



U.S. POSTAGE PAID
PERMIT no. 320
MENLO PARK, CA. 94025

TO:

RETURN REQUESTED:
PAARA P.O. BOX 911
MENLO PARK, CA. 94025

Andy Korsak VE3FZK/W6
504 Lakemead Way
Bedwood City CA 94062

vol. 27

APRIL

1981

PAARA

Graphs



**palo alto
AMATEUR
RADIO ASSN.**

MENLO PARK C.D. RADIO CLUB, K6YQT

SHAVER RADIO, INC.

(408) 998-1103

1378 S. BASCOM AVE. SAN JOSE, CALIF.

New! AZDEN® PCS 3000 BLAZING THE FRONTIER OF MICROCOMPUTER COMMUNICATIONS



**SUPERIOR
COMMERCIAL GRADE
2-METER FM TRANSCEIVER**

INTRODUCTORY OFFER

\$339⁰⁰

FREE TOUCH-TONE® PAD KIT INCLUDED.

COMPARE THESE FEATURES WITH **ANY** UNIT AT **ANY** PRICE

- **8 MHz FREQUENCY COVERAGE, INCLUDING CAP/MARS BUILT IN:** Receive and transmit 142 000 to 149 995 MHz in selectable steps of 5 or 10 kHz. **COMPARE!**
- **SIZE:** Unbelievable! Only 6 1/2" by 2 1/2" by 9 1/2". **COMPARE!**
- **MICROCOMPUTER CONTROL:** All frequency control is carried out by a microcomputer.
- **MUSICAL TONE ACCOMPANIES KEYBOARD ENTRIES:** When a key is pressed, a brief musical tone indicates positive entry into the microcomputer. **COMPARE!**
- **PUSHBUTTON FREQUENCY CONTROL FROM MICROPHONE OR FRONT PANEL:** Frequency is selected by buttons on the front panel or microphone.
- **8 CHANNEL MEMORY:** Each memory channel is reprogrammable and stores the frequency and offset. Memory is backed up by a NICAD battery when power is removed.
- **INSTANT MEMORY 1 RECALL:** By pressing a button on the microphone or front panel, memory channel 1 may be accessed immediately.
- **MEMORY SCAN:** Memory channels may be continuously scanned for quick location of a busy or vacant frequency.
- **PROGRAMMABLE BAND SCAN:** Any section of the band may be scanned in steps of 5 or 10 kHz. Scan limits are easily reprogrammed.
- **DISCRIMINATOR SCAN CONTROL (AZDEN EXCLUSIVE PATENT):** The scanner stops by sensing the channel center, so the unit always lands on the correct frequency. **COMPARE!** this with other units that claim to scan in 5-kHz steps!
- **THREE SCAN MODES WITH AUTO RESUME:** Sampling mode pauses at busy channels, then resumes. Busy mode stops at a busy channel, then resumes shortly after frequency clears. Vacant mode stops at a vacant channel and resumes when signal appears. If desired, auto resume may be prevented by pressing one button. **COMPARE!**
- **REMOVABLE HEAD:** The control head may be located as much as 15 feet away from the main unit using the optional connecting cable. **COMPARE!**

- **PL TONE OSCILLATOR BUILT IN:** Frequency is adjustable to access PL repeaters.
- **MICROPHONE VOLUME/FREQ. CONTROL:** Both functions may be adjusted from either the microphone or front panel.
- **NON-STANDARD OFFSETS:** Three accessory offsets can be obtained for CAP/MARS or unusual repeater splits. CAP and Air Force MARS splits are **BUILT IN!** **COMPARE!**
- **25 WATTS OUTPUT:** Also 5 watts low power to conserve batteries in portable use.
- **GREEN FREQUENCY DISPLAY:** Frequency numerals are green LEDs for superior visibility.
- **RECEIVER OFFSET:** A channel lock switch allows monitoring of the repeater input frequency. **COMPARE!**
- **SUPERIOR RECEIVER:** Sensitivity is better than 0.28 μ V for 20-dB quieting and 0.19 μ V for 12-dB SINAD. The squelch sensitivity is superb, requiring less than 0.1 μ V to open. The receiver audio circuits are designed for maximum intelligibility and fidelity. **COMPARE!**
- **ILLUMINATED KEYBOARD:** Keyboard backlighting allows it to be seen at night.
- **TRUE FM, NOT PHASE MODULATION:** Transmitted audio quality is optimized by the same high standard of design and construction as is found in the receiver. The microphone amplifier and compression circuits offer intelligibility second to none.
- **OTHER FEATURES:** Dynamic microphone, built-in speaker, mobile mounting bracket, external remote speaker jack (head and radio) and much, much more. All cords, plugs, fuses, microphone hanger etc. included. Weight 6 lbs.
- **ACCESSORIES:** CS-ECK 15-foot remote cable - \$35.00 CS-6R 6-amp ac power supply - \$59.95 CS-AS remote speaker - \$18.00 CS-TTK touch-tone® microphone kit (wired and tested) - \$39.95.

