



RF



ORANGE COUNTY AMATEUR RADIO CLUB, INC.

VOL. LXIV NO. 6

PO Box 3454, Tustin, CA 92781

June 2023

The Prez Sez...

By Janet KL7MF
FIELD DAY:

One Junkie's Paradise



As of this writing, I hope most of you know that Chip Margelli, K7JA, your duly elected Club President, is now an SK. He would have been the cheerleader at the June 16 meeting (perhaps being the world's biggest Field Day junkie), but I believe he left behind a club full of members who will stand up and beat the Field Day drum. The only program on the docket for June IS Field Day, so please attend either in person or via Zoom to make your voice heard.

Band Captains may need more operators or equipment, and this will be your golden opportunity to sign up. If operating isn't necessarily your interest but maybe you'd like to learn about antennas or how an emergency set up is put together, set up and tear down times will be noted during the meeting.

A great Saturday dinner and a Sunday breakfast will be provided, and more details will be available as well at the meeting. This is a wonderful opportunity to get on the air if your operating time at home is limited or restricted, so take advantage of this annual exercise in which OCARC is such an active participant.

Whether you consider Field Day a contest, an emergency exercise, or a learning experience, don't miss this opportunity to join in with other like-minded hams for some all-around fun. Bring family and friends to show them how we handle ourselves as amateur radio hobbyists. Maybe you'll spark some interest in a family member; maybe the club will recruit new members!

Please join us June 16 at 7PM at the American Red Cross, 600 Parkcenter Dr., Room 208, Santa Ana either by Zoom or, hopefully, in person. Let's show Chip how we can kick butt on Field Day!!

73 de Janet Margelli, KL7MF
Vice-President OCARC

NEXT GENERAL MEETING

**Chip Margelli
K7JA (via previous
recording)
presents**

"Field Day 2023"

**June 16th, 2023, at 7PM
at the**

**American Red
Cross**

**Orange County Chapter Santa
Ana, Room 208**

NEXT BOARD MEETING

Saturday, July 1st, 2023

See www.w6ze.org for Location

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Monthly Events

Membership Meetings*

Time: 7:00 PM
When: 3rd Friday of each Month
Red Cross Orange County, Room 208
600 N Parkcenter Dr, Santa Ana

Board Meetings

First Friday of each Month
*Board will handle Club business now
IN-PERSON.*

Club Nets (Listen for W6ZE)

10M ~ 28.375 MHz SSB

Wed- 7:30 PM - 8:30 PM
Net Control: Corey, KE6YHX
Alternate Net Control: AJ, KN6WNO

2M ~ 146.55 MHz Simplex FM

Wed- 8:30 PM - 9:00 PM
Net Control: Corey, KE6YHX

75M ~ 3.883 MHz LSB

Tue @ 8:00 PM
Net Control: Corey, KE6YHX

Other Nets

**Catalina Amateur
Repeater Association (CARA)**
147.090 MHz (+0.600 MHz) No PL
Monday - Friday
9:00AM & 9:00PM
Prg. Director. Tom W6ETC
COME JOIN US

OCARC 2023 DUES:

*Membership period is:
1 January to 31 December*

Individual New or Renewal: \$30
Family New or Renewal: \$45
Teen New or Renewal: \$15

***New Member Dues are prorated
quarterly and includes a badge:***
Additional Badges¹ \$3

Use one of our our interactive online
forms to calculate current prices, join,
renew, or order badges:

<https://www.w6ze.org/FormsShortcut.html>

¹ \$3 or less + mailing. See form.

RadioActivity

June 2023

Upcoming Activities:

June

- ***ARRL June VHF QSO Party:** 1800 UTC Saturday June 10 through 0259 UTC Monday June 12.
- **Kids Day:** 1800 UTC through 2359 UTC Saturday in June 17.
- **Field Day:** 1800 UTC Saturday 24 through 1800 UTC Sunday 25.

- **K1USN Slow Speed Test:** (CW, 20WPM Max.)
Every Friday 2000 UTC to 2100 UTC
Every Sunday night at 0000 UTC to 0100 UTC Monday
- **ICWC Medium Speed Test:** (CW, 25WPM Max.)
Every Monday 1300 UTC to 1400 UTC
1900 UTC to 2000 UTC and
Tuesday 0300 UTC to 0400 UTC

July

- **RAC Canada Day Contest:** 0000 UTC through 2359 UTC Wednesday July 1.
- **IARU HF World Championships:** 1200 UTC Saturday July 8 through 1200 UTC Sunday July 9.
- ***CQ WW VHF Contest:** 1800 UTC Saturday July 15 through 2100 UTC Sunday July 16.
- **RSGB IOTA Contest:** 1200 UTC Saturday July 29 through 1200 UTC Sunday July 30.

* Indicates club entries are accepted

** Indicates team entries are accepted

Note: When submitting logs for ARRL Contests indicate your club affiliation as "Orange County ARC"

State QSO Parties:

- **West Virginia QSO Party:** 1600 UTC Saturday June 17 to 0400 UTC Sunday June 18.
-

Repeating Activities:

- **Phone Fry** Every Tuesday night at 0230 UTC to 0300 UTC Wednesday
- **SKCC** Weekend Sprintathon (Straight Key CW) on the first weekend of the month after the 6TH of the month. 1200 Sat. to 2359Z Sunday.
- **SKCC** Sprint (Straight Key CW) 0000Z to 0200Z on the 4th Tuesday night (USA) of the month.
- **CWops** Every Wednesday 1300 UTC to 1400 UTC, 1900 UTC to 2000 UTC and Thursday 0300 UTC to 0400 UTC

OCARC Club Nets:

- **75 Meter Net:** Every Tuesday night at 8:00 pm to 8:30 pm Local Time. SSB 3.883 MHz
- **10 Meter Net:** Every Wednesday night at 7:30 pm to 8:30 pm Local Time. SSB 28.375 MHz
- **2 Meter Net:** Every Wednesday night at 8:30 pm to 9:30 pm Local Time. FM Simplex 146.55 MHz

Other Nets:

- **Net-AT-9:** Wellness & Support
Monday thru Friday 9:00 am
and 9:00 pm Local Time 147.090 MHz (+600 MHz) No PL

Send an email to *Ron W6WG*, w6wg@w6ze.org to have your favorite activity or your recent RadioActivity listed in next month's column.

The **Orange County
Amateur Radio Club**
Est. 1933



**W6ZE.ORG
Website
Ramblings**

Part 6 Dan - KI6X

General Information:

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- [About Ham Radio](#)
- [Board of Directors](#)
- [Board Appointments](#)

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Membership:

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Club Library:

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- ['Net News'](#)
- [Photo Gallery](#)
- [Club Archives](#)

Links:

- [Ham Related Sites](#)
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Miscellaneous:

- [Heathkit Articles](#)
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Contact Us

Serving Orange County in Southern CA

This article is a continuation of the **Club Library** section of the W6ZE website that I started last month. We will take on the last category in this section, the **“Club Archives”**. This is a complicated section so I had decided to give it its own billing.

On to the description of the **“Club Archives”** and the various parts you will find on the web page when you open it:

“Past OCARC Activities and Events”

Here you will find a listing and descriptions of past activities and events. This includes parties, elections, auctions and even descriptions of the speakers from each month during the year.

“OCARC Board of Directors” AND “Past OCARC Appointments”

This section lists the history of the Board of Directors, Club Appointments and **RF** newsletter editors. The first link leaves you at the top at the BoD list and the second link leaves you at the appointment section on the same webpage. Take on a role in the club governance and see your name on one of these lists!

“Past OCARC Field Day”

The link takes you to the historical Field Day webpages. These were the pages set-up each year to prepare for FD of that year. You will find talk about the location, any special preparations (remember Covid?), and other special announcements for each year's FD preparations.

“OCARC Membership”: This link has the membership lists from the end of each year.

“OCARC RF Newsletter”: This link takes you to the same newsletter archives section as the earlier **“RF Newsletter”** section link does.

“OCARC HF (10M-15M) Net Logs”: These logs were maintained in 2005-2015 and included here.

