QRO

Monthly Newsletter of the Palos Verdes Amateur Radio Club

May 2020

Inside this month's QRO

All **QRO** monthly issues since 2007 are on the PVARC website at: www.k6pv.org in the "Newsletter" tab

PVARC Online Meeting

"GPS for Amateur Radio: location reporting for emergencies and public service using devices you already own"

Diana Feinberg, AI6DF

Thursday, May 7, 2020

7:15 pm: Webex meeting room opens
7:30-8:30 pm: Meeting and presentation

Use almost any PC, Mac, Linux, iOS, or Android device in full video—or just audio.

Note: We'll be using video conferencing for other PVARC meetings in coming months.

PVARC's upcoming meeting topics (online in the near-term)

Speaking at our **May 7** monthly meeting via Webex is your **QRO** Editor Diana AI6DF presenting **"GPS for amateur radio: location reporting for emergencies and public service events using devices you already own."** This presentation is adapted from two GPS training classes she developed and taught to Los Angeles County Disaster Communications Service members at the L.A. County EOC in 2019. There's far more to GPS than most realize and you are certain to learn quite a bit. There actually are five different formats for GPS data plus two offshoots...who you work with determines which format you use.

Both sets of GPS coordinates below exactly define Hesse Park's building entrance. There are three other GPS formats as well.

The set you need depends on the agency or group you work with and their mission.

Hesse Park building (in Decimal degrees)	Hesse Park building (in UTM coordinates)
33.767882 -118.392385	Easting: 371062.7 Northing: 3737289.6 Zone 11S, North

Webex invitation links will be sent to all PVARC members on Wednesday, May 5. Clicking on the link enables you to join the meeting, whether using a PC, Mac, Linux, iOS, or Android device. Installing the Webex app for your system gives best results but you may also use your web browser. If all else fails you may dial-in audio only using your cellphone.

Our **June 4** meeting topic—in anticipation of ARRL Field Day on June 27-28—features our Vice President Ray Day, N6HE, giving an update of the understanding HF propagation presentation developed by our member Bill Harper, WA6ESC, in 2008. As PVARC members contemplate operating from backyards during the 2020 Field Day a renewed understanding of each HF band's propagation characteristics will be helpful to many.

The PVARC's **July 2** monthly meeting will have our members who operated Field Day at their home briefly show how they did it...and the results they achieved.■

PVARC DMR nets move to Wednesday, 7:30 pm

Effective May 6, 2020, weekly K6PV repeater Digital Mobile Radio (DMR) nets are moving to Wednesdays from 7:30-7:55 pm. Our analog FM nets continue as usual on Tuesdays during 7:30-7:55 pm.

The DMR net change will provide more opportunities for members to check into our weekly nets, especially for those having other commitments on Tuesday evenings. There's no change to K6PV's DMR parameters: we're still at 447.120 MHz (RX); 442.120 MHz (TX); Color Code 1; Time Slot 2; Talkgroup 31060.■

COVID-19 brings changes to PVARC's 2020 Field Day

ARRL Field Day on June 27-28 is still proceeding under its traditional rules nationwide. But un-traditional situations are requiring many radio clubs including the PVARC to re-think their 2020 Field Day plans.

Due to COVID-19 the PVARC Board of Directors recently decided to cancel our usual large-scale public Field Day event at Soleado Elementary School. This reflected the near-impossibility of getting use-permits for large gatherings, the COVID-19 situation in Los Angeles County likely continuing for at least several more months, and challenges in maintaining physical distancing or equipment sanitation at Field Day sites.

The PVARC is now encouraging as many members as possible to operate Field Day from home using their own call sign….and you do not need a big tower or antenna. You can be a Class 1-B (fully portable station); Class 1-D (home station with commercial mains AC power, no points for contacting other 1-D stations); or as Class 1-E (home station with portable power.) 1-D and 1-E stations may use any existing or temporary antennas with the operating position located anywhere on one's property (indoors or outside).

