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FSK adapter for SSB transmitters

focus on communications technology
Tempo was the first with a synthesized hand held for amateur use, first with a 220 MHz synthesized hand held, first with a 5 watt output synthesized hand held... and once again first in the 440 MHz range with the S-4, a fully synthesized hand held radio. Not only does Tempo offer the broadest line of synthesized hand helds, but its standards of reliability are unsurpassed... reliability proven through millions of hours of operation. No other hand held has been so thoroughly field tested, is so simple to operate or offers so much value. The Tempo S-4 offers the opportunity to get on 440 MHz from where ever you may be. With the addition of a touch tone pad and matching power amplifier, its versatility is also unsurpassed.

The S-4...$349.00
With 12 button touch tone pad...$399.00
With 16 button touch tone pad...$419.00
S-40 matching 40 watt output
13.8 VDC power amplifier...$149.00

Tempo solid state amplifier it becomes a...

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The first and most thoroughly field tested hand held synthesized radio available today. Many thousands are now in use and the letters of praise still pour in. The S-1 is the most simple radio to operate and is built to provide years of dependable service. Despite its light weight and small size it is built to withstand rough handling and hard use. Its heavy duty battery pack allows more operating time between charges and its new lower price makes it even more affordable.

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Offers the same field proven reliability, features and specifications as the S-1 except that the S-5 provides a big 5 watt output (or 1 watt low power operation). They both have external microphone capability and can be operated with matching solid state power amplifiers (30 watt or 80 watt output). Allows your hand held to double as a powerful mobile or base radio.
S-30...$89.00
S-80...$149.00
*For use with S-1 and S-5

Tempo S-2
With an S-2 in your car or pocket you can use 220 MHz repeaters throughout the U.S. It offers all the advanced engineering, premium quality components and features of the S-1 and S-5. The S-2 offers 1000 channels in an extremely lightweight but rugged case. If you're not on 220 you may be. With the addition of the S-20 Tempo solid state amplifier it becomes a powerful mobile or base station. If you have a 220 MHz station, the S-2 will add tremendous versatility.
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Specifications:
Frequency Coverage: 440 to 449.995 MHz
Channel Spacing: 25 KHz minimum
Power Requirements: 9.6 VDC
Current Drain: 17 ma-standby 400 ma-transmit (1 amp high power)
Antenna Impedance: 50 ohms
Sensitivity: Better than .5 microvolts nominal for 20 db

Supplied Accessories: Rubberflex antenna 450 ma ni-cad battery pack, charger and earphone

RF output Power: Nominal 3 watts high or 1 watt low power
Repeater Offset: ± 5 MHz

Optional Accessories for all models
12 button touch tone pad (not installed): $39 • 16 button touch tone pad (not installed): $48 • Tone burst generator: $29.95
CTCSS sub-audible tone control: $29.95 • Leather holster: $20 • Cigarette lighter plug mobile charging unit: $6

TEMPO VHF & UHF SOLID STATE POWER AMPLIFIERS
Boost your signal... give it the range and clarity of a high powered base station. VHF (135 to 175 MHz)

<table>
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<td>30A02</td>
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UHF (400 to 512 MHz) models, lower power and FCC type accepted models also available.

Henry Radio
2050 S. Bundy Dr., Los Angeles, CA 90025
931 N. Euclid, Anaheim, CA 92801
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Heathkit SB-221 2kW Amplifier has the power to punch your signal through. Rugged Eimac 3-500Z's deliver 2000 watts PEP and load to 1 kW in on both CW and RTTY. A broad-band, pre-tuned pi-input delivers maximum efficiency with extremely low distortion over the 80 to 15 meter spectrum. And now there's a tuner to put that power to efficient use.

Heathkit SA-2060 Deluxe Antenna Tuner puts you in complete control with continuous tuning in the 160 to 10 meter spectrum. Built-in dual wattmeter/SWR bridge makes tuning a snap. Bypass switch automatically disconnects tuner for dummy load or beam. It's a super tuner.

Build-it-yourself and save. Find out how easy it is to build it yourself and how much you can save. Send today for the latest free Heathkit Catalog or pick one up at your nearby Heathkit Electronic Center.

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*Units of Veitentechnology Electronics Corporation in the U.S.
Continuous Frequency Coverage — The TR7 provides continuous coverage in receive from 1.5 to 30 MHz. Transmit coverage is provided for all amateur bands from 160 through 10 meters. The optional AUX7 Range Program Board allows out-of-band transmit coverage for MARS, Embassy, Government and Commercial services as well as future band expansions in the 1.8 through 30 MHz range.* The AUX7 Board also provides 0 through 1.5 MHz receive coverage and crystal-controlled fixed-channel operation for Government, Amateur or Commercial applications anywhere in the 1.8 to 30 MHz range.

Synthesized/PTO Frequency Control — A Drake exclusive: carefully engineered high-performance synthesizer, combined with the famous Drake PTO, provides smooth, linear tuning with 1 kHz dial and 100 Hz digital readout resolution. 500 kHz up/down range switching is pushbutton controlled.

Advanced, High-Performance Receiver Design — The receiver section of the Drake TR7 is an advanced, up-conversion design. The first intermediate frequency of 48.05 MHz places the image frequency well outside the receiver input passband, and provides for true general coverage operation without i-f gaps or crossovers. In addition, the receiver section features a high-level double balanced mixer in the front end for superior spurious and dynamic range performance.

True Passband Tuning — The TR7 employs the famous Drake full passband tuning instead of the limited range "i-f shift" found in some other units. The Drake system allows the receiver passband to be varied from the top edge of one sideband, through center, to the bottom edge of the opposite sideband. In fact, the range is even wider to accommodate RTTY. This system greatly improves receiving performance in heavy QRM by allowing the operator to move interfering signals out of the passband, and it is so flexible that you can even transmit on one sideband and listen on the other.

Unique Independent Receiver Selectivity — Space is provided in for up to 3 optional crystal filters. These filters are selected, along with the standard 2.3 kHz filter, by front panel pushbutton control, independent of the mode control. This permits the receive response to be optimized for various operating conditions in any operational situation. Optional filter bandwidths include 6 kHz for a-m, 1.8 kHz for narrow ssb or RTTY, and 500 Hz and 300 Hz for cw.

Broadband, Solid State Design — 100% solid state throughout. All circuits are broadbanded, eliminating the need for tuning adjustments of any kind. Merely select the correct band, dial up the desired frequency, and you're ready to operate.

Rugged, Solid State Power Amplifier — The power amplifier is internally mounted, with nothing outboard subject to physical damage. A Drake designed custom heat sink makes this possible. The unique air ducting design of this heat sink allows an optional rear-mounted fan, the FA7, to provide continuous, full power transmit on SSTV/RTTY. The fan is not required for ssb/cw operation, since normal convection cooling allows continuous transmit in these modes.

Effective Noise Blanker — The optional NB7 Noise Blanker plugs into the TR7 to provide true impulse-type noise blanking performance. This unit is carefully designed to maximize both blanking and dynamic range in order to preserve the excellent strong-signal handling characteristics of the TR7.

* NOTE: Transmitter coverage for MARS, Government, and future WARC bands is available only in ranges authorized by the FCC, Military, or other government agency for a specific service. Proof of license for that service must be submitted to the R. L. Drake Company, including the 500 kHz range to be covered. Upon approval, and at the discretion of the R. L. Drake Company, a special range IC will be supplied for use with the AUX7 Range Program Board. Prices quoted from the factory. See Operator's Manual for details. (Not available for services requiring type acceptance.)

Specifications, availability and prices subject to change without notice or obligation.

R. L. DRAKE COMPANY

540 Richard St., Miamisburg, Ohio 45342, USA
Phone: (513) 866-2421 • Telex: 288-017
Tell 'em you saw it in HAM RADIO!
JULY 1981
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The verdict is starting to roll in and it looks like a good one. As I write this several weeks before you see it, we're already starting to receive a number of our readers' questionnaires from the June issue. Thus far, an overwhelming majority of both ham radio and former HORIZONS readers have told us that they like our new combined magazine as well as or even better than before. Your comments have not come without some good criticism, but overall the consensus is quite positive.

After meeting with many of you at hamfests, club meetings, and in the course of our normal business activities we had felt that this would be the case. However, as good as intuition may be, it is very reassuring to know for sure that you are on the right course. Equally reassuring, if not even a bit more so, is the news from our accounting department. After over two years of almost consistent bad news, primarily caused by Ham Radio HORIZONS, we have been in the black since the first of February. It's quite exciting to have the whole ham radio organization back on a solid footing once again.

I'm sure you have already noted the thicker magazine we have been able to put out several times already this year, thanks to our good response from advertisers. Not only will this mean more pages, but it will also allow us to add some excellent new features in the months ahead. For instance, in September we will be introducing a new license upgrading series by Robert Shrader, W6BNB. Bob's book, "Electronic Communication," published by McGraw-Hill, now in its fourth edition, has become the leading authority in both the commercial and Amateur license study field. Bob will be putting all his great experience in this area to work for you, and I'm sure you'll find this one of the most readable and rewarding parts of our magazine each month.

In addition to a number of other good ideas that our own staff has been working on, you readers have given us a considerable number of new projects that are worthy of serious thought. We are finding a lot of excellent suggestions being enclosed with the many questionnaires we have received so far. Of course, these questionnaires are just starting to roll in now, so we'll probably really have our hands full in another week or so when we are looking at several times the number currently on my desk.

While we are on the subject of the questionnaire I'd like to ask again that if you have not already filled it out, why not take a few moments to turn to page 49 of our June issue and give us your thoughts on ham radio's new look. It's not often that you get an opportunity like this to help guide the future of what we hope is your favorite magazine.

In closing I'd like to thank all of you for your encouragement and support during our rather difficult transition period. It would have been a much greater task for all of us here at ham radio if we didn't feel that you were behind us in our efforts to bring you the very best magazine in Amateur Radio today.

Skip Tenney, W1NLB
ICOM HF
Two Great Systems to Meet Your HF Needs

IC-720A. ICOM's Top of the Line HF System.
IC-720A. ICOM's full featured HF Xcvr...with top of the line features:
- 9 band Tx/Rx (all new WARC bands included) 160 - 10 meters broadbanded.
- General coverage receiver...0.1 to 30MHz continuum tuning.
- Passband tuning built-in standard.
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- 200 watt PEP input...all solidstate.
- 200 watt PEP input...all solidstate.
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- Memories...one frequency per band.
- Compact size...only 3.7 in(H) x 9.5 in(W) x 10.8 in(D).
IC-AH1. 5 band automatic bandswitching mobile antenna for use with IC-720A, IC-701, or IC-730 (w/optional LDA unit).

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IC-730 - 8 Band Mobile/Base Xcvr
IC-AH1 - Automatic Bandswitching HF Mobile Antenna

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.
This month we welcome a guest editorial by well-known DXer and author Bob Locher, W9KNI, who has a few words to say about today's Amateur transceivers. You, also, are encouraged to offer your observations and opinions. Those we consider to be in the best interest of Amateur Radio will be selected for future issues. Please type your material on 8-1/2 by 11 inch paper, double spaced, with 2-inch margins.

I would like to remind readers who have not already done so to please complete the readers' survey form that appeared in last month's issue.

We need your input.

Alf Wilson, W6NIF, Editor

In most respects, the state of the art of Amateur Radio equipment achieved the high-frequency operator's requirements around 1954, with the introduction of the Collins 75A-4/KWS-1 combination. These big black boxes were stable, with repeatable frequency readout to less than one-half kHz. They offered outstanding performance on SSB and CW, were reliable, and were a joy to operate. In fact, a lot of them are still in active service.

On the other hand they were large, expensive, did not offer transceive capability, and depended on "hollow state" technology. But they established a new benchmark of performance for Amateur equipment and inspired a succession of fine equipment, both from Collins and other manufacturers. Phone operators never had it so good.

Neither did CW operators. At last — stable receivers; stable enough to make really sharp CW filters usable — and a new generation of fine CW filters as well! And, stable transmitter VFOs whose outputs stayed put. Use of heterodyne techniques instead of multiplier VFOs made CW signals clean and chirp free, even on 10 meters.

The new SSB rigs required a new kind of amplifier, called a linear, and the old push-pull pair of 250THs was obsolete. The new linears worked well on CW too, and didn’t affect keying characteristics as did the old class C amplifiers; and they even had less TVI! The late fifties were great days for CW ops for sure, thanks to all that new SSB gear.

But then equipment design began to change. Collins brought out the KWM-1, and the dawn of the transceiver age arrived. It is certainly unnecessary to detail the success of this concept in high-frequency equipment. The convenience of operation for SSB and the reduction in costs and size made the concept a huge success.

In design, the early transceivers treated CW purely as an afterthought. There was no provision for CW filters in the receiver section, nor was there any provision for moving the frequency of the receiver slightly to accommodate different offsets. Little thought was given to waveform shaping of the keyed output. In justice, however, all the manufacturers of these transceivers also offered separate receiver/transmitter combinations that made fine CW equipment.

Then, transceiver sales began to far outstrip sales of separates, largely due to economic considerations — a transceiver cost little more than a receiver or a transmitter. In response, the more enterprising suppliers offered provision for CW filters in their transceivers and began to pay attention to the keyed waveform output. About this same time, paired separate receiver/transmitter combinations were discontinued, and this is pretty much where we find ourselves today.

The current generation of transceivers, with few exceptions, have no capability for accurate zero-beating of another CW signal. The most guidance generally given is what the receiver offset is, if no receiver incremental tuning is in use. Beyond that, you’re on your own.

What is the result of this? We have CW QSOs where the two stations walk up the band in tandem, each recentering the other in his receiver at each over. CW ops using transceivers usually end up getting creamed in pileups, because they can’t accurately place their transmitted frequency. Even worse, many CW QSOs use two frequencies, separated by as much as 500 Hz, when only a single frequency is needed; but the transceiver-equipped operators can’t find it.

Obviously, this causes QRM.

Today, we even have a situation where two major manufacturers offer separate receivers matched to their transceivers, but with absolutely no realistic way to zero the transceiver’s output in the "matching" receiver. What, then, is the value of the separate receiver?

There are ways to cure these deficiencies. The simplest technique is to see that the audio CW monitor is precisely equal in frequency to the differential frequency of the offset used between the transmitted and received frequency, with provision to key the monitor only. This is the method offered in the new Collins KWM-380.

A deluxe technique that would make transceivers as useful on CW as separates would be to make variable both the frequency of the CW monitor and the offset differential, with perfect tracking, so that the audio monitor only could be keyed, and then adjusted to zero beat the received station precisely. The additional cost would be negligible, and these techniques would work equally well with outboard VFOs.

Bob Locher, W9KNI
BY POPULAR REQUEST...

The Best Features Of Two Proven HAL RTTY Models
Are Now Available In ONE Convenient New Unit—
The

**DS2050 KSR**

- Self contained RTTY and CW terminal
  —RTTY demodulator is now internal!
- Best features of BOTH the DS2000 and ST5000 in one package.
- Simplified connections to your transceiver with standard phono connectors.
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- Both 170Hz and 850Hz shifts for receive and transmit.
- Full high voltage loop¹ compatible for printers, keyboards, and tape transmitters (TD’s).
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- 1-100 wpm CW; 60, 66, 75, 100, 133 wpm  Baudot RTTY; 110 or 300 baud² ASCII RTTY.
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- Edit as you type with WORD transmit mode.
- Built-in demodulator is a proven ST5000 demodulator, not a simple compromise.

¹Use your own high voltage loop supply.
²External modem recommended for 300 baud.

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DS2050 ........... $649.00
MR2000 ........... $169.00
ESM914 ........... $169.00

More Details? CHECK—OFF Page 106
Dear HR:

Where are the hams with legal training, lawyers who understand electronics and who have a desire to serve the Amateur community while possibly making a buck, who have imagination and verve?

It was depressing to read in *ham radio*, March, 1981, a brief statement concerning an Amateur who had been sued by a neighbor for causing interference in the neighbor’s stereo. The Amateur was ordered by a judge to cease operation. This item seems quite newsworthy to the Amateur community, but it happened in 1977 and I had not previously been aware of it.*

Some of us have heard of situations where hams have been forced to choose between giving up the hobby or spending large amounts in legal fees to fight for their rights, but there has been no communication of the facts to Amateurs on a current, national basis. Those situations evidently arise infrequently and in widely scattered areas so none of us know the full story. We need to become aware before many legal rulings become precedent setting, adversely affecting all of us. What is needed is a central clearing house where hams experiencing problems can seek and find relief through action taken by professionals in the fields of electronics and law. If every ham were to participate, the necessary supporting fee would be very low, and every ham could be encouraged to participate regardless of affiliation or lack of affiliation in any other organization. We must all stand together. If support were denied to any ham, and he were to lose in court, undesirable results could adversely affect all hams.

In organizing there can be great strength, to wit, the National Rifle Association. We need such strength to protect us from the avarice of manufacturers who could build stereos immune to interference but reject that idea as too costly. Remember the rampant TVI problems of years ago? Nearly non-existent now, in part because of improved TV receivers.

If the logic used by the judge ordering an Amateur to cease operations were to be carried to its ultimate, we could shut down the airlines. At least, they come in 5 by 9 in my stereo.

We need to become organized. Won’t someone take the initiative?

Donald E. Thomas, KZJY

Millville, New Jersey

Two organizations are available to help Amateurs with legal problems related to Amateur Radio: the ARRL through its Membership Services section and the Personal Communications Foundation (PCF), which provides an Amateur’s attorney with information pertaining to the Amateur’s problem. This information is furnished by attorneys who are members of the PCF. The PCF may be reached through Mr. Joe Merdler, Suite 203, 9036 Reseda Blvd., P.O. Box 812 Northridge, CA 91328. The phone number is (213) 349-6950.

county awards

Dear HR:

I am the Western States county award manager for the CHC award program. The CHC award program is active again through the efforts of interested Amateurs now assuming various responsibilities since the death of the former manager, Cliff Evans, K6BX.

The Western States part of the county award program encompasses Alaska, Hawaii, California, Oregon, Washington, Nevada, Arizona, Utah, Idaho, Wyoming, and Montana. The awards are available to both licensed Amateurs and SWLs.

Also available are the 10K and 20K U.S. Pacific awards, which are issued for confirmed contacts with 10, 20, or more of those prefixes issued to Amateurs in the islands under the jurisdiction of the U.S.A.

Another fine award is our version of the A-1 operator award. This is quite different from the ARRL A-1 Operators’ Club, and is structured to allow recognition of superior Amateur operating practice by any three Amateurs.

Details on these and other awards in the program are available for an SASE to Scott R. Douglas, Jr., KB7SB, Post Office Box 46032, Los Angeles, California 90046.

We hope to hear from you.

Scott R. Douglas, Jr., KB7SB
Los Angeles, California

good work

Dear HR:

I am surprised about your combined magazines. It will be great if some of the really good features of *HORIZONS* are put in your magazine, like DXer’s Diary, and mixed-general ham radio and technical features.

I am looking forward to getting your great magazine!

Donald Youktus, KA2GSX
Scotch Plains, New Jersey

wearing cans

Dear HR:

I’m writing in reference to the article on better audio for mobile operation that appeared in *ham radio*, February, 1981, pages 48-49. Although reference is made to some headphones, such as Sennheiser, not blocking out road noises, I think your magazine should point out that in many states (including Illinois) it is illegal to drive an automobile while wearing headphones (whether they block out road noises or not). Readers should be warned to check local and state laws before setting out wearing “cans.”

Ken Van Andel, WB9FRV
Aurora, Illinois
MFJ-941C 300 Watt Versa Tuner II
Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.

Ham Radio's most popular antenna tuner. Improved, too.

$89.95

Fastest selling MFJ tuner...because it has the most wanted features at the best price. Matches everything from 1.8-30 MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

Run up to 300 watts RF power output. SWR and dual range wattmeter (300 & 30 watts full scale, forward/ reflected power). Sensitive meter measures SWR to 5 watts.

MFJ-900 VERSA TUNER

MFJ-900

$44.95 (+$4)

Matches coax, random wires 1.8-30 MHz. Handles up to 200 watts output; efficient airwound inductor gives more watts out. 5x2x6".

Use any transceiver, solid-state or tube. Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $54.95 (+$4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $34.95 (+$4), for random wires only. Great for apartment, motel, camping, operation. Tuned 1.8-30 MHz.

MFJ-910 VERSA TUNER IV

MFJ-984

$299.95 (+$10)

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, 10/16 ref., 2000/200W.

18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV caps. 5x1x4 1/4".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $209.95 (+$10), like 984 less ant. switch, ammeter.

MFJ-982, $209.95 (+$10), like 984 less ammeter, SWR/Wattmeter. MFJ-980, $179.95 (+$10), like 982 less ant. switch.

Flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.

12 position efficient airwound inductor for lower losses, more Watts out.

Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs. Easy to use, anywhere. Measures 8x2x6", has

MFJ-949B VERSA TUNER II

MFJ-949B

$139.95 (+$4)

MFJ's best 300 watt Versa Tuner II. Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

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MFJ-941C, $69.95 (+$4), like 945, less SWR/Wattmeter.

MFJ-940B, $79.95 (+$4), like 941C less antenna switch.

MFJ-944, $79.95 (+$4), like 945, less SWR/Wattmeter.

MFJ-943, $69.95 (+$4). like 944, less antenna switch.

MFJ-948, $59.95 (+$4), like 941, less SWR/Wattmeter.

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ARRL’S BOGUS-QSL INVESTIGATION continues, with three DXers now suspended from the DXCC program. A prominent DXpeditioner has resigned from DXCC, and still others are being checked for apparently submitting questionable cards for credit.

Phone DX Cards First Attracted the attention of DXCC program manager WI3AZD late last year. Photocopies of questionable cards, with the submitter’s call blocked out, were sent to the DX station or his manager along with a request for a list of the stations worked around the time shown. Not only did the submitter’s call not appear in that list, but some of the DX stations even responded with "not on that band... or mode... or even on the air" at the time shown, and further commented the writing was not theirs or any assistant’s.