PAARAgraphs is the official organ of

The Palo Alto Amateur Radio Association and the Menlo Park Civil Defense Radio Club

1981 CLUB OFFICERS

President	:	Gerry Tucker	WA6LNV	326 4908
Vice President	:	Dave Daniel	KB6WP	325 3347
Secretary	:	J. MacKaig	N6YV	
Treasurer	:	George Nixon	GI3OEN	854 6645
Trustee, K6OTX	:	Fred Canham	K6YT	948 9238
Property	:	Ed Fairbanks	W6AIN	322 0319
ARES Officer	:	Steve Stuntz	K6FS	322 4952

BOARD OF DIRECTORS

Chairman	:	Gerry Tucker	WA6LNV
Members	:	John Buonocore	KA6CUG
		Kevin Lapp	WA6FHC
		Gerry Wagstaffe	W6NIR
		Ed Fairbanks	W6AIN
		Bill McElhinney	KA6LZI
		Bob Wheeler	K6SEM

PAARA POLICIES

Membership in PAARA is \$6.00 per calander year (payable in January) which membership includes a subscription to PAARAgraphs. Freebe distribution to those who indicate an interest in the Club and as an inducement to their becoming members, and is subject to change with changing interests in the Club. Make payment to:

PAARA, P.O. Box 911, Menlo Park, CA 94025

PAARAgraphs STAFF

Editor	:	Bob Baum	W6BFH
Production	:	Dave Daniel	KB6WP
Advertising	:	Swede Swenson	N6CHL
Printing	:	Mellonics	A10K
Mailing	:	Ed Fairbanks	W6AIN
Cover	:	Sue Lindner	LØVLY

Written contributions to the P.O. Box above, or: c/o Editor, 1043 Del Norte Av., Menlo Park, CA 94025

R E G U L A R M E E T I N G

Friday, April 3, 1981

7:30 p.m.

Rooms 15-17, Menlo Park Recreation Center, Civic Center, Alma at Mielke Drive
Menlo Park

SLOW SCAN TELEVISION

by

Gordon Meyer, W6PCP

Gordon will tell us the least expensive way to get into or in SSTV.
There will be visual demonstrations of equipment featuring live pics.

Circle the Date

April 3

FUTURE MEETINGS: May 1, June 5, July 10?, August 7, September 4.

Field Day: June 27, 28.

PAST CORNER: Gerry, WA6LNV, rapped the meeting to order at 7:40, breaking up many conversations going on around the meeting room. Guests were introduced including Art Adams, NC, from Palo Alto, Walter Murray, NC, Mountain View, and Kieth Huie, KA6NBK, from Menlo Park.

George, GI3OEN, gave the treasurer's report and indicated dues were still being accepted for 1981. George and Fred, K6YT, distributed membership cards to those who hadn't received them.

Chris, WB6WBK, made a report on Post 599's activity. Steve, K6FS, announced that the Menlo Park Civil Preparedness (ex CD) station license had been renewed for the period of Steve's license term and that it would not be allowed to lapse again while he was the station custodian. He indicated a desire to have at least a walk-through of the Menlo Park Disaster Center's area to acquaint all with where it is and what is in it.

