73 Amateur Radio Today®

OCTOBER 1994
ISSUE # 409
USA $2.95
CANADA $3.95
A WGI Publication
International Edition

QRP ACTION!

Battle of the Monobanders

A 10m Transmitter for $5

Easy Portable QRP Antennas

Home-Brew 80m Receiver

73 Reviews

QRP Rigs From: A&A, MFJ and TechSonic

10
0 74820 08725 1

Feel The Comfort Of Extended Operations With The IC-T21A!

IC-T21A
VHF FM
Transceiver

IC-T41A
UHF FM
Transceiver

Expand your coverage with a FREE! SMA/BNC Connector with every radio purchased!
(See your dealer for details on this limited time offer!)

Maximum Comfort

Elastomer Construction – This special material provides a comfortable, positive grip. The compact design fits the natural curve of your fingers and hand – especially welcome during long operating times.

Backlit Keypad – Ample spacing between keys for positive, error free operation.

Large Display – Indicates 17 different functions, battery capacity and subband frequency.

Backlit Keypad!
With 4 selectable levels of contrast!

Full Crossband Duplex Operation

Dual Band Receive Capability – Permits reception of another band (i.e.: 440 MHz on the IC-T21A).

Full Crossband Duplex Operation – Possible with the unique "whisper mode" microphone (standard) for telephone type QSO's.

6 Hours Operating Time*

Low Power Consumption – Consumes only 8 mA while standing by.

Auto Power Control – Conserves the battery by monitoring the repeater signal strength and selecting the best matching output power from 5 levels (down to 15 mW).

Auto Low Power Function – Automatically selects 15 mW just before battery exhaustion so you can complete your QSO.

* 5.5 to 6 hours with 1:1:8 duty cycle (Tx high : RX : Standby)

Battery Capacity Indicator – Shows battery capacity.

New Scanning Standards

Ultra High Speed Scan – 3 to 4 times faster than most other handhelds (33 channels/sec., 12.5 memory ch./sec.).

Bonus Band – Can be scanned while the main band is being scanned (e.g.: 70 cm for the IC-T21A).

6 Priority Watch Modes – Check for other signals while operating on a VFO frequency.

Ultra-Convenient Repeater Operations

Subaudible Tone Scan – Detects, displays *and programs* the tone frequency into the VFO. Permits access to a repeater when you don't know the tone frequency.

Auto Repeater Function – Automatically activates repeater settings (duplex ON/OFF, duplex direction, tone encoder ON/OFF) when the operating frequency falls in the repeater output range.

Repeater Memory – Quickly recall settings of your last worked repeater (RPT-M key).

5 DTMF Memories – Automatically dial your favorite telephone numbers.

Selectable DTMF Transmission Speed – Adjust the IC-T21A/T41A to the capabilities of the repeater (5 cps, 2.5 cps, 1.6 cps, 1 cps).

Powerful 6 W Output Power*

Our newly designed SC-1257 power module provides all the power necessary to reach fringe areas. Accepts 4-16 V input.

* With a 13.5 V DC power source.

Innovative Memory Functions

114 Memory Channels – Store *all* repeater information.

Memory Select Channels – For quick access, up to 30 can be designated Memory Select Channels.

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EEPROM – Memory information is retained virtually forever.

And More!

- Includes Flexible Antenna, Belt Clip, Handstrap, Rechargeable Ni-Cd Battery Pack and Charger
- Built-in Pager, Code Squelch, Pocket Beep & Tone Squelch

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CIRCLE 179 ON READER SERVICE CARD

STARTEK INTERNATIONAL INC.
FREQUENCY COUNTERS

FIND FREQUENCIES FAST with the *Startek ATH™ Series*
Four *AUTO TRIGGER & HOLD* Models, TWO Priced *Below $200!!*

NEW! ATH-10

$149.
$179 value

MADE IN USA

$189.
$235 value

ATH ™ SERIES FEATURES:
- Easy to use - simple controls
- Ultra fast response time
- Extra **BRIGHT LED** digits
- AC or Battery operation
- Maximized sensitivity

WARRANTY
5 Years Parts
1 Year Labor

ACCESSORIES

#CC-90	Soft Case for all models	$12.
#TA-90	Telescope BNC antenna	12.
#TA-90-L	Telescope Elbow BNC antenna	16.
#RD-150	150 MHZ Rubber Duck antenna	16.
#RD-2750	27 & 50 MHZ Rubber Duck antenna	28.
#RD-450	450 MHZ Rubber Duck antenna	16.
#RD-800	Cellular phone band RD antenna	29.
#C/6A	**ABOVE 7 items, SAVE $30**	**99.**
#M-207-IC	Interface Cable MFJ ant. analyzers	10.
#P-110	200 MHZ 1X-10X probe	39.
#LP-22	Low Pass, Audio probe	25.
#DC-10	Direct, 50 OHM probe	20.

Model 1350
Economy Frequency Counter
1-1300 MHZ, 3 gate times,
Hold switch
(No ATH or Bar Graph).... **$119.**

FEATURES

	ATH-10 **$149** *reg $179*	*ATH-15* **$189** *reg $235*	*ATH-30* **$249** *reg $299*	*ATH-50* **$289** *reg $339*
FREQUENCY RANGE	1 MHZ - 1200 MHZ	1 MHZ - 1500 MHZ	1 MHZ - 2800 MHZ	5 HZ - 2800 MHZ
AUTO TRIGGER & HOLD	YES	YES	YES	YES
SIGNAL BAR GRAPH	NO	YES	YES	YES
LOW BATTERY IND.	NO	YES	YES	YES
ONE-SHOT & RESET	NO	OPTIONAL	YES	YES
HI-Z LOW RANGE	NO	NO	NO	YES

OPTION #HST-15 is a high accuracy, high stability, time base upgrade that can be ordered with any ATH series model (0.2PPM TCXO)..... **$100.**

Extend readablilty distance with **BAND PASS FILTERS. $49 ea.**

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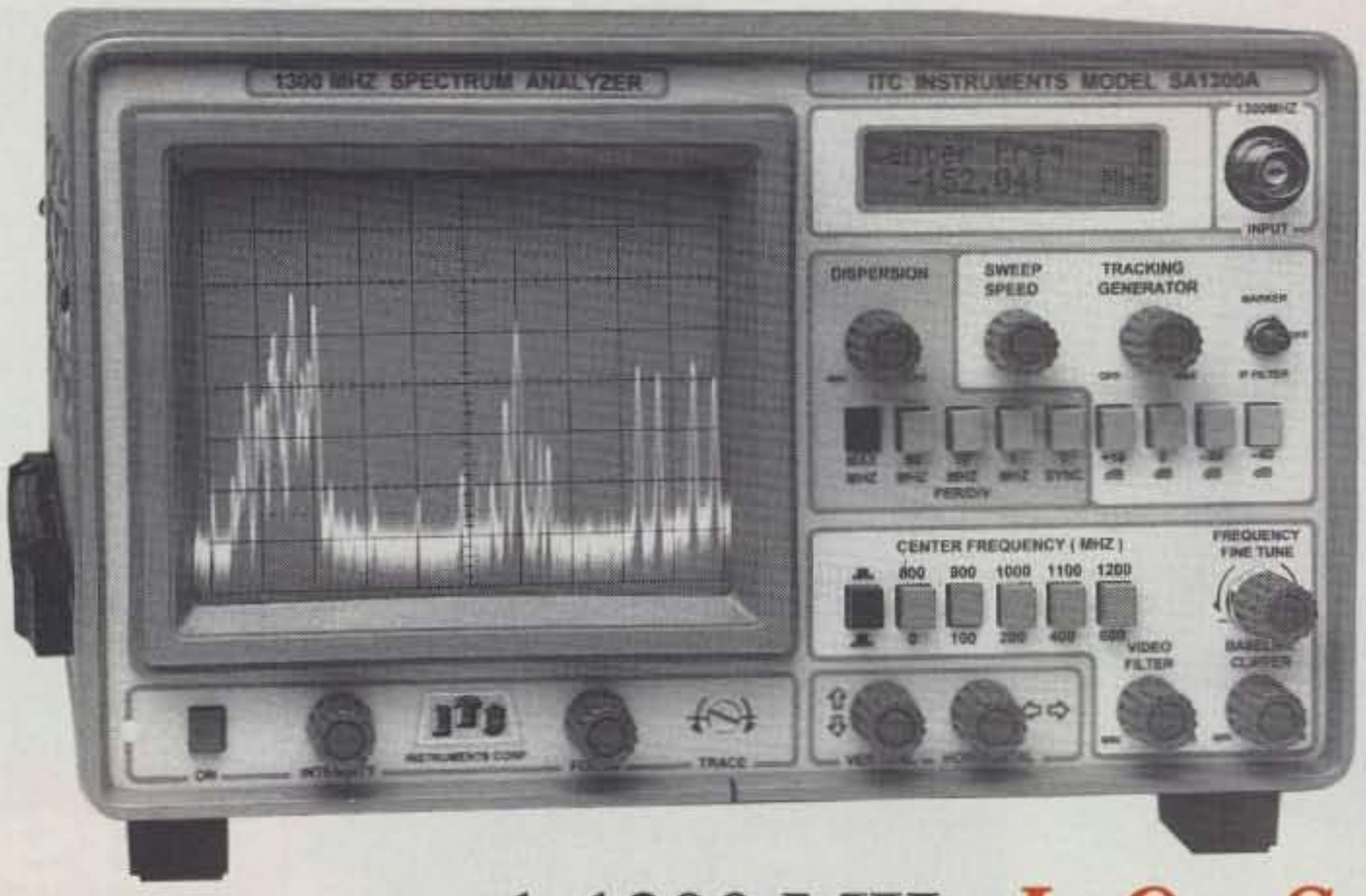

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SA1850S Covers 850 to 1850 MHz in One Sweep, LNB Power Supply, 110/220/12vdc/Battery Operation, Carring Case Center Freq. Display. The lowest cost Satellite Analyzer avalble.

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ONLY $1895.00*

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SA1800C	$1895.00
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OPT. 5 1000 MHz Tracking Generator	$250.00
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* Note: Introductory Prices for limited time only

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25 MHz Dual Trace $339.

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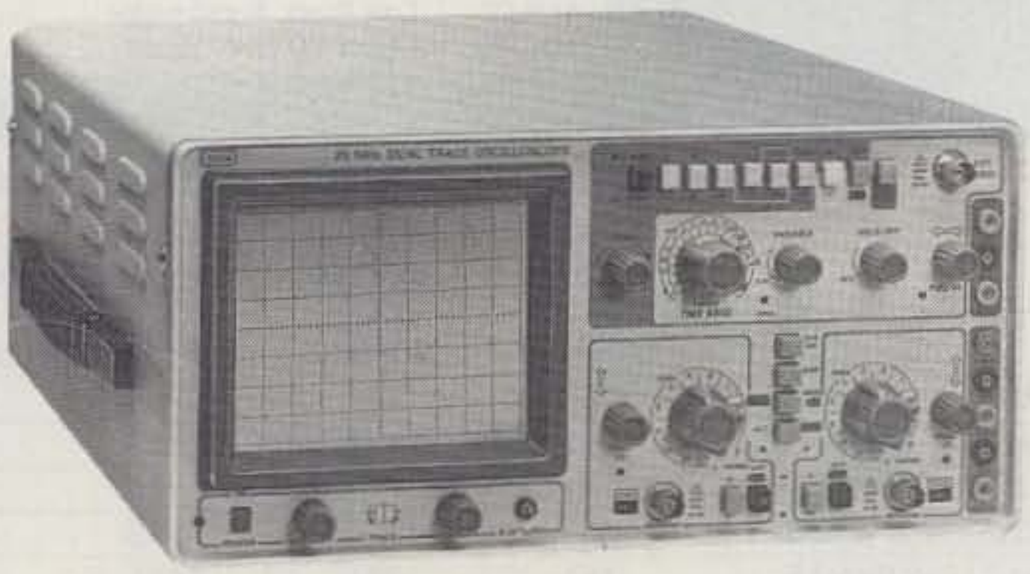

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FEEDBACK... FEEDBACK!
It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

On the cover: 73 Advertising Sales Manager Dan Harper sends a low-power CQ from Greenfield, New Hampshire, State Park. Equipment courtesy of MFJ. (Photo by Charles Warrington WA1RZW.)

FB

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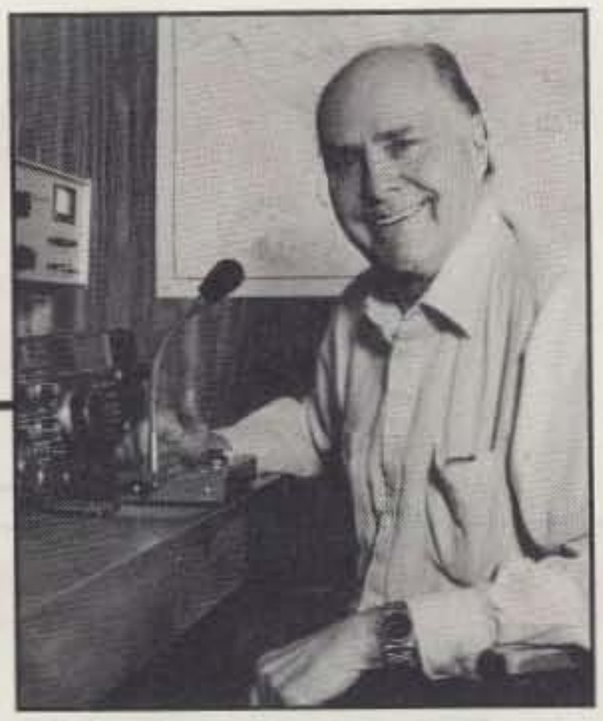
Contract: By casting a glance at this insignificant type you are hereby commanded to Elmer a newcomer to ham radio. Help mold the future of our great hobby. Uncle Wayne will be very disappointed if you don't.

Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1



Are You a Plus or a Minus?

Have you been contributing to the world? In the ham radio field, have you been helping your local club to get kids licensed? Have you been helping the club meetings to be more fun and attract more members? Have you been contributing to the ham magazines? Maybe doing a club newsletter? Organizing events? Teaching theory? How about building electronic gadgets and writing 'em up?

Or have you been spending your time on the air grumbling about this and that? Adding misery to DX pileups? Jamming contacts? Venting your irritation to anyone who will listen?

There are plus people who are contributing to the world. These are the ones who are giving us poetry, music, art, magazines and books, and other creative things for our minds. There are those who are devoted to graffiti.

Are you busy learning, teaching and creating, or are you wasting your life with inconsequentials such as soap operas, talk shows, reading newspapers, watching sports (as opposed to doing them), and so on? Are you a spectator or a participant in life? Have you ever tried painting? Have you ever tried composing a song? Writing a poem?

The candy of life is temptingly everywhere, steering you away from the meat, potatoes and veggies which will make you healthier and happier in the long run. Most people are slaves to instant gratification. Oh, they know that a salad is better for their body, but for right now make that a cheeseburger, fries and a Coke. Nobody lives forever, right? That'll be something to think about when you are 73 and have emphysema, arthritis, and a walker, not something of any great concern right now.

How are you to live and work with? Are you making people happier? Among the bundles of nice letters I get from readers there are occasionally some nasties. Name-calling. These are from angry people, and I know that not one of them is living a happy life. They're stressing their families and co-workers. Angry people should never be allowed to represent a company on the telephone or in writing. Put them where they can't do the company harm with their attitude.

Well, enough for my sociological lecture today. Repent. Try writing a poem and see if you've still got some wonder and creativity left alive. How about trying your hand at your word processor on an article for *73* or *Radio Fun* telling about something you've done or made that other hams can enjoy? How about your adventures with your new rig? My Silent Key correspondents are adamant that you will get no credit whatever for having confirmed 350 countries, knowing baseball statistics, or having religiously watched a soap opera for 20 years. In fact, you might just get recycled to Burundi on the next go around, where there are only two hams listed in the *Callbook*, one with a French address and the other at the American embassy. Serve you right.

How about trying to shoot a cover photo for*73*? Now there's a challenge. That takes creativity and skill. Or perhaps doing an article with illustrations on some club activity for your club newsletter. Stop throwing your beer cans out your pickup window and organize clean-up teams for your town.

How many hams have you contacted recently who've said at the end, "Hey, you know, I've really enjoyed talking with you?"

Whadaya Read?

If you count up the total paid circulation of the three ham magazines; if you don't figure any overlap; even so, less than half of our licensed amateurs are bothering to read any ham magazines at all!

Now, is this because over half of us have no real interest in the hobby, or is it that perhaps the ham magazines suck? And that might even include *73*, since over 400,000 licensed hams are *not* reading it.

I suppose that the essentially brain-dead who are merely logging call letters, handles, and signal reports have no need for any information about other ham activities, are satisfied with their rigs and could care less about the new stuff coming out, and so on. The whole idea of getting on packet or making satellite contacts is so far beyond their conception that magazine space devoted to these activities is irritating.

The next time you're on the air start asking the chaps you contact which ham magazines they read. Ask them which they enjoy the most; which they've found helps them learn more about technology; which has inspired them to try some new ham activity. Keep track and send me a copy of what you've discovered.

Beyond that I'd appreciate it if you'd take a good critical look at *73* and let me know how it shapes up for you on the above questions. We do have far more reports on new products than the other ham rags and publish them substantially sooner, but maybe you haven't noticed. It's fun to get something new now and then, and the readership surveys show top interest in reviews. We tend to steer away from heavy contest coverage, even though I myself enjoy them. Well, I used to, so I know what fun they can be, but I guess I contested out. *CQ* is so totally devoted to contests that I leave that small niche to them.

Maybe I'm too much of a nag on trying new aspects of the hobby. It's just that I've had so much fun learning and playing with RTTY, slow-scan, repeaters, 10 GHz, DXpeditioning, satellite contacts, and so on, that I want others to share in the fun. I'm an itch in my music magazines too, trying to get the readers off grunge and to at least try some ragtime, classical, bluegrass, and so on.

And there are so many fascinating things to talk about that I get frustrated when I get on the air and run into hams who refuse to talk. I don't give a hang what kind of a commercial antenna they've put up, I want to know what they do, what their interests are; where they've been, and so on. Maybe one of these days I can get Robot or some ham company to put a fax jack in their rigs so when I make a contact I can fax a list of things I like to talk about. And get one from him (or her?). The next step would be a packet transfer which my computer could check for items of mutual interest. Oh well, it's a thought.

Anyway, please drop me a note and let me know which ham rags you're reading. Tell me what you like about 'em, and what you don't. If you have any suggestions for my improving 73, let 'er rip. Which magazine has gotten you to try a new mode or band? Oh yes, you might mention which ham bands and modes you're using the most these days. Are you on any of the landline nets?

Taking Equipment Photos

When a ham gets through building a piece of equipment, or when a ham manufacturer needs a picture of his product to go with an ad or new product release, there is the sudden realization that taking a photo of a piece of ham gear or a circuit board isn't easy. You don't just whip out a point and shoot camera.

Not that you need a big, expensive camera . . . although the larger the negative, the better potential you'll have for getting a good shot. 35mm, even with a good macro lens, is marginal. It can be done, but the margin for error is small if you're going to enlarge the photo much. Even for photos for magazine covers I prefer a 6x9cm format. But let's say that all you've got is 35mm, so you're going to do what you can, hoping for the best.

If you need a black and white photograph you're going to shoot with black and white film. Even the best of color pictures get mushy when you try to reproduce them in black and white. Use the slowest film you can find, such as Ilford 50 or Panatomic-X. That will help you get the fine grain you'll need for sharp enlargments.

If your camera has a macro lens you can get close enough to a small piece of equipment to fill the viewfinder. With the Nikon I like the 55mm macro best. Nice lens. But when you get close to the object your depth of focus narrows and parts an inch or so further away from the lens will be out of focus, even when you close your aparature down to its minimum . . . which is usually F-32. You need a much better depth of focus, and that means you'll have to stop down your lens much more. You want something more like F-256, which is about equivalent to a pinhole. So use a piece of card with a pinhole in it for your aparature.

This has a secondary benefit. In order to have the parts or a piece of equipment stand out clearly and be well lighted from all sides, you want to have a long exposure and wash in the light by moving it around during the exposure. With a half minute exposure you have time to wash out the shadows just fine. So set your camera on a very sturdy tripod, run a test roll of film to determine your best exposure, open your lens, wash the light, and you'll have superb professional photos that would cost you hundreds of dollars for a studio to make.

When I see the blurry junk some companies are using in their ads, and the awful photos that come with so many submitted articles, it's discouraging. I used to have a corner of a room set up just for equipment shots, with the lights, and my grandfather's old 1895 Pony Premo #5 5"x7" plate camera, which stopped down to F-256.

If you're going to shoot color for an ad or a possible *73* cover picture, use Kodachrome for fine grain. Cover shots should be vertically oriented with plenty of room on the top and left side for the logo and cover copy. We're always interested in creative hammy cover pictures.

Science and Life

One of the big problems with medical research is that it's being run by scien-

Continued on page 74

COMET

MODERN, MULTI-BAND ANTENNA SYSTEMS

MOBILE ANTENNA PRODUCTS

Modern, high-performance stations use COMET Antennas, Duplexers, Triplexers and Accessories! COMET products are designed to provide an exceptional level of signal quality and coverage area. Whether operating mobile or from your base station, COMET products make you sound good. No other product line has the selection, convenience, quality and performance!

DUAL-BAND MOBILE ANTENNAS

FL-67S Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 4.5dBi 5/8 wave 446MHz 7.2dBi 5/8 wave x 3	1.5:1 or less	150 watts	4' 11"	Gold Plated PL-259

FL-62S Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 3.5dBi 1/2 wave 446MHz 6.0dBi 5/8 wave x 2	1.5:1 or less	150 watts	3' 5"	Gold Plated PL-259

NEW!

SB-7/SB-7NMO Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 4.5dBi 5/8 wave center-loaded 446MHz 7.2dBi 5/8 wave x 3	1.5:1 or less	70W FM	4' 7"	PL-259 or NMO style

NEW!

SB-5/SB-5NMO Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 3.0dBi 1/2 wave 446MHz 5.5dBi 5/8 wave x 2	1.5:1 or less	120W FM	38"	PL-259 or NMO style

NEW!

SB-2/SB-2NMO Dual-Band 146/446MHz

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 2.15dBi 1/4 wave 446MHz 3.8dBi 5/8 wave	1.5:1 or less	60W FM	18"	PL-259 or NMO style

NEW!

B-10/B-10NMO Dual-Band 146/446MHz, Cellular Look-a-like

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 0dBi 1/4 wave 446MHz 2.15dBi 1/2 wave	1.5:1 or less	50W FM	12"	PL-259 or NMO style

B-20/B-20NMO Dual-Band 146/446MHz, Cellular Appearance, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 2.15dBi 1/2 wave 446MHz 5.0dBi 5/8 wave x2	1.5:1 or less	50 watts	30"	PL-259 or NMO style

NEW!

SB-25/SB-25NMO Mono-Band 146MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 4.1dBi 5/8 wave center loaded	1.5:1 or less	100W FM	4' 9"	PL-259 or NMO style

NEW!

TRI-BAND MOBILE ANTENNAS

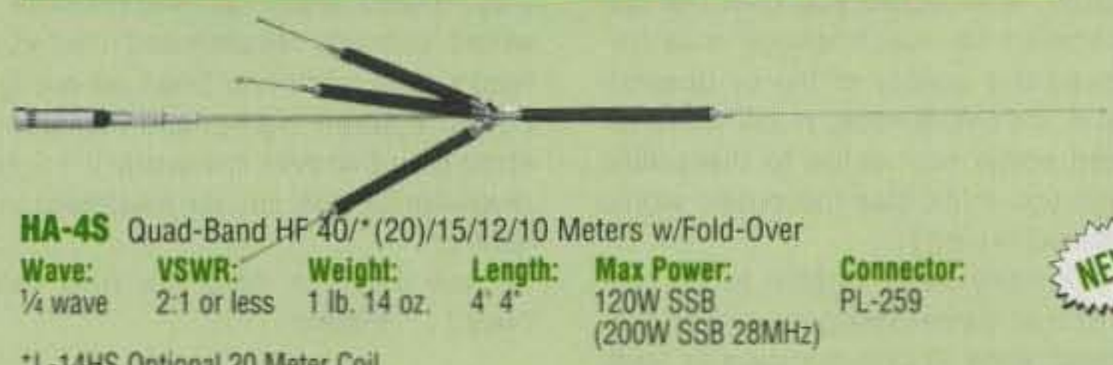
CX-224/224NMO Tri-Band 146/220/446MHz, w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 2.15dBi 1/2 wave 220MHz 3.6dBi 5/8 wave 446MHz 6.0dBi 5/8 wave x 2	1.5:1 or less	100 watts	3'	PL-259 or NMO style

FJ-15S Tri-Band 52/146/446MHz w/Fold-Over

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
52MHz 2.15dBi 1/4 wave 146MHz 4.5dBi 5/8 wave 446MHz 7.2dBi 5/8 wave x 3	1.5:1 or less	120 W FM	4' 10"	PL-259

HF MOBILE AND HT ANTENNAS



HA-4S Quad-Band HF 40/*(20)/15/12/10 Meters w/Fold-Over

Wave:	VSWR:	Weight:	Length:	Max Power:	Connector:
1/4 wave	2:1 or less	1 lb. 14 oz.	4' 4"	120W SSB (200W SSB 28MHz)	PL-259

*L-14HS Optional 20 Meter Coil

NEW!

SH-55 Super Flexible 146/446MHz HT Antenna

Gain & Wave:	Max Power:	Length:	Connector:
146MHz 1.5dBi 1/4 wave 446MHz 3.2dBi 5/8 wave x 2	10 watts	15.5"	BNC

CH-722SA High Gain HT Antenna
Gain & Wave: 146MHz 3.0dBi 1/2 wave
446MHz 5.5dBi 5/8 wave x 2
Max Power: 50 watts
Length: 35", 2 sections, 18" each
Connector: BNC

NEW!

CH-32 Miracle Baby
146/446MHz HT Antenna
Gain & Wave: 0dB 1/4 wave
Max Power: 10 watts
Length: 1.75"
Connector: BNC

DUPLEXERS AND MOBILE MOUNTS

CF-4106K, I, J,
146/446MHz
Band Pass, Ins Loss, Max Pwr.
1.3-150MHz, 0.1dB, 800w PEP
400-540MHz, 0.2dB, 500w PEP
Isolation: 60dB
CONNECTORS:

	4160K	4160I	4160J
Output:	SO-239	SO-239	SO-239
Low In:	PL-259	PL-259	SO-239
High In:	PL-259	N-Male	SO-239

RS-21
Trunk, hatchback, rear door (van, blazer, etc.) mount. Adjustable to virtually ANY angle. Rubber-coated base protects vehicle paint.

NEW!

RS-820
Heavy-Duty, Low Profile Trunk Lip or Hatch Back Mount. Rubber-coated base protects vehicle paint.

WS-1M
Multi-Adjustable Window Clip Mount.
11.5 feet of high quality coax. Gold-plated UHF Conns. for Antennas up to 40" in height.

NEW!

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13.5 feet of low loss coax. Gold plated UHF (PL-259/SO-239) connectors.
3D5M Standard Cable Assembly
Same as 3D4M, but 17 feet of coax

CK-5M Deluxe Cable Assembly
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Same as CK-5M, but 17 feet of coax

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LETTERS

Number 2 on your Feedback card

From the Ham Shack

Rob Bellville N1NTE, Northboro MA Lately, we've all been hearing about lawsuits, exam cheating, ridiculous behavior over the air, etc. Have we all forgotten that this is a hobby? If I'm going to spend my spare time (and money) doing something, you can bet I'm going to enjoy it! Why get bogged down bickering about trivial things that really don't amount to much in the grand scheme of things? Is it really so important to have a ham license that you have to cheat and pay hundreds of dollars for it? Does it really feel good to belittle people over the air?

Let's shape up *before* we lose out. Money is talking out there and frequencies all over the spectrum are being snatched up by commercial interests. Honestly, aren't there some very exciting things happening in communications? If you were in charge, who would you give the frequencies to—technology that improves the quality of life or quarrelsome, immature radio nuts? If we offered some real value to the public don't you think that the public would respond in kind?

We have been unable to be pioneers in developing new and improved ways to communicate (a fault, I believe, that is due partially to highly accelerated technology movements, again by the commercial sector). I feel that we should channel our efforts into being a cache of communicators ready and willing to fill a need where budget cuts have allowed particular public agencies to deteriorate. We should be masters at providing communications for the public's noncommercial demands. We get minimally involved in emergency communications, but that's not enough to be of real value. How about getting involved in crime watches? We have radio-equipped vehicles for patrolling. Ask your local organizations about how to get involved.

We have all these high-tech radios and all these operators waiting for action. Think of the skill level we could obtain if we were communicating with a purpose. Think of the creative process that would occur if we needed a new and improved way to communicate to accomplish a mission. Do you think we could regain our position as forerunners in communications?

As more and more new licensees are climbing on board for the enjoyment of communicating, rather than for the technical pleasures, this type of thinking becomes more valid. I enjoy amateur radio for both reasons, and do not look down on those who have singular interests. After all, isn't this hobby big enough to encourage specialists? We have accomplished CW ops, ATV pros, home-brew fanatics, and packet gurus, but why can't we have expert voice communicators? My experience has been that the newer Novice Code Techs are more enthusiastic about the hobby than anyone else. Why not allow the hobby to adapt and flourish in response to the growing ranks? People who enjoy something tend to learn more about it and tend to be pretty good at it too. Pretty soon these folks will be in the majority (and in control) and they'll be making the rules.

Athanasios Seliotis VE3TSK, from the 73 BBS After reading your editorials for a few years I thought you might be interested in a book I read while in university a few years back. The author was a radiologist by the name of Bjorn E. W. Nordenstr. He was able to cure inoperable lung cancers by the controlled use of DC current. His ideas seemed farfetched, but they worked. If you can find his book I would strongly recommend that you read it. His work has been all but ignored. If some high-priced institution should rediscover his work it might revolutionize the cancer treatment industry.

Can anyone help me find this book? . . .Wayne

Jon D. Merritt NØVTY, Burlington IA I have been getting *73* for quite a few years now. I like your format. It is a magazine, not a billboard for advertisers like another so-called magazine.

I have been into ham radio for only a couple of years now as a no-code Tech, and have just recently started working on code, instead of waiting for it to be eliminated from the exams. I work 2 meter packet mostly, and love it. And I have been experimenting with another digital mode idea, and with eliminating RFI from my TNC.

I do not agree with eliminating code. Ham operators should at the very least be tested for a general knowledge of code. Along with that, I have been hearing many stations on the ham bands not IDing their stations. In particular to my area, 2 meter ops are bringing up the autopatch on the local repeaters and not giving their ID. I have come in after their autopatch, and asked for an ID, and was ignored, and I made a point to be diplomatic about it, too. No request to use autopatch, no ID before or after! When I talked to a couple of other local operators, I was told that the overseer of the repeater should take care of the problem!

I don't believe in passing the buck, so I'm starting to make some noise around here on the local BBSs and with the local clubs. I don't want the amateur bands turned into more CB bands! I hear this on the HF bands too, and most of them sound like they have been in amateur radio for a while, too! We have these bands due to the grace of our government; we were not born with the rights to them! What a great way to show new amateurs how to operate. Why give the FCC another reason to sell off more of the radio spectrum?

We have rules and regulations to go by: Use them or lose them, along with your amateur privileges. Remember that word, privilege, not a right! I have tried to talk to amateurs about other subjects also, such as the code, the selling off of portions of the RF spectrum, and various political issues. Boy, you talk about dead band, or is it dead brain? And cold fusion. I am thrilled about it, but ask an operator around here about it and they think you are talking about cold cuts!

Olin K. McDaniel W4PFZ (Mac), Florence SC Wayne, I'm starting to worry. Recently I've found myself agreeing with you on too many issues!

What are the things on which we share common views? A major item is the slow but definite deterioration of our educational system (elementary and secondary schools) in this country. It's been over 20 years since my two children finished high school, yet I had an uneasy feeling that even they were being shortchanged. Now, 20 years later, there's no doubt in my mind. It's especially obvious when you read the writings of people coming out nowadays. Many are functional illiterates. They would have flunked every English course given when I was in high school. Even worse, they can't spell even the simplest words. I use GEnie as my BBS-type service, and see messages posted there from people who are presumably "computer whizzes." Yet, they spell "enemy" as "enema," "there" as "their" (and the reverse of that). That last error appeared repeatedly in messages from someone allegedly with a Ph.D. in a science doctrine. Even the documentation accompanying much of the high-priced computer software being released nowadays is filled with dozens of spelling and grammar errors. Without making a long list of examples, of which there are far too many, you should get my drift.

Although I'm now retired from DuPont, one of the most important things in my entire working career was not how skillful I was in my technical field, but how well I could communicate with others. This was especially true in written communications. These people coming out into the workplace today are at a terrible disadvantage with their sloppy writing and poor grammar, spelling, etc. Except for one thing, I guess—*most* of the people with whom they will compete for promotions, etc., are probably equally disadvantaged. Now for the frosting on the cake: Just this past week I read that the people who control this sort of thing are going to "readjust" the SAT scores, and artificially elevate almost all. That certainly seems to smack of endorsing mediocrity, doesn't it?

The reason I chose to write you this time was the letter from Irving Chidsey in the July 1994 issue. He seems to side with conventional scientists on issues like acid rain and the hole in the ozone layer, issues on which you have serious disagreements. I don't wish to take a position on acid rain—I have no basis for opinion. But on things like the hole in the ozone layer and global warming, I'm definitely a skeptic. In other words, I'm on your side. Much of this so-called science is overblown, hysterical and over-hyped because it's the politically correct thing. I agree with Dixie Lee Ray's position—there's simply not enough proof to justify the extravagant use of public funds. From what I've heard, even John Sununu, who holds a Ph.D. from MIT, is a skeptic about much of these so-called scientific conclusions. As far as global warming, there's almost as much compelling evidence that we are entering a period of global cooling. Obviously both positions cannot be correct; which is wrong? As for the ozone layer depletion, aren't they also at the same time screaming that fossil fuels usage is generating too much ozone? In my simple logic, I have trouble accepting that the ozone can't rise to the upper layer where it's claimed to be destroyed by the chloro-flouro carbons. Has this surplus near the surface vs. the shortage higher up been explained to your satisfaction?

Another reason for writing at this time is that you have aroused my interest in the cold fusion subject. I was especially intrigued by the bickering that went on a few years ago in the scientific community over this, with conventional scientists calling anyone supporting the possibility of it being real as charlatans, quacks, and not really scientists. I worried when my alma mater (Georgia Tech) became active in the early testing, that they would be smeared with the same tar brush. Again, this is a subject on which I have too few facts to have an opinion. (Clearly, the lack of facts doesn't deter people from having opinions, but I *try* to be objective when dealing with science.) Because of your recent editorial, I plan to follow up and become more knowledgeable on the subject. Then, perhaps I can be allowed an opinion.

Mac, as a pragmatist I hold tentative opinions built on doing my homework. Strong disagreements won't change my opinions unless they are backed up with relevant data that I might have missed.

You're right about our school system . . . you should see some of the letters I get! A mailing about K1MAN's broadcasts spelled "dedicated" as "deciated," "informantion," "injoy," "kick out off," "publishication," and "bare in mind." You get the picture.

Yes, cold fusion is alive and well, despite the elaborate burial by the hot fusion establishment. . . . Wayne 73

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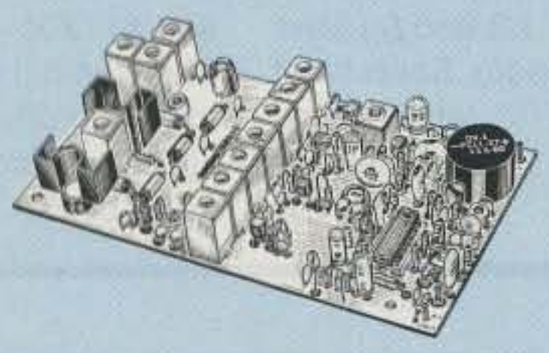

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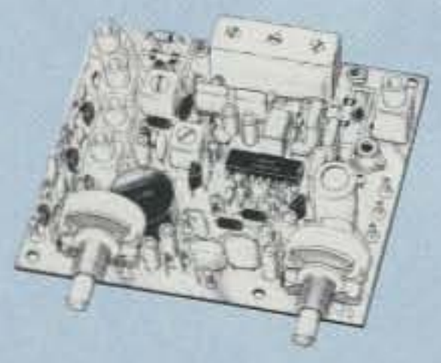

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COR-3 REPEATER CONTROLLER. Features adjustable tail and time-out timers, solid-state relay, courtesy beep, and local speaker amplifier. .....kit $49

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COR-6. COR & Real Voice ID on one board. Digital ic records up to 20 seconds of your voice.

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.....kit $59, w&t $99

TD-4 SELECTIVE CALLING Module. Versatile dtmf controller with 1 latching output. Mutes speaker until someone calls by sending your 4-digit tt code. Or use it with a long tt zero digit to alert anyone in club. Also may be used to control autopatch or other single device. .....kit $49, w&t $79

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AP-2 SIMPLEX AUTOPATCH Timing Board. Use with above for simplex operation using a transceiver .....kit $39

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MO-202 FSK DATA MODULATOR & DE-202 FSK DEMODULATOR. Run up to 1200 baud digital signals through any fm transmitter & receiver. Radio-link computers, telemetry, etc. .....kit ea $49, w&t ea $79

9600 BAUD DIGITAL RF LINKS. **Low-cost** packet networking system, consisting of MO-96 Modem and special versions of our 144, 220, or 450MHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W. CALL.

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FEATURES:
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ONLY $29 kit, $44 wired&tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size**. Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, 400-500 MHz.*

LNS-(*) IN-LINE PREAMP

ONLY $89 kit, $119 wired&tested

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Tuning range: 120-175, 200-240, or 400-500.*

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GaAs FET preamps with helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRG-(*), *$80 vhf, $110 uhf.***

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Low noise converters to receive vhf and uhf bands on a 10M receiver.

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- **Kit less case *$49*, kit w/case & BNC jacks *$74*, w&t in case *$99*.**

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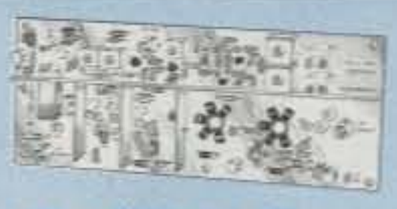

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QRX . . .

Number 3 on your Feedback card

FCC Reorganizes

In August, FCC Chairman Reed Hundt announced a massive organizational overhaul at the Federal Communications Commission. New creations include: a Wireless Telecommunications Bureau, an International Bureau, an Office of Workplace Diversity, and a Competition Division in the Office of General Counsel.

Among other changes, the Office of Small Business Activities was moved out of the Office of Managing Director and will now report directly to the Commission. The FCC will now operate with six bureaus. Besides Wireless Telecommunications and International, the other four bureaus are the Common Carrier, Mass Media, Field Operations, and Cable Services.

The Private Radio Bureau was absorbed into the new Wireless Telecommunications Bureau, which will license and administer all personal communications service (PCS) licensing and other emerging technologies. The International Bureau will concentrate on global satellite and treaty-related issues. *TNX W5YI Report, Issue #16, August 15, 1994.*

Superconductivity Strides

A Japanese researcher has discovered a method for building superconducting wires of atomic dimensions, according to *Electronic Engineering Times.* Yositaka Yosida of Iwaki Meisei University's Department of Material Science stumbled on the discovery while experimenting with caging rare earth dicarbides in large buckminsterfullerene molecules. Yosida found that elongated carbon buckytubes containing tantalum carbide—a superconductor—are formed in electric arcs.

The result of these experiments is a superconducting wire with a protective coating of carbon. Superconductivity is an emerging technology in which electricity can travel through superconducting materials which exhibit zero resistance.

In a related development, a switched 32-channel filter bank designed to eliminate interference and jamming in microwave systems has passed its first major test by the U.S. Air Force, the first giant step toward the installation of HTS (high temperature superconducting) devices in the communications and radar systems of military aircraft. The filter bank is designed and manufactured by STI, Superconductor Technology, Inc.

The STI filter is seen as a big leap in technology. Today an aircraft can filter only one or two signals, which is inadequate in dense signal environments like those in the Gulf War. Tests of STI's optically-switched 32-channel filter bank found it successfully screened all but the target signal. Other potential beneficiaries of the technology would include cellular telephone networks. *TNX Electronic Engineering Times, August 15, 1994.*

UK to QRO

Power restrictions in Great Britain have been lifted on sections of the 1.8 and 50 MHz bands, according to the Radio Society of Great Britain. Antenna and ERP (effective radiated power) restrictions no longer apply on 50 MHz, either.

Holders of the amateur Class A license may transmit with 400 watts from 1.81 to 1.85 MHz, but the power limit from 1.85 to 2.0 MHz remains at 10 watts.

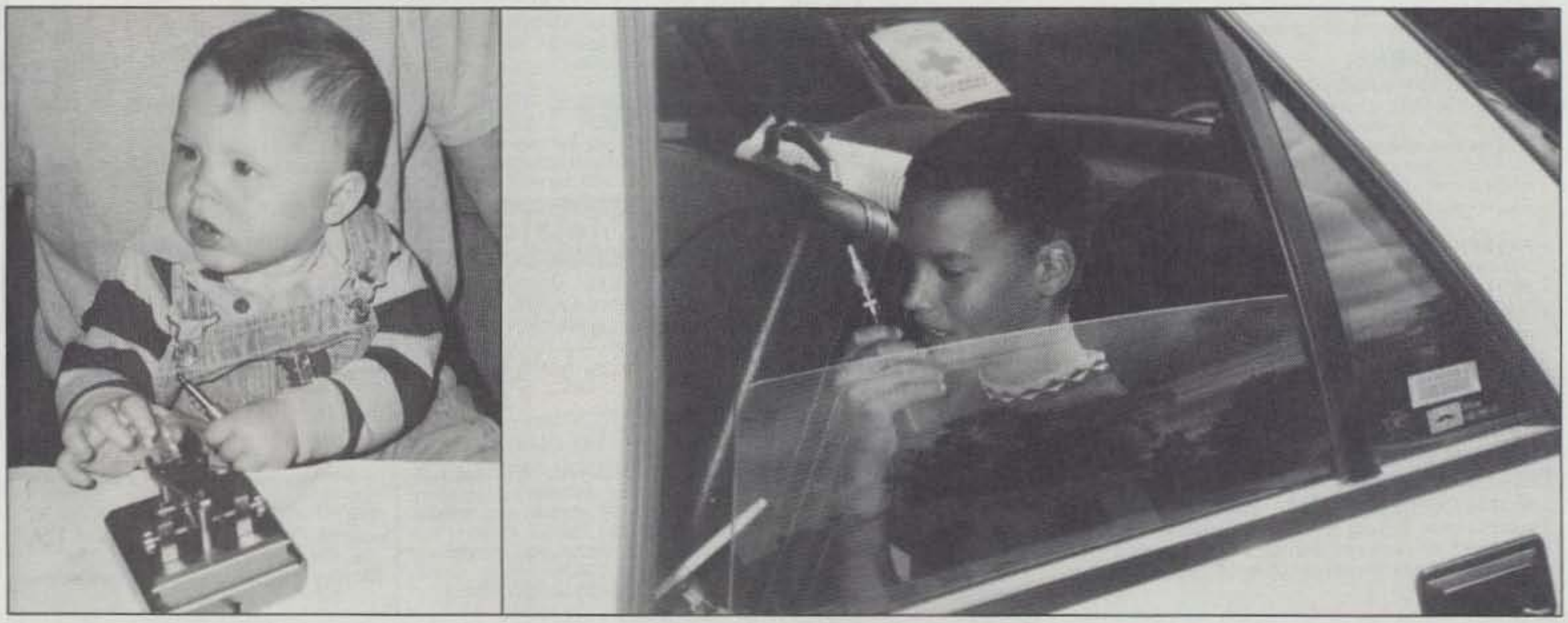
Holders of the full amateur Class A and B licenses may now run up to 400 watts between 50 and 51 MHz. The maximum permitted power between 51 and 52 MHz is still 100 watts. The ERP and antenna height restrictions have been removed from 50 to 52 MHz, allowing the use of any antenna including maritime mobile operation.

All UK amateurs are now required to notify their Radio Investigation Service office of unattended digital operation. The RSGB says this additional restriction was necessary following a number of problems with unattended operations. "The procedure is far less onerous than that required for a repeater or beacon on a hilltop site, and requires only the agreeing of suitable emergency close-down procedures," the RSGB said. *TNX Mohawk Amateur Radio Club, Inc. News, August, 1994; and the ARRL.*

TNX . . .

. . . to all our contributors! You can reach us by phone at (603) 924-0058, or by mail at *73 Magazine*, 70 Route 202 North, Peterborough, NH 03458. Or you can reach us on CompuServe ppn 70310,775@compuserve.com; or at the *73* BBS at (603) 924-9343 (1200–19.2kb), 8 data bits, no parity, one-stop bit. News items that don't make it into *73* are often put in our other monthly publication, *Radio Fun.* You can also send news items by FAX at (603) 924-9327. 73

. . . or am I just getting older?



***Youth Movement**—On the left you see the world's youngest ham, Connor McCann, carrying on a high-speed CW QSO. Well, he isn't* really *licensed yet, but his first utterance was "dah dah," according to his grandfather, Fred Doob AA8FQ. On the right, one of the youngest hams in Columbus, Georgia, 12-year-old Josh Dally KE4GRJ, is seen working an eight-hour shift, assisting the Red Cross Disaster Services with emergency communications during some of the worst flooding in memory there. What a way to spend the Fourth of July! TNX Fred Doob AA8FQ and Joe Owen KO4RR. (Right photo by Miss Billi KD4CPB.)*

Battle of the Monobanders

Iron Mike slugs it out in the QRP arena.

by Mike Bryce WB8VGE

In the past, if you wanted a QRP transceiver, you either had to use a Heathkit HW series rig, build your own, or reduce the output of your main rig. Whoa! Have things changed in the past few years. Now there's such an assortment of QRP transceivers on the market, it's actually hard to pick out the one best suited for your needs.

Since I've been using low power, I've seen a lot of QRP rigs pass through my shack. Most of them also made a stop at the service bench, too. Is there a one-and-only QRP rig? I decided to battle it out with all the single-band rigs I've either built, used or reviewed. Of course, you'll find there are some that I won't mention because I haven't had a chance to look at them.

As you can see, with all the different types and styles of QRP rigs on the market I had to set up some guidelines so we could compare one rig to other.

The Guidelines

In order for everyone to have a level playing field, I set up the following guidelines:

- Only monoband transceivers allowed.
- Transceivers only, no "transmitter-onlys."
- Either in kit form or assembled.
- Must be in current production.
- True QRP power.

With these guidelines in place, several rigs were automatically pushed from the list of candidates: the Ten-Tec Argo, because of its multiband capacity; the Index Lab transceiver, again because of its multiband capacity; and the Ramsey transmitter/receiver kits. The Ten-Tec Argosy/Argonaut/Argonaut II and the Heath HW series, along with the Yaesu FT-7, were out of the running because they are either no longer in production or are multiband rigs. Rigs by Radio Kit do not appear, either—only because I've not yet used or built any of their current lineup.

The Battle Begins

Each of the rigs I've used, or have built. Each of them has all the necessary requirements to be in the battle of the monobanders. I'll describe each of the warriors as well as any comments I noted during assembly.

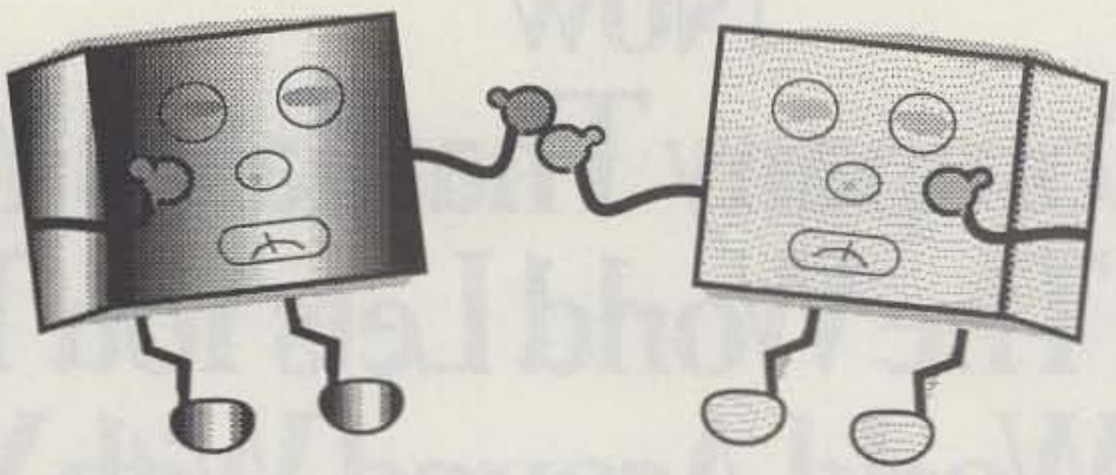
The A & A Engineering Transceiver

Based on the popular *QST* article by Gary Breed, this monoband transceiver comes in kit form. It was originally designed for 20 meters, but you can modify the tuned circuits to cover either the 40 or 30 meter bands. As with all the other rigs in the battle, this is a CW-only transceiver.

What makes this rig special is the high-tech circuit. Instead of the usual NE602s, Gary used a multifunction IC, a receiver on a chip if you will. The rig used a super heterodyne receiver; it's not direct conversion.

The VFO is controlled by a pot instead of a variable capacitor, which makes assembly much easier. A fine-tune control allows small adjustments of your operating frequency. However, you really don't know where in the band you're at with the tuning scale. There's no RIT on this rig.

This is one of the few kits that I have assembled that went together quickly and with few problems. The two PC boards are of high quality, as is the punched, silk-screened and painted cabinet. This rig is the only one to feature an S-meter that doubles as an RF output meter. It's a nice feature to have.



The manual is an assortment of pages, mostly copies from the *QST* article. Oversized PC board parts placement really helps assemble the kit. You'll need better than junk box test equipment to adjust and align the rig. Alignment and repair are provided if you want. A & A Engineering has good repair service and customer help.

A relay controls the T/R function of the rig. A robust 4+ watts proved more than enough to work the world. The internal speaker provides plenty of audio and there is even a headphone jack, too.

The Tejas Backpacker

This guy uses an improved direct conversion receiver based on the work by W7EL.

What makes the Backpacker stand out from the rest of the direct conversion rigs is the heterodyne mixing used by the VFO. Running the VFO at a much lower frequency, then mixing it with a second oscillator, improves stability. The Backpacker can be made to operate on several different bands by changing out the necessary frequency determining components. Of course, the Backpacker will only work on one band at a time. RIT is available to allow you to work those HW-7s off of your frequency.

I found the Backpacker to be quite lively in the reception of weak signals. If my old Drake R4B could hear the station, the Backpacker would, too. The QSK system has lighting-fast electronic switching. The Backpacker will produce a bit over 2 watts at 13.8 volts.

I was impressed with the keying of the transmitter. It sounds good on the air, without the usual chirps and clicks of some rigs. The Backpacker comes in a very impressive aluminum cabinet. Even the silk-screened lettering is epoxied so it won't rub off. It's a very stout little rig. The Backpacker now comes only in kit form.

On the downside, the Backpacker does not come with a speaker—an external speaker or headphones must be used. The dial readout is mostly linear, but you'll have a hard time locating a specific frequency. There are several PC boards inside the Backpacker, and a lot of interconnecting wires between the boards. It's easy for the beginner to mess up one wire connection. The manual is good, but has some rough spots. Repair service is available.

The MFJ QRP 9040

Who would think MFJ would be selling a QRP rig? Well, I bet they're doing a brisk business.

The MFJ rig is based on a very simple, well-engineered circuit. There are plenty of NE602s on the single PC board. Depending on which MFJ rig you have, they will cover 40, 30 and 20 meters, CW only.

The MFJ is built around a single PC board. This board is roughly the size of the cabinet. Other than one wire leading to the SO-239 antenna connector, there is no internal wiring. All the external controls are mounted to the PC board.

Frequency control of the MFJ is by the usual VFO using a vernier-driven capacitor.

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MFJ's 8 position *super* antenna switch lets you select two coax fed antennas, random wire/balanced line or built-in dummy load for use through your MFJ-949E or direct to your transceiver.

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MFJ's *QRM-Free PreTune*™ lets you pre-tune your MFJ-949E off-the-air into a built-in dummy load without causing QRM.

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Full Size Dummy Load

MFJ's 300 watt 50 ohm dummy load makes tuning up your transceiver and pre-tuning your antenna easy. It reduces needless QRM and saves your finals.

You'll find it handy for testing and repairing your rig, setting power level, adjusting your mic gain and more.

The MFJ-949E has a *full size* non-inductive dummy load measuring 3/4 inch diameter by 5 inches. It *easily* handles 300 watts of abusive tune-up power.

Watchout for cheap midget size dummy loads that changes resistance as it heats up -- marginal ones could burn up your rig.

Custom Inductor Switch

The inductor switch is the most likely component to burn up in *any* antenna tuner.

The inductor switch in the MFJ-949E was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner -- it's not a flimsy *plastic* switch made for small signals and wired with *tiny* gauge wire.

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Each MFJ-949E cabinet is chemically treated and has a new tough scratch-proof *vinyl* cladding -- not paint that can scratch or chip off. You won't find a tougher, longer lasting finish anywhere.

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The dial is again mostly linear, and you'll have a fairly good idea of where you're at on the band. There is no internal calibrator. The VFO stability is very good under shack conditions. The main VFO knob is large enough to twist without the feeling you'll break something inside. The center detent RIT is great to have on this little rig.

The transmitter will develop a whopping 5+ watts. Keying is very good using semi-break-in T/R control. The MFJ would be an easy rig to fix. Most of the parts are standard off-the-shelf pieces.

The first batch of these rigs suffered from low audio output. That problem is now corrected in current production units. The MFJ comes factory assembled only. Also, first production runs did not hear as well as they could have. The current units now have a post-IF amplifier to really bring out the weak signals.

You can add on an audio CW filter as well as a Curtis-based keyer. They both plug into the main PC board; there's no need to solder in anything. You can easily upgrade both options at once or add them on as you need. I recommend the CW filter.

The manual is very complete. There are schematics, block diagrams, and several pages of helpful hints. There's an 800 number for help. The MFJ unit comes with a stout warranty.

The S & S Engineering ARK-40

A newcomer in the world of QRP transceivers, the ARK-40, is the only rig on the market for under $300 that sports synthesized frequency control.

The ARK-40 comes in kit form, and there are a lot of pieces in an ARK-40. It's a kit that will require some experience in kit building. The ARK-40 is complex. It has two main boards, and both have plated-through holes and are double-sided.