Bogus Cards For About two dozen different rare DX stations have thus far shown up in Newington, though there have been claims that far more than that have been printed. Most are for stations who were active in the 60s or early 70s, though a few are current. The one DXer whose suspension is definitely related to the counterfeits is W6MZT. Two Europeans, whose calls have not been announced, have also been suspended but for alterations or other apparently unrelated QSL questions. The DXpeditioner who is resigning is Dr. Dave Gardner, W6LPL, who discussed his involvement freely in a telephone conversation with HR Report.

W6LPL said The Bogus Card Idea began at an informal meeting of a dozen or so DXers (including a number of Honor Roll Members) at the 1980 Fresno DX convention. Several were also DXpeditioners and all agreed that DXing was in a sad state with pursuit of QSLs an obsession. Cheating was rampant, they felt, yet the ARRL had seemed unresponsive to calls for change. Then they hit on the idea of wholesale counterfeiting of rare cards, as a means of demonstrating the present system’s weakness. Dave believes at least 20,000 of the phoney cards were printed, and they’ve been passed out by both U.S. and overseas Amateurs to hundreds of others. Because of his part in the scheme, he has now submitted his letter of resignation to DXCC to the ARRL.

Just How Many DXers Will eventually be involved is still to be determined. In the meantime, all DXers are warned to beware of cards from long past contacts or coming from unusual sources.

AMATEURS SERVING AS POLICE "eyes and ears" in a Los Angeles Police Department project found themselves providing needed communications in a kidnapping/shooting incident on May 8th. The volunteer program, operating just over a month, puts Amateurs with hand-helds at vantage points in likely crime areas. They report suspicious activities to others in prowl cars for follow-up. Thus far they’ve broken up one attempted rape and reported several possible car break-ins.

The Episode On May 8th began when four Amateurs and a police advisor, atop the Hollywood Holiday Inn, heard shots fired from a room just beneath them. Police from various agencies, converging on the scene, found an immediate problem with a lack of common communications frequencies and portables. The Amateurs stepped into the breach, providing coordinating communications for several hours during negotiations with the gunman, who was holding a girl hostage in his room. Eventually she escaped, and early the next morning the gunman apparently shot himself.

160 METER POWER LIMITS will be lifted shortly, at least on the bottom half of the band. At its May 21 agenda meeting the Commissioners agreed to restore full privileges to 1800-1900 kHz now that Loran A is phased out in the U.S. However, since Canada is still using Loran A above 1900 kHz, the present restrictions must remain in effect on the top half for the time being.

Effective Date For The Relaxation has not yet been announced, but should be sometime early in the summer.

10 MHZ SHOULD BE RESERVED for narrow-band (CW and RTTY) Amateur use only, the 200 Amateurs attending the Region 1 IARU conference in Brighton, England, generally agreed late in April. A couple of nations, however, still want SSB on the new band. Representatives of IARU member societies from around the world attended the busy four-and-a-half-day session. The meeting saw the best turnout ever of African IARU representatives.

Contests Should Also Be Kept Off the new 30-meter band, the conference agreed, though unlike the ARRL the Region 1 societies felt that awards for 10-MHz operating achievements would be OK. They also agreed on SSB for the new 18- and 24-MHz bands, with narrow-band modes taking the bottom half and phone the top. A new satellite working group was also established and satellite band plans set up.

10-GHZ MOBILE OPERATION has been demonstrated by three Canadian Amateurs, VE2DAG, VE2PMF, and VE2FRJ. The first contact was made back in February, and even with antennas inside the cars usable signals were found at distances up to a mile despite intervening buildings and other autos. Doppler shift was quite noticeable, however.
MORE KEYER FEATURES
FOR LESS COST

AEA Invites You to Compare the AEA Keyer Features to Other Popular Keyers on the Market.

<table>
<thead>
<tr>
<th>IMPORTANT KEYER AND/OR TRAINER FEATURES</th>
<th>AEA MM-1</th>
<th>AEA KT-1</th>
<th>AEA MT-1</th>
<th>AEA CK-1</th>
<th>AEA MK-1</th>
<th>A</th>
<th>COMPETITOR B</th>
<th>C</th>
<th>D</th>
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</thead>
<tbody>
<tr>
<td>Speed Range (WPM)</td>
<td>2-99</td>
<td>1-99</td>
<td>1-99</td>
<td>2-99</td>
<td>8-50</td>
<td>5-50+</td>
<td>?</td>
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<tr>
<td>Memory Capacity (Total Characters)</td>
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<td>500</td>
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<td></td>
<td>400</td>
<td>100/400</td>
<td>400</td>
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<tr>
<td>Message Partitioning</td>
<td>Soft</td>
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<td>Automatic Contest Serial Number</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Independent Dot &amp; Dash (Full) Weighting</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Calibrated Speed, 1 WPM Resolution</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Calibrated Beacon Mode</td>
<td>Yes</td>
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<td>No</td>
<td></td>
<td>No</td>
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<td>Repeat Message Mode</td>
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<td></td>
<td>No</td>
<td></td>
<td>Yes</td>
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<td>Front Panel Variable Monitor Frequency</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Message Resume After Paddle Interrupt</td>
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<td></td>
<td>Yes</td>
<td></td>
<td>No</td>
<td>No</td>
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<tr>
<td>Semi-Automatic (Bug) Mode</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<td>Real-Time Memory Loading Mode</td>
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<td>Automatic Word Space Memory Load</td>
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<td>Message Editing</td>
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<td>Automatic Stepped Variable Speed</td>
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<td>2 Presettable Speeds, Instant Recall</td>
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<td>Automatic Trainer Speed Increase</td>
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<td>Random Practice Mode</td>
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<td>Yes</td>
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<td></td>
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<td>Standard Letters, Numbers, Punctuation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>All Morse Characters</td>
<td>Yes</td>
<td>Yes</td>
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<td>Advertised Price</td>
<td>$199.95</td>
<td>$129.95</td>
<td>$99.95</td>
<td>$129.95</td>
<td>$79.95</td>
<td>$139.95</td>
<td>$99.50/ $229.00</td>
<td>$129.95</td>
<td>$139.50</td>
</tr>
</tbody>
</table>

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More Details? CHECK — OFF Page 106

july 1981
FSK adapter
for SSB transmitters
An easy method for exploring RTTY

I wanted a new mode of operation for my station. I've been thinking about a microcomputer for both domestic and radio use, and two recent FCC rulings made me interested in RTTY.

My station was designed for SSB or CW only, but there should be a way to operate RTTY using an audio modulator-demodulator, or modem. The following article describes how I did it. I hope others will follow suit.

the modem

The FCC now allows ASCII seven-bit code on high-frequency Amateur bands at 110 or 300 Baud.* ASCII is similar to the five-bit Baudot code of mechanical teleprinters, but has the advantage of being able to communicate with all modern computer systems for character transmission. This might be a break-through for Amateurs who want to use their computers for communicating rather than for the more conventional purposes of logging, satellite tracking, or home games.

I decided to build a modem that would make possible FSK using my SSB equipment. I'd read that some Amateurs use audio tones for FSK, and so an audio modem seemed a good route. A keyboard for character generation and a CRT display would complete the FSK adaptation. This would work with either ASCII or Baudot.

The second FCC ruling on F1 emissions indicated that this was the correct choice. F1 emissions are allowed on high-frequency bands, but the ruling states that audio tones into the audio input of a single-sideband transmitter must have good carrier and unwanted sideband suppression to qualify for F1 emission. Certain precautions would be required to meet these criteria.

This article concerns the modem design and describes how to incorporate the modem into a complete video terminal for either ASCII or Baudot. Such a system could eventually lead to exchanging computer programs over the air.

design concepts

Modem design began with the following primary goals:
1. Use a single 5-volt power supply.
2. Use a minimum number of ICs.
3. Use TTL-compatible interfaces for expansion.
4. Use audio-frequency operation for standard SSB equipment input and output.

The demodulator is a single chip made for this purpose, an Exar XR-2211 demodulator/tone decoder. It contains a preamp, phase locked loop (PLL), and comparators. Preamp dynamic range guarantees tracking with 3 mV - 3 volt rms input levels. Center frequency, bandwidth, and output delay are inde-

*ASCII is an acronym for “American Standard Code for Information Interchange.” A Baud equals bits per second in this code.

By Thomas B. Zeltwanger, WA3PLC, Box 62, State College, Pennsylvania 16801
fig. 1. Modem schematic diagram.

The current-controlled oscillator section of an LM567 tone decoder, U3, generates mark and space tones of 2125 and 2295 Hz. C8, R10, and R11 set the 2295-Hz frequency with Q1 cut off. When Q1 is conducting, C7 is in parallel with C8, and the frequency shifts down by 170 Hz. C7 may have to be trimmed slightly for the correct shift.

Ideally, a pure sine wave should be used for modulation. U3 produces a triangular waveform. A triangular shape, or any continuous waveform, can be thought of as a combination of harmonics differing in amplitude and phase. A triangular waveform can be expressed by the Fourier series:

$$V = \sum_{i=1}^{\infty} \frac{A}{i^2} \sin(\omega_i t)$$

where:
- $i = 1, 3, 5, 7,...$ (harmonics, $1 =$ fundamental)
- $A =$ normalized peak amplitude of fundamental signal
- $\omega_i = 2\pi f_i =$ radian frequency of fundamental signal
- $t = 1/f_0 =$ period of waveform

The triangular waveshape is composed of the fundamental and odd harmonics. Calculation indicates that the third harmonic of 2125 Hz is $\frac{119}{1000}$ the power level of the fundamental, or down 9.5 dB.

Buffer amplifier U4 isolates the oscillator and provides a means of setting transmitter audio input level. Legal operating practice requires a bandwidth under 3 kHz. The RC lowpass filter, R13, C10, smooths harmonics; the -3 dB point is at 3386 Hz.

**calibration**

The modulator must be calibrated with a frequency counter or accurate oscilloscope. With Q1 cut off, R10 is set for a 2295-Hz tone. With Q1 conducting through the serial-data input gate (input ground, output to Q1 base high), a value of C7 is found to lower the tone to exactly 2125 Hz.

My calculations indicated a 0.0037-$\mu$F cap should do the job. A 0.005-$\mu$F was tried, but the shift was too great, according to one Amateur with a tunable i-f filter. A 0.0015- and 0.0022-$\mu$F in parallel worked fine.*

*A high-value mica padder capacitor from the junkbox would be ideal for this trimming. Editor
test results

On-the-air tests have been encouraging. The narrow receiver bandwidth makes tuning somewhat critical but is eased appreciably by the LED indicator. After a few hours’ experience, I became familiar with the response and had no real problems.

Very weak stations can be copied, but the PLL tends to unlock from noise. I’ve copied strong stations in 60 wpm Baudot for as long as an hour and a half with no loss of information. At higher baud rates, the noise on 40 meters becomes a problem, but copy is still possible. I’ve also copied ASCII at 110 baud on 20 meters.

ASCII reception was over 95 percent error-free under normal circumstances. Most RTTY on the hf bands has been heard between 14.075 and 14.100 MHz, including many DX stations. I have not yet heard anyone using 300-baud ASCII.

some uses

The modem will interface with any TTL-compatible serial video terminal. It can also be used with a teletypewriter to replace an RTTY converter; input and output must be modified for the 20-ma current loop in teletypewriters.

Keyboards are readily available from surplus dealers for under $50. Video monitors with 12-MHz minimum bandwidth may be used for the display. The most expensive part of my FSK system is the video board.

Video boards are made in many configurations. The one I used is the Xitex SCT-100 and seems to have been designed with the Amateur operator in mind. It’s capable of both ASCII and Baudot operation; its speeds are 60 and 100 wpm in Baudot, 110 or 300 baud in ASCII. It may be purchased in kit form or fully assembled.

operation

Best reception is obtained with the narrowest receiver filter available. I use a 500-Hz i-f filter and CW mode — sometimes with an additional audio filter. Transmission must occur in the sideband mode.

Provisions have been included for inverting the FSK tones, as indicated by the jumpers and alternate data outputs in fig. 1. (This is required for frequency offsets and filter bandwidths in different receivers and transmitters.)

Upper sideband mode was first tried for both transmitting and receiving, but I couldn’t use my 500-Hz receiver filter in the SSB mode. Reception is now in CW mode, and transmission is on lower sideband. I offset-tune the receiver to zero-beat received signals. Tones are “right-side-up” in CW/LSB; that is, the higher tone is higher on the dial; they are inverted when using USB. Keep this in mind, because the demodulator will be working fine but printing will be garbled.

In CW/LSB, the idle (mark) tone will be lower in frequency, and jumper 1-2 is used. Demodulated output is taken from B (fig. 1).
A block diagram of my terminal system is shown in fig. 2. The modem is installed between the video board and all other equipment. The "key" is any switch connected to terminal D in fig. 1, and is used for calibrating the modulator tones.

The same system, less transmitter and receiver, has been used as a microprocessor terminal with no problems. Future applications will include the addition of a cassette tape, instead of paper tape, for prerecorded messages. Limited tests indicate that this is feasible.

**some final thoughts**

My system works well but my station is in an apartment, with the antenna about ten feet (3 meters) from my rig. RF shielding was a problem, because the video board generates a lot of RFI on 20 meters. I've heard the same complaint from others using computers on RTTY. Tests at another location indicated that RFI is minimal with the antenna farther away from the transmitter.

PC boards are available from the author for $5.00 plus postage. All circuit components are readily available from hobby dealers.

I'd like to extend special thanks to K4YI and KØWVN, who were very helpful with my first on-the-air tests.

**video board suppliers**

Xitex Corporation (manufacturer), 13628 Neutron, Box 402110, Dallas, Texas 75240. Mini Micro Mart, Incorporated, (distributor), 1618 James Street, Syracuse, New York 13202.
Solid advice
for
mail-order buyers

shopping for parts
by mail

To many hams, buying parts simply means a trip to the local franchised radio store, where the counter salesman is given a parts list to fill. All too often, however, the enthusiasm for your latest project is spoiled either by "out-of-stock," or by high prices. The instant-delivery convenience of the round-the-corner radio store is frequently paid for in great cost of both dollars and wasted time.

What to do? It's a good idea to preplan construction projects far in advance; to develop a complete parts list, with a breakdown into separate lists — those that are best filled by mail-order means, and those that are best filled locally.

I'm not knocking local buying; there are many occasions when it is best to shop locally. I'll cover the development and breakout of parts lists for mailorder purchase, present some tips on making parts substitutions, offer some general mail-order buying hints, and discuss the pros and cons of buying in advance of needs. Also I'll discuss the problem of component identification.

The list: getting it together

Most published construction projects include an itemized parts list that states each part's nomenclature, size, value, required voltage, current, or power-handling capacity, and other necessary information. Some projects even list brand names and recommended sources for difficult-to-obtain components.

The basic parts list can be broken down in several ways — by type of component, or — in the way I prefer — into two lists: by parts that are best locally procured, and by those that are best acquired by mail order. The two lists can be broken down again by type component to facilitate shopping and ordering. You must know something about the electronic marketplace to set up the lists, of course, and it helps to have on hand a generous selection of current catalogs and flyers to sort out which components should go on which list.

Having a good-size pile of catalogs will enable you to find almost any desired part in one of them and will often allow you to locate a single mail-order firm that may have all, or nearly all, of what you need. Having a variety of catalogs also allows you to easily make price comparisons.

Table 1 is a list of dealers. Many offer free catalogs that can be obtained by filling out the reader service cards found in electronic and Amateur-Radio magazines.

After thoroughly checking your junkbox, the buy-local list is used first, so that out-of-stock items can be identified and added to the mail-order list. You'll want to at least scan the mail-order flyers and check out local sales and hamfests to see if any bargains turn up that would suggest switching an item from one list to the other. It pays, too, to consolidate mail-order "buys," due to steep postage charges, minimum order limits, and handling fees. The word is: plan ahead.

By Karl Thurber, Jr., W8FX, 317 Poplar Drive, Millbrook, Alabama 36054
<table>
<thead>
<tr>
<th>Table 1. Direct-mail electronic parts dealers.</th>
</tr>
</thead>
</table>
| Active Electronics Sales Corp.  
P. O. Box 1035  
Framingham, MA 01701  
(617) 879-0077 |
| ADVA Electronics  
Box 4181  
Woodside, CA 94062  
(415) 328-1500 |
| Alaska Microwave Labs  
4335 E. 5th Street  
Anchorage, AK 99504 |
| All Electronics  
Box 20406  
906 S. Vermont  
Los Angeles, CA 90006 |
| Adelco  
2789 Q Millburn Avenue  
Baldwin, NY 11510  
(516) 378-4555 |
| Ancrona  
P. O. Box 2208  
Culver City, CA 90230  
(213) 641-4064 |
| Applied Invention  
RD 2, Route 21  
Hillsdale, NY 12529  
(516) 325-3915 |
| B & F Enterprises*  
119 Foster Street  
Peabody, MA 01960  
(617) 531-5774 |
| Bullet Electronics*  
P. O. Box 401244  
Garland, TX 75040  
(214) 278-3653 |
| Chaney Electronics  
P. O. Box 27038  
Denver, CO 80227  
(303) 781-5750 |
| Digi-Key Corp.  
P. O. Box 677  
Theft River Falls, MN 56701  
(218) 681-6674 |
| Digital Research Corp. of Texas*  
P. O. Box 401247A  
Garland, TX 75040  
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(617) 547-7053 |
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Notes:  
(1) *No minimum order or handling charge. There may be postage charges, however.  
(2) **Specializes in Japanese semiconductors.  
(3) Most of the firms listed will accept major charge cards, such as Master Charge or Visa, on telephone orders. A larger minimum order size may be required, however.  
(4) The "800-series" numbers listed are toll-free.
parts substitution

This discussion leads to the question of substituting components. It’s especially important when it comes to buying by mail, since it’s inconvenient, time-consuming, and expensive to return wrong-choice components — not to mention the frustration involved. It’s a fact that most small parts that aren’t right usually end up in the junkbox, since it’s normally not worth the effort to return them — and what’s in the junkbox is seldom what’s needed for a given project.

over-rated components

Generally speaking, over-rated parts can be used in electronic projects. For example, a 1-watt carbon resistor can be used instead of a ½-watt carbon resistor of the same resistance. A 100-volt, 0.01 microfarad Mylar capacitor can be used in place of a lesser-rated one, such as a 25-volt, 0.01 microfarad Mylar, assuming that the tolerance range (usually ± 10 or 20 per cent) is maintained and that the larger component will physically fit its allotted space. Both resisters and capacitors can be connected in parallel or series to yield new values. And what about those confusing decimal equivalents? Table 2 shows popular electronic metric conversions you’ll need. Get them right when shopping by mail!

Be careful when substituting components with over-rated ones when the device is supposed to perform a specific function at a certain value of voltage or current. In this case, a larger unit would not do the job. Zeners and other voltage- or current-regulating devices would fall into this category.

active components

As for active components, similar guidelines hold, as long as the substitute has equivalent parameters. For example, a transistor that has a maximum collector current (I_C) of 600 mA can be used as a substitute for one having a maximum I_C of 400 mA, providing that other specifications are comparable — such as power dissipation, current gain, maximum collector voltage and frequency.

literature

It pays to have a set of semiconductor reference books to enable quick substitution decisions. With so many construction projects stated in terms of widely-available Radio Shack component types, it’s good to have on hand the Archer Semiconductor Reference Handbook. This book is a guide to Radio Shack’s semiconductors and it’s also a useful cross-reference and substitution guide for over 100,000 devices.*

Pin connections and detailed data are provided for ICs, diodes, SCRs, LEDs, and other semiconductors. Other references are ARRL’s Electronics Data Book and Radio Amateur’s Handbook, and Bill Orr’s Editors and Engineers Radio Handbook, as well as various Sams and TAB substitution handbooks and specifications manuals. Manufacturers’ reference books and data sheets are needed if you’re really into electronic construction.

The Allied Electronics catalog and engineering reference book is another candidate for your bookshelf.†

 mail-order buying tips

Buying electronic parts and components by mail is no more difficult than buying anything else this way: you write out your order, enclose a check, money order, or charge-card number, and mail it in. In anywhere from a few days upwards, you receive the parts.

*Radio Shack, 1400 One Tandy Center. Fort Worth, Texas 76102
†Allied Electronics, 401 East 8th St. Fort Worth, Texas 76102.
Most resistors are prominently color-coded for easy identification. This chart should help dispel any confusion as to color-coding schemes.
PC-board-mounted components are usually bargain-priced since it's difficult to economically remove and reuse them. IC desoldering kit shown here has special tools for removal of in-line ICs, "TO" packages, transistors, and also includes a special device that melts and straightens bent tabs and leads to facilitate removal of delicate components, such as diodes (photo courtesy Ungar Div. Eldon Industries, Inc.).

A few pointers regarding direct-mail buying are in order. In setting up your list, have a copy of the dealer's latest catalog or flyer at hand, and use one of his order blanks to place your order. Use his part numbers, especially if they are different from, or in addition to, the generic part numbers. Accuracy in stating what you want is paramount!

Be sure to carefully check your arithmetic in pricing the order, and observe minimum-order, postage, handling, and sales-tax requirements. Failure to do so can result in embarrassment and delay. Enclosing a little extra to allow for small price changes or increased postal or UPS charges isn't a bad idea and saves later correspondence. Most firms will refund unused amounts to the penny. For very small orders, ordinary first class mail (not parcel post) is quick and inexpensive.

**substitutions**

If you will accept substitutions in filling your order, so state and indicate the range of acceptable choices, without requiring the order-filler to go through a logic tree to figure out just what is okay with you. State specific "kill" instructions, such as "fill within 10 days or cancel order" or "ship in-stock items and cancel balance of order," or the like. If uncertain as to an item's availability, a phone call or postcard will allow you to check on the stock. If you have questions or correspondence that don't pertain to the order, place them on a separate sheet of paper to expedite handling.

**consumer protection**

There are some important mail-order consumer protections. Since 1975, direct-mail firms have to fill orders within 30 days or offer a refund. If the company can't fill the order within 30 days, or within the time frame promised, you must be sent a return postcard allowing cancellation and offering a refund. There are some exceptions — such as when buying...

Industrial and military surplus, represented by this selection of meters and oil-filled capacitors, abounds in the flyers issued by direct-mail dealers. Savings over store prices can be astounding, but a bargain is a bargain only if it can be used. Stock up on the good deals if you like, but exercise care and good judgment in doing so (WRFX photo).
COD — but most merchandise is covered.