Gerry, LNV, announced the contest for Club members already four hours underway nationwide, and urged all to get active and submit their results for prizes. Mac, N6YV, and others, described the contest, its rules, and how to report.

Gerry, W6NIR, reported on Flea Market activity. The only local listed is now a memory—SPECS, March 21.

Help was solicited for antenna parties. Three. Dave, KB6WP, Ed, W6KJI, and Bill, N6CHI. No schedule on the last two yet and hopefully by mailing time Dave will be in good shape.

The meeting broke for goodies and more conversation—even strangers were seen talking to the regulars. Are they getting more aggressive or are members looking for strangers?

Ray, W6PUX, entertained and informed during his talk on interference, showing slides and explaining the characteristics of different noise sources. Using equipment "anyone can get downtown" makes the job easier, he conceded, but some things can be accomplished using gear many of us have around the shack.

The meeting ended with a raffle of prizes and in all but one or two cases different people were lucky for a change.

+ + +

BOARD CORNER: March .. March.. March 11, that was the fate the Board met at the Club trailer, 7:30 p.m. just inside the gate at SRI.

Rob, KA6NAN, the new Advisor to Post 599, was introduced to Club Officers and Board Members Ed, W6AIN, John, KA6CUG, Kevin, WA6PHC, Bob, K6SEM, Mac, N6YV, Gerry, WA6LNV, George, GI3OEN, Gerry, W6NIR, and Bill, KA6LZI.

Gerry, LNV, discussed the Club's insurance program, had questions to ask, and Mac, YV, said he'd try to get answers for next month's meeting.

George, OIN, continued discussions about PAARA financing, had questions about IRS forms which were answered by Gerry, NIR, and wondered who had the "Corporate Seal. Bob, SEM, applied the "Corporate Seal" to the papers in question.

Bob, W6BFH, announced PAARAgaphs deadline as the night of the Board Meeting to try to comply with Ed, AIN's, request for an earlier mailing date to get the paper to those outside the Menlo Park area before the meeting.

Rob, NAN, discussed Scouting Post 599 sponsorship for 1981 and it was agreed PAARA would continue its program. Gerry, LNV, as the executive officer, Ken, WB6NYB, as Chairman, and Board Members Bob, K6SEM, Fred, K6YT, Don, W6CPZ, and Alan, WA6AZP.

Bob, SEM, gave a report on the new generator that seems to be in good shape except for the D.C. commutator which needs turning down and regrooving. Bob is looking for someone with machinest's knowledge and equipment to do the job.

Bob also pushed for a spring picnic tentatively set for May 3. More information at the April meeting and in the May PAARAgaphs.

The March 7-8 contest was discussed but no results were in except a "something over 5,000,000" by Cam's, K6RU, group. Bob, SEM, discussed the upcoming field day and of training Club testers. A preliminary F.D. report will be made at the April meeting with "final" details at the May meeting. Bob suggested another PAARA contest associated with the CQ WFX Contest.

+ + +

CONTEST CORNER: The Board of Directors announced a new contest for Club members, to be held in conjunction with the CQ WFX Contest. An award will be made to the member making the highest score in any consecutive four-hour period during the contest. Complete information is in the March issue of QST, page 82.

For PAARA members there will be two classes:

- all comers
- those who have never entered this contest before.

The dates? Phone: March 28-29; CW, May 30-31

+ + +

NEW MEMBER CORNER: Jack Cline, K6JK will be remembered by some, having paid his dues years ago as PAARA Vice President and CCRC Representative. After a period of inactivity in the Club, he's back. He normally works 40-m CW QRP and you'll find him there. First licensed in 1936, he entered the game as W8OSP.

Barry Lar Rieu, WA6UIM, dropped out of the club a year or so but didn't even have his card lifted from the file—listed as inactive, even though he had attended meetings. For those who don't know him, he was first licensed in 1961, and now operates 20 and 15-m phone and CW, with a fine selection of gear. His main interest is contesting and for that reason likes to see programs about DX trips at the meetings.

Welcome back, both; at the meetings and when you talk with them on the air.