Building the kit took me about 16 hours. One feature that speeds the assembly of the ARK-40 is the many prewound coils and transformers. Also, many of the parts come in their own package so you don't have to wade through a pile of resistors just to find the 10k resistors.

The ARK-40 has full QSK keying. However, the keying relay is a bit loud. You get a full 5 watts of RF to your antenna. The ARK series is available for 40, 30, and 20 meters. You can install an internal Curtis-based keyer inside the ARK-40.

There's plenty of audio coming from this rig. It sounds really good, partly because of the front-firing speaker. An excellent audio filter is also included in the base price of the ARK-40.

The instruction manual is excellent. There's a lot of information on how the rig works, troubleshooting, and even the world's shortest burp on antennas. Factory service and repair is available if you can't get your kit working. Service from S & S is quick, friendly and timely.

The tuning method is a bit different from what most hams are used to. The use of push-buttons to set the operating frequency is both a first and a minus. I'll explain. It's great for setting the frequency to exactly where you want to be. If you have a schedule at 7.0323, you can set the frequency precisely. On the other hand, band tuning is a bit slower than just turning a knob. It's not a contest rig.

I'm impressed with the construction of the ARK series. You could use the ARK-40 as a wheel chuck for your camper, and then operate Field Day the next weekend. It's military-tough in its extruded aluminum case.

The ARK-40 is the most expensive kit of the group.

The S & S Engineering ARK-4

The ARK-4 is an ARK-40 after a trip to Weight Watchers. It's a slimmer, leaner version of the ARK-40. Instead of two PC boards, only one is required for the ARK-4. The ARK-4 comes in a vinyl-covered steel case and not the extruded aluminum style of its bigger brother.

You can build the ARK-4 in steps, checking out each stage as you go. Options such

as a CW filter, RIT, and a fine-tune control make for a very well-designed QRP rig. The ARK-4 is only available for the 40 meter band.

Full QSK, again with a rather loud relay, controls 5 watts of RF. Frequency control is also by push-buttons, but with a fine-tune control for small changes in frequency. You have the same "set it and be there" frequency control as the ARK-40.

And, like the ARK-40, the manual for the ARK-4 is great. There are plenty of pointers to help out the new builder.

The OHR Rigs

This is the one exception to my guidelines—I've never assembled any of the OHR rigs. But, I did include them in this battle simply because so many people have used them. But, this will be only a brief look at the many OHR rigs. I have operated some of the OHR rigs during Field Day.

There are several models of OHR rigs. Most are based on NE602 designs. And, like most of the other guys, you can build the OHR rig for the band of your choice.

The OHR rigs are big. They're not something I would put in a backpack. Yes, there are some smaller OHR rigs, such as the Sprint, but overall they're large. In some cases this is a plus! Larger PC boards are easier for the new builder to work on.

Depending on the model, direct conversion and superhet receivers are used. All the OHR rigs meet the QRP power level for contests.

The manuals for the OHR are very complete. There is a repair service available and phone help as well.

The Howe Transceiver

This kit was the hardest to assemble. There's a lot of drilling and custom metal work to be done on the huge aluminum chassis. A direct conversion receiver, the Howe transceiver works quite well when assembled. It's not a first-time kit, however, as each section of the rig contains its own PC board. All of the boards are then wired together to form a complete transceiver.

The receiver will not drive a speaker without microphonics developing. It's a headphones-only rig. The transmitter produces a solid 3 watts of output.

The lack of any type of QSK is a real low point in the Howe transceiver. You must manually switch from receive to transmit and back again. The assembly manual is a bit disorganized. It needs to be updated.

What Mikes Likes . . .

The winner of this battle in the kit class goes to the ARK-40 by S & S Engineering. It's solid, and a great performer. The people at S & S stand by their product with both service and assembly help. I especially like the ability to know exactly where I'm at on the band. Yes, it is expensive, but you get a lot for your money.

The runner up is the A & A Engineering rig by Gary Breed. I liked this kit because it went together so well. However, the lack of a RIT control hurts this fine QRP transceiver.

Next up, in third place, are the many rigs from OHR. Simple in design, and in use, they're fine rigs for the novice builder. Large easy access to the PC board makes building them a pleasure.

Factory-Assembled

My number one choice for this category goes to MFJ. Their 90 series of QRP transceivers put a lot of fun back into ham radio without a lot of money leaving your pocket. (Model 9015 is featured on the cover.) The street price of the MFJ rigs is running about $150. You can have an MFJ QRP transceiver on the air less than five minutes after you open the box. The MFJ-9020 is an ideal way of trying out QRP.

That's my opinion. Remember, my choices reflect what I like in a radio. Your likes may be a lot different from mine. All of these rigs are decent, so don't forget to ask around, and make a purchase that's just right for you! 73

The Traveler

A sweet home-brew receiver for 80!

by Paul G. Daulton K5WMS

Here is a simple, high-performance, 80 meter SSB receiver designed around the Motorola MC3335P IC chip. It is a true single-sideband superhetrodyne, with a three-pole crystal filter and crystal-controlled BFO, using inexpensive microprocessor crystals. The cost is comparable—no more than $8 to $10 over the cost of any of the popular direct conversion receivers using the NE602/LM386 combinations. Arrangements have been made with Dan's Small Parts Co. (1935 South 3rd West #1, Missoula MT 59801; telephone/fax: 406-543-2871) to offer a kit of parts (including the circuit board, from FAR Circuits, all board-mounted components, volume control, switch, and a 4-to-40 pF air variable with built-in 8/1 reduction drive) for $39.95 plus $3.75 S&H. If you decide to go it alone, the PC board is available from FAR Circuits (18N640 Field Court, Dundee IL 60118, $4.75 plus $1.50 S&H) and the remainder of the components from Mouser Electronics and DC Electronics (see the Parts List for addresses).

I think this design is suitable for a first-time project. Clubs and ham classes might consider this receiver for a group project for newcomers. Today there is a lack of entry-level equipment for the new hams to use to gain technical and operating experience. When I got interested in ham radio in the mid-1950s I, like others, came into the hobby through shortwave listening. Most of the hams at that time were still using AM, which was easily received on any shortwave receiver, even the home entertainment variety. Today few people come into our hobby except by exposure to CB or VHF repeater operation heard on their scanners. I think they miss a lot in this process of not being exposed to the 80 through 10 meter bands, just listening and learning. The newcomer would only need to be taught component recognition and soldering skills to be able to assemble this receiver. Only two adjustments need to be made (for alignment), and these can be made listening to signals off the air without any test equipment, if necessary.

Circuit Description

See Figure 3. The MC3335p IC is a 20-pin dip chip designed as a complete FM receiver minus the audio amp. It features two oscillator mixer combinations, limiter, quadrature detector, squelch and received signal strength indicator circuits.

"Clubs and ham classes might consider this receiver for a group project for newcomers."

The MC3335p is an application engineer's dream. Power connections are made to pin 5 (+) and pin 15 (-). Voltage is routed to each stage internally, and all biasing and regulator circuits are internal. Only two external connections need to be made to each stage. The first and second mixers have gains of 18 and 22 dB respectively. Gain of these mixers is independent of the supply voltages. In its most common application a VHF FM signal of say 49 MHz would beat against the first oscillator (10.7 MHz higher or lower) and the 10.7 MHz IF signal from the first mixer would exit the chip at pin 17 and pass through a ceramic filter. After passing the ceramic filter, the 10.7 signal would re-enter the chip at pin 16 and go to the second mixer where the signal would beat against the 10.245 MHz crystal and be converted to 455 kHz. The 455 kHz from the second mixer exits the chip at pin 4, passes through a second filter of 455 kHz and returns to the chip at pin 7 for processing through the limiter and FM detector circuits. So much for how the MC3335P works as an FM receiver.

To use the MC3335P to receive 80 meter single sideband I used the following scheme: The 4.0 MHz lower sideband signal enters the chip at pins 1 and 20 from T2, the antenna coil. The first oscillator operates at approximately 9.0 MHz, controlled by T1 and the varactor diode. This 9.0 MHz signal beats with the 4.0 MHz signal and produces a 5.0 MHz signal in the first mixer. This 5 MHz signal exits

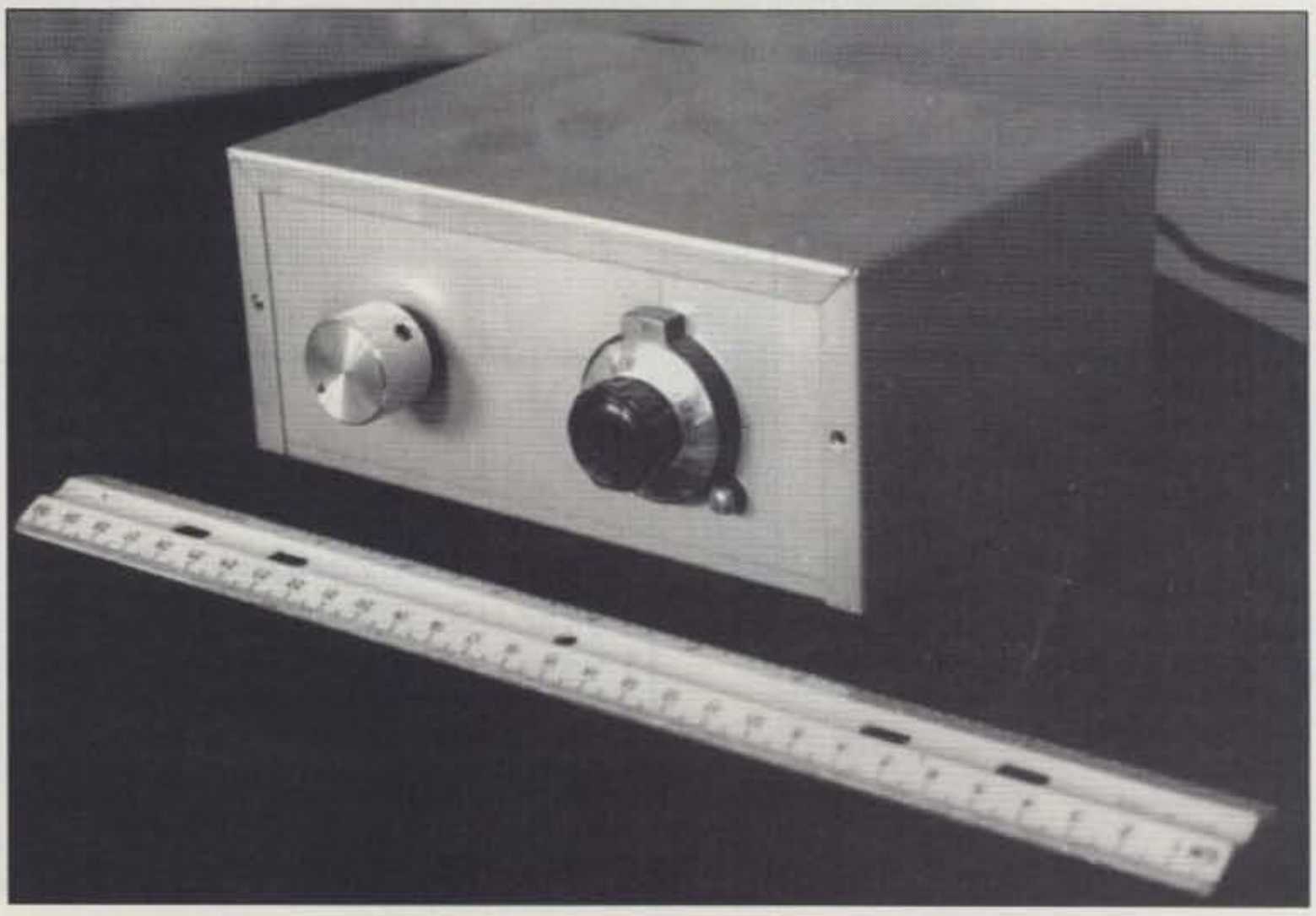

Photo A. Front view of The Traveler. (Photo by NRG Photo, Jacksonville, Arkansas.)

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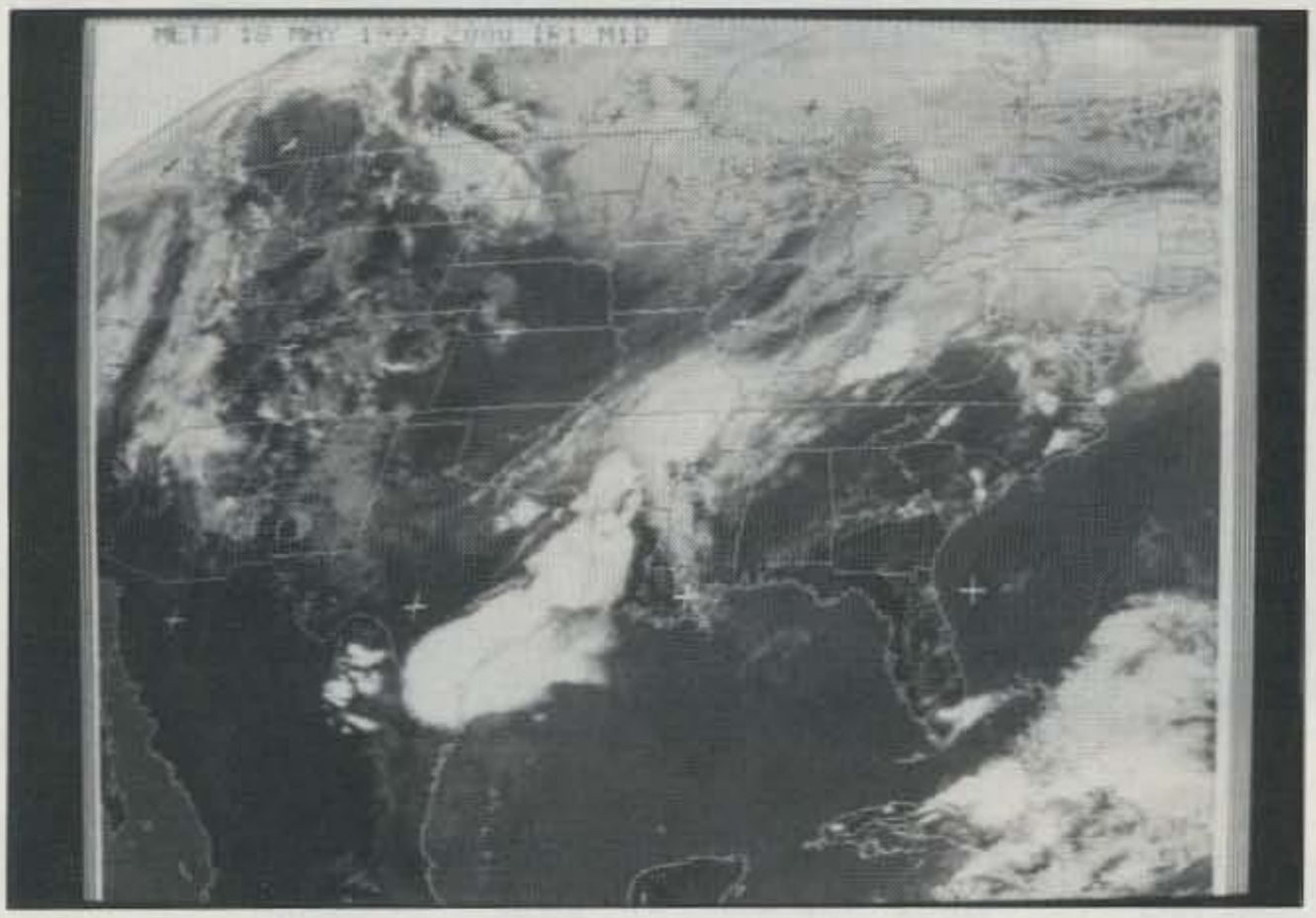

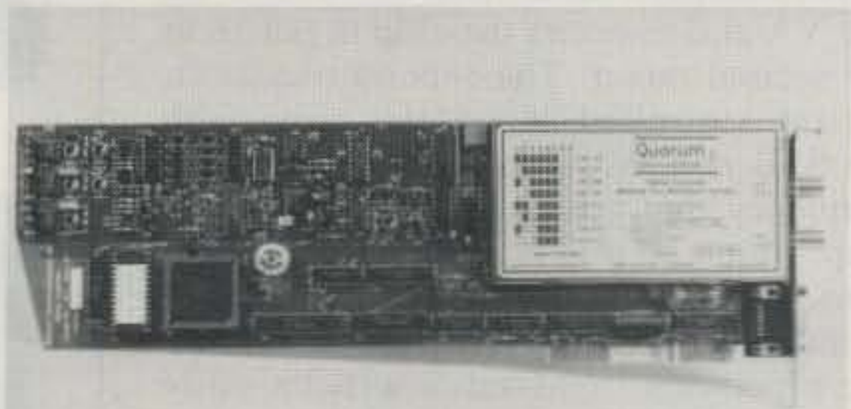

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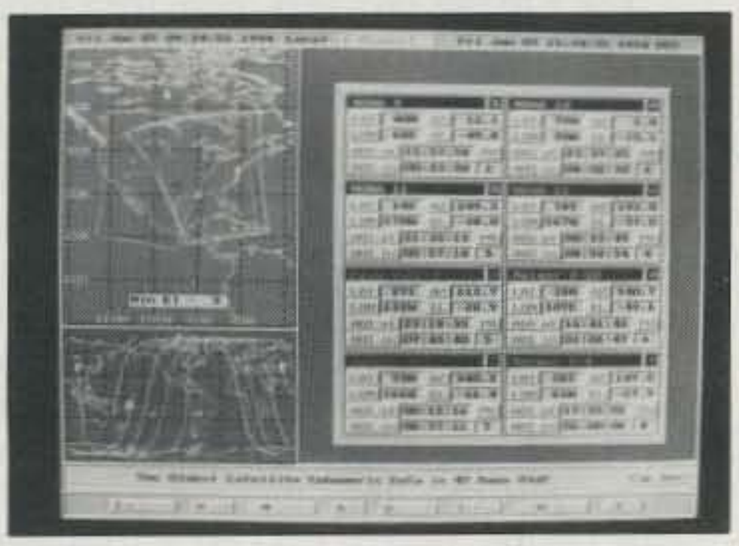

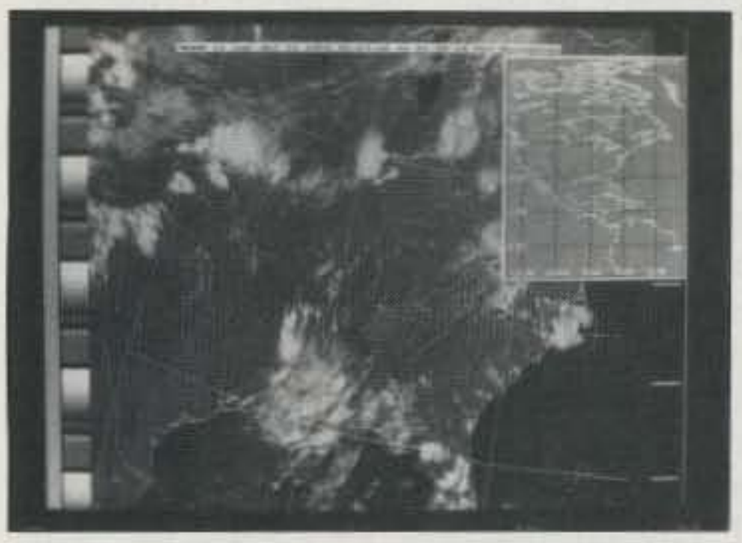

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the chip at pin 17, passes through the 5 MHz bandpass filter formed by Y1, Y2 and Y3, and re-enters the chip at pin 16 to the second mixer. The second oscillator, crystal controlled at 5 MHz, beats with the SSB or CW signal to form an audio frequency that goes to the LM386 audio amp. Much of this is an over-simplification, and the frequencies have been rounded off just to get you familiar with the processes involved. I will be more specific later on.

The real heart of this receiver is the bandpass filter formed by Y1, Y2, and Y3 (see Figure 4). Wes Hayward W7ZOI described a simple three-pole filter in his July 1987 *QST* article, "Designing and Building Simple Crystal Filters." I decided to try a variation of his filter using 5.185 MHz crystals instead of 4.0 MHz. The values shown worked so well from the first prototype that I have not done any further experimentation. The filter bandwidth is inversely proportional to the value of C and directly proportional to the termination impedance R. Increasing the value of C would narrow the filter but I would not recommend doing this. The 3 kHz selectivity of this filter is adequate for a simple receiver of this sort. Narrowing the bandpass would require moving the BFO frequency. Also, the pin spacing on the chip, 0.1", limits the amount of attenuation in the filter by leakage around the filter. The filter is terminated by the output and input of the first and second mixers. This termination impedance is close to the ideal value so no further impedance matching is required.

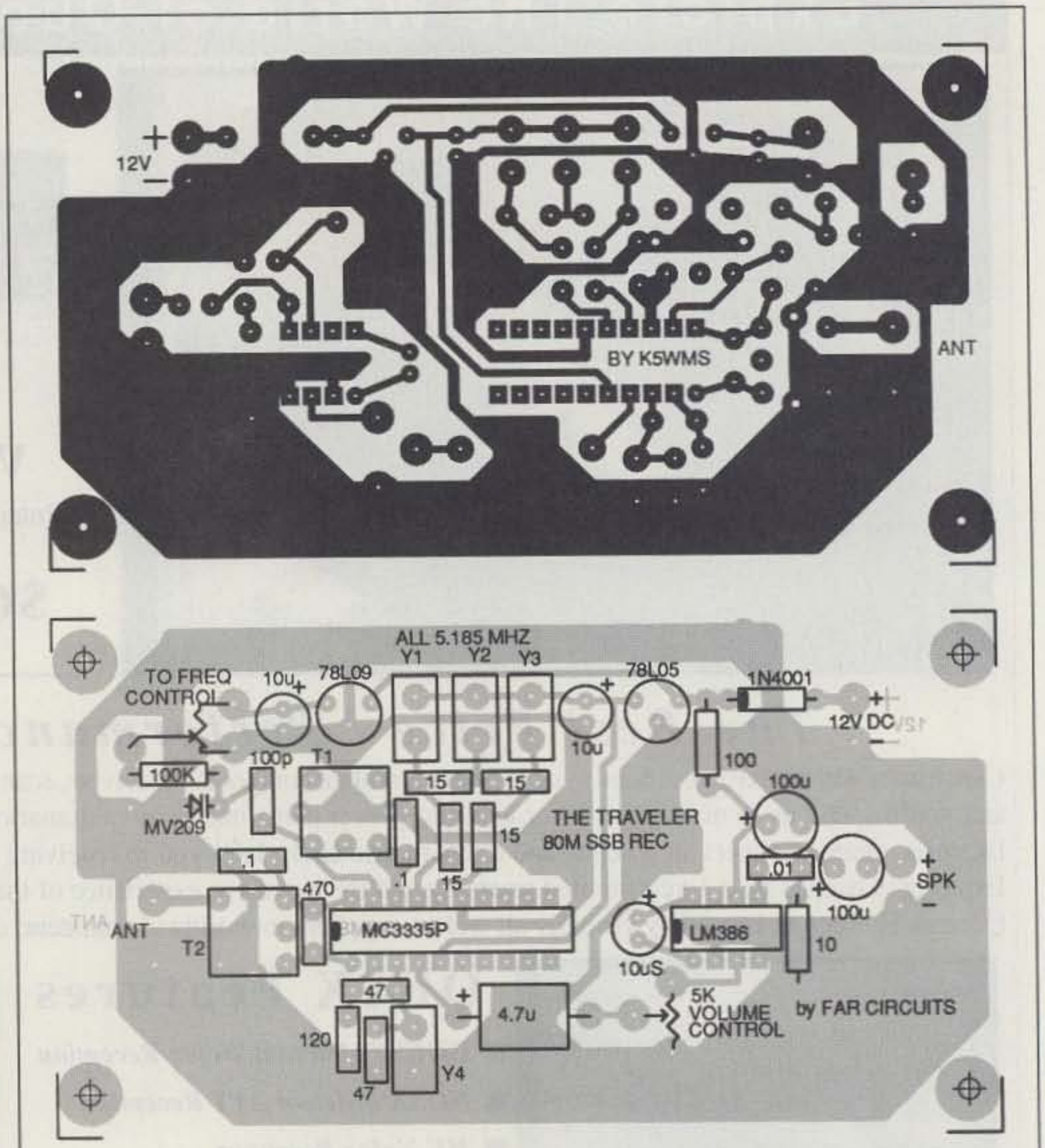

Figure 1. PC board layout and parts placement.

Selection of the IF and VFO Frequencies

To correctly receive an SSB signal it is necessary to place the carrier frequency on the edge of the filter bandpass.

See Figure 5. The second oscillator in the MC3335p is a common base circuit. With a simple oscillator circuit like that on the MC3335P, all you can do is lower the frequency by padding the crystal with an external capacitor. I selected the 47 pF and the 120 pF capacitors in the divider circuit and the 47 pF across the BFO crystal Y4 to produce the correct BFO frequency. The purist might think the 47 pF capacitor across Y4 should be variable, but that would add another adjustment the beginner might not have the equipment and skills to accomplish. Besides, I have built six of these receivers using randomly-selected crystals and 10% NPO disk ceramics, with no trouble in the BFO circuit.

The filter and BFO combination I described are for USB, as the carrier frequency is on the lower side of the filter. To receive LSB 80 meter signals I chose a VFO frequency above the IF frequency (9.0 MHz). Sideband reversal takes place when the mixer products are subtractive rather than additive. For example, with a carrier frequency of 5.185 kHz, the upper sideband limit, assuming a 2 kHz band width, is 5.187 kHz:

9.185 MHz (VFO freq)
- 5.185 MHz (carrier freq)
4.0 MHz (new carrier freq)

9.185 MHz (VFO freq)
- 5.187 MHz (USB limit)
3.998 MHz (LSB limit)

IF the antenna coil were tuned to 14 MHz instead of 4.0 MHz the unit would receive 14 MHz USB.

9.185 MHz (VFO freq)
+ 5.185 MHz (carrier freq)
14.370 MHz (new carrier freq)

9.185 MHz (VFO freq)
+5.187 MHz (USB limit)
14.372 MHz (USB limit)

I considered making this receiver a two-band unit by switching the antenna coil, or a three-band unit (80-40-20) by switching the VFO to 12 MHz for 40 meters, but I discarded that idea as too complex. I plan to add other bands with crystal-controlled converters.

Audio

The LM386 provides more than enough audio to drive a 4" speaker to comfortable listening level. With a good dipole antenna connected to my Traveler the audio gain is limited to a half rotation or less before the audio goes into distortion. I plan to use my receiver in my motor home (hence the name Traveler) with less than ideal antennas, so I wanted as much audio gain as possible. If you find this lack of range annoying, there are several ways you can limit the audio gain: You can change the 10 µF cap across pins 1 and 8 of the LM386 to a 4.7 µF, 2.2 µF, or 1.0 µF until you are happy with the range of the audio gain, or add a 4.7k ohm resistor in series with the volume control, or add a 500 ohm attenuator pot across the antenna terminal for an RF gain control. See Figure 6. I use a plastic case CB extension speaker with my receiver. These extension speakers are sold under the names of Barjan, President, Diesel and other trademarks at most truck stops; the price runs from $6 to $15.

Lack of AVC is the only limitation to

Continued on page 18

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8 Review: TheTechSonic Milliwatter
9 Handy Randy
10 Build the Quickie Cheapie Tener
11 The Capacity Tuned Folded Loop
12 Video-Charge Your HT!
13 RTTY Loop
14 Carr's Corner
15 Ham Help
16 Dealer Directory
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18 Hams with Class
19 Homing In
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25 Special Events
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28 New Products

The Traveler

Continued from page 16

this design. Since there is no access to the mixer stages the only way to control the gain is at the audio level. Steve Szabo N1AYO described an audio level controller in the February 1993 issue of *Electronics Now*. This audio leveler uses an NE577 compander in combination with an LM386 audio chip. I have built one of these and installed it in one of the Traveler prototypes and I am very happy with the performance. C&S Electronics, P.O. Box 2142, Norwalk CT 06852-2142 (phone or fax 203-866-3208) sells full and partial kits for this audio leveler.

Coils

Builders who have written me about "The Explorer" (*73*, August 1992) have expressed a preference for prefabricated and adjustable coils. I designed the Traveler to use Mouser 42f126, 10.7 MHz IF transformers for the antenna and VFO coils. I have had good luck with these. Please do not substitute another 10.7 MHz IF can—you might wind up with another turns ratio or impedance and performance would suffer.

VFO Tuning

I chose to use a varicap diode and potentiometer for tuning because of cost and availability of a proper air variable. An alternate air variable tuning system is shown in Figure 2b. Using the values shown and a carbon 5k ohm potentiometer with 270 degrees of rotation, I wound up with 900 to 1000 kHz of tuning range. Since I used a vernier dial with only 180 degrees of rotation, the tuning range is limited, mechanically, to about 600 kHz. If you choose a dial drive that has more freedom of rotation, or a 10-turn pot with a concentric dial, and you wish to expand the 600 kHz tuning range to fill the whole extension of the dial mechanism, add a 5k ohm pot between the 5k ohm tuning pot and ground.

First set the tuning pot to the high limit. You should have about 9 volts at the wiper. Next turn the adjustment slug of T1 until a 4.0 MHz signal is zero beat.

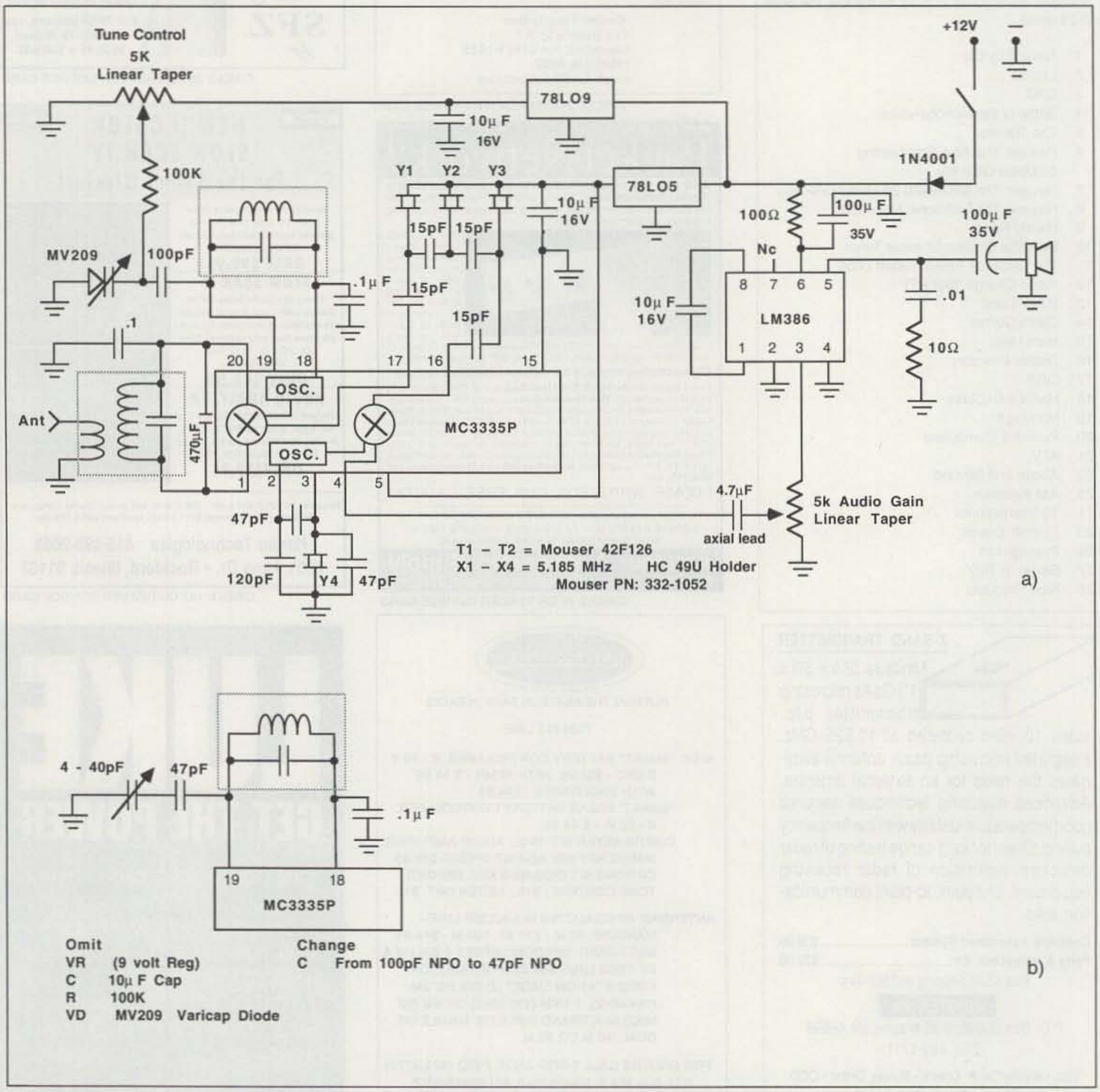

Figure 2. (a) Schematic diagram for The Traveler; (b) alternate air-variable tuning method.

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- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

- LOW PROFILE POWER SUPPLY

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

RS-L SERIES

- POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES

MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES

MODEL VS-35M

- Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

CS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

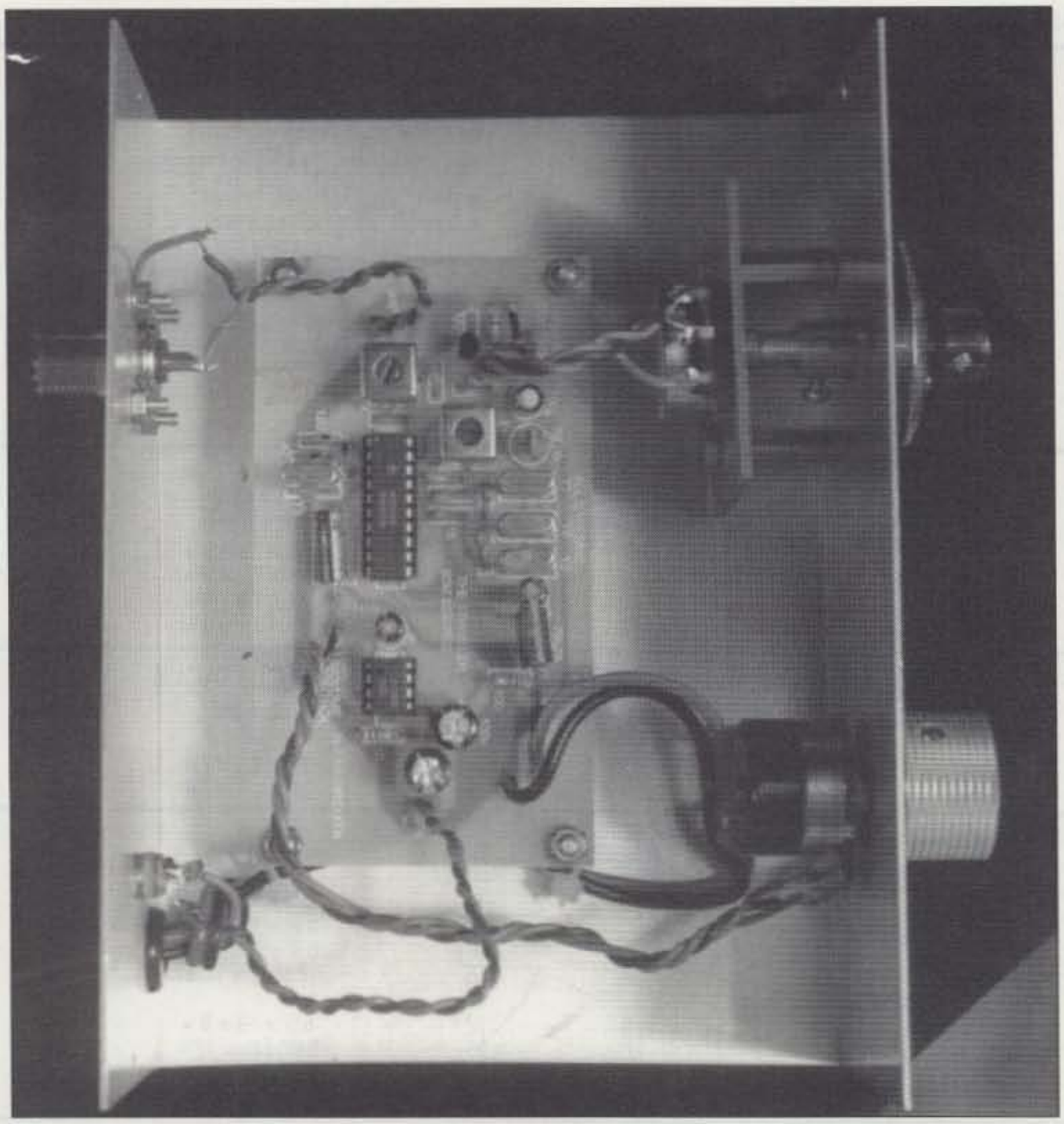

Photo B. Under the hood of The Traveler. (Photo by NRG Photo, Jacksonville, Arkansas.)

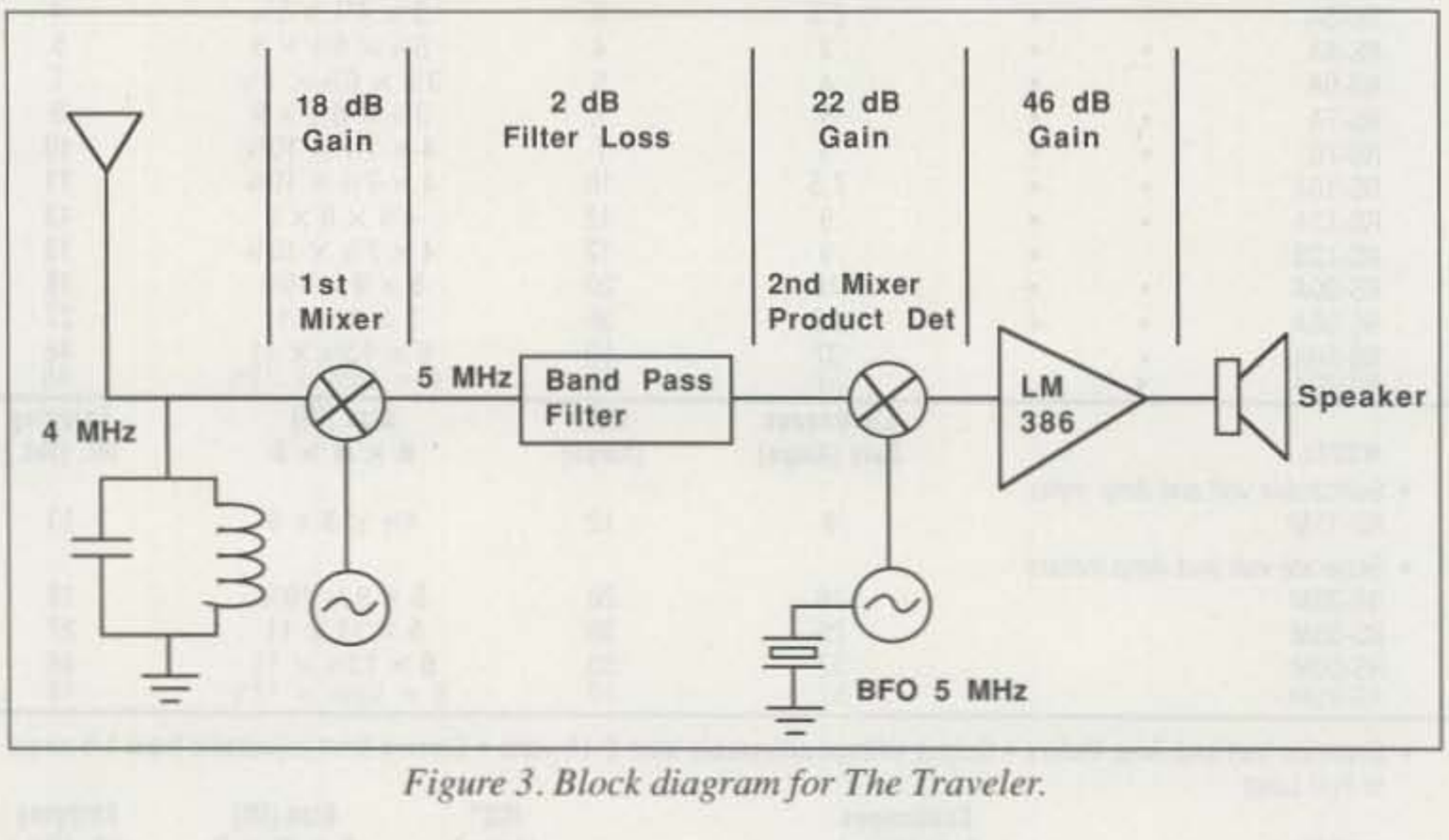

Figure 3. Block diagram for The Traveler.

Now set the tuning pot at the lower limit and adjust the scaling pot until the unit receives 3.5 MHz. Now measure the scaling pot with an ohmmeter. Then remove the scaling pot and replace it with a fixed resistor of the nearest standard value to what you measured.

Construction

I have used both a plastic cabinet and LMB minibox to house The Traveler. The 8" x 5.5" x 4" plastic cabinet is sold by DC Electronics (stock #16144; $13.64). It features removable panels of ABS plastic, easily drilled with ordinary woodworking bits. The 7" x 5" x 3" metal utility box by LMB (Mouser stock #537-tf-782; $8.10) is a bit cheaper and serves just as well. I do not recommend mounting the speaker in the cabinet as this circuit is sensitive to magnetic fields. I noticed this while running a trial fit on a speaker, the receiver would shift frequency when the magnet was brought within two inches of the MC3335p chip. Use an external speaker.

Begin by running a trial assembly on the blank board in the cabinet you intend to use. With the dial drive, tuning pot, volume control/switch, antenna connector, and speaker connector, making sure you do not have any interference between the components. Mark, drill, paint and label your cabinet, then set it aside.

Begin assembly of the circuit board by installing sockets for the ICs. After soldering the connections to the ICs, inspect each pad with a magnifying glass, checking for proper solder joints. Then check adjacent pins for shorts, using an ohmmeter set on low scale. This is the most critical part of the assembly. A short, even on the unused pins, could damage the chips. Now sort out the capacitors in like values and install these in groups of three or four. Note the + and - symbols on the electrolytic caps. A + sign is printed of the component side of the board to help you with correct orientation of the electrolytics. Locate and install the three 1/4-watt resistors. The crystals Y1-Y4 may be installed next. Install the 1n4001 diode, matching the end with the white band (cathode end) to the likeness on the circuit board. Install the MV209 varicap diode. Note the correct orientation of this diode from the drawings. Install the 5-and 9-volt regulators. Refer to the X-ray view drawing, the schematic, and part drawings for correct orientation of the regulators. I specified the small plastic case 78L05 and 78L09 regulators but you can use the larger tab mounted 7805 and 7809 regulators with no problem.

I used 22 ga. solid conductor hook-up wire for all connections to the circuit board except the 12V power leads; for that I used 18 ga. stranded. The larger stranded wire was selected for mechanical strength and flexibility rather than current capacity. Use different-colored wires going to the speaker, the controls, and antenna jacks: red for plus, black for ground, and green for the wiper on the controls. Twist the leads together five to six turns per inch to eliminate hum pickup.

With the board assembled, there are a couple of checks to make before installing the ICs and wiring the board to the cabinet. Temporarily connect 12 volts to the board. Check the 5- and 9-volt regulators. There should be +5 volts at pin 5 of IC2 and +9 volts at the top of the tune control (red wire). Feel the components; nothing should be warm to the touch. If the board passes these tests you are ready to install it in the cabinet, make the final connections, and install the ICs.

Alignment

Now that your receiver is completed, alignment is very simple. Set the tuning control to its upper limit with the set screw on the vernier dial loose. Turn the vernier dial to 100 and then tighten the

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Keep an ear on the local repeater, police, weather or just tune around. These sensitive superhet receivers are fun to build and use. Tunes any 5 MHz portion of the band and have smooth varactor tuning with AFC, dual conversion, ceramic filtering, squelch and plenty of speaker volume. Complete manual details how the rigs work and applications. 2M FM transmitter has 5W RF out, crystal control (146.52 included), pro-specs and data/mike inputs. Add our case sets for a nice finish.

FM Receiver kit Specify band: FR-146 (2M), FR-6 (6M), FR-10 (10M), FR-220 (220MHz).....**$29.95**
CFR Matching case set **$14.95**
FT-146 Two Meter FM transmitter kit **$79.95**

MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugur cube - including battery and mike. Two sets of SMT parts supplied in case you are clumsy! Terrific audio pick-up (pin drop at 5 ft) and transmit range of 300 ft. We include the battery (watch style), electret mike and even a tuning tool! Be a James Bond and learn SMT too!

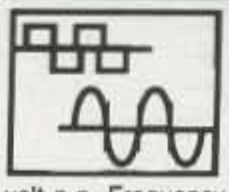
FM-5 Micro mike kit **$19.95**

FM WIRELESS MIKES

Pick the unit that's right for you. All units transmit a stable signal in the 88-108 MHz FM band up to 300' except for High power FM-4 and PB-1 Phone bug that go up to 1/2 mile.

FM-1 Basic unit **$5.95**
FM-2, as above but with added mike pre amp **$7.95**
FM-4, long range with very sensitive audio pickup **$14.95**
PB-1, Phone bug needs no battery, hooks to phone line **$14.95**
MC-1, Micro size sensitive mike cartridge for FM-1,2,4.....**$2.95**

SYNTHESIZED AUDIO GENERATOR



DDS (Direct Digital Synthesis) technology brings you a terrific audio generator at a fantastic price! Generates from 0. 01 Hz to 50 KHz with five digit LED display of frequency. Sine and square wave output adjustable 0-5 volt p-p. Frequency selected by direct keyboard entry and with handy continuous tune tuning knob. Crystal controlled accuracy of 10 ppm and two memories for rapid frequency changes. Retire that jury-rigged old generator and treat yourself to the pleasure of using a new state-of-the-art SG-550!

SG-550 Kit ..**$199.95** SG-550WT assembled **$269.95**

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4-11 MHz. True superhet, has smooth varactor tuning. AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project, provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3-22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!

Shortwave receiver kit, SR1.....**$29.95**
Shortwave converter kit, SC1 .....**$27.95**
Matching case set for SR1, CSR **$14.95**
Matching case set for SCI, CSC **$14.95**

AM TRANSMITTER

High quality, true AM broadcast band transmitter is designed exactly like the big commercial rigs. Power of 100 mW, legal range of up to 1/4 mile. Accepts line level inputs from tape and CD players and mike mixers, tunable 550-1750 KHz. Complete manual explains circuitry, help with FCC regs and even antenna ideas. Be your own Rush Limbaugh or Rick Dees with the AM-1! Add our case set for a true station look.

AM-1 Transmitter kit.....**$24.95**
CAM Matching case set **$14.95**

SCANNER CONVERTER

Tune in on the 800-950 MHz action using your existing scanner. Frequencies are converted with crystal referenced stabilty to the 400-550 MHz range. Instructions are even included on building high performance 900 MHz antennas. Well designed circuit features extensive filtering and convenient on-off/bypass switch. Easy one hour assembly or available fully assembled. Add our matching case set for a professional look.

SCN-1 Scanner converter kit.....**$49.95**
SCN Matching case set.....**$14.95**
SCN-1WT Assembled SCN-1 and case.....**$89.95**

SURROUND-SOUND/REVERB

Add concert hall realism to your stereo, TV or even 2-way radio! Easily sythesize a stereo effect from mono sources or richly enliven regular music. Add a big-voice reverb to your radio voice that others will envy! Our reverb/surround sound kit uses a Bucket Brigade IC Device for reliable solid-state performance. Adjustable reverb, delay and mix controls to customize your sound. Easily connected to radios, stereos, CB's and TV's. Plently of audio to drive a small speaker for stand-alone operation too. Experierence the fun and realism that surround sound provides - without spending hundreds! Add our case set for a neat, pro look.

RV-1 Surround Sound/Reverb kit.....**$59.95** CRV Matching case set.....**$14.95**
RV-1WT Assembled RV- 1 and case.....**$99.95**

TOUCH-TONE REMOTE CONTROL

Control virtually anything by Touch-Tone remote control. The URC-1 has 16 switched outputs, 4 adjustable voltage outputs (20 mV steps 0 to 5 VDC), two 10K digital pots (for volume, squelch, etc.) and 3 timers adjustable from 10 mS to 40 hours! Two level password control allows secure control and multi-level access. Six digit LED display shows currently entered codes and a crystal controlled touch-tone decoder provides reliable operation. There's nothing else like this unit, be in complete control of remote radios, thermostats, hi-fi's, homes or even factories with the URC-1. Add our matching case set for a handsome finish.

URC-1 Remote control kit .....**$129.95** CURC Matching case set **$14.95**
URC-1WT Fully assembled URC-1 and case **$189.95**

FM SUBCARRIER DECODER

Tap into the world of commercial-free music and data that is carried over many standard FM broadcast radio stations. Decoder hooks to the demodulator of FM radio and tunes the 50-100 KHz SCA subcarrier band. Many radios have a demod output, but if your radio doesn't, it's easy to locate, or use our FR-1 FM receiver kit which is a complete FM radio with a demod jack built-in. These "hidden" subcarriers carry lots of neat programming - from stock quotes to news to music, from rock to easy listening - all commercial free. Hear what you've been missing with the SCA-1.

SCA-1 Decoder kit.....**$27.95** CSCA Matching case set.....**$14.95**
FR-1 FM receiver kit.....**$24.95** CFR Matching case for FR-1 .....**$14.95**

L-C METER

Measure inductors from 10 uH-10mH and capacitors from 2 pF-2uF with high accuracy by connecting the LC-1 to any digital multimeter. Two pushbutton ranges for high resolution readings and we even give you calibration components to assure proper accuracy of your kit! Active filters and switching supplies require critical values, no one should be without an accurate LC meter. For a pro look, add our matching case set.

LC-1 LC meter kit .....**$34.95** CLC case set.....**$14.95**

MOTOR CONTROLLER

Control the speed and direction of any motor. Use our SMD-1 for those nice steppers you see surplus, and our MSC-1 for DC motors. The stepper driver features variable speed, half step rotation, direction and power down mode, can drive most any stepper motor. Our DC driver features pulse width modulation control allowing full motor torque even at low speeds and can drive motors up to 50 VDC @ 10 Amps! Add our case set for a professional assembly.

SMD-1 Stepper kit .....**$24.95** MSC-1 DC motor kit.....**$24.95**
CSMD SMD-1 case .....**$14.95** CMSC MSC-1 case.....**$14.95**

STEREO FM TRANSMITTER

Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna

FM-10A Stereo transmitter kit **$34.95**
CFM Case,whip ant set.....**$14.95**

DR. NI-CAD CONDITIONER/FAST CHARGER

Quit spending big bucks for replacement battery packs, rejuvenate and condition your batteries for peak capacity. Advanced circuitry has optimized discharge before charge to eliminate memory effect and to condition batteries that have been poorly cared for in the past. Quick charge rapidly brings battery to full charge in less than an hour-just 15 minutes for some types! And "top-off" charge mode squeezes every last bit of energy into each cell for the absolute most capacity. Switch-mode regulator controls constant current charge while being monitored by a negative delta-V system that cuts off the fast charge at the exact point of full charge-batteries are charged, not cooked! Charges NiCads or NiMH packs from 2 to 10 cells (easily expanded) and current capacities up to 10 Amp-hours. Runs on 12 to 15 VDC. Quit cooking your batteries, buying new packs, waiting hours for recharge, get a Dr. Ni-Cad today! Available in money saving kit form or wired and tested with case at a special price. Kit builders: add our matching case set for a snazzy finish.

DN-1 Dr. Ni-Cad conditioner/fast charger kit.....**$49.95**
CDN Matching case set.....**$14.95**
DN-1WT Fully assembled Dr. Ni-Cad with case **$89.95**

SPEED RADAR

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual Doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

SG-7 Complete kit.....**$99.95**

STEREO PEAK HOLD BARGRAPH

Finally a dual LED bar graph with a peak hold display! Bar graph displays are neat and eye catching but their speed is their downfall - they just can't capture the peaks. Our kit is like two units in one, a fast display to show the signal and a long persistance display to capture peaks, similar units go for hundreds of bucks! We offer 3 models: Linear for general use, Semi-Log for audio VU meters, and Log for power displays. Dual - for stereo! - 10 segment multi-colored LED display for snazzy, eye grabbing display and easily set ranges for virtually any signals, from voltmeters to audio VU meters to audio power amps to SWR meters. Complete intructions for easy hook-up to most any device. Add our matching case set for a sharp looking unit.

PH-14 Dual Linear bargraph kit.....**$39.95** PH-15 Dual Log bargraph kit ..**$39.95**
PH-16 Dual Semi-Log bargraph kit.....**$39.95** CPH Matching case set **$14.95**

SPEECH SCRAMBLER

Descramble most scramble systems heard on your scanner radio or set up your own scambled communication system over the phone or radio. Latest 3rd generation IC is used for fantastic audio quality - equivalent to over 30 op-amps and mixers! Crystal controlled for crystal clear sound with a built-in 2 watt audio amp for direct radio hook-up. For scramble systems, each user has a unit for full duplex operation. Communicate in privacy with the SS-70. Add our case set for a fine professional finish.

SS-70 Scrambler /descramblerkit **$39.95**
CSSD matching case set.....**$14.95**
SS-70WT Assembled SS-70 and case set **$79.95**

CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!

CS-1 Crystal set kit **$19.95**

TOUCH-TONE DECODER

Grab Touch-Tone numbers right off the air, phone or tape. A simple hook-up to any radio speaker or phone line is all that is required to instantly decipher touch-tone phone numbers or codes. A 256 digit memory stores decoded numbers and keeps its memory even in the event of power loss. An 8 digit LED display allows you to scroll through the memory bank to examine numbers. To make it easy to pick out number groups or codes, a "dash" is inserted between sets of digits that were decoded more than 2 seconds apart. A "central-office" quality crystal controlled decoder is used allowing rapid and reliable detection of numbers at up to 20 digits per second! For a professionally finished look, add our matching case set. Start cracking those secret codes tomorrow with the Tone Grabber!

TG-1 Tone Grabber kit.....**$99.95** CTG Matching case set.....**$14.95**
TG-1WT Fully assembled TG-1 and case.....**$149.95**

DIGITAL VOICE RECORDER

Chatterbox digital voice storage unit will record your message of up to 20 seconds. Time is split up into four 5 second blocks which can be played separately or cascaded for longer messages. An LED display shows message location and current mode for easy operation. Nifty built-in interfaces allow simple connection to transmitters for automatic keying when the PTT is initially closed or after it is released. You can even loop your rig's mike through the Chatterbox. For contest or fun use, the CB-1 can drive an external speaker. Includes a built-in electret mike. For that finishing touch, add our matching case set.