If you receive a "dud" part, or have a complaint, contact the company first for adjustment. Most want to please, but salespeople are human, parts do fail, and mistakes can occur. Give them a chance to "right" the situation before becoming aggressive in pursuing your grievance. If doing this doesn't yield satisfaction, you can, as an initial step, fill in a Consumer Service Card (PS Form 4314) at your post office. By completing and returning it, the Postal Service will look into the matter, dealing directly with the company. If fraud is suspected, it may refer the matter to postal inspectors.

What if all you have for the company is a post office box number? You can usually get the name and address of a principal by contacting the magazine that runs the firm's ads. It's also possible to obtain this information on commercial boxholders without charge from postal authorities. Contact your postmaster for help.

 telephone orders

Worth noting is the fact that if you place your order over the phone, you do not have the same protection, since you didn't use the mail to place the order. Fraud is still fraud, of course, and fraudulent use of the charge card may place the bad-boy firm in other kinds of trouble. Using over-the-phone charge cards is fine, in my opinion, for mail-ordering major items, but ordering large numbers of small components by phone can lead to confusion and mistakes in filling the order. This is especially true if it's a tape recorder that's taking your order.

if problems occur

It pays to check out a firm in advance, especially before placing a substantial order. Most of the advertisers in the Amateur and electronics publications are reputable. It's a relatively small, specialized market, and laggards will eventually be driven from business if they offer less than prompt, reliable and honest service. However, if you do have problems, you can take several courses of action after trying to resolve matters with the company. You can contact the magazine that ran the company's ads; write state or local consumer agencies; call or write a "consumer action line," such as operated by many newspapers and radio/TV stations; contact the Better Business Bureau; write the state Attorney General; complain to industry or trade associations; or write to the federal Office of Consumer Affairs (Washington, D.C. 20506). You can also contact the Mail Order Action...
in summary

Here are some general mail-order buying guidelines that should contribute to successful results with a minimum of headaches:

1. Check out the company and its reputation. Have you seen their ads before? Is there a street address and phone number listed, or just a post office box? Think before mailing in your hard-earned dollars.

2. Understand the firm's return policy. Is there a money-back guarantee? What about a restocking charge?

3. Double-check your order before mailing or calling it in. Have you provided a street address? Many firms use UPS for delivery, and they usually need a street address not a post office box number.

4. Send a large-enough remittance. But enclosing a blank check to be filled in with the exact amount by the firm is risky. COD is okay, but these special charges add to the cost of the order. Never send cash. A money order or cashier's check will help speed delivery, as will ordering by charge card.

5. Allow sufficient time to get the merchandise. Realize that it may take a few weeks to clear your personal check, process your order, and actually get the parts to you. On "special deals," look for guaranteed delivery times (and prices) or the caveat, "quantities limited."

6. Always keep a copy or record of your order, showing the date you sent it in, what you ordered, and your charge number.

7. Hold onto your charge-account records and cancelled checks. You may need these papers later on. Never send in the originals when inquiring about your order.

8. Many companies routinely issue small refunds in the form of credit slips. If you don't want them, say so in advance on your order form. However, you may want to accept the slips from those firms that allow the slips to be applied to your next order at more than face value, a sort of "consolation" for the out-of-stock problem.

buying in advance: does it pay?

The answer to this question is a crystal-clear "yes and no." A bargain isn't a bargain unless it can be used. The suppliers' catalogs and flyers are filled with bargains — parts by the bagful, manufacturers' seconds, unbranded and unlabeled components, surplus PC boards, and hundreds more — sometimes top-grade components for your next project at prices that are hard to beat, sometimes not. It's best to steer a middle course, taking advantage of quantity discounts and attractive parts "specials" on a highly selective basis, resisting the urge to squirrel-away and stockpile more than you could ever use.

Despite the bargain-filled flyers, direct-mail parts suppliers often have to backorder specific items to the intense displeasure of their customers — you and me. Thus, it's often not a bad idea to pad your order with limited quantities of widely-used chips, transistors and other parts for future use. Doing this is logical when you are trying to build up your order to minimum purchase levels, sometimes $10 or $15 or even more. Also, consider combining club construction project orders and those for friends. Quantity discounts may sometimes be brought into play. Grab-bag specials on assorted parts can help put your junkbox into first-class shape. Practically every mail-order outfit offers a variety of plastic bags full of diodes, capacitors, resistors, potentiometers, transistors, ICs, and other small components.

A few words of caution apply. Buying these goodies is of use only if you are building up a spare parts inventory, not to yield components for a specific project. Rarely will you come out with just what you need from a grab-bag. Carefully check the description of what's in the bag. For example, are the components assorted popular values, or are they all of one unusual (and possibly unusable) value? Are the leads cut too short, good for use in PC board wiring only? To what tolerance are the component values? And, are the components new, used, or seconds?

For the beginners, assortments of hardware, hook-up wire, small switches, knobs, low-wattage carbon resistors, ceramic disc and polystyrene capacitors, high-capacitance, low-voltage electrolytic or tantalum capacitors, popular transistors and common ICs, carbon potentiometers, and small transformers are good for starters.

A $15 or $20 investment in plastic bag components, if the choices are made wisely, represents money well spent. Realize that there isn't much recourse for a bad selection. You take what you get and chalk up the results to experience. It's a good idea to check out plastic bag components for proper value, shorts, open circuits, and physical damage before using them in construction projects.

component identification

Most direct-mail firms carefully label and package components they ship so that you will have little problem in identifying the parts you receive. General-
ly speaking, ICs are labeled, transistors stenciled or mounted on labeled cardboard sheets, capacitors imprinted with their values, resistors and transformer leads color coded, and so on. Exceptions are diodes and some bulk-sale components, especially ICs, coils, and capacitors, which may not be labeled. These present real problems in component identification for all but the most knowledgeable experimenter. Special color codes exist for some diodes, however, and capacitor and coil values can be measured. But determining IC and transistor types can be sporty, to say the least. Buying surplus PC boards is risky, too. Identifying and safely removing the components is sometimes a real challenge. Most resistors and capacitors are prominently color-coded for easy identification.

Coding and values for other components, such as hookup wire, transformers, pilot lamps, and diodes can be found in the ARRL Handbook and the Editors and Engineers Radio Handbook, as well as in other radio-electronic reference books. Identifying the values of unknown/unmarked components, like capacitors, coils, and chokes is an art unto itself. However, ARRL's LCF Lightning Calculator provides the data needed to make many tricky identifications, when used in conjunction with a grid-dip oscillator or other rf source.

**Closing remarks**

We've only scratched the surface. But you should have a good idea of the facts to consider when lining up parts for your next construction project. Buying parts by mail-order can be a money-saving and interesting way to help complete your electronic projects. Provided you recognize the rules of the game, direct-mail buying can even be fun. Give it a try!

---

**Did anyone hear Amelia?**

For the last several years, Paul L. Briand, Jr., Professor of English at the State University of New York at Oswego, has been conducting research into the disappearance of Amelia Earhart in 1937. Amelia Earhart, the first woman to fly the Atlantic, was last heard from while crossing the Pacific on the final leg of an around-the-world flight. Any shortwave listeners who might have heard her transmissions in early July of 1937 (her call letters were KHAQQ) are asked to contact Dr. Briand, Department of English, SUNY College, Oswego, New York 13126 (telephone 315-343-0635).
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10-meter preamp for the FT-101E

Easy mods for improving the sensitivity of this popular radio — and others as well

This article does not provide construction details for a preamplifier; rather it describes how to install a preamplifier in an FT-101 transceiver. The preamp chosen by the author was described in the March, 1979, issue of QST by Doug DeMaw, W1FB. If you don’t wish to use the referenced amplifier, others are available in kit form. Some examples are the Hal-Tronix HAL-PA-19 or the Hamtronics P-30. Editor

During a 1979 10-meter contest, my station was operated for the first time in the full-power, multi-operator category. My partners in this effort were KA1BMB, WA1YEC, and WB1GIF. Before the contest began, we felt that all was in readiness, having set up the amplifier and antenna in plenty of time (that afternoon). The first hint of trouble came about an hour into the test when we calculated our less-than-astonishing rate of 25 QSO’s per hour. Maybe it’s the band? The second hint was the phone calls that started coming in, asking why we were calling CQ over the JAs, etc., who were calling us. One-way propagation?

The real problem, of course, turned out to be the rather poor 10-meter sensitivity of my FT-101E. After talking with other FT-101 owners, I found this to be a relatively common problem in an otherwise well-engineered transceiver.

design considerations

A preamplifier seemed to be the logical remedy for

By Dave Malley, K1NYK, 132 Lydall Street, Manchester, Connecticut 06040
the problem of poor sensitivity. Since I enjoy homebrewing, I decided to build the preamp and set about to find an existing design that met the following goals:

1. Stable (no self-oscillations)
2. 1-MHz bandwidth or better
3. Good gain (15-20 dB)
4. Inboard installation
5. No loss of resale value (no hole drilling)

The advantages of the design criteria are readily apparent. In a broad sense, the circuit should bring a weak signal up to a solid Q5 copy without retuning when switching between the phone and CW sub-bands. Retaining the resale value meant not drilling holes for cables or switches, as well as minimizing circuit mods to the transceiver. The internal installation requirement simplifies portable/mobile operation and keeps the station from being cluttered with yet another black box and its various wires. A method of switching the preamp into the circuit without using rf relays was also desired.

I reviewed several construction articles to become familiar with the circuit options before making a selection. The design I selected was simple, and all the goals were met. This preamp also can be set up for 15 meters instead of 10 meters if two toroid windings are changed.

The contest was still on my mind, though, so I decided to stick with the 10-meter version. Construction is uncomplicated using a homemade circuit board, I found parts in my junkbox (oops, I mean my electronic inventory) — proving that no unusual components are needed. However, if all the parts are purchased, the bill will come to only around $8. This works out to about half a buck per decibel. If you’re not inclined toward building this unit, a satisfactory commercial preamp can probably be found that will fit in the rig. Check the ads.

The first step should be to align both the receiver and transmitter 10-meter front-end sections. The FT-101 owner’s manual covers this trimmer capacitor peaking procedure quite well. This procedure ensures maximum performance on 10, as would be expected.

As mentioned earlier, I hoped to avoid hold drilling and other mechanical (or major electronic) surgery. I wanted to be able to restore the transceiver to its original state.

After removing the bottom cover, I quickly found that the preamp board should be installed topside. The most space above the chassis is directly in front of the PA cage. As luck would have it, the 1.7 inch x 3.9 inch (4.3 x 99 mm) dimensions of my board allow it to fit vertically in this spot without interfering with the top cover. To avoid relays, which probably wouldn’t fit inside the rig anyway, the preamp should be installed in the FT-101’s receiver section.

A review of the circuit diagram showed that this could be done between the lamp fuse (rf overload protector) and T101A, (see fig. 1). The modified circuit diagram is shown in fig. 2. A 4PDT miniature toggle switch places the preamp into the circuit and simultaneously applies the 12-14 volts. Operation on all bands is not affected when the switch is off.

**Hardware and wiring details**

A bracket was formed from a 3/4-inch-wide (19-mm) piece of 1/32-inch (1-mm) aluminum, which serves double duty by holding both the preamplifier circuit board and the miniature switch in position (fig. 3). The dimension marked with an asterisk should not be exceeded, or the top cover will not close properly.

Switch wiring is shown in fig. 4. RG-174 miniature coax was used for each rf run, and all coax braids must be grounded at each end. The circuit board and

---

**fig. 1.** FT-101 circuit before adding preamp showing the location (X) selected for its installation.

**fig. 2.** FT-101 circuit after modification showing added control switch and preamp module. Calibrator can be placed at point A, which may be more desirable (see text).
the switch should be mounted on the bracket, then wired for greatest convenience. The cables that connect to the rig should also be soldered to the switch at this point. One or two short machine screws will ultimately secure the bracket assembly to an existing hole in the perforated PA cage cover. Make sure that these screws do not touch any components inside the PA compartment! This bracket arrangement provides very good mechanical stability.

The input/output lines from the preamp switches were passed around the driver tube socket and down through the opening beneath the heterodyne crystal oscillator board (PB1073), located in the right-front corner of the transceiver. Routing the coax cables around the tube socket is not necessary but gives enough slack to allow removing the board for adjustment or repair without unsoldering it.

The supply voltage wiring was routed from the switch through the opening under the VFO assembly and along to pin 7 of the mixer board socket (PB1180). I used a piece of scrap RG-174 for this cable, too, and pin 6 or 8 of the PB1180 socket can be used for grounding the braid. Passing the wiring between the chassis underside and the speaker plate gives the neatest appearance. Although each FT-101 circuit board has one or more 13.5-volt connections, the mixer socket seemed to offer the easiest access point.

**FT-101 circuit considerations**

The simplest location for splicing the preamp into the FT-101 was right at the secondary of T101A, where the incoming signal is applied. The circuit board containing the front-end alignment trimmers must be temporarily moved aside to allow access to the T101A connections, which are between it and the underside of the chassis. Removing the wrap-around cover also is convenient.

T101A has five terminals, with three of them on the transformer secondary. One secondary terminal is grounded, while another connects to the incoming signal and the crystal-calibrator signal. In my radio, the red wire carries the incoming signal, and the yellow wire goes to pin 16 of PB1547. It would be wise to check these wires in your radio with an ohmmeter to make sure that no production changes have occurred. The middle terminal is not connected to T101A and serves as a convenient tie point.

Remove the incoming and calibrator signal wires from their existing transformer terminal. Attach them and the preamp input to the T101A middle (dummy) terminal. Now connect the preamplifier output coax cable to the terminal that originally held the incoming and calibrator wires. Both preamp input/output coax shields are grounded at, or adjacent to, the transformer ground terminal. Note that the calibrator wire can remain in its original location. Once this work is finished, be sure to replace the circuit board containing the front-end alignment trimmers that was moved aside earlier.

**alignment**

Alignment of the preamp I selected involved peaking two trimmer capacitors on the preamp board. This condition is registered on the S-meter using a signal generator loosely coupled to the FT-101's antenna terminal. I aligned the preamp before the bracket assembly was attached to the PA compartment cover then later tweaked the caps after final assembly. (This step may not be necessary if the caps are properly peaked initially.)

It’s important to couple the signal generator very loosely to the rig without developing AGC voltage (no S-meter reading). Using the calibrator signal was unsatisfactory because it was too strong and masked the correct adjustments. This resulted in no amplification of the weak signals. After all, making the
weak signals stronger is the whole ball of wax! This unit works well and has no self-oscillations, body capacitive coupling, or other problems that can occur when LC circuits are not in resonance.

**a final word**

That completes the rig modifications, and the cabinet can be put back together. The photograph shows the circuit board and switch assembly installed beside the PA compartment. When the preamp is switched off, the receiver should work normally on all bands as before. My unit pushes a barely audible station to an $S_5$-$S_8$. While the no-signal noise is also amplified, this noise does not register on the S-meter, which indicates an overall increase in the signal-to-noise ratio. I found a minor secondary advantage of this modification with the rf-gain pot. Previously, a signal would disappear altogether when the rf gain was set below about 6. This pot now provides variable attenuation throughout its entire range when the preamplifier is turned on.

While the mods discussed in this article are directed toward the FT-101, the same philosophies should apply to many other transceivers and receivers as well. This mod is quite effective. Having it integrated into the transceiver’s circuitry certainly helps keep the station more orderly. Looking to the future, I expect this unit will be most beneficial as 10-meter propagation declines.

**reference**


**Ham Radio**
A survey of antenna tuners — how QST and Lew McCoy, W1ICP, pioneered the “Transmatch”

Society seems to go through a progression of fads. Senior citizens well remember when miniature golf courses, “Amos ‘n’ Andy,” and the snood were all the rage in the thirties and forties. Most of us can name some post-war fads: the hula hoop, tail fins on autos, and hot tubs.

Amateur Radio, being in some ways a mirror of society, also has its facts. Old timers remember from pre-war times the Astatic D-104 microphone, the RME-69 receiver, preselectors, and the Johnson-Q antenna. In vogue today are keyboards and RTTY, quad antennas, speech processors, SWR meters, baluns, and antenna tuners. Time will tell which of these technological developments will be of the greatest benefit to Radio Amateurs.

This brings me in a roundabout way to the subject of this column: antenna tuners. If you look in the various ham magazines, you’ll see a bunch of advertisements featuring antenna tuners. Everybody has gotten in on the act! You can even buy an antenna tuner to match the decor of your equipment. Obviously, you’ve got to have an antenna tuner to be a part of the action.

**antenna tuner? what’s that?**

The term *antenna tuner*, as By Goodman, W1DX, once pointed out, is a misnomer. It *doesn’t tune the antenna*. Rather, it’s a matching device that translates the electrical characteristics of the antenna system into values more compatible with the communications equipment attached to the antenna.

Back in the days of open-wire feedlines and simple antennas, the antenna tuner was a resonant circuit coupled to the transmitter. A few copper alligator clips on the tuner coils permitted the operator to make loading adjustments to his taste. He didn’t worry about the standing wave ratio (SWR) on the feedline — these magic initials were unknown to most Amateurs.

**The SWR meter.** With the availability of good, inexpensive coaxial cable after World War II, the switch-over from open-wire lines was inevitable. At about that time, Amateur Radio was introduced to the SWR meter. And the Federal Communications Commission introduced the Novice license, which brought a large number of new Amateurs on the air.

The influx of new, inexperienced hams on 80 and 40 meters brought a blizzard of problems for the FCC and Amateur Radio. The beginner’s transmitter was unsophisticated and, more often than not, a prolific generator of strong harmonic signals. Moreover Amateur Radio as a whole was plagued with serious television interference (TVI) problems. Many
fig. 1. The antenna-tuner design that started it all. Shown in the March, 1959 issue of QST, this design brought the antenna tuner out of the dark ages. It incorporated a simple SWR bridge made from a length of coaxial line and a link-coupled circuit that could be adjusted for either series or parallel tuning of an open-wire transmission line. The air-wound coil is about 2 inches in diameter, 10 turns per inch. (Drawings from QST, March, 1959.)

The length $A$ should be more than a quarter wavelength at the lowest operating frequency. When you determine the length of $A$ to half the distance, add a sufficient length of feed line (B) to equal a quarter wavelength or multiple thereof. For example, let's assume you can put up an antenna 80 feet long and you plan to operate on the 3.7-Mc. Novice band as the lowest frequency. From the formula

$$245 \times 66.5 = 66.5 \times 40 = 26.5 \times 133 \approx 40 = 93\text{ feet}$$

This can be carried out for greater feeder lengths, depending on the requirements of the installation.
Amateurs thought that perhaps the old-fashioned antenna tuner might solve these problems. How could the old-design tuner be adapted from open-wire line to coaxial line?

The antenna tuner and SWR bridge circuit. Several solutions to this problem were introduced during the 1950s, but the most popular and effective tuner was that developed by Lew McCoy, W11CP, the Novice Editor and Technical Assistant for QST magazine. An early version of Lew's device is shown in fig. 1. This tuner adapts a medium-power transmitter having a 50-ohm coaxial antenna output to a center-fed, all-band antenna. A simple SWR meter is incorporated into the tuner. Small copper clips make connections to the tuner coil as the band is changed. This is a prac-
tical all-band (80- through-10-meter) antenna and tuner, and I recommend it to any Amateur looking for a versatile, simple, and inexpensive antenna system. For more details, refer to the March, 1959, issue of *QST*, pages 11-15.

Later, in the November, 1961 *QST* Lew showed a high-power (500-watt) version of his tuner — a deluxe model having a wider adjustment range — and he called it a Transmatch. Again, it was designed to match a 50-ohm coaxial antenna output to an antenna having a balanced feed system. But he also added a coaxial output plug to the Transmatch to match to a 50-ohm transmission system. In this manner, the Transmatch could be used as a highly selective circuit in a 50-ohm coaxial system that would greatly attenuate the harmonics of the transmitter. The circuit is shown in fig. 2.

By 1966 the impetus had switched to harmonic suppression on 50-ohm transmission lines; so the October, 1966, issue of *QST* featured a simplified McCoy Transmatch that eliminated the SWR meter and emphasized single-ended output (fig. 3).

In 1967 an entirely different approach to an “antenna tuner” was described by Lance Johnson, K1MET. He built a simplified, single-ended tuner based upon a T-section network that provided an unbalanced-to-balanced match for a 50-ohm transmission system (fig. 4). This compact and simple Transmatch is an excellent solution to some of today’s problems with solid-state rigs: it will reduce the SWR on an antenna system to near unity, so that the transmitter does not suffer reduced power output caused by operation into a mismatched load.

**the “Line Flattener”**

This circuit has shown up in Radio Amateur literature numerous times since its first introduction by K1MET (then an ARRL Lab Assistant). Previously, it had been in wide commercial use but somehow had never filtered into ham literature. In addition to providing a good match, the T-section (fig. 4) provided up to 20 dB attenuation for transmitter harmonics falling into the TV channels. An extremely practical circuit, this low-cost device is recommended to today’s Amateurs who have solid-state transmitters and who wish to achieve easy and efficient antenna matching with a minimum of fuss.

By now the name Transmatch was slipping into the public domain, and almost every “antenna tuner” was called a Transmatch. (Too bad, Lew. You’ve suffered the fate and fame of Kodak™ and Xerox™!) A simplified Line Flattener for a tri-band beam (10-15-20 meters) can be built. Capacitor C1 is reduced to 250 pF, capacitor C2 is removed, and the end of coil L2 is connected directly to receptacle J2 (fig. 4). Then, coils L1 and L2 are reduced to nine turns each. Readers with a good memory will recall that I described a compact, 100-watt version of the Line Flattener for my antenna column in *QST*, April, 1979. A somewhat similar device was also described by W6EBY in the September, 1978, issue of *ham radio* (page 22).