+ + +

ARRL CORNER: Join or resubscribe to QST through the Club and keep yourself in good standing and PAARA as an affiliated Club. PAARA gets a slice of the cake when George, OIN, submits your application for membership or resubscription.

FIVE COUNTY EMERGENCY PREPAREDNESS ORGANIZATION

8-25-80

SECTION EMERGENCY COORDINATOR:	Ed Gribi	WB6IZF	(408) 385-6164
San Mateo County District Emergency Coordinator:	Steve Stuntz	K6FS	(415) 322-4952
Emergency Coordinators:	Half Moon Bay	George Black	WA6EEP (415) 726-5028
	Pacifica	John J. Geary	K6IIG (415) 355-8663
	Portola Valley	George Badger	W6TC (415) 854-4649
	San Mateo	James Knochenhauer	K6ITL (415) 345-9511
Santa Clara County District Emergency Coordinator:	Mac Mc Callum	WB6LVD	(408) 867-0399
Emergency Coordinators:	Campbell	Alan Borken	WB6LZH (408) 378-8021
	Cupertino	Alf Modine	K6TWF (408) 252-0347
	Gilroy	Doc Crane	W6GJZ (408) 842-2554
	Los Altos)		
	Palo Alto)-	Walt Read	W6ASH (415) 948-6753
	Mountain View)		
	Milpitas	Lou James	WB6BPU (408) 263-2952
	Morgan Hill	Lynn Rosa	K6IYD (408) 683-4410
			683-4173
	San Jose	Woody Woodward	W6PLT (408) 226-5908
	Sunnyvale	Walter Rees	WA6BAX (408) 378 8021
			(415) 968 9211
South Counties District Emergency Coordinator:	Bob Martin	K6LFPZ	(408) 637-3281
Emergency Coordinators:	Monterey Peninsula	Bill Webb	WD6COR (408) 375-2005
	Salinas Valley	Walt Del Conte	WD6EKR (408) 449-2380
	San Benito County	Bob Martin	K6LFPZ (408) 637-3281
	Santa Cruz County	Ron Shannon	KD6BD (408) 475-2891

EMERGENCY MOBILIZATION PLAN 80-1

PURPOSE: To facilitate the mobilization of amateur radio operators and equipment in the shortest possible time without the need for detailed additional instructions.

SCOPE: This covers the five counties of the Section -- San Mateo, Santa Clara, Santa Cruz, San Benito, and Monterey. Each Emergency Coordinator (EC) shall have a more detailed emergency plan that will define local and functional mobilization procedures.

APPLICABILITY: All licensed amateurs, whether or not they belong to any ARES group should respond to this plan. Every amateur is an Acting Emergency Coordinator and should be prepared to take responsibility to activate a useful response in a real or threatened emergency.

ORGANIZATION: The man on the spot is responsible for doing whatever he shall be capable of doing, as quickly and as efficiently as possible.

The chain of command, alerting and advice shall be as follows:

1. The man on the spot.
2. EC, Assistant EC (AEC), and designated net controls.
3. Section Emergency Coordinator (SEC) and District EC's.
4. Section Communications Manager (SCM)
5. Advice to Division Director or Assistants and to ARRL Headquarters hotline and Communications Department and to Division Regional Emergency Coordinator.

INSTRUCTIONS

1. All available amateurs shall respond to this and local plans without further direction.
2. All volunteers shall report to assembly points designated in local plans with required equipment and supplies. If such instructions are not available, amateurs should make themselves and their capabilities known to local public service or disaster response groups such as the Red Cross.
3. Emergency Coordinators and AEC's shall activate their local key nets and plans and advise the SEC via HF and VHF alerting nets. Mobile and base stations shall monitor local and alerting nets and respond to instructions. Listen before transmitting and do not transmit unless called or unless conditions warrant.
4. Alerting will be by local nets or repeaters or by telephone or by section-wide alerting nets as described in the Section Alerting Roster. Section alerting may be on 7255kHz, WCARS (days); 3952kHz, WPSS (nights); or 3952kHz, Weather Net (early mornings). VHF high level repeaters may be used as well. Generally local nets may be established for the particular situation on other HF frequencies, on low level repeaters, or on simplex VHF frequencies (including repeater outputs if repeaters are down).
5. These procedures should be second nature to all concerned hams.