A backyard 1-B station must operate completely separately from the house or any attachments such as decks or patios, not use any existing antennas or other structures. That means operating like a true Field Day site with an outdoor tent or canopy in the yard away from any building, using portable power, flashlights/lanterns, and temporary antennas.

At our Saturday, May 9, HF Enthusiasts Group meeting online via Webex we'll be discussing ways to operate as an individual Field Day station—including using inexpensive wire antennas. You might not be able to work all 50 states but even a wire dipole relatively low to the ground should work many stations within 500 miles. ■

PVARC HF Enthusiasts Group still meets on 2nd Saturdays; new EmComm Interest Group is online 3rd Saturdays

Our HF Enthusiasts Group is temporarily meeting via Webex online video conferences from 10:00 am to Noon on the 2nd Saturday each month. The HFE Group meetings will return to the Palos Verdes Library's Purcell Room when in-person meetings can resume. The Library website currently says its branches are "closed until further notice." Our April 11th HFE meeting was held by video conference and it went very well.

The Webex meeting invitation link will be sent to all PVARC members with our Weekly Bulletin and again early on the morning of each meeting.

Because many new hams are interested in emergency communication the PVARC recently started an online EmComm Interest Group from 10:00-11:00 am on 3rd Saturdays. The EmComm Interest Group will always meet via video conference and its first meeting on April 18 attracted a lively group. The Webex meeting invitation link will also be sent to members in our Weekly Bulletin and just before each meeting.

Repair of an HF/VHF/UHF Transceiver

- Some useful troubleshooting/repair techniques

By Jerry Kendrick, NG6R

A troubleshooting and repair challenge was recently presented to the author that exercised some investigative skills and repair techniques that had rested dormant for a few years. After repair was completed, it seemed appropriate to write down the process steps if others can benefit from the lessons learned (and relearned).

A **Kenwood TS-2000 HF/VHF/UHF transceiver** was reported to have good receive performance but no output power on any of its bands: HF (including 6m), VHF (2m) or UHF (70cm). A quick search of the World Wide Web netted copies of both the owner's manual and service manual, the latter being immensely valuable—make that essential—in completing the troubleshooting and repair. As is typical, the service manual shows schematics, component lists, component layout and printed circuit board (PCB) traces for all the boards. In quick order, the board most likely to be responsible for this failure was identified. It is the "FINAL UNIT" board. Since this particular radio function (transmit) is apt to generate the most heat, board(s) responsible for transmit power generation are almost always near the top of the unit (heat rises!), so that removal of just the radio's top cover is often all that is necessary to get to the component(s) responsible for the failure.

The troubleshooting approach follows two lines of reasoning, and in a particular order. Most likely, the DC voltage available to one or more active components has been removed/terminated, so that possibility must be verified or refuted first. This part of the process relies on a good multimeter. But, if DC voltage on all the active components is nominally correct, then the next step is to use a diagram (also found in the service manual) that shows the progression of RF power buildup through the various amplification stages.

Troubleshooting Details. The service manual for this transceiver was located on-line and was downloaded for display as a PDF document for ready access at the workbench. That document is cited here:

https://rigreference.com/documents/131e3c24-c209-11e2-8072-da0005d0708b

(Click on *Kenwood TS-2000* and follow path to *Manuals, diagrams and brochures; Kenwood TS-2000 Service Manual PDF*)

The workbench arrangement for troubleshooting this radio, displaying the schematic diagram for easy access while taking voltage and resistance measurements, is shown in Figure 1 *(right).*