“OCARC Miscellaneous”: Included here are meeting/event locations, past President list, Good of Club and Lifetime Achievement winner lists, club history articles, and club net items.

“OCARC Bylaws History”: Historical Bylaws. Rev G is the current active so before that are there.

“OCARC Historian Records”: Some very detailed historical records kept by the Historian. Please contact the Club Historian, found on the page, for more details.

I will get to the **“Links”** section next month and then over the coming months to the rest of the sections that have yet not been discussed... KI6X

Heathkit of the Month #117: by Bob Eckweiler, AF6C



AMATEUR RADIO - SWL

Heathkit HX-11 CW Transmitter

Introduction:

In late May the world community of ham radio, as well as the Orange County Amateur Radio Club, lost an icon, Chip Margelli - K7JA. At the time, Chip was president of the OCARC – W6ZE; he will be sorely missed. For more on Chip see "K7JA" sidebar.

Chip was interviewed on the Amateur Radio Roundtable podcast (9/6/2016) by Katie Allen – WY7YL¹. During part of the interview Chip talked about getting started in the hobby as a novice and commented that his first transmitter was a Heathkit HX-11 CW Transmitter (**Figure 1**). Other than a short mention in HotM #3² the HX-11 has not been discussed here, nor really has its predecessor the DX-20. So, in memory of Chip, this month the HX-11 will be covered as well as the earlier DX-20.

The HX-11 was first announced in the fall of 1961 (see **Figure 2**) for \$43.50. It replaced the DX-20 which had been selling since 1957. You can think of the HX-11 as a refined DX-20. They share the same tube lineup and the circuitry is very similar.

Here is a link to the index of Heathkit of the Month (HotM) articles:

http://www.w6ze.org/Heathkit/Heathkit_Index.html

1. Notes begin on page 15



Figure 1: Heathkit HX-11 CW HF Transmitter.

The HX-11 CW Transmitter Overview:

The HX-11 is an inexpensive entry-level CW transmitter that is primarily designed for the novice. It has a plate input power of 50 watts and the frequency is crystal controlled. In the sixties the novice license allowed up to 75 watts DC input, but the frequency had to be crystal controlled. In those days there were three HF novice bands:

- 80 meters: 3,700 to 3,750 kc³
- 40 meters: 7,150 to 7,200 kc
- 15 meters: 21,100 to 21,250 kc.

The HX-11 will also transmit on the 20 and 10 meter bands for the novice who successfully upgrades. It can also work with a VFO such as the Heathkit VF-1, but that requires some circuit modifications to the oscillator stage. If you wanted to go back to using crystal control, the modification has to be undone. Unlike the DX-40 and its successor, the DX-60 series, the HX-11 (and DX-20) did not have the capability to power a VFO, so an external power supply is required. Heathkit never sold a power supply kit for this purpose.

Operating Crystal Control:

Custom crystals were on the expensive side and many hams only had one or two for each band they worked. You called CQ and then had to tune around to find who was answer-

ing you. QSOs were rarely on the same frequency. After WWII the radio surplus market was flooded with crystals. Many used FT-243 holders ⁴ and some were already cut for the novice band. They were inexpensive, but those frequencies got very crowded. Some companies bought a lot of the surplus crystals and reground them for the ham/novice bands.

The HX-11 Controls and Connectors:

The HX-11 controls and connectors are shown in **TABLE I**. Of interest is the crystal access. To change frequency a 2" hole plug, located on the left side of the cabinet, must be removed and the crystal mounted just inside swapped, and the hole plug reinstalled. If left off, it could cause a dreaded TVI complaint.

The Heathkit HX-11 Specifications:

The specifications of the HX-11 and its predecessor the DX-20 are shown in **TABLE II**. Mostly they are identical. The HX-11 will still cover the 11 meter band with the correct crystal, but by the time the HX-11 was released 11 meters had been reallocated for citizen band use. The output impedance range is reduced due to the inclusion of a low-pass filter not found on the DX-20.

Operating the Heathkit HX-11:

Prior to transmitting with the HX-11 it is important that the correct crystal for the band and desired frequency be installed in the crystal socket. The proper frequency crystals are given in **Table III** for the bands as they were in the late 1950s and 60s ⁵. It is also important that the proper antenna is connected for the desired band. Initial testing and tuning practice should be done into a 50Ω dummy load. A 40 watt 120 V light bulb can be used for this purpose.

With the **TRANSMIT-STANDBY** switch in **STANDBY**, the **OPERATE - TUNE** switch in **TUNE**, and the **BAND SWITCH** set to the

Heathkit HX-11 Front Layout

Top Row Center:

Meter: 3 mA full scale, 500Ω (D'Arsonval movement)
Scale (top): **0, 50, 100, 150, 200 MILLIAMPERES**
Tic marks every 10 mA.(Plate)
Scale (Bottom): **0, 2, 4, 6, 8 MILLIAMPERES**
Tic marks every 0.4 mA (Grid)

2nd Row Center: (below meter)

Switch, slide, DPDT (horizontal)
GRID, PLATE (meter switch)

3rd Row (L to R):

Variable capacitor, 50 μf
OSCILLATOR (tuning)

Switch, rotary, two wafer five position
BAND SWITCH, (80, 40, 20, 15, 10)

Variable capacitor, 3-section: 50 μf, 50 μf, 50 μf
AMPLIFIER (plate tuning)

Bottom Row (L to R):

Switch, slide SPST (vertical)
ON, OFF (Power)

Switch, slide DPST (vertical)
TRANSMIT, STANDBY

Variable Capacitor, 2 section: 420 μf, 420 μf
LOADING

Switch, slide SPDT (vertical)
OPERATE, TUNE

Jack, ¼" Phone, Shorting upon removal of plug.
KEY

Heathkit HX-11 REAR Layout

Rear Chassis (L to R - Viewed from rear):

Power cord, 2-wire, Heyco strain relief
117 V. A. C., 2 AMPS

Fuse Holder, Bayonet type
FUSE, 2 AMPt

Coaxial connector, UHF, SO-239
← **R. F. OUTPUT**

2-wire A. C. Outlet
117 V. A. C., ANT. RELAY

#10-32 x 5/8" bolt with two #10 nuts for wire attachment
GND.

Heathkit HX-11 Other Layout

Left cabinet side, ~ 2" from front and ~ 3 1/8" from top:

2" chrome hole plug with knob handle
Access to crystal socket to change crystal.

TABLE I

Heathkit® can fill every Amateur Need



*Brand new!...specially designed for CW work...
specially for novices...the Heathkit HX-11*

- NEW! . . . Built-in low pass filter
- NEW! . . . Provision for single-switch station control
- NEW! . . . Large "clear view" panel meter
- NEW! . . . Modern styling
- Single-knob bandswitching
- "Tune-operate" switch
- Built-in power supply





Kit HX-11

\$43⁵⁰

Here is an excellent CW transmitter for the novice or general class amateur who appreciates a clean, quality signal and wants the most "watts-per-dollar" in an amateur transmitter. The new HX-11 is designed exclusively for CW work on the 80, 40, 20, 15 and 10 meter amateur bands, using either crystals or external VFO such as the new Heathkit HG-10, page 72. The efficient circuitry features a single 6DQ6A final amplifier stage with full 50-watt plate power input and a 6CL6 crystal oscillator. The husky power supply uses a heavy-duty 5U4GB rectifier and top-quality "potted" transformer for long service life. Other features include, single-knob bandswitching, switched antenna relay power, pi-network output coupling, built-in low pass filter for minimum TVI, and easy-to-read panel meter for final grid or plate current indication. Easy access to crystal socket is provided by a metal pull-out plug on the side of the cabinet. Very easy to build and operate with the complete instructions supplied. 17 lbs.

Kit HX-11 . . . NO MONEY DOWN, \$5 mo. \$43.50

SPECIFICATIONS—RF power input: 50 watts CW. Output impedance: 50-600 ohm (non-reactive). Output coupling: Pi network. Operation: Crystal—external VFO. Low pass filter cutoff frequency: 34 MC. Band coverage: 80, 40, 20, 15, 10 meters. Tube complement: 5U4GB rectifier, 6CL6 oscillator, 6DQ6A final amplifier. Power requirements: 117 volts AC, 60 cycles, 150 watts. Dimensions: 13" W x 8½" H x 7" D.