CB-1 Voice recorder kit.....**$59.95** CCB Matching case set **$14.95**

ORDERS CALL **1-800-4 HOBBY KITS** (446-2295) ORDERS ONLY
TECH/ORDER/INFO (716)924-4560 FAX (716)924-4555

TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. Add $4.95 for shipping, handling and insurance. For foreign orders add 20% for surface mail. COD (U.S. only) add $5.00. Orders under $20 add $3.00 NY residents add 7% sales tax. 90-day parts warranty on kit parts. 1-year parts & labor warranty on wired units.

RAMSEY ELECTRONICS, INC 793 CANNING PARKWAY VICTOR NY 14564

CIRCLE 34 ON READER SEVICE CARD

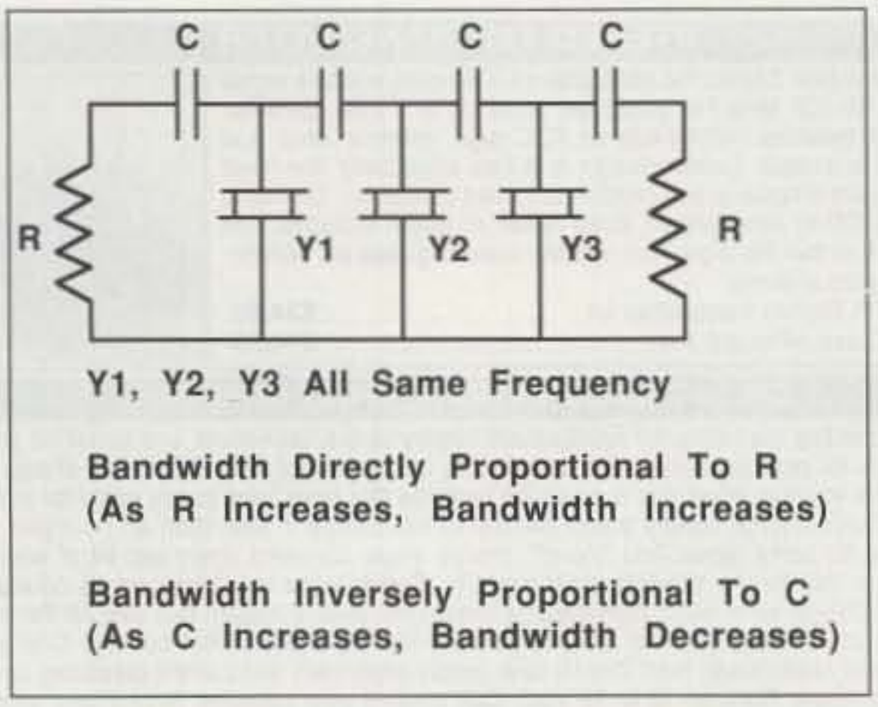


Figure 4. The filter described by W7ZOI.

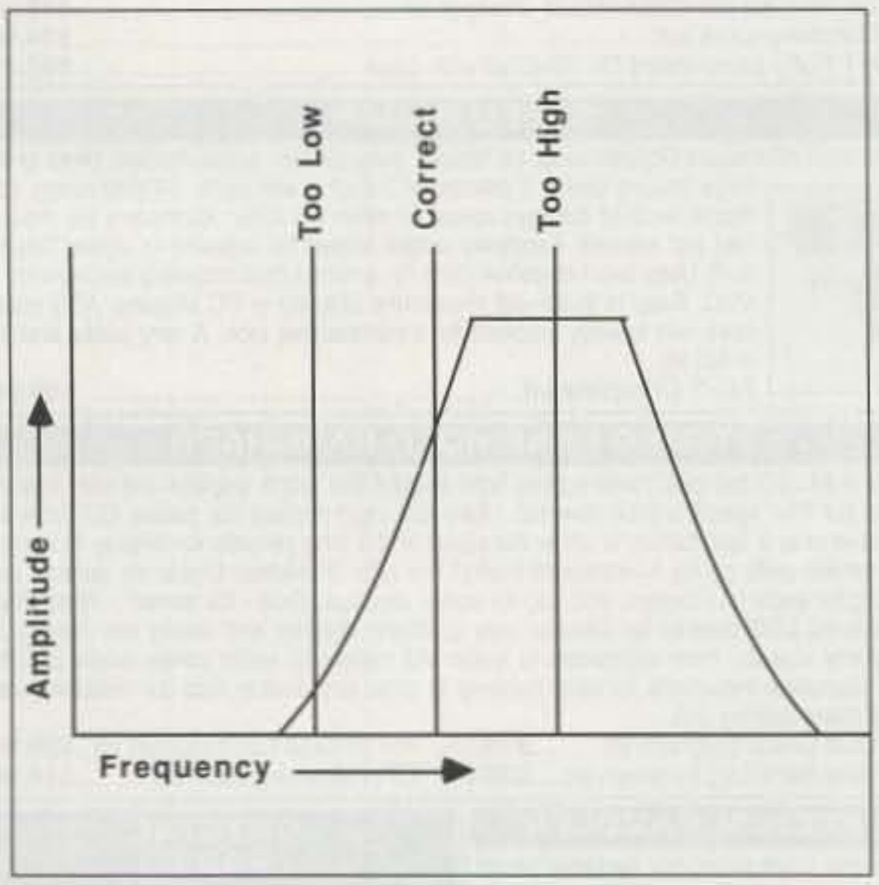


Figure 5. BFO frequency placement.

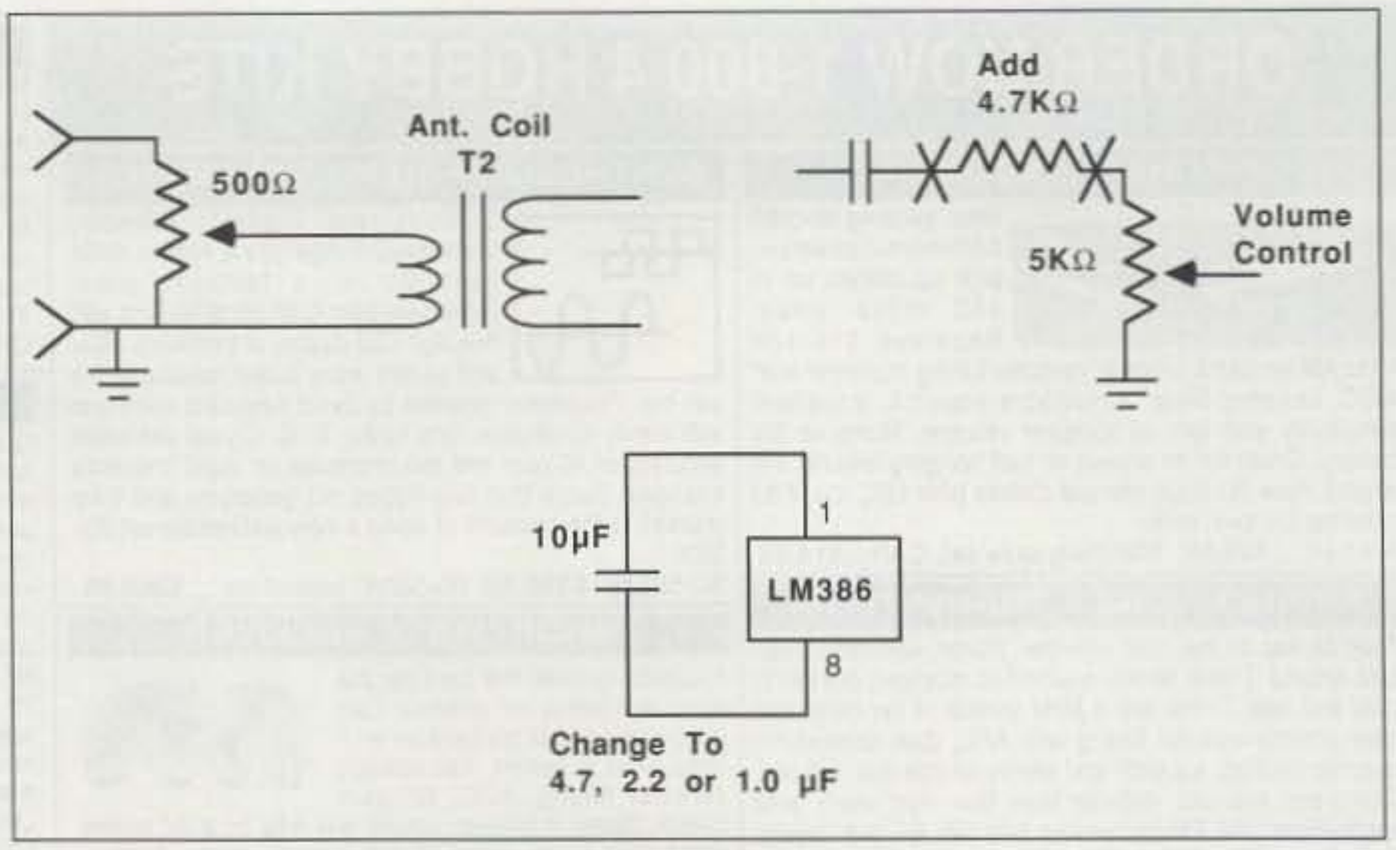


Figure 6. Ways to limit audio gain.

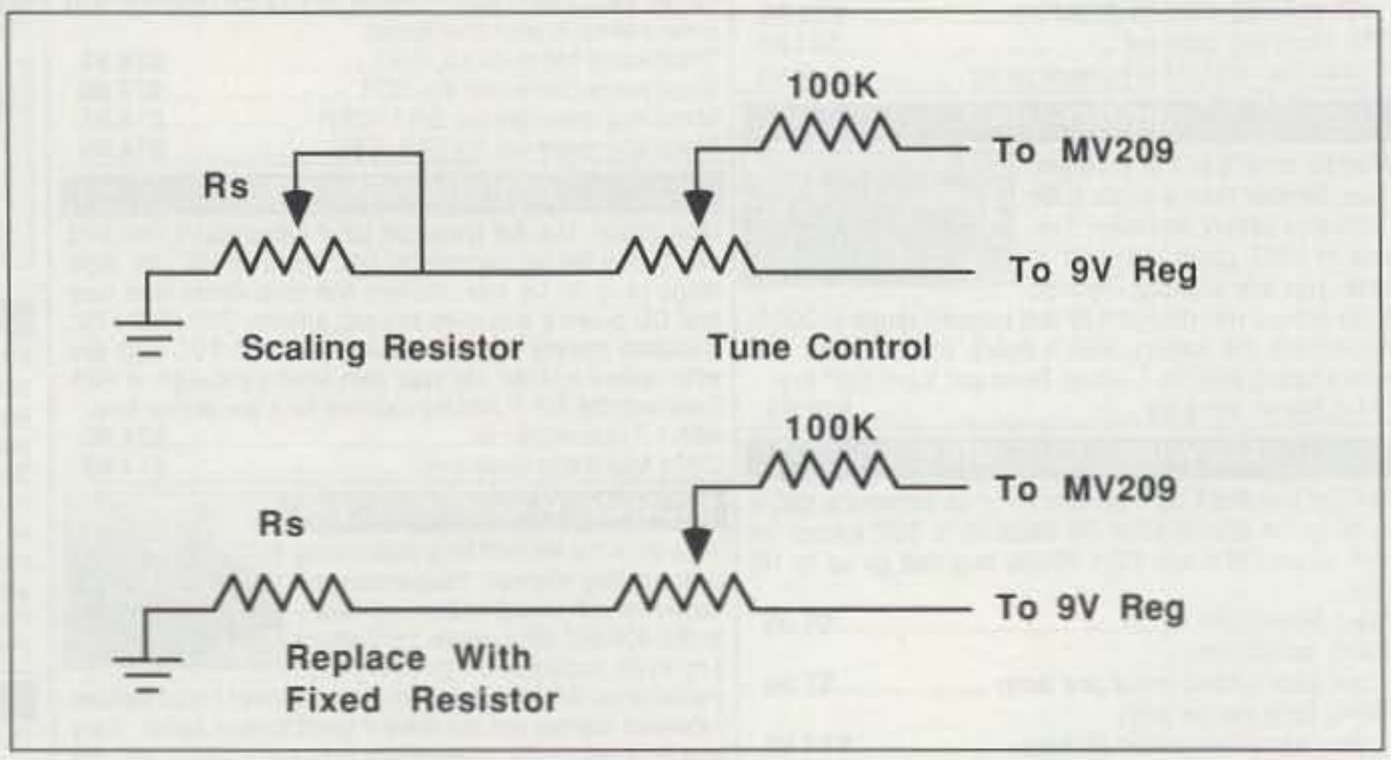


Figure 7. Band-spreading the VFO.

If you do not have a signal source like a grid-dip oscillator, signal generator, or ham transmitter, you can listen to the phone signals up at the top of the 80 meter band and get close. The adjustment of T2, the antenna coil, is very broad so do not expect much of a peak. This adjustment is best made listening to a weak signal. Now you are ready to sit back and enjoy your receiver.

Performance

My Traveler has very good sensitivity. Signals of less than one microvolt are readable. Selectivity is about 2.5 to 3 kHz. Tune downward across a steady carrier and you will hear a signal come into the passband of the receiver at a beat note of 2 to 3 kHz. The signal will rise in strength until you pass the zero beat where it will drop out and disappear or be very faint. That's single sideband selectivity. With a direct conversion receiver you would hear the signal on both sides of zero beat. Short-term stability is good; however, the varactor is more sensitive to temperature changes than an air variable would be. I use an 80 meter dipole at my home station. For portable or mobile operation I use an MFJ antenna tuner for short long-wire antennas and whips.

Special thanks go to Fred Reimers at Far Circuits for the excellent design work on the printed circuit board.

I hope you find this project fun and educational. I've had 35 years of enjoyment from amateur radio and it's time I put something back into the hobby!

A word in closing about the kit offered by Dan's Small Parts: We decided to go with the alternate air variable tuning system partially because of cost, and partially for performance. The air variable Dan uses in these kits has a built-in reduction drive, eliminating the need for an expensive panel-mount drive. The 9-volt regulator and associated components are also

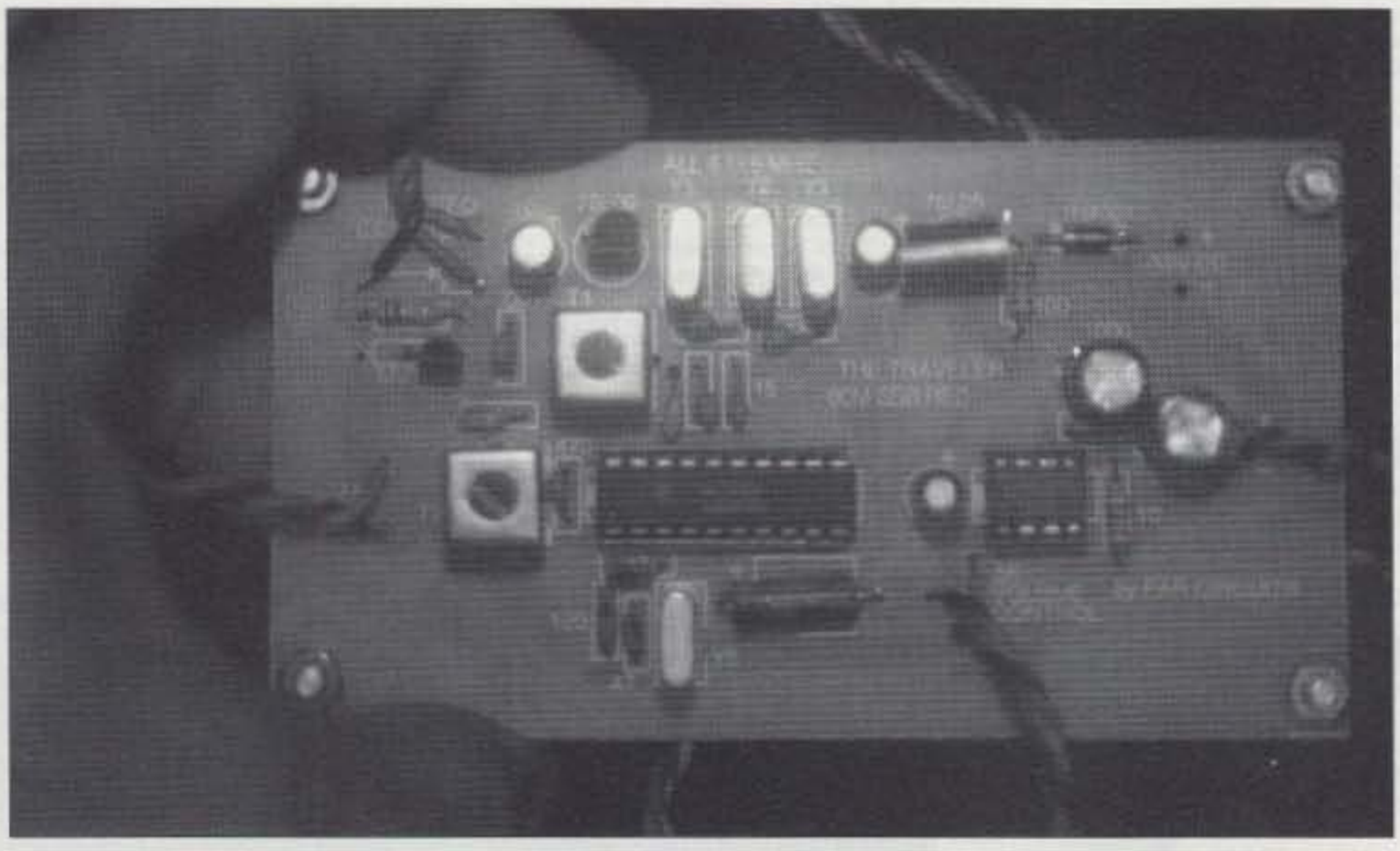


Photo C. The Traveller's circuit board (photo by K5WMS).

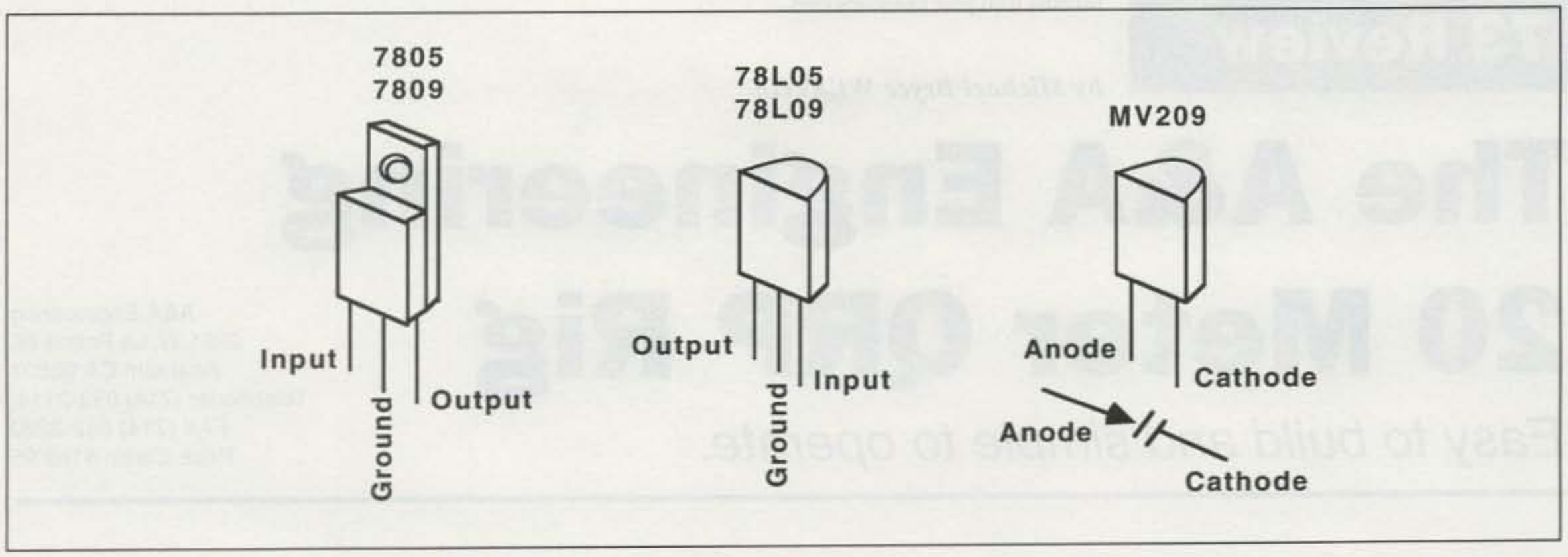


Figure 8. Part drawings for varicap and voltage regulators.

Parts List

Item	Quantity	Description	Source
IC1	1	LM386	DC
IC2	1	MC3335P	DC
T1,T2		Mouser 46F126 10.7 MHz IF trans.	DC, Mouser
IC3	1	78LO5 5-volt reg.	DC
IC4	1	78LO9 9-volt reg.	DC
D1	1	IN4001 diode	RS
D2	1	MV209 40 pF varicap	DC
C1,2	2	0.1 µF mono or disk	DC, RS
C3-6	4	15 pF NPO disk, ceramic	Mouser 21FL015
C7,8	2	47 pF NPO disk	Mouser 140 CD50NC-097IL
C9	1	120 pF NPO disk	Mouser 140 CD50N6-121k
C10	1	470 pF NPO disk	RS
C11	1	4.7 µF axial lead	RS
C12-14	3	10 µF 16V radial lead Electrolytic cap	RS
C15,16	2	100 µF 35V radial lead electrolytic cap	RS
C17	1	0.01 disc ceramic cap	RS
C18	1	100 pF NPO disc ceramic	RS
R1,2	2	5k ohm linear taper pot	RS
S1	1	Switch mounted on audio chain	RS
R3	1	100 ohm 1/4-watt res	RS
R4	1	10 ohm 1/4-watt res	RS
R5	1	100k 1/4-watt res	RS
Y1-Y4	4	5.185 MHz crystal HC49U holder	Mouser 332-1052

Builder's option: 1-1/2" or 2" vernier drive; cabinet.

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A parts kit (including the circuit board, from FAR Circuits, all board-mounted components, volume control, switch, and a 4 to 40 pF air variable with built-in 8/1 reduction drive) is available from Dan's Small Parts Co., 1935 South 3rd West #1, Missoula MT 59801, (406) 543-2871, for $39.95 plus $3.75 S&H.

A drilled and etched PC board is available from FAR Circuits, 18N640 Field Court, Dundee IL 60118 for $4.75 plus $1.50 S&H.

eliminated, further reducing the cost. And, as a bonus, the receiver can be operated from a 9-volt battery as well as a 12-volt DC power supply. If you build one of these receivers please drop me a postcard and let me know how it works. 73

73 Review

Number 6 on your Feedback card

by Michael Bryce WB8VGE

The A&A Engineering 20 Meter QRP Rig

Easy to build and simple to operate.

A&A Engineering
2521 W. La Palma #K
Anaheim CA 92801
Telephone: (714) 952-2114;
FAX (714) 952-3280
Price Class: $159.95

If you've been looking for a small monoband QRP transceiver, the current market has quite a bit to offer. Your search may come to an end if you take a closer look at A&A Engineering's rig.

This CW-only QRP transmitter was designed by Gary Breed K9AY and appeared in the December 1990 and January 1991 issues of *QST*. Gary designed the rig to be easy to duplicate for the average ham. For this review, A&A Engineering supplied the 20 meter version; 40 and 30 meters versions are also available.

It's Different

The circuit is different from what we have been seeing in other QRP rigs. Instead of several NE602s doing the work, a single multifunction IC does all the magic. The Motorola MC3362 is a dual-conversion superhet VHF FM receiver on one chip. Other than an audio power amplifier, all you need is a handful of parts to make a receiver. That's exactly what Gary did.

The rig is tuned by a varactor controlled by the voltage coming from the main tuning control. Two tuning pots are used. One is the main tuning control, which covers about 50 kHz, and the other is a fine-tune control. It works just like the bandspread control used in the older receivers. The fine-tune control allows +/-2 kHz of tuning. There is no vernier drive to either pot, so tuning is a bit fast. There is no RIT control either. The transmitter provides an automatic 800 Hz offset of frequency during transmit.

Four handpicked crystals make up the IF filter for the A&A Engineering rig. These crystals provide the 400 Hz selectivity so useful in CW work. But, for my taste, it's a bit too narrow.

Since the MC3362 requires an external audio amplifier, Gary added some bandpass filtering and a smooth-working AGC to control the LM386 audio power amplifier. An LM324 provides excellent bandpass filtering. In addition, this filter avoids the ringing that so often comes with a narrow-audio filter. Two sections of the LM324 provide a low-pass of 1200 Hz cutoff and the other section provides a high-pass cutoff of 600 Hz.

The audio-derived AGC is controlled by an MC3340P. This audio-gain-control chip provides a smooth AGC without the popping that sometimes occurs with audio-derived AGC. The attack time and delay seem just about right for me and the way I like to listen to CW. The AGC is fast attack, slow release.

The AGC circuit also drives an S-meter. This A&A Engineering rig is the only QRP monobander that I know of with an S-meter. It's a nice way to tell how strong one signal is compared to another; it's not a laboratory-calibrated meter by any means. The S-meter does double duty, too: You can use it to adjust the front end of the receiver during tuneup.

A conventional audio power amplifier, using the LM386, rounds out the receiver. It produces enough volume for a small room. The LM386 is not known for rattling windows. The A&A Engineering rig has one of the largest speakers of any of the monobanders I've reviewed. It won't blow you out of the room with shear volume, but it sounds really good. A front-mounted 1/8" headphone jack automatically disconnects the internal speaker when you plug in your phones.

The square-wave sidetone is injected after the volume control, so its level is not affected by the setting of the volume control. The sidetone level is set by a PC-board-mounted trimpot. Sidetone pitch is not adjustable.

The Transmitter

Unlike the receiver, the transmitter is quite straightforward. An NE602 is used as a transmitter mixer to supply the proper signal to the transmitter chain. The transmitter offsets the receive frequency by 800 Hz. A filter removes the unwanted frequencies from the mixer, leaving only 14 MHz energy to reach the buffer and then the driver, a husky 2N3866. The final RF power amplifier is a MRF476. This burly and rugged device will generate up to 12 watts of RF. In the A&A Engineering rig, I got a tad over 5 watts output. I could have squeezed more out of the amplifier if I did some fine-tuning to the output coils in the filter network, but 5 watts is more than enough for worldwide communication. A five-pole low-pass filter keeps harmonics from reaching the antenna. Using a 13.8 volt power supply, the transmitter required 770 mA. That's an input of about 10.5 watts, so we are looking at about 60 percent transmitter efficiency. It might even be better if you could eliminate the current from the relay and the sidetone amplifier combination.

Transmit/receive control is provided by a relay. You can set the delay time for the relay

Photo A. The A&A Engineering 20m QRP kit.

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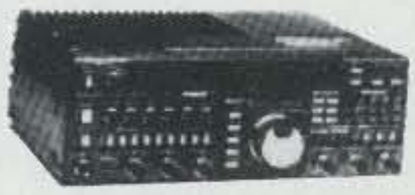

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by adjusting a PC-board-mounted control. You have anywhere from about a second of delay to almost nothing. The key jack is on the front panel. It's a mini 1/8" jack.

Putting the A&A Engineering Kit Together

The kit comes with a dozen or so sheets of instructions. The original article by Gary is included. The instructions describe the circuit and how to start construction. A block diagram and a full-sized photo of the completed rig is very helpful. There's information on how to solder and how to tell which part is which. However, I would have liked to see some troubleshooting tips with the instructions.

The rig consists of two PC boards, one for the receiver and the other for the transmitter. Each PC board has its own parts bagged separately. The parts placement overlay is silk-screened on both PC boards. The boards are single-sided G-4 Fiberglas. The boards are solder-reflowed, too.

You assemble one board, then move on to the other. After both boards are assembled, you mount them in the case using the supplied hardware. Interconnections between the two circuit boards and the real world are done with test points. These test points (loops of metal with a plastic holder) solder in along the edge of the circuit boards. You connect the two boards by soldering directly to the test points. This way, you don't have to remove a board to solder the wires. Chassis wiring is not too complex. Drawings show you what goes where. In fact, I used the drawings and did not read though the remaining construction details. A&A Engineering supplies all the necessary wires and miniature coax with the kit. An SO-239 antenna connector is used for the antenna connection.

There are three coils you must wind for the rig. The instructions make this about as clear as humanly possible, and the drawings are there to back up the text so you should not have any trouble with the coils. I did find that the burn-away insulation on the wire did not burn away like it was supposed to. I cleaned the enamel from the wires before I installed the coils to the PC board.

Because the main tuning control is a pot, it's a lot easier to mount than a variable capacitor. In a way, this adds to the mechanical stability of the rig.

All the parts mount in a ready-to-use cabinet. It's nice-looking, with silk-screened labels. You get all the necessary mechanical parts to mount the boards in the cabinet. Why, even the knobs are included!

Tuneup and Adjustments

After you have completed the assembly and after re-checking your work, you must align the receiver and transmitter. This isn't hard to do, but you'll need some test gear. Tuneup is easiest if you have an oscilloscope; if not, you can use a general coverage receiver. A frequency counter is very handy to have. It's real difficult, but not totally impossible, to set the VFO frequency without one. A source of low-level RF is also required. Of course, a dummy load and source of power are also required. A wattmeter will come in very handy for the transmitter's tuneup.

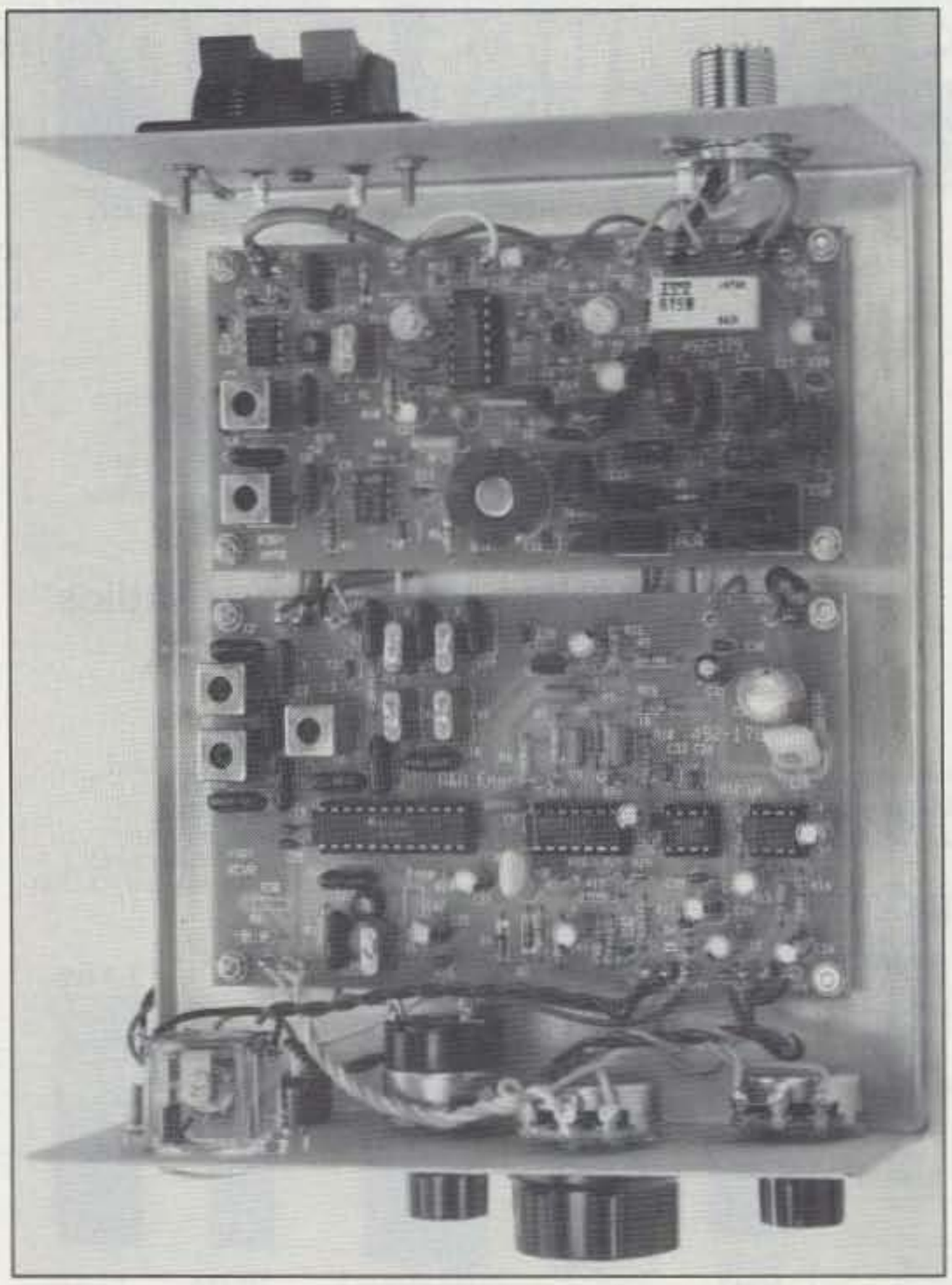

Photo B. All of the electronics fits neatly onto a pair of PC boards.

There are several slug-tuned coils you must adjust. I would have liked to see A&A Engineering supply the necessary tuning tool. It's way too tempting to use something other than the proper tool.

If you don't have the proper test gear, all is not lost. A&A Engineering will align the rig for you for only $20 plus $5 shipping. It's not a bad offer and I'm glad to see it's available.

Tuneup went smoothly until I reached the transmitter. There was no output from the rig, even though I measured almost 1 amp of current at keydown. I traced the problem down to late-night kit building in conjunction with stale Oreo cookies and flat Diet Coke. I had a solder bridge on the output filter of the rig. All my RF was going directly to ground! The solder bridge was a big hunker, too. You could see it from across the room. I removed the solder bridge and the transmitter snapped up to full power. It's interesting to note that the final did not suffer any damage from the shorted output.

If you can't get the rig to work, A&A Engineering does have a repair service; repair and alignment is $55 for the rig.

On-The-Air Results

By now, you want to know how it works? Well, it works very well indeed! The receiver is plenty sensitive, and can stand up with the best of them. The dynamic range is better than most of the monobanders I've used in the past, but it's not as good as some commercial rigs. A&A Engineering says the dynamic range is 70 dB.

The AGC works very smoothly and there is little pumping of the gain. A really strong signal close to the desired signal will grab the AGC. This is to be expected and is not really a flaw with the rig. As I mentioned earlier, the rig sounds good. It's nice to just keep it on in the background to listen in on the bands.

With its 5-plus watts of RF, contacts were easy to make on 20 meters. The semi break-in keying works very well with not too much noise from the relay. The sidetone, while only a square wave, is not half bad.

Rough Edges

As noted in the original article, temperature stability of the VFO is not one of the best features of this rig. In your shack, you'll have no problems; out in the woods, it's going to move on you.

You have no idea at all where you're at on the band. The tuning is not very linear. Tuning is way too fast with the main tuning control. You can move 50 kHz with a flip of your wrist. The fine-tune control will be used most of the time.

Without a RIT control, you could find yourself hopping across the band when you work someone. I can just image the amount of ground you would cover if you work a guy with an HW-8 on the other end.

Kudos

Of all the monobanders I've built and reviewed, this one went together easier than most. Its superhet receiver provides single signal reception, with a smooth-working AGC. The transmitter has enough bite to make 20 meters interesting, even if you're not a diehard QRPer. And, the completed rig looks and sounds great. Operation is simple. The only controls are the off/on volume and station selector.

The case design will make troubleshooting easy if required down the road. You can remove a board without too much hassle. The A&A Engineering alignment and repair policies seem very reasonable.

If you want to try QRP and assemble a kit at the same time, you'll be happy with the results of the A&A Engineering rig. Gary succeeded in designing a rig the average ham can duplicate and have fun with. 73

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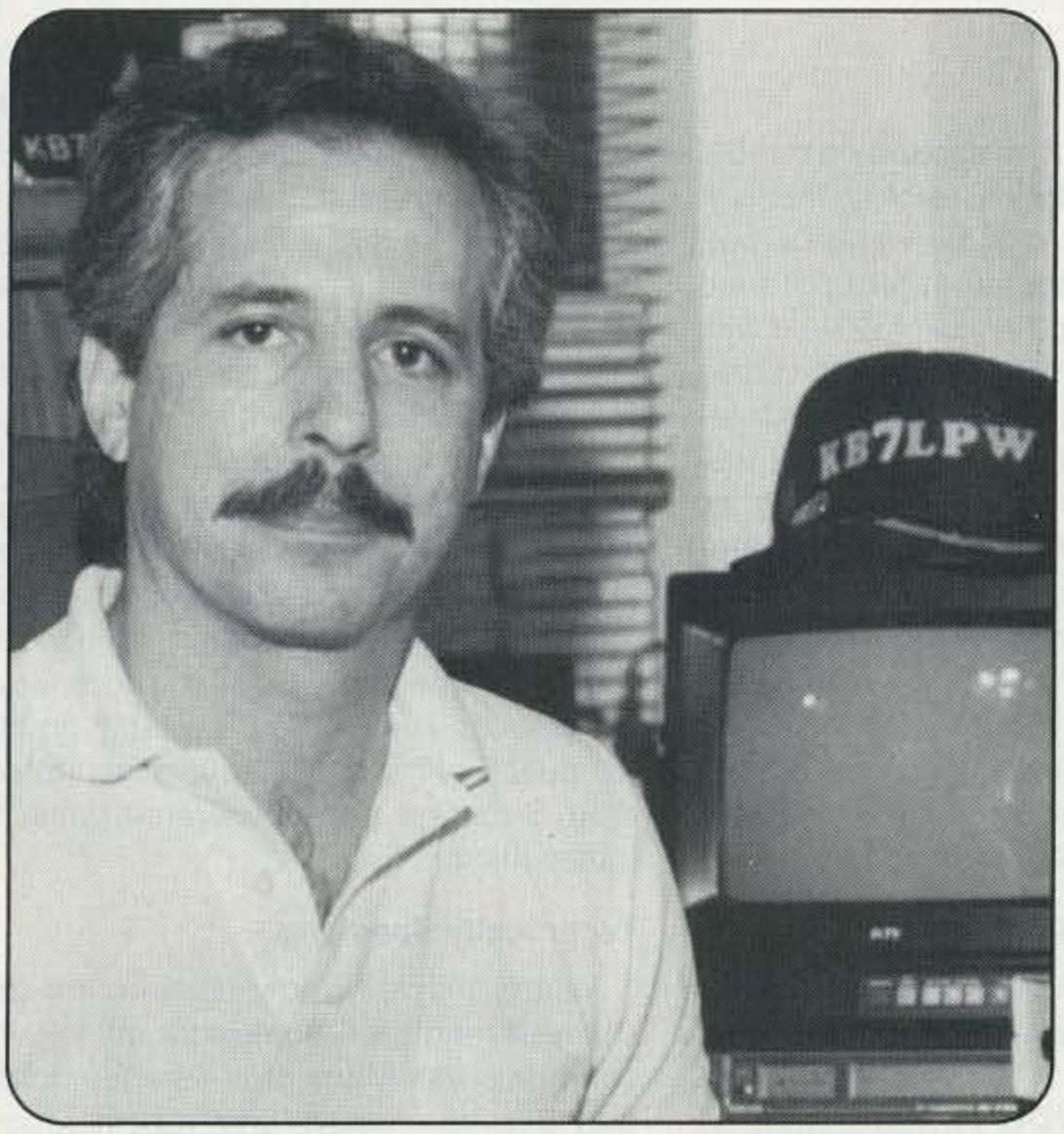

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73 Review

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The MFJ-9420 20 Meter QRP Rig

MFJ's new QRP SSB station for 20 meters.

What good is a 20 meter SSB QRP transceiver? I kept mulling this over in my mind as I unwrapped the newly-arrived MFJ-9420. After all, all my previous experience on 20 meters was based on my activities as a serious DXer; I rarely ventured onto this band unless the trusty 2 kW linear was online and ready for battle.

Plays Right Out of the Box

Within several minutes the radio was up and running—the MFJ-9420 is ready to plug in and play right out of the box. Just connect an antenna, a 13.8-volt power source (I used the optional wall-plug power pack) and the optional hand mike, and the radio is ready to use. Tuning the usually crowded band yielded some surprises: The MFJ receiver is a real performer. Under the tiny hood a well-designed six-pole crystal filter gave good single-signal performance that rivaled some of the full-sized multiband HF rigs I have owned. The rig covers the American phone band from 14,150 to 14,350 kHz. MFJ uses a custom-made 4 to 1 vernier drive capacitor, along with an analog dial scale calibrated in 10 kHz steps. Besides the tuning, only three other controls are provided—a volume control, power switch, and tune switch.

Internal Speaker, AGC and S-Meter

An internal speaker is mounted under the cabinet cover. No skimping here, the speaker is 3.5" for good fidelity and volume, and faces upward where it will do the most good. The designers used a bridge-type audio IC for some real AF power.

Another surprise for a radio in this price class was the inclusion of an S-meter that is fairly accurate—a 50 µV signal from my signal generator produced the desired S9 meter reading. Another nice touch was including backlighting for the meter. The AGC, which is derived from the audio, was also smooth acting, without "thumps," overload, or other glitches being noted. I parked the MFJ-9420 on several net frequencies for hours at a time, and no drifting was noted. I also found that I was able to quickly find and tune to the DX stations spotted on the local PacketCluster node.

Working DX

Working the DX stations spotted on the DX Cluster was another story. Basically, this is a QRP radio, and even with 12 watts output, some discretion is needed in a pileup. I tried the usual ploy of yelling my call, followed with a plaintive, "QRP . . . QRP . . .," but, alas, this usually resulted in several competing stateside stations responding with catcalls of disbelief. Abandoning the DX Cluster with its self-generated pileups yielded much better results. By finding a clear frequency and calling CQ, or better yet, careful tuning and finding the DX first, I quickly filled two or three log pages with European, South American, and Caribbean stations. Almost all of the reports were S9 or better, and were given before I disclosed my transmitter power.

The Transmitter Has Punch

Used with the optional AC wall adaptor power supply, the transmitter will deliver about 9 watts output.

Going to a 13.8 VDC source, such as batteries, will produce 12 or more watts of power. The "tune" button locks the transmitter on, and gives about 5 watts of carrier for adjusting an external antenna tuner, when used. The Motorola final transistor used in the MFJ-9420 is rated for 40 watts, so it is unlikely that any sort of mismatch will damage it.

MFJ proudly advertises their new "constant carrier" RF speech processing system in the 9420. This is simply a transmitter ALC circuit with a very fast decay time that permits the transmitter to follow voice peaks and valleys so that the average transmitter power is always maintained at a fairly high and constant level. The transmitter ALC action is monitored on the S-meter during transmit. This probably yields results similar to what a good AF speech processor would do: in the order of a 3 or 4 dB improvement in my readability to another station. In any event, while a true RF clipper would give more talk power, it would also double the cost of producing a radio in this price class. And besides, an honest 3 or 4 dB improvement is nothing to sneeze at. DX stations commented favorably on the audio punch of my signal, and a few noted that their S-meters barely wavered while I was transmitting.

Technically Speaking

What's inside? In my opinion, the designers really did their homework on this American-made set. Many of the stages do double duty between receive and transmit, most notably the AGC/ALC and IF stages. The radio is a single conversion design, with a 10 MHz IF and the VFO running in the 4 MHz range. The front end is a NE602 serving as the RF mixer and VFO. CAD-designed bandpass filters are used in the receiver front end and transmitter driver stages. NE602 mixers are used for the product detector and transmitter mixer stages as well. The IF stage is a single MC1350 IC, followed by the six-pole ladder filter. Most of the circuitry is IC; in a quick

peek inside I counted seven eight-pin ICs and a small handful of discrete active components. A miniature antenna relay is used—no antenna switching diodes to burn out here.

What I Didn't Like

It was hard to find any fault with the radio since, even though my set was from the first production run, no problems have been found. One thing I noticed was that the large amount of IF and RF gain during transmit, all following the IF ladder filter, did produce a transmitter white noise floor that could be a problem when used in close conjunction with other 20 meter stations, such as during Field Day. But, please note that the transmitter does meet current FCC specs for spectral purity.

I also missed having a RIT control, my voice is slightly bassy, and stations have a tendency to off-tune my signal so I sound better to them. Including an earphone or external speaker jack on the rear apron would be an useful addition.

What I Did Like

Almost everything! The case is solid and well-made. The tuning is smooth, thanks to the vernier drive and hefty 1.25" tuning knob; and the dial is accurate and the VFO is stable. The speaker size and placement is ideal for good volume and audio clarity. I was impressed with the IF ladder filter performance, and with the AGC action and the inclusion of a backlighted analog meter. These are nice touches for a radio in this price class and for its intended QRP audience.

Twelve watts and the RF processing system used by MFJ will produce contacts. You don't have to be an experienced QRP milliwatt masochist to enjoy QRP! Yoy can see fine results without the usual frustration encountered by some beginning QRP enthusiasts. And the radio (it measures 2-1/2" x 6-1/2" x 6.0") battery supply, mike and a simple wire dipole can easily be toted in a small gym bag to exotic DX locations or on your next business or camping trip. To sum it up, MFJ's 9420 is a winner! 73

73 Review

Number 8 on your Feedback card

by Mike Bryce WB8VGE

The TechSonic Milliwatter

It's easy to build your own QRP transmitter!

TechSonic
1642 Butler Pike, Suite 127-F
Conshohoken PA 19428
Telephone: (610) 834-1978
Price Class: Single Band Kit—$29.95;
Built—$39.95; Metal Case—$9.95;
Band Packs (incl. Xtals)—$9.95;
Milliwatter Deluxe (kit, case, and 3 band conversion packs)—$54.95.

There's an upswing today in the number of soldering irons burning at night. Perhaps it's the QRP bug biting both newcomers and old-timers alike. For those wishing to get their feet wet in low power ham radio, I may have the perfect solution. It's called the Milliwatter, and it's from the people at TechSonic.

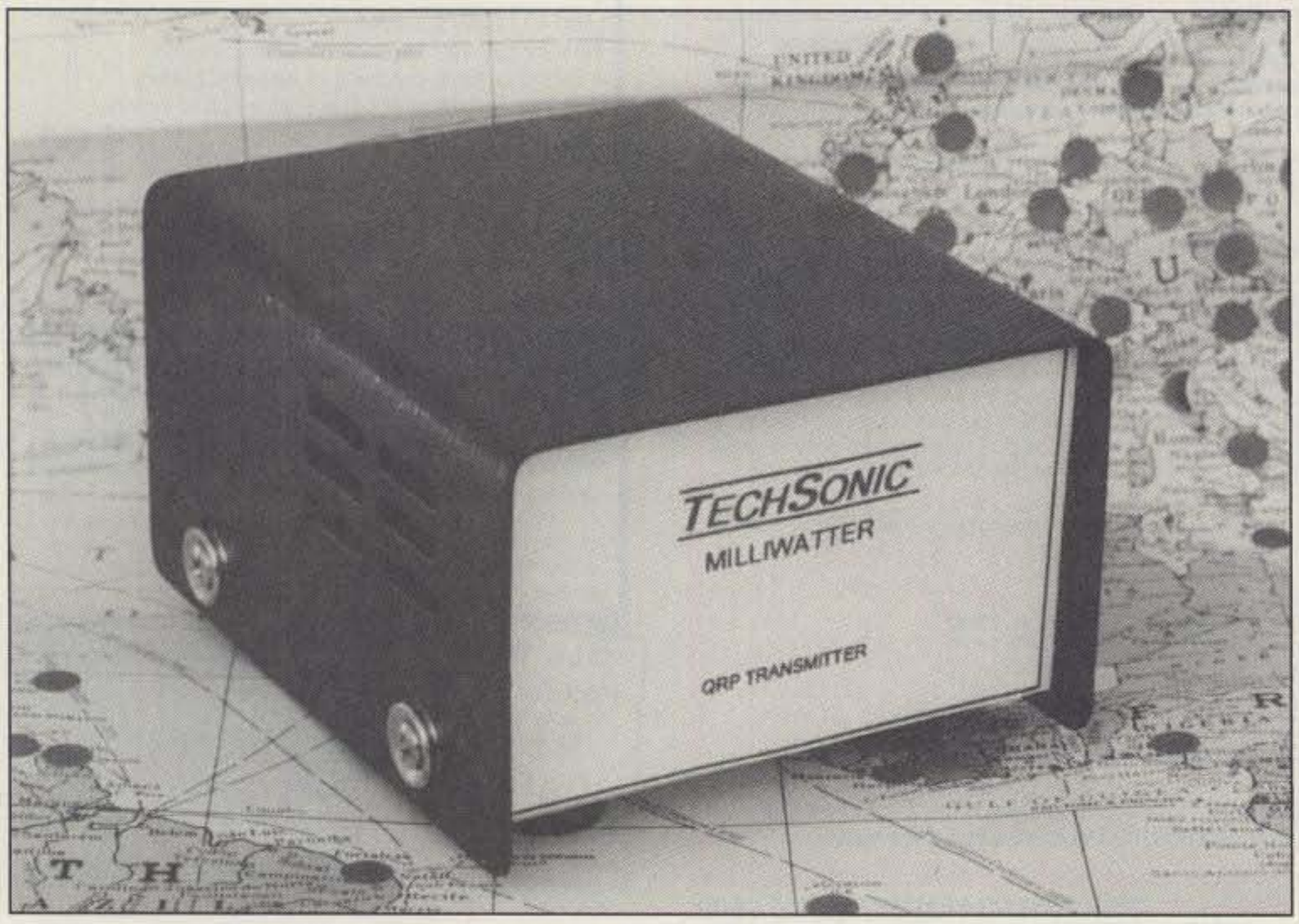
The Milliwatter

The Milliwatter is a basic QRP transmitter that is so easy to assemble, anyone could do it. The Milliwatter provides several watts of RF on many of the popular ham bands. Of course, you can put the Milliwatter on only one band at a time. I assembled the Milliwatter for use on the 40 meter band (a great place to work other QRP operators, too).

You can put the Milliwatter on just about any of the ham bands by installing a different band pack. However, you must first remove all the components from the band you want to remove and then install the new parts. The manual advises you to keep the parts you remove so you can install them in again if you want to change bands. I'm not sure I like this idea. It would seem to me that, unless you are careful to avoid excessive heat, the copper on the PC board might begin to lift up and cause you trouble after a number of band changes. *[In all fairness, the factory says this has not been a problem so far.—Ed.]* Each band kit comes with all the necessary components and a crystal. All the coils come prewound, too.

QSK On Board

The Milliwatter has provision for electronic antenna switching QSK. The diode switching is very fast, and of course quiet. There is a loss of signal going to the receiver when using the QSK circuit. Using my old Drake R4B, I noticed the attenuation by jumping the QSK circuit in and out of the antenna line. The Milliwatter does not provide a sidetone, either. Since the QSK system does not mute the receiver, you can listen to your own keying. There is no *spot* function either, so you must key down at full RF output to find your signal on the band. Use a dummy load and not the antenna for spotting.



The Kit

The Milliwatter comes with all the parts necessary to get on the band of your choice with as little pain as possible. It comes with a small PC board, all board mounted parts, and a crystal for the band in use. Since I chose the 40 meter band, the crystal came on the QRP calling frequency of 7.040 MHz. A nice touch!

Assembly

Assembly is straightforward. The instructions are clear for the most part, with an error popping up here and there. These were simple enough to see through, and should cause no trouble with the kit.

There is no wiring to be done with the Milliwatter. Every connector is mounted to the PC board. This includes the antenna, power and receiver jacks. RCA-type jacks are used for the RF connections and key while a coaxial jack is used for power.

Each step is spelled out in simple terms and each stage is explained. The manual contains an oversized parts overlay, but no PC board pattern. A schematic is also included. Techsonic has recently revised their assembly manual in response to customer feedback.

The PC board, about the size of a playing card, is fairly open, with trace spacing wide enough to prevent solder bridges—a big plus to the new builder. Stuffing the board is quite simple. However, some of the resistors are mounted on end, and this may confuse some people.

The Milliwatter does come with quite a few surplus parts. And while there is nothing wrong with that, sometimes parts don't exactly fit the PC board. The capacitors were especially hard to fit. In fact, the 0.1 caps went from the kit into the junk box and I used my own supply of 0.1 caps to finish the board. *[Factory note: Currently shipped caps drop perfectly into the holes.]* One capacitor had no markings at all. During assembly, a 100 pF capacitor was called for. I could not locate this part in the kit, so I suspected it was missing. After the rest of the parts were installed on the board, I had one leftover capacitor—

the unmarked critter. I decided I had three choices. I could dig up a 100 pF cap in my junk box. Naw, that would take a week. Or, locate my capacitor checker. Nope, that would take a month. Or, solder in the mystery capacitor. That's what I did and everything worked out just fine. *[Factory note: The 100 pF caps have been remarked at TechSonic to avoid confusion.]*

Don't get me wrong, there's nothing wrong with surplus parts. Hey, if they're good enough to go in an M1A1 tank, they'll work just fine in my QRP transmitter. The biggest problem with surplus parts is getting them to fit the PC board. For instance, a 0.1 cap on 0.5" lead spacing will be a rough fit on a PC board with holes laid out for 0.2" spacing.

Frequency Control

The Milliwatter uses a VXO to move the crystal's frequency around. In my kit, I could move from 7.049 to 7.053 MHz with the VXO capacitor. It's interesting to note, the VXO capacitor is a small trimmer mounted on the PC board. It's not a panel-mounted control. In fact, if you are going to mount the Milliwatter in its optional case, you're instructed to solder the VXO trimmer capacitor on the foil side of the PC board. I'll talk about this again.

The Milliwatter is keyed in the oscillator circuit. Keying is just about right: not too hard and not too soft. The Milliwatter does not sound like your typical QRP transmitter. Depending on the supply voltage, the RF output from the Milliwatter will be from milliwatts to several watts. With 3 watts of RF, I was able to work all over the East Coast, with some W6s thrown in for good measure, despite the bad conditions on 40 meters.

"The Milliwatter is easy to build and provides a lot of fun for first-time kit builders."

What's Cool

The Milliwatter is easy to build and provides a lot of fun for first-time kit builders. The crystal VXO gives enough frequency swing to prove useful. Mounting all the inputs and outputs directly to the PC board eliminates mistakes during assembly. Including a crystal with the kit is great. It's a well-thought-out circuit that works quite well. The KISS standard is working here. Perhaps the best part about the Milliwatter is its cost, well within the reach of every ham, regardless of their budget.