**back to the Transmatch**

By 1961 the antenna tuner had taken an interesting turn, and an article describing the “50-Ohmeter” by Lew McCoy appeared in the July, 1961, issue of *QST* (fig. 5). This device was a form of Line Flattener designed to be used with a coaxial system to reduce the SWR on the

---

**fig. 3.** The tuned-circuit antenna-matching device reduced to the simplest form. The SWR meter is eliminated, but provision for 50-ohm coaxial output is included. (Drawings from October, 1966, *QST*.)
transmission line. It used a “band-switching adjustable transformer” capable of handling SWR values as high as 5 to 1. Of interest to the circuit connoisseur is the use of a split-stator tuning capacitor with network input attached to the floating rotor. This shunt provided a capacitive short circuit to ground for the transmitter harmonics and gave protection up to 20 dB for harmonics falling into the TV channels — a slightly different version of the K1MET design.

the Ultimate Transmatch

In July, 1970, W11CP came up with the Ultimate Transmatch in his “Beginner and Novice” column of QST. This circuit was a sophisticated version of the 50-Ohmer, adapted for either coaxial lines or balanced lines. A 1-to-4 ferrite balun was used to achieve balanced output (fig. 8). This Transmatch combined simplicity and flexibility, requiring only one split-stator capacitor, one single-section capacitor, and one variable inductor. Many of the antenna couplers sold today employ this circuit or variations of it. The output termination for the balanced configuration is 200 ohms when the input to the Transmatch is 50 ohms.

The use of a ferrite balun, however, should be approached with caution. Most balanced lines are other than 200 ohms (300 ohms for TV ribbon line, and 450-600 ohms for open-wire transmission line). Ferrite baluns don’t like to work into a mismatch because of core saturation. The result of this misuse is increased harmonic radiation and the chance of balun flashover at medium power levels. An air-core balun at this point is recommended.

the SPC Transmatch

Shown in the 1981 ARRL Handbook is the SPC Transmatch (SPC standing for series-parallel-capacitance) — another offspring of the long series of antenna matching units pioneered by W11CP and others. A simplified schematic of the ARRL Handbook version is shown in fig. 7. This unit was developed by Doug DeMaw, W1FB. It provides a wide range of matching and gets around the ferrite-core balun problem by substituting an air-core device.

which antenna tuner to build or buy?

So much for the background of the Transmatch, now firmly established as part of the history of Amateur Radio. Much information is available for the interested Amateur who

---

**Fig. 4. The 1966 Transmatch (top). This is a T-section network that provides a match within a 50-ohm transmission line system. The configuration is well suited to today’s solid-state equipment. Tuner is designed to cover 100 through 10 meters. A pinetwork circuit, below, is used in the Drake MN-4 matching network. (Drawings from QST, October, 1967.)**
wants to buy or build a Transmatch. As to the question, "Which antenna tuner should I build or buy?" the first answer is, Don't use an antenna tuner unless you really need it. Too many Amateurs are swept away by antenna tuner fever when they could just as well get along without one.

Where the Transmatch really shines is in conjunction with a solid-state transmitter and, say, a triband antenna. The tribander provides various terminating impedances as operation is conducted across the bands, and sometimes the solid-state transmitters encounter loading problems, especially at the band edges. The Transmatch will transform the odd-ball impedance at the station end of the transmission line into 50 ohms, which is what you would want for a good match to the transmitter.

The transmitter employing vacuum tubes and a pi-network output circuit is considerably more tolerant of a high SWR antenna load, and in most cases a Transmatch is not required to match a 50-ohm line to the transmitter, with one exception: 80 meters. The great majority of 80-meter ham antennas cannot work across the whole band without exhibiting a high value of SWR at one end of the band or the other. And here is where a Transmatch is worthwhile. Even though the antenna may be operated "off tune" and may exhibit a high SWR on the feedline, the Transmatch can provide a satisfactory load for the transmitter.

Which model Transmatch to build or buy? I'm not going to get into a dispute over that. My Transmatch needs are modest, so I have a haywire version of the T-section device shown in fig. 4. In fact, I have two of them. One is built up very pretty in a low-profile case, complete with SWR meter and all bells and whistles. The other one is built upon a small sheet of plywood, and the components are interconnected with flexible leads and copper-plated battery clips. It is very flexible and I can rearrange the circuit at a moment's notice to fit the need at hand.

If I were buying a Transmatch I would want to look inside the pretty case and examine the innards. Is a good quality ceramic switch used? Do the capacitors have sufficient plate spacing for the power level indicated? Are all rf connections well made — solid and firm? Is there sufficient air space around the inductor so that the metal cabinet is not inductively coupled to the coil, producing an unwanted shorted turn in the metal of the box? Sometimes a

---

*However the antenna matching unit does attenuate harmonics. Editor*
Circuit diagram of the Ultimate Transmatch.

C1 = Split-stator variable, 350 pF per section; see text. For low-power version, E.F. Johnson type 16250; or similar, for high-power version, Milten type 15250, or similar.

C2 = 200-pF variable, for low power, E.F. Johnson type 157-12 or similar, for high power, Milten type 16520, .171-inch spacing, 16520A, .077-inch spacing, or similar.

J1, J2 = Coax chassis fitting, type SO-239.

J3, J4, J5 = Feed through insulators.

L1 = Roller inductor, see text. If 150-meter operation is desired, total inductance should be 28 uH, E.F. Johnson type 229-203, otherwise, 18 uH is adequate, E.F. Johnson type 229-202.

T1 = 1-to-4 balun, see text for details, cores are American type T-209-2.

fig. 6. The Ultimate Transmatch of 1970. The split-stator circuit is used, and a ferrite-core balun has been added for balanced feeders. (Drawing from QST, July, 1970, page 24.)

fig. 7. The SPC Transmatch shown in the 1981 ARRL Handbook is merely the Transmatch of W11CP hooked up backwards! For balanced lines, an air-core balun is attached to antenna receptacle J2.

photograph of the interior of the tuner will give you these answers.

Note: A few months ago I offered readers of this magazine a reprint of my series of articles entitled “Design Considerations for Linear Amplifiers.” This brochure has been reprinted and is again available. If you wish a copy, I’ll be happy to send one to you for two 78-cent stamps (overseas readers send four IRCs). Write to me at EIMAC, 301 Industrial Way, San Carlos, California 94070 U.S.A.
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More Details? CHECK — OFF Page 106

july 1981

37
an audio amplifier
for your handheld transceiver

Build this convenience accessory and avoid freeway trauma

Today's handheld transceivers are marvelous little radios. A long list of optional accessories makes it possible to tailor them to many applications. However, most don’t have sufficient audio output to be used in a car. It’s not much fun to drive while trying to hold the radio and its speaker/microphone to your ear. So a simple audio amplifier, with sufficient output to be heard over any amount of road noise, is a useful accessory. Let’s build one.

the circuit

In fig. 1 an LM383 IC (U1) does all the work. It contains a preamplifier, power amplifier, and circuitry to protect against overheating, short circuits, and voltage spikes from an automotive electrical system. It operates from a 13.5-volt supply and can provide up to 5 watts of audio output. It delivers a gain of 100, about 40 dB.

Looking at fig. 1, R1 provides a load for the audio section of the handheld. (Some of the components used in the circuit prevent 2-meter energy from getting into the amplifier.) RFC1, C7, and C2 filter the input line, and RFC2 and C6 decouple the speaker lead.

The LM373 is a stable, well-behaved amplifier. R2 and R3 form a resistive divider, which provides negative feedback to pin 2 through C8. A key to stability is C4, which must be a metalized-film capacitor, with short leads, connected from pin 4 to pin 3 of U1. Other types of capacitors should not be substituted. Components used in the amplifier, except for the ferrite beads, are available from many local electronic equipment suppliers. Ferrite beads are sold through mail order (check the ads).

By Douglas A. Blakeslee, N1RM, 4 Maple Lane, Brookfield, Connecticut 06804
To produce loud audio, a speaker must move air. Thus, a 2-inch diameter speaker isn’t much good. A 4-inch diameter speaker is adequate, and 5- or 6-inch speakers are even better. I chose a 5-inch diameter speaker with housing, sold as an add-on rear-seat extension speaker. I mounted the audio amplifier inside the speaker housing (photo). If you use one of the extension speakers sold for CB radios and there is not enough room inside the speaker enclosure for the circuit, use a small aluminum box to house the amplifier.

power

The nominal 13.5 Vdc from an automotive electrical system is just what’s needed for the audio amplifier. However, it’s also desirable to power the handheld from the car electrical system, as rechargeable batteries are insufficient for long trips. Powering your handheld may not be so simple. Read your instruction book carefully. My FT-207 manual cautioned that the voltage applied be limited to 12 volts or below.

Inspection of the circuit diagram showed two dc input paths: one for needle-pin connections in a holder/power supply, and the other a jack for the battery charger. The circuit has one diode in series with the pin contacts and two diodes between the battery-charger jack and the set. (Silicon diodes typically have a voltage drop of 0.6 volt.)

Automotive electrical systems are noisy electrically and often have high-voltage spikes called transients. The lead-acid storage batteries used in cars have a nominal voltage of 12.6. Fully charged, the batteries will show a potential of approximately 13.5 volts. The battery-charging system delivers 14 volts or more. Transients of up to 300 volts are produced during normal operation of the car. This is not the sort of power source to be directly connected to a handheld.
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I chose to use the charger input jack to power my radio. With a maximum of 14.5 volts from the car, the power circuit of fig. 4 was used. The two diodes inside the FT-207 provided a 1.2 volt voltage drop. I used two additional diodes in series with the power lead, so that the maximum voltage applied to the radio would be 12.1 volts. I included a 15-volt zener diode to clip any voltage transients. Also, I used a capacitor to reduce the noise from the automotive electrical system. (In some installations, a more extensive filter may be needed to eliminate alternator whine.)

fig. 4. Schematic diagram of the power circuit.

Installation

Installation details can be changed to suit individual requirements. My original goal was to use the radio for hamming while on family trips. I built the circuit of fig. 4 into the speaker on a solder-lug strip. The power cord is equipped with a cigarette-lighter plug for instant installation.

Two short cords with miniature phone jacks connect to the radio, one for power and one for audio. S1 of fig. 4 ensures that power is off until the power cord to the radio is in place. (It's impossible to insert or remove a "hot" phone plug without hitting ground simultaneously, which results in an impressive flash and a blown fuse.)

If you want to a semi-permanent installation, the speaker and amplifier can be mounted under the dash or at any other convenient spot. I place my radio beside me on the car seat when traveling and use the remote microphone. Volume and squelch controls are handy, and the band-search feature is useful for finding repeaters when in unfamiliar areas. Best of all, when I arrive at my destination, the radio can be disconnected in seconds and clipped to my belt.
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July 1981
Printed-circuit techniques, solid-state devices, and some old-time technology — a project for the first-time builder

field-strength meter for the high-frequency Amateur bands

Here's a project for the first-time builder — a band-switching field-strength meter. It's a neat accessory for your station that indicates the relative field strength of a signal. Actually, it's a small, band-switched receiver covering the Amateur 80, 40, 20, 15 and 10 meter bands. In this unit the speaker or headphones have been replaced by a meter that indicates the relative field strength. The receiver is a very basic unit, but it's sensitive enough for critical antenna adjustment and tuning. It's battery powered, allowing you to work at some distance

By Ken Powell, WB6AFT, 6949 Lenwood Way, San Jose, California 95120
from the antenna. And it's sensitive enough so that a short whip antenna, as used on 2-meter portables, will serve as a pickup or receiving antenna.

The field-strength meter is constructed on a single printed circuit (PC) board. Component count is low, overall cost is minimal, and the highest voltage encountered is only 3 volts. The field-strength meter has a minimum number of controls: a push-button bandswitch, an rf-level meter, and a sensitivity control that keeps the instrument within reasonable bounds as you get your antenna and transmitter really humming!

The complete unit is about 5 inches wide, 6 inches deep, and 3 inches high (13 x 15 x 8 cm). It could be squeezed down a bit smaller; but, in the interest of making construction a pleasure rather than a chore, the package was kept on the roomy side. Component values are not overly critical, and no special tools or equipment are required for construction or adjustment.

circuit

The description of the field-strength meter makes it sound a bit more complex than it really is. A glance at the schematic (fig. 1) shows the simplicity of the circuit. Band switching sounds complex because we tend to think of large rotary switches and the like; but in this case, band switching is handled by a simple push-button switch mounted on the PC board. This eliminates a lot of wiring and the chance for errors. This type of switch is a real boon to the builder.

The circuit is actually a crystal set, much like those used by the pioneers of early wireless. The antenna is connected to the primary of the rf coil, L1; the secondary of this coil is tapped to provide resonance on each of the high-frequency bands covered by the field-strength meter.

The push-button bandswitch, S1, selects the desired tap on the secondary winding of the coil, L1, and shunts the secondary tap with the required capacitance to provide resonance at each switch position. To make parts procurement easy, the same variable capacitor is used on each band and is shunted by a fixed capacitor where required (see fig. 1). This provides a trimmer for setting each band and eliminates the need for a front-panel tuning control.

The voltage developed across L1 is applied to the detector, CR1, a germanium diode. This rectified voltage is filtered by capacitor C10 and applied to the base of Q1. This general-purpose germanium NPN transistor is an amplifier. It allows the use of a low-cost meter movement as an output indicator. (The alternative is a more sensitive meter, which is more expensive and more subject to damage.) The meter is shunted by sensitivity control R1, which allows a selected portion of Q1's collector current to bypass the meter movement. This enables you to maintain the meter needle within a usable portion of the meter scale as varying signals are applied to the antenna terminal. The overall collector current of transistor Q1 is limited by resistor R2. The power OFF/ON switch, S2, is coupled to the sensitivity control. The wiring is such that the full clockwise rotation of the control yields maximum sensitivity.

Power for the field-strength meter is supplied by two AA cells mounted on the PC board. Current consumption of the unit is low: battery life should approximate the shelf life of the batteries. Trimmer capacitors C1 through C5 provide individual tuning for each of the bands, and once the unit is adjusted, it's not likely that any drift will be encountered.

construction

Construction of the field-strength meter is really tailored for the first-time builder, and the parts cost, even in today's wild economy, is low. Components aren't especially sensitive to rough handling, and the package is not crammed or difficult to assemble. Radio-frequency circuits are often difficult to duplicate, but printed-circuit construction and standard coil stock take care of that nicely.

Standard hand tools and a drill are all that are required for construction. The aluminum of the case is very soft, and woodworking tools handle it well. A bit of filing is required to get the rectangular holes for the band switch and meter movement, but it's really not much of a task.

let's get started

The first step in the construction of the field-strength meter is to obtain the components shown in table 1. The PC board should be etched and drilled in accordance with the foil layout depicted in fig. 2. If you don't have the facilities for fabricating the PC board, an etched and drilled board, complete with the bandswitch assembly installed, is available. The source for this board is shown in table 1.

To start construction, mount the bandswitch and solder it in place on the PC board. Next, mount the four spacers on the foil side of the PC board. These spacers elevate the board above the base of the cabinet.

Now, before mounting any other components on the PC board, take the time to work out the mechanical details of the PC board in relation to the cabinet. If you use the same case I did and want to have the same general layout on the front panel, see the layout in the photos of the completed unit.

The front panel will require five rectangular holes for the switch assembly, a rectangular hole for the meter, and a round hole for the sensitivity control.
The rear panel will require holes for the UHF connector used for the antenna.

After making the cutouts in the case, the PC board can be placed into the case, and the clearance for the push buttons can be checked. If things seem to fit well, mark and drill the four holes in the base for mounting the PC board and the rubber feet furnished with the case. When you're satisfied with the mechanical details, you can go on to complete the assembly of the board.

mounting small parts

The PC-board-mounted components, with the exception of rf coil L1, can now be mounted and soldered in place on the board as shown in fig. 3. When mounting components try to develop the habit of installing like components in the same direction so all values can be read from one side or edge of the PC board. In this case, all capacitors would be installed in the same direction. This is a good practice for all your projects and can make service and checkout easier.

Install the four wires that leave the board, using stranded wire to reduce the chance of wire breakage. Leave these leads about 6 inches (15 mm) long and trim them during the final stages of wiring. Color-coded wire is good for this purpose, and if you use color codes, note them on the schematic for reference. The PC board can now be set aside and work can be started on rf coil L1.

the rf coil

Before starting work on L1, study the drawing shown in fig. 4. Develop a fairly good idea in your mind of how the coil is to be formulated, as it is a very easy thing to get confused. Initially, the coil stock is 3 inches (76 mm) long and contains 48 turns held in place by four plastic formers.

Starting at the left end of the coil, as shown in fig. 4, count off four complete turns then go about one-third of a turn further, just past the second former, and cut the wire. Fold this wire back so it leaves the coil stock parallel to the lead at the start of the coil. This forms the four-turn primary of L1. The remaining end of the wire just cut will be the lead wire for the secondary and is peeled from the coil stock until it is parallel with the primary coil leads. This will leave a single-turn space between primary and secondary windings of L1. From this initial point on the secondary, count off 31 turns and again cut the wire about one-third way around the coil form. Fold this wire back parallel with the other coil leads. Remove the remaining coil stock and you should have a four-turn primary and a 31-turn secondary.

Now to put a few taps on the secondary. Using nail polish or other marking device, put a small mark at the fourth, seventh, ninth, and eighteenth turns of the secondary. These marks should be placed at the former, and the taps will be soldered just past the marks in the direction of the coil winding.

Scrape the coil plating lightly with a sharp hobby knife where each tap will be placed. This will make soldering the taps easier. Tin each of these spots lightly with your iron before soldering the taps in place. Form the four tap wires from resistor leads or solid wire that is well tinned. Don't try to use wire left
fig. 2. PC board, foil side, for the field-strength meter.

fig. 3. Component layout and associated wiring viewed from component side of PC board.
table 1. Parts list for the field strength meter.

<table>
<thead>
<tr>
<th>component</th>
<th>description</th>
<th>part number</th>
<th>source*</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 through C5</td>
<td>5 to 30 pF ceramic trimmer</td>
<td>E.F. Johnson 275-0430-005</td>
<td>CS</td>
</tr>
<tr>
<td>C6</td>
<td>150 pF ceramic cap</td>
<td>Sprague 5GA-T15</td>
<td>CS</td>
</tr>
<tr>
<td>C7</td>
<td>68 pF ceramic cap</td>
<td>Sprague 5GA-Q68</td>
<td>CS</td>
</tr>
<tr>
<td>C8</td>
<td>22 pF ceramic cap</td>
<td>Sprague 5GA-Q22</td>
<td>CS</td>
</tr>
<tr>
<td>C9</td>
<td>10 pF ceramic cap</td>
<td>Sprague 5GA-Q10</td>
<td>CS</td>
</tr>
<tr>
<td>C10</td>
<td>0.001 μF</td>
<td>Sprague 5GA-D10</td>
<td>CS</td>
</tr>
<tr>
<td>CR1</td>
<td>1N34A diode</td>
<td>276-1123</td>
<td>RS</td>
</tr>
<tr>
<td>E1</td>
<td>1.5 V &quot;AA&quot; cells (2X)</td>
<td>23-552</td>
<td>RS</td>
</tr>
<tr>
<td>E1 Holder</td>
<td>for 2 &quot;AA&quot; cells</td>
<td>12A2016-0</td>
<td>GM</td>
</tr>
<tr>
<td>J1</td>
<td>UHF jack, SO-239</td>
<td>278-201</td>
<td>RS</td>
</tr>
<tr>
<td>L1</td>
<td>1&quot; x 16 turns/inch</td>
<td>B&amp;V W3015</td>
<td>QE</td>
</tr>
<tr>
<td>M1</td>
<td>1 mA meter</td>
<td>Calectro D1-905</td>
<td>CS</td>
</tr>
<tr>
<td>Q1</td>
<td>transistor, germanium</td>
<td>276-2002</td>
<td>RS</td>
</tr>
<tr>
<td>R1</td>
<td>5 k pot, linear taper</td>
<td>271-1714</td>
<td>RS</td>
</tr>
<tr>
<td>R2</td>
<td>270-ohm, 1/2 W resistor</td>
<td>271-016</td>
<td>RS</td>
</tr>
<tr>
<td>S1</td>
<td>switch, 5-position pushbutton</td>
<td>18A1731-9</td>
<td>GM</td>
</tr>
<tr>
<td>S2</td>
<td>switch for R1</td>
<td>271-1740</td>
<td>RS</td>
</tr>
<tr>
<td>case</td>
<td>5-1/4&quot; x 3&quot; x 6&quot;</td>
<td>270-253</td>
<td>RS</td>
</tr>
<tr>
<td>knob</td>
<td>0.750&quot; diameter x 1/4&quot; shaft</td>
<td>274-415</td>
<td>RS</td>
</tr>
<tr>
<td>spacers</td>
<td>No. 6 screw spacers</td>
<td>64-3024</td>
<td>RS</td>
</tr>
<tr>
<td>PC board</td>
<td>with S1 installed</td>
<td>FSM1</td>
<td>JO</td>
</tr>
</tbody>
</table>

CS: Circuit Specialists  
1344 N. Scottsdale Road  
Tempe, AR 85281  
Tel. 800-528-1417  

GM: Gravois Merchandisers, Inc.  
715 Armour Road  
No. Kansas City, MO 64116  
Tel. 800-821-3686  

QE: Quement Electronics  
1000 S. Bascom Avenue  
San Jose, CA 95128  
Tel. 408-998-5900  

JO: Jim Oswald  
1436 Gerhardt Avenue  
San Jose, CA 95125  
PC board with S1 installed $9.75 postpaid  
Tel. 408-269-2314  

The field-strength meter ready for final assembly. PC-board construction and the use of pushbutton switches make a clean layout and an attractive package. Mounting screws for the meter are avoided by mounting the meter with epoxy cement.

Inside the field-strength meter showing, from left, the battery pack; rf tuned circuit consisting of L1 and C1 through C10; meter, and sensitivity control. Note that component layout pretty much follows the schematic diagram.
over from the coil stock, as this is often difficult to solder in place.

Solder the four taps in place as shown in fig. 4. This operation is a bit tricky. Should you splash some excess solder on the coil form, it will lift off using solder wick or even a pipe cleaner.

After all the taps are in place, the coil leads can be trimmed to size and the coil can be mounted and soldered to the PC board. Don’t get the tap leads too hot during this process or they may pop off the coil!

**final details**

Now that the PC board is complete, the mechanical details can be finished on the case. If desired, the case can be sanded with 320 or finer paper and a coat or two of your favorite color can be applied. I usually do this, as I invariably scuff up the front panel when making the required cutout.