Figure 2: Introductory ad For the HX-11 From the Fall & Winter 1961 - 62 Catalog.

planned operating band, the transmitter **ON – OFF** switch is moved to ON. Once the tubes warm up (~ 60 sec.) tune up can commence.

Set the meter switch to **GRID**. With the key closed (or removed from the jack) the TRANSMIT-STANDBY switch is moved to TRANSMIT and the OSCILLATOR control is adjusted for 2 to 2½ mA on the meter on all bands except 10 meters, where it should be peaked on the meter scale (4 to 5 mA typically). Plug a key into the **KEY** jack, or open the key if one is already plugged in.

With the grid drive adjusted properly, turn the **LOAD** control to '0' (fully CCW), move the meter switch to **PLATE**, and then move the OPERATE - TUNE switch to OPERATE. Press the key, and immediately adjust the

AMPLIFIER control for minimum current on the meter. Open the key. Increase the **LOAD** control a division or two, press the key and again adjust the **AMPLIFIER** control for minimum current on the meter. This time the minimum current will be higher than it was before. Continue this process until the minimum current reads 120 mA. Recheck the **GRID** current adjusting it to 2 to 2½ mA (or peak it on 10 meters). The transmitter is now correctly tuned. The reason the drive needs to be peaked for maximum on 10 meters is because, on this band, the final is acting as a frequency doubler and requires the extra drive to get maximum power out.

THE HX-11 V.S. THE DX-20:

As mentioned above, the HX-11 is an updated DX-20 with some significant changes:

The DX-20 is not fused. The HX-11 is fused at 2 A. It has a bayonet type fuse holder on the rear panel.

The DX-20 meter, which is metal framed and undamped, is replaced with a plastic case D'Arsonval movement meter. This meter is damped; the DX-20 meter swings wildly when sending CW. Both meters are 3 mA full scale with 500Ω internal resistance. However,

the meter scales changed from 6 mA to 8 mA in the GRID position, and from 150 mA to 200 mA in the PLATE position of the meter switch. This change results in the chang-

Specifications		
<u>SPECIFICATION:</u>	<u>DX-20</u>	<u>HX-11</u>
RF Power Input:	50 Watts	50 Watts
Output Impedance:	50 – 1000 Ω	50 – 600 Ω
Output Coupling:	Pi-network (coaxial)	Pi-network (coaxial)
Output Filter	(none)	Low-pass; cutoff at 34 MC.
Operation:	Crystal - external VFO*	Crystal - external VFO*
Band Coverage:	80 - 40 - 20 - 15 - 11 - 10	80 - 40 - 20 - 15 - 10*
Tube Complement	5U4GB rectifier 6CL6 oscillator 6DQ6A final amplifier	5U4GB rectifier 6CL6 oscillator 6DQ6A final amplifier
Power Requirements:	117 volts AC, 60 cycle, 160 watt	117 volts AC, 60 cycle, 160 watt
Fuse	n/a	2 AMP
Cabinet Size:	13" W x 8½ H x 7" D	13" W x 8½ H x 7" D.
Net Weight:	16 lbs.	16 lbs.
Shipping Weight:	18 lbs.	17 lbs.

* (See Text)

TABLE II

ing of the meter shunt resistors between the models. The new meter mounts with a U-bracket in the rear instead of screws on mounting studs.

The HX-11 has a brass sleeve that fits around the final amplifier tube (6DQ6A) that is wired to provide neutralization. It is not adjustable. The DX-20 lacks this feature.

Both radios have a DPST slide switch for the TRANSMIT - STANDBY switch. One section switches on the B+. On the DX-20 the other contacts are unused. Pictorial 4 in the DX-20 assembly manual states "EXTRA SWITCH CONNECTIONS FOR OPTIONAL ANTENNA RELAY". In the HX-11 these switch contacts are wired to provide 117 VAC to a two-wire AC outlet on the rear panel for an antenna relay when in the TRANSMIT position. (External contacts on the antenna relay can be used to mute a receiver.)

The HX-11 adds a low-pass filter in the RF output line. With a cutoff frequency of 34 mc,

HX-11 CRYSTAL FREQUENCY CHART			
BAND METERS	CRYSTAL BAND	MIN. FREQ.	MAX. FREQ.
80/75 M	160 M	1750 kc	2000 kc
80 NOVICE*	160 M	3500 kc	4000 kc
80/75 M	80 M	1850 kc	1875 kc
80 NOVICE*	80 M	3700 kc	3750 kc
40 M	80 M	3500 kc	3650 kc
40 NOVICE*	80 M	3575 kc	3600 kc
40 M	40 M	7000.kc	7300 kc
40 NOVICE*	40 M	7150 kc	7200 kc
20 M	80 M	3500 kc	3587 kc
20 M	40 M	7000 kc	7175 kc
15 M	40 M	7000 kc	7150 kc
15 NOVICE*	40 M	7034 kc	7083 kc
10 M	40 M	7000 kc	7425 kc

* **Caution:** These novice bands have changed.

TABLE III

it strongly reduces any harmonic content that might be a cause of TVI. Due to the addition of the filter, the impedance matching range of the transmitter output is reduced.

The cabinet is very similar to the DX-20 cabinet but sports a new part number and green color. The front panel keeps the same physical layout, but adds a new green and beige paint scheme to match the ham equipment of the time, such as the Apache and Mohawk, HM-11 SWR bridge, etc. The knobs are also new. their style is identical with the DX-20 but they sport new colors. The large knobs are grayish-green and the small knobs are light tan.

There are a few minor component changes, mostly in the 6CL6 oscillator and metering circuits, as well as the new low-pass filter. These changes are briefly discussed in the circuit discussion section.

HEATHKIT HX-11 CIRCUIT DESCRIPTION:

The HX-11 circuit can be divided into four sections: The power supply, the oscillator, the final amplifier and the metering circuits. (see **FIGURE 5** on page 14 for the schematic). A larger schematic is also available online ⁶.

The Power Supply Circuit:

The power supply is transformer based with a single 117 VAC primary. The primary circuit is fused at 2 amperes and bypassed in each leg by a 0.005 μf 1.4 KV disc ceramic capacitor. The A.C. line is also connected to an A.C. socket on the rear panel (**ANTENNA RELAY**) through a set of contacts on the **STANDBY - TRANSMIT** switch. This socket is not fused.

The transformer secondary has three windings. The first is a dedicated 5V 3A winding for the 5U4GB rectifier tube filament. The second winding is a 6.3V 2A heater winding for the 6CL6 oscillator and 6DQ6A amplifier tubes. The other winding is a 1,200 volt cen-

ter-tapped, 120 mA winding feeding the plates of the 5U4GB dual rectifier tube. The DC at the cathode of the tube is filtered by a 5 Henry choke and two 20 μf capacitors in series. Each capacitor is shunted by a 15 K Ω 10 watt resistor. These resistors, in series, act as a bleeder resistor and provide a minimum load required for the choke input filter. In transmit the supply provides 420 volts DC under load to the final amplifier and oscillator. The tap between the two capacitors provides a voltage of about 180 V to the oscillator tube screen grid. It is less than half the voltage due to the additional current being drawn through the upper resistor. A 0.1 μf 1200 volt capacitor “tunes” the power supply choke. This reduces the “surge voltage” when the current through the filter choke drops below the critical choke current⁷. This allows a lower bleeder current in key-up conditions.

The Oscillator Circuit:

A 6CL6 pentode tube is wired as a classic crystal Colpitts oscillator. Surprisingly, Heath has this tube running with 420 volts on the plate, which is substantially above its 300 volt maximum rated plate voltage. The circuit is identical to the DX-20 except for one capacitor in the feedback divider which was changed from 220 μf to 180 μf . The oscillator tube's cathode is connected to the keying line so the oscillator is keyed along with the final amplifier. The plate of the oscillator is tuned by L2 and C6, the **OSCILLATOR** capacitor. Additional capacitance (C8) is switched in on 80 meters. On 80, 40, 20, and 15 meters the plate is tuned to the desired band. On 10 meters it is tuned to 20 meters⁸. The oscillator acts as a doubler when the next lowest band crystal is used on 80, 40 or 20 meters, a tripler on 15 meters, and a quadrupler when an 80 meter crystal is used on 20 meters. On 10 meters it acts as a doubler, with the amplifier also a doubler.