Not Cool

The optional case for the Milliwatter is nothing special. It's imported and, while it is painted and silk-screened and punched (and I do mean *punched*), I could do better.

Putting the VXO capacitor on the foil side of the PC board and then mounting the board into the case means you have to turn the rig over to adjust your transmitter's frequency. Then you must hit the trimmer through the hole with a tweaker of the correct size. These small trimmer capacitors were never meant to be tweaked and tweaked all the time. I suspect you could easily wear out the trimmer capacitor in a short time. There should be a spot button to let you find your transmit signal without going on the air (or dummy load).

All In All

The Milliwatter is a dandy way to get your feet wet in the exciting field of QRP. It's simple and easy to build. For the money, it's a hard act to follow. It would be a great club project. Why who knows, maybe the Milliwatter will make you dig out your soldering iron! 73

MFJ Dual Band Mobile Antenna

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For an incredibly low $14.95, you get an MFJ dual band 2 Meter /440 MHz mobile antenna!

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New!

Dual band ground plane antenna for 2 Meters and 440 MHz gives you extra long range on 440 MHz with a high gain halfwave over quarter wave radiator. On 2 Meters you get solid quarter wave performance. Mounts on 1 to 1½ inch mast with single U-bolt. Easy-to-tune.

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MFJ-1740
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You get easy tuning, low loss ceramic antenna insulator and strong lightweight aluminum construction.

Single U-bolt mounting for 1 to 1½ inch mast. Cutting chart included for 220/440 MHz. Made in USA.

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2 Meter halfwave J-pole antenna

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Roll up this *halfwave* 2M J-pole antenna and stick it in your pocket! It's the perfect *gain* antenna for traveling.

Get home station performance on the go. Just hang your *MFJ Pocket Roll-Up*™ in the clear and plug the BNC connector into your handheld.

It's omni-directional and has significant gain over a ¼ wave. It does not need a cumbersome ground plane so it's convenient for indoors and works great with handhelds. Made in USA

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A. *High Gain FlexiDuck*™, **MFJ-1717, $19.95**. Enjoy dependable QSOs when other rubber ducks give you noise. High gain ½ wave on 440 MHz, full size ¼ wave on 2M. Won't jab you -- bends, twists, flexes with you. 15¾ inches.

B. *FlexiDuck*™, **MFJ-1716,** **$16.95.** Similar to MFJ-1717. Full ¼ wave on 440 MHz, efficient loaded ¼ wave on 2 Meters. 8¾ inches.

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Add this *short*, 4¼ inch *ShortyDuck*™ to your 2M handheld for a Q-5 signal! Impedance matched for maximum gain. High-Q helical wound radiator.

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5/8 Wave 2 Meter Mobile Antenna

MFJ-1728/B
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For *maximum range* while mobile, use MFJ's ***Maximum Gain***™ 5/8 Wave 2 Meter Mobile Antenna. You'll get the maximum possible gain of any single element mobile antenna!

Competitive 5/8 wave mobile antennas can't work any better -- no matter how much more they cost.

You get low SWR so your rig can safely deliver maximum power into your antenna. It's rated at 300 watts PEP so you can use any mobile rig plus a mobile amplifier.

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You get a stainless steel radiator that'll endure years of harsh mobile use and 12 feet of coax cable.

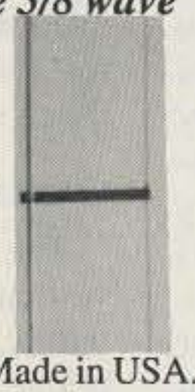
You get MFJ's one year *No Matter What*™ unconditional guarantee.

Order MFJ-1728 with standard PL-259 coax connector or MFJ-1728B that also includes a BNC adapter for your handheld.

Stacked 5/8 Wave for 2 Meters

gives twice the omni-directional gain of a single 5/8 wave

MFJ-1764
$34.95



MFJ's stacked 5/8 wave radiators give you *more than twice* the *omni-directional* gain of a single 5/8 wave radiator!

Wide 10 MHz 2:1 SWR bandwidth . . . excellent ferrite choke balun feedline decoupling . . . shunt choke for bleeding off unwanted static . . . strong lightweight aluminum.

Fully assembled -- simply attach radiators -- no tuning required. Mounts vertically for FM/Packet or horizontally for SSB. Installs with single U-bolt on 1 to 1½ inch mast or tower leg. 1½ lbs., two 47 inch radiators, 23 inch boom. Made in USA.

Also works as excellent ***6 Meter*** full halfwave centerfed antenna.

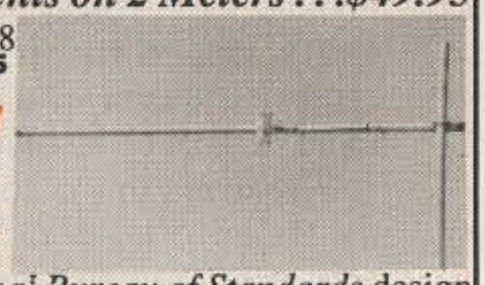
MFJ-1766, $89.95, gives you *four times* the gain of single 5/8 wave. Includes 2 MFJ-1764, phasing cables. Doubles gain on 6 Meters.

MFJ-1765, $29.95, phasing cables for 2 MFJ-1764s, other 2M ant.

MFJ dual band 144/440 MHz Yagi

5 elements on 440 MHz . . . 4 elements on 2 Meters . . .$49.95

MFJ-1768
$49.95
New!



Get two Yagis for the price of one . . . enjoy two Yagis in the space of one with single coax feed!

MFJ's *exclusive* dual band balanced feed with *FerriteChoke*™ decoupling prevents pattern skewing and gives you low SWR.

The MFJ-1768 is based on the *National Bureau of Standards* design that's optimized for maximum forward gain with high front-to-back ratio and a clean symmetrical pattern.

Mounts vertically for FM/Packet or horizontally for SSB with single included U-bolt on 1 to 1½ inch mast or tower leg.

High strength 6061-T6 aluminum 5 foot, 1⅛ inch diameter boom. 2 pounds. Elements are electrically isolated from boom. Made in USA.

Portable 3 element Yagi for 2 M

MFJ-1763
$39.95

You can set up or take down MFJ's *portable* 3 elements 2 Meter Yagi in seconds! Elements simply screw into the boom.

You can take it with you wherever you go and have the "oomph" and directivity of a beam.

It's easy to store and sturdy enough to use as your home station antenna.

Mounts vertically for FM/packet or horizontally for SSB. *Center* or *end* mounts with single U-bolt. Great for packet/PacketCluster™.

It's compact 2¾ foot boom gives you a calculated gain within 1 dB of a four element Yagi with a boom nearly twice as long.

Extra thick elements maintain high gain and directivity over entire 2 Meter band. MFJ's *FerriteChoke*™ decouples feedline.

Elements and boom are made from strong lightweight aluminum and protected by MFJ's *Permanent Molecular Bonding Technology*™.

Weighs just 2 pounds. Boom is 30½ inches. Made in USA.

5/8 Wave Ground Plane

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$19.95

For a low, low $19.95, you get a *high performance* 2 Meter 5/8 wave ground plane home station antenna -- you'll get the maximum gain of any single element antenna.

More expensive 5/8 wave ground planes can't work any better -- no matter how much they cost.

You get . . . shunt fed matching that bleeds off unwanted static and gives you low SWR . . . strong lightweight aluminum construction . . . low loss ceramic antenna insulator . . . MFJ's *RapidTune*™ radiator . . . MFJ's one year *No Matter What*™ guarantee. It mounts on 1 to 1½ inch mast with single U-bolt and is Made in USA.

MFJ-1752, $19.95, for 220 MHz .

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Telescoping antennas for handhelds

A. *Long Ranger*™ 2 Meter Halfwave, **MFJ-1714**, $16.95. For really long range this MFJ endfed halfwave is hard to beat. It outperforms a ⅝ wave on a handheld because the ⅝ wave needs a ground plane. The MFJ halfwave doesn't. It's shorter, lighter, has more gain and places less stress on your antenna connector than a ⅝ wave antenna. When collapsed, it performs like a rubber duck. 40" extended, 10½" collapsed.

A. B. C.

B. *Dual Bander*™ for 2 Meters and 440 MHz, **MFJ-1712**, $14.95. Got a new dual band handheld or separate units? One antenna fits all. It's a ¼ wave for 2 Meters and a ⅝ wave with gain for 440 MHz. 7¼" collapsed, 19" extended.

C. *Pocket Linear*™ ⅜ Wave, 2 Meters, **MFJ-1710,** $9.95. Carry this pen size antenna in your pocket like a ballpoint pen. When you're using your rubber duck, on the fringe and noisy, put on the *Pocket Linear*™, extend it to 24½" and carry on your QSO. Has pocket clip. 5¼" collapsed.

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CIRCLE 86 ON READER SERVICE CARD

Handy Randy

The tiny tag-along almost *random wire tuner for QRP.*

by Donald L. Shipman W3RDF

In the October 1988 issue of the *ARCI QRP Quarterly*, I described a toroid-loaded kite-supported antenna and the fun of operating a small 30 meter station from the beach. Since then I've successfully used this toroid-matching technique in hundreds of setups with varying lengths of wire, with and without the kite. Most recently I used the technique while operating from several small islands in the Baltic as OH2, and from the Arctic as OH9. With a toroid-loaded wire, woven through tree branches not very high off the ground, I enjoyed hundreds of contacts and many fine rag-chews with hams all around Europe and Western Asia. These experiences led me to develop a little jewel which now accompanies my QRP rigs every time they leave home. Although, it's not truly a random wire tuner, since you can't vary the inductance, I've decided to call it "Handy Randy."

Handy Randy is for the QRP operator who likes to operate from remote places but doesn't want to carry a lot of extra weight. It's for the operator who wants to spend more time operating than trying to properly situate a well-designed antenna. It is not for the QRO operator. I would never use this tuner in a QRO environment—there's too much stray RF to burn my fingertips and make my keyer go haywire. In fact, whenever possible I ground my transceiver to provide a more stable tuning environment. Never underestimate the importance of a good ground.

Handy Randy is quite simple and inexpensive to build. It's lightweight and takes up little space, yet performs like a real champ. As you can see (Photo A), Handy Randy is housed in a 35mm film container. C1, a ceramic compression trimmer with a quarter-inch shaft, is attached with a screw to the container lid, and L1 is attached to C1. A short length of coax feeds through the back wall of the film container and the tuned output attaches to a random length of wire with an alligator clip. I've found it helpful to insert some additional capacitance in series with some random wire lengths while operating in the 40 meter band. I carry a 100 pF mica with a miniclip on one end (Photo B) for insertion between the tuned output and the random wire, if needed.

Construction

The value of C1 isn't critical as long as you can obtain enough capacitance and can reduce it to a few picofarads. I have an RLC bridge and the one I used ranged from 10 pF to slightly over 400 pF. L1 is wound on a ferrite toroid (Figure 1). I used an FT82-61 from Amidon Associates (12033 Otsego St., North Hollywood CA 91607) and wound a total of 14 turns of stranded number 20 hookup wire (Radio Shack #278-1219). The coil is tapped six turns from one end. The center conductor of a convenient length (18 to 30 inches) of 50 ohm coax (RG-58U, etc.) was soldered to the coil tap and the braid to the six-turn end of the coil. The ends of the coil were then soldered to the tabs on C1, and, at the same time, a short piece of hookup wire was soldered where the eight-turn end of the coil meets C1. The coax and the wire were fed through small holes in the bottom of the film container pulling the container and the lid together. A PL-259 was attached to the coax and an alligator clip to the wire. Finally, a small knob was placed on the shaft of C1.

Testing

The whole project took only a few minutes. Locating the right trimmer with a mounting bracket and shaft took the most time. I had accumulated several from hamfest flea markets. The first test was conducted with a 150-foot wire and 5 watts on 30 meters. With a few twists of the trimmer a 1 to 1 SWR appeared. Hand capacitance around the film container had some effect but a flat SWR was easily found.

Next I connected Handy Randy to a 20 meter QRP rig. A slight adjustment to C1 netted a nearly flat SWR. It was difficult to get the SWR below 2 to 1 when applying a 40 meter signal, but after inserting a 100 pF mica in series with the antenna the SWR dropped to about 1.2 to 1. I again tuned up on each band and made several contacts.

If you have difficulty, try a wire that is 1.2 x the wavelength of the operating frequency. Example: Here is a sure thing for the low end of 40 meters. Use 7025 as the target frequency. Using the halfwave dipole formula:

$$\frac{468}{7.025} = 66.619' \times 2 = 133.238' \text{ (fullwave)} \times 1.2 = 159.8'$$

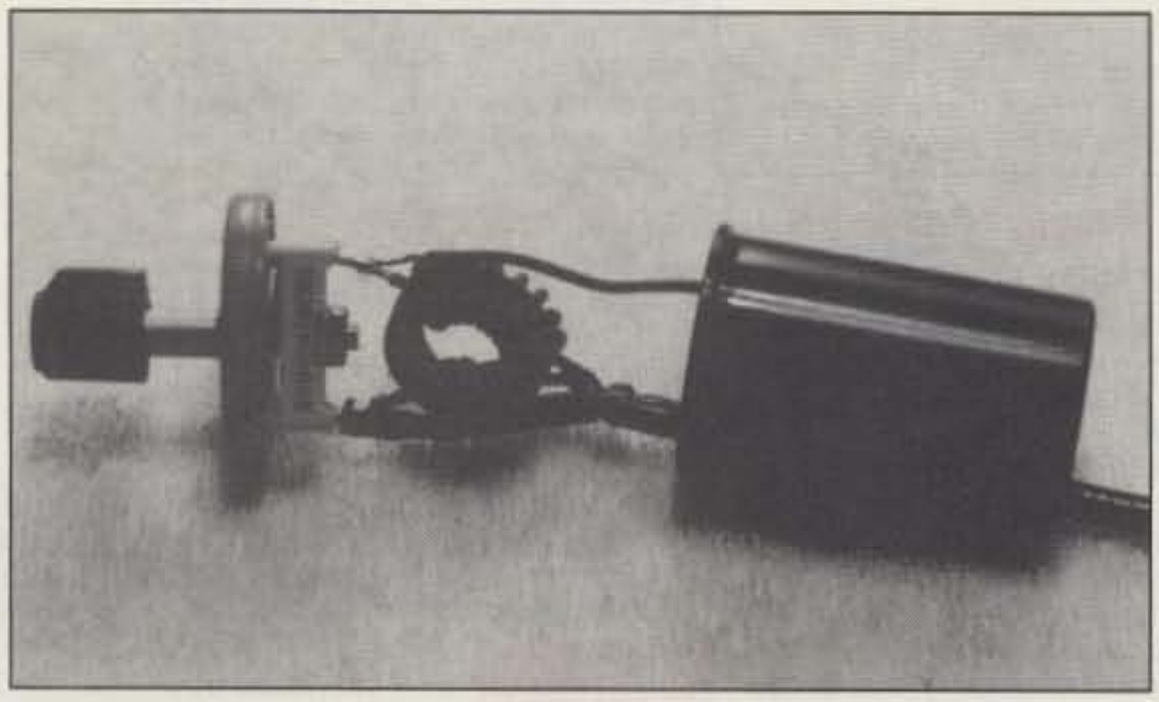

Photo A. The whole works to Handy Randy fit neatly in a common film container.

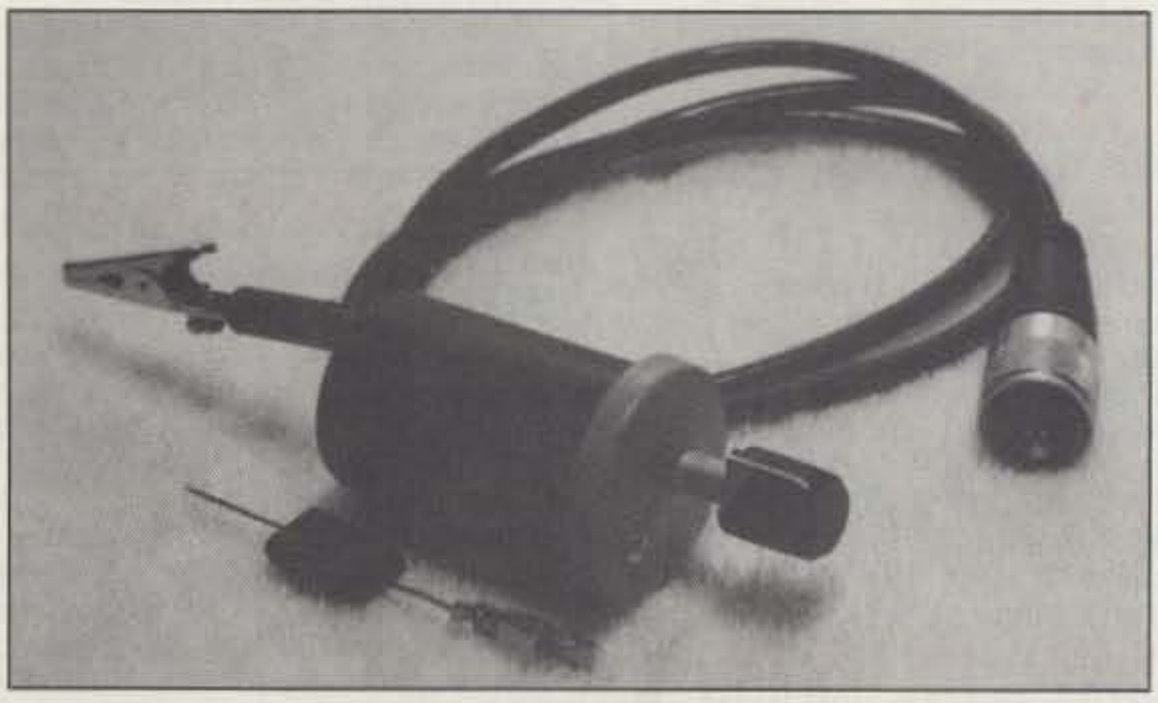

Photo B. You may want to add a little capacitance for best results, so keep one on hand with an alligator or mini-clip. (See text.)

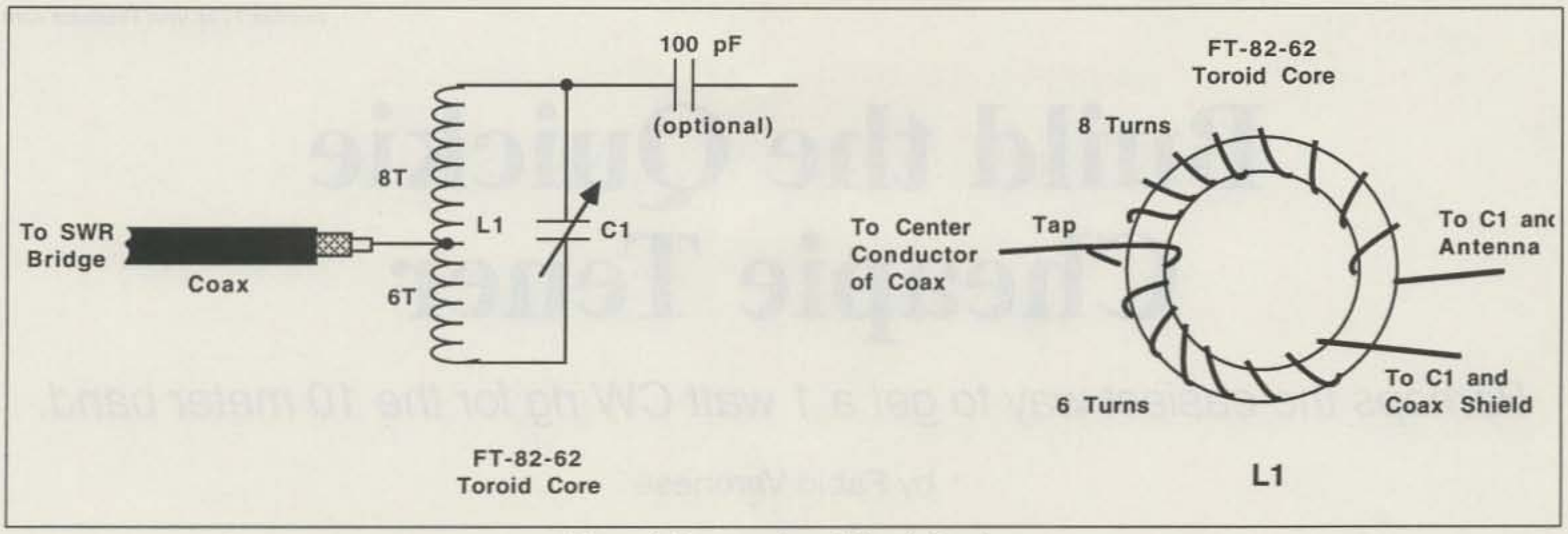

Figure 1. Construction of Handy Randy.

A 160' wire will load like gangbusters. If space is a problem, use less than a full wavelength. Use .667 x wavelength. For 7.025, the full wavelength is 133.238'. 133.238 x .667 = 88.9'. You'll be surprised at how well this will work—just remember to ground your rig.

I seldom know what I'll have to deal with when it comes to stringing an antenna so I usually carry an assortment of wire lengths which can be clipped together to give me several length options. Each length is made from #20 insulated, stranded, hookup wire and each has a small fishing swivel attached to both ends. Also, at one end of each wire I've soldered a three-inch jumper wire, terminated with a small alligator clip. The lengths can be coupled together by connecting the swivels and by attaching the alligator clip jumper to ensure continuity. A large rubber band serves as a handy insulator if I need to use one of the wire lengths as a convenient support line to reach a tree limb.

I always run my QRP stations from batteries when they're away from home. A 12 volt, 7 Ah Gel Cell lasts several days without recharging, and although it weighs a lot it's easy to carry and doesn't take much space. Once the power is connected and the antenna is tuned I'm set for hours of operating fun. However, I'm always aware of the fact that, if I change anything, like adding a ground or connecting a battery charger, I'll have to retune Handy Randy. After all, the whole glob is part of the antenna system. 73

Build the Quickie Cheapie Tener

Perhaps the easiest way to get a 1 watt CW rig for the 10 meter band.

by Fabio Veronese

Who says that one-transistor transmitters necessarily have to be unreliable toys? The output power may not be so high—that's quite obvious—but, if you choose the right project, you can be sure of building a little, perfect QRP transmitter while spending less than five bucks and with minimum effort.

The 1 watt, 10 meter CW rig that's described here uses only 11 cheap, readily-available parts and their values aren't critical at all. This means that it will work as soon as its power supply is connected, assuming that all connections are right and are kept reasonably short and direct.

It's a winning card for young experimenters taking their first steps as hams, and for older people who have never tried to build an RF circuit or who enjoy QRP operating.

A Look at the Circuit

Figure 1 shows the schematic diagram of the Quickie Cheapie Tener. It's nothing more than a quite straightforward Pierce crystal-controlled oscillator with tuned output, equipped with a medium-power NPN silicon transistor, like a 2N3866 or similar device.

Basically, this circuit is a common-emitter amplifier. Resistors R1 and R2 set a proper polarization voltage for the base, while R3 plays the same role for the emitter; that is, RF is bypassed to ground by means of capacitor C3. The connection of the XTAL (crystal) between the Q1 collector and base creates a feedback path that causes the stage to break into oscillation at the crystal frequency that may be modified by a few kHz by acting on trimmer capacitor C1. Fixed capacitor C2 just prevents collector DC from uselessly affecting the XTAL, and has practically no effect on output frequency.

The collector circuit is tuned at crystal frequency by means of a toroidal inductor (L1) and a trimmer capacitor (C4) connected in parallel. A two-turn link, L2, allows the output signal on L1 to be fed to a resonating aerial by a coax cable. Capacitor C5 bypasses supply voltage and at the same time creates an RF path to ground for the output-tuned circuit.

The transmitter requires a 12 to 20 VDC regulated power supply; this should deliver a continuous current of at least 300 mA.

Building the Quickie

The Quickie Cheapie Tener may be assembled just as you like, as long as you keep in mind that connections must be kept as short as possible. So, you can build it on a small piece of perfboard, or pick up a scrap of unetched PC material and adopt the "dead bug" technique. If you prefer a smarter and longer-lasting solution, just etch the PC board shown in Figure 2 (or better yet, drilled and etched PC boards are available for $3.75 plus $1.50 S & H per order from FAR Circuits, 18N640 Field Court, Dundee, IL 60118). After etching, cleaning and drilling (use a #74-size drill bit for all holes), take a look at the parts layout shown in Figure 2 and start with installing resistors. Then go on with fixed and trimmer capacitors, and finally solder Q1 and the XTAL—unless you prefer to use a socket for this last item.

Now it's time to wind up the coils. You need a small Amidon toroid core, like FT-37-2 or FT-37-6. Slightly different toroids will do if the ferrite mix is suitable for frequencies up to 30 MHz or more. Inductor L1 consists of 10 turns of #24 enameled copper wire; L2 is a two-turn link wound between the ends of L1, still using

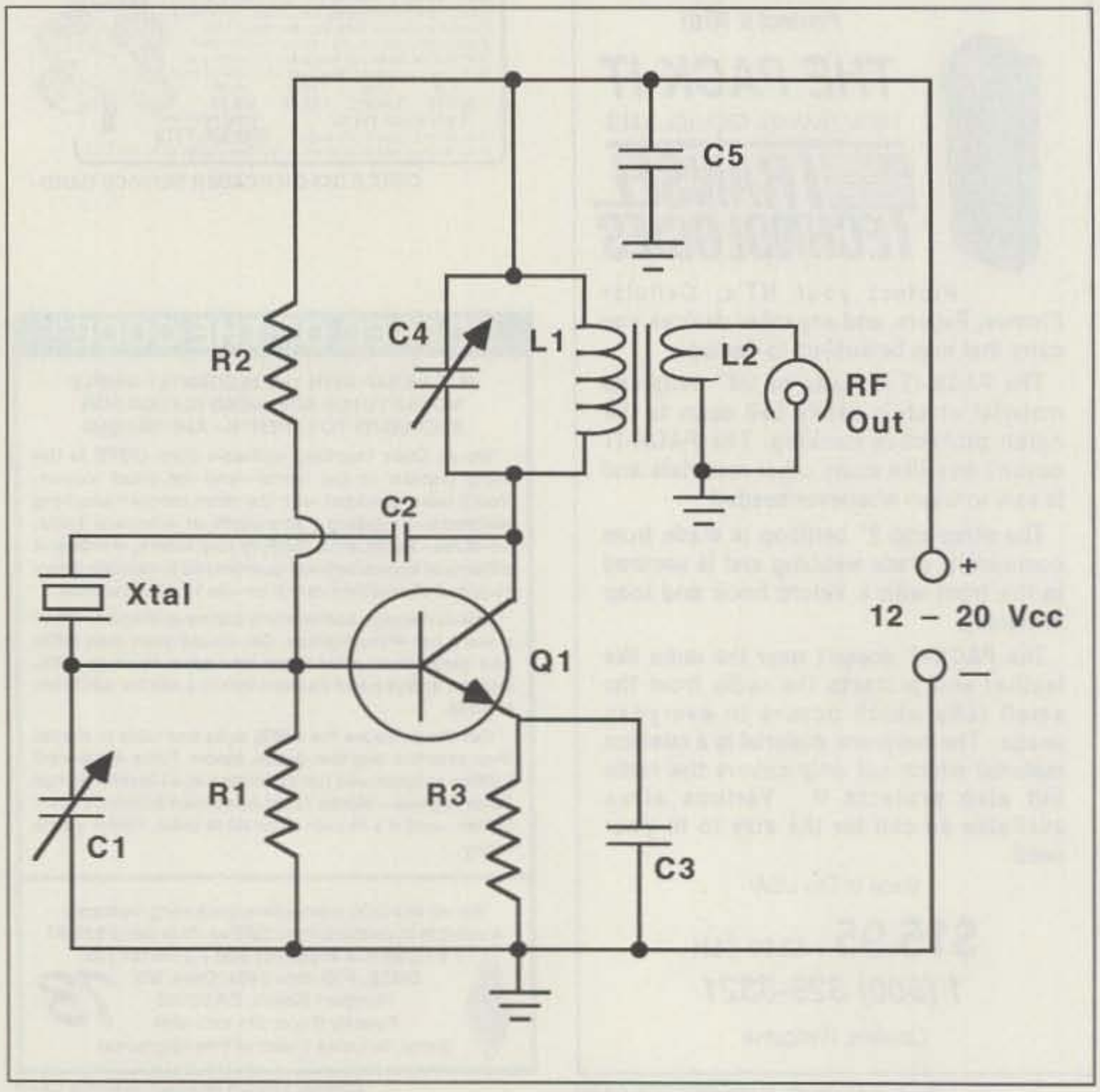

Figure 1. Circuit diagram for the Quickie Cheapie Tener, a 1 watt 10 meter transmitter.

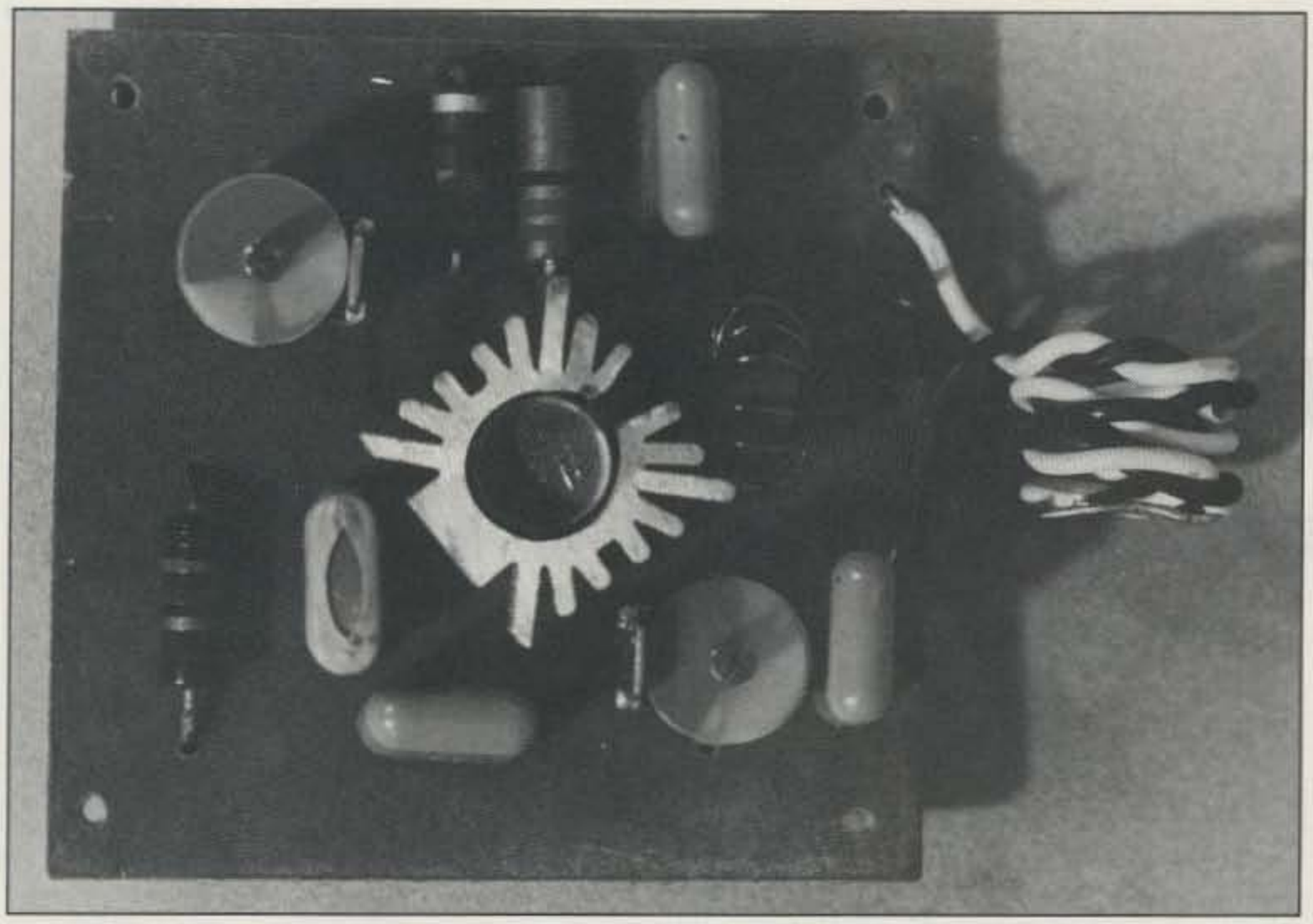

Photo A. The assembled 10 meter rig.

#24 wire. Before soldering L1 and L2, scrape away the enamel from the ends of the windings (about 1/4" is enough) with a sharp blade, then pre-tin them using an hot soldering iron.

Parts List

Q1	2N3553, 2N3866 or similar medium-power NPN transistor
XTAL	28,000 kHz miniature crystal
R1	5.6k resistor
R2	15k resistor
R3	330 ohm resistor
C1,C4	10-60 pF trimmer capacitors
C2,C3,C5	0.1 µF ceramic or polyester capacitors
L1,L2	Coils; see text

Misc.: Crystal socket, PC board, case.

Tuneup

If an outdoor antenna resonating on 28 MHz is not available, temporarily connect 5 to 10 feet of insulated copper wire to the output of the Quickie. You may also use a "dummy load" made by a small filament lamp—say, 6V, 100 mA. Its brightness will roughly tell how much RF energy is coming from the transmitter output. Put a communications receiver near the transmitter board and tune it to the XTAL frequency. Connect the Quickie to the power supply and slowly turn C4 with a plastic screwdriver (don't use metal tools!) until you can receive its carrier. Adjust C4 for maximum reading from the S-meter of your receiver, then set the exact transmission frequency by means of C1.

This completes the tuneup of the transmitter. To send CW, connect a key in series

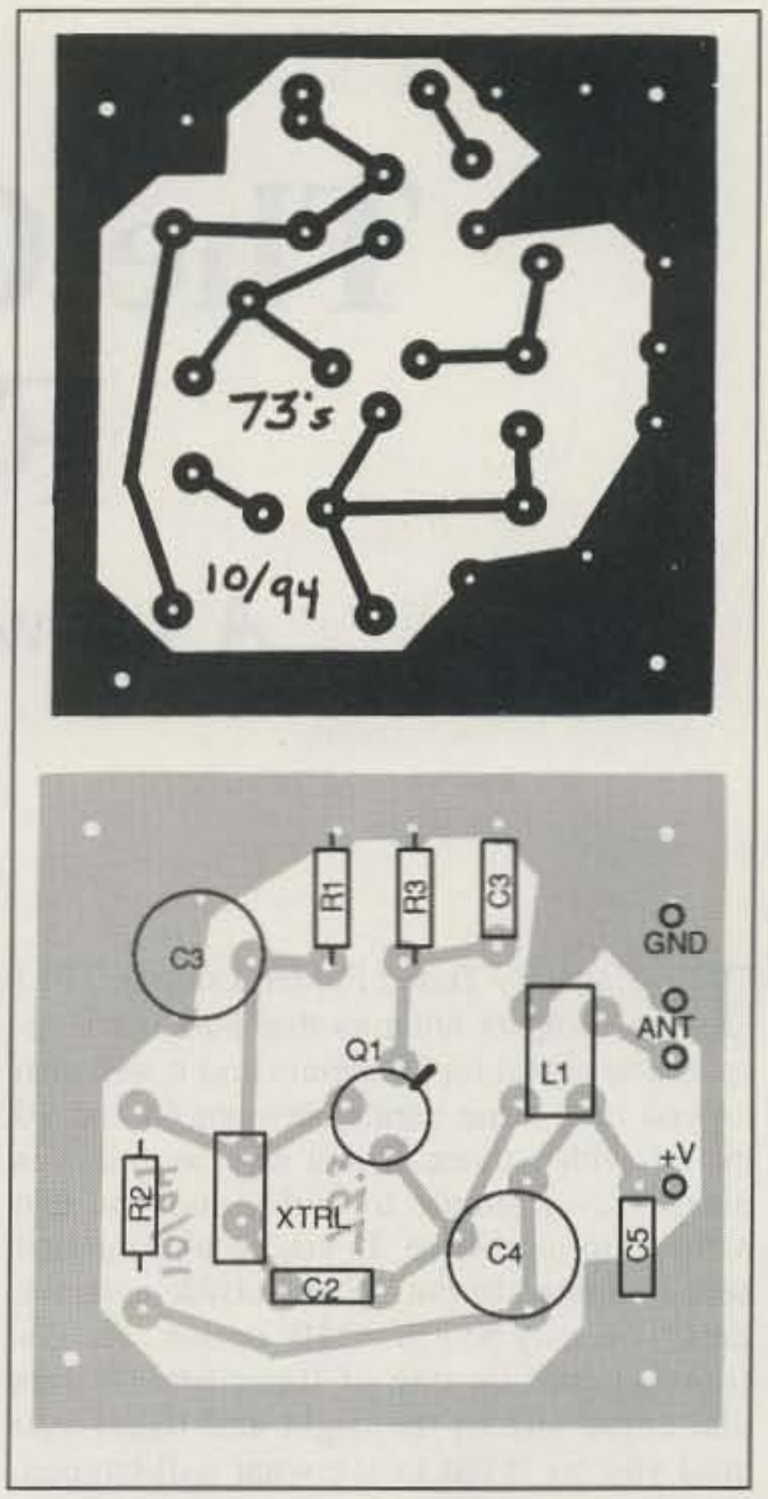

Figure 2. PC board foil pattern and parts placement.

with the positive or the negative rail of the power supply. It's advisable to put a 100,000 pF ceramic capacitor in parallel to the key in order to reduce manipulations or "clicks" due to current transients. If you have an FCC license, you are now ready for your first Quickie-QSO (. . . or Quickie-DX, who knows!). Otherwise, just leave the dummy load lamp in place and use your brand new rig to take some exercise in Morse code. 73

The Capacity Tuned Folded Loop

A 1/3-wave, 7-foot, 20 meter antenna.

by Jim McLelland WA6QBU

The Capacity Tuned Folded Loop (CTFL) is a compact antenna that puts out a respectable signal on 20 meters and it will also let you tune other bands between 40 and 10 meters with a tuner. It is a wire loop that is inexpensive, simple to build, and you can hang it up anywhere. If you're like me and aren't allowed to put up an outside antenna, the CTFL may be a good HF option. The design is based on one of those brainstorms that come late in the night and haunt you until you try it out to see what will happen. (The XYL says I've been haunted for years, and points to all the strange noises that come from the shack when I'm in there.) Try it! You won't be sorry.

The Antenna

The CTFL is a small wire loop designed primarily for single-band HF operation. It is a folded dipole, shortened until the impedance drops from the typical 300 ohms to 50 ohms, then bent into a delta loop, with a capacitor between the ends to tune it back down to the original resonant frequency. It's then fed through a half-wave length of twin lead that terminates in a 1:1 balun at the tuner and SWR bridge. You could put the 1:1 balun at the antenna and use coax, but I wanted the option of using my tuner to resonate the CTFL on other bands and twin lead is more efficient in this respect. Although the CTFL is probably at its best on the design band, it will work on the others. But, if you can work it out, it's better to have one antenna for each band of interest.

With this system, you get a self-resonant antenna on 20 meters with a 2:1 SWR bandwidth of about 280 kHz and an impedance of 50 ohms. I found that I could easily resonate on the center of the phone band and run up and down the band without need of the tuner and stay below 2:1 SWR. Even moving to the bottom of the CW portion only required minor tuner touch-up. Another interesting point is that you *do not* need a good ground to make it work. Some kind of ground is always a good idea to help with RFI and RF feedback, but it is absolutely not required to make the loop work efficiently.

Construction

Take a look at Figure 1. All the lengths are based on the characteristics of Radio Shack 15-1153 5/16" twin lead (get two rolls if you want to feed it with twin lead). Other varieties will require somewhat different lengths, especially with the capacity tuning stub. Cut the 20 meter loop to 24' 8", short both ends together, and open one conductor halfway between the ends for connection of the feedline. Keep in mind throughout the project that all connections should be twisted and soldered. Further, you need to use shrink tubing everywhere possible for both added strength and insulation. A little planning here will save you a lot of grief later.

Now solder a 24" open stub to the ends. Then, cut 27' 10", or some multiple of it, for your feedline (half-wave with a velocity factor of 0.80) and solder it on. Keep the loop end spacing constant at about 1" by attaching a short piece of rope with shrink tubing. Now all you need is a 1:1 balun on the rig end of the feedline and you're done. You can buy a balun, although they're easy to make. Ten to 15 turns of RG-58/U in a 6" coil will work fine, or you can wind some RG/174/U on an open ferrite form that Radio Shack sells. You can also use a 4:1 balun like the one that's probably in your tuner, but then you'll have to use the tuner to match the system.

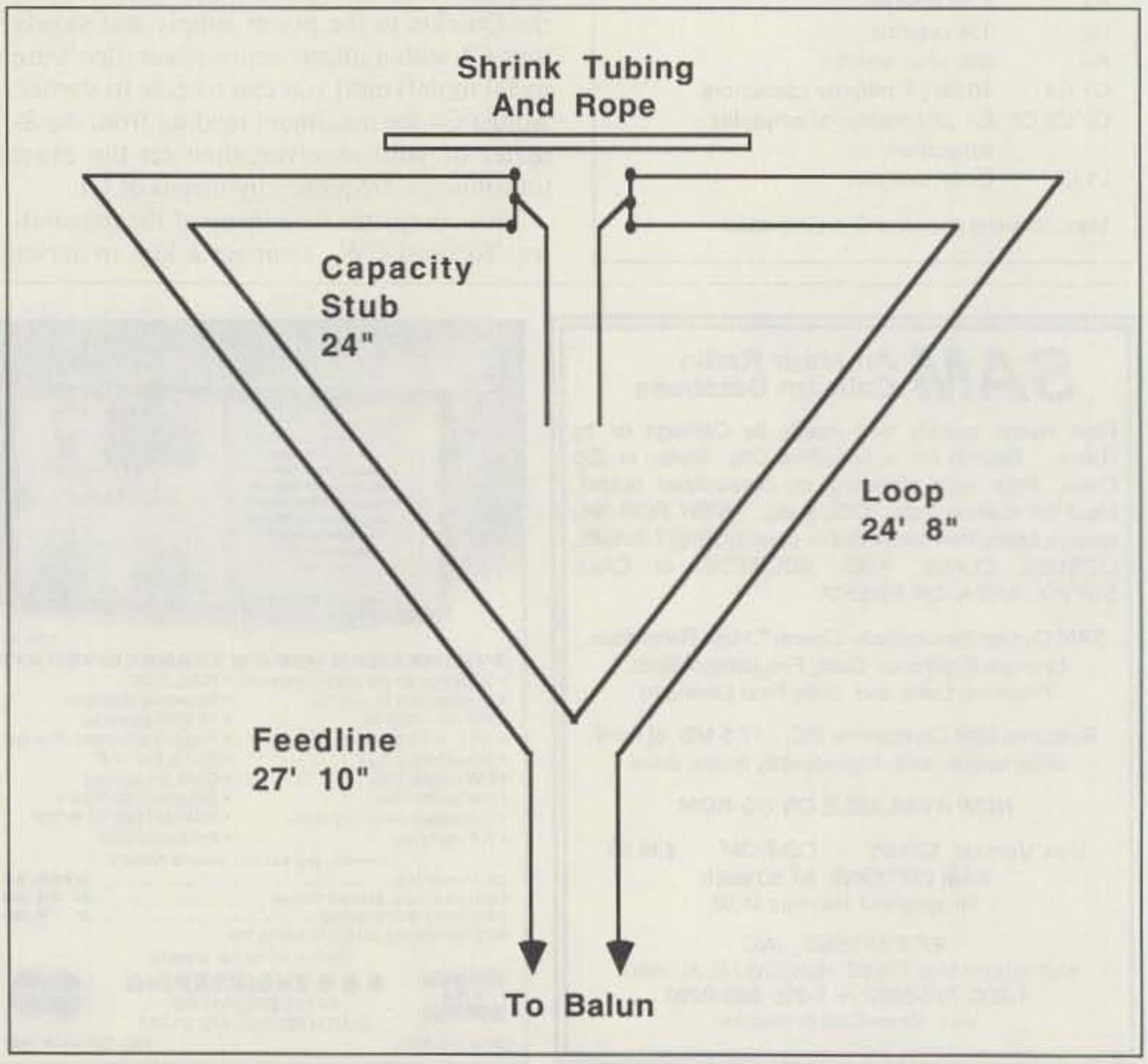

Figure 1. The Capacity Tuned Folded Loop. Use these dimensions for 20 meters.

Installation

If your loop is quite close to the ground, install it vertically. Keep in mind, however, that the loop has directivity perpendicular to its plane. Therefore, if you have a favorite direction and your space will permit it, point it that way. You can also reduce interference, if that's a problem, by positioning the loop sideways to the noise or stations you want to reduce. If you've got a two-story house, you can mount the loop horizontally in the attic. I've tried both at the same time and usually closer stations are better horizontal whereas I hear DX better when its vertical. Being able to easily switch back and forth between two antennas keeps the QSO going awhile longer. Install the loop as an equilateral triangle if possible.

Changing the feed angle tunes the loop up as the feed point angle gets wider and the impedance goes up also (60 degrees = 50 ohms and 90 degrees = 100 ohms), so it should be stable before trimming the stub. Stay away from metal objects and use insulating material for mounting purposes. If you mount the loop vertically, feed it from the bottom, and keep the line away from metal objects as well.

Tuning

Built as described above, the CTFL is probably resonant at the bottom of the band, depending on your loop angle and proximity to objects. Using an SWR bridge, find the dip near 14 MHz. To raise the frequency, just trim 1/2" pieces from the capacity stub until it resonates where you want it. If you don't want to bother, just use your tuner and it'll work fine. If you're a real stickler, use an antenna bridge and you can get it right on. That's what I did but I really don't think it matters that much with a tuner.

Testing

Does it work indoors? Yes—yes—yes! With no tuner on 20 meters, I've been able to work all over North America with the loop hanging on a door. Often, signals were the same as my reference antenna in the attic.

I think you cliff dwellers are going to like this one. Try hooking it to the XYL's hanging plants like I did and see what happens. Ha-ha. 73

Parts List

Twinlead—5/16"	100'
Shrink tubing—3/8"	1'
Shrink tubing—3/16"	1'
Banana plugs	2
Dacron line	50'
Double split twinlead insulators w/hardware	4

Note: All parts needed to build this antenna can be obtained by ordering the Compact Loop Experimenter's Kit. Introductory price w/shipping (40% discount for *73* readers): $24. Available from Antennas West, 1500 N. 150 W., Provo UT 84604; tel. (801) 373-842.

Notes on Impedance and Matching

A single wire loop of 1/3 wavelength has an impedance of about 13 ohms. This is typical of small loops and, in fact, many designs are down around 5 ohms. Since modern equipment is designed for 50 ohm antenna systems, some sort of matching is necessary. The "folded" design (multiple wires in parallel) was attractive because it is built into the antenna. Further, the impedance multiplying factor can be chosen, depending on how many "folds" are used. The final impedance is determined by multiplying the original impedance by the square of the number of wires in the antenna.

Expressed as a formula: Z(f) = Z(o) x N x N

Z(f) = Final Impedance
Z(o) = Original Impedance
N = Number of parallel antenna wires

For example:

	Z(f) ohms	=	Z(o) ohms	x	N # wires	x	N # wires	Antenna Configuration
1.	13	=	13	x	1	x	1	single wire
2.	52	=	13	x	2	x	2	twinlead x 1
3.	208	=	13	x	4	x	4	twinlead x 2
4.	468	=	13	x	6	x	6	twinlead x 3

The CTFL uses example #2. I settled upon it because it is simple; further, I felt that as I attempted to use the antenna at higher frequencies, the impedance would be less likely to go through the roof. However, I have experimented with example #3 as well and it worked just like the formula said it should. I merely made two identical loops and taped them together, connecting them at their shorted ends and using one capacitive stub and one feedline connected in one of the four wires that now forms the antenna. For a purely single-band antenna, this is a more elegant design and gives a good match with 300 ohm twin lead. One step further would be to use three loops as in example #4 and feed it with 450 ohm ladderlead (available from Antennas West—see the Parts List). Also, more folds should be more efficient since there's more total copper and less current per wire.

Using 300 ohm twinlead with a large mismatch on the line does not cause a loss problem, but some interesting things can happen that must be kept in mind. Let's look first at the CTFL's 52 ohm impedance (#2 above) as an example. When a feedline has a mismatch, it will act like an impedance transformer of some kind, depending on several factors. If it is exactly 1/2 wavelength long, it will act as a 1:1 transformer, *period!* You just have to make sure that you really have a half wavelength. To do this, you must divide 492 by the frequency in MHz, and then multiply by the Velocity Factor (VF) of the feedline to get the length in feet.

For example:

492 /14.14 MHz = 34.8 ft.
34.8 ft. x 0.80 = 27.8 ft. = 1/2 wave at 14 MHz

Furthermore, all of this happens regardless of the line impedance. (If you use coax and roll some of it up in a coil, you also get a balun—see below.) As a side note here, folded antennas do not work at their folded second harmonic. (Think about what your rig sees if the other end of a half-wave line is shorted: You got it, a short!) One leg of a folded loop or dipole is normally a 1/4 wavelength but at the second harmonic (frequency x 2) this equals a short circuit! With the loop described in the article, the second harmonic of the folded portion is about 32 MHz—safe on 10 meters.

Now we need to consider the other extreme, a 1/4 wavelength of feedline. This type of impedance transformer makes major changes and depends on both the line and antenna impedance to determine the final system impedance. System impedance equals line impedance squared, divided by the antenna impedance. To see how this works, look at the following formula:

$$Z(\text{system}) = \frac{Z(\text{line}) \times Z(\text{line})}{Z(\text{antenna})} = \frac{300 \times 300}{52} = \frac{90{,}000}{52} = 1{,}731 \text{ ohms}$$

As you can see, the system impedance suddenly went quite high, and that's one reason why I went with a half-wave line in the article.

Earlier I mentioned a balun. The reason you need one is to keep the feedline from radiating, and so you don't distort the radiation pattern. The latter may not be so important, but only the antenna should radiate and nothing else. On the higher bands, it doesn't take much coax to make a half-wave (27.8 ft. at 14 MHz) line and if you wind half of it, or more, into a 6" coil, you've got yourself a balun. However, it's frequency sensitive unless you use coax that matches the system impedance. For example, RG/58/U is 50 ohm coax and so is the antenna in the article. As the XYL would say, "Voilà." Now the length isn't even important but I'd stay with at least 1/4 wavelength as a minimum. Hollow ferrite cores made for coax also work well if you use enough of them, but I really like the little snap-apart ferrite core that Radio Shack sells. You can wind quite a bit of RG/171/U coax (that's the little-bitty 50 ohm stuff) on it and it makes a real small balun that you can put at the antenna or anywhere else. I wind as much as I can inside, and some more around the outside, and then tape the whole mess together. I suppose you could use a big piece of shrink tubing or put it inside some PVC pipe but I just use electrical tape and it works fine.

Video-Charge Your HT!

An easy way to quick-charge your handie-talkie with your video charger.

by Michael Jay Geier KB1UM

Having recently purchased a new HT, I found myself frustrated with the tiny wall-cube charger with which it came. It worked fine, but it took 15 hours to charge that little 600 mAh pack. I contemplated buying the quick charger, but the high cost put me off. I was ruminating on the fact that my camcorder came with a quick charger and how indispensable it was, when it suddenly hit me: Could I adapt my camcorder's charger for use with my HT? It seemed like a reasonable idea. After all, the batteries used with most camcorders are normal, quick-charge nickel-cadmium types, just like the ones in our walkies. So, it appeared to be a simple job of connecting the HT pack to the charger. As it turned out, it wasn't quite that easy, but it wasn't all that hard, either.

Apples and Oranges

To get this project working, several differences between camcorder and HT packs had to be considered. First of all, there's the matter of voltage. The Sony-type camcorder I have uses a 6-volt battery, while my walkie, like most, uses a 7.2-volt battery. I decided right from the start that any modification to the camcorder's charger was unacceptable because I still needed to use it to charge the camera battery. So, I sure wasn't going in there and adjusting the charging voltage! As it turned out, it wasn't necessary, because of the charging method these quick chargers use.

Quick chargers don't simply pump continuous high current into the battery; that would overheat the cells and ruin them. Instead, the chargers use fast, short, high-current pulses which force the cells to take lots of current without heating up. Of course, there's some heat, but it's a fraction of what you'd get with an equivalent steady current. The pulses are delivered at up to several amps, and the voltage is high enough to ensure that the cells will take that much current. On my Sony-made, Ricoh charger, the charge output is specified at 10V, 1.3 amps. So, I deduced that the voltage of the battery was irrelevant, as long as it was lower than 10 volts. That turned out to be true.

But, there's another important difference. Camcorder packs are charged through direct connection to the battery terminals. Most HT packs, though, have protection diodes between the cells and both the quick-charge terminals and the slow-charger input jack. (The idea is to prevent a disaster at either of these entry points because NiCd batteries can deliver an *enormous* amount of current into a short.) It certainly would be possible to make a connection plate of some sort that would slide on top of the battery and make contact with the directly-connected output terminals, but that seemed like a mechanical headache; I preferred to go in through the slow-charge jack. Could the camcorder charger work through the diode?

Sort Of

As it turns out, it does work, but with one hitch. There's a circuit in the charger which senses when the battery has finished charging by detecting the slight voltage drop NiCds exhibit at the end of their charge cycle. The diode prevents the detection of the drop. But, the charger doesn't simply charge the batteries into oblivion, as you might expect. Luckily, there's also an error-detecting circuit which notices that the batteries aren't responding properly. This circuit turns the charger off and blinks the charge light to inform you that a problem has occurred. The result is that the charge still proceeds properly, and the charger turns off, but the light blinks instead of simply going out! Ultimately, it is, as Mr. Spock so eloquently put it, a "difference which makes no difference at all." Of course, you can avoid this issue by making a jig which bypasses the diode by connecting to the direct terminals, but I haven't found it to be necessary; everything works fine as it is.

Don't Overdo It

There's one last difference between camcorder and HT packs which needs to be addressed. Camcorder packs usually have at least one amp-hour (1,000 mAh) of capacity, while most standard-issue HT packs are rated at 600 mAh. Even with the diode in series with them, the HT packs will be charged too fast with a camcorder charger. The result will be overheated cells and possible damage ranging from a blown thermal fuse to ruined cells. So, I included a 1 ohm resistor in series with the pack to limit the charging current and slow the whole process down a bit. This arrangement works well with my 600 mAh pack, allowing it to charge, with only moderate warmth, in about 90 minutes. If you bypass the protection diode, you may want to increase the resistor to, perhaps, 2 ohms or even more. But, if you are charging a high-capacity pack with a rating of more than 1,000 mAh, you may not need it at all. Just don't try charging a smaller pack without the resistor, or you'll probably fry the battery.

