IB) controller board. Need option switch setting information and software driver, if possible. 408-988-1948/ FAX 408-988-4869.



WANTED: SMD IC'S working or not. Unmarked or house marked O.K. We buy large quantities only. Flat Packs, PGA, LCC, PLCC, SOIC, QFP, etc. We use for dummy components. Call or FAX Lew Garrigus, **TOPLINE COMPONENTS**, Phone 310-433-7000, FAX 310-498-0490.

TUBE-TYPE amps, preamps, tuners wanted. PA, theater, industrial, or home hi-fi. Any condition. Large, old speakers. Rick Graves, 206-632-9929. 4500 9th Ave. N.E., Seattle, WA 98105-4762.



WANTED: EXCESS ELECTRONIC INVENTORIES. IC'S, MEMORY, EPROMS, PALs, LEDs, CIRCUIT BOARDS, DIODES AND TRANSISTORS. CALL ACTIVE MICRO, 310-494-4851 OR FAX 310-494-4913.

POWER CORDS, IC MASTER. Cord: White SPT-1; brn/blk SPT-2; 105 C, 6 ft. clean! 22/24 AWG Teflonwire. C-MOS/linear ICs. CKO5 Caps. 714-777-7738, FAX 777-3382.

WANT TO Buy: IC's, relays, diodes, transistors, floppy drives, electronic test equipment & most components. Al Hoffman, Hoffy Electronic Ent., 818-845-1479, FAX 818-341-5506.

WANT USED or surplus DC motor controls or adjustable frequency AC drives, 1/2 HP and up. DC motors fractional to 3 HP. C. Woodruff, 5507 55th Ave. So., Seattle, WA 98118. 206-723-8487.

WANT TO BUY platters (Media) for hard drives. Call Peter 714-542-1037.

WANTED: FENDER guitars and amplifiers, old or in need of repair preferred. 215-767-9097.

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IC REMOVER - \$89.95

10 Times Faster Than A \$2,000

Vacuum Desoldering Station



8 Piece Set Fits 6 Thru 40 Pin DIP IC Fits Radio Shack Soldering Iron

(Not Included)

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P. O. BOX 813 NV, SELMER, TN 38375, 601-287-1594

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PARTIAL KIT + PLANS 19.95

(You get other parts at Radio Shack, Hardware Store)

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KIT + PLANS 19.95

DETECTS INTRUSION OR THEFT FOR 1,000 FEET BUT ONLY WHERE YOU WANT IT. PROTECT SPECIFIC ITEM OR WIDE AREA.

ELECTRIC FISH WORM DIGGER PORTABLE AND BATTERY POWERED.

PLANS 9.95

PARTIAL KIT + PLANS 19.95

750,000 CANDLE POWER BURGLAR SPOTLIGHT. BATTERY POWERED, PORTABLE, RECHARGEABLE. 500 TIMES AS STRONG AS 5 CELL FLASHLIGHT. Build For Under 50.00 From Locally Available Materials.

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HELP WANTED

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IF YOU WOULD LIKE TO MAKE THAT KIND OF LIVING, LEARN FROM SOMEONE WHO HAS. TO BE A SUCCESS YOU MUST LEARN FROM THE SUCCESSFUL. I MADE \$117,000 IN ONE YEAR REPAIRING ELECTRONIC EQUIPMENT WORKING FOR MYSELF. MY REPAIR TECHNIQUES AND BUSINESS IDEAS ARE ON 23 VIDEO TAPES THAT LIST FOR \$44.95 EACH. FOR CATALOG, SEND SELF ADDRESSED STAMPED ENVELOPE AND \$1.00 (REFUNDABLE WITH ORDER) TO:

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601-287-1594

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WE BUY SURPLUS/USED NON-DESTRUCTIVE TESTING EQUIPMENT. Ultrasonic flaw detectors, industrial x-ray, eddy current, magnetic particle (Magnaflux). Call for our free brochure with names of manufacturers and models. UXR, 805-527-9219, FAX 805-520-7274.

USED TUBES WANTED. We are buying the following used tube types: 2A3 \$8, 6A3 \$6, 6A5 \$6, 6B4G \$5, 6C5G \$2, 6F5G \$2, 6F6G \$2, 6L6G \$3.50, 10 33, 12A \$5, 45 \$8, 50 \$23. Tubes must test good on transconductance tester. Ship to us by UPS or Parcel Post. We'll send check upon receipt including shipping charges. We buy all types of receiving tubes. Send us your list for our bid. **ANTIQUE ELECTRONIC SUPPLY**, 6221 S. Maple Avenue, Tempe, AZ 85283. 602-820-5411, FAX: 602-820-4643.

