



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  
Redwood City CA 94062

vol. 25  
MARCH  
1982

# PAARA

GRAPHS



PALO ALTO  
AMATEUR  
RADIO ASSN.

MENLO PARK C.D. RADIO CLUB, K6YQT



**TELE-COM** ELECTRONICS

RADIO  
•AMATEUR  
•MARINE  
•INDUSTRIAL  
•EQUIPMENT

15460 UNION AVE. SAN JOSE, CA 95124 (408) 377-4479

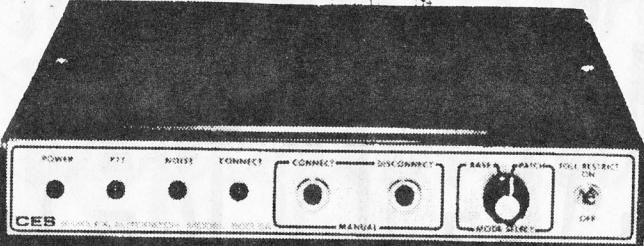
# NEW

## The CES Simplex Autopatch

— some hot new hardware for two

THE NEW CES SIMPLEX AUTOPATCH IS IN STOCK AT TELECOM

READ THE WRITE-UP IN THE JUNE ISSUE OF 73 MAGAZINE  
VISIT US FOR A HANDS ON LOOK AT THIS EXCITING NEW PRODUCT.



ALL POPULAR

**Communications Specialists**

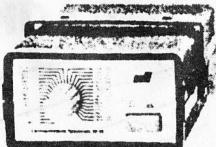
PRODUCTS

IN STOCK AT TELECOM

WE STOCK THE NEW SS32A DESIGNED SPECIFICALLY FOR THE IC2AT

INSTALLATION AVAILABLE

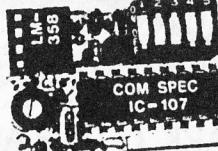
TE-64



TS-32



SS-32



\*\*\*\*\*  
PAARAGraphs is the official organ of  
The Palo Alto Amateur Radio Association & the Menlo Park Civil Defense Radio Club  
\*\*\*\*\*

1982 CLUB OFFICERS

|                 |   |                 |        |          |
|-----------------|---|-----------------|--------|----------|
| President       | : | Gerry Tucker    | WA6LNV | 326-4908 |
| Vice-Pres.      | : | Kevin Lapp      | WA6FAC | 364-2654 |
| Secretary       | : | Gerry Wagstaffe | W6NIR  | 325-4670 |
| Treasurer       | : | George Nixon    | GI3OEN | 854-6445 |
| 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    | KD6ZL  |
|           | : Wally Porter    | K6URO  |
|           | : Alan Jenson     | W6UVP  |
|           | : Ed Fairbanks    | W6AIN  |
|           | : Bill McElhinney | KA6LZI |
|           | : Bob Wheeler     | K6SEM  |

PAARA POLICIES

Membership in PAARA is \$6.00 per calendar year (payable in January), which membership includes a subscription to PAARAgraphs. Freebee 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 :  | George Nixon  | GI3OEN |
| Product.: | Dave Daniel   | KB6WP  |
| Advert.:  | Swede Swenson | N6CHL  |
| Printing: | Mellonics     | ALOK   |
| Mailing : | Ed Fairbanks  | W6AIN  |
| Cover :   | Sue Lindner   | L6VLY  |

Written contributions to the P.O. Box above, or to the Editor, 1140 Sherman Avenue, Menlo Park, CA 94025. Deadline is two or three days after the Board of Director's meeting.

Friday March 5, 1982

7:30 pm

R E G U L A R   M E E T I N G

LANDINGS AND LAUNCHES OF THE  
SPACE SHUTTLE COLUMBIA

by

Steve Greenberg  
&  
Patty Winter - N6BIS

Patty and Steve were in the Press area at both landings and Steve went to Florida for the last launch.

Future meetings: April 2, May 7, 1982

Circle the Date.