Building It

The hardest part of this project is mechanical: How do you hook up to the charger? Most of these chargers use a switch which starts the charge cycle when the battery is

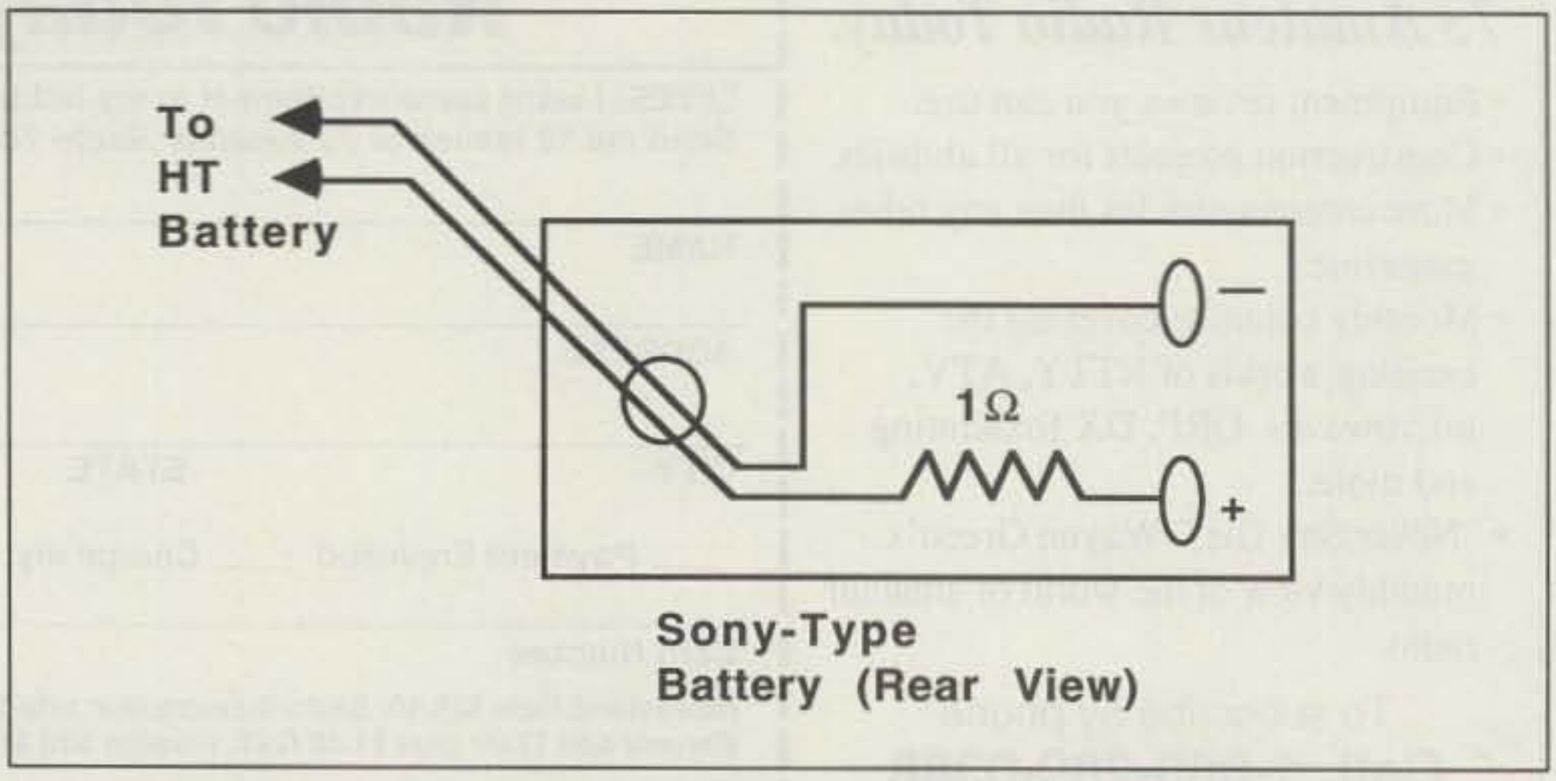

Figure 1. You'll need to get a dead battery pack for this charger conversion.

snapped on the top. Consequently, it can be hard to get them to turn on with anything other than a real battery. The solution is to get an old, dead pack and remove the cells. If you've had your camcorder more than a year or so, you may already have an ailing pack you can gut. If not, ask around. Perhaps a friend has one. If all else fails, go to any shop that services camcorders and, chances are, they'll give you one for nothing. I've obtained a couple of them that way, the hardest part being the explanation as to why I could possibly want a dead battery pack!

Once you have the pack, use an X-acto knife to carefully cut it open along the seam which runs around the sides. Make note of which terminal is positive and which is negative, either from markings on the outside of the case or from the cell connections. Pull the cells out and cut them away from the connector terminals. Now, hot-melt glue the terminal assembly back into the shell so that the terminals line up where they originally were. Take the 1 ohm, 2 watt resistor and connect it to the positive terminal. Bend the lead so that the body of the resistor hangs in the air and doesn't come in contact with the plastic case. Connect about 6 to 8 inches of wire to the negative terminal, and the same length from the other end of the resistor. Put a hole in the top half of the battery case and run the wires out through it. Finally, connect them to the jack or jig you're using to mate with the HT pack. Be absolutely *certain* to get the polarity right; reversing it will ruin your battery and might even destroy the charger. Just connect + to +, and - to -. Now, close the empty camcorder pack up with a thin film of hot-melt glue around the seam. Be sure to keep the glue thin so the pack will slide onto the charger without impediment. That's it—you've just created your own quick and easy video HT charger!

Using It

To quick-charge your HT battery, first connect it to the jack or jig. Be sure to do this before you snap the other end onto the camcorder charger, in order to avoid causing even a momentary short which the charger may not appreciate. Now, snap the dummy camcorder battery onto the charger. The charge light should come on. If you're charging a standard 600 mAh battery, the charge light should begin to blink (or shut off if you've bypassed the diode) in about 90 minutes, indicating that the battery is fully charged. The battery will be a little warm, just as it would be with the factory quick charger, but it should not be hot.

Some Thoughts

I designed this project around my Sony-type charger. It should work with most charger brands but, if it won't work with yours, the likely cause is the HT pack's protection diode. I tried it with one of those "universal" aftermarket chargers, and the diode prevented it from working, because that unit avoids the use of a starting switch by sensing the presence of battery voltage, which the diode blocks. Also, if you want to use a unit with a "discharge" function, you must bypass the diode for the discharge cycle to work.

The 1 ohm resistor gets fairly hot during the first part of the charge cycle, and that's normal. I used a 2 watt resistor, but you can use a bigger one if you are worried about it. But, be certain *not* to use a wirewound resistor, because its inductance might interfere with the pulse action of the charger. Be sure to use a non-inductive resistor.

Finally, don't try to charge a battery with a rating at or near your charger's output voltage. You can't charge a 12-volt battery on a 10-volt charger!

I hope you find this project useful. I still have my old wall-cube charger, but don't ask me where it is—I think I threw it in a drawer somewhere. Once you start quick-charging, you'll never go back to the old overnight routine again. There's nothing like having your HT back on line only 90 minutes after the battery dies. And the best part is, you didn't have to spend big bucks to do it! 73

RTTY LOOP

Number 13 on your Feedback card

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

All in all, one of the most popular features of "RTTY Loop" in the past few years has been the accumulated programs for RTTY, packet, and the like represented by the "RTTY Loop" disk collection. This month, I humbly present to you, my faithful readership, the sixth disk in the collection.

This disk contains six programs which add a wide variety of features and functions.

GRAPHIC PACKET Version 1.61—GP161.ZIP

Graphic Packet is an icon-oriented, mouse-driven terminal program that runs with TNC software such as the WA8DED package, or similar. Mouseless users can access functions through hot keys. Up to 10 channels of communication are available, with mailbox operation as well. Even a small text editor is built into the system.

GP requires an IBM compatible computer with a minimum of 512K RAM, DOS 2.0 or higher, and an EGA or VGA graphics card. A basic version is included for 8088 and higher computers, with a special version optimized for 80286 and above included as well.

LAN-LINK Version 2.20—LL220EXE.ZIP

In the words of the author, LAN-LINK is a Personal Packet Terminal Program for the TNC1, TNC2, KPC-2, and, most of all, a smart multimode digital communications controller for the KAM, MFJ-1278, and the PK-232. LAN-LINK is designed to optimize the configuration of the TNC in each communications mode and to provide some smart terminal features. It takes advantage of the extra features of the PK-232, made by Advanced Electronics Applications Inc. It is designed to allow anyone to use and get the most out of their packet TNC as well as from the PK-232, the MFJ-1278, and the KAM for Morse, ASCII, BAUDOT, AMTOR and packet radio communications without having to keep the manual handy.

LAN-LINK is a sophisticated program. In its basic state it allows you to use the TNC in an optimal manner. It configures the TNC (it types the commands) for you to maximize the communications efficiency in the communications mode of your choice. That means, for example, that when working packet on HF you need to program the TNC parameters to different values than you would use on VHF to make maximum use of the mode. One significant difference is the length of the packet itself: the longer it is, the greater the probability of QRM destroying it. This program will adjust the packet parameters for you.

Since the computer is now involved, other features have been added to simplify operation, and several features have been automated. All these operations are performed using menus and function keys, as documented below. It will take a while to learn how to use this program in a manner which suits you. Read this document and have fun. After all, isn't that one of the purposes of amateur radio?

PACKHACK—PACKHACK.ZIP

Again, I think the author has said it best. PACKHACK is a program used to analyze packet radio activity taking place on a specific radio channel. It identifies and counts packets from each station, and categorizes the packets into frame types. Generally, only "I" frames contain user information. The "RR" frames are Acks, the "UA" frames are Acks for disconnect requests, the "D" frames are disconnect requests, and the REJ frames are Reject, send again requests. See a TNC-II manual for a complete discussion on frame types. With PACKHACK you can see a list of stations on the air, and the number and type of each packet sent by each station. You can see which node is most active and if most of its activity is retries or real information. It is interesting to compare the ratio of I to RR frames for different stations, and hopefully it will be useful, too.

PktWin Version 2.1—PKTWIN21.ZIP

This program is a shareware packet TNC controller program for amateur radio. As such, it requires connection to a TNC or similar via a serial port. It is designed to run under Windows 3.1.

The program has two main windows, a large receive window, and a smaller transmit one. Both are fully scrolling, with buffer sizes from 1K to several hundred kilobytes. It has the facility to both receive and transmit text files, with YAPP transfer for binary files.

RTTY Frequency List—RTTYFREQ.LST

This is a little file I picked up some time ago, which lists various RTTY signals heard on the HF bands. It is a bit dated, and many of the stations may have moved on, but it at least gives some potential hot spots to listen for, which many of you have asked for. As an aside, I am more than willing to update this list with recent findings, as information arrives at this QTH.

TERM Version 2.0—TERM2.ZIP

TERM is a simple interrupt-driven communications program written in assembly language. It supports up to 115.2 Kbps. It will detect a 16550A UART chip and will use the FIFO buffers if one is found. It does not offer any binary file transfer protocols. It will capture ASCII to a disk file or to a printer. Version 2.0 will now upload ASCII files. It also will support any number of rows on the screen, but the screen mode must be set prior to executing TERM. The commands are patterned after those of Procomm Plus. Version 2.0 also accepts a command line option (/M) that forces monochrome display colors. The author uses TERM for packet radio and for accessing host computers at work. It is great for any communications that do not require binary file transfers. It is small, fast and easy to use.

Well, there you have it. Six programs that run from simple information, to a simple terminal, to a complete graphics packet package. And all this can be yours by sending me a 3.5" disk, a self-addressed, stamped disk mailer to return the disk to you, and $2 in US funds, to the address at the top of this column. The other five disks remain available as well, and a listing of all programs available is on the disk. Alternatively, just a printed listing can be yours by sending me a self-addressed, stamped envelope, requesting the latest "RTTY Loop" disk collection list.

I look forward to your comments and questions, and am busily looking into some of your recent questions for future "RTTY Loop" columns. Keep them coming to me by SnailMail at the above address, or Email on CompuServe (ppn 75036,2501), Delphi (MarcWA3AJR), America Online (MarcWA3AJR), or Internet (MarcWA3AJR@aol.com). 73

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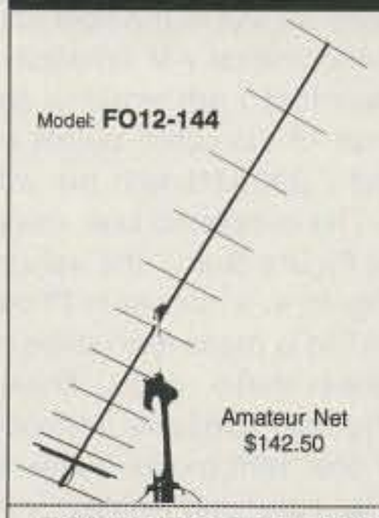

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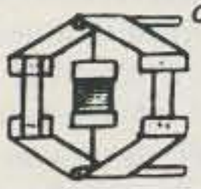

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Simple Band-Pass Filters for Receiver Projects

One approach to designing simple radio receivers is to use a broadband front end. Although at one time the front ends of radio receivers were tuned to a specific frequency, for the past two decades or so a broadband approach has been popular. The need for broadband tuning became apparent to me when I was working on some direct conversion receiver (DCR) designs. The DCR is similar to the superheterodyne (Figure 1), except that the local oscillator (LO) operates on or quite near the desired RF frequency.

For example, if you wanted to tune a DCR to receive a 7050 kHz CW signal, and wanted about a 1000 Hz beat note in your earphones, then the local oscillator would be set to either 7049 or 7051 kHz. When the local oscillator signal and the 7050 kHz RF signal is heterodyned together, the result is the 1000 Hz difference signal. An audio low-pass filter, or a transformer that acts inherently as a "low-pass filter" when the other signals in the passband are RF, at the output will select the difference signal over the LO and RF components that survive the heterodyning process.

Most DCRs use simple double-balanced mixers (DBM) of the diode variety, or Wilson Transconductance Cells (of the NE-602 IC variety) as the frequency converter. In both cases, strong signals appearing at the input can wipe out the effectiveness of the mixer. In addition, there are a number of other ways that even relatively weak out-of-band signals can appear in the output of the DCR. Although specific frequency tuning is used, it adds one tuning control. The minimalist design approach requires a bandpass filter at the front end that admits only those signals that are desired.

Figure 2 shows the circuit to a bandpass filter made by cascading low-pass and high-pass filter sections. In practice, some isolation may be required between the LPF and HPF sections, unless there is a relatively wide separation between the cut-off frequencies. Each section is a five-element design with 0.1 dB ripple (more or less), as defined in recent editions of *The ARRL Radio Amateur's Handbook*. The values for the components are found as follows:

L1 = 9.126/F
L2 = 15.72/F
L3 = 9.126/F
L4 = 5.803/F
L5 = 5.803/F
C1 = 4365/F
C2 = 4365/F
C3 = 2776/F
C4 = 1662/F
C5 = 2776/F

where F is the frequency in megahertz (MHz), the inductances are in microhenrys (μH) and the capacitances are in picofarads (pF).

The printed circuit board (PCB) pattern in Figure 3 is designed for miniature 7mm and 10mm coils of the sort made by Toko, and sold through Digi-Key (P.O. Box 677, Thief River Falls MN 56701-0677; 1-800-344-4539). However, if a toroidal core coil is used, which you can home-brew, then use the two outer pins on the three-pin side of the coils' foil pattern to make the connection (that corresponds to the internal wiring of the Toko coils). If you want a copy of the PCB, they are available for $4.25 plus $1.50 S & H per order from FAR Circuits (18N640 Field Court Dundee IL 60118).

Figure 4 shows one version of the circuit intended for use at the front end of a high performance AM broadcast band receiver that I am working on. The filter has -3 dB cutoff points of 500 kHz and 2,000 kHz with the values shown. The completed filter, using the PCB of Figure 3 and the values shown in Figure 4, is shown in Photo A. The shielding is made from strips of 1" brass sheet metal strips. These strips are typically available in hobby shops that deal with model builders, as well as "lapidary" and amateur jewelry makers' shops. The sides of the box were bent square, then soldered. The corners were joined with soldered bits of brass right angle stock (available from the same sources).

By the way, if you wish to experiment with direct conversion receivers, you might want to look into the NE-602 IC and the Mini-Circuits passive double balanced mixers. Ocean State Electronics (P.O. Box 1458, Westerly RI 02891; 401-596-3080) lists one of the Mini-Circuits DBMs in their catalog. They also sell the MAR-x series of Mini-Circuits monolithic microwave integrated circuits (MMICs). Write for their 1994-95 catalog—it's interesting for the ham builder.

If there is enough interest, then I'll cover the basic direct conversion receiver designs in this column in the near future.

Book Note

Recently one of my publishers, Hightext Publications (P.O. Box 1489, Solana Beach CA 92075; 1-800-247-6553) sent me a newly-released book that I found thrilling. *Modeling Engineering Systems* by Jack W. Lewis is a real must for anyone interested in writing PC-based software models of electrical circuits and mechanical devices. This text grew out of a course the author took at MIT, as well as his own professional experience. Expecting to find this topic a real snooze, I was pleasantly surprised for Lewis' book makes the once-arcane art of modeling accessible to anyone with a basic math background.

Although at least introductory calculus is needed to get the most out of this book, calculus is not strictly necessary, as the clear, well-thought-out writing style makes complex concepts easily understood.

Lewis starts off by teaching us something about the engineering design process " . . . in a nutshell," as he puts it. Although the book is on the subject of creating PC-based models, Lewis cleverly uses electrical circuits and mechanical thingees to illustrate the different approaches . . . a fact that is immensely important to those of us who have some knowledge of technology but are not yet well-versed in the mysteries of writing models.

I tried very hard to find something negative to say about *Modeling Engineering Systems* because, as my own experience for the past 25 years indi-

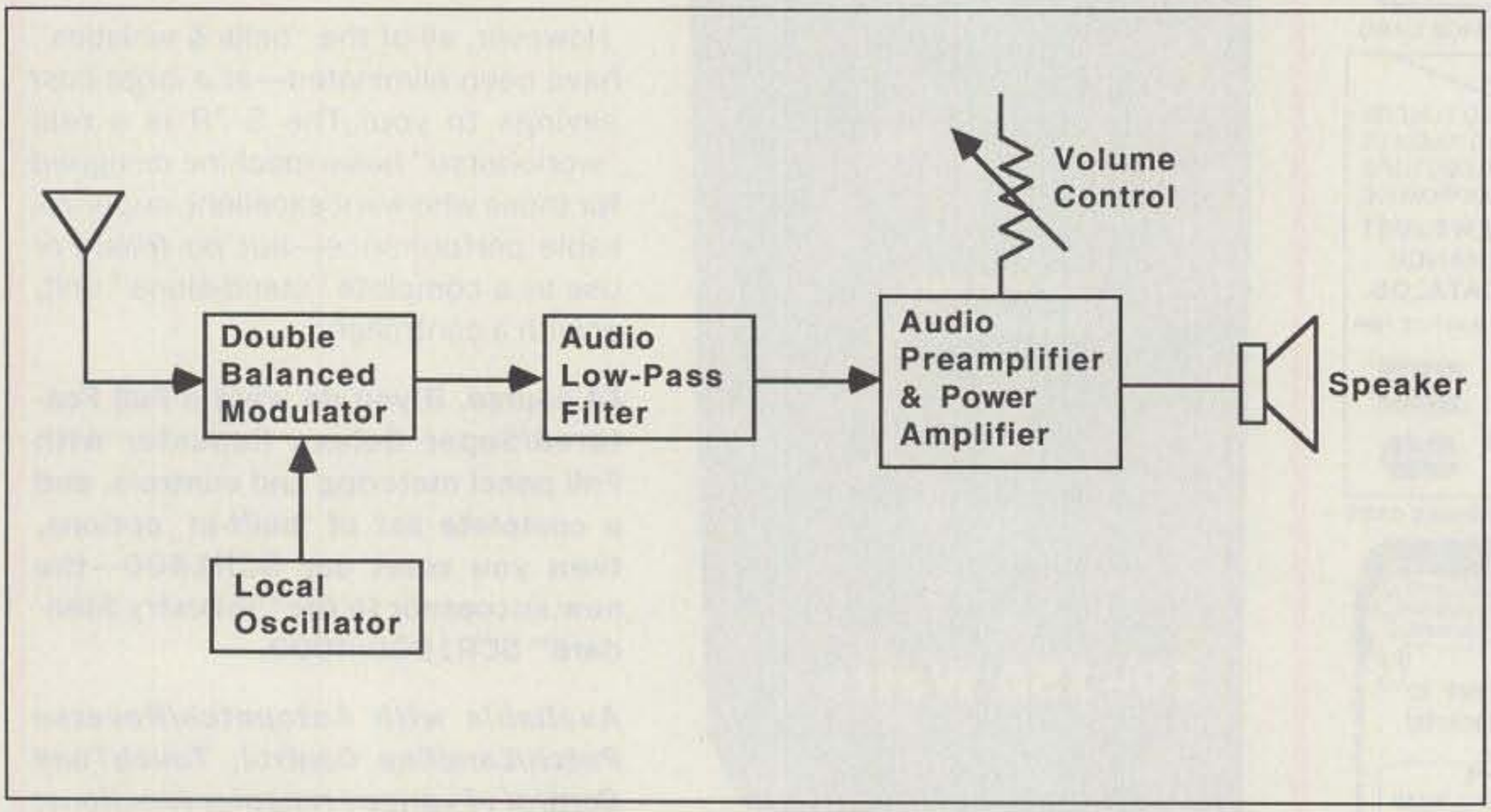

Figure 1. Block diagram of a direct conversion receiver.

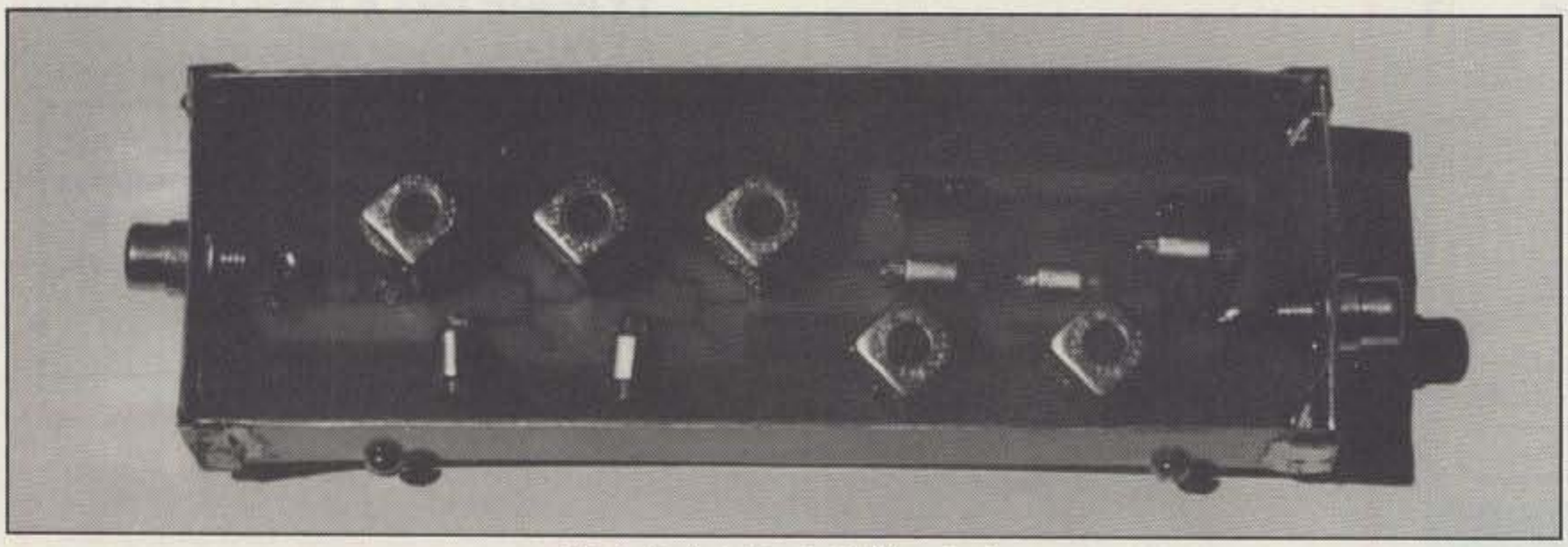

Photo A. Actual as-built filter circuit.

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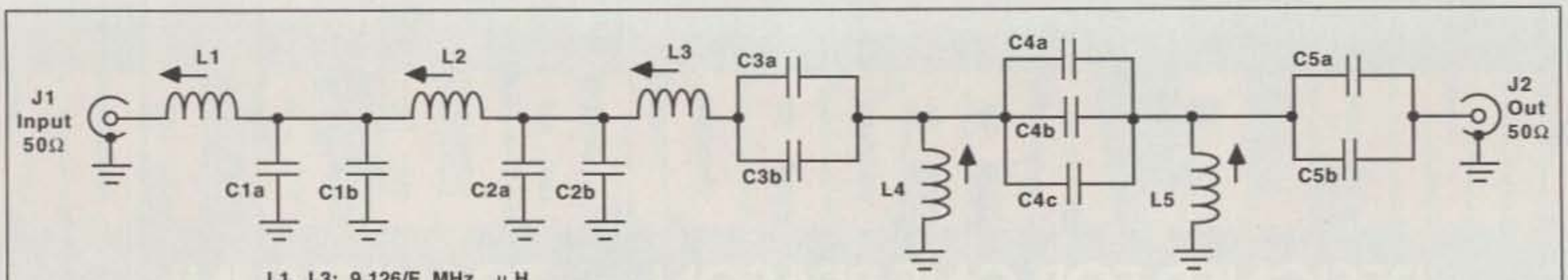

Figure 2. Bandpass filter circuit.

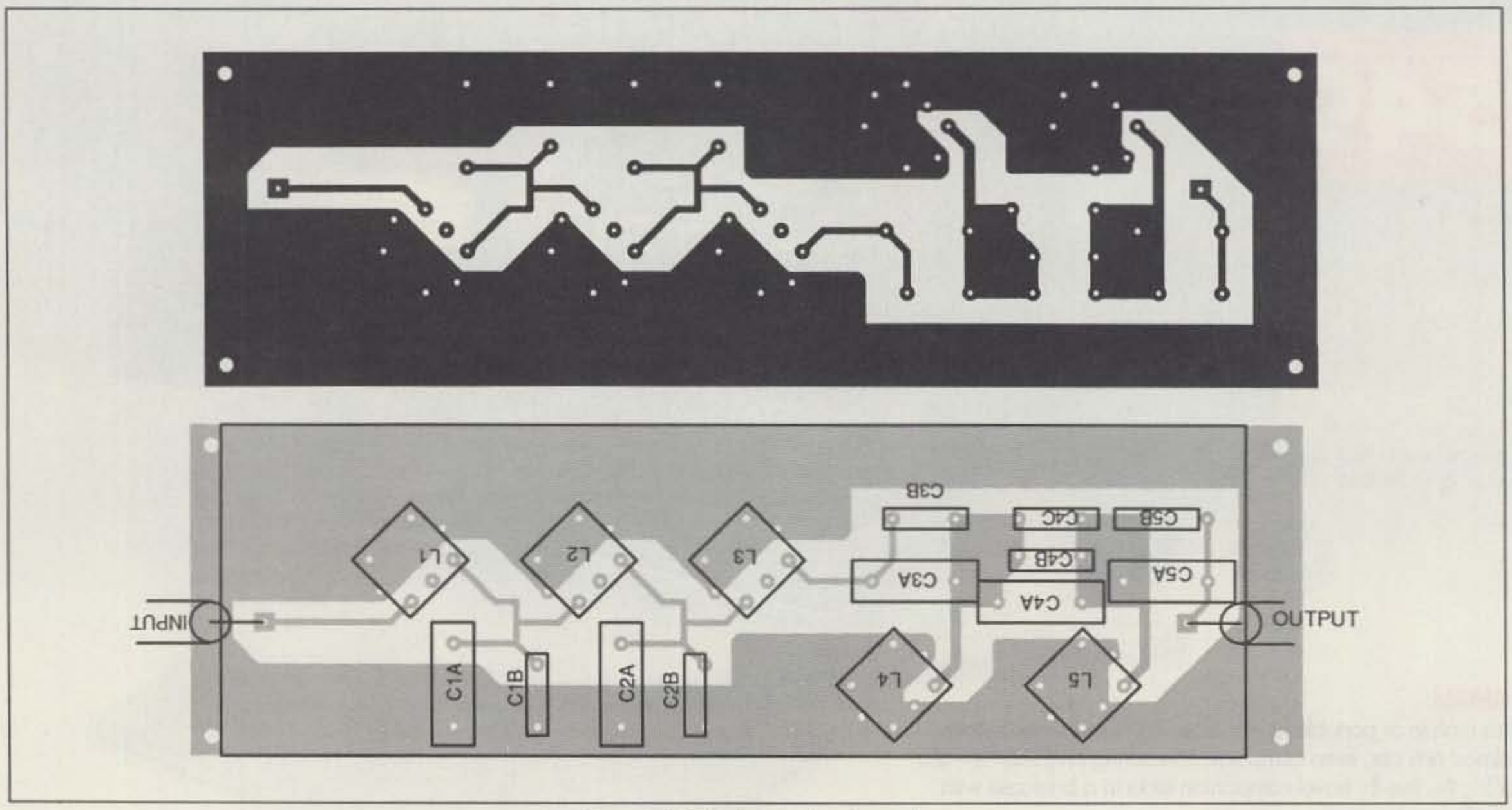

Figure 3. PCB pattern and parts overlay.

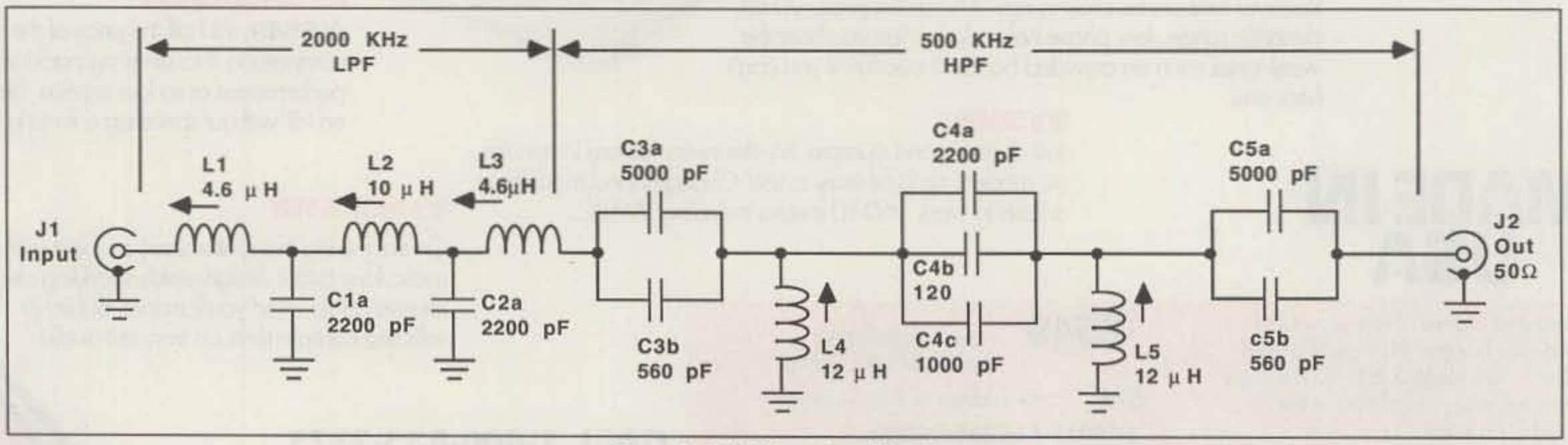

Figure 4. AM BCB version of the filter.

cates, reviewers are supposed to maintain their "tough image" by castigating the ancestry of authors, or tearing down their ego or somehow vilifying their work. But that would be the jealousy of a fellow author speaking, not my actual judgement. I really couldn't find anything missing or wrong in Lewis' book, try as I might.

I can predict one thing about Modeling Engineering Systems, however: Forward-looking engineering and electronic technology schools will adopt Lewis' book and recommend it to their students. Backward schools, where the professors are less like practicing engineers and more like sedentary slugs teaching running, will take note of three facts: 1) it is low-priced ($19.95 not $99.95); 2) it is an easy read; and 3) it is a large paperback rather than clothbound . . . and thereby reject it. After all, they will unreason, why give students an easy-to-read book, that makes a difficult subject damn near easy, and that costs less than dinner out?

Seriously, though, if you have any interest in computer modeling of circuits (or any engineering system), then give Jack Lewis' book, *Modeling Engineering Systems*, a close read. 73

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WANTED: Manual for LAFAYETTE Six-band Communications Receiver BCR-101. I will pay for copy and postage costs. Thanks. *Eugene Taylor KB6KRI, 12016 Willard St., North Hollywood CA 91605. Tel. (818) 767-2972.*

I am in need of any schematic, manual or specifications on a 1986 microwave downconverter manufactured by Microelectronics Technology Inc., Model CL-2011. It was used for INMARSAT (approx. 1600 MHz). I want to use it for GOES reception (1691 MHz). I will pay any costs. *Jim Kocsis WA9PYH, 2217 Hidden Oaks Ct., South Bend IN 46628.*

I am trying to locate Earl L. Eggers HR1EZ, or anyone that may be able to help me learn about the time he spent in Honduras. Earl was active in Honduras in the late 50's. *Dr. Michael K. Gauthier K6ICS, 9550 Gallatin Rd., Downey CA 90240-2538.*

I would like to correspond with Amateur Radio and CB Radio operators. Please write to *Estelle Casaldi, AAAA, 3343 Webster Ave., Pittsburgh PA 15219.*

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QRP

Low Power Operation

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Several months ago, I described a small QSK module for the Howes transceiver. This circuit worked so well that I decided to use it in another rig. However, I did not want to build another one on perfboard. That method is fine if you only need one or two copies. So, this month, here is the PC board and overlay for the QSK module.

Several items have been changed since the circuit came out. First, the switching relay is now a sealed multipole jobbie that switches very fast. It's available from Digi-Key electronics at a reasonable price. Also, there are several holes in the PC board for extra connections to the +12 volts and ground returns. No more running wires back to an undersized terminal strip. A reverse polarity protection diode and fuse has been added as well. Everything mounts on one PC board, with plenty of room for new builders to move around with. The PC board is available from FAR Circuits (see the Parts List).

Aside from the relay and the two trimmer pots, nothing is especially critical. You should use your junk box for this project. You can assemble only the sections you need, without worrying about screwing something up. If you don't need the sidetone, then don't install those parts. Likewise, if you don't need the keying relay. The reed relay for the transmitter is an off-the-shelf part from your local Radio Shack store. Any suitable reed relay will work, provided you can get it to fit on the PC board.

I'll refer you to the original article for the ins and outs of the circuit. Most of the circuit is very simple stuff to figure out. Troubleshooting should be limited to taking voltage reading at the pins of the LM324.

Now, the next time you need a QSK board, you have a cheap, easy and quick option.

Junk-Box Fillers

In the older days of ham radio, you could set up a complete station with a couple of burned-out TVs. Since things have gone totally solid-state, I've found used TVs to be a rather limited source of building material. However, I received this letter from Neil Iverson N7NI. The following is how Neil gets most of his parts for his QRP projects.

"A local TV repair shop sets their unrepairable TVs outside by the side of the shop, and they welcome me to pick parts out of them. Note that many of the tuners now being tossed out have absolutely superb dual-gate MOSFETS in both the VHF and UHF sections, along with some switching diodes and varicaps, too. I bring home the whole tuner assembly and carefully lift out the parts. These tuners are varactor-tuned and so there is no shaft or knob sticking out from them.

"Some of the IF strips also use dual-gate MOSFETS at 41 MHz. They will work great in our QRP projects.

"Another place to look is at the CRT connector. There is usually a small circuit board there with three video output transistors on it. Sometimes those three transistors are suitable for power output RF finals in a QRP transmitter. You can check their specifications in the NTE or SK replacement guides by seeing what their replacements will do. Here are some common types I've found in junk box TVs:

Type	Watts	Ic	VcBo	Hfe	FT (MHz)
2SC1124	10	1A	140	160	120
2SC1226	10	3A	50	120	150
2SC1678	10	3A	65	40	150
2SC1957	0.75	1A	75	90	250
2SC1959	0.6	4A	70	120	200
2SC1973	12	3A	65	80	300
NSD U01	6.25	1A	90	120	200
039-I	—	1A	90	90	150

"Some of these video transistors have breakdown ratings of 300 volts, and pretty good high frequency response. They're well worth saving out and keeping for future projects.

"Another part I watch for are the damper diodes. Those have ratings of 600 volts and higher, usually 1 amp of current, and they switch within 200 nanoseconds. There are also lots of small inductors and beads that are always useful."

An HW-8 Modification

Here's a new modification for the HW-8 rig. It's by Robert Walter N1EBA, and came to me via CompuServe. I hope you enjoy this modification. Robert writes the following:

"Last year I bought a used HW-8 and after using it for some time, particularly on the 80 meter band, I became annoyed at the constant adjusting of the RF gain control, due to strong signals. If the signal was too strong one would have to turn the RF gain control down. If the signal was too weak, the RF gain control had to be turned up. This was annoying because in the real world radio signal strengths do not remain constant. There was never an ideal position for this control. With the RF gain control in its most clockwise position on the HW-8 there is a tendency for the RF amp to overload itself or the product detector and audio circuits. As a result, distortion is heard. I decided to investigate why this was happening.

"After looking at the schematic of the HW-8, I discovered that the HW-8 does not have an automatic gain control (AGC) circuit. I decided to look into the possibilities of installing my own AGC circuit into my HW-8 and came up with the circuit shown.

"The circuit applies a negative voltage derived from the audio output to the gate of Q1 of the HW-8. The half-wave rectifier D1 rectifies the audio to produce unfiltered DC taken from pin 6 of the audio gain control. This voltage is then filtered by C1 to produce a negative DC voltage. Current is then passed through R2. C2 is then charged and discharged by the RC constant created by C2 and R3. This RC constant determines how fast the AGC action will be. D2 ensures that the voltage presented to the gate of Q1 never goes positive more than 0.6 volts. S1 is used to bypass the AGC circuit altogether, if you want the option of no AGC. I found that the AGC circuit may not be necessary on higher frequency bands. Most of the parts values were determined by what I had available at the time. Other values may be used to optimize the circuit for personal preferences. In addition, a variable resistance may be used at R3 to change the RC constant, thereby changing the action of the AGC (faster or slower). Other configurations are possible as well. I chose to keep my circuit as simple as possible. I also increased the receiver sensitivity slightly by replacing Q1 with a 2N4416. A 2N4416 has a higher transconductance than the MPF105. Changing Q1 is optional.

"I mounted all components on a 1 x 2 piece of perfboard and glued the board with silicone sealer to the interior of the chassis. To connect the circuit to the HW-8, disconnect the ground side of R5 in the HW-8 and connect the output of the AGC circuit to R5. Connect the input of the AGC circuit to pin 6 of the AF gain control in the HW-8. I attached S1 through the extra holes of the connector on the rear of the HW-8 since I didn't want to alter the cabinet. Connect the ground of the AGC circuit to the chassis of the HW-8.

"I found having an AGC circuit on my HW-8 handy when working signals on the 80 meter band. It can be tricky at times to copy code with signals varying all over the place, especially if one cannot concentrate, like myself, because of other distractions. This circuit will be beneficial where an extra hand may not be available." From Robert Walter N1EBA, Waterford, Connecticut, Prodigy SDMT67A, CompuServe 72614,3270.

HW-9 Modification

Have you picked up an HW-9 lately? Can't seem to figure out why it seems to work great on some bands, but plays dead on another? Well, the trick may be as simple as a mistuned stage. After checking out the switching diodes for each bank oscillator, be sure you have the slugs in the proper

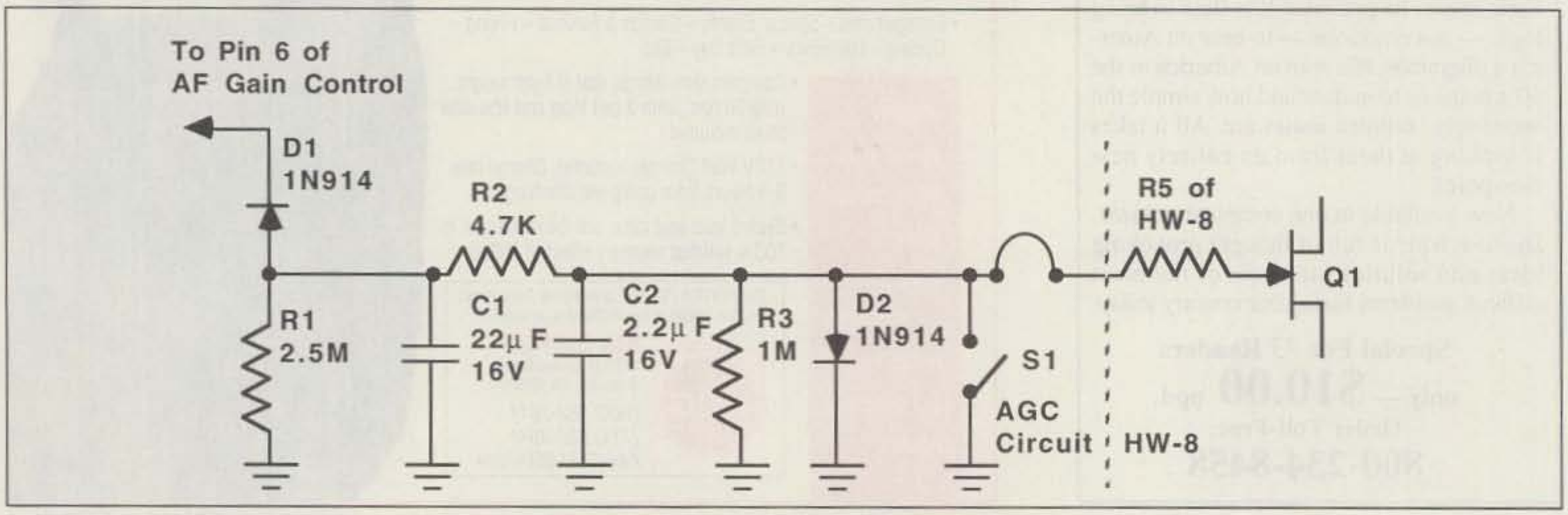

Figure 1. Schematic diagram for the QSK Module.

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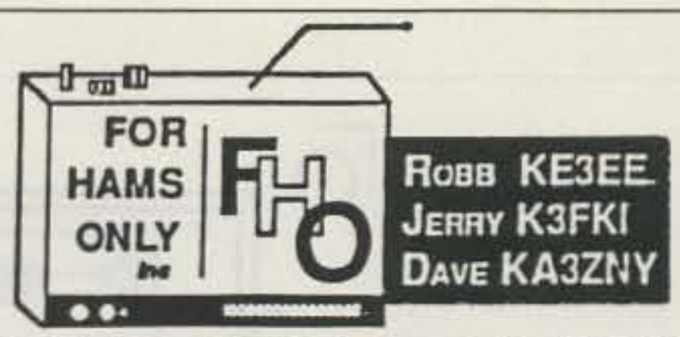

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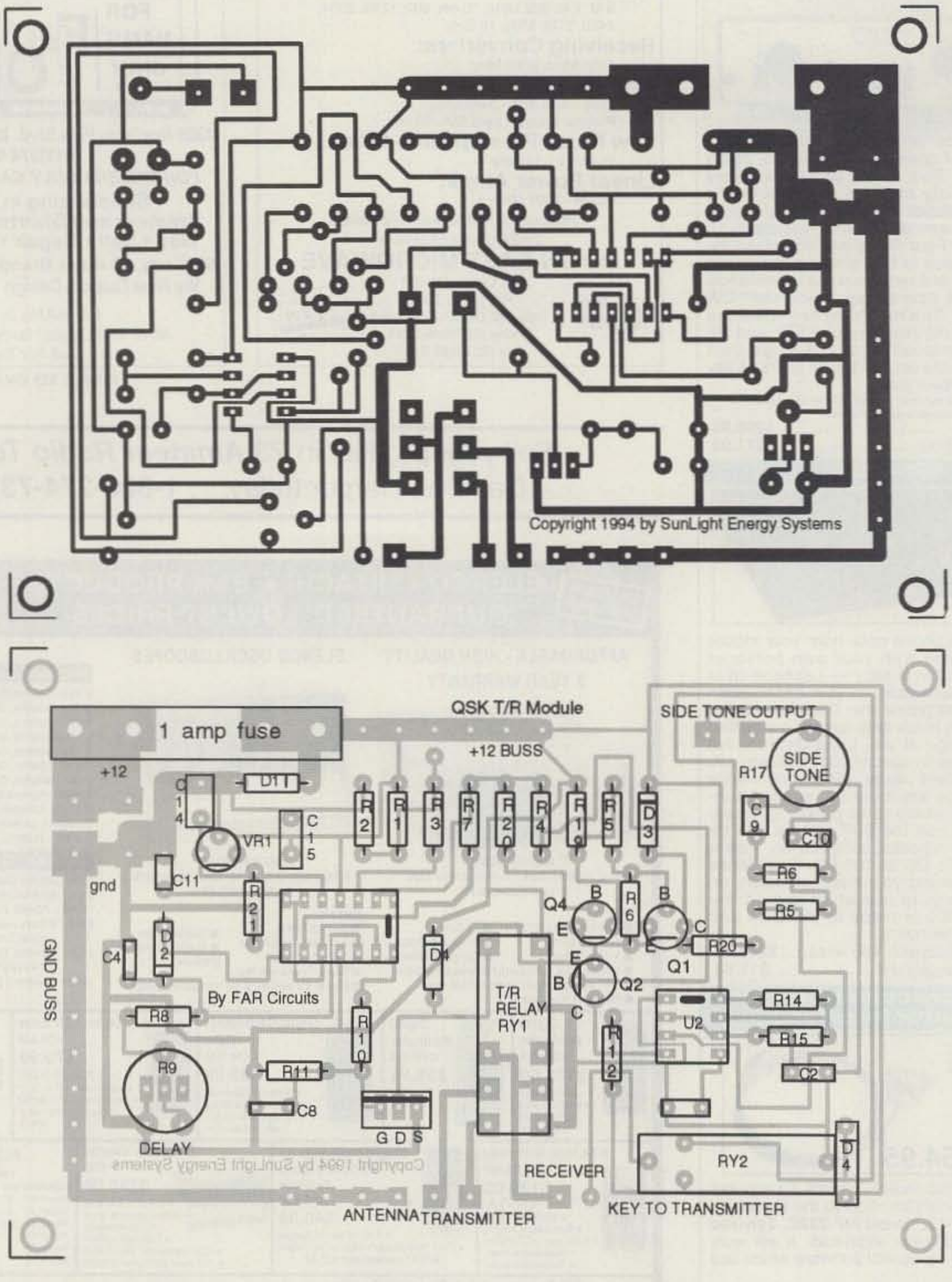

Figure 2. PC board pattern and parts placement overlay.

place as per the manual. You can have more than one peak in some of the coils. This false peak will prevent the rig from operating on one or more bands. Also, while you're checking out the cans, be sure you have the IF coils adjusted properly. The HW-9's receiver can easily go into oscillation if the IF coils are misaligned. A lot of *white* noise in the receiver is a dead giveaway that something is out of whack.

Modifications like these are available from the HW-8 *Handbook*. At $11 a copy, I'll ship you out one and even throw in the shipping cost. My address is at the beginning of this column.

The QRP ARCI

As of this April, I've taken over the job of membership person. If you would like to join the QRP ARCI, send $12 for new membership. If you would like to renew your old membership, the cost is $10. If you have not been active on the HF frequencies in the past, but were a member way back when, you still keep your old QRP number. If giant Iranian goat-eating cockroaches got the best of your membership certificate, for $2 you can get a replacement from me. If you just want some more information about QRP ARCI, I'm the guy for that, too. The PR package is $2 which includes a copy of *The Quarterly*. 73

Parts List

R17-R19	470k trimmer
VR1	78LO8 regulator
Q3	IRF511 or equal power MOSFET
Q1-Q2, Q4	2N2222 or equal NPN transistor
U1	LM324 op amplifier
U2	NE555 timer
RY1	Reed relay (Radio Shack)
RY2	Omron G2R-24 sealed relay (Digi-Key # Z747-ND)

A drilled and etched printed circuit board is available for $7.75 plus $1.50 S&H per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

Note: C3 is not on the PCB, but is part of the circuit as shown in the schematic. The rest of the parts are garden variety resistors and diodes. Feel free to play with the values.

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NASA Follow-Up Activities

At the end of every term I have the children in my sixth, seventh, and eighth-grade ham radio classes summarize the units that they enjoyed most. With very few exceptions, the children pick the unit on "Space Travel and Communications" amongst their best-loved experiences in class. Speaking with astronauts on the radio, following the SAREX (Shuttle Amateur Radio Experiment) program, having a chance to view a shuttle launch in person, and having your personal questions answered by a human being who has been in space, are obviously glamorous and exciting experiences for youngsters. Because of the motivation generated by these unique adventures, the kids are very interested in all the follow-up activities as well. Always remember that as an instructor or teacher in a classroom, the single most important thing you do is to motivate everyone so that they will be receptive to learning.

The following activities are suggested by the NASA Resource Centers for Teachers. I incorporated them into my unit on space, and the kids really loved doing them.

One of the biggest fascinations the children have is with the spacesuit. Shuttle suits are worn only when it's time to venture out of the spacecraft. At other times, the crew wears comfortable shirts and slacks, or coveralls. Fully assembled, the shuttle EMU (Extravehicular Mobility Unit) becomes a nearly complete short-term spacecraft for one person. It provides pressure, thermal and micrometeoroid protection, oxygen, cooling water, drinking water, food, waste collection (including carbon dioxide removal), electrical power, and communications.

The EMU lacks only maneuvering capability, but this can be added by fitting a gas-jet-propelled Manned Maneuvering Unit (MMU) over the EMU's primary life-support system. On earth, the suit and all its parts, fully assembled but without the MMU, weighs about 113 kilograms (about 248 pounds). Orbiting above earth, it feels as if it is weightless. It does, however, retain its mass in space, which is felt as resistance to a change in motion.

Photo A. Actual tools used by astronaut Jay Apt N5QWL on his spacewalk in April 1991.

Activity One: Spacesuit Mobility-Bending Under Pressure

Objective: To compare the ability of inflated balloons to bend in an analogy to the arm of a spacesuit.

Materials: Two long balloons, three plastic bracelets, metal craft rings or thick rubber bands.

Procedure: Step 1. Inflate one balloon fully and tie it.

Step 2. Inflate the second balloon, but while it is inflating, slide the bracelets, craft rings, or rubber bands over the balloon so that the balloon looks like sausage links.

Step 3. Ask the students to com-

pare the "bendability" of the two balloons.

Discussion: Maintaining proper pressure inside a spacesuit is essential to astronauts' survival. A lack of pressure is fatal. Pressure, however, produces its own problems. An inflated spacesuit can be very difficult to bend. In essence, a spacesuit is a balloon with the astronaut inside. The rubber of a balloon keeps in air. But as pressure inside the balloon builds up, the balloon's walls become stiff and hard to bend. It would be impossible for an astronaut to function effectively in a stiff suit.

Spacesuit designers have learned that strategically placed breaking points (the rings in this demonstration) at appropriate points outside the pressure bladder (the balloon-like layer inside a spacesuit) makes the suit become more bendable. The breaking points help form joints that bend more easily than unjointed materials. The same thing happens with the balloon and rings. Built-in joints, like ribs on vacuum cleaner hoses, also promote easier bending than unjointed material.

Activity Two: Space Tools

Objective: To experience the difficulty of using tools that astronauts encounter on spacewalks.

Materials Needed: Several sets of thick, insulated ski gloves or heavy rubber work gloves. Miscellaneous tools and items such as needle-nosed pliers, socket wrenches, small, machine screws and nuts, lamp cord and plug, Tinker Toys, or Legos, paper and pencil.

Procedure: Step 1. Instruct students to put on the gloves and begin working with the tools and other items. The gloves represent the stiff, bulky gloves astronauts wear while on spacewalks.

Step 2. Have your students compare the difficulty of doing a particular task such as wiring a lamp cord to a plug, assembling a structure out of construction toys, or writing a message, with and without gloves.

Step 3. Ask your students to try to design tools that could help them do their work in space if they were repairing a satellite.

Discussion: Spacesuit gloves can be stiff and hard to work in. The gloves worn by *Apollo* astronauts on the moon caused much finger fatigue and abrasion during long moonwalks. Designers have placed special emphasis on making pressurized gloves more flexible and easy to wear. When inflated, the gloves become stiff just like an inflated balloon. Designers have employed finger joints, metal bands, and lacings to make gloves easier to use.

Another effort is underway to create design tools for use with spacesuit gloves. This activity illustrates the problem of manipulating objects and encourages students to custom-design tools to help spacewalkers do their jobs.

Photo B. The spacesuit is a constant source of fascination to kids. On a visit to the Johnson Space Center. Carole gathers NASA Resource Center materials to use in class.