The Final Amplifier:

The final amplifier circuit uses a 6DQ6A tube which is a TV horizontal sweep tube. When Heath first designed the DX-20 a lot of testing was done on the use of this tube as an RF power amplifier. At the time it was in mass production for the TV market and inexpensive. (Heath's price was \$1.02).

The tuned signal from the oscillator is fed to the grid of the 6DQ6A tube through a small capacitor and 22 Ω stabilizing resistor. Grid bias is produced across R4, a 27 K Ω 2-watt grid resistor. Should grid drive be lost, the tube will draw excessive current and could be damaged as there is no clamping circuit. A grid bias of about minus 50 volts is developed with typical grid drive from the oscillator. To protect the tube one should always set the OPERATE - TUNE switch to TUNE until grid drive is established. This switch is in the screen circuit of the amplifier tube and grounds the screen when in the TUNE position. In the OPERATE position the grid is connected to the 420 volt B+ through a 50 K Ω 10-watt resistor (R7). The screen current of about 5½ mA results in a screen voltage of 150 volts. On 80 through 15 meters the amplifier operates straight through, but on 10 meter it doubles the 20 meter signal.

The plate circuit is a standard pi-network and is identical, down to the part numbers, to the DX-20. The AMPLIFIER tuning capacitor has three 50 μf sections (C15A – C15C). On 80 and 40 meters all three sections are used. On 20 through 10 meters just one of the sections (C15A) is used. On 80 meters it would be possible to accidentally tune the pi-network to 40 meters if the wrong dip in current is used when adjusting the AMPLIFIER control. To prevent this an additional fixed 68 μf 4 KV capacitor (C14) is switched across C15. The pi-network LOAD control

(C16A, C16B) consists of dual 420 μf sections in parallel, along with a fixed 150 μf capacitor (C15) also in parallel.

Heath added a low-pass filter between the output of the pi-network and the antenna connector on the rear chassis. the filter has a cutoff frequency of 34 mc. This internal filter is not in the DX-20, though an external low-pass filter may be installed.

Unlike the DX-20, Heath provides some neutralization in the HX-11. A bit of research showed no problems with the DX-20 that neutralization would have fixed. Perhaps Heath due to a minor layout change . Neutralization cancels out the plate to grid capacitance that can cause self-oscillation. Often it uses a variable capacitor to couple a bit of the amplifier output to the previous stage at a point where it provides negative feedback. In the HX-11 the capacitance is fixed. A brass plate is partially wrapped around the tube. This plate is connected to the DC end of the oscillator tank circuit. A 0.001 μf feed-through capacitor replaces a 0.005 disc ceramic capacitor used in the DX-20. It is not adjustable but does provide some negative feedback. One caveat is that the brass plate has the full 420 volt B+ on it. BE CAREFUL if you are testing with the HX-11 out of the cabinet.

The Metering Circuit:

Heath decided to use a new meter in the HX-11. This meter uses a damped D'Arsonval movement that doesn't bounce around wildly while sending CW. The new meter has the same sensitivity (3 mA full scale) and internal resistance (500 Ω) as the meter used in the DX-20. However, Heath changed the scale ranges of the meter, as mentioned previously. The grid scale was changed from 6 mA to 8 mA F.S. and the plate scale was changed from 150 mA to 200 mA F.S. This change of scales meant the meter shunt re-

sistors needed to be changed. In the DX-20 Heath uses two precision 1% ½ -watt resistors (500Ω for the grid shunt and 12 Ω for the plate shunt). In the HX-11 these resistors were replaced with new values and, surprisingly, regular 10% carbon resistors were used. Evidently Heath was not concerned with the accuracy of the meter reading as felt 10% was acceptable.

Calculating meter shunt resistors can be difficult. However there is a simple way to proceed if you realize that any milliamperere me-

ter is also a voltmeter. These meters both have a full scale range of 3 mA and an internal resistance of 500 Ω. From ohms law a voltage of 1.5 volts across 500 Ω will result in 3 mA flowing. To select the correct shunt resistor to make the meter read full scale all you need to do is shunt it with a resistor that will pass 5 (eight minus three) mA when 1.5 volts is applied. (1.5/ 0.005) or 300 Ω. Heath chose 330 Ω a standard value⁹, which they probably had a in large quantities.

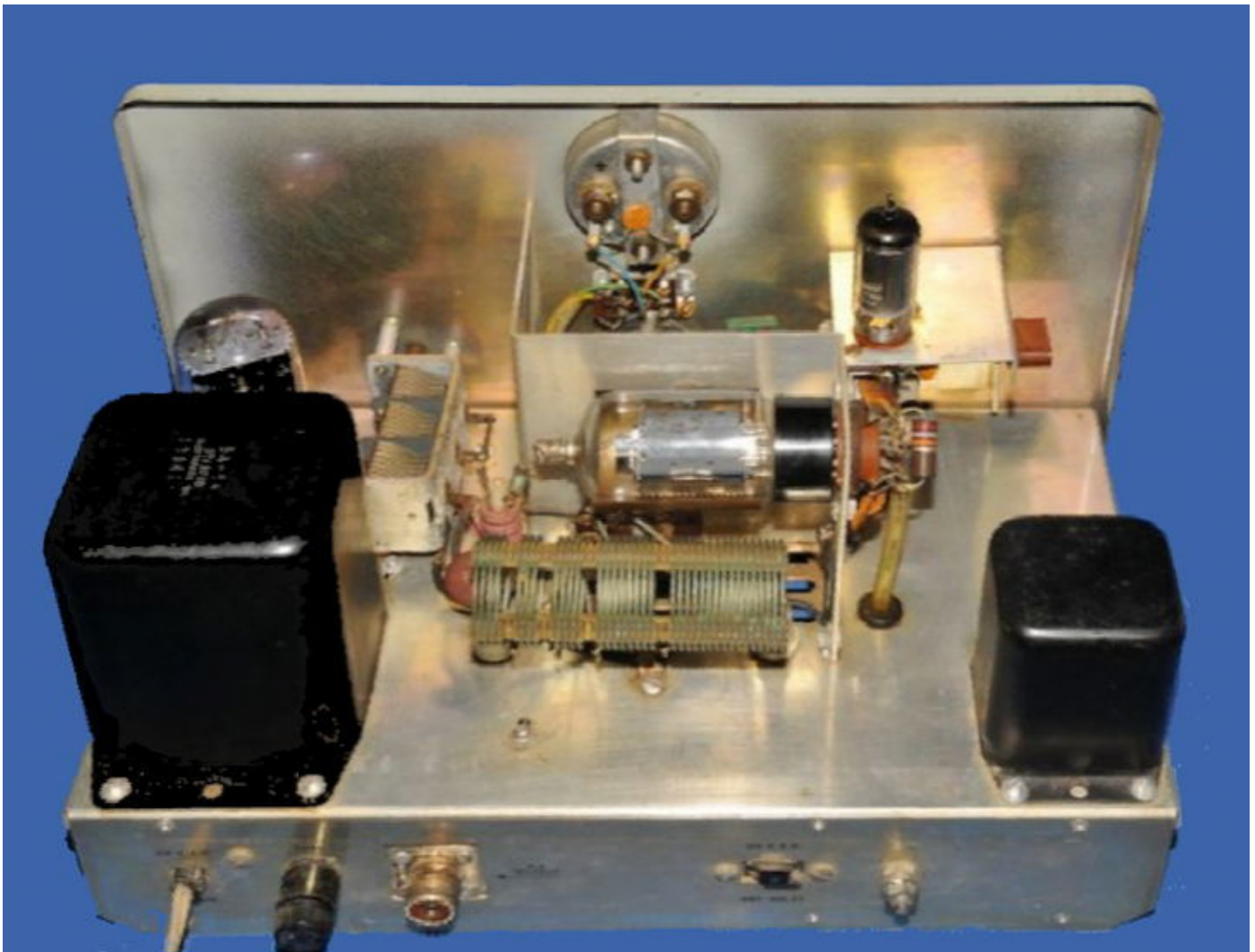


Figure 3: Inside top view of the HX-11. On the left is the large power transformer in front of the 5U4GB rectifier tube and the 3-section AMPLIFIER tuning capacitor. On the right is the power supply choke. The 6CL6 oscillator tube is on the platform to the right and the brown crystal socket is to its right. The 6DQ6A amplifier tube is mounted horizontally in the center alongside the plate tank coil. The brass neutralization plate can be seen partially wrapped around the tube. It is connected to the white feed-thru capacitor near the base of the tube. Along the back of the chassis is the power cord, fuse, antenna connector, relay socket and ground stud.