After the paint is thoroughly dry, the rub-on lettering can be applied. This type of lettering and a few racing stripes can give your home projects a commercial look. A coat of clear lacquer will protect the lettering and level out the paint on the panel.

After all’s dry, the PC board can be installed in the case and the sensitivity control, meter, and antenna jack mounted. The meter described in table 1 has two small mounting holes. However, rather than use these, I mounted the meter with a couple of drops of epoxy cement between the front panel and the mounting tabs. This eliminated the mounting screws in the front panel and makes for a clean package.

The remaining wiring can be completed as shown in fig. 3, and the control knob can be installed on the sensitivity control. Give the unit a quick once-over against the schematic and drawings, then install the two AA cells, observing proper polarity. You are just about ready for the smoke test.

Turn the field-strength meter to **ON** and advance the sensitivity control slowly. As you advance clockwise, the meter will move slightly off the zero position in a positive direction. This is normal and indicates that all is well so far. Should the meter move slightly in the negative direction, the meter leads are reversed and must be transposed to correct the problem.

**adjustment**

The field-strength meter can be tuned with a signal source such as a signal generator, grid-dip meter, or your transmitter. If you use your transmitter, be sure to couple it to a dummy load so you don’t radiate signals that will bother other Amateurs. In the absence of a dummy load, turn your transmitter output down and pick a time when the band is dead. Remember to listen on frequency before transmitting and keep each transmission short, ten seconds or less, and identify each transmission as a test transmission.

Choose your favorite frequency on the 80-meter band, and with the field-strength meter in the 80 position, inject a signal from the generator or use a pickup antenna for off-the-air or grid-dip signal source.

Adjust trimmer capacitor C1 for a maximum meter reading. Next, repeat this procedure with your signal source and the field-strength meter set for the 40-meter band. Trimmer capacitor C2 will provide adjustment for this band. Repeat this procedure for the 20-meter band, using C3 for adjustment. Capacitor C4 is for 15 meters, and C5 will be the trimmer for the 10-meter band. This completes the adjustment of the field-strength meter. The cover can be installed and you can sit back and admire your handiwork!

**a final word**

While the field-strength meter isn’t a technological breakthrough or a state-of-the-art device by today’s standards, it’s a good project for getting started in the fascinating field of home brew. It will help you gain the skills necessary to go on to bigger, better, and more interesting projects. Most first-time builders will be able to complete the project during a weekend once the parts have been procured. And keep in mind that if you do have any problems or areas that are confusing you, ask one of your Amateur buddies for a bit of help. You will both enjoy the project!

The next project? Well, I hope to put an SWR meter together soon, and when we’re armed with the field-strength meter and an SWR meter, there won’t be a tune-up problem we can’t handle. So do a good job on the field-strength meter and watch for the SWR meter soon.

ham radio
super beep circuit
for repeaters

Here’s a circuit for your repeater that features an inhibit and selectable wait function.

A beep signal in your repeater, if used properly, could be an asset; otherwise it’s nothing more than another piece of trivial hardware. The super beep circuit, described here, was designed to provide the following:

1. An inhibit function against fluttering signals, as from mobile stations.
2. A selectable wait function to allow breakers to start a conversation before the beep signal is activated.
3. An adjustable duration of two independent audio oscillators, which generate a mellow and pleasant sound.
4. A high-level audio output to drive most repeater circuits.

The super beep circuit was designed for the Upper-Valley Amateur Radio Club repeater (Dayton, Ohio) using a VHF Engineering COR board. Input to the beep circuit, fig. 1, is obtained from the PTT point on the COR board. Output from the beep circuit feeds the audio input to the repeater’s transmitter.

The super beep circuit uses standard TTL and CMOS logic, operating from a 5-volt supply. As shown in fig. 1, the circuit consists of an inhibit one-shot, a wait one-shot, and the two triggered audio oscillators. A buffer amplifier isolates and drives the repeater’s audio input.

inhibit function

The inhibit function of the circuit is provided by U1, a 555 timer used as a monostable, which is made retriggerable by connecting a diode (CR1) between pins 6 and 2 (fig. 2). When the squelch from the repeater is broken, the PTT signal on the COR board, normally at logic 1, is forced to a logic 0. This action makes U1 pin 2 a logic 1. So long as the repeater’s COR board keeps the PTT signal low, the output of U1 will stay high, and no timing function will be permitted since CR1 will not allow the timing capacitor to charge.

By Al Torres, KP4AQI, 4850 Hollywreath Court, Dayton, Ohio 45424
If the COR signal momentarily switches states (as during mobile flutter), the timing cycle of U1 is initiated. This timing cycle was designed to keep U1 pin 3 at logic 1 for 0.75 second after the COR signal changes state. If the COR signal recovers before 0.75 second, U1 pin 3 will not change state, and the timing cycle is aborted (see fig. 3). Keep in mind that the wait one-shot is activated only on transitions that go from high to low.

**wait function**

This function is implemented by using a 74121 (U2, fig. 2) as a monostable. The time duration of this one-shot is determined by:

\[
T_D = K_d R_T C_T \left( 1 + \frac{0.7}{R_T} \right)
\]

where:

- \( T_D \) = time duration (seconds)
- \( K_d \) = constant supplied by manufacturer (ND)

---

**fig. 1.** Block diagram of the super beep circuit, which uses standard TTL and CMOS logic. Two triggered oscillators provide the beep tone.

**fig. 2.** Schematic diagram of the super beep circuit.
\[ C_T = \text{capacitance (farads)} \]
\[ R_T = \text{resistance (ohms)} \]

With the values shown, the one shot can be adjusted from more than 100 milliseconds to more than 2 seconds. In practice, I found that 0.75 second was optimum; such time duration, in addition to the 0.75 second from the inhibit circuit (a total of 1.5 seconds), is enough time for someone to break in between transmissions and before the beep signal is activated.

**oscillators**

The oscillators use CMOS logic (U5, a CD4011) and operate in the gated mode. When the input to the first gate is at logic 0 no audio is generated. Using this concept, the oscillators are fired for a fixed-time duration; control for such time duration is accomplished by two one-shots (U3 and U4). By making U3's duration longer than that of U4, a pleasant, mellow sound is generated.

The pitch of each oscillator is controlled by a 100k pot, which can be adjusted to satisfy your taste. After careful experimentation with our system, we made U3's duration approximately 170 milliseconds and U4's just 70 milliseconds. Results showed that a ratio of 3:1 creates the most pleasant sound. The audio is then coupled to the repeater through two 510-ohm resistors to a unity-gain voltage follower (U6), a \( \mu \)A741 op amp. Audio level is controlled by a 1k pot.

The input impedance of this voltage follower is such that no loading occurs at the CMOS audio oscillators. Audio range, with the components used, is adjustable from 1000 Hz to 10 kHz.

**construction**

The super beep circuit was built on a Radio Shack two-voltage-source edge-card board (RS 276-154), which mates to a 22-pin dual edge-card socket (RS 276-1551). The ICs were mounted in DIP sockets, which were soldered to the board.

Nothing is critical about the circuit. The unit operates from 5.0 Vdc, which is available on most popular repeaters. Current drain is not significant.

When adjusting the audio level, make sure that you provide enough audio to deviate your repeater 4-4.5 kHz; any greater amount will become bothersome to the operators and to adjacent repeaters.

---

*Ham Radio*
The right design — for all the right reasons. In setting forth design parameters for ARGOSY, Ten-Tec engineers pursued the goal of giving amateurs a rig with the right features at a price that stops the amateur radio price spiral.

The result is a unique new transceiver with selectable power levels (convertible from 10 watts to 100 watts at the flick of a switch), a rig with the right bands (80 through 10 meters including the new 30 meter band), a rig with the right operational features plus the right options, and the right price for today's economy—just $549.

Low power or high power, ARGOSY has it. Now you can enjoy the sport and challenge of QRPP operating, and, when you need it, the power to stand up to the crowds in QRM and poor band conditions. Just flip a switch to move from true QRPP power with the correct bias voltages to a full 100 watt input.

New analog readout design. Fast, easy, reliable, and efficient. The modern new readout on the ARGOSY is a mechanical design that instantly gives you all significant figures of any frequency. Right down to five figures (± 2 kHz). The band switch indicates the first two figures (MHz), the linear scale with lighted red bar-pointer indicates the third figure (hundreds) and the tuning knob skirt gives you the fourth and fifth figures (tens and units). Easy. And efficient—so battery operation is easily achieved.

The right receiver features. Sensitivity of 0.3 μV for 10 dB S+N/N. Selectivity: the standard 4-pole crystal filter has 2.5 kHz bandwidth and a 2.7:1 shape factor at 6/50 dB.

Other cw and ssb filters are available as options, see below. I-f frequency is 9 MHz, i-f rejection 60 dB. Offset tuning is ± 3 kHz with a detent zero position in the center. Built-in notch filter has a better than 50 dB rejection notch, tunable from 200 Hz to 3.5 kHz. An optional noise blanker of

Here's a Concept You Haven't Seen In Amateur Radio For A Long Time—
Low Price.

New TEN-TEC Argosy

$549

the i-f type has 50 dB blanking range. Built-in speaker is powered by low-distortion audio (less than 2% THD)

The right transmitter features. Frequency coverage from 80 through 10 meters, including the new 30 meter band, in nine 500 kHz segments (four segments for 10 meters), with approximately 40 kHz VFO overrun on each band edge. Convertible power: 100 or 10 watts input with 100% duty cycle for up to 20 min-

utes on all bands. 3-function meter shows forward peak power on transmit, SWR, and received signal strength. PTT on ssb, full break-in on cw. PIN diode antenna switch. Built-in cw sidetone with variable pitch and volume. ALC control on "high" power only where needed, with LED indicator. Automatic normal sideband selection plus reverse. Normal 12-14V dc operation plus ac operation with optional power supply.

The right styling, the right size. Easy-to-use controls, fast-action push buttons, all located on raised front panel sections. New meter with lighted, easy-to-read scales. Rigid steel chassis, molded front panel with matching aluminum top, bottom and back. Stainless steel tilt-up bail. And it's only 4" high by 9½" wide by 12" deep (bail not extended) to go anywhere, fit anywhere at home, in the field, car, plane or boat.

The right accessories—all front-panel switchable. Model 220 2.4 kHz 8-pole ssb filter $55; Model 218 1.8 kHz 8 pole ssb filter $55; Model 217 500 Hz cw filter $55; Model 224 Audio cw filter $55; Model 224 Audio cw filter $55; Model 223 Noise blanker $34; Model 226 internal Calibrator $9; Model 1125 Dc circuit breaker $15; Model 225 117/230V ac power supply $129; Model 222 mobile mount, $25; Model 1126 linear switching kit, $15.

Model 525 ARGOSY —— $549.

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Questions and Answers

Entries must be by letter or post card only. No telephone requests will be accepted. All entries will be acknowledged when received. Those judged to be most informative to the most Amateurs will be published. Questions must relate to Amateur Radio.

Readers are invited to send a card with the question they feel is most useful that appears in each issue. Each month’s winner will receive a prize. We will give a prize for the most popular question of the year. In the case of two or more questions on the same subject, the one arriving the earliest will be used.

I notice that pattern plots for beam antennas show the beamwidth at the 3-dB down points. Why is this figure used rather than, say, the 4- or 5-dB downpoint? — Sylvester McCutheon.

The 3-dB down point for antenna beamwidth measurements is a convenient reference point. The beamwidth is the angular distance between the directions at which the received or transmitted power is 0.707 times its maximum value, also called the half-power point.

I've moved a number of times in the last couple of years. The way I understand the FCC regulations is that if I move I have to notify the FCC — unless it is a temporary move. But what amount of time is considered temporary? — David Carrington, WL7ACD.

The FCC rules pertaining to addresses of licensees are contained in Sections 97.43 and 97.44. Basically, these rules state that you must furnish the FCC with an address in the United States where they can reach you with correspondence and documents (pink tickets, for example). Furthermore, every Amateur Radio station shall have one land location, the address of which appears on the station license, and at least one control point. Unless advised otherwise, the Commission will use the address contained in your most recent application to contact you.

After reading an article in which negative resistance was mentioned, I have wondered just what this term means. — Ted Brice.

Some devices have a property that exhibits a characteristic opposite to Ohm’s law for positive resistance. This property, called negative resistance, is characterized by a decrease in voltage drop across the device as current through it is increased, or vice versa. Alternatively, a decrease in current through the device will occur as voltage across the device is increased, or vice versa.

A tunnel diode is an example of a device that exhibits negative resistance. The characteristic curve of the tunnel diode, which shows forward current as a function of forward voltage, contains an area where the diode’s current decreases with increased voltage. This, of course, is opposite to the behavior of a regular resistor, which permits a greater current to flow as the voltage increases. The reverse condition occurs in the diode over this range of voltages; thus it is said to have negative resistance. With suitable external circuits added, it can be used as an oscillator or amplifier.
My TH6DXX antenna is on a 105-foot tower, and a 2300-MHz TV down converter is on the same tower at the 45-foot level. When I run about 800 watts input on 15 meters, the television screen goes blank and the down converter is inoperative. I have no interference problem with the down converter disconnected. The interference does not occur when operating on any other Amateur high-frequency band. Is the problem caused by overload on the down converter, and if so, why only on 15 meters? — Jim Brown, N4DDS.

The transmission line from your converter to the TV set might be some length that is resonant at 21 MHz. So even if you disconnect the converter and don’t remove the feed-line, the latter will act like a beautiful antenna. Try putting a shorted quarter-wave stub (at 21 MHz) at the input to the TV set. The problem should then disappear.

What is the best location for a multiband vertical antenna — on the ground, on the roof, or on top of a mast? — Richard L. Beaty, KA5DDG.

The antenna should be mounted as high above ground and as far from surrounding objects as possible. In any case, a good ground system is important for a vertical antenna to work efficiently. Most vertical-antenna ground systems consist of radial wires arranged around the base of the antenna. It is not absolutely necessary that the radials form the spokes of a wheel; they can be run in almost any convenient manner. Installing radials on a mast-mounted vertical is more difficult than if the antenna is ground mounted, of course. However, you can use the radials as guy wires and slope them downward at an angle of, say, 45 degrees from the horizontal. This arrangement will make the antenna’s feedpoint impedance closer to that of 50-ohm coax than if the wires were run horizontally.

Would you discuss ALC in some detail? I can’t find anything on the subject in any authoritative source, including ARRL publications or my manual for my Yaesu FT-101. — Harold F. Keenan, WA1FJR.

ALC is an acronym for both Automatic Level Control and Automatic Load Control. The former is used with speech amplifiers in the radio-broadcast service. In the Amateur-Radio Service, the latter term describes a form of compressor, or automatic variable-gain amplifier, which is used in SSB transmitters. Automatic load control keeps SSB transmitter gain at the highest usable level without exceeding the peak-power capability of the power amplifier — a sort of insurance policy.

In the simplified circuit shown, which is used with zero-biased triodes, the power-amplifier tube draws grid current over a certain portion of each excitation cycle. C1 and C2 divide the rf voltage in the amplifier plate circuit. The rf voltage produced across C2 is rectified by CR1, which is connected so that its dc output voltage is negative. This negative dc voltage is applied to the control grid of a remote-cutoff tube in the driver to reduce the gain of the driver stage on signal peaks.

Other circuit elements provide appropriate attack and release time constants and bias. The overall effect of ALC is to keep the rf output relatively constant and at a level below the point where the amplifier is overdriven by widely varying audio input.
VBT, notch, IF shift, wide dynamic range

**TS-830S**

Now most amateurs can afford a high-performance SSB/CW transceiver with every conceivable operating feature built in from 160 through 10 meters (including the three new bands). The TS-830S combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF. Its optional VFO-230 remote digital VFO provides five memories.

**TS-830S Features:**

- **100-10 meters, including three new bands**
  Covers all Amateur bands from 1.8 to 29.7 MHz (LSB, USB, and CW), including the new 10, 18, and 24-MHz bands.
  Receives WWV on 10 MHz.

- **Wide receiver dynamic range**
  Junction FETs (with optimum IMD characteristics and low noise figure) in the balanced mixer, a MOSFET RF amplifier operating at low level for improved dynamic range (high amplification level not needed because of low noise in mixer), dual resonator for each band, and advanced overall receiver design result in excellent dynamic range.

- **Variable bandwidth tuning (VBT)**
  Continuously varies the IF filter passband width to reduce interference. VBT and IF shift can be controlled independently for optimum interference rejection in any condition.

- **IF notch filter**
  Tunable high-Q active circuit in 455-kHz second IF, for sharp, deep notch characteristics.

- **IF shift**
  Shifts IF passband toward higher or lower frequencies (away from interfering signals) while tuned receiver frequency remains unchanged.

- **6146B final with RF NFB**
  Two 6146Bs in the final amplifier provide 220 W PEP (SSB)/180 W DC (CW) input on all bands. RF negative feedback provides optimum IMD characteristics for high-quality transmission.

- **Built-in digital display**
  Six-digit large fluorescent tube display, backed up by an analog dial. Reads actual receive and transmit frequency on all modes and all bands. Display Hold (DH) switch.

- **Adjustable noise-blanker level**
  Built-in noise blanker eliminates pulse-type (such as ignition) noise. Front panel threshold level control.

- **Various IF filter options**
  Either a 500-Hz (YK-38C) or 270-Hz (YK-48CN) CW filter may be installed in the 8.83-MHz first IF, and a very sharp 500-Hz (YG-455C) or 250-Hz (YG-455CN) CW filter is available for the 455-kHz second IF.

- **More flexibility with optional digital VFO**
  VFO-230 operates in 20 Hz steps and includes five memories. Also allows split-frequency operation. Built-in digital display. Covers about 500 kHz above and below each 500-kHz band.

- **Built-in RF speech processor**
  For added audio punch and increased talk power in DX pileups.

- **RIT/XIT**
  Receiver incremental tuning (RIT) shifts only the receiver frequency, to tune in stations slightly off frequency. Transmitter incremental tuning (XIT) shifts only the transmitter frequency.

- **SSB monitor circuit**
  Monitors IF stage while transmitting to determine audio quality and effect of speech processor.

More information on the TS-830S is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

**Specifications and prices are subject to change without notice or obligation.**
Small wonder.

Processor, N/W switch, IF shift, DFC option

An incredibly compact, full-featured, all solid-state HF SSB/CW transceiver for both mobile and fixed operation. It covers 3.5 to 29.7 MHz (including the three new Amateur bands) and is loaded with optimum operating features such as digital display, IF shift, speech processor, narrow/wide filter selection (on both SSB and CW), and optional DFC-230 digital frequency controller. The TS-130S runs high power and the TS-130W is a low-power version for QRP.

TS-130 SERIES FEATURES:

- 80-10 meters, including three new bands: Covers all Amateur bands from 3.5 to 29.7 MHz, including the new 10, 18, and 24 MHz bands. Receives WWV on 10 and 15 MHz. VFO covers more than 50 kHz above and below each 500-kHz band.
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- TL-522A linear amplifier
- HS-5 and HS-4 headphones
- IC-1010 world digital clock
- VS-20 base-station power supply for TS-130W
- SP-40 compact mobile speaker
- VFO-230 digital VFO with five memories

Specifications and prices are subject to change without notice or obligation.
Garth Stonehocker, K0RYW

DX FORECASTER

last-minute predictions

Very good conditions on the lower-frequency bands are expected during the first few days, perhaps through the first week, of July, then another good period is expected during the third week of the month. The DX conditions for the higher-frequency bands should improve steadily until the third week. During this time the daylight hours into the evening will be favored. Some disturbance is expected for a day or two in the first week, again around the 15th, and possibly of longer duration near the 21st of the month.

events of the month

Geophysical events that may affect DX on various bands are plentiful this July. The moon comes on stage with a partial eclipse on the day it is full (July 17th). The eclipse begins at 0325 and ends at 0609 UT. It can be seen from Africa except in the northeast; southwestern Europe; Antarctica; South America; North America except the northwest; the east Pacific; and New Zealand. The maximum obscuration of moon diameter is 0.55. Lunar perigee is on the 27th.

The sun is the big performer, with a total eclipse on the 31st beginning at 0111 and ending at 0620 UT, with a maximum duration of two minutes, two seconds. The path of totality begins on the Arabian Peninsula then extends across the southern Black Sea, northern Caspian Sea, into the USSR and China border, across Japan and Hawaii, and into Alaska and Northern Canada. Near the path of totality radio propagation goes from day conditions (high-frequency ham bands) to night conditions (lower-frequency ham bands) and returns to daytime conditions in just a couple of hours.

When daytime conditions return after totality, look for DX from unusual locations, as extra ionized layers are usually formed, which change slowly in height from the E to F region. The extra layer will support only nighttime radio frequencies near totality, changing slowly to daytime frequencies at the end of the eclipse. It should be fun to try some of the frequencies for DX if your QTH is near the path of the eclipse. Hams have in years past participated in eclipse propagation experiments.

The Aquarid meteor shower starts about the 18th, peaks about the 28th, and lasts until about August 7th. The radio-echo rate at maximum is about 34 per hour.

more on sporadic E (Es) DX

Before the Es season gets further along, a few more observations come to mind about using Es propagation in DX hunting. The DX Forecaster for May, 1981, went into some geophysical aspects of Es production. This was to give DXers an idea of where and when to look for summer short skip. Some antenna design considerations, to be able to couple well into the Es propagation mode, were mentioned.

To try to short skip into a DX location use the following antenna takeoff angles and bearings: The takeoff angle should be around 5 degrees to make a hop length of 900 miles (1500 km) to obtain maximum signal strength of about 60 dB above a microvolt. To obtain the highest probability of being able to use the Es when it occurs, a fairly wide beamwidth should be used. That is, a small beam is better than a rhombic, and a wide-angle beam is better than a narrow one. Another rule is to use the lowest high-frequency band commensurate with the higher daytime versus nighttime absorption of the signal and the static. In other words, in the daytime don't use the 10-meter band when 20 is available or use 40 meters at night when 80 meters is available (if the static is not very bad); 6-7 dB are available for this difference in Es frequency range.

band-by-band forecast

Ten meters should provide excellent daytime propagation, particularly north/south path DX to South America, Africa and Pacific areas. Expect conditions to peak during the afternoon hours. There will also be some good short-skip sporadic-E conditions on many days of the month to distances between 500 and 1500 miles (800-2400 km) or more.