March 5, 1982

PRESIDENT'S CORNER: My thanks to Ron Panton, W6VG, for last month's pre-evaluation of, "Whats New IN NIUE" with those candid shots of Cam Pierce. As I recall the three most important things you need for such a trip are 1) time on your hands, 2) 65 wpm, 3) and money! No sweat! Kevin WA6FHC kindly covered for me at the last board meeting. My class in classical control theory (good grief!) will be moved to Thursday next week so that conflict will cease. I'm enjoying my "new" (to me that is, Via K5OSQ and W6NIR) IC-22A on Monday night net. If you don't check in its not too late to change your ways. Help is available in the way of locating equipment or crystals; check with me or Gerry, W6NIR. One club member was heard to have amassed four 2m units, and thinks maybe he should get rid of a couple. The swap portion of Monday night net seems to be popular. The goodies with good prices don't last long, which is another reason to be on 147.45. There is a swap meet at West Valley in late March. Hopefully we can put one of their flyers in this issue with the particulars.

WA6LNV

CLUB MEETING AND BOARD MEETING REPORTS: As the Editor did not expect to be writing these reports, he did not make any notes at the time, so he hopes that any errors or omissions will be excused.

The Club meeting of Feb. 8, 1982 was held in the Menlo Park Recreation Centre, with a large crowd in attendance, attracted, no doubt, by the speaker.

The Post 599 report was submitted and it seems that the Post will be meeting at the Lucie Stern Centre, at Middlefield and Embarcadero, in Palo Alto, in the future. These facilities are supplied by the parent Boy Scout organization. Anyone wanting information about the schedule of meetings, code classes, etc. should contact one of the Post members listed in the November membership roster.

The Post report also included a graphic account of their presentation of amateur radio for interested high school students. Armed with a computer prepared list of interested students, the Post invited those students to the presentation. Hardly anyone showed up! The Post members were very disappointed, of course, and they wondered why so few students had shown up. However, by the time of the board meeting, the puzzle was solved. By error, the Post had been given the wrong list.

The Speaker of the evening was our own Ron Panton, W6VG, and his topic was the recent DXpedition to Niue in Western Samoa, along with our own Cam Pierce, K6RU.

It was Cam, in fact, who arranged the shipment of gear through the Oakland Airport, all the way to Niue, with great finesse.

After sundry adventures and lots of high living, our expeditioners arrived on Niue, with all their gear intact, and set up station, with help from the local amateur community.

As Ron explained, there are several active local amateurs on Niue, but it was selected for a DXpedition because it is fairly rare, and it

was desired that a station be on the air from Niue during the recent cw contest.

Ron's excellent photographs showed, not only the amateur radio aspect of their expedition, but also something of the culture of the island.

Most of the men, for example, wore a short of below-the-knee, wrap-around skirt, and in his photographs, Cam wore his with great aplomb.

Another interesting feature of Niue, is that deceased relatives are buried, not in a community graveyard, but in their home gardens. Ron said that the graves were neat and well-maintained.

After the contest, Ron and Cam left most of the equipment behind. Some large items were sold to local amateurs; other items were donated outright.

When Ron finished his talk, he was well applauded, and the PAARA members then dug into their pockets for their raffle tickets, and then the disaster of the evening began.

Your Editor is not exactly sure of what went wrong; however, he believes that the following is fairly accurate.

When the first few tickets were drawn, it seemed that the holders of those tickets had gone home; then someone realized that the numbers being called were thousands away from the numbers that we were all holding. To confuse things further, tickets had been sold from two rolls. An investigation was then launched, and it was found that the numbers on the two halves of the tickets

were not the same in all cases. Our apologies to those who should have won a prize but didn't.

\*\*\*\*\*

The Board meeting of Feb. 10, 1982, was held at the Club trailer, and present were: Kevin, WA6FAC; Gerry, W6NIR; George, G130EN; Wally, K6URO; Alan, W6UVP; Bill, KA6LZI; and Kevin chaired the meeting.

The major item of discussion was the large increase in PAARAGraph printing charges. Mellonics has increased the monthly charge to over \$89 per month for a typical issue, and, to give perspective, the club's annual income from dues is about \$750.