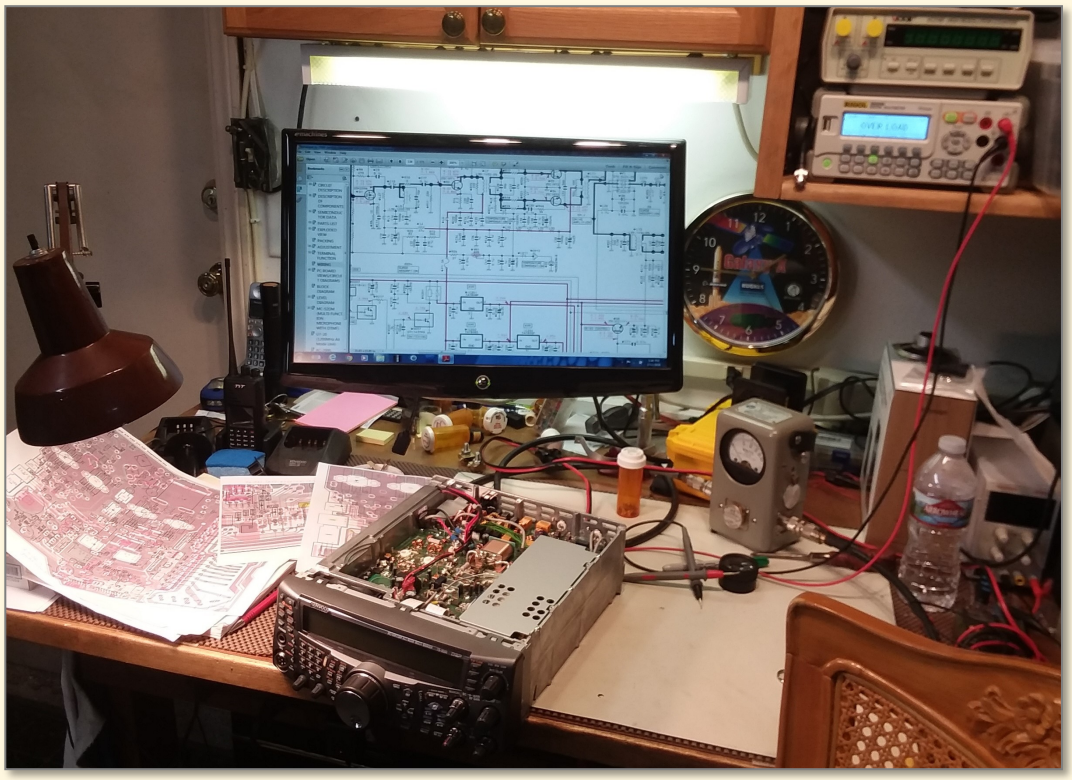

Figure 1. The transceiver main board, including the final RF stage and RF driver circuitry, is accessed by removing the transceiver cover and a secondary RF shield panel. The schematic diagram for relevant circuitry in the service manual is displayed on the wall-cantilevered and positionable computer screen [1], thus providing zoom access to any portion of the schematic under investigation. The handy digital multimeter is shown in the upper right. PHOTO: JERRY KENDRICK, NG6R

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Repair of an HF/VHF/UHF Transceiver

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Referencing the service manual with a known failure mode of no RF output power, the following relevant pages were located and carefully analyzed: a portion of the block diagram (p. 162/171, upper left), FINAL UNIT component side board layout (p. 134/171, lower middle), and schematic diagram (p. 136/171, upper left). As indicated earlier, there are generally two potential causes for this type of symptom: loss of DC voltage on one or more active components, or RF-amplification-chain power loss. The former is easier to test and also the more likely of the two types, so the investigation path of DC voltage loss was chosen.

The schematic diagram for the entire FINAL UNIT board is shown in Figure 2. DC voltage measurements were made at a sufficient number of nodes on this board to determine that the problem was located within the red rectangle.