Fifteen meters will provide good worldwide DX during the daylight and early evening hours on most days of the month. Expect conditions to peak during the late afternoon, with long- and short-skip signals.

Twenty meters will be open to some area of the world for the entire twenty-four hour period on most days of the month. The band should peak in all directions just after local sunrise, and again toward the east and south during late evening hours. During darkness, the band will peak toward the west, in an arc from southwest through northwest, that will take in Pacific areas.

Forty meters can often provide good DX from sunset, through darkness, until just after sunrise, despite the atmospheric noise levels (static) — provided you choose times when local thunderstorm-related static is at a minimum.

Eighty meters can sometimes provide openings to DX areas during darkness and at sunrise, but signals will be weak and static will be strong. For these DX conditions, coastal stations often have a better chance of working DX than do stations in the center of large land masses.

One-sixty meters is almost hopeless during the hours of darkness and during the daytime. Forget it!

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More Details? CHECK-OFF Page 106
a new look
at the
W8JK antenna

This old standby provides interesting possibilities for the new bands

The W8JK antenna or "flat-top beam" was adapted for Amateur use and described in QST in 1938 by John D. Kraus, W8JK. This antenna was widely used for several years but has now been largely superseded by the Yagi, which has higher gain for a given size.

In 1970, 32 years after his original QST article, W8JK described a 5-band rotary beam antenna with several modes of operation. In mode 1, having the highest gain, the antenna consists of a pair of vertical W8JK antennas stacked horizontally. Whether by design or chance, the same issue of QST contains a description of a device called "The Ultimate Transmatch," which is a considerable aid in making the basic W8JK an attractive antenna.

In this article the W8JK antenna is compared to the widely-used 3-element Yagi, and it will be shown that, despite its lower theoretical gain, the W8JK is in several respects the better antenna.

By Frank Regier, OD5CG, Department of Electrical Engineering, American University of Beirut, Beirut, Lebanon
The basic W8JK antenna, consisting of two closely spaced dipoles fed out of phase.

The spacing should not be reduced to much below this figure but can be increased to a quarter wavelength with very little reduction in gain.

Antenna length is subject to the same constraints as in the case of a simple dipole: length should not be reduced much below a half wavelength because of reduced radiation resistance, and gain increases with length up to a maximum at one and a quarter wavelengths.

The gain of a basic W8JK antenna with eighth-wavelength spacing and half-wavelength elements is about 4 dB in free space. This figure increases gradually to about 6 dB at twice the design frequency, and to a maximum of about 7 dB at 2.5 times the design frequency.

The familiar 3-element Yagi antenna is shown in fig. 2. This antenna is similar to the W8JK in that its gain results from the cancellation of radiation from the various elements in some directions and addition in others. It differs, however, in how power is applied to the various elements. In the W8JK antenna both elements are fed directly. In the Yagi only one element is fed directly, and the others behave simultaneously as receiving and transmitting antennas, receiving power from the driven element and re-radiating it with an amplitude and phase determined by the length of the element and its spacing from the driven element. This method of supplying power to the parasitic elements makes the Yagi easy to feed, but the critical dependence of the phase of radiated power on element length makes the Yagi a narrow-band antenna, operating as intended only near the design frequency. At frequencies far removed from resonance, the parasitic reflector and director receive and re-radiate little power, and the pattern of the antenna is not very different from that of the driven element alone.

Variations on the 3-element Yagi include: a) an increase in the number of directors, leading to improved forward gain (additional reflectors, being in a low-field region, would have little effect and are rarely used), b) interlacing elements for various frequency ranges, and c) the addition of traps in the various elements to cause resonance at several frequencies. This is a useful procedure but requires compromise spacing at the different frequencies.

a comparison

Although a 3-element Yagi has more gain in free space than the W8JK, there are at least three respects in which the latter is the better antenna. These are: noncritical construction, bandwidth, and operation at low elevation.

The noncritical nature of the W8JK results from the fact that, unlike the Yagi, it does not depend on resonance for its symmetry; and, provided symmetry is maintained, element length and spacing are relatively unimportant.

Its large bandwidth, too, results from the nonresonant nature of the W8JK antenna. This bandwidth is such that operation is possible over at least a 2.5:1 frequency range. Operation over such a range does require the use of an antenna tuner or transmatch and a tuned transmission line, since antenna impedance does change with frequency.

antenna height

We turn now to the question of operation at low elevation. It is a matter of great importance, and in fact the major point of this article, that the basic principle of operation of the W8JK antenna remains valid even at very low elevations, whereas under the same conditions the behavior of a Yagi degrades to that of
fig. 3. Basic W8JK antenna spaced at a height \( h \) above a ground plane. Although reflection from the ground plane takes place and the angle of radiation is raised, symmetry is retained, and the basic principle of operation — cancellation of radiation in the vertical direction — remains valid.

Although not disturbed by the ground plane, the fundamental principle of operation — cancellation of radiation in the vertical direction — remains valid. Considering next the Yagi (see fig. 4), we find that the nearby ground plane will severely detune both director and reflector and interfere with their excitation by the driven element. These two parasitic elements therefore become ineffective, and performance degrades to that of a simple dipole near ground.

It follows from the above argument that there must be some critical height below which the W8JK outperforms the Yagi, and it would be interesting to know what that height is. In principle it should, of course, be possible to calculate the characteristics of both the W8JK and the Yagi as functions of height above a perfect ground. But, particularly in the case of the Yagi, this presents difficulties, and an experimental approach seems preferable. I am not in a position to carry out the experimental work, but I have found a reference\(^5\) that seems to contain the essential results. In this reference it is stated that a 20-meter antenna, essentially equivalent to a W8JK, at 38 feet (11.6 meters) gave results comparable to a 3-element Yagi at the same height. When 10-meter antennas were compared at the same height, the 3-element Yagi was found to be superior. This would seem to imply that at an elevation of about one wavelength, a 3-element Yagi outperforms a W8JK, but that at a half wavelength elevation, the two are about equal. This would mean that the critical height is about a half wavelength, and that below that height a W8JK can be expected to outperform a Yagi.

Fig. 5 (from reference 4) shows the W8JK vertical radiation pattern at a height of \( 1/2 \) wavelength.

**conclusions and remarks**

The W8JK antenna has a number of desirable characteristics and makes a particularly good antenna in situations where only a low height is possible. An elevation of a half wavelength seems to be about the critical height below which the W8JK provides higher gain than a 3-element Yagi. Thus a W8JK at 20 feet (6 meters) should be about comparable to a 3-element Yagi at the same height on 21 MHz, poorer at higher frequencies, and better at lower frequencies.

Although the W8JK exhibits gain over at least a 2.5:1 frequency range, the antenna has an impedance that is a function of frequency and should be fed by a transmatch and an open-wire line of some sort.

In addition to the 10-, 15-, and 20-meter bands, the new Amateur bands at 10, 18, and 24 MHz can be ac-
concluded. For example, an antenna with a length \( L = 40 \text{ feet} \) (12 meters) and a spacing \( d = 11 \text{ feet} \) (3.4 meters) should provide good performance on the Amateur bands at 10, 14, 18, 21, 24, and 28 MHz. In addition it should provide much improved reception on the 12- , 15- , 18- , and 21-MHz shortwave broadcast bands, where most listeners make do with a random length of wire, or at best, a dipole. If operation below 14 MHz is not required, the spacing can be reduced to \( d = 8 \text{ feet} \) (2.4 meters), and the length \( L \) can be anything from 24-40 feet (7.3-12.2 meters).

In closing I might mention that my own experience in feeding a 30-foot-long (9-meter) WBJK with 8-foot (2.4-meter) spacing by means of a 40-foot (12.2-meter) length of 300-ohm TV twinlead has been better than might be expected. There has been no breakdown with 1200 watts PEP input, and although losses are no doubt somewhat higher than those of an open-wire line, the use of twinlead is extremely convenient. The main disadvantage of the twinlead is that it is necessary to cease operation during rainstorms because the input impedence of the feed line becomes erratic.

**references**


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**bibliography**


ham radio
Mounting a handheld transceiver (HT) in your car any place other than on the front seat can sometimes be a problem — particularly if you want to be able to remove it easily. I found a simple solution that works well for me, with only about one evening’s work. My Toyota Corolla (like most cars) has an ashtray in a convenient and accessible location on the front dash. It suddenly seemed obvious (particularly as I no longer smoke) that this would be an ideal location for mounting my radio. The sketch in fig. 1 is for a bracket to hold a Kenwood TR-2400, although the dimensions and design can be altered to suit any HT.

fig. 1. Ashtray bracket for mounting a handheld transceiver.

By Herb Bresnick, KB2XM, 16 Creekside Drive, Honeoye Falls, New York 14472
Homebrew mounting bracket fastens to the front of automobile ashtray.

Since the tone pad is on the front of the radio, the bracket is cut higher on the sides and lower in the front to permit access.

The ashtray is removed from the dash by simply pulling it beyond the normal stop position. Some ashtrays require pressing a tab so they can be removed for emptying. The plastic pull is next unscrewed from the inside and removed, leaving a flat mounting surface. The same holes can be used for attaching the bracket.

After the bracket was bent, a coat of black enamel was applied and the inside lined with self-stick, felt contact-paper to protect the set from scratches. A small piece of foam on the bottom absorbs shocks while you’re driving, further protecting your set. I used a strip of Velcro™ to hold the top part of the radio to the bracket, although a small leather strap would work as well.

One advantage of this mount is that it can be easily slid out for quick removal. It also functions as a simple stand on a table, and the ashtray even holds accessories (charger, earphone, and so on).

As a further refinement, I mounted a microphone holder on the lower front of the bracket and plugged an external microphone into the microphone jack, so that the entire radio doesn’t have to be lifted out for talking. A low-impedance dynamic cassette microphone, with a series 0.5-μF capacitor was found to work fine with the TR-2400. The microphone is light and compact, and the plugs mate exactly with the radio jacks. I replaced the original cable with a coil cord for added convenience.

This was a fun project and has considerably improved the utility of my HT as a mobile rig. Incidentally, if you are a smoker, this is good incentive to quit smoking!

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Includes Resistors Asst. 1-7 (350 pcs.) $10.95 ea.

### CAPACITOR CORNER

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### PRICE SUBJECT TO CHANGE

July 1981
battery backup for the K4EEU frequency standard

Because of frequent power failures in my area, I made the modifications shown in fig. 1 to Bert Kelley's "Universal Frequency Standard," which was published in *Ham Radio*, for February, 1974.

When line power is on, it provides load power as well as charging current of near 50 mA as the battery approaches the discharged condition. However, because of the nonlinearity of the LED, current is reduced to below 10 mA trickle charge as the battery nears the fully charged state. It takes about 140 per cent of the battery rated ampere-hour (AH) capacity to fully charge a nicad at the normal rate. Typically it is AH/10 × 14 hours, or a trickle charge of AH/150 continuously, depending on the amount and duration of power failures.

As shown, the battery will provide backup power for about eight hours at the normal load rate of 150 mA. When fully charged, the battery reads near 5.5 volts but in minutes reduces to 5.2 volts when discharging. At this voltage the frequency standard runs about +5 Hz in 10^7. For about 80 per cent of the battery discharge cycle, the battery voltage is relatively stable near 4.8 volts, and the frequency standard runs near normal frequency. When the battery nears discharge (below 4.4 volts), the standard runs about −5 Hz in 10^7. However, when line power returns, the standard returns to normal in minutes instead of requiring days to regain normal frequency stability.

John R. True, N4BA

---

516F-2 low-voltage and bias modification

Owners of Collins 516F-2 power supplies who have changed from vacuum-tube rectifiers to solid-state devices should check the low-voltage supply potential. This supply is nominally given a 275-volt value under load and will rise to approximately 300 volts during standby. With the use of silicon rectifiers, an increase of 10 per cent in these values might be expected, but I found it (in two cases) to be closer to 20 per cent. This means the voltage during keydown would be 330 volts and during standby would rise to 360 volts. While this had no immediate detrimental effects, I felt that this condition isn't one that's in the best interests of equipment longevity!

Fortunately, the secondary of the low-voltage-supply transformer has a center tap lead separate from the high-voltage winding. Two parallel 600-ohm, 10-watt resistors were inserted between this lead and chassis ground (fig. 2). A terminal strip or insulated standoff was mounted near the chassis side rail beneath the filter chokes. The center tap lead of the low-voltage secondary winding was lifted from its ground connection at the terminal strip close to the line cord entry and reconnected at the junction of the terminal strip and Resistors. The resistors were placed along this side rail as well.

When I was done, I found the low voltage to be within a few volts of the recommended value. A check should be made of the paralleled combina-
VSWR is at 7.15 MHz. Multiply that frequency by the number of feet used; you have the constant for your antenna out there to prove it! This is a number near 468 and correct for your antenna location and height: this is a number near 468 and correct for your antenna.

E.R. Lamprecht, W5NPD

radio interference to shortwave receivers

A troublesome source of interference to shortwave receivers is known as ITV. That’s interference caused by the horizontal sweep oscillator in TV sets. It produces harmonics that cause hash every 15 kHz or so in your receiver. Cures for ITV have been described in numerous Amateur publications.

But what about other sources of interference to your receiver? An excellent description and some cures are found in reference 1, an article by the late Jim Fisk that appeared in an early issue of ham radio. Jim described causes of and cures for interference produced by TV receivers, electric-motor-powered appliances, fluorescent lights, power lines, neon signs, diathermy machines, furnace igniters, and TV boosters.

new interference sources

Now come some new interference sources. For example, I recently purchased an ion generator. That’s a gadget that is supposed to produce a healthful environment by shooting out ionized particles. It also shoots out a lot of rf interference. It wasn’t long before I heard a new noise in my receiver — and so did my neighbors. In fact, when I put a key into the power line to the ion generator, I was able to send spark signals (damped waves) all over the neighborhood. (I haven’t figured out how to eliminate this source of interference, except by turning off the ion generator.)

Other sources of RFI (radio interference) are light dimmers and digital clocks. Some digital clocks have a small disk that rotates about once per second and produces a noise that can be heard some distance away in shortwave receivers.

Finding cures for this type of interference means working patiently with a sensitive monitoring device, locating the source, and then taking appropriate action with filters.

No one prohibits the sale of these interference-producing devices. They may crop up in your neighborhood any time. So if you hear a strange noise in your receiver, start looking at some of your new appliances. You might be surprised.

reference

Ed Marriner, W6XM

ac-line switching precautions

A friend called me the other day and said that he’d used his equipment just before dinner and when he left the room, he turned “everything off.” A few hours later my friend went into the radio room and smelled something burning. His linear-amplifier transformer had burned out!

“How could this have happened?” he asked. “I turned the switch off.” It developed that my friend had a heavy-duty cord running into a box on the operating table through a single-pole wall switch, since he had an ordinary two-wire plug on the end of the cord. It looked like he was breaking the neutral instead of the hot side of the ac line, since the linear amplifier was grounded. It wasn’t too hard to understand that the transformer was still on the line. (See fig. 3.)

Orville Gulseth, W5PGG
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Tell 'em you saw it in HAM RADIO!
## MEMORY

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NEW & USED BCD SWITCHES
3 switch with end plates
$8.99 New $6.95 Used

NEW GE OPTO COUPLERS
4N26 .69 ea. or 10/$5.00

MICRO-MINI WATCH CRYSTALS
32.768 Hz $3.00 each

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Thumb wheel type.
.39 each or 10/2.50
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### RF Transistors

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### RF Transistors

| MRF911    | 4.29 |
| MRF5176   | 11.73 |
| MRF8004   | 1.39 |
| BF9R1     | 1.00 |
| BF9R91    | 1.25 |
| BF9R96    | 1.50 |
| BF9W92    | 1.00 |
| BF9W92    | 0.79 |
| MMCM918   | 14.30 |
| MMCM2222  | 15.65 |
| MMCM2369  | 15.00 |
| MMCM2484  | 15.25 |
| MMCM3960A | 24.30 |
| MWA120    | 7.80 |
| NWA130    | 8.06 |
| MWA210    | 7.46 |
| MWA220    | 8.08 |
| MWA230    | 8.62 |
| MWA310    | 8.08 |

NEW MRF472
12.5 VDC, 27 MHz
4 Watts output
10 dB gain
1.69 ea.
10/9.50
100/69.00
1000/460.00

### Transistors

| 2N3960JANTX | 10.00 |
| 2N4072      | 1.60 |
| 2N4427      | 1.10 |
| 2N4439      | 7.00 |
| 2N4877      | 1.00 |
| 2N4959      | 2.00 |
| 2N4976      | 15.00 |
| 2N5070      | 8.00 |
| 2N5071      | 15.00 |
| 2N5108      | 4.00 |
| 2N5109      | 1.50 |
| 2N5179      | 1.00 |
| 2N5583      | 4.00 |
| 2N5589      | 6.00 |
| 2N5590      | 8.00 |
| 2N5591      | 11.00 |
| 2N5635      | 5.44 |
| 2N5636      | 11.60 |
| 2N5637      | 20.00 |
| 2N5641      | 5.00 |
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### Johnson AIR Variables

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<td>T-9-5</td>
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### CRYSALS

| 5.120       | 7.4825 | 9.565 |
| 7.3435      | 7.4865 | 9.575 |
| 7.4585      | 7.4925 | 9.585 |
| 7.4615      | 7.4985 | 10.000|
| 7.4625      | 7.5015 | 10.010|
| 7.4665      | 7.5025 | 10.020|
| 7.4685      | 7.5065 | 10.030|
| 7.4715      | 7.7965 | 10.040|
| 7.4725      | 7.8025 | 10.0525|
| 7.4765      | 9.545  | 10.130|
| 7.4765      | 9.555  | 10.140|

| 10.150      | 11.155 | 11.905 | 17.315 |
| 10.160      | 11.275 | 11.955 | 17.355 |
| 10.170      | 11.700 | 12.000 | 17.365 |
| 10.180      | 11.705 | 12.050 | 37.600 |
| 10.240      | 11.730 | 12.100 | 37.650 |
| 10.245      | 11.750 | 16.965 | 37.700 |
| 10.595      | 11.755 | 17.015 | 37.750 |
| 10.605      | 11.800 | 17.065 | 37.800 |
| 10.615      | 11.850 | 17.165 | 37.850 |
| 10.625      | 11.855 | 17.215 | 37.900 |
| 10.635      | 11.900 | 17.265 | 37.950 |
| 10.640      | 11.960 | 17.300 | 38.000 |

| BLY38       | 1.00 |
| 40280/2N4427| 2.00 |
| 40281/2N3920| 5.44 |
| 40282/2N3927| 10.48 |

$4.95 each
$1.00 each
WIDEBAND

Tyep T16-1
Model New Mallory Mini Generator
3500

#70169-2 ........................ 4.99 each
26 VCT @ 1 Amp and
2.5 V @ 1 Amp

New GE model 6C-9 9 V Nicad
Battery .................................. 3.69

New MCM Moving Coil Tach
Generator
Model M100 .......................... 6.99 each

New Mallory Mini Sonalert
Model #SC-18 Works at 12 VDC
3500 Hz ............................... 4.69 each

New T.V. Colorburst Crystals
3.579545 .............................. 99 each

WIDEBAND RF TRANSFORMERS

Tyep T16-1 .............................. 6.50 each

.1 to 120 MHz 3dB
.7 to 80 MHz 2dB
5 to 20 MHz 1dB

SEMICONDUCTORS SURPLUS
2822 North 32nd Street, #1 • Phoenix, Arizona 85008 • Phone 602-956-9423

July 1981

Node
AIR Variables

1/4 x 2 1/2" shaft
$2.50 each

193-10-6 2.2 to 34 pF
193- 1.5 to 27.5 pF
193- 6 to 6.4 pF

$1.00 each

160-107-16 .5 to 12 pF
193-10-9 2.2 to 34 pF
193-10-104 2.2 to 34 pF
193-4-5 3 to 30 pF

CHOKES

.1-3 uH ..................... 2.99
VIV .15 .15 uH .............. 2.99
VIV 150 -150 uH ........... 2.99
5-20 uH ..................... 1.69

Variable coil 10-80 uH .... 2.99
Transformer dual 2.8 mH .... 1.00

.47 uH ............. 1.00 ea. or 10/7.50
.68 uH ............. 1.00 ea. or 10/7.50
1 uH .............. 1.00 ea. or 10/7.50
1.2 uH ............ 1.00 ea. or 10/7.50
1.5 uH ........... 1.00 ea. or 10/7.50
2.2 uH ........... 1.00 ea. or 10/7.50
2.7 uH ........... 1.00 ea. or 10/7.50
3.3 uH ........... 1.00 ea. or 10/7.50
6.5 uH ........... 1.00 ea. or 10/7.50
7.5 uH ........... 1.00 ea. or 10/7.50
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20 uH ............ 1.00 ea. or 10/7.50
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47 uH ............ 1.00 ea. or 10/7.50
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56 uH ............ 1.69
62 uH ............ 1.00 ea. or 10/7.50
68 uH ............ 1.00 ea. or 10/7.50
100 uH .......... 2.99
120 uH .......... 1.69
185 uH ........ 1.00 ea. or 10/7.50
538 uH ........ 1.00 ea. or 10/7.50
680 uH ........ 1.00 ea. or 10/7.50
1000 uH .......... 1.00 ea. or 10/7.50
1630 uH .......... 1.50

.1 mH ...................... 2.99
.2 mH ...................... 2.99
.22 mH ..................... 2.99
.27 mH ..................... 2.99
.33 mH ..................... 2.99
.39 mH ..................... 2.99
.44 mH ..................... 2.99
1.2 mH ..................... 2.99
1.5 mH ..................... 2.99
1.65 mH .................... 2.99
1.75 mH .................... 2.99
1.9 mH ..................... 2.99
1 mH ...................... 1.69
1.88 mH .................... 3.99
2 mH ...................... 2.99
2.4 mH ..................... 2.99
2.5 mH .............. 1.00 ea. or 10/7.50
2.7 mH .............. 2.99
3 mH ...................... 2.99
3.6 mH ..................... 2.99
4.3 mH ..................... 2.99