SECTION VHF NET: 146.925, W1PW, 1900 LT, Wednesdays.

SECTION HF NET: Frequency and time to be announced.

de Ed, WB6IZF

CUT AND PASTE CORNER: PLEASE add the following new members to your December Roster

Jack Cline	K6JK	3527 Arbutus	Palo Alto, CA	94303	(415) 493 5620
Barry J. Lar Rieu	WA6UIM	P. O. Box 752	Menlo Park, CA	94025	(415) 326 2020

Please add a phone number to Bob Hill, W1ARR/6 listed last month (415) 969 2122
 Bob's office phone is still -- (415) 361 4177

S I L E N T K E Y

John F. Roberts, Jr. W6QFX

January 31, 1981

Past President,
PAARA 1958-1981

THE KA6M/R PACKET REPEATER INFORMATION SHEET

The KA6M repeater is San Francisco's first, and possibly the nation's first, all digital simplex packet radio repeater for use in amateur radio. The repeater went into operation on December 10th, 1980 and since then has been running both as a packet repeater and a beacon. Here are some facts about the repeater and its operation:

- A packet radio repeater or digital repeater or "digipeater", as the Canadians call it, is a machine which receives a message or block of data, and after verification, retransmits that message on the same frequency channel where it was received. Thus, only a simplex channel is used, and the message transmitted is the same as the message received, except for the possible modification of some address or control bytes. The primary function of a packet repeater, as with a more conventional repeater, is to extend the geographic range and coverage of fixed or mobile stations.

- The KA6M/R repeater is currently operating on a simplex channel assigned for non-voice use, 146.58MHz, and transmits data at a speed of 1200 Baud. The machine consists of a Z80 microprocessor, a Bell 202 compatible modem, and a solid-state transceiver. The initial site is in Menlo Park, CA.

- The basic format of a packet or message block is an HDLC frame. The word HDLC stands for High-level Data Link Control which is a new and internationally recognized standard in the communications industry. A frame consists of an opening flag byte, an address byte, an information field, two bytes of CRC checking, and a closing flag. The repeater uses NRZI (Non Return to Zero Inverting) encoding of the frame, which allows both clock and data to be recovered from one signal. The use of HDLC framing and control procedures guarantees highly reliable, nearly error free communications. The first use of HDLC framing by amateurs was done by members of the Vancouver Digital Communications Group, and we are following their lead.

- As a beacon the machine transmits three packets every 5 minutes, immediately following its CW ID. Each packet contains approximately seventy ASCII characters. In functioning as a repeater, the machine will repeat any packet it receives which has the correct address and CRC checksum. The information field

is currently limited to 256 bytes maximum.

- The control software for the repeater is written in PASCAL/Z, a PASCAL which generates native Z-80 code instructions. Assembly language interface routines have been written to control a Western Digital 1933 HDLC chip.

This repeater is just a first step in what will someday be a nationwide network of interconnected computer systems. Packet radio is a new frontier for amateur radio, a new medium unlike anything we are accustomed to today.

If you are interested in more information about the repeater or wish to communicate with it, call Hank, KA6M at 854 1927, or write him at: 311 Stanford Avenue, Menlo Park, CA, 94025.
de Hank, KA6M.

+++

CONVENTION CORNER: The 39th Annual Fresno Hamfest will be held May 15, 16 and 17, 1981 at the Hacienda Inn, Clinton Ave. and Hiway 99 in Fresno.

Always one of the best Hamfests in the country, the programs include something for everyone. If you haven't received an announcement, pick one up at the April meeting. The pre-registration prize goes to one who signs up before May 8.

+++

UNCLASSIFIED CORNER: This space is made available to Club members, and others, as space permits for the acquisition and/or disposition of nearly anything electronic.