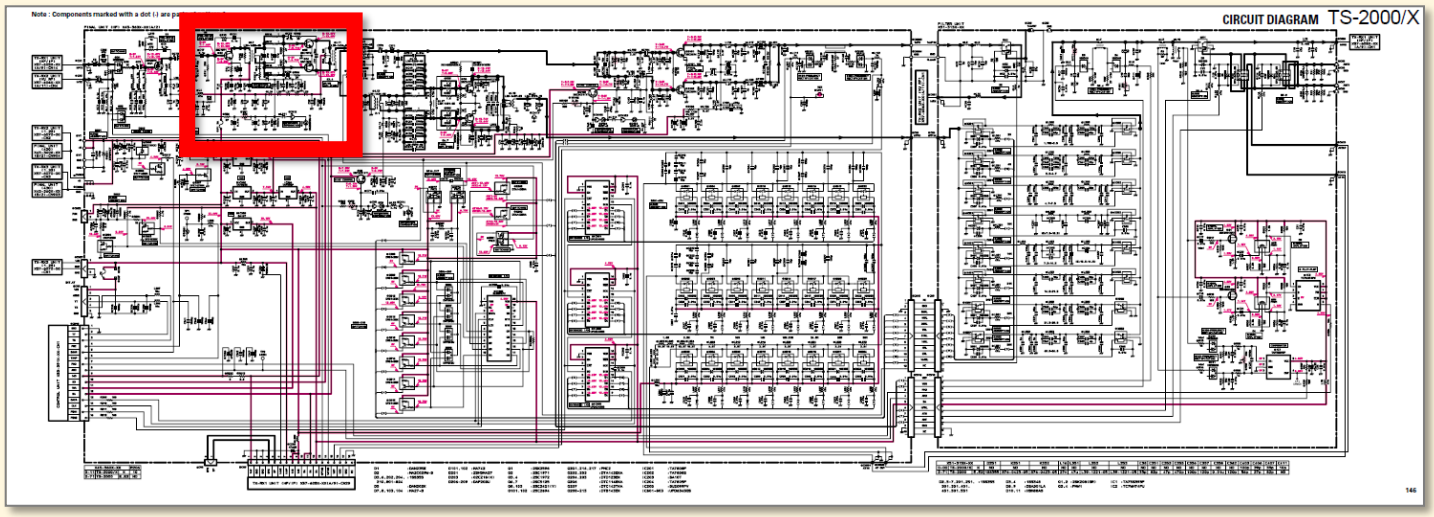

Figure 2. Schematic diagram (details unreadable) for the FINAL UNIT showing problem area in the red rectangle, depicted in Figure 3 below.

Within a few hours of measuring voltages throughout much of the FINAL UNIT board shown in Figure 2, the investigation zeroed in on the circuit snippet shown in the red rectangle and enlarged in Figure 3. Note the fusible link in the lower left corner of Figure 3 labeled F1 5A. This 5-ampere fuse normally provides ~13.8V DC voltage to the collectors of both the pre-drive amplifier transistor Q2 (2SC1971) and the two "push-pull" drive amplifier transistors Q3/Q4 (2SC1972). Measurement of the collector voltages on all three transistors showed zero volts. So, a replacement solder-in-place fusible link was acquired, along with a couple of spares, from a local electronics supply store and replaced. However, the replaced part also fused open when power was applied, indicating a more serious issue within this circuit.