The NASA follow-up activities can be a fun, meaningful way for kids to learn scientific principles and to become interested in the space program. 73

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Radio Direction Finding

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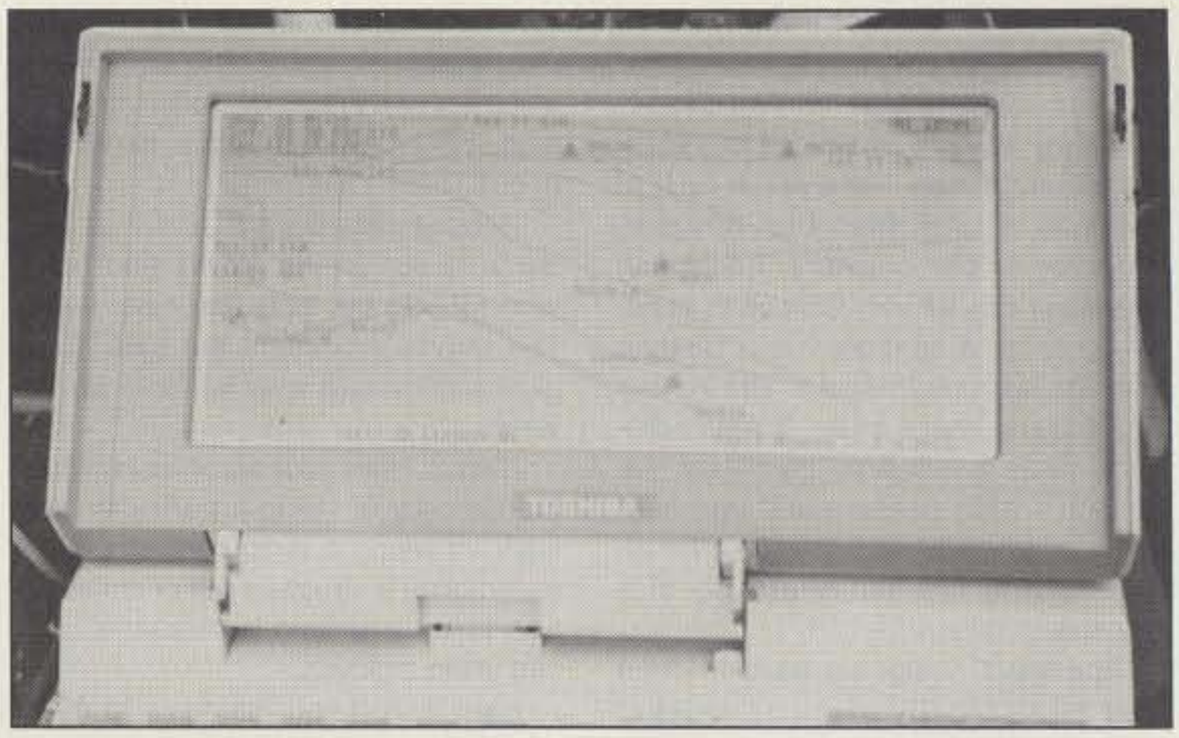

Photo A. With a packet radio terminal and a portable computer running APRS software, mobile transmitter hunters can triangulate bearings posted by other base and mobile stations. Several methods to automate the bearing transmission process are now in the works.

Navigation and Networking via Packet

There is an unusual signal on your favorite round-table frequency or the input to your local repeater. Where is it coming from? You rotate your directional antenna and the peak on your S-meter (or the null, depending on antenna type) tells you that the direction to the signal is due south (a 180-degree true bearing).

You call a ham friend a few miles to the east and ask him to listen for the signal. A few minutes later, he calls back to say that he hears it best with his antenna pointed at 300 degrees true. You draw both of the lines of bearing on a street map and discover that they intersect in an industrial area on the west side of town.

The procedure you have just performed is called triangulation. The term comes from surveying, where land is mapped by trigonometry. Terrain is divided into triangles and the angles within them are measured.

Signal triangulation with practical antennas doesn't provide pinpoint accuracy, of course. If you and your friend want to identify the exact location of the emitter, you need to take your directional antennas to locations near your bearing intersection and repeat the triangulation process as you home in.

Where Am I?

Most hams envision the above scenario when hearing the term "radio direction finding" (RDF). You know where you are, and your mission is to find the unknown location of the transmitter. But you can use the same method of direction determination and trigonometry in reverse when you know the locations of two transmitters, but you don't know where you are.

Throughout the history of RDF, which began in the first world war, its usefulness as an aid to navigation has been just as important as its ability to find hidden signals. Back then, ships steered their courses based on information from their directional antennas and shore beacon transmitters. At the same time, these stations listened for signals from enemy ships and triangulated them to determine their movements. Legend has it that the Battle of Jutland, a decisive naval conflict, was launched when British RDF stations detected movement of the German fleet.

In World War II, FCC's Radio Intelligence Division tracked enemy signals from distant continents, while our aircraft used friendly radio signals to determine their own positions. In the 1950s, our government feared that hams' signals would be both homing and navigation aids to Soviet bombers if they staged a surprise attack on the USA. So every amateur radio station was required to have a Conelrad monitor in constant operation during on-air periods. (I think mine is in the garage somewhere.)

Accuracy and user-friendliness of radionavigation systems have steadily improved over the years. Long Range Navigation (LORAN) replaced longwave direction finding on ships. VHF Directional Range (VAR), Omnidirectional Radio Range (VOR), and Distance Measuring Equipment (DME) on aircraft replaced RDFing of radio range and AM broadcast stations.

Now the NAVSTAR Global Positioning System is in full operation. It's the navigation system of the nineties, offering accuracy to within 100 meters and continuous automatic position computations. This level of location accuracy is impossible using the old reverse-triangulation method. Errors of a fraction of a degree in bearing-taking can affect triangulated positions by many miles. What's more, accurate directional antennas cannot fit into today's HT-sized navigation units.

Instead of relying on directional bearings to reference transmitters, GPS measures the difference in propagation time of the pulsed signals from them. The difference in time gives the relative difference in distance from each reference, which is enough data for computation of latitude and longitude. This technique is called multilateration. It was first used in LORAN and DME for surface-only positioning. The orbiting satellite references of the GPS system allow determination of your altitude, as well.

It takes knowledge of the relative distance to three known points, not

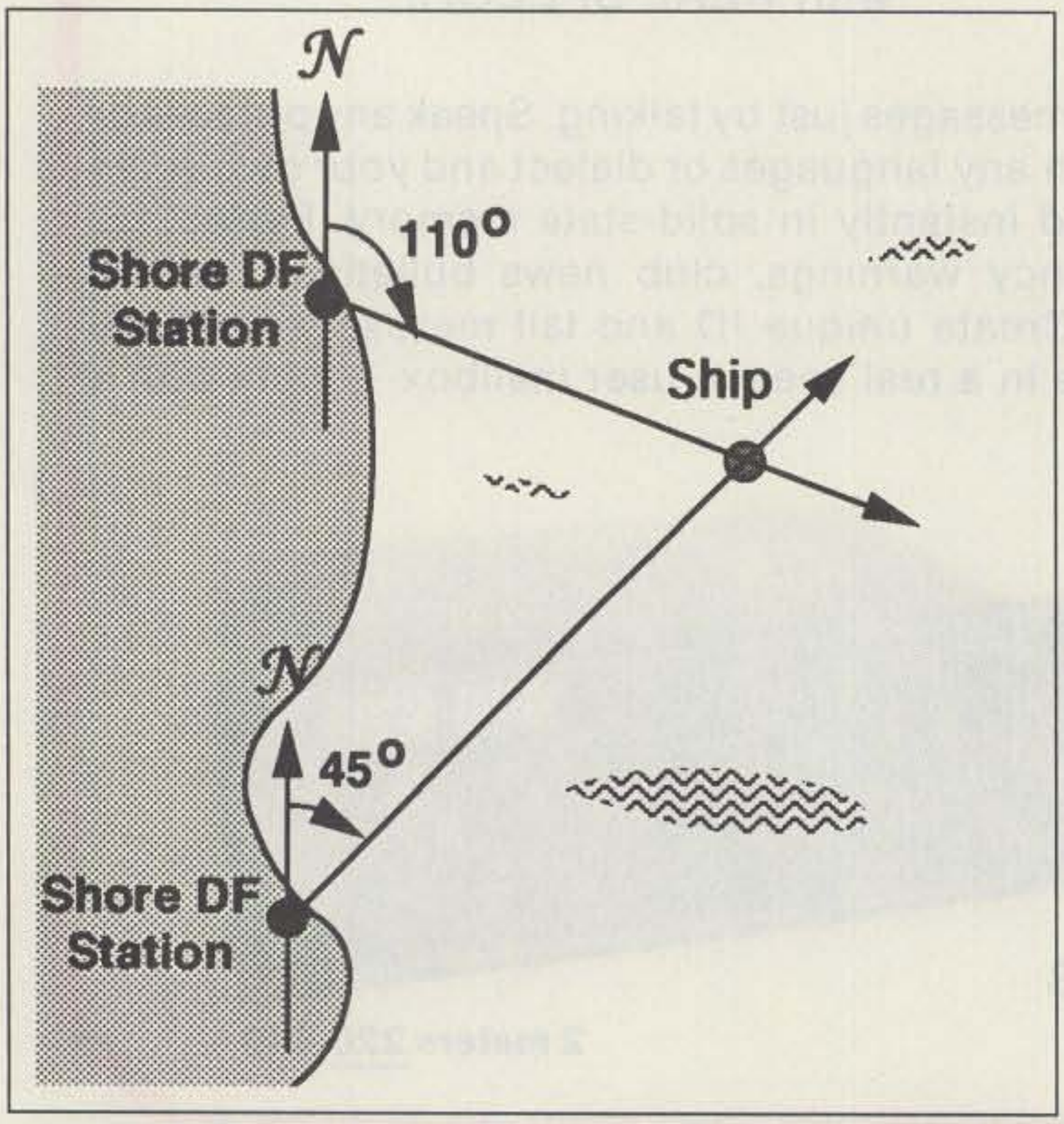

Figure 1. In the earliest days of RDF, navies plotted the location of enemy and friendly ships by triangulating the bearings of their radio signals.

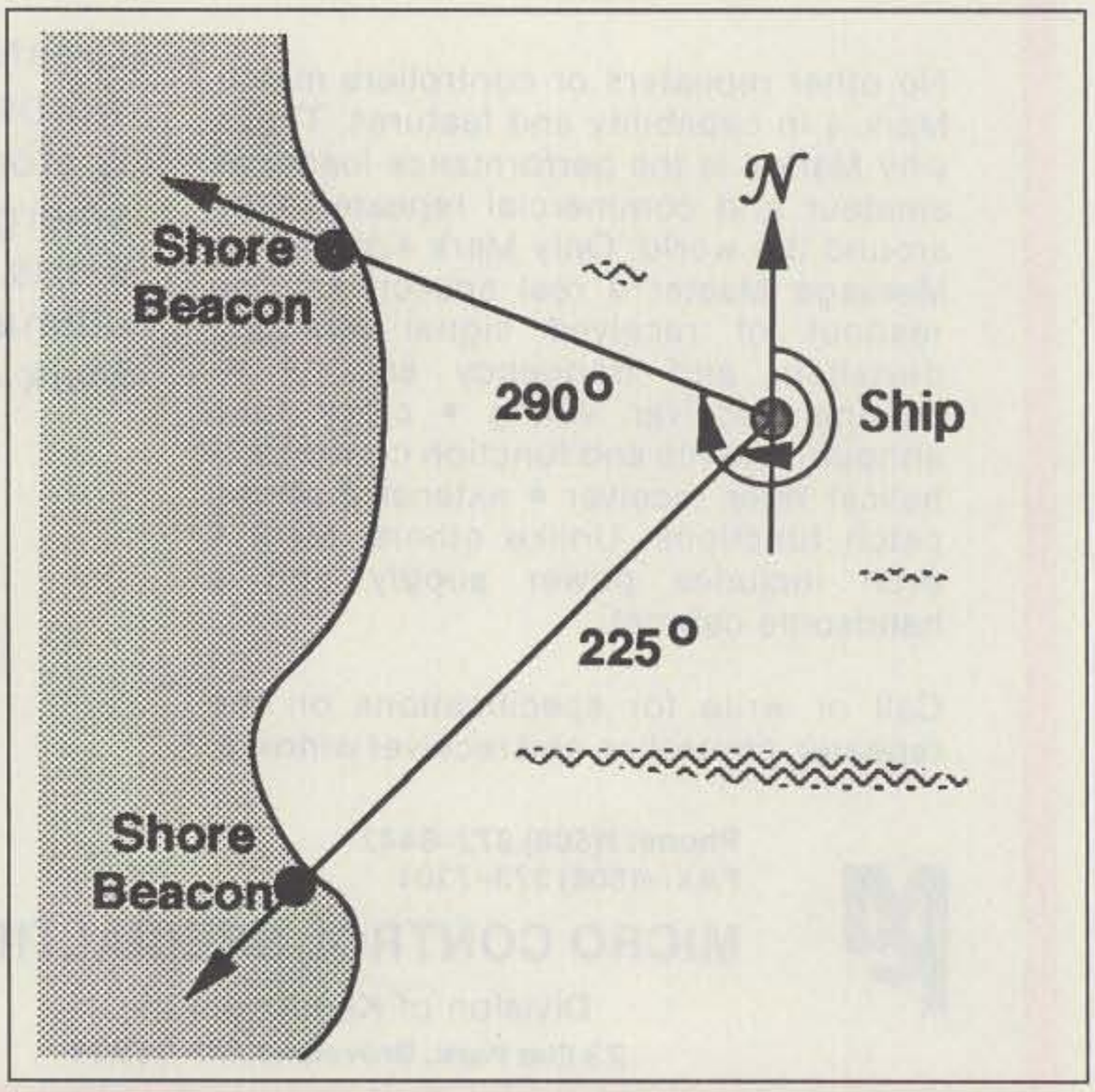

Figure 2. Triangulation in reverse was the first method of radionavigation. Ships found their positions using transmissions from known shore stations.

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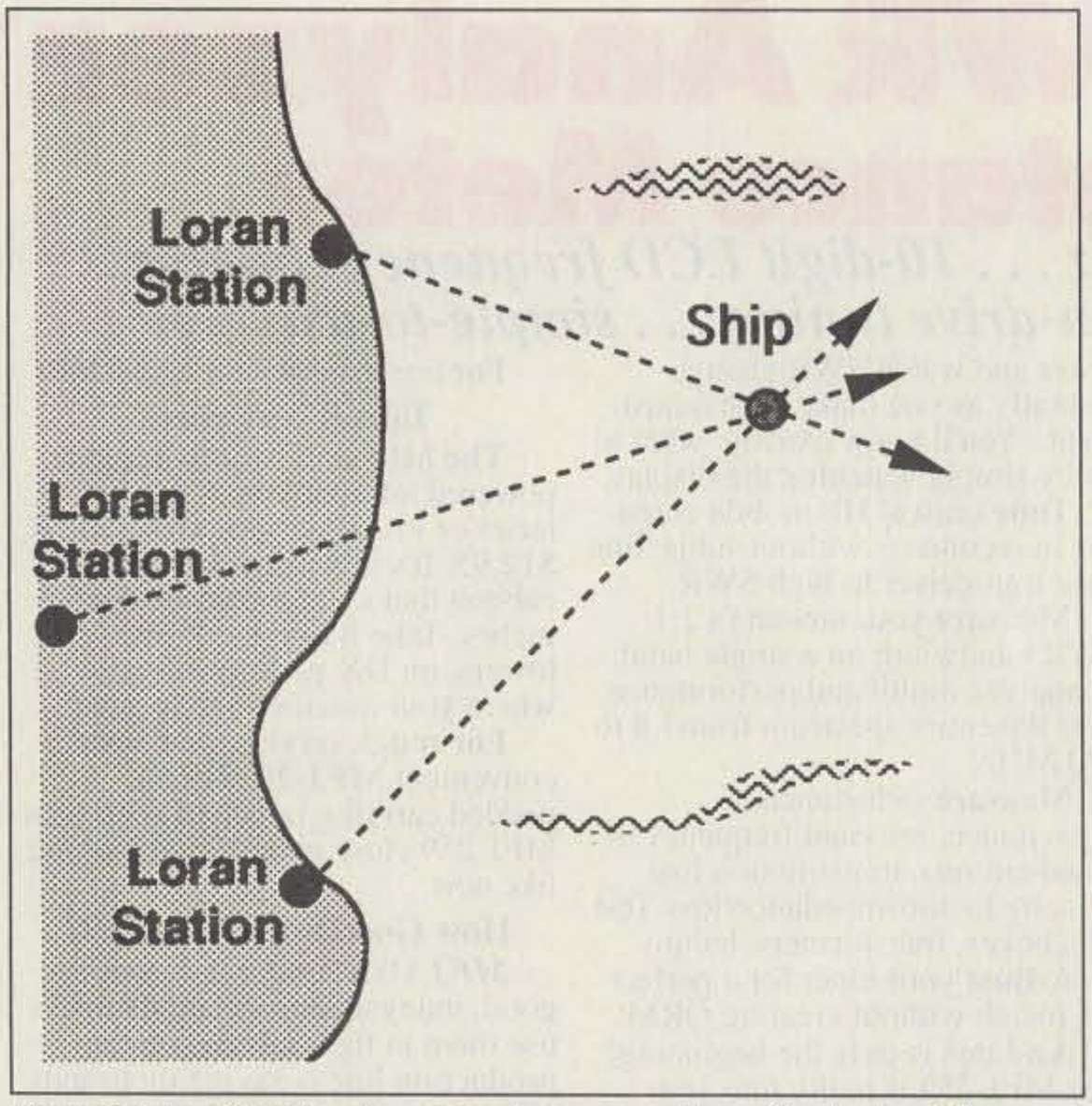

Figure 3. The LORAN system determines a vessel's position by the difference in arrival time of coded pulsed signals from three known land stations, using multilateration. GPS uses satellites to give worldwide coverage and add altitude measurement capability.

two, to fix yourself on a map using satellite multilateration when you are on the ground. If you are airborne, a four-satellite fix is needed to find your position and altitude. Details of the GPS system and available GPS receivers have been published widely, so there is no need to give the whole story here. For a good GPS overview, pull out your July 1994 issue of *73* and read the articles by WA4BLC and WB6NOA, beginning on page 10.

Mapping the Fleet

In addition to knowing your own coordinates, it is often just as important to track the positions of other moving things. For example, a police dispatcher who knows the exact location and status of each squad car can rapidly determine which one is able to respond most quickly to an emergency call. So why not put a GPS unit in each cruiser, hooked to the officer's radio such that it sends a burst of digital data with each transmission or upon command, giving the unit's position to the dispatcher's computer? A few commercial companies now offer tracking systems like this to governmental agencies, perhaps one in your town.

It is possible that ham operators were first with the idea of building a network of moving position-squawking transmitters. At least one ham has been experimenting with the concept for over 12 years. He is Bob Bruninga WB4APR, whose comprehensive shareware tracking program is called Automatic Packet Reporting System (APRS).

In its simplest form, APRS is just a mapping program. All stations in an APRS network transmit their exact locations at regular intervals. Fixed stations beacon occasionally, while moving stations beacon more often, depending on their speed. APRS-equipped stations receive the packets and display all station locations on a map of appropriate scale. Stations can send additional information, such as course, speed, weather, and RDF bearings, for processing by APRS.

"As an early packet radio user, I was involved in putting up digipeaters and building the network around here," says Bob. "The graphical representation of net stations was always the question. The early maps of digis, nodes, and BBSs were manually drawn and always out-of-date.

"Once I saw GPS gear coming out," WB4APR continues, "I had a reason to sit down and write a program to automatically display station locations, even if they are moving. The biggest hump was deciding what I was going to use for on-screen maps. I talked with people who worked at the geological survey and people who were involved with software, to see if anyone could identify a commercial program that drew maps, but also gave you, as a programmer, a hook to use in your application.

"After three or four years, I got tired of waiting for cheap commercial maps and developed my own strategy. The beauty of it is that it doesn't belong to anybody else. The maps that we hams draw, we own. We don't have to pay royalties to anyone. The commercial digital map companies not only wanted royalties for the data, but also wanted royalties for every copy of every map. That would just not work in the ham community. APRS mapping is done in a way such that anyone can use a text editor to create maps."

For a network of marathon checkpoints on 2 meter packet, a street map or a special course map is used by all APRS stations. For a wide area operation on HF, such as a boat race, a map of all or part of the USA is just right. Since all beaconed coordinates are in degrees and minutes of latitude and longitude, it is not required that every station's display use the same map scale.

Coordinates of moving stations are most easily captured by connecting the station's APRS computer to a GPS receiver's NMEA-0183 data output port. If no GPS unit is available, the user can enter coordinates on the computer keyboard. An object to be tracked does not have to have a computer hooked to the transmitter. To automatically beacon to the network, all that is required is a packet node controller, transmitter, and GPS receiver. PacComm Packet Radio Systems sells integrated TNC/GPS sets, ready to connect to your transceiver.

To demonstrate APRS tracking, WB4APR and other members of the US Naval Academy Radio Club followed the progress of the game ball for the 1992 Army/Navy game on its traditional 128-mile relay run from Annapolis to Philadelphia. All the beaconing equipment fit inside the helmet of the midshipman carrying the ball. The chase vehicle contained a digipeater to relay data to a network of APRS-equipped packet stations displaying the ball's progress to spectators and officials along the route.

Unlike other packet networks such as DX Packet Cluster, where all stations maintain a connection with the host, all APRS reporting is done with unconnected information (UI) frames. An unlimited number of stations can contribute information to the network simply by transmitting the data. If course and speed information for an object is sent along with the time of observation, APRS will dead reckon the predicted position of the object thereafter, upon command.

Bob and others have been industrious map-makers. Much of the world is now digitized. In addition to world and USA maps, there are regional maps, state maps, local street maps, and aviation sectional maps. As a result, you will need a fast modem to download all APRS files. It takes a high-density diskette to hold them in compressed form. After unzipping, the complete program, maps and sample/demo files require about 2 MB of hard drive space.

WB4APR's program supports CGA, VGA and EGA graphics and runs in color on all popular PC, XT, and AT computers. That's great for the well-equipped shack, but you don't need an expensive machine to get going. The latest APRS505E.EXE file is only 280K, and maps are less than 20K each. For my mobile experiments (Photo A), I use a rudimentary Toshiba T1100+ laptop, which has an 8086 processor, 640 KB memory, and one working 720K floppy drive. It's slower and the number of available maps is much smaller, but it is fine for portable

APRS Resources in this Article

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Glen Burnie MD 21060

Keith Sproul WU2Z
698 Magnolia Rd.
North Brunswick NJ 08902

PacComm Packet Radio Systems, Inc.
4413 N. Hesperides Street
Tampa FL 33614
(813) 874-2980

Annapolis BBS: (410) 280-2503

Other BBS APRS Sources:
(614) 443-4249 Ohio
(407) 575-9680 Florida
(703) 255-2172 Virginia
(602) 938-7528 Arizona
(415) 359-6985 No. California
(310) 541-2503 So. California

Packet Addresses for non-business messages:
WB4APR@WB3V.MD.USA
WU2Z@KB4CYC.NJ.USA
KØOV@WB6YMH.#SOCA.CA.USA

APRS Frequencies:

HF (kHz LSB)	VHF (MHz FM)
7085.6	145.79
10151.5	145.79
14098.0	147.345

use in public service and RDF events.

I doubt that any software engineer is more dedicated to optimizing and improving his product than WB4APR. In the six months I have been investigating APRS, Bob has put out many revisions, each with significant improvements over the ones before. The program keeps getting new features and becomes easier to use.

An APRS version for Macintosh fans is also coming onto the scene. Author Keith Sproul WU2Z is trying to make his product compatible with Bob's PC version in terms of maps and hardware interfaces, while exploiting the special graphics capabilities of color Macs. Now in beta testing, his Version 1 program should be released about the time you read this. It runs on almost any Mac, except SE or Plus, if it has 6 MB or more memory and System 7.

Stay Tuned

APRS is ideal for hams who want to keep track of multiple moving objects in near real-time. But if that were its only use, it would be of only passing interest to hams who hunt hidden signals for sport and for volunteer enforcement. The big attraction of APRS for T-hunters is its ability to network RDF teams, display all their bearings on each team's screen, and perform automatic triangulation on its built-in maps.

An APRS/RDF interface circuit for automatic bearing transmissions is still in the bug-squashing stage, but it appears to be only a month or two away from publication. Meanwhile, you can try out the basic APRS program and eavesdrop on APRS activities locally and nationally by hooking it to your packet TNC.

Bob posts his latest APRS version on the Annapolis BBS. Other BBSs around the country have recent versions, as do online services such as CompuServe's HamNet. Older versions do not have all the latest features, but they are fine for viewing APRS activities in your area.

APRS diskettes are showing up at ham conventions and swap meets. Be sure to look for the latest version. If you can't easily download APRS or find it locally, Bob will send you a disk copy if you include $5 dollars for a high density disk or $10 for two double density disks along with your registration fee.

Program registration costs $19, which is quite reasonable, considering its versatility. One registration is good for all versions. Most features are functional even if you don't register, including the TNC interface, so you can give it a good test drive. Unregistered users cannot save their current configuration (startup map, location, and digipeater path) and must re-enter upon each startup.

When you register, you will receive a unique validation number for use with your own callsign. Enter both and the program enables the writing of configuration files. Additional registration and validation codes are required for special port operations such as the automatic interfaces to GPS receivers and RDF sets. If you aren't registered, you can enter your GPS coordinates and DF bearings from the keyboard. If you don't know your exact latitude/longitude, move the cursor on the map to your location. APRS will determine your coordinates and enter them.

There is too much power and versatility in APRS to cover in a single article. As it is, I'm fighting the urge to add more paragraphs, each starting with "But wait, there's more!" Watch for additional APRS information in upcoming "Homing In" installments, including comparisons of the PC and Mac versions. You will also see how APRS can be used to form an automatic RDF network of fixed and mobile stations. You will learn how to tie your RDF equipment, computer, GPS, and packet gear together for APRS. 73

Number 20 on your Feedback card

PACKET & COMPUTERS

Digital Amateur Radio

Jeffrey Sloman N1EWO
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70 Route 202 North
Peterborough NH 03458

This column is not called "Packet & Computers" by accident. When I first started writing for *73*, it was decided to make this column cover computers themselves as well as their ham radio use. Well, I haven't taken the time to do that yet, so I am going to start this month as a break from our JNOS discussions. (Those of you following the JNOS series, there will be more.)

Choosing a Computer for Your Shack

Let's take a look at what things to consider when buying a computer to use for ham radio. We'll take a look at two paths—cheap, and good.

First, cheap: Many of us work on limited budgets when it comes to buying ham gear (radio is a hobby, after all). After you buy the HF rig, the 2m handheld, the various antennas, batteries, meters, and power supplies, there might not be much left for computer equipment. But all is not lost. In some ways, those of you forced to buy used, low-power machines may be lucky.

Buying a Cheap Machine

Before you rush out and buy a computer, it is important to step back and decide what it is that you plan to do with the machine. If you must buy cheap, you'll have to think cheap. That is, a cheap used machine is just *not* going to run the latest and greatest software. Windows is out, ditto OS/2, NT, and UNIX. On the other hand, DOS will run just fine, and the overwhelming majority of ham software is currently DOS-based. While this is (very) likely to change (very) quickly in the (very) near future, the older software will still be (very) useful for a (very) long time.

You'll be able to run logging programs, packet radio terminal programs, some TCP/IP programs, and assorted calculators for everything from beam design to grayline plotting. You won't feel left out with a low end machine if you are interested in *using* it (rather then collecting the latest and greatest software, which seems to be a hobby in itself.)

So maybe it's time for a definition of a low power system. Just in case it isn't clear, we are discussing IBM-PC compatible systems. No slight is intended to Macintosh, Commodore, Silicon Graphics, Altair, or any other machine. It is simply the case that the PC is the overwhelming favorite among hams. If you are interested in any of the other possibilities (for example, if you already own a Mac), don't be discouraged, you'll find software and hardware for your machine if you look around. The low power/low end machine I have in mind is an 8088 to 80386SX machine with a 10 to 100 MB hard drive, 640 kb to 4 MB of RAM (Random Access Memory) and MDA (Monochrome Display Adapter—text only) to VGA (Video Graphics Array—color graphics) adapters. This is a relatively wide range of equipment, but all of it is "obsolete" by current standards.

Wait, you say . . . hold on just a minute! I run Windows on my 386SX machine. Yes, you might just—between lockups, GPFs, and reboots—be able to "run" Windows. Folks, regardless of what you say, the 386SX is a machine dead to the latest and greatest software and the 386DX is running a close second. If your SX has 8+ MB of RAM, you'll have better luck, but you will still find it *terribly* slow.

So within this broad range of equipment, how do I choose my low end machine? Well, the basic low end is beautifully embodied in the IBM Model 30. This was a fairly expensive machine when it first appeared. As a used machine, it has a number of advantages that are good examples. First, it is built very well. One thing that all hams—but especially the HFers—will appreciate is that the 30 is *quiet*. No, I am not talking about the fan, though it is quiet that way. I mean RFI. The nicely built box that holds the 30's guts is well sealed against RF leaks, and it just doesn't make radio noise. This is a very important point, because a cheap case can mean that you just can't get on the low bands while the computer is turned on—some machines are incredible RF generators.

The Model 30 also has VGA built-in. It's right on the motherboard. This means that you can view color graphics as decent resolutions. Unfortunately, the monitors that came with the Model 30, made for IBM by Tatung, are notorious for going terribly out of focus—then dying. This means you might have to replace the monitor. If you can find a VGA monitor cheap, great. If not, you can put a monochrome display adapter in the box and use a mono monitor (which you can certainly get cheap) or use a mono VGA monitor, a bit more expensive.

The 30 includes a serial port—a ham radio necessity—and a printer (parallel) port. If you do find a 30 for a good price (less than $500 with monitor) at a hamfest or flea market, *be sure to get the keys and configuration diskettes*. Unlike most clone machines, the key to the Model 30 is a must. It is a real key, which fits a real lock, which really locks the case. The configuration diskette is required to do things like set the system time and configuration. You *need it*.

So, what have we learned from this example? First, since we are buying low end, we can pick up a good name-brand machine. Look for older IBM, Dell, Compaq, AST, Samsung, Hyundai, etc. machines. These are all built very well and won't cost much, since the low end machines are "obsolete." Avoid no-name clones unless you can be sure they come in very good cases; RFI is bound to be a problem in cheap machines.

Color is nice, but mono will work. Don't spend a lot of extra money on color unless you have specific plans for it. You'll find that most ham software for DOS works just fine in monochrome modes. Be suspicious of used monitors; test them or get some sort of guarantee that they will work.

Make sure the machine has at least one serial port. This is standard, but you might be very disappointed if you do not check. All is not lost if your machine is short a port—add-in port cards are cheap and available.

Be sure to get any keys and diskettes for whatever machine you buy. Frequently machines contain hardware that is useless, or nearly so, without the right software. Check this carefully.

Buying New Hardware

If you are ready to go out and spend some money, you'll need to think about the future. Operating Systems and applications are growing in sophistication, and are hungrier than ever for system resources. Lots of RAM and disk space are needed to make things work right. The processor is also an issue, modern software wants lots of CPU.

The best-value processor today is the 80486DX/2 66. This is a processor that runs at 33 MHz outside, but 66 MHz inside. Thanks to the 486's internal cache memory, which can store instructions, this higher internal clock rate makes a big difference in performance. Why not just run the whole thing at 66 MHz? Cost. Building a 33 MHz motherboard is much easier (and so cheaper) than a 66 MHz board.

One important point is to get a motherboard that supports a large external processor cache. By large, I mean greater than 128 kb. Many processor caches are upgradable, so you may be able to start smaller. The importance of this external cache will be obvious when running more advanced operating systems like NT. Performance of NT is dependent upon at least 128K of cache.

Video is very important for a new machine. Do not buy a frame buffer video adapter. A frame buffer adapter is a dumb card that simply provides a memory space that corresponds to the display. Values stored in this memory space determine what appears on the screen. Frame buffers are death to Windows performance. They simply can't deal with the video intensive nature of Windows and will bring even the fastest machine to its knees. Instead of the frame buffer, buy an accelerator. An accelerator card uses its own processor to speed up the video, and can make a dramatic difference in the performance of even the slowest of Windows-capable machines.

8 Mb of RAM is the minimum for a new machine; four simply doesn't hack it. 16 Mb is even better, and Windows-NT-OS/2 performance will certainly show it. A large disk drive is also a necessity. Look at 300+ Mb drives. Applications are getting outrageously large, as are operating systems. NT wants 80 Mb! Applications run about 16 Mb each today. AN IDE (Integrated Drive Electronics) drive is fine; SCSI is better (though more expensive). SCSI can take advantage of advanced OS (Operating System) features, and offers a way to attach peripherals (CD-ROM, tape drives, scanners, etc.).

The case of your new machine is very important. It should be worthy of your shack. If you are building a machine yourself, look into a premium case. If you are buying a brand name, you're probably OK. IF you are buying a local clone—look out! Bring a portable HF receiver with you and check for RFI. If the standard case from the vendor is leaky, see if they can supply a premium-quality box. It will cost more, but it's worth the money.

See you next month. Until then, 73 de N1EWO. 73

ATV

Number 21 on your Feedback card

Ham Television

Bill Brown WB8ELK
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

The Ultimate DX

This past July 11th, record-breaking contacts exceeding 2,500 miles on fast-scan ATV (434 MHz) were made by California ATVers watching transmissions from Paul Lieb KH6HME from his vantage point on the side of Mauna Loa volcano on the big island of Hawaii.

The California-Hawaii Duct

This amazing distance was possible due to a tropospheric duct that develops several times each year between California and Hawaii. Usually the duct supports weak signal contacts on 2m SSB and occasionally as high as the 23cm band (and sometimes beyond). The strongest conditions seem to occur each summer (typically June or August) whenever a strong Pacific high pressure system builds up along the path. During a few particularly good openings, 2m FM QSOs have been made with signal levels exceeding S9. The path is usually strongest along the California coast near sea level, while at the Hawaii end it tends to be best at higher elevations. To take full advantage of this unique phenomenon, Paul KH6HME obtained permission from Hawaii television Channel 9 to locate a series of beacon transmitters (6m—23cm) at their transmitter shack high on the side of the Mauna Loa volcano at around the 8,200 foot level (see the article by Gordon West WB6NOA in the July 1991 issue of *73*, p. 14, for a complete description of the KH6HME beacon system). These beacons are usually the first tip-off of the duct opening for many weak-signal DXers all along the West Coast of the U.S. mainland.

The ATV Tropo Experiment

Back in 1991, Gordon West WB6NOA and Tom O'Hara W6ORG brought an ATV experiment over to Hawaii so that Paul could attempt a record ATV contact between Hawaii and California. The ATV experiment consists of a P.C. Electronics' transmitter with an Elktronics VDG-1 video ID and a 100-watt Mirage amplifier fed into a pair of K1FO yagis.

Photo A. The KH6HME (Mauna Loa volcano, Hawaii) ATV signal booms into Southern California (reception by Gordon West WB6NOA—2,500 miles).

Although there have been many openings since then, none of the ATV attempts prior to this July have been able to produce much more than sync buzz over the path.

The BIG One

That all changed this summer when the KH6HME CW beacons were observed pounding into the Californian and Mexican coast on July 10th. Many 2m SSB QSOs were then made by Russ KH6FOO (near sea level at Hilo, Hawaii) and Al WH6VY with the mainland. Early in the afternoon (PDT) on Monday, July 11th, Paul KH6HME arrived at the Mauna Loa beacon site and hooked up the ATV experiment. Signal levels on 2m were now peaking well over S9. As soon as Paul turned on the ATV transmitter, Gordon West WB6NOA received a P4 color picture over an incredible 2,500 mile path (see Photo A). Gordon contacted Tom W6ORG, who spread the word to the Southern Californian ATV community.

New World Record—2,514 Miles

Mike Henkoski KC6CCC of San Clemente heard the news and jumped up to his rooftop to flip his KLM 440-10X over horizontal and point it towards Hawaii. Around 2:30 p.m. PDT Mike received a snowy picture that peaked up to P3+ about five minutes later (see Photo B). Mike sent me a videotape of the contact. It's fascinating to watch as the picture builds in strength to the point where you can actually read the fine print on the ID screens. As a result of this contact, the new world ATV DX reception record is now 2,514 miles! Mike observed the ATV signal for over four hours that afternoon.

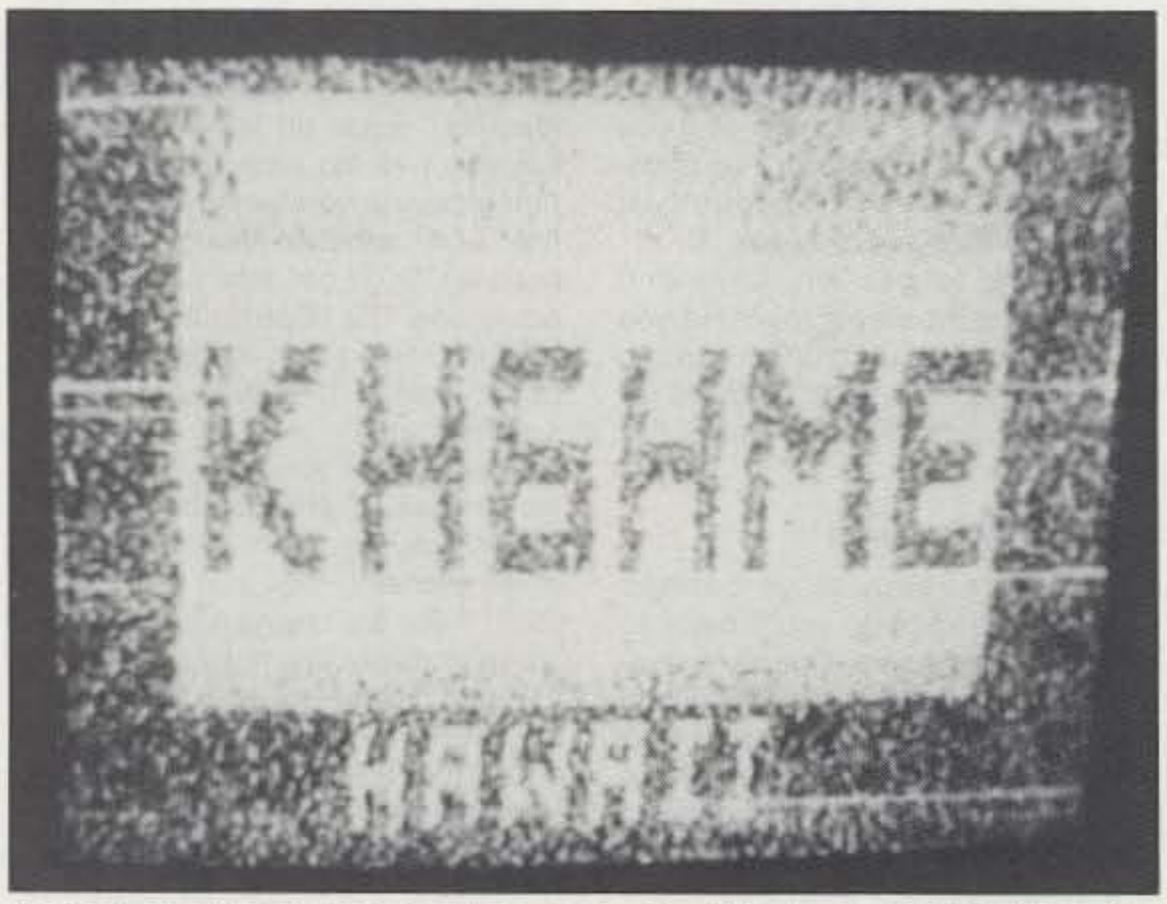

Photo B. The Hawaii ATV signal as received by Mike Henkoski KC6CCC in San Clemente (2,514 miles).

The ATV signal was also received briefly (around P1) by Don WA6BHF in Westchester (2,480 miles) and Al KF6YM reported seeing possible sync bars from Running Springs (2,555 miles).

More New Records

This opening also resulted in a record two-way contact between KH6HME and Chip Angle N6CA, with both CW and SSB on 2304 MHz. An attempt to make contact on the 10 GHz band was unsuccessful, however. This opening may well be one of the best yet observed, and resulted in hundreds of new stations working the duct on VHF.

Gordon WB6NOA traveled to Hawaii shortly after the big opening to help Paul KH6HME get set up for the next big ATV challenge: the first-ever two-way ATV QSO between California and Hawaii! 73

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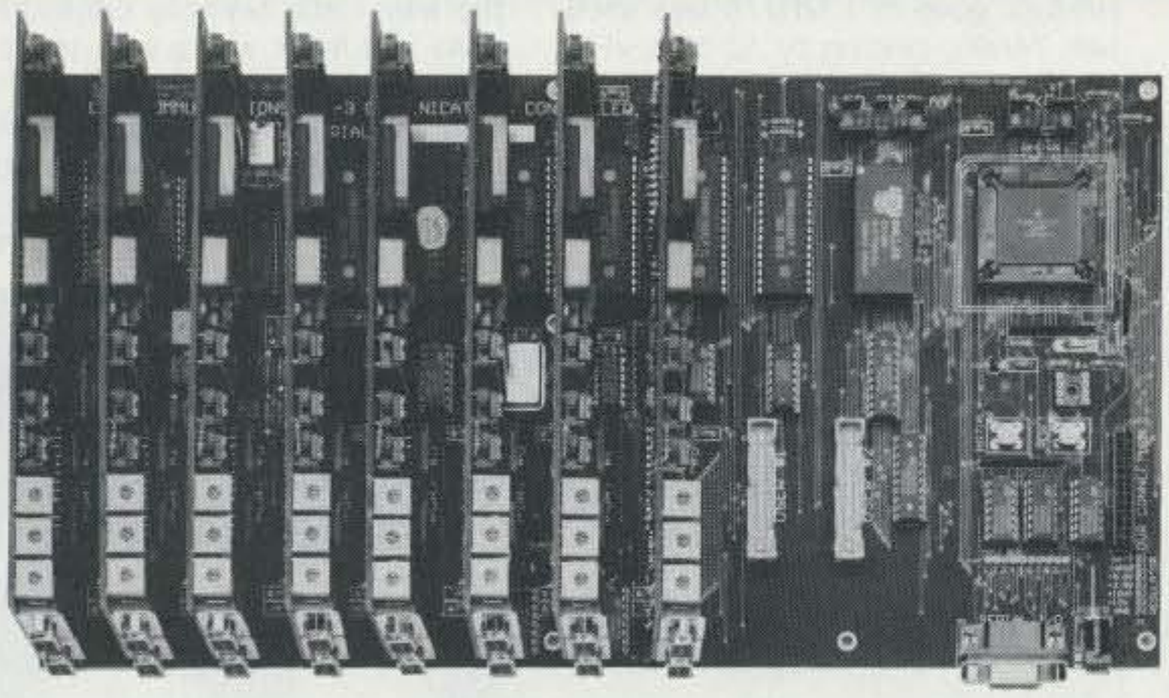

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VHF/UHF Microwave Frequency Counters

Last month I covered Loran and some of its attributes, namely the calibration of frequency standards, or the internal calibration oscillator of your frequency counter. This month I will cover the various surplus counters that are available. Both inexpensive new counters and surplus units can be a problem from a calibration standpoint. It can be an uphill battle to maintain a frequency reference that is dependable and accurate enough to properly maintain calibration.

This facet of frequency counters, their accuracy and how good their internal references are, is often misunderstood. These internal oscillators require periodic calibration to ensure that your capability to measure accurately is OK. If the calibration standard in your frequency counter is off, your measurements will be as well. The Loran calibration process described in my August and September 1994 columns is but one method of verifying your system's accuracy.

As the frequency of interest becomes higher and higher in the microwave region, the small error that is not important at high frequency becomes larger and larger. If you calibrate your counter with WWV, is it good enough for use? Why use Loran or WWVB at 60 kHz for verifying your standard's frequency? I hope to answer these and other questions this month, and to show the basics in frequency counter acquisition from the eye of a surplus junkie. Well, not only surplus counters—I would like to review some of the very new mini pocket frequency counters as well. In short, I will present what I have learned from all the frequency counters that I have used.

Choosing a Frequency Counter

One type of question that comes up is: If two frequency counters are capable of measuring a specified frequency, say 1296 MHz, which one would you choose? How would you rate the performance and accuracy of each? Is price the only criteria for selection? Whew, what choices!

First, let's start out by stating that almost any counter will do a great job displaying the frequency that you want if it is within the counter's frequency range. There are many other attributes that need to be considered: sensitivity to input signals, digits resolved, agility or ease of use, and accuracy. A counter's ability to display the frequency accurately depends on how well its internal time base (reference oscillator) stays on frequency.

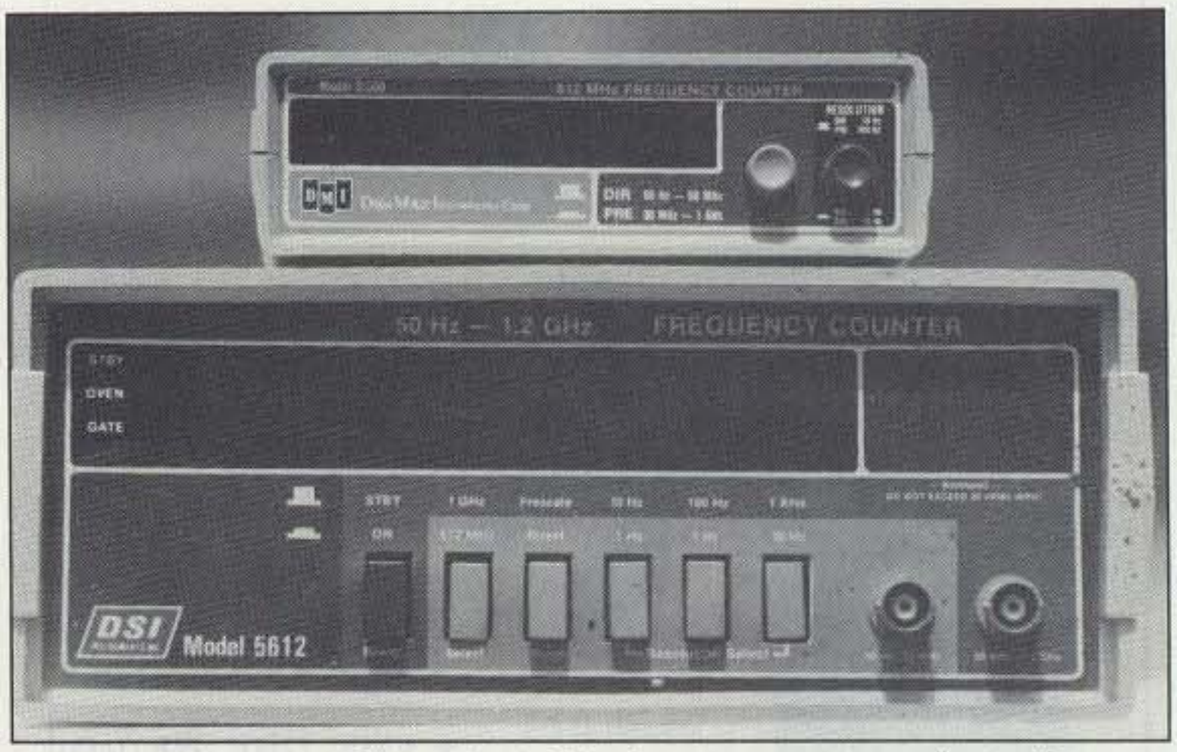

Photo A. Digimax 500 MHz and 1.2 GHz frequency counters, about eight years old and still working well.

Let's cover accuracy. Each system has a little different approach on the calibration process that you should be familiar with in order to get good results from your unit. It is not realistic to state that your frequency is OK just because the frequency counter is reading the proper frequency. The frequency might look just fine, but if you don't know what your counter's time-base error is you don't know for sure that your frequency measurement is OK.

Many years ago, in the early 1960s, one of my first calibration attempts was to bring a crystal-controlled HT (transfer oscillator) in to work and set the frequency with the counter there. When I returned home I could calibrate my equipment by a comparison method by retesting the HT's frequency. This process calibrated my first counter, an HP-523, good to 1 MHz. It was used with 74H90, dividing by 10 from VHF. My only other calibration process at this time was WWV at 10 MHz.

How accurate was this system in the mid-'60s? Well, WWV was good to 1 hertz per MHz, and checking the HT at work and then at home proved my test to be within 300 hertz at 2 meters. What a cumbersome calibration method I went through in those early days. In actuality, it wasn't too bad if you could set your 2 meter crystal frequency to something less than 300 hertz. Remember—this was the early 1960s, and while this was not the best, it was doing just fine for amateur standards at 2 meters. At much higher frequencies this was another matter.

The next major quantum leap in counter technology available to amateurs during the latter 1970s was the HP-5245 frequency counter. This counter would count to 50 MHz and had plug-ins that could increase its range to 18 GHz. At the time we were very lucky to acquire an HP-5245 with a 500 MHz plug-in. The other plug-ins were "Unobtainium" because they were too pricey, even in surplus. I remember the HP-5245s still being sold for something near $1,000 in 1985. By the way, I still have my original HP-5245 and it still works well nearly 20 years later; it's a real workhorse. The cost today for an HP-5245 in working condition with a 500 MHz plug-in should be less than $200.

This technology was quite a jump in

Photo B. My old trusty HP-5245 counter with a 500 MHz plug-in displays 10 MHz frequency to eight digits.

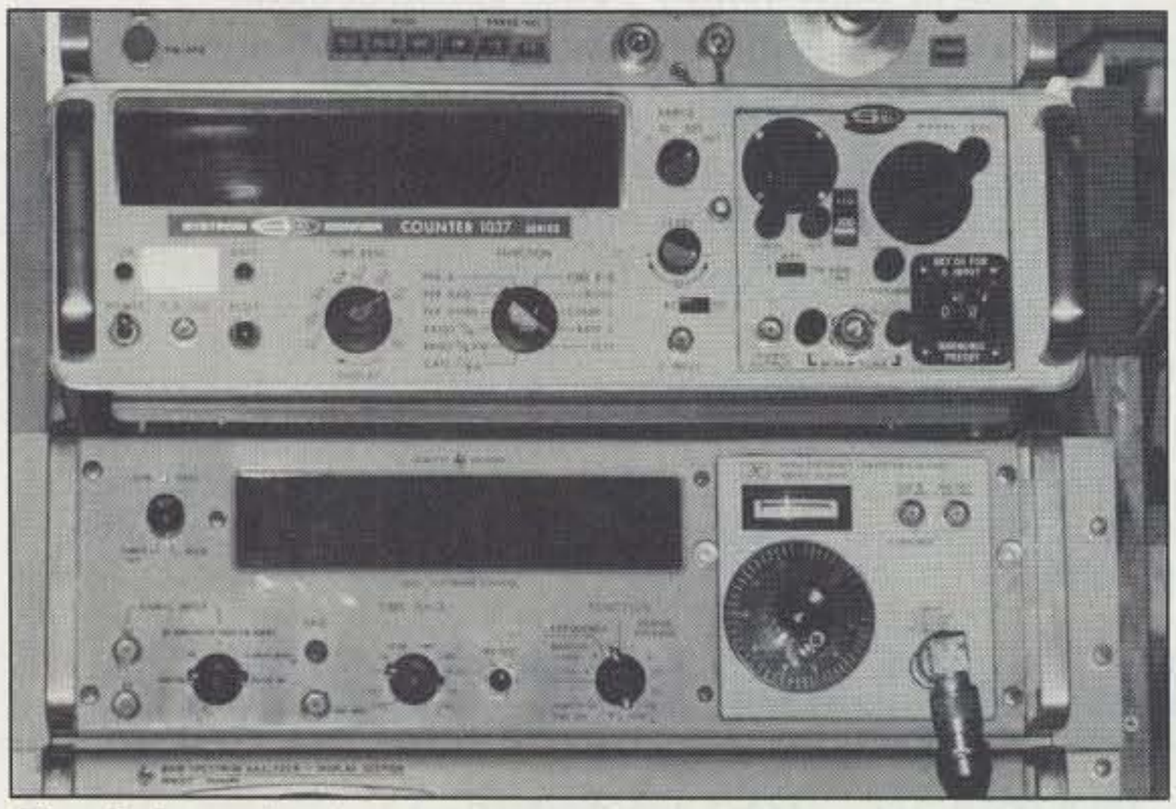

Photo C. Comparison between an HP-5245 with a 3-to-12.4-GHz plug-in (bottom) and a Systron Downer 1037 frequency counter with a transfer oscillator plug-in good to 18 GHz (top).

Photo D. Systron Downer Model 6053, direct-reading to 3 GHz.

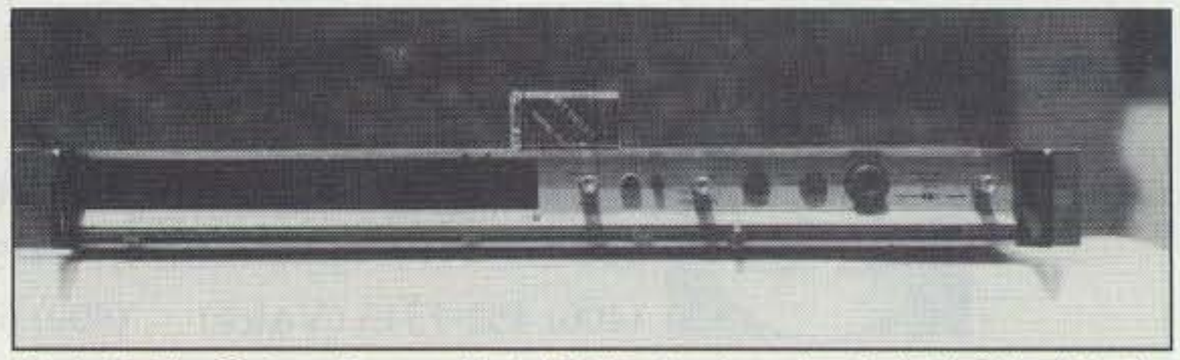

Photo E. The Systron Downer Model 6016, direct-reading to 12.4 GHz. Note the 9-volt battery on top for size comparison.

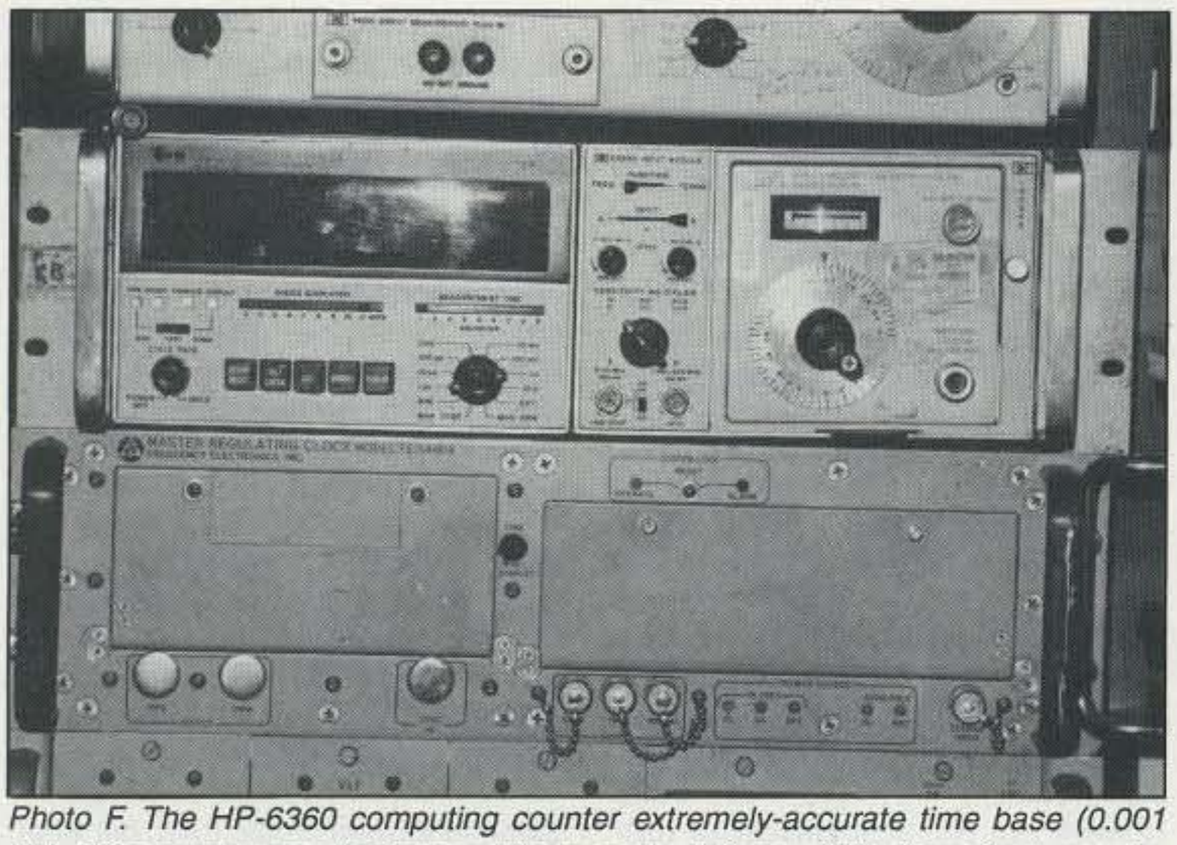

Photo F. The HP-6360 computing counter extremely-accurate time base (0.001 Hz). This counter can do Boolean Algebra calculations with its three frequency inputs. It displays 10 MHz frequency to 11 digits.