The plate current is actually measured in the cathode which also includes grid and screen grid current, both of which are small compared to the plate current. For 200 mA full scale the shunt must draw 197 mA when there is 1.5 volts across it. From ohms law that resistance is $1.5/197$ or 7.615Ω . Heath used an 8.2Ω resistor in parallel with a 100Ω resistor or 7.58Ω which is quite close, but the 10% resistor tolerance seems excessive.

HX-11 Construction:

Figure 3 and **Figure 4** show the layout of the inside top and bottom of the HX-11. The layout is very clean. The oscillator tube and socket sit on an 'L'-shaped bracket that also holds the crystal socket. The oscillator tank

coil sits out of view in the area below the meter, shielded by the 'Z' bracket that holds the 6DQ6A amplifier tube and socket. Below the oscillator tube and also hidden from view is the OSCILLATOR tuning capacitor, C6. This layout places the underside of the oscillator section and the final amplifier section in very close proximity, making the lead lengths between the tubes very short. The large off-white capacitor above the 5U4GB tube socket is the $0.1 \mu\text{f}$ 1.2 kV capacitor C26 that is wired across the 5 henry filter choke.

The layout is very similar to the DX-20 with the exception of the addition of the low-pass filter shielded enclosure. Its location, under the chassis, made it necessary to move the

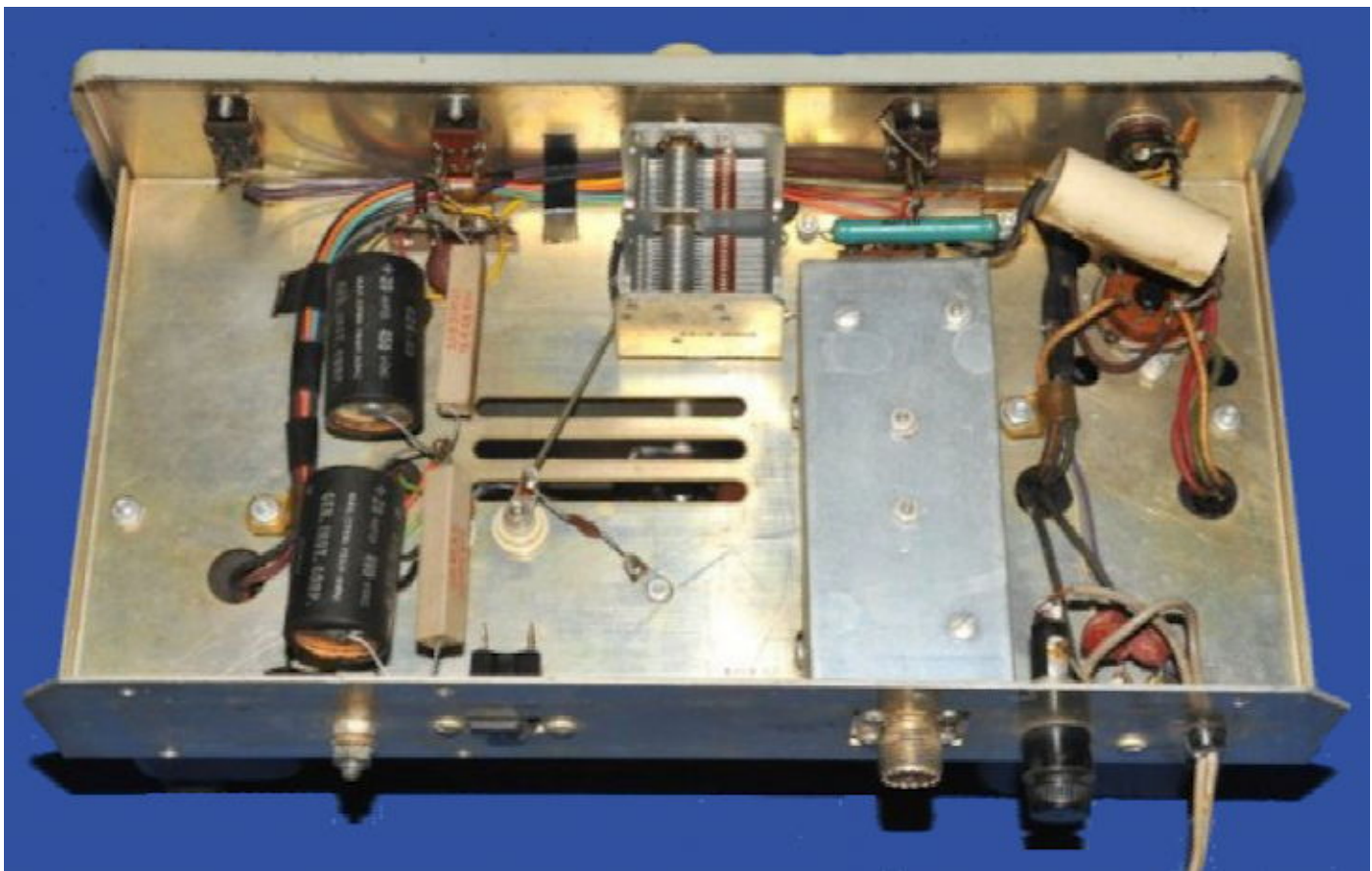


Figure 4: Underside view of the HX-11. The black filter capacitors are on the left adjacent to the two sand-colored bleeder resistors. To the right of the nearest bleeder resistor is a feed-through from the tank circuit. C30 comes off the feed-through to a ground lug. It is in parallel with the two section variable LOAD capacitor at the center top. At left center is the shielded low-pass filter. The green power resistor above it is the screen resistor. Near the top-right is the 5U4GB octal socket, the key jack and C26, the choke resonating capacitor. The leads coming through the two grommets are from the power transformer.

LOAD capacitor C16 A & C16B to just behind the front panel, instead of near the rear of the chassis with an extended shaft, as in the DX-20. This creates longer lead lengths for C16. Perhaps this is why Heath decided to add the neutralization circuit?

HX-11 Restoration:

The HX-11 is somewhat rare, it stopped production in early 1965. The last catalog in the author's files that show it for sale is the Christmas 1964 catalog, where it was still for sale at the introductory price of \$43.50.

This kit would make a good restoration project. It lacks can electrolytic capacitors which can make a project either complicated, or expensive. Replacement can capacitors sell in the order of \$35 to \$50 each. This uses axial can capacitors that are a lot less expensive and easy to find. Here are the things that one might consider changing or updating the HX-11 during a restoration.

- A) As mentioned, replace the two 20 μf axial electrolytic capacitors ¹⁰.
- B) Replace the two 0.005 1.4 kV capacitors that go from each power lead to ground. For safety sake replace them with approved Y2 safety capacitors that are designed especially for this purpose ^{11, 12}. At the same time a properly wired three-wire line cord should be added.
- C) Replace the 10% carbon composition meter shunt resistors with more precision ones (1 or 2%). Select 300 Ω for R5, 107 Ω (a standard 1% value) paralleled with a precision 8.2 Ω for the two resistors that make up R6.
- D) Find a way to fuse the antenna relay socket. A simple internal fuse would work.