After much discussion, it was decided to find another printer, so if you (1) are a printer; or (2) have access to cheap printing, can you contact the committee? It would be nice if the magazine could be printed for \$40 or so per month. At present, though, the magazine will continue to be printed by Mellonics. During the discussion, tribute was paid to Rick Ferranti, WA6NCX, who printed the magazine on the club mimeograph during his tenure as Editor/publisher.

Last month's call for club-net frequency crystals failed to produce any, so those club officers who lack them have decided to fork over their hard-earned cash and buy them.

There was some talk at this point on grinding large WWII crystals but no one volunteered to move HC25U crystals a few hundred kc.s.

A discussion of Colkswagons, ancient and modern, then followed,

culminating in Alan, W6UVP, deciding to sell his Volks bug or possibly swap it for a hf transceiver (see the Member's Ads.)

At this point, the meeting ended with George, G130EN, saying that he would dig out a copy of the patent drawing of the original bug key and possibly include it in this issue's articles. (However, due to lack of space, this will be held over until another time.)

\*\*\*\*\*

PAARAGRAPHS POLICY: The question of whether articles should be signed by the author came up recently.

PAARAGraphs policy is that all articles should be signed and a by-line given. The experience of former Editor, Bill King, N6CHI, is sufficient justification.

The Santa Clara Valley Section of the Office of the Section Emergency Coordinator had a meeting on Feb. 1 called SCV ARES REPEATER THREATENED. The Coastside Amateur Radio Club, Pacifica, placed a repeater on North Peak, a medium level site in San Mateo County, on Jan. 29, 1982. It is on the same 146.925 output as our W1PW/R SCV-ARES repeater on the Crystal Peak high level site south of San Jose. It creates mutual interference on outputs and by user input. The Pacifica Club says we're wrong and they're right. We disagree. Regardless of who is right and who is wrong, Phil Walker and I feel that the good of amateur radio is best served by: first, maintaining a high level 2 meter repeater operation dedicated to SCV-ARES; and, second by keeping such an operation clear of controversy.

The high level site limits the number of frequency possibilities. However, there are some and they all depend on some horse-trading, coordination, and mutual accomodation. By this notice he advised that we will accept and encourage all the help we can get in trying to relocate on another pair that is acceptable to all concerned in the first 200 mile radius.

PUBLIC SERVICE CORNER: On Sunday, May 16, Peninsula School, Peninsula Way, Menlo Park, will hold its annual open house and science fair. Last year PAARA, at the request of one of the teachers, set up a demonstration HF and 2-meter station, affording a chance for interested students and parents to get a brief glimpse of amateur radio at work, and to get some idea of what is involved in licensing and operating a ham station. This year PAARA is again being asked to set up a simple HF (and any other bands) layout, to run about 4 hours on that day. It's a great chance to gain some exposure for PAARA and to stimulate interest in ham operation - especially among potential novices. Peninsula is an alternate school, staffed mainly by parents of children attending at all grade-levels through high school senior (12th grade.) The students themselves are bright, interested, and eager to learn - but ham radio is one subject not included in their curriculum. Let's give it a good shot. If you're interested in helping set up and operate, and answer questions about ham radio, call Steve, K6FS, 322-4952. Remember: Sunday, May 16, from 11 a.m. to 3 p.m. (approximately.)

Steve Stuntz  
K6FS

OUR GREAT COLLECTOR - Erv Rasmussen, W6YPM, joined PAARA in 1948 after returning to the Bay Area from Los Angeles. The house the Rasmussens bought in Redwood City was perfect because, among other qualifications, it provided room for Erv's collections. Even then his collections, ranging from call books to vacuum tubes, were demanding a great deal of space.

Erv began collecting in 1921 after he obtained his first amateur radio license in Oshkosh, Wisconsin, with the call of 9BCH. (It annoyed him when stations calling him would slur the letters to sound like "Nine Bich.") He began accumulating radio items, some to be used in his station and some just because they were good buys, and from this start he developed an interest in all types of older radio gear.