FOR SALE:

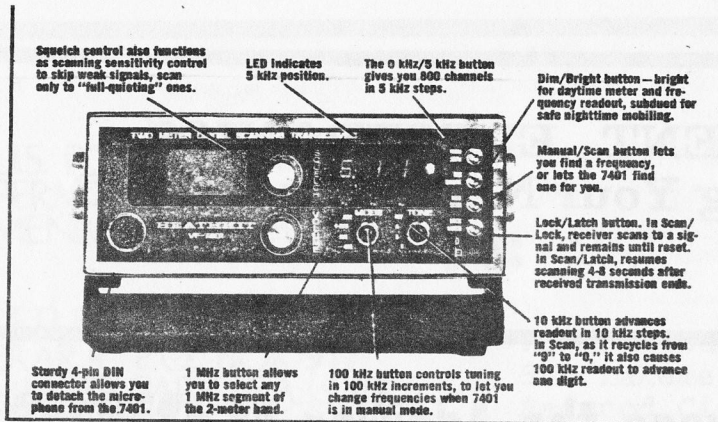
- Vertical antenna, Hgain 18AVT/WB, 80-10m \$ 85.
- Transmitter, B&W 5100B with 51SSB Sideband adapter 75.
- Tower, telescoping foldover 50.
- Rotor, CDR Ham M 85.
- Receiver, Collins 75A4 350.
- Mike, Astatic 10-D 25.
- Keyer, TenTec 20A 30.

from the estate of John, W6QFX. See Bill, W6DVB or call Bill at 326 0112.

FOR SALE: Gonset GSB-100, 100 watt transmitter, AM, FM, SSB, CW, in excellent condition. See Irv, W6HHN, or call 494 1791.

FOR SALE: Heathkit HX-10 xmtr, 80-10m, CW, AM, SSB, FSK, \$150. Heathkit Seneca VHF-1 2m xmtr, 100w, CW, AM, with manual, \$60. Western Union Teletypewriter Model 103, \$50. See Tony, WA6KJJ, or try him again, this time at 739 1145.

WANTED: Old style twistlock plugs and sockets, 20A 240 V, 3 and 4 pin. For the new generator. Call Bob, K6SEM, at 494 6549 or Fred, K6YT, at 948 9238.



Squelch control also functions as scanning sensitivity control to skip weak signals, scan only to "full-quieting" ones.

LED indicates 5 kHz position.

The 0 kHz/5 kHz button gives you 800 channels in 5 kHz steps.

Dim/Bright button — bright for daytime meter and frequency readout, subdued for safe nighttime mobiling.

Manual/Scan button lets you find a frequency, or lets the 7401 find one for you.

Lock/Latch button. In Scan/Lock, receiver scans to a signal and remains until reset. In Scan/Latch, resumes scanning 4-8 seconds after received transmission ends.

10 kHz button advances readout in 10 kHz steps. In Scan, as it recycles from "9" to "0," it also causes 100 kHz readout to advance one digit.

Sturdy 4-pin DIN connector allows you to detach the microphone from the 7401.

1 MHz button allows you to select any 1 MHz segment of the 2-meter band.

100 kHz button controls tuning in 100 kHz increments, to let you change frequencies when 7401 is in manual mode.



The exciting Heathkit VF-7401 FM Digital Scanning Transceiver finds all the 2-Meter action for you

\$349.95
with PTT microphone

- Continuously adjustable, 15-watt output
- Band scan capability 1 MHz at a time — front panel selectable
- 800-Channel synthesized capability
- Preprogrammed power-up on your favorite channel
- Microphone is detachable

If you have one or more repeaters in your reception area, you need the Heathkit VF-7401 2-Meter FM Digital Scanning Transceiver. You can't effectively monitor one or more repeaters, plus simplex frequencies, without a scanning transceiver like the VF-7401. And never again will you have to search through a repeater guide on the highway. The VF-7401 will find all of the local activity for you, because this exciting Transceiver scans the entire 2-meter band in 1 MHz segments. When it finds an active channel, it stops! It stays on the active channel, when you select the Scan/Lock Mode, until you reset it. Or, set your VF-7401 in the Scan/Latch mode, and it will resume scanning when the received transmission ends.