The rest of the restoration should follow well known routines. Cleaning up half a century of grit and grime, testing, and replacing if need-

Chip Margelli K7JA - SK

On May 25th the world of ham radio suddenly lost a top-notch operator and well known radio amateur. Those who knew him knew he was dedicated to the hobby and he has the awards and certificates to prove it. The last time I saw Chip was at our May 19th Orange County ARC (W6ZE) club meeting. He was our club president and was enthusiastically discussing our upcoming Field Day plans. Chip and his wife Janet KL7MF, our club Veep, were longtime members. Chip often was our speaker at the June meeting a week before Field Day teaching tips and techniques. He was our auctioneer at most of our recent yearly October auctions. Yes he dressed the part! Just like he did on the Tonight Show with Jay Leno. when he and Ken Miller - K6CTW took the challenge to compete head-to-head with the nation's champion text messenger; CW was victorious.

Chip worked for Yaesu and spent a lot of time in Japan. He learned to speak the language and made many friends while there. You may have spoken with him at a Ham convention when you visited the Yaesu booth. After Yaesu he worked for Heil Sound and InnoVAntennas and for HRO in Anaheim, managed by his wife Janet.

Chip was not just a DXer, he was also found on the other end of a pileup. He was one of the operators that put Albania on the air, and also was a part of COØUS from Cuba.

Chip is going to be missed for all he's done for amateur radio and by all the friends he's made along the way. This short sidebar barely touches Chip's accomplishments. It is directed more for readers of my Heathkit articles than for our club members, many of whom knew Chip well.

Here are some links about Chip, I'm sure a search on Google will bring up many more:

A 2016 interview of Chip by Katie Allen - WY7YL on the W5KUB podcast:

<https://www.youtube.com/watch?v=pD47QNP603M>

Chip and Ken blow away the phone texting champs on Leno's Tonight Show in this 3 min. 43 sec. WMV video:

[https://www.w6ze.org/Newsletter/ITEMS-of-INTEREST/Morse Competition.wmv](https://www.w6ze.org/Newsletter/ITEMS-of-INTEREST/Morse%20Competition.wmv)

Remembering Chip on QRZed:

<https://forums.qrz.com/index.php?threads/k7ja-chip-margelli-sk.866284/>

SK, Bob AF6C

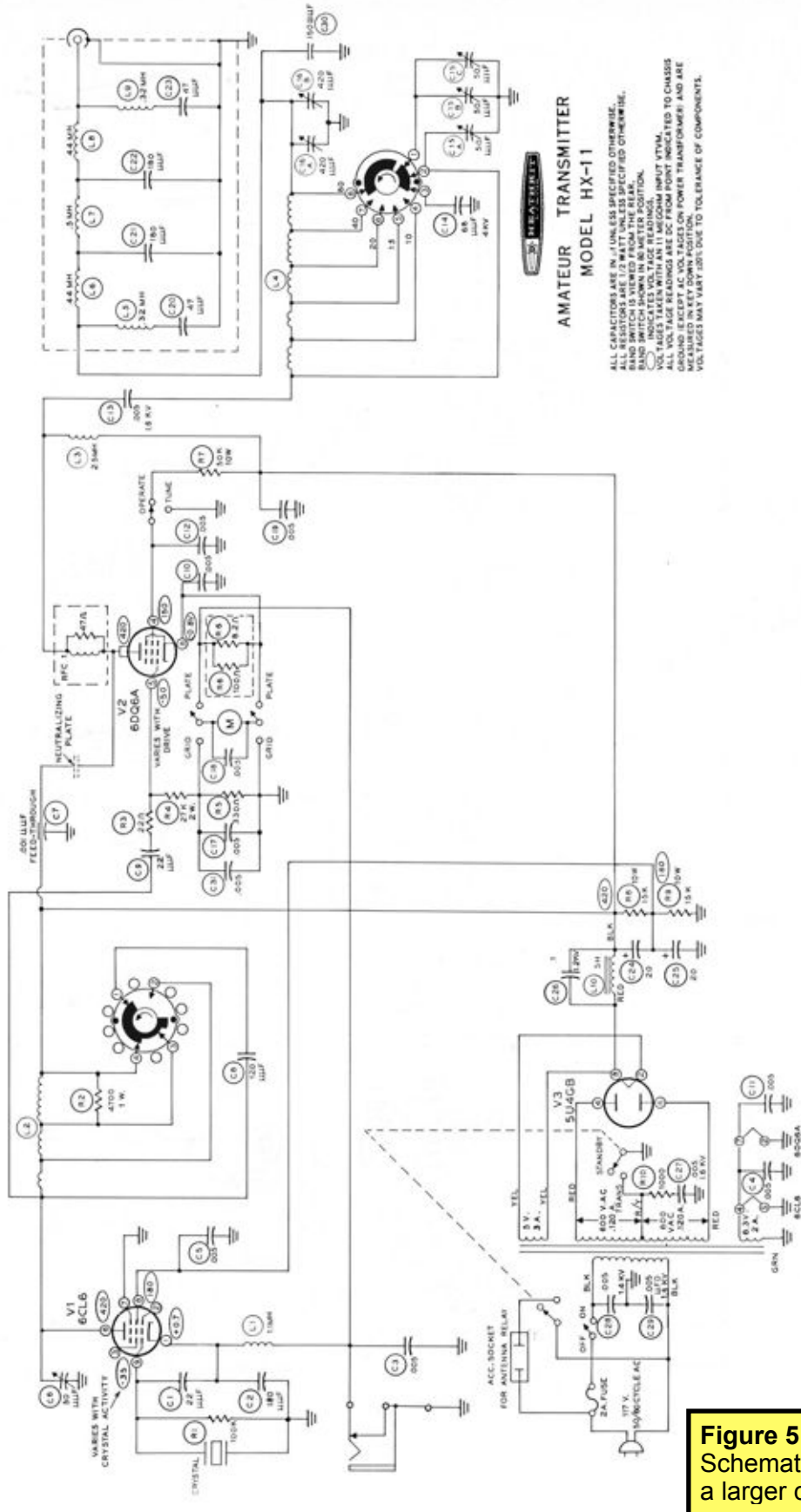


Figure 5: Heathkit HX-11 Schematic. See notes for a larger copy.

ed, components. Checking cleaning and lubricating moving parts, variable capacitors and pots, etc. A forum such as the Heathkit forums on Groups IO ^{13, 14} has a lot of hints and techniques to help restoration projects

Final Comments:

Those of us who started our ham radio career in the era of the Novice license and learned code by operating CW in the small novice bands of 80, 40 and 15 meters find it a memorable period of time. The Novice license term was one year and NOT renewable. You had to reach 13 WPM in the one year the license was good for. Failure meant either trying for a Technician class (which was a lot different then), or find a new hobby.

Those days of sending CQs and then tuning the 50 kc (or on 15M 150 kc) looking for a reply are never forgotten. My contacts came regularly, usually on weekends or between the time I got home from Jr. High and dinner. After that it was homework and study time. I was late for dinner a lot in those days!

73, from AF6C



NOTE: due to time constraints this article was written in a rush. Expect a revised edition to be available on the HotM website in a few weeks. (the URL is on the first page of this article in the lower left.)

Remember, if you are getting rid of any old Heathkit Manuals or Catalogs, please pass them along to me for my research.

This article is Copyright 2023 R. Eckweiler, AF6C and The OCARC Inc.

Thanks - AF6C

Notes:

1. A link to the interview is given in the K7JA sidebar.
2. Heathkit of the Month #3 mostly discussed the Heathkit DX-40.:
https://www.w6ze.org/Heathkit/Heathkit_003_DX40.pdf
3. In keeping with the period of the kit kc is used instead of kHz, mc instead of MHz, and μmf instead of pf.
4. FT-243 crystal measures 13/16" X 3/8" x 1-1/8" tall (less pins). Pins are 3/8" long x 0.093" dia, and spaced 0.486". Up to 2 can be plugged into a standard octal tube socket.