4.7 mH ..................... 2.99
5 mH ...................... 2.99
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7.2 mH ..................... 2.99
8.25 mH .................... 2.99
8.28 mH .................... 2.99
8.6 mH ..................... 2.99
10 mH ..................... 2.99
12 mH ..................... 2.99
15 mH ..................... 2.99
17 mH ..................... 2.99
19.6 mH .................... 2.99
20 mH ..................... 2.99
20.5 mH .................... 2.99
22.6 mH .................... 2.99
24 mH ..................... 2.99
27.4 mH .................... 2.99
28.7 mH .................... 2.99
29.9 mH .................... 2.99
30 mH ..................... 2.99
36 mH ..................... 2.99
36.5 mH .................... 2.99
40 mH ..................... 2.99
40.2 mH .................... 2.99
43 mH ..................... 2.99
47 mH ..................... 2.99
50 mH ..................... 2.99
59 mH ..................... 2.99
60 mH ..................... 2.99
71.5 mH .................... 2.99
78.7 mH .................... 2.99
86 mH ..................... 2.99
100 mH .................... 2.99
120 mH .................... 2.99
150 mH .................... 2.99
175 mH .................... 2.99
200 mH .................... 2.99
205 mH .................... 2.99
237 mH .................... 2.99
240 mH .................... 2.99
300 mH .................... 2.99
360 mH .................... 2.99
390 mH .................... 2.99
430 mH .................... 2.99
500 mH .................... 1.50
600 mH .................... 2.99
1000 mH ................ 2.99
1.5 Hy ...................... 2.99
2.0 Hy ...................... 2.99
2.5 Hy ...................... 2.99
3.0 Hy ...................... 2.99
5.0 Hy ...................... 2.99
10 Hy ...................... 2.99

RF Power Device

MRF454 Same as MRF458
12.5 VDC, 3-30 MHz
80 Watts output, 12dB gain
$17.95 ea.
# NEW 2" ROUND SPEAKERS
100 Ohm coil $ .99 each

# PLASTIC TO-3 SOCKETS
4/$1.00

# NEW WELLER SOLDERING IRON KIT
# SP-23F............. 9.99 each
Kit includes:
1 - 25 Watt soldering iron, develops 750° of tip temperature
3 - tips (screwdriver, chisel, cone)
1 - soldering aid tool
1 - coil 60/40 rosin core solder

# CERAMIC PLATE CAPS
#1 type for 3/8 plate cap
#2 type for 5/8 plate cap

# USED NICADS
Used C Nickel Cadmium Batteries
1.8 amp hour
Pack of ten $8.99 per pack

# CERAMIC COIL FORMS
$1.99 each

# ATLAS CRYSTAL FILTERS FOR ATLAS HAM GEAR
Your Choice $15.95 ea.
5.595 - 2.7 USB
5.595 - 2.7/8/L
5.595 - 2.7 LSB
5.595 - 500/4
9.0 - USB/CW

# MURATA CERAMIC FILTERS

<table>
<thead>
<tr>
<th>Cap Value</th>
<th>Type</th>
<th>Frequency</th>
<th>Price</th>
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<tr>
<td>5.595</td>
<td>500</td>
<td>2.7 USB</td>
<td>$2.00</td>
</tr>
<tr>
<td>5.595</td>
<td>500</td>
<td>2.7/8/L</td>
<td>$2.00</td>
</tr>
<tr>
<td>5.595</td>
<td>500</td>
<td>2.7 LSB</td>
<td>$2.00</td>
</tr>
<tr>
<td>5.595</td>
<td>500</td>
<td>500/4</td>
<td>$2.00</td>
</tr>
<tr>
<td>9.0</td>
<td>USB/CW</td>
<td></td>
<td>$2.00</td>
</tr>
</tbody>
</table>

# J-FET
J310 N-CHANNEL J-FET 450 MHz
Good for VHF/UHF Amplifier, Oscillator and Mixers 3/$1.00

# ATLAS FILTERS
ATLAS CRYSTAL FILTERS FOR ATLAS HAM GEAR

<table>
<thead>
<tr>
<th>Your Choice</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$15.95 ea.</td>
<td></td>
</tr>
</tbody>
</table>

# ATLAS CAPS
Sprague. Stable Polypropylene
.50 each or 10/4.00 not sold mixed
1.2 to 13pF
2 to 30pF
3.9 to 18pF
3.9 to 40pF
3.9 to 55pF

# J-FET
J310 N-CHANNEL J-FET 450 MHz
Good for VHF/UHF Amplifier, Oscillator and Mixers 3/$1.00
### 1.9-2.5G CONVERTERS

1900 MHz to 2500 MHz DOWNCONVERTERS
Intended for amateur radio use.
Tunable from channel 2 thru 6.
34 dB gain 2.5 to 3 dB noise.
Warranty for 6 months Model HMR 11
Complete Receiver and Power Supply
(does not include coax) .......... $225.00

4 foot Yagi antenna only .......... $39.99
Downconverter Kit - PCB and parts .. $69.95
Power Supply Kit -
Box, PCB and parts ............. $49.99
Downconverter assembled ....... $79.99
Power Supply assembled .......... $59.99
Complete Kit form .............. $109.99
(includes Yagi antenna and instructions)

REPLACEMENT PARTS
MRF901 ................................ $3.99
MHD101 ................................ 1.29
.001 Chip Caps ...... 1.00
Power Supply PCB ............. 4.99
Downconverter PCB .......... 19.99
Instructions for any separate item .. 10.00

NEW BOGNER DOWNCONVERTER
Industrial version.
1 year guarantee ......... $225.00

### NEW TRANSFORMERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Price each</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-18X</td>
<td>6.3 VCT @ 6Amps</td>
</tr>
<tr>
<td>F-46X</td>
<td>24V @ 1Amp</td>
</tr>
<tr>
<td>F4IX</td>
<td>25.2VCT @ 2Amps</td>
</tr>
<tr>
<td>P-8380</td>
<td>10VCT @ 3Amps</td>
</tr>
<tr>
<td>P-8604</td>
<td>20VCT @ 1Amp</td>
</tr>
<tr>
<td>K-32I</td>
<td>28VCT @ 100 MA</td>
</tr>
<tr>
<td>E30554</td>
<td>Dual 17V @ 1Amp</td>
</tr>
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</table>

### TRANSFORMERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price each</th>
</tr>
</thead>
<tbody>
<tr>
<td>#2899652-01</td>
<td>$9.99 each</td>
</tr>
<tr>
<td>26.8 VCT @ 600 MA</td>
<td>21.9 VCT @ 1.1 Amps</td>
</tr>
<tr>
<td>#1800711P</td>
<td>$1.99 each</td>
</tr>
<tr>
<td>24 V @ 100 MA</td>
<td>$12.99 each</td>
</tr>
<tr>
<td>#2099459-00</td>
<td>28 V @ 1.5 Amps</td>
</tr>
<tr>
<td>9.6 V @ 9 Amps</td>
<td>16.8 V @ 300 MA</td>
</tr>
</tbody>
</table>

### TO-3 TRANSISTOR SOCKETS

Phenolic type ........ $6.00 each

### PL259 TERMINATION

52 Ohm 5 Watts $1.50 each

### DOOR KNOB CAPS

470 pF @ 15 KV $3.99 each
Dual 500 pF @ 15 KV 5.99 each
800 pF @ 6 KV 3.99 each

### HIGH VOLTAGE CAPS

420 MFD @ 400 VDC 3.99 each
600 MFD @ 400 VDC 3.99 each

### NEW SIMPSON 260-7

$99.99

### TEXAS INSTRUMENTS TIL-305P

5 x 7 array alphanumeric display $3.85 each

### JUMBO LED'S

- Red 6/$1.00
- Clear 6/$1.00
- Yellow 6/$1.00
- Green 6/$1.00
- Amber 6/$1.00

### MEDIUM LED'S

- Red 6/$1.00
- Green 6/$1.00

### NE555V TIMERS

- 39 each or 10/$3.00

### NEW DUAL COLON LED

- 69 each or 10/$5.00

### PLATE CHOKES

- 75 uH 3.00
- .94 mH 3.99

### REPLACEMENT PARTS

- MRF901 ................................ $3.99
- MHD101 ................................ 1.29
- .001 Chip Caps ...... 1.00
- Power Supply PCB ............. 4.99
- Downconverter PCB .......... 19.99
- Instructions for any separate item .. 10.00

### UHF/VHF RF POWER TRANSISTORS

<table>
<thead>
<tr>
<th>Type</th>
<th>Price each</th>
</tr>
</thead>
<tbody>
<tr>
<td>F18X</td>
<td>6.3 VCT @ 6Amps</td>
</tr>
<tr>
<td>F18X</td>
<td>24V @ 1Amp</td>
</tr>
<tr>
<td>F41X</td>
<td>25.2VCT @ 2Amps</td>
</tr>
<tr>
<td>P18X</td>
<td>10VCT @ 3Amps</td>
</tr>
<tr>
<td>P18X</td>
<td>20VCT @ 1Amp</td>
</tr>
<tr>
<td>K18X</td>
<td>28VCT @ 100 MA</td>
</tr>
<tr>
<td>E18X</td>
<td>Dual 17V @ 1Amp</td>
</tr>
</tbody>
</table>

### 75W05

Same as 7605 but only 1/2 Amp
5 VDC .49 each or 10/$3.00

---

**SEMICONDUCTORS SURPLUS**

2822 North 32nd Street, #1 • Phoenix, Arizona 85008 • Phone 602-956-9423

**July 1981**
### CONTINUOUS TONE BUZZERS

- HM00-4075-03
- CV31D350

### MINIATURE CERAMIC TRIMMERS

- Model NEW BCD SWITCH
  - 8 switch with end plates
  - Model TSM200-1011 (CDI) $16.87

### 12VDC MAGNET WIRE

| #  | AWG  | Style   | Price/Spool
|----|------|---------|-------------|
| #24 | 24   | A.W.G.  | $22.50
| #26 | 26   | A.W.G.  | $22.50
| #28 | 28   | A.W.G.  | $22.50
| #30 | 30   | A.W.G.  | $22.50
| #31 | 31   | A.W.G.  | $22.50

### TOTAL 41 LINE ITEMS

### TRANSISTORS/IC'S

- **Motorola Triacs**
  - Type T4121D/40799
  - 10 Amps, 400 VDC
  - $2.00 each

- **Motorola Power Transistors**
  - Type MPS 153
  - 2.5 Watts output
  - $3.00 each

### DIODES

- **Fairchild ECG 707**
  - 0.25 A, 10,000 V
  - $1.69 ea., 10 for $12.50

### CRYSTAL FILTERS

- **Tyco 001-19688**
  - Same as 2194F
  - 10.7 MHz narrow band
  - $2.50 each

### CABLE TIES

- **Cable Ties**
  - #4/1-16:00
  - 100 per bag
  - $2.50 per bag
  - 10 bags = $25.00

### MINIATURE CERAMIC TRIMMERS

- .50 each or 10/$4.00

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Model</th>
<th>Price/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV31D350</td>
<td>2222 North 32nd Street, #1 • Phoenix, Arizona 85008 • Phone 602-956-9423</td>
<td>$1.69 ea., 10 for $12.50</td>
</tr>
<tr>
<td>HM00-4075-03</td>
<td>25000-2000-04</td>
<td>$1.69 ea., 10 for $12.50</td>
</tr>
<tr>
<td>300425</td>
<td>2.5 to 13 pF</td>
<td>$1.69 ea., 100 for $15.00</td>
</tr>
<tr>
<td>E5-25A</td>
<td>5 to 25 pF</td>
<td>$1.69 ea., 10 for $12.50</td>
</tr>
<tr>
<td>NYK 1153</td>
<td>25 mA, 20,000 V</td>
<td>$1.69 ea., 10 for $12.50</td>
</tr>
</tbody>
</table>

### OTHER ITEMS

- **Motorola Power Supply**
  - Type MPS 153
  - 2.5 Watts output
  - $3.00 each

- **Motorola SCR**
  - Type MPS 153
  - 2.5 Watts output
  - $3.00 each

- **Fairchild LEDS**
  - FLV 5007 & 5009 red
  - $4.50 ea., 100 for $90.00

- **Motorola Emitter-Base**
  - Type MPS 153
  - 2.5 Watts output
  - $3.00 each

- **Linear Components**
  - Type MPS 153
  - 2.5 Watts output
  - $3.00 each

- **High-voltage diode**
  - Type EK500
  - 5000 Volts, 20 mA
  - $3.99 each
Parts/Assemblies/Accessories

Wakefield Thermal Compound 120-8
8-oz. jar, $5.35

TY-Raps 00470
7 in.
50/$2.00

1/2 W Audio Amplifier
Parts List:
3 transistors
5 resistors
1 capacitor
1 volume control pot
All parts assembled on PC board.
Requires 5-9 VDC for operation.
High-impedance input; 8-ohm output.
$1.00 each

12 VDC lamps, 60 mA
1/8” round x 1/2” long w/12” long leads.
...39 ea., 10 for $2.50

Heat Sink
(Great for rf power amplifiers.)
3 3/4” high x 7” long.
Flat one side only.
$4.99 each

5-pin DIN Jack & Plug Set.
$1.29 per set

Grain-of-wheat lamps
6.3 VDC, 50 mA.
8 for $1.00

Cooling fans
2” round x 3” long, 12 VDC.
$1.95 each

Ten-turn pot w/ten-turn knob
2000 ohms.
$0.95 each

Rf choke 70P276A1
2.7 uh, 250 mA.
...69 ea., 25 for $12.00

Water pump, multi-purpose
6 VDC/0.33 gpm.
$2.99 each

Switch, dpdt, pushon/push off
Microswitch No. 92PB19-T2.
5 A, 250 VAC.
$1.29 each

New Sylvania Pathmaker CATV amplifier.
Hybrid IC ampl. Model 152.
No data. Has two rf transistors and 1 rf amplifier plus many other parts.
$29.99 each

New big rf connectors, type 1
Prodelin, Inc. No. 78-880-1.
$12.99 each

Type 2
Cablewave System, Inc.
735201/FX38-50NF/16733.
$12.99 each

1000 pF feedthru caps
Solder Type.
4/$1.00

TO-5 type relay
WABCO 9130301-10.
26 VDC.
$4.99 each

Transco rf coax switch - 28 VDC
Type 16000NAU12-15, 1 input, 3 output
Type N connectors $39.99 each

Type 2 - No. 1460-20/SA-303/U
SPDT-Type N connectors $39.99 each

4 each RCA 7651 tube with socket
$200.00 per set
One tube and one socket
Socket only $100.00

Rotron biscuit fan
115 VAC Part BT 2A1.
$12.99 each

3-M Company Bumpons.
2 types:
Type 1
SF-5012, black
0.5” dia. x 0.14” high
(12.7 x 3.55 mm)
10-0100-1813-3
sheet of 4
$3.00

Type 2
SJ-5519, brown
0.18” x 0.35” rect. x 0.2” high
(19.8 x 8.89 x 5.08 mm)
10-0700-2982-5
sheet of 64
self adhesive
$4.39

Joy sticks
JVC-40 40kn.
(2) video controllers, $4.99

Power one
Model CP-198 power supply.
Input 105-125 VAC; output 5 VDC.
6 Amps.
$19.99 each

Wakefield Thermal Compound 120-8
8-oz. jar, $5.35

More Details? CHECK—OFF Page 106
BRAND NEW!
The Gunnplexer Cookbook  
by Robert M. Richardson, W4UCH/2

Ever wanted to take a good look at 10 GHz operation? Well, here's your chance. Starting with the basic theory of the Microwave Associate's Gunnplexer transceiver, author Richardson describes in 16 building-block chapters, how to put a functioning Gunnplexer system into operation.

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Time tested and field proven STOP-SIGN converter with added on, high performance preamp.

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- Hi/Low power pushbutton selectable
- Touch Tone® available with optional HM8 microphone
- Convenient hookup points for subaudible tone encoder or continuous tone controlled squelch system
- 5 KHz step (600 T/R channels standard)
- Covers the complete 144-147.995 MHz ham band

ICOM Performance.
- 5 helical resonators for outstanding selectivity
- Continuous duty rated 10 watt transmitter — rugged performance
- Excellent receiver sensitivity
- Patterned after ICOM's extremely successful and reliable IC-22S.
- APC circuit for protection of finals

Versatile.
- Easily set up for CAP/MARS use
- 8 pin mic connector
- 9 pin undedicated accessory socket
- Removable frequency selection option
- Compact size [6.2 in (W) x 2.3 in (H) x 8.6 in (D)]

2112 - 116th Avenue NE, Bellevue WA 98004
3331 Towerwood Dr., Suite 307, Dallas, TX 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.
GRAB BAGS

JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.

FEATURES:
- Adjustable regulated power supplies, post. and neg. 1.2VDC to 15VDC
- Power Output (each supply):
  5VDC @ 500mA, 12VDC @ 500mA
- 15VDC @ 75mA
- Two 3-terminal adj. IC regulators with thermal overload protection
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- Size: 3-1/2"w x 5-1/16"L x 2-1/4"H

JE215 Adj. Dual Power Supply Kit (as shown) ... $24.95

DESK TOP ENCLOSURES

DTE-8 (Pictured) ... $31.95
DTE-11 (Pictured) ... $34.95
DTE-14 ... $36.95
DTE-HK (For JE800) ... $47.95
DTE-AK (For JE110) (Pictured) ... $52.95
FAST SCAN ATV

WHY GET ON FAST SCAN ATV?
- You can send broadcast quality video of home movies, video tapes, computer games, etc., at a cost that is less than sloscan.
- Really improves public service communications for parades, RACES, CAP searches, weather watch, etc.
- DX is about the same as 2 meter simplex - 15 to 100 miles.

ALL IN ONE BOX
- TC-1 Transmitter/Converter
  Plug in camera, ant., mic, and TV and you are on the air. Contains AC supply, T/R sw., 4 Modules $399 ppd

PUT YOUR OWN SYSTEM TOGETHER
- TXAS ATV Exciter
  contains video modulator and xtal on 434 or 439.25 mHz. All modules wired and tested $89 ppd
- PA5 10 Watt Linear
  matches exciter for good color and sound. This and all modules run on 13.8 vdc. $89 ppd
- TCV-2 Downconverter
  tunes 420 to 450 mHz. Outputs TV ch 2 or 3. Contains low noise MRF901 preamp $55 ppd

PACKAGE SPECIAL
- four modules $249 ppd

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Tom
WB6ORG

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Scalar 725 9677

VICTORIA:
Telecom Trans Chile 25471

CONCEPCION:
Multi-Radio 773-1266

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Col. Analhuac 2-50-32-40

HELSEKIKI:
Erikosmedall (90) 611258

AUSTRIA:
Renox Tele.: 76021

FRANCE:
SFL (90) 5339-40

GERMANY:
Williges 04221-504021

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\[RP-CQ\]
Softbound $4.75

THE RADIO AMATEUR ANTENNA HANDBOOK
by William I. Orr, W6SAI and Stuart Cowan, W2LX
If you are pondering what new antennas to put up, we recommend you read this very popular book. It contains lots of well-illustrated construction projects, vertical, long wire, and HF/VHF beam antennas. But, you'll also get information not usually found in antenna books. There is honest judgment of antenna gain figures, information on the best and worst antenna locations and heights. A long look at the quad vs. the yagi antenna, information on baluns and how to use them, and some new information on the increasingly popular Sliver and Delta Loop antennas. This text is based on proven data plus practical on-the-air experience. We don't expect you'll agree with everything Orr and Cowan have to say, but we are convinced that The Radio Amateur Antenna Handbook will make a valuable and often consulted addition to any ham's library. 190 pages. ©1978
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Softbound $6.95

BEAM ANTENNA HANDBOOK
Here's recommended reading for anyone thinking about putting up a yagi beam this year. It answers a lot of commonly asked questions like: What is the best element spacing? Can different yagi antennas be stacked without losing performance? Do monoband beams outperform tri-banders? Lots of construction projects, diagrams, and photos make reading a pleasurable and informative experience. 188 pages. ©1977
\[RP-BA\]
Softbound $5.95

Please add $1.00 to cover shipping and handling.

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Tell 'em you saw it in HAM RADIO!
New Product Report

Several years ago, in one of the April Fool’s articles that appeared in QST, there was a design for a hydraulic antenna mast that retracted into the ground. As I remember the story, you had to drill a hole as deep as the mast was high. To raise or lower the mast you filled the hole with water. At least at that time it seemed like an April Fool’s article.

Now, N-Pro, from Oregon City, Oregon, has designed and perfected an antenna mast that can be used in much the same fashion! Their design, however, goes way beyond the QST article and is rapidly finding a home in both ham and professional applications. TV stations, for example, are putting both cameras and antennas for their remote-site shots onto N-Pro masts. They find they’re able to get better pictures from an elevated camera, and also improve their transmitted signals. The N-Pro K2 mast extends to 22 feet 2 inches, and can lift 150 pounds in just under two minutes. When retracted the mast is only 7 feet 6 inches long. The K2 is fabricated from four sections of 6061-T6 aluminum alloy. The pipe sections are splined to prevent antenna or camera rotation during elevation.

The K2 uses easy-to-find automotive automatic transmission fluid, rather than any of the more expensive hydraulic fluids. The hydraulic reservoir and pump can be conveniently located anywhere in the vehicle.

Hams will find the N-Pro masts of interest for mobile communications centers, VHF hilltopping installations, and for field day operations. For the ultimate in hidden antennas, you can even bury the mast as was done in the QST article. For more information, write N-Pro, 1022 Hazelwood Drive, Oregon City, Oregon 97045.

J. Craig Clark, N1ACH

Ten-Tec Argosy

Ten-Tec’s new Argosy solid-state transceiver reverses the upward Amateur Radio price spiral with an Amateur net price of $549, hundreds of dollars lower than you would expect for a high performance transceiver. Dual power is a unique feature: a switch converts the Argosy from a 10-watt QRPP rig to a 100-watt SSB/CW transceiver.

The Argosy receiver features 80 through 10 meter coverage (including the new 30-meter band) with broadband design for instant band change without receiver “peaking”; typical sensitivity figure of 0.3 μV for 10 dB S + N/N; 2.5 kHz four-pole crystal filter (plus optional 1.8-kHz, 500-Hz and 250-Hz filters); 9-MHz i-f with 60 dB rejection; ±3-kHz offset tuning with center “off” position; built-in 50 dB notch filter that’s tunable from 200 Hz to 3.5 kHz; optional i-f type 50-dB noise blanker; and built-in speaker with low distortion audio.