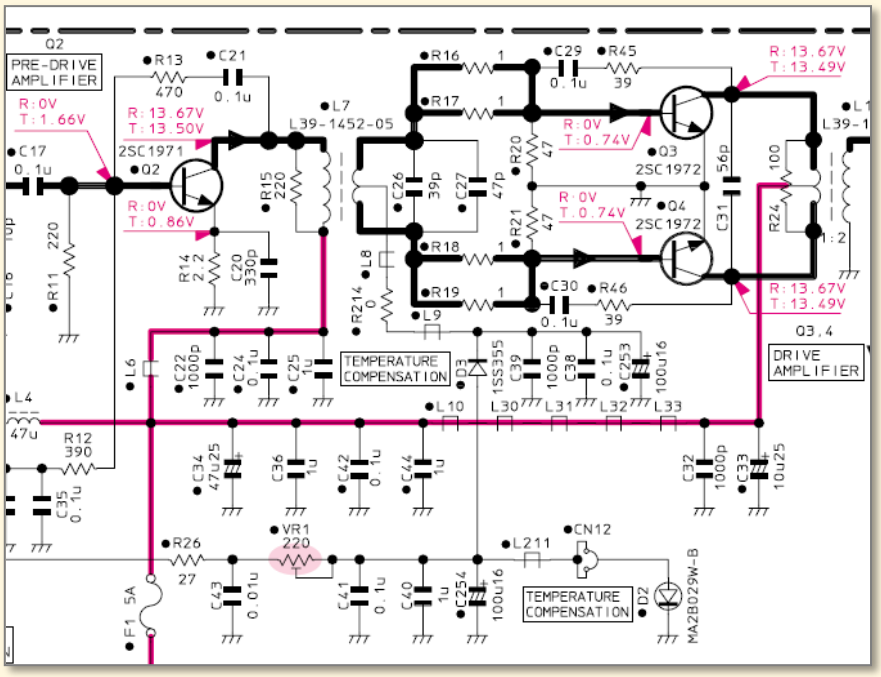

Figure 3. The investigation ultimately focused on this portion of the schematic, outlined by the red rectangle in Figure 2. The fusible link in the lower left (F1 5A) had failed, was replaced, but then failed again. Further troubleshooting in this region would be required to locate the cause of excessive current draw through the fuse.

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Repair of an HF/VHF/UHF Transceiver

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A systematic investigation was undertaken along the three paths that led from the fuse (indicated by the red lines in Figure 3). The path off the figure toward the left (going through L4) was first ruled out by strategic voltage and resistance measurements on certain components. The line going up to Q2 (2SC1971) and the line to the right going up to Q3 and Q4 (2SC1972) have several components along those paths, many of which are surface mounted devices (SMDs). SMDs are very small and are quite challenging to remove for testing. As a result, in order to determine if one or more SMD components were shorted, a sometimes-used troubleshooting technique of trace-cutting was employed to isolate components (or groups of components) from the circuit in which they are embedded. Figure 4 shows two instances of repaired trace cuts made for the purpose of component isolation.

Figure 4. The technique of trace-cutting was used to isolate, test and then exonerate some surface mounted devices along suspected shorted paths. Two examples of trace-cutting and subsequent solder-bridging are circled here near the 2SC1971 and 2SC1972 transistor emitter hold-down tabs. PHOTO: JERRY KENDRICK, NG6R

First, at a strategic location the copper PCB trace is cut completely through the conductive foil with a razor blade or X-ACTO knife. Then, after resistance measurements are made and the associated parts have been exonerated, the coating on the copper trace is scraped away to expose the nearby copper on either side of the cut and a solder bridge is created to complete the repair—good as new! This technique eventually exonerated all the components in this circuit except for the three transistors and one electrolytic capacitor. That capacitor was replaced, but the short that caused the original fuse to blow still persisted. The digital multimeter showed a resistance of only 3.7 ohms between the fuse and ground, way too low a value and a clear indication that the short still existed.

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Repair of an HF/VHF/UHF Transceiver

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The collector pin on the 2SC1971 transistor was unsoldered and lifted from its pad so that the component could be tested. This 2SC1971 pre-driver transistor tested OK and the collector pin was soldered back into position. Then, the collector pin on one of the two 2SC1972 driver transistors was lifted and the transistor tested. It showed that it had failed and was shorted between collector and emitter. The transistor was removed and the short was confirmed as shown in Figure 5.