5. Current novice band allocations are:

80 NOVICE	3525 kc	to	3600 kc
40 NOVICE	7025 kc	to	7125 kc
15 NOVICE	21025 kc	to	21200 kc
10 NOVICE	28000 kc	to	28500 kc

Current novice crystal frequencies for the HX-11 are:

BAND	CRYSTAL	MIN.	MAX.
METERS	BAND	FREQ.	FREQ.
80 NOVICE	160M	1763 kc	1800 kc
80 NOVICE	80M	3525 kc	3600 kc
40 NOVICE	80M	3513 kc	3562 kc
40 NOVICE	40M	7025 kc	7125 kc
15 NOVICE	40M	7009 kc	7066 kc
10 NOVICE	40M	7025 kc	7125 kc

6. A larger schematic is available at:
<https://www.w6ze.org/Heathkit/sch/HX11.pdf>
7. This is called a resonant choke power supply. For more information see:
<https://www.qsl.net/i0jx/supply.html>
8. On ten meters the oscillator puts out a 20 meter signal that is then doubled in the final amplifier.
9. 270 Ω and 330 Ω are the closest 10% resistor value to 300 Ω . However, 300 Ω is a standard 5% value and 301 is a standard 2% and 1% value.
10. One source for axial electrolytic capacitors is Just Radio. Their website is: <https://justradios.com> they also have axial tubular mylar capacitors and carbon and film resistors.
11. For more information on X, Y safety capacitors see:
<https://www.w6ze.org/btt/BTT050.pdf>
12. One source for X, Y Safety capacitors is Just Radio. See note 10 for URL.
13. <https://groups.io/g/heathkit>
14. <https://groups.io/g/Heathkit-Radios>.

Notes for HotM #117 (HX-11) 6/2023



Here's a Recap of April's

Three Bags of Resistors Puzzle:

Bob is working on a project in the lab that requires lots of 2-watt 5% resistors of two values: 470 K Ω (yellow violet yellow gold bands) and 1 Meg Ω (brown black green gold bands). He needs 150 of each.

Bob goes to the electronics store to pickup his order. The guy behind the parts counter hands him three brown paper bags. Each bag has a tag on it. The tags read:

- 100 ea. 470 K Ω 2-watt 5% resistors.
- 100 ea. 1 Meg Ω 2-watt 5% resistors.
- 50 ea. 470 K Ω and 50 ea. 1 Meg Ω 2-watt 5% resistors.

After Bob pays and is about to leave he is warned that since it is April Fools Day, the guy who filled his order had some fun and made sure each bag had the wrong label tied to it. When Bob gets home he decides to change the tags so they are on the correct bags. He will make a puzzle of it. Here are the rules he sets for himself.

1. He can not look into the bags.
2. He can remove only one resistor from a bag at a time, look at its value, and put it back in the bag.
3. He can repeat Step 2 as many times as he needs until he is able to put the correct tag on each of the bags.

The question is: How many times does he have to preform Step 2?

Three Bags of Resistors Puzzle Answer:

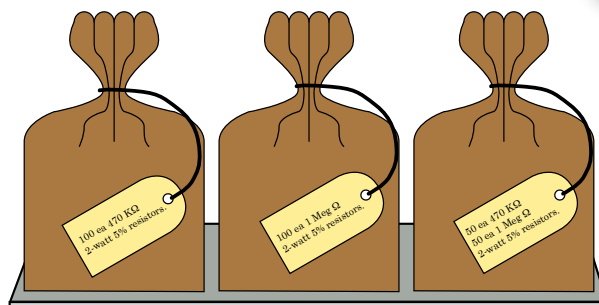
Bob only has to perform Step 2 ONCE. Here's how he does it:

1. Bob starts with the bag marked 50 ea. 470 K Ω and 50 ea. 1 Meg Ω resistors. Since that bag is marked wrong he knows it will contain only one value of resistors.
2. **Bob reaches into the bag and pulls out a resistor.** Let's say he pulls out a 470 K Ω resistor. He immediately knows the bag marked 50 ea. 470 K Ω and 50 ea. 1 Meg Ω resistors is the bag that actually contains 100 each 470 K Ω resistors.
3. Bob swaps the tag from the bag marked 100 ea. 470 K Ω resistors with the one marked 50 ea. 470 K Ω and 50 ea. 1 Meg Ω resistors.
4. Bob now puts aside the bag correctly marked 100 ea. 470 K Ω resistors.
5. Bob now has two bags left. He doesn't need to know what's in them, because Bob knows the one that still contains the original label is wrong, so he just swaps the label on the two remaining bags.
6. All the bags are now properly labeled !

Once Bob remembers what those resistors were for, he plans get started on his project!?!?

*Response to this puzzle was poor (I keep trying!) I stuck it out and got five responses, passed on a clue or two to them if their first response was wrong. Those with the correct answer are **Ken - W6HHC, Corey KE6YHX & Tim N6TMT.***

73, from AF6C



ORARC Member Q&A

This month I'm interviewing Jim, KB6TKA. Jim joined OCARC in 2021 at the invitation of Tom, W6ETC.

Can you tell us something about yourself?

I was born in Spokane, Washington and grew up in South Gate and Brea. I drove an 18-wheeler for 31 years primarily between California, Arizona, and Nevada. After I retired as a driver, I taught vocational education in Santa Ana Unified School District for 10 years. My wife Karol, KC6LJF is a ham, also. My family I enjoyed camping in our 30-foot 5th wheel pulling a quad trailer, and had fun boondocking throughout the western United States.

How did you originally become interested in amateur radio?

I first did 11 meters while driving a truck and met some hams on the road and they talked me into getting my license in 1988, first as a Novice, then Technician, General; and, finally, Advanced, which is still my license class today. My original interest in amateur radio was as an alternative, to CB and for keeping in touch with home, while on the road through the Condor system.

What have been some of your recent amateur radio interests and activities?

I am an active member of the Catalina Amateur Repeater Association ("CARA") and serve as an NCO at least twice a week. CARA has great social activities and I especially enjoy meeting the people

from the radio for face-to-face QSOs and club activities. I enjoy listening to and making contacts on HF, especially 17 meters where I have made contacts in many places, especially Alaska and Japan.

On what equipment and antennas are you presently operating?

I primarily operate on my Yaesu FTM-400 and my TYT 9800 for VHF/UHF and my Icom 718 (10m – 160m), with an automatic antenna tuner. On my roof I have a center-fed 40-meter dipole, a 10m - 20m cobweb antenna and a Comet GP-6 for VHF/UHF, although I often have great luck using a mag mount on the hood of my wife's SUV.

What are your future interests in amateur radio?

I have recently been getting active in C4FM. I have been using my FTM-400 for that, and just recently acquired a Yaesu FT-70 to also use for that mode. I like that the C4FM allows me to hear and talk with stations in distant locations such as England and New Zealand.

How do you anticipate that your membership with Orange County Amateur Radio Club will enhance your knowledge and enjoyment of amateur radio?

I have learned quite a bit from attending 2 winter field days and 1 summer field day, including set-up, takedown and logging. Also, I have attended several club meetings and enjoyed meeting the other OCARC members and learning from the guest speakers.

de Bill KN6SMP

**OCARC BOARD MEETING
MINUTES
2023-06-03**

The sixth Board Meeting of the year was on Saturday, June 3, 2023. The meeting was called to order by acting club president, Tim Millard N6TMT at 8:07 AM PDT. Seven (7) directors were present for a quorum. Director-at-Large, AJ KN6WNO was absent. We were Tom Cowart W6ETC's guests, and Arnie Shatz N6HC was present. Fourteen (14) topics were brought to the Board this morning, including four (4) Director Reports, and ten (10) discussion items. Three (3) motions were carried, including adjournment.

Director Reports

•**Treasurer:** Total inflows are \$2,203 and total outflows are \$711 for a net total of \$1,491.

Our treasurer, Tim G. N6GP, reports he transferred \$1,600 from the PayPal account to the Wells Fargo account. We are on-track for the rest of the year, with positive inflows.

•**Activities:** Our activities chairman, Nicholas AF6CF, reports he was at the Dayton Hamvention, and there were fewer visitors than past years, but still many. He saw some interesting novelties, including a tri-band morse code transceiver, and a video display adapter for the Icom IC-7300 or any other Icom transceiver. It costs about \$120. Nicholas also bought a crystal radio.

•**Technical:** Technical chairman, Bob AF6C, reports the club still has the radio equipment at Steve N1BKB's QTH. Something needs to be done with them. The Henry amplifier needed to be taken to HRO, but Tom has a buyer, and the Kenwood TS-430S has been earmarked for the Field Day GOTA station.