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CABLE DESCRAMBLERS-CONVERTERS

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DESCRAMBLERS

Dear Nuts & Volts:

I cannot tell you how upset I am about not getting my N&V on time. For four months at least, I've been understanding about it being late. I didn't mind too much because I could always pick it up at the swap meet on time or a day or two late. Last month the guys at the swap meet said you would not release copies to them because too many subscribers called or wrote to tell you they were unhappy because it showed up at the swap meet before they got the copy in the mail. I don't care if it does get to the swap meet first. At least I will have a copy sometime in the first week of the month. I don't even mind paying you and picking it up at the swap meet, as long as I can get a copy the first of the month.

N&V has been very good for me. I couldn't begin to tell you the large sums of money I've made because of your magazine. I can't do without it. I've got to have my copy now! I'll never get rich without your help. Swap meet or whatever it takes, get that thing distributed. We can't buy from your advertisers if we don't see the ads.

I am hoping to get my September copy on time, either in the mail or at the swap meet.

Thanks for letting me get this off my chest.

W. Myers

Our goal is to have Nuts & Volts in the mail on or before the first of the month. I know blaming the Post Office for slow delivery is like blaming Congress for the budget deficit, but there is no way around the fact that after the

magazine goes into the postal system we no longer have control over the delivery time. It is not uncommon to have our copy arrive in 7 to 10 days even though the post office is one mile away. At some point in the hopefully near future, we will qualify for second class mail which should speed things up.

NV

Dear Nuts & Volts:

I am disappointed in the answers to Tech Forum questions #6928 and #6922.

That circuit printed for #6928 is very complex and is not complete. It needs a 5 volt power supply and output drivers. The circuit I supplied was both simple and complete using 12 volts directly.

The answer to #6922 is simply wrong. The author seemed very confident in his answer, but the floppy handling is in DOS and not in BIOS! He suggested that the questioner buy a new BIOS, no small expense, which may not help. If the questioner will send me his address and a disk, I will give him a generic setup file that will enable and support the high density drives, for free. To be sure, my Phoenix BIOS has a CONT-ALT-S called setup and it does include the high density drive, but that is not the only way. One must have DOS 3.3 or later to directly support the 3 1/2 inch high density drives without using driver.sys, no matter what BIOS is installed.

T. Brackeen

Regarding #6922

Out of approximately 15 responses to this question, 10

were identical to this answer. Usually when there is such a consensus of opinion, we will go with the majority. This is not to say that there can't be other correct or alternative answers. It's for this reason that we forward all material to the person submitting the question. They can then read all the responses and determine which best fits their need.

Regarding #6928

The reason we did not choose your answer to this question will have to remain a mystery. As I explained above, we send all unused answers to the "questioner" so it is not available for review. In any case, not selecting your answer does not indicate we found fault with your design. It could be that it was not received in time or some other logistical problem prevented our using it.

NV

Dear Nuts & Volts:

I like the new format very much. Is there any way to highlight the "New This Month" ads or listings?

Keep up the great job. No one holds a candle to you.

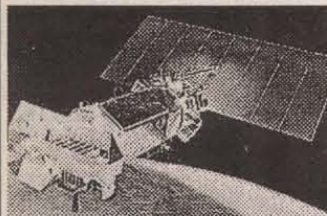
T. Laraway

Dear Editor:

Just a quick note of thanks to your staff. Because of the classified ad I ran in your March issue, a very enthusiastic radio amateur novice will be 'on the air' very soon. Thanks.

B. Aldridge

SPY ON THE EARTH



See live on your PC what satellites in orbit see

Send \$20 (\$25 Air) for our fantastic 8 diskette set of professional quality copyrighted programs (IBM type) that does satellite tracking, data acquisition, image processing, file conversion and much more. Diskette package includes catalog and \$20 discount certificate.

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WE BUY electron tubes, diodes, transistors, integrated circuits, semiconductors. Astral Electronics, P.O. Box 707-NV, Linden, NJ 07036. Call toll free 800-666-8467.

CASH WAITING for your excess inventory. We buy Japanese and American semiconductors, transistors, fuses, capacitors, resistors, flybacks, bridges and more. Call or FAX your inventories to LJ Enterprises. 516-766-2304, FAX 516-766-2348.

TOP DOLLAR PAID FOR EXCESS COMPONENTS. WE BUY MILITARY/INDUSTRIAL CONNECTORS, RELAYS, IC'S, CAPACITORS, RESISTORS, TRANSISTORS, DIODES. PLEASE CALL OR SEND YOUR EXCESS INVENTORY LIST TO: JIM RHODES, INC., 1025 RANSOME LANE, KINGSPORT, TN 37660. 615-247-1484, FAX 615-247-4963.