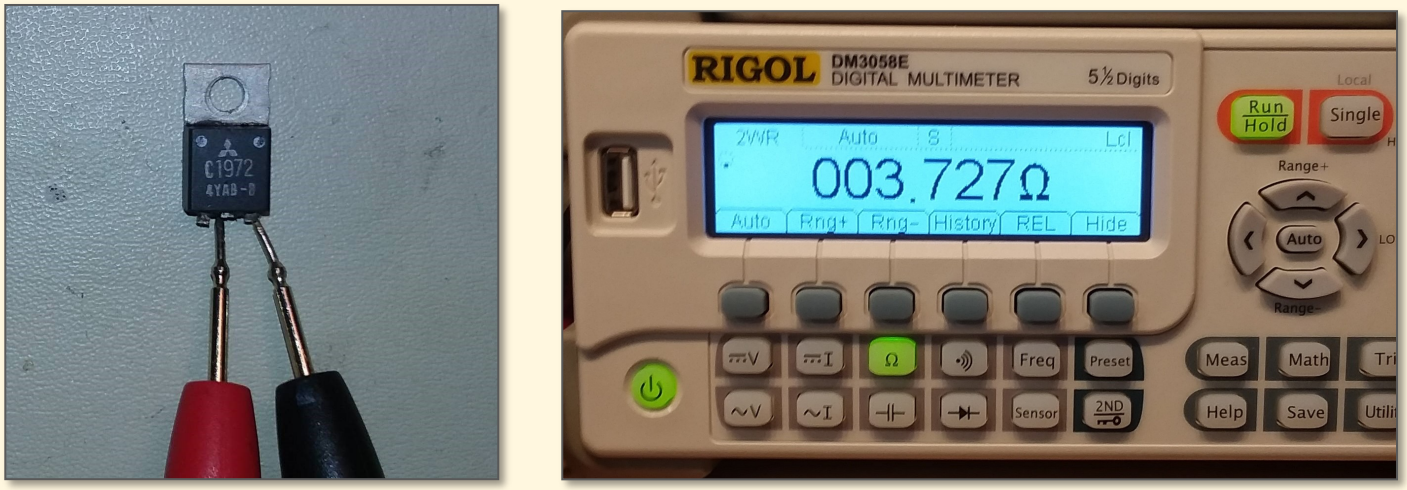

Figure 5. One of the two RF driver transistors (2SC1972) was found to be shorted from collector to emitter. This was the "smoking gun" that led to the fusible link opening and terminated transmit operations. PHOTOS: JERRY KENDRICK, NG6R

Believing that the failure of this 2SC1972 transistor was the sole and causative factor for the transceiver failure, a replacement part would need to be acquired and installed. However, it was learned that the 2SC1972 transistor has not been manufactured by Mitsubishi in many years. There are several "equivalent" transistors, including the NTE343 and 2SC3133. A new old stock (NOS) NTE343 transistor was purchased from a local electronics store and installed in place of the shorted and removed 2SC1972. However, upon transceiver transmit power up, that transistor failed.

Whether the NTE343 was a bad transistor or whether the other 2SC1972 transistor that had not been removed or tested was itself bad, we'll never know. The fact that this "push-pull" configuration is quite sensitive to a big gain mismatch between the two transistors might mean that the second 2SC1972 transistor was already bad (brought down by the failure of the first 2SC1972) and probably should have been replaced at the same time. Hindsight!

Genuine 2SC1972 NOS Mitsubishi transistors are very scarce and expensive, as lamented in a long but fascinating ***QRZ.com Forum*** exchange from 2016 and even truer now four years later [2]. They are also easy to counterfeit by removing the silk-screened lettering from an ordinary inexpensive power transistor and re-stenciling with new lettering including the counterfeit Mitsubishi triangular logo.

Shown in Figure 6 (next page) is a photo of a recent purchase from China (advertised as NOS) of such a counterfeit device compared with the original part removed from this transceiver. **Warning: eBay buyers beware!**

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Repair of an HF/VHF/UHF Transceiver