You can adjust the receiver to stop scanning for "full-quieting" signals only. Or, open up the squelch when there are 2-meter band openings. Your VF-7401 will find that "2-meter DX" for you without the tedious task of flipping through channels one by one. Naturally, your VF-7401 lets you change frequencies manually, too. Three small front panel switches allow you to select manually any desired frequency at the scan rate. Once you have the frequency you want, you may also offset it by a separate 5 kHz switch.

Your VF-7401 will "power-up" on the frequency of your choice. While building your transceiver, you program in any simplex or repeater frequency. Then, every time you turn it on, before it begins to scan, that frequency is monitored first. Besides simplex, your VF-7401 has +600 kHz, -600 kHz and 1 MHz offsets. It can accommodate any 2-meter amateur band offset combination, even MARS and CAP.

The VF-7401 is a continuously adjustable, 15-watt (nominal), solid-state, narrow-band FM transceiver. Featuring a hot receiver, it incorporates a double-tuned front end with MOSFET RF amplification, dual-conversion, 8-pole crystal IF filter-

ing for perfect bandpass shaping and outstanding adjacent channel selectivity, IC limiting, Quad detection and excellent audio quality. An improved synthesizer eliminates the need for a panel-mounted syn lock light. Power amp tuning and output power level adjustment are both accessible from the rear panel without removing the case. Also added — a sturdy 50-239 antenna connector, plus chassis-mounted power and external speaker jacks.

Your VF-7401 has a detachable microphone with rugged 4-pin DIN connector. And if you choose the optional Micoder™ II Microphone/Auto Patch Encoder (described on page 64), stop worrying about when your mike battery is going to run down. The Micoder II draws its power directly from the VF-7401. Also included is a handy gimbal-mount bracket for mobile installation. The Transceiver requires a 13.8 V, 3 amp continuous, 4 amp intermittent, power source such as a charging automobile electrical system, or the optional VFA-7401 AC Power Supply described on the next page.

- Kit VFS-7401-1, Transceiver and Micoder II, Shpg. wt. 12 lbs. 369.95
- Kit VFS-7401-2, Transceiver and PTT Microphone, Shpg. wt. 12 lbs. 349.95

VF-7401 SPECIFICATIONS: Receiver: Sensitivity: 0.5 μ V for 12 dB SINAD (or 15 dB of quieting). Squelch Threshold: 0.3 μ V or less. Audio Output: 1.5 watts at less than 10% THD; 2 watts maximum output (typical). Image Rejection: -50 dB or greater. Spurious Rejection: -50 dB or greater. IF Rejection: -80 dB or greater. Internally Generated Spurious Signals: Below 1 μ V equivalent. Bandwidth: 6 dB at 15 kHz minimum and 60 dB at 15 kHz maximum and 60 dB at 30 kHz maximum. Modulation Acceptance: 6.5 kHz minimum. Transmitter: Power Output: 15 watts nominal to a 50 Ω C_0 (resistive) load at 25 $^{\circ}$ C and 13.8 VDC. Harmonic and Spurious Output: -60 dB. Modulation: FM, 0-7 kHz, adjustable. Duty Cycle: 100% with VSWR of less than 10:1. Tone Encoder: 3 tones 70 to 200 Hz, approx. 700 Hz deviation. Transmitter Offset: -600 kHz, +600 kHz, +1 MHz (AUX). General: Frequency Coverage: Any 4 MHz segment from 143.5 to 148.5 MHz. Frequency Increments: 5 kHz. Frequency Stability: \pm .0015%. Operating Temperature Range: +15 $^{\circ}$ F to +125 $^{\circ}$ F (-10 $^{\circ}$ C to +50 $^{\circ}$ C). Operating Voltage Range: 12.6 to 16 VDC (13.8 VDC, nominal). Current Consumption: Receive Mode: 550 mA max., squelched; 750 mA max., full rated audio. Transmit Mode: 4A max. at 13.8 VDC. Dimensions: 2 3/4" H x 7 1/4" W x 10 1/4" D (7.0 x 18.4 x 26.0 cm).

Code Courses and Reference Books to help you get more from Amateur Radio

Ameco Senior Code Course. Here's the way to learn the code and make sure you'll pass your FCC CW exam. Two 33 RPM long-playing records contain 22 lessons that take you from an introduction to the Morse code through to 18 words per minute.