Perhaps the most extensive, valuable and exciting of all the radio material is Erv's collection of vacuum tubes--over 500 of them--which friends all over the country have helped him to acquire. His collection starts with a DeForest tube of 1910 vintage and progresses through audiotrons and water-cooled tubes to the latest products before transistors took over. The great number of 201A's, each from a different manufacturer, is outstanding. Prominently displayed is a one-of-a-kind Japanese tube of 1920. It doesn't look very good and, according to Erv, it did not work any better than it looks.

Erv also had practically every type of receiver starting from a

loose coupler with crystal detector to the modern Collins in his shack. At one time he had among his acquisitions a whole Marconi radio station complete with commercial receiver and transmitter.

Another collection began when Erv, an ARRL member, started accumulating copies of QST magazine. He decided to try to gather a complete set. This involved a great deal of detective work as well as considerable expense. Often he would ferret out one early issue he wanted--and then have to buy a large number of other copies just to get it. He captured a very rare 4 page issue, the first one put out in 1919 after World War I ended, but he still couldn't find an available Volume 1, number 1. Finally, in 1965, he heard of a man who had a large collection of QST's, including that special first issue he wanted.

Erv managed to meet the other collector at a radio convention and became friendly with him. The man invited Erv home to see his collection. Resisting the impulse to clobber the owner over the head and make off with the prize, Erv began a sales talk better than any he had ever made. Noticing that the man was of advanced years, Erv stressed that he had had a long period of pleasure from owning that issue, and now was the time to allow someone else to enjoy owning it. Particularly him, Erv.

"Besides," Erv says, "I pointed out that he should use the sale money to go out and have a good time while he could still put one foot in front of the other." With his resistance worn down, the owner agreed to the offer and Erv made a quick exit clutching Volume 1, Number 1 in his hot little hand.

Erv bought his first call book in 1921 for the same reason that all of us buy one; to learn the location of stations we've worked. At that time, call books were published by the Government Printing Office. He bought another book in 1922, and then he knew--he had to have a complete set. In time, he collected every call book that had been issued, including the first one published in 1913. Later when the government stopped publishing the books, Erv purchased the commercially printed call book and he continues to do so every year. This collection of call books is considered one of the most complete in the United States, and has proved very valuable in providing information regarding calls of the early years of amateur radio.

Through the years Erv didn't neglect his library. At every opportunity he purchase books relating to all phases of radio to add to his collection. Most of them are reference books, but some, like "SOS To The Rescue" are stories of the early days of wireless. Many of the books have been out of print for years, so Erv's collection is a treasure trove for research. He usually did not buy singly, preferring instead to pruchase a load and then see what goodies turned up. In one pile of books he was amazed to find a hardcover notebook which was PAARA's membership roster for 1937. In it a member's attendance at each meeting was indicated by a neat "X" beside his name. Erv has, incidentally, offered to donate this book to PAARA when a "responsible person" will accept it for safekeeping.

Early on Erv also began to collect ham radio conventions.

He now has a collection of over 100, starting with the first ARRL National Convention in Chicago in 1921. He picked up interesting old radio equipment at the meetings and spread the word that he wanted more. Being a paint salesman with a wide territory Erv was able to make his business calls coincide with the area and time of the radio meetings.

He retired from selling paint in 1960. Later, looking for some low impedance transformers for phone patches he intended to build for himself and friends he head of 60 being available at a military surplus sale, and he put in a bid. Apparently fate refused to let him stop collecting. His bid was successful but he received not 60 transformers, but 6000.

Erv rose to the challenge. He designed, manufactured and merchandised the KWIK-PATCH phone patch. For ten years he made thousands of the little patches, described so well by PAARA member Dick Ferranti, WA6NCX, in the June 1978 issue of CQ magazine.

Now Erv is taking things a little easier and is gradually disposing of some of his collected treasures. But one treasure he will always keep--the huge collection of friends in every part of the country he has acquired during his 60 years of collecting.