•**Membership:** Our membership chairman, Corey KE6YHX, reports we have 94 members. Chip K7JA (SK) will remain on the roster until the end of the year.

Current Business

•Newsletter Editors

June: Tim M. N6TMT
July: Tim G. N6GP
August: Nicholas AF6CF
September: Dan KI6X
October: --open to volunteers--
November: --open to volunteers--
December: --open to volunteers--

•General Meeting Programs

The Board discusses future General Meeting programs.

June: ARRL Field Day 2023
July: Gordon West WB6NOA: "VHF/UHF Propagation"
August: Doug Millar K6JEY: "Modern-Day Test Instruments"
September: OCARC 90th Anniversary Celebration
October: Club Auction
November: --tentative--
December: Christmas Party

•Summer Field Day Plans

-Operators: We need more operators, for the VHF/UHF station especially.
-Tower Transport/Rental Truck as Backup: Tom W6ETC may have his truck available to tow Gene KJ6OML's trailer, and an optional rental truck may cost as much as \$300. Tim M. N6TMT can help with his vehicle, but his Friday schedule needs to be worked-out.
-Propane for Generator: Nicholas AF6CF will fill the club propane tank as well as the others one (1) week prior to Field Day.
-Transceiver Rigs: Tim G. N6GP reports he has the Kenwood TS-590SG, and Bob H. AA6PW has the Kenwood TS-990.
-GOTA: Tony N2VAJ has offered a Kenwood TS-480 for this purpose. The Kenwood TS-430S at Steve N1BKB's QTH is a backup. A GOTA Captain is yet to be arranged.
-Digital: With the exception of 6/10m and GOTA, this station is going away this year.
-Message to Section Manager (7.3.5): Tim G. N6GP will take this task.
-Message Handling (7.3.6): Tim G. N6GP will follow-up on this as well.
-W1AW Message (7.3.9): Corey KE6YHX will take-on this task.
-Food: A budget of \$500 for food has already been approved. There will be meal tickets sold, and an option to pay for individual meals, as well as a donation can at Field Day.
-A motion for a Field Day budget of \$1200, including food and an optional rental truck, is made, seconded and carried unanimously for the Board Members present at 8:59 AM PDT.
-Arnie N6HC will be the Safety Officer again.

•Future General Meeting Zoom Plans

Tim M. N6TMT reports we are paid for the year on the Zoom account. Information regarding log-in is available via the www.w6ze.org web site a few days before the General Meeting.

•Future Meeting Prizes and Show & Tell

A budget of \$250 is set for the June General Meeting Opportunity Drawing Grand Prize. Tim G. N6GP may have a very nice prize for the Opportunity Drawing as well. Nicholas AF6CF may have something Field Day related for Show & Tell.

New Business**•Vice President Resignation**

--The Board has discussed this item, and has tabled it until further notice--

•June General Meeting Agenda

The Board discusses plans for the June General Meeting.

-Field Day

Field Day 2023 will be the main topic for the General Meeting, and a video and discussions are planned.

-June through December 2023 Board of Directors Elections

Nominations Committee:

The Board of Directors present is acting as the Nominations Committee.

-Current Board Nominations as of June 3, 2023:

President: Nicholas Haban AF6CF

Activities: Tom Cowart W6ETC

The Board mentions the need for nominations for the 2024 Board of Directors.

•Promotional Field Day Signage

-Tom W6ETC will collaborate with Tim G. N6GP, and look into this. A motion to set a budget of \$300 for Field Day signage is made, seconded and carried unanimously for the Board Members present at 9:42 AM PDT.

•October Auction: Nicholas AF6CF agrees to be auctioneer. A ten (10) item limit for sellers is to be discussed at a future meeting.

Good of the Club

There are no items for the Good of the Club.

Adjournment

A motion to adjourn is made, seconded, and carried at 9:50 AM PDT.

--Respectfully submitted by Corey KE6YHX, OCARC Acting Secretary

September General Meeting

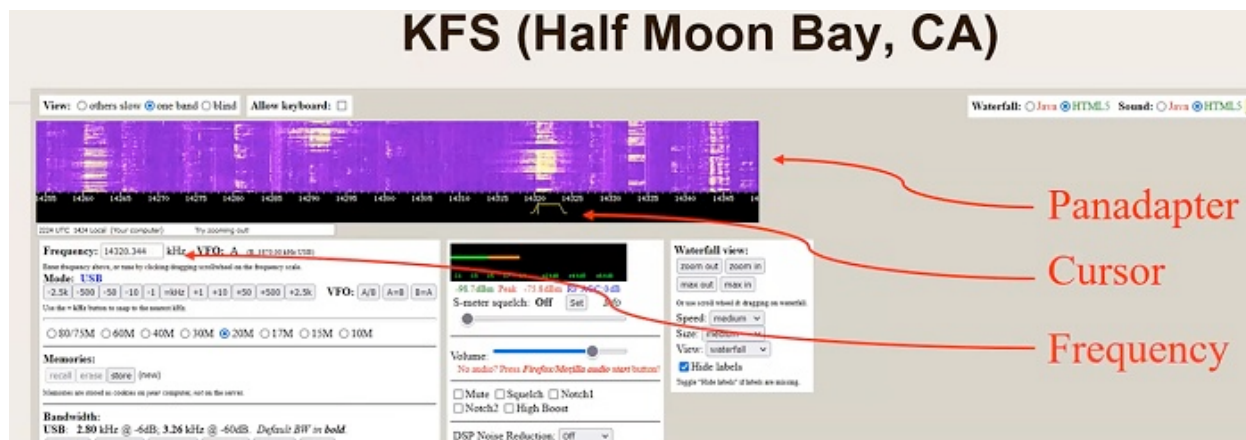
90th Birthday Celebration for the Club

Watch for more details soon!

OCARC General MEETING 2023-05-19

President Chip K7JA started the meeting on time and proceeded with introductions for those members and guest in attendance.

Janet KL7MF introduced this month's speaker Dennis Kidder, W6DQ with his presentation called "Propagation Reporting Tools or Can You Hear Me!" Dennis covered the ways and means to determine where and how well your signal is getting out.



Some of the resources that Dennis covered included: <https://websdr.org> , <https://www.wsprnet.org> , <https://www.zachtek.com/> , <https://www.reversebeacon.net> , <https://pskreporter.info> ,

- **Testing your own antenna(s) and equipment**
 - WebSDR great for checking your signal quality
 - WSPR great for current propagation from your QTH
 - Using dedicated hardware
 - Using common station hardware
 - RBN and PSKreporter great for adjusting antennas!
 - Provides actual S/N of your signal
 - WSPR w/ common station eqt: antennas
- **Remember: all of these tools are free to use!**
- **Now you should know WHO can hear you, anytime!!**

Figure 1 – Dennis answering our questions.



Figure 1

After a short break we had a business meeting.

Plans are being made for Summer Field Day.

Vice President report from Janet KL7MF let us know about some of the upcoming speakers such Gordon West in July.

Treasurer Tim N6GP - Club finances are in good shape also.

Membership Corey KE6YHX reports that we have a total of 35 online and/or in person at the meeting tonight.

Next meeting is Jun 16th Field Day Ready.

Meeting adjourned at 8:45 PM



OCARC Cash Flow - Year To Date - Year to Date

1/1/2023 through 6/2/2023

Category	1/1/2023- 6/2/2023
INFLOWS	
Badge Income (PayPal)	3.00
Donations - FD	30.00
Dues, Membership (PayPal) 2023	1,290.00
Dues, Membership 2023	645.00
Opportunity Drawing -Monthly	235.00
TOTAL INFLOWS	2,203.00
OUTFLOWS	
Guest Speaker Meal - Exp	160.02
Opportunity Drwg - Monthly Exp	157.38
PayPal Fee	69.39
Propane Tank	61.30
Secretary of State	5.00
Web Site Hosting	76.00
WFD - Propane	47.39
WFD Flowers	30.00
WFD Rental - Tent	150.00
ZOOM subscription	-44.97
TOTAL OUTFLOWS	711.51
OVERALL TOTAL	1,491.49