HDP-332, Shpg. wt. 2 lbs. 7.50

"By the Word" Code Course. Two audio cassette tapes teach you the code using the world-famous, success-proven "by the word" method. It begins by presenting simple material at 13 words-per-minute, and then increases in complexity, not speed. The cassette tapes make it easy and convenient to rewind and listen a second time.

HDP-132, Shpg. wt. 1 lb. 9.95

Amateur Radio License Study Guides. These guides make getting your higher class license easier, and also serve as convenient reference guides as you advance in your Amateur Radio hobby.

GENERAL, EDP-123 7.95

ADVANCED, EDP-124 8.95

EXTRA, EDP-125 8.95

US Callbook. Your "telephone directory" of names and addresses — a complete list of the Radio Amateurs in all US call areas and territories. Also contains a listing of SSTV, AMSAT, OSCAR users, Great Circle bearings, and more. A big 1070 pages.

EDP-126 17.95

DX Callbook. Complete listing of foreign Amateurs, addresses, postal rate charts, call zone maps, world time conversion chart, world QSL bureaus, more. 500 pages.

EDP-127 16.95

1981 Edition. ARRL Radio Amateur's Handbook. Up to date electronics theory and application. 538 pages.

EDP-293 16.00

73 Dipole Antennas. Description, construction of 73 different dipole and long-wire antennas. 160 pages.

EDP-190 4.95

ARRL Antenna Handbook. Antennas, transmission lines, propagation, antenna design. 336 pages.

EDP-182 5.00

AMATEUR RADIO



Now use your Visa or MasterCard credit cards or Heathkit Revolving Charge to purchase your kit!

HEATHKIT ELECTRONIC CENTER
2 001 MIDDLEFIELD RD.
REDWOOD CITY, CA 94063
415 365 8155



QUEMENT ELECTRONICS

Serving Your Needs Since 1933

Proudly Announces the Addition of **BIRD** Electronic RF Measuring Equipment

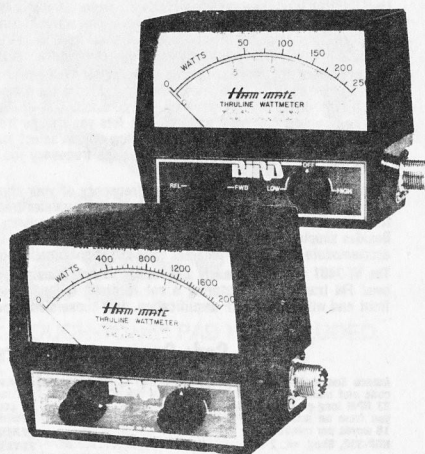
SEE THE HAM MATE WATTMETER FOR
1.8 TO 30 MHZ OR 140-180 MHZ. ONE UNIT,
NOTHING MORE TO BUY.

BIRD ACCURACY FOR UNDER \$100.00

CHECK WITH QUEMENT FOR OUR
YEAR-END SPECIALS. BIG DOLLAR
SAVINGS ON OVERSTOCK ITEMS,
PLUS SOME DISCONTINUED UNITS.
WE HAVE IN-DEPTH STOCK OF
CURRENT GEAR FOR YOUR CONVENIENCE.
LET US WORK WITH YOU TO "YOUR" ADVANTAGE.

Price - Quality - Service

THAT MEANS QUEMENT ELECTRONICS



40,000 SQ. FT. OF ELECTRONIC PARTS,
COMPONENTS, TUBES AND ACCESSORIES.

- ANTENNAS - NEW SERVICE DEPT
- HAM GEAR - ACOUSTIC SOUND DEMONSTRATION ROOM
- CITIZEN'S BAND - COMPLETE STEREO HI-FI DEPT.
- COMMERCIAL AND INDUSTRIAL PARTS SUPPLY
- BANKAMERICARD - FIRST NATIONAL - MASTERCARD

1000 SO. BASCOM AVE.
SAN JOSE, CA 95128
408-998-5900

P.O. BOX 6000, SAN JOSE, CA 95150

VHF model 4362
HF model 4360