(My thanks to Gerry Wagstaffe, W6NIR, for providing the information about Erv's adventure with the KWIK-PATCH)

Jerry Zobel, W6ARA  
Club Historian

dB? dBj? dBs? dBv? dBm?

Wondering about the dB system?

How does this relate to your equipment? How can you compare measurements? It ain't easy! This brief illustration of the problem is only intended to further confuse and is not intended to be completely comprehensive.

Signal levels in radio, TV and audio service literature are commonly specified either in microvolts, millivolts, and volts, or in one of several dB systems. A problem arises when a level is specified in the service literature in dB, and your signal generator and voltmeter are calibrated in microvolts or millivolts. To convert from a voltage level to a dB level, or vice versa, is when it gets confusing. You need to know what the dB reference level is. The dB microvolt system where  $0\text{dB}=1\text{ microvolt}$  is the standard dB system in Europe and Japan, so RF products from these countries are noted according to this system. The dB system where  $0\text{dB}=1\text{mV}$  is sometimes called the dB<sub>J</sub> since it was pioneered by Jerrold, a manufacturer of MATV and CATV equipment. So, most U. S. made TV and much RF test equipment uses this system. Note that this amounts to a 60 dB difference between these two systems.

A third dB system is the 50 ohm dB<sub>m</sub> since in this system  $0\text{dB}=\text{the voltage level (.233V)}$  which produces 1 mW dissipation into a 50 ohm load. Nearly all U.S. laboratory grade signal generators having calibrated output use both dB<sub>m</sub> and microvolt calibrations.

The relationship of voltage to E/J and dB<sub>J</sub> are turned regardless of the impedance level used since these are absolute voltage levels. This would not

hold true for the voltage to dB<sub>m</sub> relationships, since the reference level for this system is actually a power level. (1mW into 50 ohms.)

Now then, let's get to the dB used most commonly in audio work. You surely didn't think it would be the same as any of the ones already mentioned, did you? The dB<sub>V</sub> system where  $0\text{dB}=1\text{V}$  isn't it, as this notation is no longer used. This was used to indicate absolute voltage level to 1 volt. In the now standard audio dB system  $0\text{dB}=0.775\text{V}$ . Although generally referred to as simply "dB," the correct designation is 600 ohm dB<sub>m</sub>, since it's zero reference is the voltage required to produce 1mW across 600 ohms. This is sometimes referred to as "dBs" to differentiate it from the RF dB system. Nearly all audio oscillators and voltmeters made today are calibrated in volts and/or this dB system. Also, this system is used throughout the world, and is identical to the VU system long used in broadcasting.

The dB notation systems discussed here are just the most popular ones. There are many other ones in use, some are highly specialized which you probably would not come into contact with, and there are "company" systems used by certain manufacturers exclusively on only their products, and generally only used "in house." There are also other names and methods for denoting the systems discussed here. So, now is dB perfectly clear?

Bill Jenkins, WB6LML



## For real CW fun, you can't do better than the popular Heathkit HW-8 QRP Transceiver

**\$169.95**

- 80,40,20 and 15 meters CW
- 0.2  $\mu$ V receiver sensitivity
- Adjustable T/R delay and semi break-in

- 2-Position active audio filter
- Front panel meter to show relative power

The rugged portability of this great little CW transceiver means that now you can take your Amateur Radio hobby with you wherever you go, whether it's on a camping expedition or a business trip. The Heathkit HW-8 CW Transceiver is small enough to fit in a suitcase, and not too bulky to pack. A trail bike's battery will power it. Or join the growing number of hams experimenting with solar-powered QRP (low power) operation. You can even run it off of your automobile's lighter socket. And, of course, you can also operate your HW-8 at home on 120 or 240 VAC power with the HWA-7-1 Power Supply (right).

No matter where you operate or how you power yours, the HW-8 is a great performer - you can be sure of that. Performance begins with a quiet, super-sensitive receiver section. Hum and noise figures are minimal, and as little as 0.2  $\mu$ V in at the antenna terminal gives you a useable signal. Couple that with a tunable preselector, direct conversion with RF amplification, a balanced product detector followed by active audio processing, and you have a hot little receiver that's going to dig in and dig out the stations you're chasing to assure you of a wall covered with QSL cards from all over the globe.