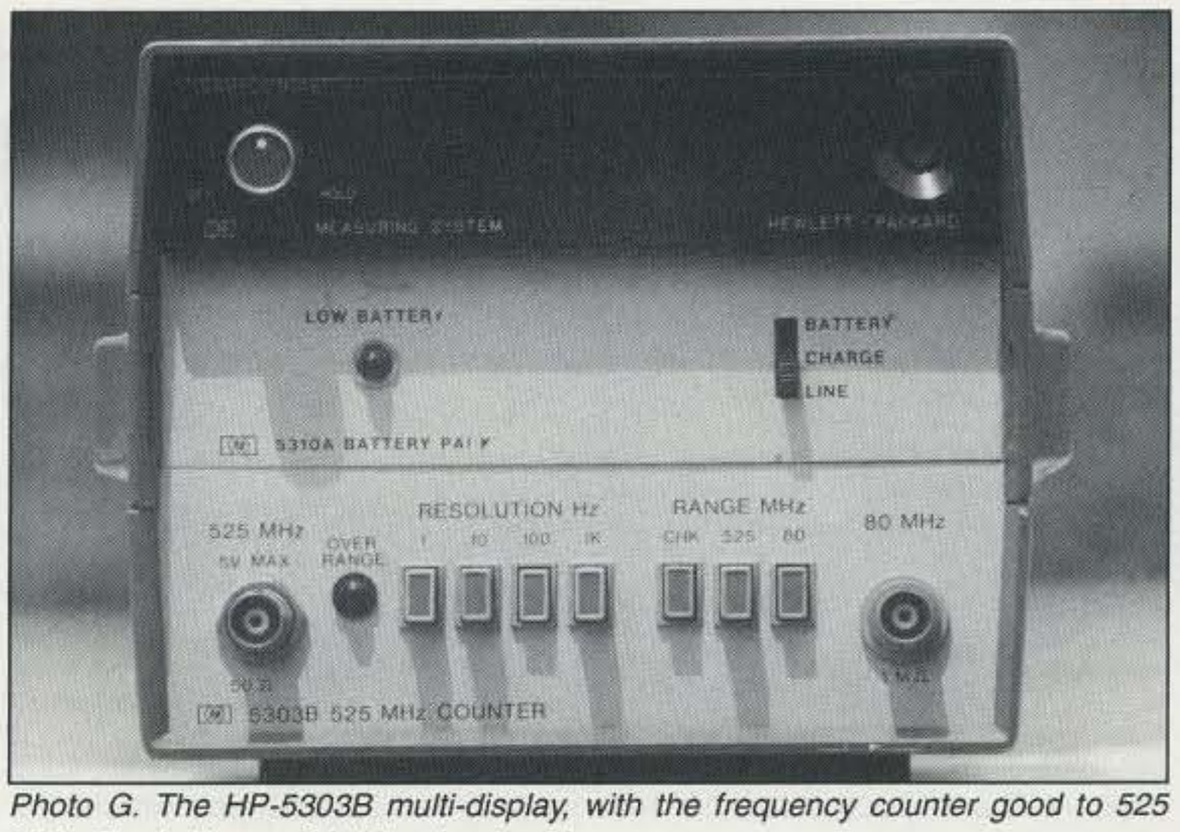

Photo G. The HP-5303B multi-display, with the frequency counter good to 525 MHz. The bottom unit is interchangeable.

performance from my original HP-523. The HP-523 couldn't compare with the HP-5245, which ran circles around it (I then scrapped the HP-523). The accuracy of the HP-5245 was good to 0.1 hertz at 10 MHz. Its calibration could be compared to WWV at 10 MHz and reset to this accuracy with care. However, the internal oscillator could be set more accurately, requiring something other than WWV at 10 MHz. *[Note: To obtain accurate calibration results you must have a standard or reference that has a greater accuracy than the unit you wish to calibrate.]*

Evaluating a Frequency Counter's Accuracy

Let's take a little counter accuracy quiz. I hate quizzes, but let's see what happens in accuracy terms, just for the sake of conversation. Question: What counter would you buy for the best accuracy?

Counter A. 1 part per million (1 PPM)
Counter B. 0.001 %
Counter C. 0.1 hertz per MHz
Counter D. 5 millihertz @ 5 MHz
Counter E. +/- 0.05 hertz per MHz

Sounds like apples, oranges, pears and grapes? It's not all that difficult. What happens is that the accuracy is stated in different terms, just like comparing labels at the supermarket. Let's break the terms down one by one. In all cases, a 10 MHz frequency is measured. With counter "A" (1 part per million—1 PPM), there would be a maximum error of 10 hertz at 10 MHz. With counter "B," 0.001%, the same 10 MHz error would be 100 hertz. With counters "C" or "E," the statements are the same and the error would be 1 hertz. With counter "D," 5 millihertz at 5 MHz, the error would be 0.01 hertz (or 1/100 of a hertz or cycle, if you prefer), making counter "D" the most accurate.

Commercial counters on the amateur market (new) range in accuracies from 1 PPM for units with an internal time base oscillator that is not temperature-controlled, to ones that have higher-accuracy time bases, good to 0.1 PPM or 0.2 PPM. This is usually an option that can cost up to $100 extra. This extra cost is added to the base price, making the total cost between $300 and $400 dollars. The limiting factor here is not the counter itself, but rather the cost of the internal time base crystal oscillator. Here we have the paradox: The cost of a really good time base can exceed the cost of

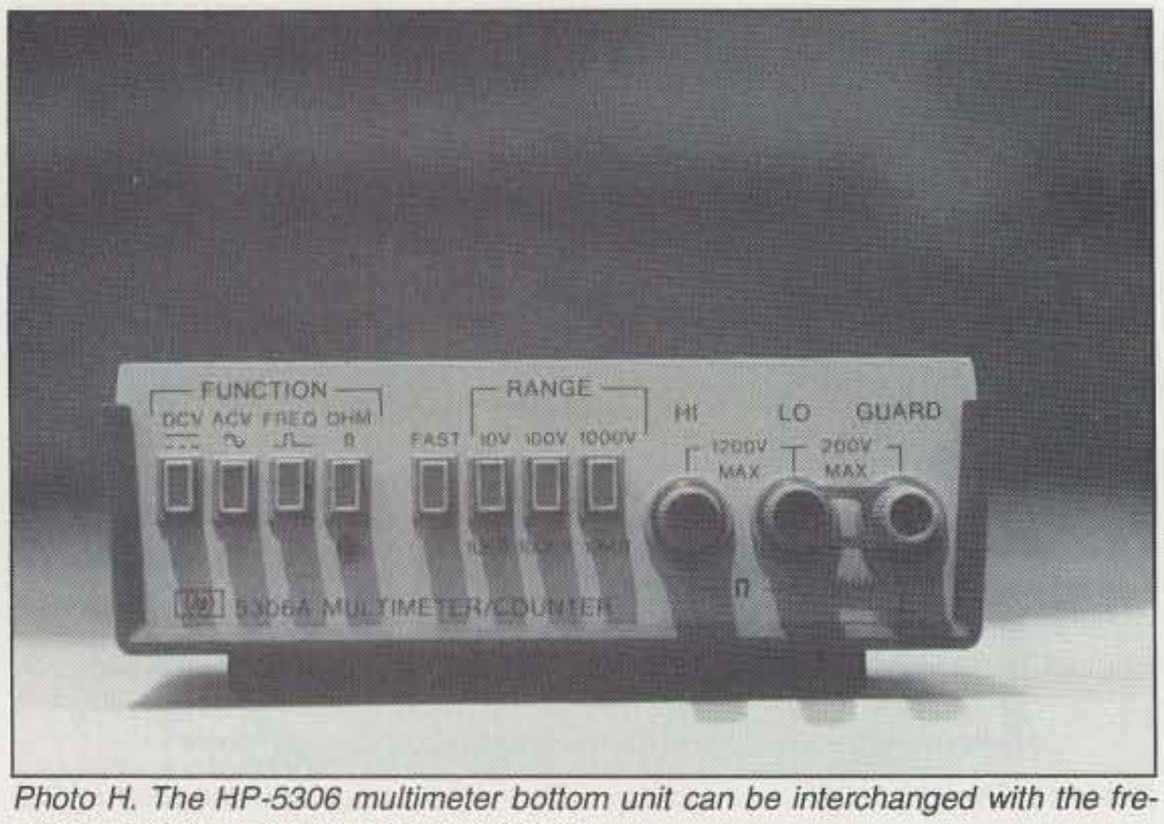

Photo H. The HP-5306 multimeter bottom unit can be interchanged with the frequency display unit to form a multimeter.

a modest frequency counter by a 2:1 ratio. For instance, a very good TCXO from EG&G or a similar manufacturer can cost nearly $300 new for 0.1 PPM accuracy. Costs for accuracies in the 0.001 PPM range are out of sight for amateur pocketbooks.

Frequency counters that use these optional higher-accuracy type TCXOs (temperature-compensated crystal oscillator) or ovenized standards in the new amateur market are typical of products from the following manufacturers (the 800 numbers following these companies are reserved for orders only): Digimax, 800-854-1566, San Diego, CA; Startek, 800-638-8050; or Optoelectronics, 800-327-5912 (the last two are located in Ft. Lauderdale, Florida). Their available products include units that are capable of frequency measurements to almost 3 GHz (their top-line models). In the base- or beginning-line models, frequency measurements are good to 1500 MHz (1.5 GHz). All this in a hand-held portable frequency counter!

What an improvement from my original counter, and even from the first type of units that I purchased! I currently have two of these counters on my workbench, both from Digimax. When I need a measurement in the field, certainly these miniature portable battery-operated counters give great results and as such are part of my tool kit for Field Day operations. Good input sensitivity and ease of use are universal in most basic models. Some improved top-end units have options that can dazzle you with S-meter bargraph-type indicators, and special features such as triggering and AC/DC coupling in the more expensive models. There are many different types out there and you will have to check the advertisements for the specific model that will serve your needs in a new miniature frequency counter.

Now, don't let me get into trouble here, but I need to insert a disclaimer as I switch from new products to surplus frequency counters: I use both. However, surplus (commercial or military) counters are regarded not as portable units but rather as bench-type units married to the 110 AC mains for operation.

Surplus varieties are usually based on military specifications and as such usually have very high-accuracy oven-controlled crystal time base oscillators within them. This type of oscillator is not inexpensive—costs now run several hundred dollars and up for them. I have purchased junk counters in the $50 dollar range just for the high accuracy time base oscillator, scrapping out the remainder of the chassis for parts. This is sort of a "Hangar Queen" type of operation, using a sacrificial unit to keep others in operating condition. This is a typical method of many instrument suppliers and savvy amateurs, helping to hold down repair costs for parts.

Calibrating these oscillators can be a task. The accuracy of even 0.01 hertz per MHz is better than can be verified using WWV at its best. This is due to the Doppler effect that occurs between the WWV transmitter and the receiver making the comparison. Frequencies good to 0.1 hertz are certainly realizable, but it would be a tough statement to say you can calibrate well to 0.01 hertz using WWV. The accuracy at WWV is good at the transmitter to about 0.000001 hertz, but the path/transmission medium (HF) changes its precision, due to the Doppler effect. It's somewhat like a train whistle whose note is always the same to anyone on the train, but when the train is speeding toward or away from you and the whistle blows, the note changes pitch as the train moves. This is just the same type of thing that the ionosphere does to the radio signal at HF—it changes the frequency slightly, reducing its accuracy at the receiver.

So how do you get out of this predicament? Well, WWV also operates a Very Low Frequency (VLF) transmitter at 60 kHz, doing the same work as WWV at 5, 10, 15 MHz. The 60 kHz transmissions can be used for extremely accurate frequency calibrations. The difference is that at 60 kHz there are no voice announcements. The format is different and so is the

ionospheric performance in that there is minimum Doppler effect in a radio path using ground waves or skywaves. As we covered last month in LORAN operation at 100 kHz, the ground wave is dominant.

Signals are reasonably strong and the calibration is about as good as it gets. Accuracies to 0.001 hertz are commonplace and, with longer time sampling, 0.0001 hertz is possible using older surplus equipment. Now, this kind of accuracy puts to shame the HP-5245 only because it can't resolve enough digits in its display, which is limited to cycles or parts of a cycle when reading these frequencies.

As I said, I still have my old HP-5245 and it still works just fine. In the surplus market I have seen them go for peanuts for they are relay-rack wide and five inches tall—too big for some folks. With the proper plug-in they will work to 18 GHz with very good results. Plug-in ranges are 50 to 500 MHz, 300 MHz to 3 GHz, 2.4 GHz to 12.4 GHz, and 8 to 18 GHz. There is a rather sought-after plug-in called a transfer oscillator; its capability is good from 50 MHz to 18 GHz. The cost of microwave plug-ins varies from $200 to $400.

Don't get rid of these counters because of their age; they are quite acceptable and are capable of giving many years of good service. The HP-5245 type has a cousin in the Systron Downer type counters of the same period, type 1037. Basically, it's the same counter as the Hewlett Packard HP-5245. They look somewhat alike, but there are major electrical differences. The plug-ins are not interchangeable between HP and Systron Downer. Some of the early Systron Donner plug-in units have an "ACTO" unit. It was one of the first to use the automatic tuning of frequency measurement to microwave frequencies that I was able to obtain in surplus. Most of the Hewlett Packard type plug-in units from this period (1970 to the early '80s) used the harmonic mixing technique, together with a high "Q" cavity to resolve microwave frequencies to be displayed on the counter mainframe. These were the early counters that used plug-ins to extend measurement into the high microwave frequency ranges.

As newer types of frequency counters came into existence, several of the Systron Downer types became available in the surplus market. These units did not require plug-ins, and were direct-readable into the microwave region. The first one I acquired in surplus was a Systron Donner 6053 good to 3 GHz. the unit was small, about half the size of an HP-5245. I picked this unit up for $50 because it had a defective time base oscillator. As I maintain a home master oscillator, it was no problem; I set the time base oscillator switch to external reference and I have been using the counter since 1987. Of course, it's tied to the master time base and AC mains, but on the workbench, who cares?

A similar counter that is starting to show up in surplus in quantity is the Systron Donner 6016. This counter is very low-profile: 1-1/4" high and relay-rack wide. Its claim to fame is that it will read frequency to 12.5 GHz directly. The cost on the surplus market for one of these counters in working condition is about $350, and about $200 for one that shows signs of life but needs some attention. By that I mean it works on some ranges but not on all. It's not a junk counter but is partially functional. A lot of money can be saved by doing your own repair if you have some basic test equipment to support the repair function.

Concerning accuracy: If you want the ultimate your frequency counter can deliver, you can shift to an external oscillator for the best accuracy. Most large repair shops or manufacturers refer to this as a house standard, a master frequency oscillator of exceptional stability, good to 0.0001 hertz or better, and distribute it about the facility to reference all other instruments to this same standard. Now when you read frequency at one of several counters they will all be the same. In amateur applications, a master frequency standard would connect to all instruments that need a calibration oscillator (time base). By connecting all counters to this external reference, measurements on all counters should be the same as they share the same time base.

The next generation of frequency counters in surplus is the HP-5360 and the HP-5345 counter mainframes—still a VHF mainframe using plug-ins to reach up into the microwave region. The HP-5360, which I have, uses an adapter, allowing the same plug-in units for the HP-5245 to be used. Improvements on the HP-5360 counter include a very accurate time base oscillator (internal). It's quite comparable in accuracy to my master house standard, a Frequency Electronics FE-10A. Both are good to 0.001 hertz anytime. With a program of calibration, either device is capable of much better accuracies. HP-5360s can be purchased for $100 to $200.

We have high hopes for the Loran project to solve the calibration problems. I'm still having trouble with interference on home Loran applications but I'm still working on the antenna and filters to determine what is going on. I have been told by many people that Loran works best out on the road away from low frequency sources of man-made noise products.

Taking a look with a fast o-scope shows noise spikes disturbing the Loran operation as its pulse information. WWVB is a constant carrier and does not show that much interference affecting its operation. Well, time will tell the tale on this one. I'm still using VLF at 60 kHz to copy WWVB with my Tracor 599J VLF receiver. It's tunable from 1 kHz to 99.9 kHz in 50 hertz frequency steps. A similar type (much newer) can be found in most instrument calibration labs, used to calibrate their master oscillators.

Well, so much for frequency counters and surplus availability, at least what I have observed on the surplus market. As to pricing: These are the prices that I have observed in surplus, with little for guarantees. I hope it gives you some idea of what to expect on the surplus and new market.

A note on the Loran PCBs we spoke about last month: sorry we are sold out. We are always on the lookout for more surplus bargains though, so stay tuned.

Next month I plan to get into frequency references and standards, showing some of the different types of crystal oscillators that exhibit high accuracy. As always, I will be glad to answer questions concerning this and other related subjects. Please send an SASE for a prompt response. 73
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More Electrono-Art

Last time, we were exploring the rash, fun concept of developing a circuit from scratch, without any plans. Let's get back at it:

HELP!!

Even experienced designer-artists sometimes want to make things that don't seem too hard but are out of their realm of experience. Let's say you are trying to design a circuit stage. You know what you want it to do to the signal, but you don't know how to make it work. Sure, you can puzzle it out for hours, but a much easier way to get where you're going is to look through books and magazines for a project which has a similar circuit stage. Don't kid yourself—there ain't much that hasn't been done before. And, even if your idea is very novel, you may find some circuit meant for an entirely different purpose which has a stage like the one you need. You'd be surprised at how much seemingly unrelated circuits can overlap in function. Heck, I've designed things as disparate as a pressure switch and an ultra-sensitive capacitance detector, both using the same pulse processing technique. And, I've found answers to design problems in very odd places, including schematics for old radios and TVs, as well as 20-year-old project magazines. You just never know.

When you do find a clue in another circuit, don't feel as if you need to use it verbatim. Often, you can learn enough from studying the pre-existing circuit to sit down and design your own solution. In fact, I used to have a huge book of circuits, with hundreds of topics and thousands of schematics. I referred to it many times, and it helped me out of lots of jams. Strangely, though, I never actually built anything directly from that book in all the years I had it! It just helped me see solutions which I then applied in my own way.

Make Something

Now that you know the basics of how to get set up to do this kind of "blind" playing, let's walk through the steps and actually design some small gadget. Well, perhaps I should say we'll simulate designing it; it wouldn't be fun if I did all the work, would it?

So, what to make? Hmmm, how about a delayed trigger for your scope? If you've ever worked with a signal which had lots of features between its periodic points, such as a TV signal or digital pulse train, you know how frustrating it can be to see the feature you want when it's somewhere down in the middle of the signal. If you run your timebase slowly enough to see the desired spot, everything will be too scrunched together to let you observe any detail; all you'll see is a blurry dot. But, if you speed the timebase up, the spot you want to see will go off the screen! The proper way out of this dilemma is to use a delayed-sweep scope. All that means is that it has a control which lets you set a time delay between the point at which the scope triggers and when the sweep starts; you simply turn the knob until the portion of the signal you want to see is on the screen.

Unfortunately, many low-cost scopes don't have delayed sweep. If you mostly make oscillators and such, you've probably never missed having it. But, I promise you will run into something one of these days which will require it, and you'll wish you had that delay knob. Even if you never mess with video, you're bound to try and make a CW keyer, identifier, or something like that, and you'll be stuck.

How to Start?

So, how do you get started? Well, give some thought as to what kinds of signals you want to delay. If you're mostly interested in video, you have some special requirements: You need a clamp (to keep the sync tips from wandering around in DC level) and a sync separator. There are specialized chips which will do those things for you, but why bother to order them and wait (not to mention pay), when you can make those fairly simple circuits from stuff you already have? A video clamp is nothing more than a diode, a capacitor and a couple of resistors, and sync separation can be accomplished with one transistor. But how?

If you need to study a video clamp, look at a TV schematic; there should be one just before the sync separator. Or, check out the "Micro ATV Transmitter" article from the July 1991 issue of *73*, and its update in the August issue. (Surely you didn't throw them out, did you??) You can make a clamp just like that one, or you can design your own, now that you see the basic configuration.

Other Signals

If you're not interested in video, your job is easier. Really, all you need to do is to be sure your input signal is big enough to drive the next stage. Often, one transistor inverter stage is all that's required. But what if you anticipate the input signal's being *too* big? Well, an

RC-coupled input with a couple of clipping diodes isn't a bad idea. Once you've designed one, you'll never forget how again.

Next, Please

OK, we've gotten an input signal conditioned to the point where we can use it to drive the next stage. Our signal is now of the proper level (usually something close to the full zero-to-supply voltage swing), and it's nice and clean, with no spikes or noise to trip us up. What, it isn't that clean? Actually, that's a common problem. If you're going to be driving logic chips, as we are in this gadget, it would be a good idea to get rid of as much noise as possible. How? Well, if you're just dealing with pulses, you can run them through a Schmitt trigger stage before you send them on their way. A Schmitt stage is nothing more than a gate which has hysteresis. That is, its turn-on and turn-off points are not the same. So, once a signal turns the gate on, little noise pulses won't turn it off; the signal will have to change quite a bit to make the stage switch. The same happens in the reverse direction. The hysteresis effect can really go a long way toward removing noise. But where do you find one? Well, if you're going the CMOS route, with fairly low-speed signals (under a few MHz), a 4093 gives you four Schmitt NAND gates for under a buck. And, if you only need one, you can still use the other three as regular NAND gates. Which brings up a subject onto which I must digress for a few moments.

Be Subversive

A NAND gate is a NAND gate, right? Maybe, maybe not. A NAND gate can be subverted into being an inverter, and a couple of NANDs can be made to be an OR, a one-shot, or several other kinds of things. All it takes is an understanding of how you hook them together to get your desired function. Theoretically, you could build an entire computer from NAND gates, but you'd have to be crazy, and have a nearly unlimited supply of chips, to try it. For a more practical example, though, I recently had an urgent need for a manually resettable latch circuit. All it had to do was switch once, on the very first pulse it received, and then stay in the same state from then on, until I manually reset it with a push-button. There are plenty of set-reset (SR) flip-flops which do that, but I couldn't find any at 4 a.m., although I'm sure they're here somewhere. So, I used a 25-cent 4011 NAND chip and one resistor to do it, and it worked great. As an exercise in this kind of subversive thinking, see if you can figure out your own latch, using just NAND gates and a resistor. A hint: It only takes two gates.

Back to Our Show

OK, we're ready for the next stage. How do you delay a pulse? The easiest way is with two one-shots, also known as monostable multivibrators. All these things do is produce one pulse for each input pulse. The trick is that the output pulse's width is not determined by that of the input. Rather, it depends on an RC time constant, which means you can control it. Some good 4000-series monos are the 4098, 4528 and 4538. These are all variations on the same theme; the higher numbers are just higher-precision chips with stabler output widths, and all the parts have the same pinout. For our purposes, it doesn't matter which one you use. The first mono is set up to trigger on the rising edge of the input signal; that's called a "positive-edge" trigger. (The pinout diagram shows which trigger is which.) It produces an output pulse almost immediately, and the output's duration depends on the RC values you've chosen. We're going to use that duration to determine the delay, so it's helpful to use a trimpot for the R value, so that we can make the delay variable.

Ta-Da!

OK, so now we have a variable output pulse which occurs on each pulse of the input. So what? Now, let's connect the output of the first mono to the input of the second. Only this time, let's use the negative-edge trigger. So, this mono will fire at the *end* of the first one's duration. And, we don't need a variable duration for this one. As long as the pulse lasts long enough to trigger the scope, we're in business.

A last emitter-follower transistor to buffer the chip's output from the scope's load, and we're done. Let's examine how it works: The incoming signal gets cleaned up and triggers a mono which produces a variable output width. The end of that pulse triggers another mono which puts out a nice, short pulse to trigger the scope. As we vary the length of the first mono, we vary the time before its output falls and triggers the second one. Voilà, variable delayed triggering!

Of course, we haven't actually designed this thing to the point of wiring it all up. If you try it, you may find that, for instance, the output of your clean-up amp is upside down, requiring you to use an extra NAND gate or inverter to get it the right way. Those are the pitfalls of this kind of work, but they're easy to overcome once you get the hang of it.

I hope you've enjoyed this sojourn through the unstructured, arty side of home-brewing. You can use the same approach to develop all kinds of little things, right on up to simple receivers and transmitters. For really big, complex projects, this kind of thinking can get you into trouble. But, for smaller circuits, it often is the easiest, fastest way to turn an idea into silicon reality. And it's fun. 'Til next time, 73 from KB1UM. 73

73 INTERNATIONAL

Number 24 on your Feedback card

Arnie Johnson N1BAC
43 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

This is a busy month! There's lots of information and not enough room for all of it, so I'll make my remarks very brief. Already on tap for next month is more news from China, Hong Kong, Israel, and the Philippines, and who knows what else will show up in the mail.

This month marks David Cowhig's final good-bye to Okinawa. As mentioned last month, he will reside in Taiwan after a deserved break in the U.S. Note his new address, which will also be good after his move to Taiwan.

On to the latest from your world. 73, Arnie N1BAC.

Roundup

Baku Azerbijan *FAX from Howard Barbrey KB9XN:* **4KØIM NOW ACTIVE** Dave Bendt KC9IM has been licensed in Baku, Azerbijan, to operate on all bands and all modes. The license was effective on May 1, 1994. If anyone would like me to forward a Xerox copy of the license, I would be happy to do so. Dave is the first U.S. operator to be licensed and he holds the calls of TL8IM, KH2AD, KC9IM, and YBØAIM. I will be handling QSLs for Dave during his stay in Baku, which will end in approximately 18 months. Look for Dave on 20 meter phone, and hopefully on the WARC bands also.

Thanks and 73, Howard Barbrey.

Brazil *QSL Manager List from Ronaldo Bastos Reis PS7AB:* For those of you who need an extensive QSL Manager List of Brazilian hams *[5 pages]*, please send US$1 or 1 IRC to: Ronaldo Bastos Reis PS7AB, PO Box 2021, Natal, RN, 59094-970, Brazil. It is published in July and December.

Mount Athos *Letter from Walery Sawka KB2FIV: Last week I received a letter from my friend SV2ASP/A, a.k.a. Father Apollo of Mount Athos, Greece. I wish to share it with other readers of your column. He is back on the air after one year of humble silence! Too bad he never resolved his famous grievance with the ARRL in some meaningful and civilized fashion. I might see him in person this coming fall, with more news and pictures. I wish him all the joy in his radio hobby.*

"Dear DX friends: It's been over two years since Mount Athos went off the air as a protest to ARRL, which, despite the evidence we provided and despite our efforts, finally recognized and approved the illegal transmissions of DJ6SI Baldur Drobnica, from Mount Athos.

As an amateur radio operator and as a Mt. Athos monk, I did my duty in trying to prevent lowering the quality of amateur radio to a level of self-interest, as amateur radio admittedly includes in its entirety many worthy individuals.

However, since many individuals and clubs all over the world insist and beg for the amateur radio voice of Mt. Athos to be heard again as a message of hope and peace to our troubled world, I want to make it known that in the coming year I will occasionally use some of my precious time to see to it that the serene and "out-of-this-world" voice of Mt. Athos will once again be spread to the ends of the earth.

And this, despite my justified grievances toward ARRL, which, as if what happened with DJ6SI was not enough, recently tabled a proposal to expel Mt. Athos from the DXCC list.

But ARRL ignores the fact that Mt. Athos is the continuation and survival to this day of the Byzantine Empire. Despite the fact that it is under the jurisdiction of the Greek State, it has its laws as it is a self-ruled part of it. This privileged status of Mt. Athos has been officially adopted by the European Community, while the undisturbed continuity of its unaltered life has exceeded 10 centuries.

I remain with the conviction that a similar situation will be avoided in the future and send you my best wishes from Mt. Athos.

God Bless You, SV2ASP/A Apollo Monk."

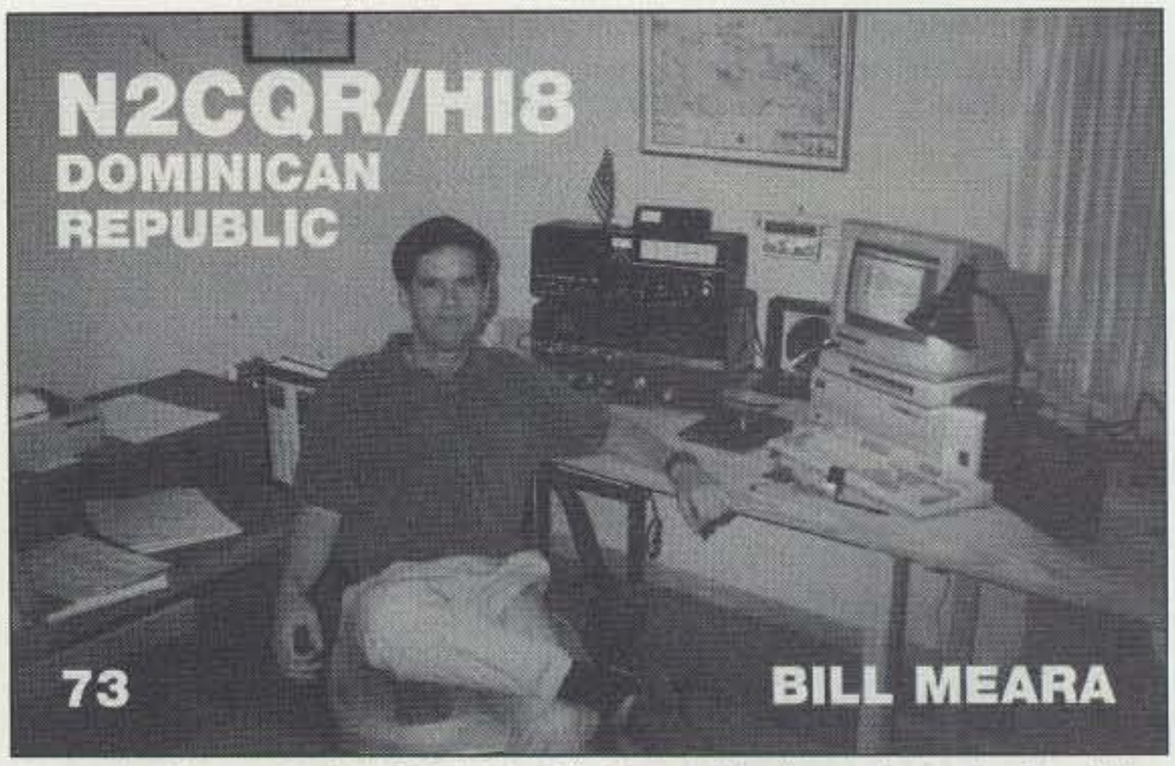

Photo A. QSL card of N2CQR/HI8, Bill Meara, Hambassador to the Dominican Republic.

Switzerland *From the International Telecommunication Union (ITU) Newsletter:* The European Radiocommunications Committee (ERC) of the European Conference of Postal and Telecommunications Administrators, the regional telecommunications organization for Europe, has developed regulatory mechanisms to ease the establishment and operation of amateur stations in Europe. CEPT Recommendation T/R 61-01 was recently revised to permit nationals of any country willing to apply the recommendation to operate their amateur stations during short stays in a CEPT country that also applies the recommendation without any further formalities. Three non-CEPT administrations have already joined this process, known as the CEPT radio amateur license.

In a new development, the ERC at its March 1994 meeting in Cyprus revised CEPT Recommendation 61-02 on the Harmonized Amateur Radio Examination Certificate. Again, non-CEPT countries can also participate in this regulatory process. This will permit radio amateurs holding an approved certificate to obtain without further examination an amateur license in any CEPT country in which they are resident and which has implemented Recommendation T/R 61-02.

Any ITU Member administration can, subject to the successful completion of the process, participate in Recommendations T/R 61-01 and T/R 61-02. If further information is required please contact: European Radiocommunications Office, Holsteinsgade 63, DK-2100 Copenhagen (Denmark); Tel: +45 35 43 24 42; Telefax: +45 35 43 35 14.

Ukraine *Letter from Boris Chuistov UU5JK:* I have known your *73* magazine for a very long time since I've been licensed, and I was glad when I found your February 1994 issue here in Ukraine, an old and nice acquaintance of mine! Not expensive, good articles, nice columns "Ham Help" and "Barter 'n' Buy."

Now we have here an independent state of Ukraine, free press, and no Iron Curtain. We can even subscribe to *73 Amateur Radio Today* and send QSL cards directly to your country and the world.

I am a Russian ham of Extra license with home-brew equipment, like all our amateurs have in the former USSR, as there is not the amateur equipment and radio parts on sale in this country.

I live in Yalta, Peninsula Crimea, on the Black Sea. I am married, with one son, and work as an electrical engineer for a local construction firm.

Now we all changed our prefixes of the callsigns for the different independent countries of the ex-USSR, and Ukraine has now US, UR, UT, UU, UX, and UY prefixes, with the numbers 1 - 0. The Crimean region, where I live (Oblast 067 for W-100-0 awards), uses the prefix UU.

I send greetings to all hams and hope to make contact with them in the future. All letters and QSLs will be answered.

Best wishes from Ukraine, Boris Chuistov UU5JK, PO Box 20, Yalta, Crimea, 334200 Ukraine.

Photo B. Another QSL card of SV2ASP/A, Monk Apollo.

DOMINICAN REPUBLIC

Bill Meara N2CQR/HI8
Unit 5510
APO AA 34041
USA
Packet N2CQR @
HI8WR.SD.DOM.CAR.NA

Greetings from Santo Domingo! I have no central theme for this dispatch—just some "odds and ends" from HI8.

When I got back into ham radio last year, I decided to earn my spurs and do some building. I wondered about how I would be able to find parts in Santo Domingo. I soon discovered that finding components here can be challenging and fun. There is only one Radio Shack outlet in Santo Domingo, and it is very lightly stocked, so a ham

engaged in rig building has to learn where the real "electronic parts markets" are. There is one street here with seven or eight electronics shops. Very little is thrown away, so the shops in Santo Domingo's "electronics district" are full of used components salvaged from broken stereos, TVs, etc. When a choke or transformer burns out, there are several small businesses standing by to rewind it.

Of course, the most important source of spare parts here is the collective junk box of our radio club's membership. This source is particularly important for those of us running older gear. Imagine being in a foreign country and trying to come up with switch wafer FS1 for an ailing HT-37 . . . or the IF filter for an HQ-100! With the help of my fellow hams, I was able to find both these parts in short order right here in Santo Domingo!

A U.S. ham operating from HI8 soon finds himself standing astride the gap that divides two different worlds—with one foot in each! You never stop being an "N2," but you learn a bit about how ham radio looks from HI8! Appropriate of my "odds and ends" theme, I thought I'd use this column to offer a few observations on the use of the Spanish language in ham radio.

Non-Spanish-speaking hams probably perceive Spanish language radio transmissions as a lot of indecipherable high-speed chatter. Those of us who do understand the language know that amidst that chatter one can find the full range of radio conversations: the good, the bad, and the ugly! On the bad and ugly side, you'll hear lots of talk that seems to have little to do with our hobby and more to do with efforts to reduce telephone bills. On the good side, you'll hear many, many QSOs in keeping with the highest traditions of ham radio. Spanish is a very graceful, courtly language that allows for elegant expressions of friendship. Non-Spanish-speaking hams would probably be surprised by what they could hear if they could program their computers to translate QSOs from the Hispanic world! Instead of the "Old Man" used by English speaking hams, the Spanish speaking world seems to go with a simple "Amigo," i.e. "Buenos Dias Amigo Bill!" The very warm fraternal "Hermano" (brother) is frequently used in a sincere manner—even during first contacts! I think English-speaking hams would find Spanish language QSOs very florid, filled with lengthy expressions of best wishes and kind remarks about the other ham's country.

I find that hams from Spanish-speaking countries really appreciate it if a U.S. ham makes the effort to use Spanish. Put yourself in the other guy's shoes: Imagine having to do most of your QSOs in a difficult foreign language! You can almost hear the happiness on the other end when you make the switch to Espanol. This works even in CW (where Hermano and Amigo are also used as described above). The Hispanic world is famous for its tolerance of foreigners who butcher the language. By all means, pull out that high school Spanish and incorporate it into your operations. *[Article continued next month.—Arnie]*

OKINAWA

David Cowhig WA1LBP
AIT TAIPEI
Department of State
Washington, D.C.

I do Japanese language packet contacts in my Okinawa home using my aging 386SX PC running PC-DOS 5/J (J for Japanese language) at my 7J6CBQ home station. I use the WTERM freeware program and the AEA PAKRATT 232. In English-language packet, data is exchanged at a one-character-per-byte rate using the 128-character standard ASCII code. In Japanese language packet, two bytes are used to exchange each character since the 5,000-odd characters of the Japan Industrial Standard (JIS) standard character codes I and II cannot be expressed using just the 256 code combinations in one byte. The DX-TERM packet program now available for Japanese DOS automatically displays NAPLPS videotext images if NAPLPS code is encountered amidst packet data!

Okinawans are preparing to commemorate the 50th anniversary of the Battle of Okinawa during 1995. Every June 23 Okinawans commemorate the Battle of Okinawa, one of the most murderous battles in history, which killed over 200,000 people, mostly Okinawan civilians. Some American veterans of the battle will travel to Okinawa next year to participate. Many Okinawans in their sixties and seventies today have memories, like the taxi driver who told me last week "After my father was wounded in the battle, he came home to us and we all fled north. Later, in the summer of 1945 as we starved in the wooded hills of northern Okinawa, we decided to surrender to the American soldiers. Although the Americans shot at people who ran away from them, they took care of people who came to them and surrendered. I had caught malaria during those months in the woods. I am here today only because an American soldier gave me the medicine that made me well. Many of us feel very grateful to the American soldiers."

Another man, a survivor of the Battle of the Kerama Islands, told me in April how his parents tried to kill their entire family because of the fearful stories they had been told about American soldiers. Many people in the Kerama Islands to this day feel grateful to the American medical corpsmen of the U.S. Army's 77th Division. Recently, I heard that some veterans will return to Okinawa in 1995 on a tour being organized by Military History Tours of 1500

King St., Suite 200, Alexandria, VA 22314; (703) 739-8900.

This week I say good-bye to Okinawa, Japan, after partying vigorously with many of my JS6 friends. My two-year stay in this borderland between China and the main islands of Japan has been great fun. The great Japanese writer Oe Kenzaburo, author of *Okinawa Notes*, has said that the warmth and positive outlook on life of the Okinawans he experienced for three years 20 years ago transformed him and made him "Okinawa sick" forever after. The Okinawan traditional sayings "inochi du takara" (life is a treasure) and "ichari ba chode" (to be like brothers and sisters from the first meeting) give an idea of this Okinawan outlook on life. My JS6 ham friends and many other Okinawan friends have helped me understand how Oe Kenzaburo feels about Okinawa and how I too have become "Okinawa sick."

PEOPLE'S REPUBLIC OF CHINA

Rick Nui BZ1QL
Room 316 Building 25
Tsinghua University
Beijing 100084
People's Republic of China

Both my club and I wholeheartedly appreciate the *73* magazine's reprint of our *China Ham News* bulletins. With no 2 meter packet net in the Beijing area, SB this WW is not a breeze. I have been very grateful for the relay help offered by JA5TX, KE7XO, WA8DRZ, VK2AGE and many other BBS gateways. Please go ahead, gentlemen, as the world needs to know about modern China. TU!

National ham exam: The first-ever Individual Amateur Radio Operator's License exams were scheduled to be held July 16 and 17 in up to 26 cities nationwide. Organized and processed by the Chinese Radio Sports Association (CRSA), the tests cover five different categories: 1. V/UHF Class 3 (CW/SSB); 2. V/UHF Class 3 (SSB); 3. HF Class 3 (CW/SSB); 4. HF Class 3 (SSB); 5. Class 4 (SWL). Different requirements exist for different classes. Some of the contents of these exams are radio regulations, communication procedures, radio fundamentals, hamspeak, international phonetics and Morse code TX/RX.

TUARC on CCTV TUARC was again on television May 29 in one of China Central Television's most popular programs, "Studio 12." The show was about 10 recently-elected Student Elites of Tsinghua University where Rick, the TUARC Public Relations Manager, was one of them. Welcomed by an audience of millions, especially young men and women, "Studio 12" broadcast all throughout China every Sunday evening during the golden time slot 2125-2200, focusing on economic reforms, national policies, social phenomena, youth problems and other sorts of current affairs.

"CQ Taiwan" report A TUARC article written in English was translated into Chinese and got published in the February issue of Taiwan's *CQ Amateur Radio* magazine. As many as 13 photographs accompanied the article, showing the BY1QH QSL cards, the Tsinghua University campus, and what the club has been doing during the past one year. Thanks to Bear BV2WC, the *CQ* editor, for all his efforts. We also compliment him on his excellent interpretation.

Yet another quad If everything goes OK, a booming signal on the three WARC bands will have appeared early in June through our newly designed and erected 2-el cubical quad. Dieter prepared all the cables, wire and a lovely switch box with four red/green LCDs on it, while Sean was in charge of the entire project. Mike and Henry cleaned and painted the steel frame, Mark and Gray measured and cut the bamboo, John drilled eight holes on the angel iron, Will bought some other hardware—it is teamwork that counts. Planned date for installation was June 5.

CQ WPX test As a Single Single Low Power contestant, Rick BZ1QL took part in the CQ WPX CW Contest with the club call on May 28 and 29, operating DJ7BU's Kenwood 440S into a 4-el 20 meter monoband yagi fixed north. A lot of fun. Europe has been fairly easy to work with, not to mention Japan, while there's not much propagation from stateside. By this time next year there will have been a good number of BGs and BAs coming out in China so the world is going to enjoy more unique prefixes from BY land.

China on OSCARS Klaus DJ3NY and Sean BZ1LUV set our FT-726R to 145.812 but nothing was heard when AO-13 was overhead. The German OSCAR enthusiast, currently traveling in China, visited TUARC and helped us check the satellite ground station on May 29. A longtime chap of Dieter DJ7BU's, Klaus brought some N-type connectors to the club during this trip.

Rotor report The very last packet message from Presley N5VGC informed us that the needed parts for our broken CDE HAM IV rotor had been on their way to Beijing from Dallas. With fax, packet radio and airmail involved, our cowboy pal did us a great favor one more time. When we get the rotor repaired, hooked up and running fine, we'll turn it directly to Texas.

TUARC can be reached via any of the following paths:

Digital: BY1QH @ JA5TX.JPN.AS

Internet: Contact gateway_request@Arasmith.COM

Airmail: Rick Niu, Public Relations Manager TUARC, Room 316 Building 25, Tsinghua University, Beijing 100084, People's Republic of China. 73

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NEVER SAY DIE

Continued from page 4

tists. And scientists have a giant problem coping with the concept of life. They've been doing a good job of tracking down matter . . . well, they were doing pretty well when they got it down to atoms, but then some wiseacres weren't satisfied. They wanted to know what atoms were made out of. That got them down to protons and electrons, neutrons and positrons. A few more unsatisfied wiseacres wanted to know what those things were made of. I'm not sure quarks have been that helpful, even now that they think they've finally cornered the sixth, and supposedly last, the top quark. So what are quarks made out of? Let's spend a few billion dollars and find out. And let's know more about K, mu, tau, and pi-mesons. And muons.

Medical scientists have been doing about the same thing with the materials of life. They've taken cells apart and found DNA, a complex molecule with the ability to replicate itself. Now they're busy taking our genes apart and cataloging them with the genome project. But the scientists still haven't a clue as to what makes life.

Perhaps the missing element is one they haven't looked for yet . . . awareness. That's the one really basic difference between the animate and inanimate. How does awareness fit into all this? Consciousness? The mind? Sentience? All living things seem to have awareness, even single cells. Plants and trees seem to have some sort of awareness in that they fight back with chemicals when they are attacked. Apparently it doesn't take a brain for something to have awareness. Awareness, whatever it is, seems to be a property of all life, and thus presumably is the most firmly hardwired circuit of our system.

Plants show an awareness of other plants, and of people. People experience telepathy and other such psi phenomena, so there is some sort of an awareness to awareness communications system which is quite different from molecules, DNA and genes.

Scientists will, I believe, achieve a lot more progress with their medical research when they have a better understanding of life and the awareness that goes along with it. This means researching things that scientists really hate . . . like placebos, prayer, psychic healing, mob psychology, and so on. However, as Barrow and Tipler say in their *The Anthropic Cosmological Principle,* "Physicists . . . are loath to admit any consideration of Mind into their theories."

But then scientists have a long way to go in every branch of science. Physicists still don't agree on what gravity is. Or inertia. Or even what electricity really is. They don't know for sure whether there are magnetic or gravity "fields" or not. In biology they don't know yet how cells decide when to duplicate and how they know what part of the body they are making or replacing. How do they know to become part of a toe? The blueprint, they think, is in that big mess of DNA, only about 10% of which seems involved with the blueprints for the current model human being. They also don't have a clue as to how memory works or how we can retain memories for a lifetime when every cell in our body is being replaced every so often. They don't even know if memory is in the brain. If it is, how come plants, which are even more brainless than some people I've met, have memories?

And how come some people who've lost 90% of their brains still have their memories? And other people with a different 90% of their brain missing, also have their memories?

It gets worse. I was just reading that if you take some of your blood out and connect a sensitive galvanometer to it, even though it is miles away from you it will register the same swings the blood in your body is registering at the time. You can watch it respond as you are calm, excited, having sex, and so on. This almost makes me wonder about what conflicts may result from blood transfusions. It also may help explain how identical twins have so many common events in their lives, even when living apart.

There are many theories of how life got started, but none, other than the Hoyle-Wickramasinghe theory of evolution from space, has any explanation for the existence of such universal awareness. And even their theory only moves the creation of life back one level of abstraction (thanks Korzybski!). However, no amount of taking DNA apart has yet given us any inkling as to how awareness developed. Of course it had to, otherwise we wouldn't be able to hold our ground in the eternal fight for life.

Every plant and animal has to fight on some level for food and the ability to reproduce. Plants do it slowly and man more quickly, with guns and bombs. Awareness is necessary for life. But how did it develop? And what is it?

It Gets Even Worse

Once we recognize that consciousness is something separate from the physical body, we open a very messy door. Then we can no longer categorically deny the existence of non-physical phenomena. Once we open this can of worms we're dealing with what are often non-repeatable experiments. Worse, since this is a fuzzy area, it's alive with con artists. In the medical field we have quacks, both well-meaning and mercenary.

For instance, take out-of-body experiences. I've read some very convincing reports on them. I even attended a Mensa-sponsored conference where Mensa research teams reported on their amazing success with getting people to see what was in a basket hanging up near the ceiling — when not even the experimenter knew what was in it. The only way to avoid confusion once you get into the non-physical is to just refuse to believe anything, no matter how well researched. Fortunately, many people (including scientists) are able to do this. I consider this pathological skepticism.

Instead of ridiculing experimenters and trying to discourage research, we should admit that there just may be some things we don't know about yet and do what we can to learn more. So let's check out precognition, fortunetelling, psychometry, past lives, reincarnation, telepathy, telekinesis, mind reading, auras, Kirlian photography, ghosts, psychics, near death experiences, poltergeists, UFOs, contactees, prayer, haunted houses, voodoo, Indian fakirs, dowsing, Ouija boards, automatic writing, Tarot cards, astral travel, palmistry, phrenology, astrology, all religions, angels, miracles — stuff like that. Sure, some of it is baloney. But is all of it fantasy?

On the medical side of things, how about homeopathy, acupuncture, herbal medicine, ultraviolet light therapy, hydrogen peroxide, photoluminescence, dental amalgam, and so on?

How come so many of the great composers have said that their music often suddenly came to them in completed form when they were dozing off?

We're pretty good at cramming a million or so transistors on a tiny silicon chip, but we've hardly even peeked into the realm of consciousness. That's been off-limits.

The only way I know to be a skeptic (a disbeliever, as opposed to an agnostic) in many of the paranormal fields I listed is to avoid reading about them. For instance, I've just finished reading *Across Time and Death, A mother's search for her past life children,* by Jenny Cockell, a story by a woman who remembered a previous life in good detail and checked up on it. It's a Fireside Book, $10 in paperback. There are a bunch of good books on reincarnation. Two in pocket books are by Michael Talbot and Edith Fiore.

Psychologists frequently find their patients suddenly recalling a past life when under hypnosis. When I was working as a professional psychologist I often found there were present-life problems that could only be resolved by going to a past life, and they were always right there, easily contacted. I also found that anybody can recall a past life. Everybody has 'em.

Indeed, many children annoy their parents with memories of their most recent past life, but these usually fade away by the time they're three or four. At this age it doesn't take much discouragement by one's parents to shut off these memories.

Now how does reincarnation fit in with the 100,000-plus proteins that make up our bodies? Or genes, DNA, and so on? Maybe you'd better check out *The Secret Science Behind Miracles* by Max Freedom Long from your library and see how that goes down.

Author Barbara Taylor Caldwell has made a career out of writing about her past life experiences. Historians have been amazed at the historical accuracy of her novels. Maybe it's time to take a closer look at the mystery of life, which may have little to do with our physical universe, atoms, the speed of light, and even time, itself. 73

Hamfest Premium Deal

Hamfest chairmen…I've got something you can use to make some money, or generate interest inexpensively. You see, we always print a few extra of each issue of *Radio Fun* so we'll have some available for those needing back issues. Not wanting to disappoint anyone, I always print a few too many. The result is that I've got stacks of back issues around here which will be of much more value if I can get them into the hands of readers.

How'd you like to set up a table and sell back issues of *Radio Fun* for 25¢ each? Or, if you are feeling really generous, you can give 'em away. Here's the deal. Just for the cost of packing and shipping I'll send you a bundle. The magazines are free. How many can you use? 250? 500?

Your cost for a box of 250 assorted back issues is $20. Let's see, if you sell 'em for only a quarter apiece you'll bring in $62.50. Pretty good deal. 500 is twice as good. Heck, that'll buy a nice antenna.

Contact 73 Hamfest Premium, 70 Route 202 North, Peterborough NH 03458; or telephone (603) 924-0058 and ask for Harvey Chandler.

Number 25 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check ***Special Events File Area #11*** *on our* ***BBS (603-924-9343)****. for listings that were too late to get into publication.*

OCT 1-2

LOUISVILLE, KY The Greater Louisville Hamfest/ARRL KY State Conv. will be held at the Commonwealth Conv. Center in downtown Louisville. Mail requests for tickets or info to *The Greater Louisville Hamfest Assn., P.O. Box 34444-Q, Louisville KY 40232-4444.* For commercial spaces, call *(812) 948-0037*; Flea Market spaces, *(812) 282-4898.*

OCT 2

HUNTINGTON, IN The Huntington County ARS will sponsor its 6th annual Hamfest from 8 AM-1 PM at the PAL (Police Athletic League) Club. Set-up at 6 AM. VE Exams. Flea Market. Talk-in on 146.085/.685 and 448.975/443.975. Contact *Chris Richardson N9QVI, P.O. Box 284, Huntington IN 46750. Tel. (219) 356-0319.*

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot - Flushing Meadow Park, 47-01 111th St. Set-up at 7:30 AM. Doors open at 9 AM. Talk-in on 444.200 WB2ZZO Rptr.; 146.52 simplex. For reservations, call eves., *Arnie Schiffman WB2YXB, (718) 343-0172; Charles Becker WA2JUJ, (516) 694-3955.*

SAN DIEGO, CA Over a dozen San Diego ARCs, the American Red Cross, and the Salvation Army, will stage the 3rd annual "Ham Radio Roundup." Location: Missile Pk., Missile Rd. & Clairemont Mesa Blvd. Each club or agency (ARRL, MARS, and others) will display the various aspects of amateur radio. Set-up begins at 7 AM; gates open at 10 AM. Contact *Harry A. Hodges WA6YOO, (619) 743-4212.*

OCT 8

GRAND FORKS, ND The Forx ARC will hold their Hamfest/Computer Fair at Grand Forks Civic Auditorium, 615 - 1 Ave. N., starting at 8 AM. Setup at 7 AM. VE Exams at 10 AM, walk-ins welcome. Talk-in on 146.94. Contact *Bob Smith ND1H, 1203 Shakespeare Rd., Grand Forks ND. Tel. (701) 746-9498.*

ST. PETERSBURG, FL The St. Petersburg ARC (SPARC) will sponsor its annual Autumn Hamfest from 8 AM-1 PM at First Unity Church, 469 45th Ave. North. Contact *Caddie Wilmshurst KE4EME, (813) 527-3426.*

TEANECK, NJ The Bergen ARA will hold its annual Fall Hamfest from 8 AM-2 PM at Fairleigh Dickinson Univ. in Teaneck. Please pre-register for spaces with power. VE Exams. Talk-in on 146.790/.190. Contact *Jim Joyce K2ZO, (201) 664-6725.* Please, no calls after 10 PM.