MEDICAL EQUIPMENT wanted: respirators, X-Ray equipment, CAT scanners, EKG machines, will buy excess inventories. Send descriptions of equipment and asking price to: 5630 Placita del Risco, Tucson, AZ 85745. Phone/FAX 602-743-3370.

WANTED TO buy: Ribbons and ribbon cartridges for all computers, word processors, typewriters. Also typing elements, laser cartridges, new and used, and most computer supplies. Call John, 619-461-6361 or FAX 619-461-4882.

4PR1000A TUBES wanted. Call Mr. Mitchell, 312-264-1922.

WE ARE buying Intel 8748, 8749, 8748H, 8749H, National 87P50 chips, new, or good used (must have stickers off). FAX info. to Thorn, 716-872-1447 Rick. Also want surplus thumbwheels any type. 716-872-4810 voice.

DEC EQUIPMENT WANTED!!! We are buying DEC systems, boards, terminals, drives and peripherals. Also Scientific Micro Systems (SMS), DSD, Emulex, Dialog, and other DEC compatibles. Please call for a quote or fax us your equipment list. **COMPUTER KEYWAYS**, 513-299-8200 or FAX 513-299-8242.

TUBES WANTED: We pay top cash price for receiving and transmitting tubes. Prefer to buy in quantity. Contact George Sr., Antique Electronic Supply. Phone 602-820-5411, Fax 602-820-4643.

WANTED: LATE MODEL TEST EQUIPMENT (Tektronix, HP, Fluke, Wavetek, ESI, GR). Also, lab standards, Data I/O Unipak 2B. And test equipment service manuals. Pepper Systems, 214-353-0257.

WANTED: LIGHTBULBS and sockets. Sunray Lighting Inc., 3012 S. Croddy Way, Santa Ana, CA 92704. Phone 800-854-4487, FAX 800-255-3141.

EDUCATION

180

HIGH TECH dictionary or acronyms, jargon, keywords, latest terms and phrases. Send \$24 to HDS Company, 2798C S. Bascom Ave., San Jose, CA 95124.

BECOME A PERSONAL COMPUTER EXPERT. "USER FRIENDLY" HOME STUDY. LEARN DOS, SOFTWARE APPLICATIONS, MUCH MORE. FREE LITERATURE. 800-362-7070 DEPT. KL498.

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Small, Attractive, High End Quality, 2 Channel Transmitter
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RF300T 150' Transmitter		24.95	19.95	15.95
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Small, High End Quality, Receiver for the RF300 Transmitters
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News - Views - Reviews

by Steve Berkoff

As satellite communications have rapidly evolved and grown during the past 20 years, a broad base of clearly explained technical information has been hard to find. Not so anymore. The second edition of "World Satellite TV and Scrambling Methods" — an easy-to-read 352 page, 8-1/2" by 11" book with over 200 photos, diagrams, tables and wiring schematics designed to aid a reader in navigating the exciting world of receiving signals from communication satellites — is now available. I strongly recommend that this book be added to the library of any technician having an interest in satellite television.

The authors have explored each component of a satellite reception system from the perspective of a technician who wants to understand their design, operation and repair. Circuit and block diagrams of most components including LNBs and actuators

are presented and clearly explained. The book has the added attraction of including complete circuit diagrams for four modern satellite receivers: the GI 2400R, the Chaparral Cheyenne, the Sakura and the Maspro SRE-90R.

Nearly a third of this book is devoted to an in-depth study of broadcast formats including NTSC, PAL, SECAM and MAC, digital audio and techniques, as well as basic scrambling and encryption methods. This material is a backdrop to a discussion of all current American and European satellite TV technologies including the VideoCipherII and II+, Oak Orion, RITC, IRDETO, FilmNet, Sky Channel, EuroCypher, B-MAC, D2-MAC, VideoCrypt and Teleclub Payview III systems.

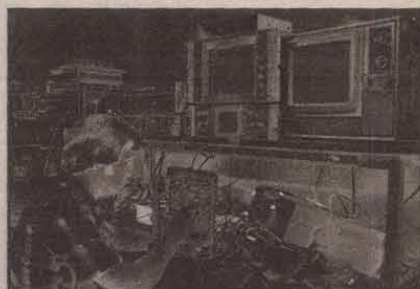
I feel that the three final chapters on troubleshooting and setting up a

test bench are particularly useful. Throughout the text, the expert guidance on testing, servicing and tuning is complemented by a wealth of detailed illustrations. The recently published second addition includes information on Smart Cards, duobinary encoding, the VideoCipher II and II+ and SCART connectors as well as an

World Satellite TV and Scrambling Methods

The Technicians' Handbook

- 2nd Edition -



FRANK BAYLIN RICHARD MADDOX JOHN McCORMAC

additional chapter on decoder connections.