**The transmit section's the same story... performance.** You'll get a minimum of 3.5 watts in on 80 meters, 3.0 watts in on 40 and 20, and 2.5 watts in on 15. Each band is individually selected, and crystal controlled heterodyne circuitry insures accurate frequency mixing. The HW-8's VFO features an MPF-105 FET in a temperature compensated Hartley configuration. This design approach provides overall stability and covers the Transceiver's 3.5-3.75, 7.0-7.25, 14.0-14.25 and 21.0-21.25 MHz operating ranges with excellent accuracy. Operating convenience hasn't been forgotten either. The HW-8 features an RF and AF gain control, solid-state band switching, pushbutton band selection, and semi break-in CW operation, including adjustable T/R delay. The clean, modern front panel includes a relative power meter.

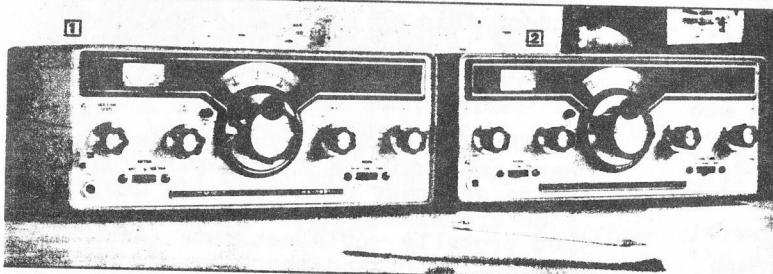
**The HW-8 is an easy and enjoyable kit to build, too,** with most parts mounting on a single printed circuit board. There's a minimum of point-to-point wiring. And, of course, the thorough Heathkit assembly manual guides you every step of the way. The manual for the HW-8, incidentally, even includes hints to help you make more contacts once the fun of construction is finished and it's time for you to get your Transceiver on the air.

Just imagine all the fun you're going to have, transmitting your HW-8's signal into a dipole stretched between two towering pines out in the wilderness... or strung from corner to corner of your hotel room, high in a metropolitan skyscraper. Reading articles on QRP operation in the national Amateur Radio magazines will give you more ideas on using your HW-8. And, by the way, these articles may surprise you when you discover the number of DX and domestic contacts that Hams are making with this quality-engineered CW Transceiver, using ordinary antenna configurations you can build and erect.

A great performer that's going to give you hours of fun - that's the Heathkit HW-8. Order yours now and join the growing fraternity of QRP operation with the Heathkit HW-8 QRP Transceiver. Requires headphones (Assembled GD-396 Superex Headphones listed below).

|   |        |
|---|--------|
| Kit HW-8, Shpg. wt. 6 lbs.  | 169.95 |
| Kit HWA-7-1, AC Power Supply. Designed to operate your HW-8 from standard 120/240 VAC house current. Shpg. wt. 4 lbs. | 24.95  |
| GD-396, Superex Headphones. Fully assembled, 2 lbs.   | 7.95   |

**HW-8 SPECIFICATIONS:** TRANSMITTER - DC Power Input: 3.5 watts (80 meters), 3.0 watts (40 meters); 3.0 watts (20 meters), 2.5 watts (15 meters). Frequency Control: built-in VFO. Frequency Stability: Less than 150 Hz/hour drift after 60 minute warm-up. Output Impedance: 50  $\Omega$ , unbalanced. Spurious and Harmonic Levels: -35 dB or better. Offset Frequency: approximately -750 Hz, fixed on all bands. RECEIVER - Sensitivity: 0.2  $\mu$ V for readable signal, 1  $\mu$ V or less for 10 dB S - N/N Selectivity: wide, -750 Hz @ -6 dB narrow, -375 Hz @ -6 dB. Audio Output Impedance: 1000  $\Omega$ , nominal. GENERAL - Frequency Coverage: 3.5-3.75 MHz (80 meters), 7.7-25 MHz (40 meters), 14.1-25 MHz (20 meters), 21-21.25 MHz (15 meters). Frequency Stability: less than 100 Hz/hour drift after 30 minute warmup. Power Requirement: 12-16 VDC, 90 mA, receive; 430 mA, transmit. Dimensions: 4  $\frac{1}{2}$ " H x 9  $\frac{1}{2}$ " W x 8  $\frac{1}{2}$ " D (10.8 x 23.5 x 21.6 cm). Net Weight: 2 lbs.