OCT 8-9

MEMPHIS, TN "MemFest '94" Greater Memphis Amateur Radio/Computer Show will be held at Shelby Farms Show Place Arena, 105 Germantown Pkwy., in Germantown TN. The Greater Memphis Amateurs will host this event Sat. 8:30 AM-4 PM; Sun. 8:30 AM-2 PM. VE Exams both days 9 AM-Noon. Talk-in on 144.61/145.21, 447.00/442.00 and 1272.00/1292.00. For Flea Market info, contact *Lee Bowers KA4KVW, (901) 867-3461 after 6 PM.* For general and exhibitor info, call *Steve Fletman KC4ZOV, (901) 363-3159 after 4 PM; or Mary Moore AC4GF, (901) 758-0661.*

OCT 9

DURHAM, CT The Meriden ARC, the Middlesex ARS, and the Shoreline ARC will co-sponsor the Nutmeg Hamfest and CT State ARRL Convention at the Fairgrounds on Route 17 in Durham. Time: 9 AM-3 PM. Campsite and vendor setup at 4 PM Sat., Oct. 8th. VE Exams; call *Ted Trudel, (203) 345-4008* to register in advance. Computer Flea Market. Talk-in on 145.29 Rptr. Vendors contact *John Bartscherer, (203) 238-2453, days.* For general info, call *Jim McCandless, (203) 349-3353 eves. Packet: N1GNV @ W1NRG.CT.USA.NA; Internet: wilsonc@iia.org.*

LIMA, OH The Northwest Ohio ARC will hold a Hamfest at Allen County Fairgrounds. Doors open at 8 AM. Set-up after 4 PM Sat., Oct. 8th. VE Exams, all classes pre-register with completed 610 and check for $5.75 payable to *ARRL/VEC.* Send to *Jon Solomon, 1370 Stevick Rd., Lima OH 45807.*

LINCROFT, NJ The Shore Area Hamfest - '94, sponsored jointly by the Jersey Shore ARA, Neptune ARA, Ocean-Monmouth ARC, Garden State ARA, and the Brookdale ARC, will be held at Brookdale Comm. College in Lincroft. VE Exams at 0900. One CW test session will be held at 0930. Dealer set-up at 0600; doors open to the general public at 0800. For reservations and/or tickets, send an SASE to *Shore Area Ham and Computerfest, P.O. Box 635, Eatontown NJ 07724-0635* before Sep. 25th. Talk-in on 145.485(-). For info, contact *Al Allen K2LG, (908) 495-3246.*

SACRAMENTO, CA The Student ARC of California State Univ.-Sacramento

will sponsor a Swap Meet on the campus located at US 50 and Howe Ave. The Swap will be held from 7 AM-Noon. Talk-in on 145.230(-dup PL 162.2). Contact *Gary Webbenhurst KC6URB, (916) 381-6602, eves.*

OCT 15

DEWITT, NY The Radio Amateurs of Greater Syracuse will hold its 39th Hamfest from 8 AM-3 PM at the Academy Green American Legion Hall in Syracuse (between S. Salina St. & Valley Dr.) Set-up at 7 AM. VE Exams. Write to *RAGS, Box 88, Liverpool NY 13088;* or call *WA2PUU, (315) 469-0590* Talk-in on 147.30 MHz.

JOHNSON CITY, TN The 14th annual Tri-Cities Hamfest will be held at the Appalachian Fair Grounds located off I-181 in Grey TN. The Kingsport, Bristol, and Johnson City Radio Clubs will cosponsor this event. Flea Market. Mail inquiries to *Tri-Cities Hamfest, P.O. Box 3682 CRS, Johnson City TN 37602.*

SANFORD, NC The Lions Club Fairgrounds at 7th & Weatherspoon Sts. has been chosen by the Central Carolina ARS as the location for its Fall Festival. Time: 8 AM-4 PM. Contact *April Maggart KD4QMU, 8512 Deep River Rd., Sanford NC 27330.*

SCOTCH PLAINS, NJ A Hamputer Fest will be held by the Tri-County Radio Assn. from 8 AM-1 PM at Union Catholic Regional H.S. Walk-in VE Exams. Bring check for $5.75 (except Novice exam), made payable to ARRL VEC; bring your original license plus a Xerox copy, 2 forms of ID, pencils and a pen. All who wish to take the exams must be in the exam room by 9:30 AM. Pre-registration is required for tailgating spaces and flea market tables. Contact *Dick Franklin W2EUF, 310 Indian Trail, Mountainside NJ 07092. Tel. (908) 654-4943.* Talk-in on 147.255/.855, 449.975/444.975, and 146.52.

WAYCROSS, GA The Waycross Area Rptr. Assn. 3rd annual Hamfest will be held at Waycross Ware County fairgrounds Exchange Club bldg., Hwy. 82 East. Open 8 AM-4 PM. Talk-in on 146.640 Rptr. License exams, all classes, at 9 AM. Contact *Don Minchew KD4CEX, (912) 283-9553; Woodrow Kirten N4UNC, (912) 449-5357;* or write or call *David Sweat KD4FGC, 3492 Wren Dr., Waycross GA 31501. Tel. (912) 283-4603.*

OCT 16

BENSALEM, PA The Penn Wireless Assn. will hold its annual TRADEFEST from 0800-1400 hours at the Robert Yezzi Fairgrounds on Hulmeville Rd. Auction. Vender setup at 0600. Preregister by Oct. 1st to *PWA, P.O. Box L-734, Langhorne PA 19047;* or call *John N3NUB, (215) 355-0879.* VE Exams. Exhibits. Talk-in on 145.25/144.65, 146.925/146.325, 448.225/443.225 and 146.52 simplex.

LONG ISLAND, NY The Long Island Mobile ARC will hold a Hamfest outdoors at the New York Institute of Tech., Rte 25A, in Old Westbury NY. Time: 9 AM-4 PM. VHF Tune-up Clinic. Talk-in on 146.25/.85. Contact *Neil Hartman WE2V, (516) 462-5549.*

TUCSON, AZ "Tucson Hamfest '94" will be sponsored by the Old Pueblo Radio Club, ARRI and ARCA. The event will be held from 7 AM-1 PM at De Anza Drive-In, 22nd St. and Alvernon Way. Talk-in on 146.22/.82, 146.28/.88, and 146.52 simplex. Contact *A.J. Pawlowski KB7KZ, 3418 W. Green Trees Dr., Tucson AZ 85741. Tel. (602) 742-2605.*

OCT 22

FRANKLIN, PA The Fort Venango Mike & Key Club will host its Ham Radio Auction & Flea Market starting at 8 AM at Venango County 4-H Fairgrounds, (Route 62 between Polk and Franklin PA). Auction at 10 AM. Talk-in in 147.12(+), 145.23(-), and 145.19(-). Contact *Doug Smith N3BDJ, (814) 677-6523* or *Bruno Wolozyn K3MHB, (814) 677-8694;* or write to *Fort Venango Mike & Key Club, RD #1, P.O. Box 591, Cranberry PA 16319.*

OCT 23

SELLERSVILLE, PA The Sellersville Nat'l Guard Armory will be the location for a Special Event that will be held by the RH Hill ARC. VE Testing starts at 9 AM, all classes. Bring documents. Contact *Linda Erdman, (215) 679-5764;* or *P.O. Box 29, Colmar PA 18915.*

WARREN, MI The "USECA SWAP" will be held at Macomb Comm. College, South Campus Student Comm. Center (K-Bldg.) at 12 Mile Rd. & Hayes. Doors open at 8 AM. VE Exams, pre-registration required; call *Bill N8CVC, (313) 468-8345.* Computer Hardware/Software. Ham Gear. Electronic Parts. Connectors and Cable. To register for tables, call *Virginia N8NLS, (313) 268-0691* or *Kevin N8QVX, (313) 772-8082.* Talk-in on 147.18(+) or 146.42 simplex. Make checks payable to *U.S.E.C.A.* and mail with legal size SASE to *Virginia Przekaza, 34473 Coachwood Dr., Sterling Hts MI 48312.* Sponsor: Utica Shelby Emergency Communications Assn.

WAUKESHA, WI The Kettle Moraine RAC Inc., will hold its 16th annual Ham Radio/Computer Swapfest at the Waukesha County Exposition Center, Hwys J & FT. Reservations accepted until Oct. 14th. Doors open 8 AM-1 PM; set-up at 6 AM. VE Exams. For reservations, send a check payable to *KMRA Swapfest, P.O. Box 411, Waukesha WI 53187-0411.* Please include an SASE with your order, or it will be held at the door.

OCT 29

CONNECTICUT The annual Ham Radio Auction, sponsored by Tri City ARC, will be held at the Senior Citizens Center, Waterford Municipal Complex. Set-up at 9 AM. Auction from 10 AM until sold out. Talk-in on 146.07/.67 Rptr. For info call *KA1BB, (203) 739-8016.*

MOBILE, AL The Mobile ARC will hold its Ham/Computer Fest at ABBA Shrine Temple, 7700 Hitt Rd., off Schillingers Rd., from 8 AM-4 PM. VE Exams start

at 9 AM: bring a copy and original of your current license, copy and original of current CSCE, two IDs (one must be a photo) and $5.75. Contact Louis AC4EN. Talk-in on 146.22/.82. Ragchew on 146.34/.94. For more details, contact *Richard Ireland KD4TTD, (205) 824-2749*, or write *M.A.R.C., P.O. Box 81791, Mobile AL 36689.*

OCT 29

PORT ST. LUCIE, FL The Port St. Lucie ARA "PSLFEST94" will be held from 0800 hours-1300 hours at Prima Vista Blvd. and Irving St. Talk-in will be on 146.955 (-) and 146.520 simplex. For details, contact *Bob Blackwell W3HVS, (407) 335-1341* or *Wes Sammis W2YRW, (407) 878-4739.*

ST LOUIS, MO West County Tech School is the location for the Ham Radio Club Hamfest. Time: 8:30 AM-2 PM. Talk-in on 146.34/.94. For details, call *Dave N0OFF or Joe N0SJR at (314) 230-9402;* or write to the club at *10 Ann Ave., Valley Park MO 63088.*

ST. PAUL, MN The Twin Cities FM Club will celebrate the 10th Anniversary of the Hamfest Minnesota & Computer Expo! The event will be held in the main arena at the St. Paul Civic Center, at Kellogg & West 7th St., from 8 AM-4 PM. For info and advance registration, write to *Hamfest Minnesota & Computer Expo!, P.O. Box 5598, Hopkins MN 55343*, or call the Hamfest Minnesota Info Line at *(612) 535-0637.*

OCT 30

DENVER, CO the 1994 RMRL Hamfest will be held by the Rocky Mountain Radio League, Inc., from 8 AM-2 PM at Jefferson County Fairgrounds, 15200 W. 6th Ave., Golden CO. VE Exams. ARRL Forum. Talk-in on 144.62/145.22 MHz. Contact *Joe Dickinson WT0C, (303) 771-9577.*

LEBANON, IN The Boone & Clinton Co. ARCs will stage a Special Event at Boone Co. 4-H Fairgrounds, Warm & Dry Comm. Bldg. Flea Market. VE Exams. Talk-in on 147.105 and 443.150. Contact *Sam Paul WA9YZE* or *P.O. Box 186, Lebanon IN 46052.*

WESTMINSTER, MD The Radio Clubs of Carroll County MD and Penn-Mar PA will hold the 5th annual Mason-Dixon Computer/Hamfest at the Carroll County Ag Center in Westminster MD. Setup at 6 AM. Opening at 8 AM. VE Exam registration begins at 8 AM, pre-registration requested. Talk-in on 145.41 MHz. Contact *Gary Viands KE3FN, (717) 259-7342.* To pre-register for VE Exams, call *Page Evans NE3P, (717) 359-7610.*

SPECIAL EVENT STATIONS

SEP 30-OCT 1

ISHPEMING, MI The Hiawatha ARA will operate Station KB8DNS Sep. 30th 1700 UTC-0200 UTC, and Oct. 1st 1500 UTC-2000 UTC. This is to commemorate the 40th Anniversary of the Nat'l. Ski Hall of Fame; and the 90th Anniversary of the U.S. Ski Assn. Freq.: General phone and CW Novice on 80, 75, 40, 15, 20, 10, and 2 meters. For a certificate, send a 9" x 12" SASE to *Rod KB8DNS, 1740 Rosewood Ln., Ishpeming MI 49849.*

OCT 1

ALAMOGORDO, NM The Alamogordo ARC will operate Station N5SUM from The Intern'l Space Hall of Fame & Museum, in conjunction with the annual induction ceremonies. Operation will be from 1500 UTC-2300 UTC. SSB: 28.475, 21.375 and 14.275 +/- QRM. CW frequencies will be announced on the air. A station for satellite contacts is being planned. A QSL card picturing the Space Hall will be mailed to all 2 way/SWL requests received and confirmed. No SASE required. Address mail to *Intern'l Space Hall of Fame, ATTN: N5SUM, Route 2001 P.O. Box 533, Alamogordo NM 88311-0533.* Do not send requests to callbook address. For more info, contact *Bill Leehan N5SUM, (505) 437-9781*, or via *K5DI BBS in NM.*

ANAMOSA, IA The Jones County ARC will operate N0CWP 1500Z-2000Z, to celebrate their annual Pumpkinfest. Operation will be in the lower 50 kHz of the General subbands. For a certificate, send confirming QSL to *Jim McClintok N0CWP, Box 462, Morley IA 52312.*

RICHARDSON, TX The Alcatel ARA will operate N5TBQ from the Open House site of Alcatel Network Systems, Inc. Time: 1500Z-2200Z. Frequencies: General phone portions of 40, 20, 15, and 10 meters. For a QSL card, send contact report to *Alcatel Network Systems, Inc., AARA, M/S 401-212, 1225 North Alma Rd., Richardson TX 75081-2206.*

OCT 1-2

PITTSBURGH, PA The Breezeshooters ARC will operate Station W3XX 1400Z-2100Z Oct. 1-2, from the submarine U.S.S. Requin, docked at the Carnegie Science Center. Operation will be CW on 7.123 and 21.123, and phone on 7.250, 14.250, 21.350, 28.460, and 146.52. For a certificate and QSL card, send QSL and an 8 1/2" x 11" SASE to *Ron Berry WB3LHD, 326 Sunset Dr., Bethel Pk., PA 15102.*

OCT 8

SANTA ROSA ISLAND, FL The 30th Anniversary of Islands On The Air (IOTA) will be observed by the SHARC group of Pensacola, operating from Fort Pickens on Santa Rosa Island (NA-142), from 1300Z-2000Z. SSB and CW operations will be on 40, 20, 15, and 10 (Novice sub-band, conditions permitting), and on the IOTA call-in freqs. of 14.260 and 21.26o MHz, +/- 10 kHz. For a QSL card, send yours with QSO contact number given (enclose an SASE). Send to *N4MAD.*

SAYREVILLE, NJ Members of the Raritan Bay Radio Amateurs will operate /ABRA from 0000Z-2400Z to commemorate the 40th Anniversary of their

club. CW operation will be in the Novice CW sub-bands. Phone operation will be in the lower portion of the General phone sub-bands on 80-15 meters, as well as in the 10 meter Novice phone sub-band. For a certificate, please send a QSL and a 9" x 12" SASE to the callbook address of the station worked.

OCT 14-16

GREEN VALLEY, AZ The Green Valley ARC will operate KC7MF from 1600Z Oct. 14th-2300Z Oct. 16th, to commemorate the dedication of the Green Valley Titan Missile Museum as a Historical National Monument. Phone Bands: 3.860 (AM or SB); 7.230; 14.250; 21.330; 28.450 MHz. The local 2M Repeater operation will use 145.290 MHz(-600). For a certificate send QSL and an 8" x 12" SASE to *GVARC, 601 N. La Canada, Green Valley AZ 85614.*

WISCONSIN To commemorate its 3rd annual disaster-services seminar, SATERN (Salvation Army Team Emergency Radio Network) will sponsor Station WW9E. CW and SSB activities are planned for the lower portions of the General and Novice subbands. Digital activities are also planned. For QSL, please send your card, SASE, and name of operator worked to *NH2Z, Apt. #608, 84-265 Farrington Hwy, Waianae Hawaii 96792*, or directly to operator contacted.

OCT 15-16

TABLE MOUNTAIN, CA The 4th annual "Mountain Top Mobile" will be conducted in the San Gabriel Mts. Operations will be in the lower portions of the 20 and 15 meter phone subbands, RS 12 satellite passes, and in the 40 meter Novice CW and 10 meter Novice phone subbands. Listen for "Mountain Top Mobile" moniker. For a certificate, send QSL and 9" x 12" SASE to *Ivan Hinkle N6PQB, 2121 E. Ave. I #70, Lancaster CA 93535.*

WESTPORT, MA The Westport Hams (WHAMS) will operate K1MYL on 15 and 16 Oct. from 1400 UTC-2100 UTC, to celebrate the 4th annual Westport Harvest Festival. Operation will be in the General portion of 80, 40, 20, 17, and 15 meter bands, and the Novice portion of 10 meters; and on 147.45 simplex. For a special QSL, send your QSL and SASE to *Leonard A. Moniz K1MYL, 43 Kirby Rd., Westport MA 02790.*

OCT 16

WARMINSTER, PA WA3DFU and the Warminster ARC will sponsor the "Almost Annual Delaware DX-pedition." Operation will be from 1200 UTC-2100 UTC. Look for them near 7225, 14275 and 28440; CW on request. Send SASE to *WA3DFU, P.O. Box 113, Warminster PA 18974.*

OCT 22

LYNCHBURG, TN The Alabama Goodtime Gang will operate WD4JDB from 1100Z-0000Z from the location of the 6th annual Jack Daniels Internat'l Invitational Barbecue Cookoff. Operation will be in the middle of the General phone portion of 80, 40, 20, 15, and the Novice portion of 10 meters. Packet frequencies will be 145.01 and 145.05. For a certificate, send QSL and a 9" x 12" SASE to *AGTG, P.O. Box 1624, Anniston AL 36202.*

YORKTOWN, VA The Williamsburg Area ARC will operate W4TMN 1200Z-0100Z to celebrate the 213th Anniversary of the surrender of Cornwallis at Yorktown in 1781. Frequencies: 28.350, 24.950, 21.350, 18.150, 14.270, 7.270, and 3.870. For an unfolded certificate, send QSL and a 9" x 12" SASE to *Michael Conte KD4HYT, 120 Crescent Dr., Williamsburg VA 23188.*

OCT 22-23

CRESCENT CITY, CA KA6SPO will operate Sat. and Sun. 1500Z-0600Z, to celebrate 102 years of the Point Saint George Light House. Operation will be in the lower portions of the General sub bands. A certificate and QSL card are available. Send an SASE to *KA6SPQ, Bill Wortell, 110 Cannon Dr., Crescent City CA 95531*

OCT 29

PISCATAWAY, NJ AA2KS from Long Valley NJ will celebrate Halloween by operating a SE Station from the site of "The Ghost of Long Valley." Operation will take place on Oct. 29th for 24 hours. Frequencies: General portion of 40, 20, and 15 meters, and Novice 10 meters. For a special QSL card, send QSL and SASE to *Piscataway ARC, P.O. Box 1233, Piscataway NJ 08854.* Sponsored by the Piscataway ARC.

OCT 31-NOV 1

BREVARD, NC The Transylvania County ARC will operate Station KD4ZY, from Transylvania County NC. Time: 2100Z Oct. 31-0100Z Nov. 1. Frequencies: 7.234. 14.295. 21.365. and 28.335 SSB; and 146.52 FM simplex. For a certificate, send a legal size or 9" x 12" SASE to *Willis B. Casey KD4ZY, 116 Campbell Dr., Pisgah Forest NC 28768.* Operation will be from the Devil's Courthouse on Blue Ridge Pkwy., weather permitting.

NOV 5-7

WICHITA, KS The Wichita ARC will operate W0SOE from the Wichita Boathouse. The Station will commemorate the world's first all female yacht racing team aboard the America 3. Operation will be on the final day of the World Cup yacht races. Time: Nov. 5th, 10 AM-5 PM; Nov. 6th, 1 PM-5 PM. Freqs. include lower portions of General phone subbands on 20 and 15 meters, and Novice phone subband of 10 meters (propagation permitting). QSL with SASE to *KD0AY, 1603 Fairview, Wichita KS 67203.*

Number 26 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 East Chateau Circle
Payson AZ 85541

This month will provide a mixed bag of conditions, and it appears that there may not be any constant conditions that remain the same for even three days in a row. You can expect almost constant changes in propagation, and it looks like the week of the 9th through the 15th will be the closest approximation to consistency from day to day for Fair-to-Good propagation. The *worst* periods will be the 3rd through the 5th and the 18th through the 20th (see the chart), and again on the 24th and 25th. The contest weekends won't be spectacular, but ought to prove Fair-to-Good propagation for you DXers.

10 and 12 Meter Bands

Occasional F-2 layer skip on Good days to tropical areas (South America and countries below the equator) during daytime hours. The band closes before local dark.

15 and 17 Meter Bands

Fairly good DX to Africa and Latin America from North America, and fairly good short skip out to 1,000 miles or so during the day. The band will close early and open late. Some grey-line DX is possible. The band closes shortly after dark.

20 Meter Band

This is *best* band of all for DX between sunrise and sunset to most parts of the world. On Good days you may find the best results in the mornings and afternoons, and occasionally long-haul trans-equatorial openings. There will be short daytime skip out to about 2,000 miles on Good days.

30 and 40 Meter Bands

DX can be expected between about sunset and sunrise on Good days . . . and even on Fair days. Signals from the east will peak between sunset and midnight local time, and from other directions between midnight and sunrise local time. Short skip out to about 1,000 miles during the daytime, and out to beyond 2,000 miles during the evening hours. The band "goes long" after sunset local time on both 30 and 40 meters. Some aspects of 30 are similar to 20, while other aspects are similar to 40. You'll just have to watch closely each day and night, paying attention to the WWV numbers at 18 minutes past any hour.

80 and 160 Meter Bands

You will find decent conditions between local sunset and sunrise on Good days (see chart) to DX areas of the world, with very short skip (300-400 miles) during the daytime, and to about 2,000 miles or so at night. I never had much luck on 80 around noon, but found late afternoon and early morning to be the best times during daylight hours. DX on these two bands is noise-dependent as well. Best results will occur at night when QRN levels are low, and on Good days per the chart. 160 works best when you use a vertical antenna to transmit and a Beverage or similar horizontal antenna for reception. There won't be any daylight skip on 160, but DX usually peaks around midnight and again about sunrise. Nighttime skip can be up to 1,000 miles (short skip) and over 2,000 miles (long skip DX) on Good days.

General Comments

Keep an eye on WWV daily; use Good days for best results; and do your operating when the static levels are low. See you next month. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20						20					15
AGENTINA	20	40A	20	40					10		20A	20A
AUSTRALIA	20	40A		40	40	20	20	20		20	15	15
CANAL ZONE	40A	40A	40	40	40		20	20A	10	15A	20A	20
ENGLAND	40	40	40	40				15	20A	20		
HAWAII	20	20				20	20			15	15	15
INDIA						20	20	20				
JAPAN	20					40	20				15	15
MEXICO	40A	40A	40	40	40		20	20A	10	15A	20A	20
PHILIPPINES							20					
PUERTO RICO	40A	40A	40	40	40	20	20A	15A	15A	20A	20	40A
SOUTH AFRICA	40	40A	20					15A	15A	20A	20A	20A
U.S.S.R.	20	20					20	15			20	20
WESTCOAST	21A	20	40	40	40	40	40	20	15	15A	15A	15A

CENTRAL UNITED STATES TO:

ALASKA	20				40	40	20	20			15	15
ARGENTINA	20	40	40	40						15A	20A	20A
AUSTRALIA					40	40	20	20	20		15	15
CANAL ZONE	40	40	40	40	40	20	20	15	15A	15A	15A	15
ENGLAND	40	40	40	40				15	15	20A	20	20
HAWAII	20	20	20	40	40		20	20		10	10	15
INDIA	20	20					20	20				
JAPAN	20					40	20	20				15
MEXICO	40	40	40	40	40	20	20	20	20	15A	15A	15
PHILIPPINES	20A	20					20	20			15	15
PUERTO RICO	40	40	40	40	40	20	20	20	20	15A	15A	15
SOUTH AFRICA							10	15A	15	20A	20A	20
U.S.S.R.							20	20A	15	20	20	

WESTERN UNITED STATES TO:

ALASKA	20A	20A	20			40	40	40A	20	20	20	20A
ARGENTINA	20A	20	40A	40						15A	15A	15A
AUSTRALIA	20A	20A	20	20	40	40	40		20	20	15	15
CANAL ZONE	20	20	40A	40A	40			20	20A	15A	15A	15A
ENGLAND			40					20	15	20A	20	20
HAWAII	15	20A	20A	40A	40	40	40	20	20	20		15A
INDIA	20A	20A						20	20			
JAPAN	20A	20A	20			40	40	40A	20	20	20	20A
MEXICO	20	20	40A	40A	40			20	20A	15A	15A	15A
PHILIPPINES	15			20		40	40		20	20		
PUERTO RICO	20	20	40A	40A	40			20	20A	15A	15A	15A
SOUTH AFRICA	20							20	20	15	20	20
U.S.S.R.			40	40				20A	15A	10	20	20
EAST COAST	15A	20	40	40	40	40	40	20	15	15A	15A	15A

A=Next higher frequency band may also be useful. G=Good, F=Fair, P=Poor.

OCTOBER 1994

SUN	MON	TUE	WED	THU	FRI	SAT
						1 G-F
2 F	3 F-P	4 P-VP	5 P-F	6 F-G	7 G	8 G
9 G-F	10 G-F	11 F-G	12 G	13 G-F	14 G-F	15 F
16 F	17 F-P	18 P	19 P	20 P	21 P-F	22 F
23 F-P	24 P	25 P	26 P-F	27 F	28 F-P	29 P-F
30 F	31 F-G					

Number 27 on your Feedback card

BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the Barter 'n' Buy, Judy Walker, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls.

The deadline for the November classified ad section is September 8, 1994.

ALL ABOUT CRYSTAL SETS. Theory and construction of crystal set radios. $9.95 each, ppd USA. Send to: **ALLABOUT BOOKS**, Dept. S, P.O. Box 22366, San Diego CA 92192. BNB200

CUSTOM MADE-HAND TOOLED leather products with your initials, name, call letters. Photo's & estimates available. Key rings, wallets, belts, purses, hanging signs, specialty items. GREAT GIFT. **LEATHER & WEST,** 67 Causeway Rd., West Swanzey NH 03469. (603)352-6256. 9-4 pm. M-F ET. BNB215

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette, $12.00. LEARN MORSE CODE IN 1 HOUR. Amazing supereasy technique, $12.00. Both, $20.00. Moneyback guarantee. Free catalog: SASE, **BARH-T6,** 150 Greenfield, Bloomingdale IL 60108. BNB221

WANTED: AUDIO EQUIPMENT. Tube, Solid State, McIntosh, Marantz, Tannoy, EV-Patricians, Western Electric, Nakamichi preferred. John, (410)465-2699. BNB268

KPC-3 WINDOWS TERMINAL PROGRAM User friendly Split Screen, 400 line Scrollback Buffer, Save & Send files easily, 3D Command Buttons, $29.95 or SASE for FREE details. **COMTREK** P.O. Box 4101, Concord NH 03302-4101. BNB271

QSL SAMPLES- 50 cents. **SAMCARDS,** 48 Monte Carlo Dr., Pittsburgh PA 15239. BNB275

DWYER WIND SPEED INDICATOR only $55.00 plus $4.00 S/H. For home or office. Accurate, low-cost, practical. Roof mounted pickup. Send check or M.O. to: **RAD-MON COMPANY,** Dept A, Box 751, Marathon NY 13803-0751. (NY Residents add Sales Tax) BNB285

ATTENTION HAMS! Subscribe to *6-50 Worldwide for Six Meter Enthusiasts*, *DX Digest for DX Chasers*, or *The Novice/Tech Report*. Call (817)694-4047 or FAX (817)694-2522. BNB292

COMMODORE 64 REPAIR. Fast turn around. **SOUTHERN TECHNOLOGIES AMATEUR RADIO,** 10715 SW 190th Street #9, Miami FL 33157. (305)238-3327. BNB295

KIT BUILDERS— NEW, SYNTHESIZED qrp Transmitter/Transceiver, the ARK4. Full Transceiver Kit w/case only $199.95. One board, no wiring, top quality components & PCB. GUARANTEED TO WORK. For info send SASE; Call/Write to order: **S & S ENGINEERING**, 14102 Brown Road, Smithsburg MD 21783; (301)416-0661. BNB304

WANTED: Electron Tubes, ICS, Semiconductors. **ASTRAL,** P.O. Box 707ST, Linden NJ 07036. Call (800)666-8467. BNB307

KENWOOD AUTHORIZED REPAIR. Also ICOM, Yaesu. **GROTON ELECTRONICS,** Box 379, Groton MA 01450. (508)448-3322. BNB310

GMRS: ALTERNATIVE TO CB AND HAM RADIO. Great for traveling, camping or other family use, 2ed. Send $3.00 to: Neiferd, KG8EP, 2695 Haystack Dr., Colorado Springs CO 80922. BNB326

PROGRAMMABLE COUNTER— Works with ANY VFO Rig! Get a digital display for your rig, 100 Hz resolution. You can read the tuned frequency directly, no need to calculate offsets. Counts to 40 Mhz, up OR down. Counter Kit, $69.95; Kit w/case, $99.95; Assembled w/case, $139.95. GUARANTEED TO WORK. For info send SASE: Call/write to order: **S & S ENGINEERING,** 14102 Brown Road, Smithsburg MD 21783; (301)416-0661. BNB334

Continued on page 80

Number 28 on your Feedback card

NEW PRODUCTS

Compiled by Charles Warrington WA1RZW

ICOM

Icom has introduced the IC-21H 2 meter mobile with receive capability on the 440 MHz band. By using this bonus band, hams can enjoy full duplex crossband operation!

You can automatically store your last 10 transmit frequencies in the scratchpad memories (five simplex and five duplex). This allows you to instantly recall recent operating information. Add to this the IC-281H's 60 regular memory channels and you have a very smart mobile rig.

Automatic memory channel advance enables easy programming. A TNC can be connected directly to the modulation circuit via the DATA jack. The IC-281H can handle 9,600 bps with no modification. Special circuit design prevents overmodulation during high data throughput. This rig is designed to handle high duty-cycle operation, such as packet, with high stability.

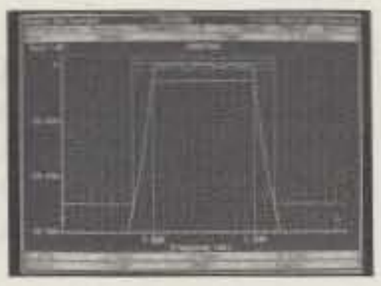
The suggested retail price is $462. Many options are also available. For more information, visit your favorite dealer or contact *ICOM America, Inc., 2380-116th Avenue N.E., Bellevue, WA 98004; (206) 454-8155.* Or circle Reader Service No. 201.

NUMBER ONE SYSTEMS

Until now, designing passive filters for use in electronic circuits has often been regarded as a black art. Your choice used to be limited to either complex mathematical problems or the error-prone manipulation of esoteric constants derived from tables.

Now Number One Systems has introduced Filtech, a new filter circuit synthesis program. Filtech gives the practicing design engineer or homebrewer quick and painless answers to filter design problems while encouraging experimentation and learning in an interactive manner.

Filtech is able to analyze synthesized filter circuits independently and display a graphic plot of the calculated



frequency response, superimposed on the specified filter limits. The program can synthesize both active and passive filters up to sixth order with a frequency range extending from fractions of a hertz to over a gigahertz. It is priced at US $275. For more information contact *Number One Systems, 1795 Granger Avenue, Los Altos, CA 94024; (415) 968-9306.* Or circle Reader Service No. 204.

CONTACT EAST

The new Contact East catalog is now available, 244 pages filled with new test instruments and tools for engineers, technicians, and homebrewing hams. Quality products from brand-name manufacturers are featured for the testing, repairing, and assembling of electronic equipment.

Product highlights include new items: DMMs, custom tool kits, EPROM programmers, power supplies ELF meters, books, breadboards, scope meters, and precision hand tools. Also included are popular

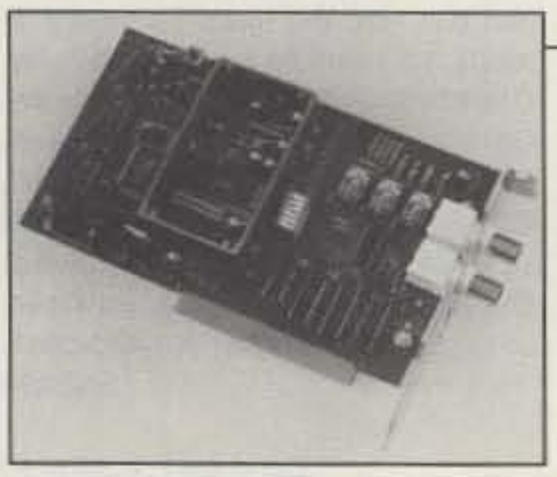
test equipment, soldering/de-soldering systems, static protection products, ozone safe cleaners, magnifiers, inspection equipment, workbenches, cases and more. All orders placed by 4 p.m. are shipped by 5 p.m. To receive your free copy, contact *Contact East, 335 Willow Street, No. Andover, MA 01845; (508) 682-2000, FAX (508) 688-7829.* Or circle Reader Service No. 206.

TRIPP LITE

The MasterTouch under-monitor surge suppressor from Tripp Lite offers features not found on any other console-style surge suppressor at any price. The unit features special diagnostic circuitry to warn of potential power problems before the equipment is turned on. Color indicators display power protection status plus wiring integrity of the outlet source. An exclusive brownout indicator signals the presence of dangerous low voltages that can damage equipment, allowing the user to power-down until the danger passes.

The MasterTouch Plus features FAX/modem protection. Both models feature an attractive low-profile design. They have ISOBAR surge suppression circuitry, with 1080 joules of spike protection at up to 54,000 amps. Superior noise filtering is also provided. Both feature a lifetime warranty and Ultimate Lifetime Insurance to protect connected equipment against surge damage, up to $25,000.

The MasterTouch has a suggested retail price of $139.95; the MasterTouch Plus has a suggested retail price of $149.95. For more information contact *Tripp Lite, 500 N. Orleans, Chicago, IL 60610-4188; (312) 329-1777, FAX (312) 644-6505.* Or circle Reader Service No. 208.



NOVATECH INSTRUMENTS

Novatech Instruments has introduced the Model DDS4 PC—a 34 MHz Synthesized Signal Source on a PC Card for use in PC XT and PC AT, or later ISA bus computers. The DDS4 PC Direct Digital Synthesizer provides 10 ppm/year stability and excellent spectral purity for an economical price. It can generate sine and TTL clock signals simultaneously from 5 Hz to 34 MHz in 0.02 Hz steps.

By using the latest digital technology, it achieves spectral purity comparable to that of older instruments costing many thousands of dollars.

The DDS4 PC comes with a C language program that runs under DOS and makes it easy to set frequency and attenuation or to sweep through a set of frequency, attenuation, or dwell time settings. The DDS4 PC is priced at $550. For more information contact *Novatech Instruments, Inc., 1530 Eastlake Ave. E., #303, Seattle, WA 98102; (206) 328-6902, FAX (206) 328-6904.* Or circle Reader Service No. 207.

ADVANCED ELECTRONIC APPLICATIONS

AEA has introduced the latest addition to its high-quality data controller line—the PK-12 Packet Controller. The PK-12 is a low cost, 1200 bps VHF/UHF packet controller designed for those hams who are just getting into packet radio, as well as for those serious packeteers who want a small portable unit.

The PK-12 comes with AEA's MailDrop feature, allowing users to automatically receive and reverse-forward messages and third-party traffic. The unit is a power saver as well, requiring less than 80 mA @ 13.6 VDC.

You don't have to spend time learning a huge command list with the PK-12. The command set can be be limited to the most-often-used commands. Just plug it in and get on the air!

The suggested retail price is $129. For more information, visit your favorite amateur radio dealer or contact *Advanced Electronic Applications, Inc., P.O. Box C2160, Lynnwood, WA 98036; (206) 774-5554, FAX (206) 775-2340.* Or circle Reader Service No. 202.

NCG COMET

The new Power Pocket from NCG Comet is a convenient, compact slim design Yuasa battery providing a dependable 2 Ah of 12V power.

The lightweight (30 oz.) Power Pocket is enclosed in a comfortable soft case, which can be worn on a belt or with the included shoulder strap/hip belt. A standard cigarette lighter adapter plug inserts into the fused adapter socket, providing hours of extended operation.

The sealed-case lead-acid battery can be topped-off without the memory effects of NiCds. A 110 VAC wall charger is included.

The Power Pocket offers a good backup for your HT battery for emergency and extended use. For more information, visit your favorite dealer or contact *NCG Comet, 1275 North Grove Street, Anaheim, CA 92806; (714) 630-4541, FAX (714) 630-7024.* Or circle Reader Service No. 203.

THE TOOL RESOURCE

The Hexacon HTR 3320 soldering station is now available from The Tool Resource. This workhorse is designed with temperature regulation from 350 degrees F to 850 degrees F. The thermal compensating element increases the iron's output as the work rate increases.

The HTR 3320 solders a wide range of electronic connections and multi-layer PC boards, making this a good choice for the workbench. There are no moving parts, ensuring high reliability and simple maintenance. It also accepts a wide range of surface-mount tips.

The price is $74.99. For more information contact *The Tool Resource, P.O. Box 1106, W. Dundee, IL 60118; Voice and FAX (708) 468-0849.* Or circle Reader Service No. 205.

BARTER 'N' BUY

Continued from page 79

RCI-2950/2970: New modification manual including Power increase. Clarifier modification. Modulation increase. Operating hints, and more. Parts included. Only $20.00 ppd in U.S. (Missouri residents add $1.15 tax). **SCOTT**, P.O. Box 510408, St., Louis MO 63151-0408. (314)846-0252. Money Orders or C.O.D. BNB340

HR2510, RCI2950, CONNEX 3300, COBRA 148, GALAXY SATURN, plus many more kits to increase your modulation, $19.95. **(800)536-0109.** BNB350

QSL CARDS — Standard and custom. Your ideas or ours. Excellent quality. Foil stamping available. Many designs and type styles. Catalog and samples $1.00 refundable. **WILKINS**, Dept. A, Box 787, Atascadero CA 93423. BNB370

CALLSIGN WRISTWATCH - Free details. **KC6UEC,** 9438 Broadway, Temple City CA 91780. BNB379

NEW NN1G CW SUPER-HET SINGLE BAND TRANSCEIVER KIT. Available in 20M, 30M, 40M, 80M. $59.95 plus $3.75 S/H. (Catalog-2 Stamps). **DAN'S SMALL PARTS & KITS,** 1935 South 3rd West #1, Missoula MT 59801. BNB385

SERVICE . . . . .MONITORS . . . . .WANTED . . . . .
SERVICE . . . . .MONITORS . . . . .WANTED . . . . .
Any late model . . . . .Test Equipment. . . . . .
Call, (408)241-7376. BNB390

CW'ers, USN FLAMEPROOF KEY, new, packed 1955, $59 (shipping included). Collectors, 15 pages, mostly telegraphic, refundable $2.00 plus 2 Stamps. Joseph Jacobs, 60 Seaview Terr., Northport NY 11768. BNB393

IT'S BACK! The return of the HW-8 Handbook! Second printing. Modifications for the Heath QRP rigs. First class mail $11. DX add $4 for air mail shipping. **Mike Bryce, WB8VGE,** 2225 Mayflower NW, Massillon OH 44647. BNB404

47 FOOT ANTENNA WORKS ALL BANDS. Only $40.00 ppd in 48 states. Fully assembled, not a kit. Superb results! Satisfaction guaranteed 100%. SASE for catalog and information sheet. **THE ANT FARM,** P.O. Box 3196, Wescosville PA 18106. BNB409

ULTIMATE CONSTRUCTION directions for inexpensive project to determine accurate beam direction for DX from your QTH. For plans send SASE and $5.00 to: KA1EHG/1, Box 11, North Bridgton ME 04057-0011. BNB417

MAHLON LOOMIS, INVENTOR OF RADIO; (patented 1872) by Thomas Appleby. (Copyright 1967). Available from **JOHAN K.V. SVANHOLM, N3RF, SVANHOLM RESEARCH LABORATORIES,** P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. BNB420

BROWNIES QSL CARDS SINCE 1939. Catalog & samples $1 (refundable with order). 3035 Lehigh Street, Allentown PA 18103. BNB430

BUTTERNUT ANTENNAS, NEW—in box. (2)HF6-VX, $125.00; (2)HF5B, $200.00; (2)HF2V, $110.00; (1)HF7VX, $150.00. (210)435-6190. BNB435

RADIO DOCTOR VIDEOS for Repair and Alignment of HF Transceivers. Reviewed by Gordon West, January—*73 Magazine.* Videos for popular KENWOOD, YAESU, and ICOM. ORDERS: **(800)788-1416** MC/VISA. **Catalog: SASE** (2 stamps): **RADIO DOCTOR**, 710 Teague Dr., Kennesaw GA 30144. BNB442

FREE...Ham Radio **Gospel Tracts:** DX Contact and Christian Helps, SASE: N1GDP, RAR-OFC, P.O. Box 8, Harmony ME 04942. BNB443

SKED-ALARM A Windows based alarm to track your radio schedules. Keeps up to 5 skeds with dual-digital clocks in UTC/local time/date. Records Time/Date/Frequency. Send $22.50 check or M.O. to: **SOFTSPARKS SOFTWARE,** 2601 Cartwright Rd., Suite D-306, Missouri City TX 77459. (Include Name and Call. Texas residents include state tax.) BNB446

ICOM IC-736 RAFFLE: One hundred tickets ONLY at $30.00 a piece. Drawing to be held at 1 p.m. on December 23 at the RC of JHS 22 in NYC. Tickets/Questions - WB2JKJ, RC of JHS 22, P.O. Box 1052, New York NY 10002. Phone (516)674-4072, Fax (516)674-9600. This will go fast, ACT TODAY. BNB455

HAMS, DO YOU NEED PRINTER RIBBONS? Lowest prices. Color or Black. Tell us what you need. Free Info. **HARCLY(A),** P.O. Box 830, Coquille, OR 97423. BNB457

CDROM-94 HAM RADIO CALLSIGN DATA BASE Ham Radio Callsign Database with hundreds of PC Compatible programs, radio mods, TCP/IP Usenet, Ham Radio Archives, FCC Rules & Regulations, current exam question pools, and Canadian Call Signs. Only $24.95, with Windows/DOS Interface. Includes shipping! Send check to: **CDROM**, 2348 Karen Dr., #6, Santa Clara CA 95050 or call (408)241-7376 with your Visa or MC. BNB540

DACRON ROPE, WHY RISK FAILURES with aerial supports? Strong, high UV resistant, non-stretch Military Type black DOUBLE (unlike our competitors' single) braided Dacron. 3/32": $.06/ft., 3/16" (770 lb. test): $.11/ft., 5/16": $.16/ft. **DAVIS RF CO. 24 HOUR ORDERS:** (800)328-4773. BNB557

HF TRANSCEIVER, IC-781, mint, in Box, only used 10 hours, manuals included, $3,700.00. Mike, (408)227-7460 after 6 p.m. BNB590

DON'T BUY QSL CARDS UNTIL YOU SEE MY FREE SAMPLES. Also I specialize in custom cards and QSL business cards. Write or call for free samples and custom card ordering information. **LITTLE PRINT SHOP,** Box 1160, Pflugerville TX 78660. (512)990-1192. Mastercard and Visa now accepted. BNB595

WANTED: Western Electric tubes and other tube audio equipment. (800)251-5454. BNB615

DUPLEXER TUNING GUIDE. A complete booklet showing step-by-step instructions on tuning all types of duplexers. Included is theory of operation, detailed diagrams and much more. Send $9.95 plus $2.50 s&h to **RGM PUBLICATIONS**, 533 Main Street, Hillsboro NM 88042. For faster service using a major credit card call (505)895-5333 and order today. 30 day money back guarantee. BNB635

SATELLITE EQUIPMENT Best $$$ USA. (800)851-6534. BNB640

UNIVERSAL PROGRAMMERS Data IO, XELTEK, Logic Devices, Magic IO, EETools, Needhams, from $399.00. EPROM programmers from $117. Call for free catalog. (408)241-7376. BNB645

VHF-UHF-SHF Large SASE. **VHFer,** P.O. Box 685, Holbrook AZ 86025. BNB660

QSLS—ELEGANT, AFFORDABLE. Samples $1 (refundable with order). **AACO**, Dept. S410, 1639 Fordham Way, Mountain View CA 94040. BNB670

FOR SALE Icom IC-2SAT, IC-W2A, PK-88 Laptop computer, personal autopatch, Epson Printer. Anthony Nota, (201)284-1105. BNB675

HAM RADIO REPAIR- All makes and models. Fast, Professional Service. **AFFORDABLE ELECTRONIC REPAIR,** 7110 E. Thomas Rd., Scottsdale AZ 85251. (602)945-3908. BNB700

ROSS' $$$$ NEW OCTOBER (ONLY) SPECIALS. SAVE TIME AND MONEY HAVE MODEL NUMBER AND MANUFACTURER READY WHEN YOU CALL OR WRITE. PLEASE CALL FOR KENWOOD, AEA, ALINCO, YAESU, TIMEWAVE TECHNOLOGY, TELEX HY-GAIN, RF CONCEPTS, MIRAGE, LARSEN, PRICES. ICOM 4KL, $6,176.00; 04AT, $250.00; P-2AT, $280.00; UX-49A, $380.00; 970A, $2,750.00; TEN-TEC 9420, $670.00; 535, $1,150.00; 2510, $429.90; 425, $2,600.00; 500 FT. ROLL RG-213, $150.00. POWER SUPPLY SALE, 20 A. DUAL METERS, VOLTAGE ADJUSTER, $100.00 PLUS MANY MORE. LIMITED TIME OFFERS. LOOKING FOR SOMETHING NOT LISTED OR HARD TO FIND? CALL OR WRITE. OVER 9000 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. HOURS TUESDAY-FRIDAY 9:00 TO 6:00, 9:00-2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. **ROSS DISTRIBUTING COMPANY,** 78 SOUTH STATE, PRESTON ID 83263. (208)852-0830. BNB707

ELECTRON TUBES: All types and sizes. Transmitting, receiving, microwave . . . Large inventory = same day shipping. **DAILY ELECTRONICS,** 10914 NE 39th ST. Suite B-6, Vancouver, WA 98682. (800)346-6667 or (206)896-8856. BNB719

MINIATURE POLICE RADAR TRANSMITTER One mile range, $41 assembled, $31.00 kit. 9025 Coldwater Rd. Bldg. 100A, Fort Wayne IN 46825. BNB725

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FT-2500M/FT-7400H 2m/70cm Mobiles

Specifications

- **Frequency Coverage:**
  FT-2500M
  RX: 140-174 MHz
  TX: 144-148 MHz
  FT-7400H
  RX/TX: 430-450 MHz
- Rugged Military Spec Design
- Advanced Track Tuning (ATT)
- Selectable Alpha-Numeric Display
- Largest Display Available
- Power Output:
  FT-2500M 50/25/5 Watts
  FT-7400H 35/20/5 Watts
- Flip Up Front Control Panel Hides Seldom Used Buttons
- Backlit DTMF Mic
- 31 Memory Channels
- CTCSS Encode Built-in
- Automatic Power Off (APO)*
- Time-Out Timer (TOT)*
- Manual* or Automatic Backlighting Adjustment
- **Accessories:**

FTS-17A	CTCSS Decode Unit
FRG-6	DTMF Paging Unit
SP-4	External Speaker
FP-700	Power Supply

*FT-2500M

"No other mobile has a Military spec rating. This radio can really take it!"

"Backlit DTMF Mic, too. Only Yaesu radios have this."

NEW

"3-stage advanced track tuning really reduces intermod. Its great!"

"Yaesu did it again."

US MILITARY APPROVED MIL-SPEC 810

Performance beyond the call of duty.

Just when you thought you had the most formidable mobile built, we made the FT-2500M. It's the next evolution of powerful, rugged mobile radios.

The FT-2500M, based on the acceptance of the popular FT-2400H, takes its durable quality, features, and performance then goes one better! The FT-2500M has a new easy-to-operate front panel design with rubber coated knobs and large amber display, and the Yaesu exclusive 3-Stage Advance Track Tuning feature which reduces intermodulation and front-end overload. With its superior technology, the FT-2500M is as close as you can get to commercial grade performance in amateur frequencies.

The FT-2500M is the only mobile with a Military spec rating; the only mobile radio with the most often used controls on the front and those you "set and forget" neatly hidden; and the only mobile radio with a backlit DTMF mic. With its extra large heat sink and one-piece die-cast chassis, the tough FT-2500M is unlike any other mobile in its class.

So test the mettle of your mobile, if it doesn't measure up to the endurance standards set by the U.S. Military, you need the FT-2500M. Designed for flawless performance in rough and rugged situations, the FT-2500M is really formidable – just what you'd expect from Yaesu. See it at your dealer today!

YAESU

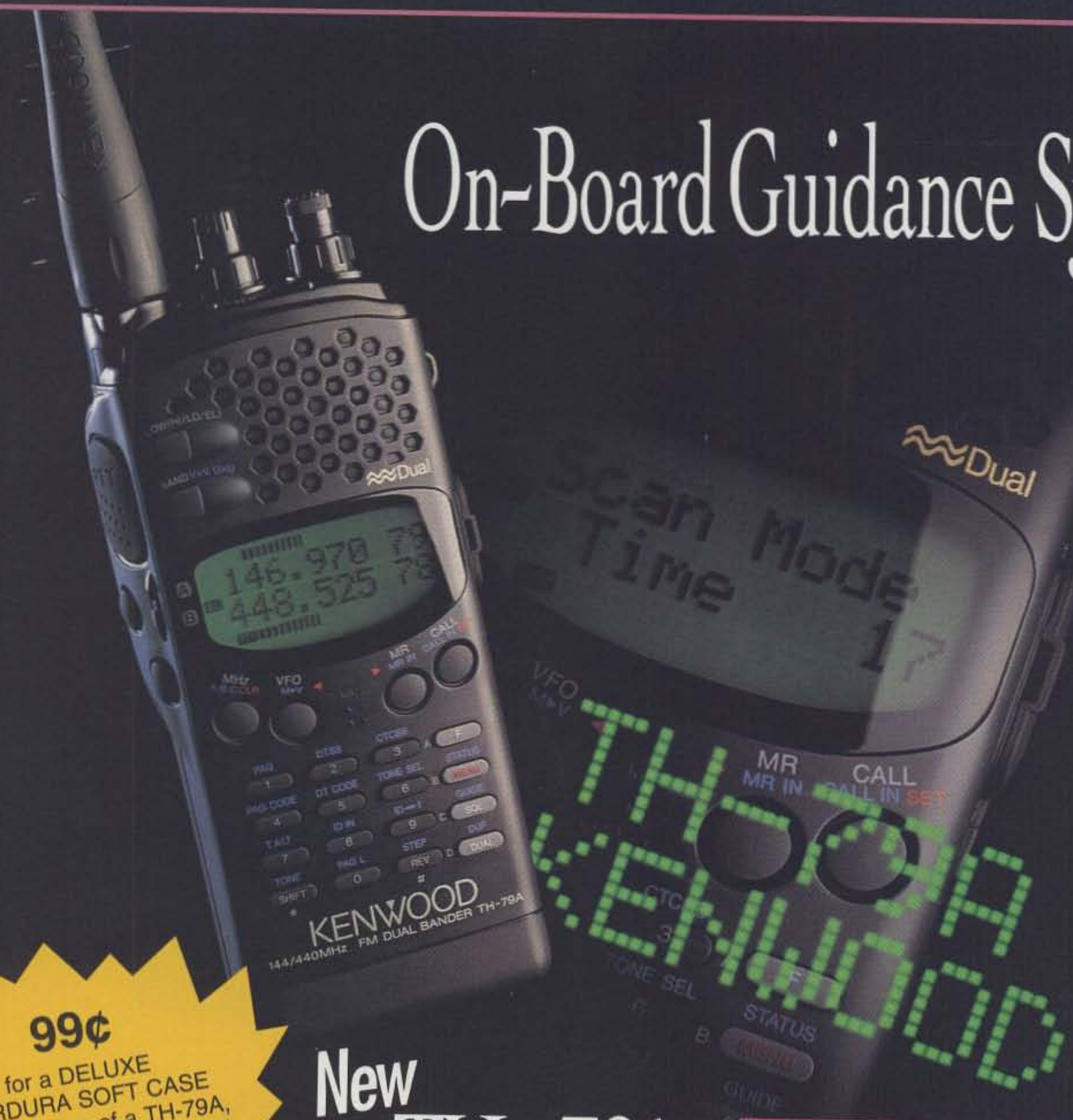
Performance without compromise.℠

FT-2200/7200

Just 5.5"W x 1.6"H x 6.5"D, the FT-2200/7200 radios are designed to fit into today's more compact cars with ease.

SPECIFICATIONS • Frequency Coverage: FT-2200 RX: 110-180 MHz, TX: 144-148 MHz. FT-7200 RX/TX: 430-450 MHz. • Wide Receiver Coverage: 110-180 MHz • AM "Aircraft" Receive: 110-139 MHz • Built-in DTMF Paging/Coded Squelch • Selectable Channel Only Display • 10 Memory DTMF Auto Dialer • Backlit DTMF Mic • Power Output 50/25/5 Watts (FT-7200 35 Watts) • 50 Memory Channels • Remote Operation w/ Optional MW-2 • CTCSS Encode Built-in • Optional Digital Voice Storage System. Accessories: See your authorized Yaesu dealer.

On-Board Guidance System



99¢
for a DELUXE CORDURA SOFT CASE with purchase of a TH-79A, now through Dec. 31, 1994
See Kenwood dealer for details

New TH-79A
FM DUAL BANDER

Information at your fingertips. Everything you need to know about operating the new TH-79A FM dual-bander (144MHz/440MHz) can be viewed in its unique dot-matrix LCD with alphanumeric display. No need for the manual. In addition to this innovative guide function, the TH-79A sports a user-friendly menu system, providing easy access to the many powerful features of this slim-line handheld transceiver. Such as 82 non-volatile memory channels with ID, DTSS and page functions, and a DTMF memory function for auto-dial operation. Full-crossband duplex operation is available, as is the ability to receive two frequencies on the same band (VHF+VHF or UHF+UHF) simultaneously. And thanks to the FET power module, long hours of operation are possible on one charge. With the TH-79A, transceiver technology enters the 21st century.

Features

- 2.7W output (144MHz), 2W output (440MHz) from MOS FET power module and supplied 6V battery; 5W output using optional PB-34
- Dot-matrix LCD with menu/guide system
- 82 non-volatile memory channels with ID
- DTMF keypad with memory function
- DTSS (Dual-Tone Squelch System) with page
- Built-in CTCSS tone encoder/decoder
- Automatic band change
- Power-on call sign display
- Auto repeater offset (VHF)
- Input overvoltage warning
- 3-position output power control
- Auto power-off and battery save function
- Time-out timer
- Multiple scan modes
- Cross-band repeater function
- Page answer-back function
- Channel display function
- Wideband receiver coverage, including AM receive on the aircraft band*
- Modifiable for MARS/CAP use**

*Specifications guaranteed for Amateur bands only.
**Permits required. Specifications guaranteed for Amateur bands only.

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