"World Satellite TV and Scrambling Methods" is available from Baylin Publications, 1905 Mariposa, Boulder, Colorado 80302 for \$40 plus \$3 for shipping and handling. Baylin Publications also publishes and distributes other books as well as software and videos on satellite, wireless cable and private cable television. A free catalog is available upon request. **NV**

Steve Berkoff has been involved with cable and satellite television, wireless cable, and SMATV since the 1970s. He is technical director for Wireless Technologies Incorporated. As the former Technical Editor of "Private Cable plus Wireless Cable Magazine," he has authored numerous articles on all aspects of building and operating wireless and multi-unit satellite systems. Prior to joining WTI, Steve was the Director of Education for the National Satellite Technology Institute where he developed and taught educational programs.

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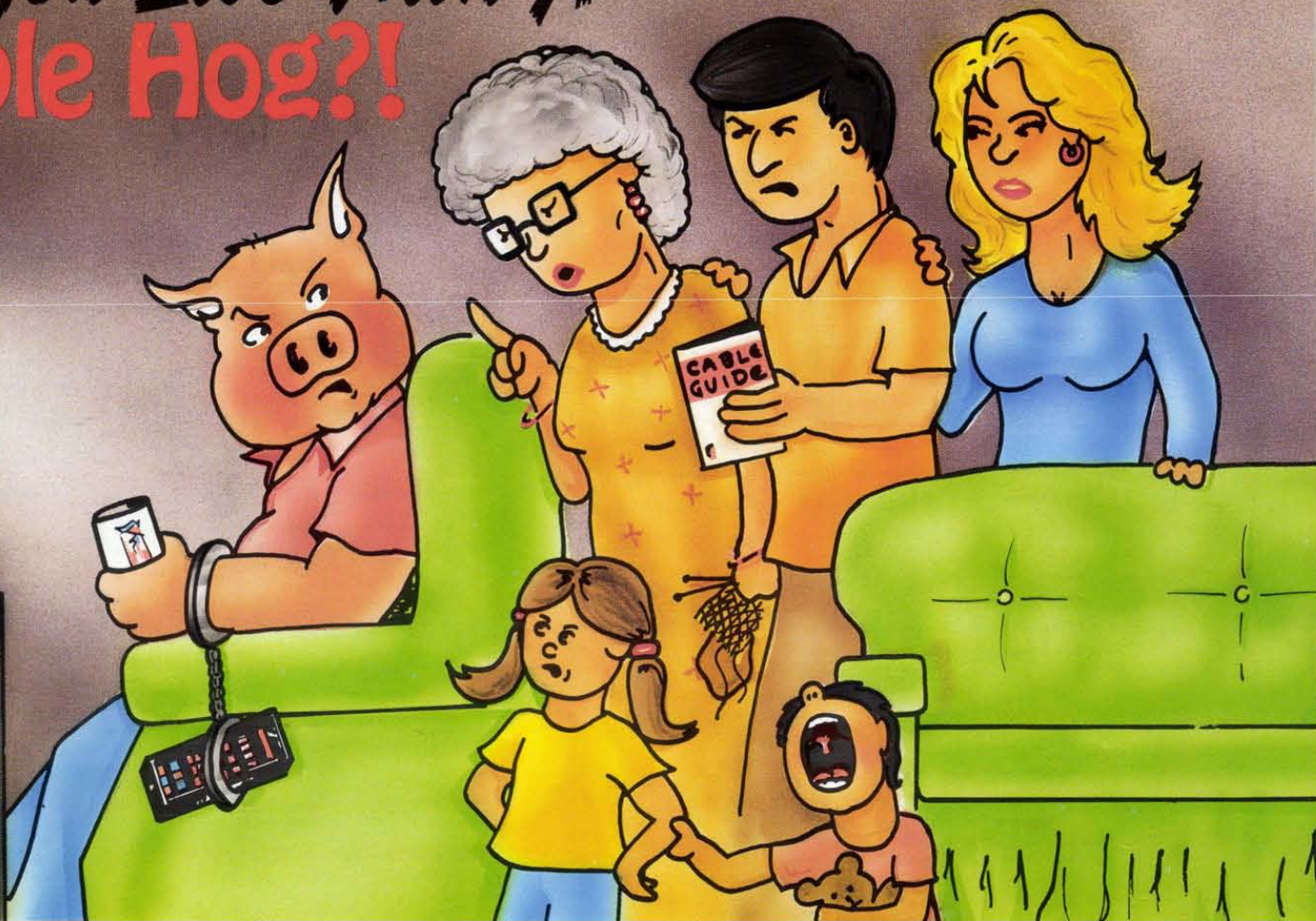
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