## This Receiver/Transmitter combo adds up to enjoyment, value

### Full break-in (QSK) CW Transmitter

**\$199.95**

- 100 watts out on 80-15,
- 75 watts out on 10

Whether you're a veteran brass-pounder or have just earned your Novice ticket, the HX-1681 Transmitter is ideal for use with virtually any solid-state or tube-type receiver. It's an unbeatable value, too! Full break-in capability means you can hear other

stations whenever your key is up... even between individual dots and dabs of your own transmission. A pair of rugged 6146A finals combine with solid-state design to give you a clean 100 watts minimum on 80-15, and 75 watts out on 10. The HX-1681 features built-in T/R switching, adjustable sidetone output, and receiver muting. Keying is provided for adding an external power amplifier. Harmonic radiation is 50 dB down at rated output, and spurs are down 60 dB. Covers 3.5-4.0, 7.0-

7.5, 14.0-14.5, 21.0-21.5 and 28.0-28.5 MHz. Requires the PS-23 Power Supply described on page 61. 6  $\frac{3}{4}$ " H x 12  $\frac{3}{4}$ " W x 12" D.

|                                  |        |
|----------------------------------|--------|
| Kit HX-1681, Shpg. wt. 16 lbs.   | 199.95 |
| Kit PS-23, Power Supply, 17 lbs. | 84.95  |

### HR-1680 Ham Bands Receiver

**\$229.95**

- Dual conversion front end
- works 70 through 10 meters

Looking for your first receiver? The solid-state HR-1680 is the right choice. It combines high performance and low cost for serious Ham band listening. A perfect companion for the HX-1681 QSK CW Transmitter (described at left), the HR-1680 Receiver is both fun to build and enjoyable for Ham band operation. A hot dual-conversion front end and 0.5  $\mu$ V sensitivity cover 80 through 10 meters: 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-28.5, and 28.5-29.0 MHz. Selectivity is outstanding. With a matched 4-pole crystal filter in the IF, you can count on your 1680 to be razor sharp. A tunable preselector filters out unwanted signals. Includes built-in 100 kHz calibrator. Align without instruments. 120/240 VAC or 11.5-15 VDC. 6  $\frac{3}{4}$ " H x 12  $\frac{3}{4}$ " W x 12" D.

|                                       |        |
|---------------------------------------|--------|
| Kit HR-1680, Shpg. wt. 14 lbs.        | 229.95 |
| Kit HS-1661, Matching Speaker, 5 lbs. | 29.95  |



See the large selection of tools, books and accessories at your nearby Heathkit Electronic Center.

**HEATHKIT ELECTRONIC CENTER**  
2001 MIDDLEFIELD RD.  
REDWOOD CITY, CA 94063  
415 365 8155

# SHAVER RADIO, INC.

(408) 998-1103

1378 S. BASCOM AVE. SAN JOSE, CALIF.

*CELEBRATES ANOTHER*

# FIRST!

DRAKE  
SWAN  
COLLINS

YAESU  
KENWOOD  
TEN-TEC

**HF TRANSCEIVERS  
AT  
DEALER COST!**

**WITH ANY PURCHASE OF \$100 MIN.**

**NEW, SEALED, FULL WARRANTY**





# Quement Communications Department

Complete communications service  
under one roof.

Amateur, CB, commercial, installation  
and repair all in one department.

Bring all your communications needs  
to us. We will be pleased to assist you!



QUEMENT  
ELECTRONICS

1000 SO. BASCOM AVE.  
SAN JOSE, PHONE 998-5900  
Open Mon.-Sat. 9-6