The transmitter features tuning in nine 500-kHz segments (four segments for 10 meters) with approximately 40-kHz VFO overrun on each band edge; 100 percent duty cycle up to 20 minutes on all bands; three-function meter shows forward peak power or SWR on transmit and received signal strength; full break-in on CW plus PTT on SSB; built-in sidetone with adjustable tone and volume; ALC control on high power only, where needed; automatic sideband selection plus reverse; normal 12-14 Vdc operation plus ac operation with optional power supply.

Styling includes molded front panel, matching aluminum top, side and back panels. Size is 4 x 9 1/2 x 12 inches, to fit and go anywhere. A full accessory line is available including filters, noise blanker, audio CW filter, and calibrator. Full details are available from Ten-Tec, Inc., Highway 411 East, Sevierville, Tennessee 37862.

book review:

The Art of Electronics

Many books are submitted to us for review, but here’s one that deserves special attention. It’s a 716-page, hard-bound volume entitled The Art of Electronics, written by Paul Horowitz and Winfield Hill. The publisher: Cambridge University Press, 32 East 57 Street, New York, New York 10022. (It is also available in the United Kingdom for overseas readers.)

We like this book. It is written for the newcomer as well as the advanced electronics enthusiast. The book covers the design of modern electronic circuits, without mathematics, in an easy-to-understand manner. Just a few of the subjects:

- Current sources and current mirrors
- Single-supply operational-amplifier design
- Operational-amplifier frequency compensation
- Active filters (with tables and graphs)
- Voltage references and regulators, including constant-current supplies

The book is both novel in its approach and, in many ways, unique in the topics treated. Much emphasis is placed on tabular data and circuit examples, so that you can understand circuit behavior and the limitations imposed by available components. Standard topics are discussed, as well as the more specialized techniques needed for the design and construction of high-frequency and low-noise, high-precision circuits.

The book provides a well-balanced introduction to modern electronics.
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For further information contact EICO Electronic Instrument Co., Inc., 108 New South Road, Hicksville, New York 11801.

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A twelve-page brochure from Vector Electronic Company describes 109 professional electronic packaging and breadboarding products that are available, over-the-counter, from electronics and personal-computer-component stores throughout the United States and Canada. Highlighted are microcomputer interface boards, Vector Plugboards™, motherboards, cases, tools, wiring terminals, and kits. A complete price list is included. Write to Vector Electronic Company, Inc., 12460 Gladstone Avenue, Sylmar, California 91342.
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<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
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</table>
| W1AW Schedule  
April 26-October 25, 1981  
UTC Slow Code Practice  
MFV: 2000, 1300, 2300  
TTHSSn: 2000: S: 0200  
Fast Code Practice  
CW Bulletins  
Dv: 0300, 2000, 1400  
Code practice and CW bulletin frequencies: 1.836, 3.58, 7.08, 14.08, 21.08, 28.08, 50.08, 147.556 MHz. | WEST COAST BULLETIN  
BPM PST (0400UTC-2040)  
KCS, A-1 2200PM 8  | AMSAT Eastcoast Net  
3850 kHz 9:00 PM EDST  
(0100Z Wednesday Morning)  | AMSAT Eastcoast Net  
3850 kHz 9:00 PM EDST  
(0100Z Wednesday Morning)  | MACKINAC RACE EVENT 22  | RAC ANNUAL FIRECRACKER HAMFEST — Shelleville VFW picnic grounds Hamlin/Fa As  |  |
| | | AMSAT Mid-Continent Net  
3850 kHz 9:00 PM CDST  
(0200Z Wednesday Morning)  | AMSAT Westcoast Net  
3850 kHz 8:00 PM PDST  
(0300Z Wednesday Morning)  | WEST SUG DIVISION ARRl CONVENTION  
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Cultural Annex Hannibal ARC, 2108 Orchard  
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| | | | | | VENEZUELAN SSB CONTEST — Starts 0000 GMT Sat. Ends 2800 GMT Sun. 6:30  |  |
| | | | | | IARU RADIO SPORT CHAMPIONSHIP 11-12  |  |
| | | | | | NEW HAMPSHIRE FM ASSOCIATION — Electronic flea market  
at Manchester Municipal Airport. — Dick Dausser W1KZ 18 |  |
| | | | | | CARY ARC NINTH ANNUAL MID SUMMER SWAPPET  
Cary ARC, POB 52.  
Cary NC 27511 18  |  |
| | | | | | 12TH ANNIVERSARY OPERATION NEIL ARMSTRONG — Neil  
Armstrong Jr Space & Science Museum  
Wakoneta, OH — Gary  
Strotherman. 711 W. Renton St.  
Wakoneta OH 44067 18  |  |
| | | | | | FORT WAYNE RADIO CLUB'S ANNUAL THREE RIVERS FEST  
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| | | | | | 4TH ANNUAL NOARFEST  
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Anderson VEC/0. 25-26  |  |
| | | | | | JOBANCON/conf  
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| | | | | | COUNTY HUNTERS C.W. CONTEST — 25-27  |  |

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More Details? CHECK—OFF Page 106

July 1981
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& Stuff, Dept. H7, Box 973, Mobile, AL 36601.

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trade, DCO, 10 Schuyler Avenue, No. Arlington, N.J.
07032 (800) 526-1270.

FOR SALE: Ten-Tec Model 200 VFO, built-in power suppl,
y use with Drake 2-N, Heath HW-16, etc., transmitters
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WANTED: Hammarlund HQ-100 Receivers, Prime Condition. Send description and price. Savvy Electronics, P.O. Box 5727, Ft. Lauderdale, FL 33310.

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COLLINS 515-A, 312B-4 for sale. Excellent condition. W5XK, 1732 Willow Point, Shreveport, LA 71119.

RECIPROCATING DETECTOR Construction Handbook.$10 post. Peters Publications, P.O. Box 62, Lincoln, MA 01773.

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QUALITY PRINTED CIRCUIT BOARDS mean trouble-free projects. Catalog of over 600 popular boards, $1.50 postpaid. Dynacraft Industries, P.O. Box 296, Meadowlands, PA 15347.

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Coming Events
ACTIVITIES
“Places to go...”

ILLINOIS: Radio Expo '81 sponsored by the Chicago FM
Club will be held, rain or shine, on September 19th
and 20th at the Lake County Fairgrounds, routes 45 and 120
in Grayslake. Graylsake is 30 minutes north of Chicago
and 45 minutes south of Milwaukee. This year we
will have a super large flea market with plenty of indoor
and outdoor space, free with a gate ticket. Just bring your
own table and chair or tag it all. Parking is free. We
will also have new camping sites complete with power hook-
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day. YL's have a ladies program and door prizes both
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display building for you to meet and buy from. As in
the past, Expo will be giving out thousands of dollars
worth of prizes and admission tickets are good for both days.
For advanced registration, send $3.00 per person and a
$10.00 S.A.S.E. to Radio Expo Tickets, P.O. Box 1532,
Evanston, Illinois. Tickets at the gate are $4.00 each.
Kids under seven are free. For more information call
(312) BST-EXP0. Talk-in on 146.16, 146.52, and
222.5224.10.
SOUTHERN ILLINOIS: Shawnee Amateur Radio Associ-
ation's 24th annual Silver Jubilee Hamfest will be
August 30 at JOHN A. LOGAN College in Carterville.
Tickets are available. Contact Bob
Albright, Upland, CA 91786.

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OPERATING EVENTS

"Things to do..."

MAY 30th - SEPTEMBER 9th: The Parma Radio Club will once again be operating from the WW1 submarine, USS Cod using the club call, K865ZV. Operations will run every weekend (except the Field Day weekend) through September 6th. An attractive certificate will be awarded for 2-way contacts from the ship upon receipt of a QSL and 300 to cover postage. All bands will be operated, 10 to 80, band conditions will determine band of major activity. Send QSL’s to: WDBZG. Info: Don Winner, WDBZG, 827 Torrance Ave., Brooklin, OH 44144.

JULY 2nd - 7th: C23JM will be operated by members of the Niagara Peninsula ARC. Operation will be on July 2-7, 1981, for the special anniversary celebration of the bicentennial of Niagara-on-the-Lake, Ontario, and the bi-centennial of Cayuga County. Operation will be on 80-10 meters. Special QSL cards will be available via P.O. Box 692, St. Catharines, Ontario, L2R 6Y3.

JULY 17th - 23rd: SWOT (Side-Winders-on-Two) is holding its fourth annual QSO party. Begins at 0000 UTC on the 17th and ends 2359 UTC on the 23rd. No restrictions on numbers of hours operated. Must exchange QSL cards with other stations participating. No special QSL cards will be issued. Check the nets on 14.350 MHz.

JULY 18th and 19th: The Neil Armstrong Air and Space Museum in Wapakoneta, Ohio is the operating place for the 12th anniversary commemorating Neil Armstrong’s historic first walk on the moon. Wapakoneta is the hometown of Neil Armstrong. Hours: 9:00 AM to 5:00 PM on the 18th or 6:00 PM on the 19th local time. Two stations on the site will be operating on 10 and 11 meters. They will be using 200Watts of power on 10 and 11 meters.

JULY 25th: Buffalo, Wyoming last year was first in the country for $25 and 3600 MHz using the call W7GUX. The station was operating in honor of and for the Johnson County Centennial Celebration. The Buffalo station will be operating in honor of the same celebration.

JULY 26th: The Franklin Middle School Radio Club and Shawano area amateurs will operate a special event station from the Shawano County Fairgrounds in conjunction with the exposition honoring various Shawano groups for either 100 or 50 years of service. Hours: From 2000 UTC on the 25th to 0600 UTC on the 26th during the times the bands are open. Frequencies plus or minus 10 MHz: 2800, 14200, 24500, and 25800 as well as 145.50 MHz 145.75 MHz 145.50 MHz.

AUGUST 1st - 2nd: The nineteenth annual Illinois QSO Party from August 1st to 2nd on 10 meters. The event begins at 0000 UTC on the 1st and runs for 24 hours. All bands, CW and Phone will be operated. No band conditions allowed. Any frequency will be used, but low frequency for activity about 50 Mhz above or below. Operation will be on 10 meters from 2000 UTC on the 21st and run for about 25 hours from each of Novice bands, even on the hour and half hour. Exchange RST and county by Illinois stations.
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CHIP CAPACITORS

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<td>MRF475</td>
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- **MRF454**
  - $21.83
  - Designed for power amplifier applications in industrial, commercial and amateur radio equipment to 30 MHz.
  - Specified 12.5 Volt, 30 MHz Characteristics: Output Power = 80 Watts, Minimum Gain = 12 dB, Efficiency = 50%

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  - $2.50
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- **MRF475**
  - $5.00
  - Common Collector Characterization

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- **MFW 710 - 2**
  - $46.45
  - 440 to 470 MHz
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- 1665: DC to 30 MHz Scope with a 1/2" Dual Trace
- 1666: UHF Output
- 1667: Low Level
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### Tubes

- **1655**
  - 1.8 MHz
  - 1656: 2.5 MHz
  - 1657: 3.5 MHz

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<td>6684-20F</td>
<td>Variable Attenuator 0 to 180 dB</td>
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Cover III

106 Ham Radio July 1981
ENCOMM, INC. LIMITED WARRANTY

Encomm, Inc. warrants this product against defects in material and workmanship for a period of 90 days from the date of purchase by the original purchaser. Encomm, Inc. will at its option repair or replace any and all defective parts, assemblies or entire units, at its sole discretion, free of charge for both the parts and the labor necessary to correct any defects in material or workmanship for the 90 day period.

The purchaser is responsible for the transportation costs of returning the equipment to and from Encomm, Inc. or its designated repair center for purposes of obtaining the warranty service described in this form.

EXTENDED SERVICE PERIOD

FOR A PERIOD OF TWO (2) YEARS FROM DATE OF PURCHASE
THE ORIGINAL PURCHASER MAY OBTAIN EXTENDED SERVICE ON ALL THE SEMICONDUCTOR COMPONENTS USED IN THIS UNIT NOT INCLUDING FINAL TRANSISTORS. FAILURES CAUSED BY IMPROPER INSTALLATION, STATIC DISCHARGE, ABUSE, OR UNAUTHORIZED ALIGNMENT ARE NOT INCLUDED.
MAXIMUM CHARGE FOR THIS SERVICE WILL BE ONE HOUR AT THE THEN CURRENT ENCOMM, INC. SHOP RATE

The above warranty does not include incidental or consequential damages and Encomm, Inc. disclaims any liability for any such damages. All implied warranties, if any, are limited in duration to the above stated 90 day warranty period. Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you.

The completion and return of an enclosed registration form is a condition precedent to the warranty coverage and the above undertaking to repair. This warranty gives you specific legal rights and you may also have other rights, which may vary from state to state.

Food for thought.

Our new Universal Tone Encoder lends its versatility to all tastes. The menu includes all CTCSS, as well as Burst Tones, Touch Tones, and Test Tones. No counter or test equipment required to set frequency—just dial it in. While traveling, use it on your Amateur transceiver to access tone operated systems, or in your service van to check out your customers’ repeaters; also, as a piece of test equipment to modulate your Service Monitor or signal generator. It can even operate off an internal nine volt battery, and is available for one day delivery, backed by our one year warranty.

- All tones in Group A and Group B are included.
- Output level flat to within 1.5db over entire range selected.
- Separate level adjust pots and output connections for each tone Group.
- Immune to RF.
- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak.
- Instant start-up.
- Off position for no tone output.
- Reverse polarity protection built in.

<table>
<thead>
<tr>
<th>Group A</th>
<th>TEST TONES</th>
<th>TOUCH TONES</th>
<th>BURST TONES</th>
</tr>
</thead>
<tbody>
<tr>
<td>67.0 XZ</td>
<td>600</td>
<td>697</td>
<td>1600</td>
</tr>
<tr>
<td>71.9 XA</td>
<td>700</td>
<td>770</td>
<td>1650</td>
</tr>
<tr>
<td>74.4 WA</td>
<td>800</td>
<td>852</td>
<td>1700</td>
</tr>
<tr>
<td>77.0 NB</td>
<td>900</td>
<td>941</td>
<td>1750</td>
</tr>
<tr>
<td>79.7 SP</td>
<td>1000</td>
<td>1072</td>
<td>1800</td>
</tr>
<tr>
<td>82.5 VZ</td>
<td>1100</td>
<td>1148</td>
<td>1850</td>
</tr>
<tr>
<td>85.4 YA</td>
<td>1200</td>
<td>1230</td>
<td>1900</td>
</tr>
<tr>
<td>88.5 YB</td>
<td>1300</td>
<td>1365</td>
<td>1950</td>
</tr>
</tbody>
</table>

- Frequency accuracy, ± .1 Hz maximum - 40°C to + 85°C.
- Frequencies to 250 Hz available on special order.
- Continuous tone.

<table>
<thead>
<tr>
<th>Group B</th>
<th>TEST TONES</th>
<th>TOUCH TONES</th>
<th>BURST TONES</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>697</td>
<td>1600</td>
<td>1800</td>
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<tr>
<td>700</td>
<td>770</td>
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<td>2500</td>
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<tr>
<td>1600</td>
<td>1633</td>
<td>2100</td>
<td>2650</td>
</tr>
</tbody>
</table>

- Frequency accuracy, ±.1 Hz maximum - 40°C to + 85°C.
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor.

Model TE-64 $79.95

COMMUNICATIONS SPECIALISTS

426 West Taft Avenue, Orange, California 92667
(800) 854-0547/ California (714) 998-3021
The FT-101ZD Mk III is the latest chapter in the success story of the FT-101 line. Armed with new audio filtering for even better selectivity, the FT-101ZD now includes provision for an optional FM or AM unit. Compare features and you'll see why active operators everywhere are upgrading to Yaesu!

Variable IF Bandwidth
Using two 8-pole filters in the IF, Yaesu's pioneering variable band-width system provides continuous control over the width of the IF passband — from 2.4 kHz down to 300 Hz — without the shortcomings of single-filter IF shift schemes. No need to buy separate filters for 1.8 kHz, 1.5 kHz, etc.

Improved Receiver Selectivity
New on the FT-101ZD Mk III is a high-performance audio peak/notch filter. Use the peak filter for single-signal CW reception, or choose the notch filter for nulling out annoying carriers or interfering CW signals. In the CW mode, you can choose between the 2.4 kHz SSB filter and an optional CW filter (600 or 350 Hz) from the mode switch.

Diode Ring Front End
The FT-101ZD now sports a high-level diode ring mixer in the front end. This type of mixer, well known for its strong signal performance, is your assurance of maximum protection from intermod problems on today's crowded bands.

WARC Bands Factory Installed
The FT-101ZD Mk III comes equipped with factory installation of the new 10, 18, and 24 MHz bands recently assigned to the Amateur Service at WARC. In the meantime, use the 10 MHz band for monitoring of WWV!

RF Speech Processor
Not an additional-cost option, the FT-101ZD RF speech processor provides a significant increase in average SSB power output, for added punch in those heavy DX pile-ups. The optimum processor level is easily set via a front panel control.

Worldwide Power Capability
Every FT-101ZD comes equipped with a multi-tap power transformer, which can be easily modified from the stock 117 VAC to 100/110/200/220/234 VAC in minutes. A DC-DC converter is available as an option for mobile or battery operation.

Convenience Features
Designed fundamentally as a high-performance SSB and CW transceiver, the FT-101ZD includes built-in VOX, CW sidetone, semi-break-in T/R control on CW, slow-fast-off AGC selection, level controls for the noise blanker and speech processor, and offset tuning for both transmit and receive. The Mk III optional FM unit may be used for 10 meter FM operation, or choose the optional AM unit for WWV reception or VHF AM work through a transverter (AM and FM units may not both be installed in a single transceiver).

Full Line of Accessories
See your Yaesu dealer for a demonstration of the top performance accessories for the FT-101ZD, such as the FV-101Z External VFO, SP-901P Speaker/Patch, YR-901 CW/RTTY Reader, FC-902 Antenna Tuner, and the FTV-901R VHF/UHF Transverter. Watch for the upcoming FV-101DM Digital Memory VFO, with keyboard frequency entry and scanning in 10 Hz steps!

Nationwide Service Network
During the warranty period, the Authorized Yaesu Dealer from whom you purchased your equipment provides prompt attention to your warranty needs. For long-term servicing after the warranty period, Yaesu is proud to maintain two fully-equipped service centers, one in Cincinnati for our Eastern customers and one in the Los Angeles area for those on the West Coast.

Note: A limited quantity of the earlier FT-101ZD (with AM as standard feature) is still available. See your Yaesu dealer. FT-101ZD Mk III designates transceivers bearing serial #240001 and up, with APF/Notch filter built-in and AM/FM units optional.

Price And Specifications Subject To Change Without Notice Or Obligation

YAESU ELECTRONICS CORP., 6851 Walthall Way, Paramount, CA 90723  
(213) 633-4007
YAESU Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246  
(513) 874-3100
"Cents-ational."

IF shift, digital display, narrow-wide filter switch

**TS-530S**

The TS-530S SSB/CW transceiver is designed with Kenwood's latest, most advanced circuit technology, providing wide dynamic range, high sensitivity, very sharp selectivity with selectable filters and IF shift, built-in digital display, speech processor, and other features for optimum, yet economical, operation on 160 through 10 meters.

**TS-530S FEATURES:**

- **160-10 meter coverage,** including three new bands
  - Transmits and receives (LSB, USB, and CW) on all Amateur frequencies between 1.8 and 29.7 MHz, including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
  - Built-in digital display
    - Large, six-digit, fluorescent-tube display shows actual receive and transmit frequencies on all modes. Backed up by analog subdial.
    - IF shift
      - Moves IF passband around received signal and away from interfering signals and sideband splatter.

- **Narrow/wide filter combinations**
  - Any one or two of three optional filters
    - VFO-88SN (1.8 kHz) SSB and CW: YK-88C (500 Hz) CW, YK-88CN (270 Hz) CW may be installed for selecting [with "N-W switch] wide and narrow bandwidths on CW and/or SSB.
  - Wide receiver dynamic range
    - Greater immunity to strong-signal overload, with MOSFET RF amplifier operating at low level for improved IMD characteristics, junction FETs in balanced mixer with low noise figure, and dual resonator for each band.
  - Built-in speech processor
    - Combines an audio compression amplifier with change of ALC time constant for extra audio punch and increased average SSB output power, with suppressed sideband splitter.
  - Two 6146B's in final
    - Runs 220 W PEP/180 W DC input on all bands.
  - Advanced single-conversion PLL system
    - Improved overall stability and improved transmit and receive spurious characteristics.

- **Adjustable noise-blanker level**
  - Pulse-type (such as ignition) noise is eliminated by built-in noise blanker, with front-panel threshold level control.
  - RF attenuator
    - The 20-dB RF attenuator may be switched in for rejecting IMD from extremely strong signals.

- **Optional VFOs for flexibility**
  - VFO-240 allows split-frequency operation and other applications. VFO-230 digital VFO operates in 20-Hz steps and includes five memories and a digital display.
  - RIT/XIT
    - Front panel RIT (receiver incremental tuning) shifts only the receiver frequency, for tuning in stations slightly off frequency. XIT (transmitter incremental tuning) shifts only the transmitter frequency, for calling a DX station listening off frequency.

More information on the TS-530S is available from all authorized dealers of Trio-Kenwood Communications, Inc., 3111 West Walnut Street, Compton, California 90220.

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**Matching accessories for fixed-station operation:**
- SP-230 external speaker with selectable audio filters
- VFO-240 remote VFO

**Other accessories not shown:**
- VFO-230 remote digital VFO with 20 Hz steps, five memories, digital display
- TL-922A linear amplifier
- SM-220 Station Monitor
- KI-1 deluxe VFO knob
- PC-1 phone patch
- HS-5 and HS-4 headphones
- AT-230 antenna tuner/ SWR and power meter
- MC-50 desk microphone
- HC-10 digital world clock
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters and YK-88SN (1.8 kHz) SSB narrow filter
- MC-30S and MC-35S noise-canceling head microphones

Specifications and prices are subject to change without notice or obligation.