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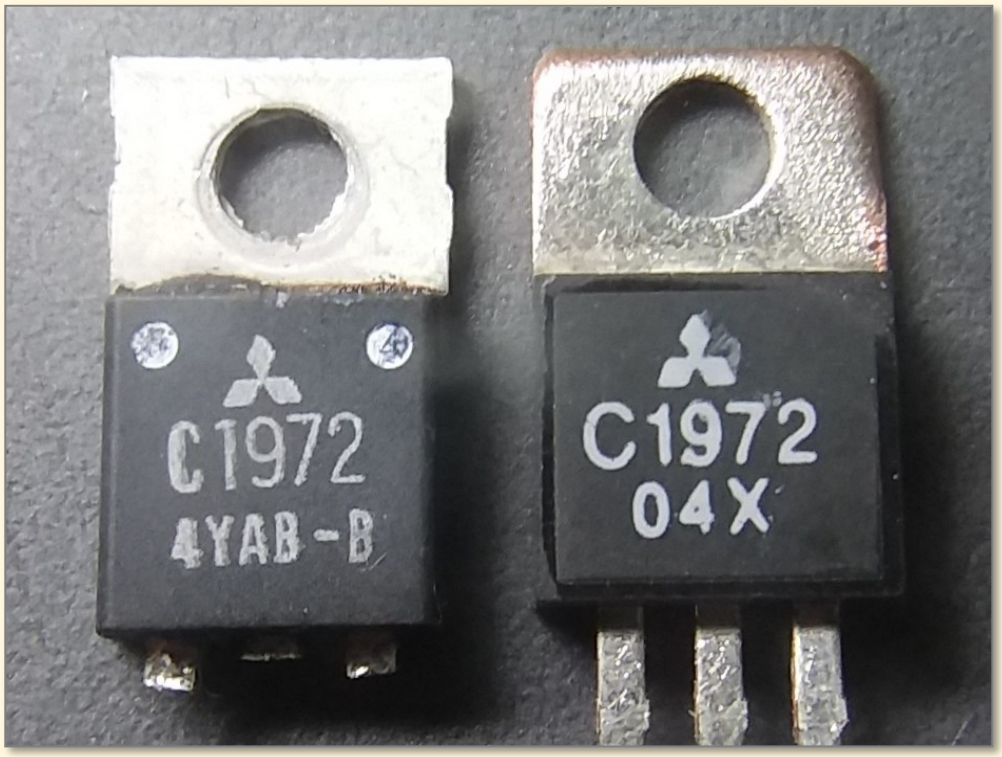

Figure 6. Counterfeit transistor on the right compared with failed Mitsubishi device removed from this transceiver.

Note the tell-tale transistor width increase from 9.1mm on the left to 10mm on the right. Also note the flawed and smudged stenciling near the enlarged center of the triangular logo, where the three rhombus or diamond shapes depicted on a genuine Mitsubishi logo converge to just a point. This candidate replacement transistor checked faulty on the transistor tester. Ignore the filing away of a portion of the metal emitter tab at the top, as this was done by the author to enable mechanical fit, prior to later determining that the transistor was electrically flawed.

PHOTO: JERRY KENDRICK, NG6R

Equivalent 2SC3133 transistors are available from many eBay vendors as well, and with tempting prices. But, integrity of the devices is always considered suspect. The author found that all 10 of a group of ten 2SC3133 transistors purchased from an overseas vendor via eBay were defective (or didn't match known characteristics of the correct part).

Two 2SC3133 transistors were finally purchased from "a friend of a friend" who does electronics repair professionally. He had purchased these devices as part of a bulk buy and knew them to be genuine and of good quality. These transistors were manufactured by ASI—Advanced Semiconductor, Inc. This global wholesale company, which will sell to the public with a minimum purchase of $500, has been doing business since 1979 and is headquartered in North Hollywood CA.

These two 2SC3133 transistors were installed in place of the removed 2SC1972 transistors. The drive voltage to this new pair of drive amplifier transistors was reduced prior to their installation by adjusting the variable resistor VR1, shown near the lower left corner of Figure 3. This VR1 was now adjusted clockwise in TRANSMIT mode to bring the drive voltage on the bases of Q3 and Q4 (2SC3133) up to the 0.74V indicated on the schematic of Figure 3. At this potentiometer setting, output power from the transceiver was measured at just slightly more than 100W, as indicated by the Bird 43 wattmeter. The transceiver was then put through its paces and tested on all bands (HF/VHF/UHF) and in both FM and SSB modes and it performed flawlessly. Of particular interest was any audio distortion that might be created due to potential mismatch in hFE (current gain) between the two new drive amplifier transistors in this push-pull configuration. But, over-the-air audio transmissions on both FM and SSB sounded full and distortion free. **Success!**

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Repair of an HF/VHF/UHF Transceiver

A close-up of the replaced devices is shown in the right photo of Figure 7. The white compound obscuring the labeling on one of the two 2SC3133 transistors envelops a heat sensitive diode (used for thermal compensation and shown as D2 in the lower right corner of Figure 3), re-secured into place with thermally-conductive grease, the same grease placed under the transistors before their emitter tabs were screwed down tightly onto a metal heat sink beneath each transistor.

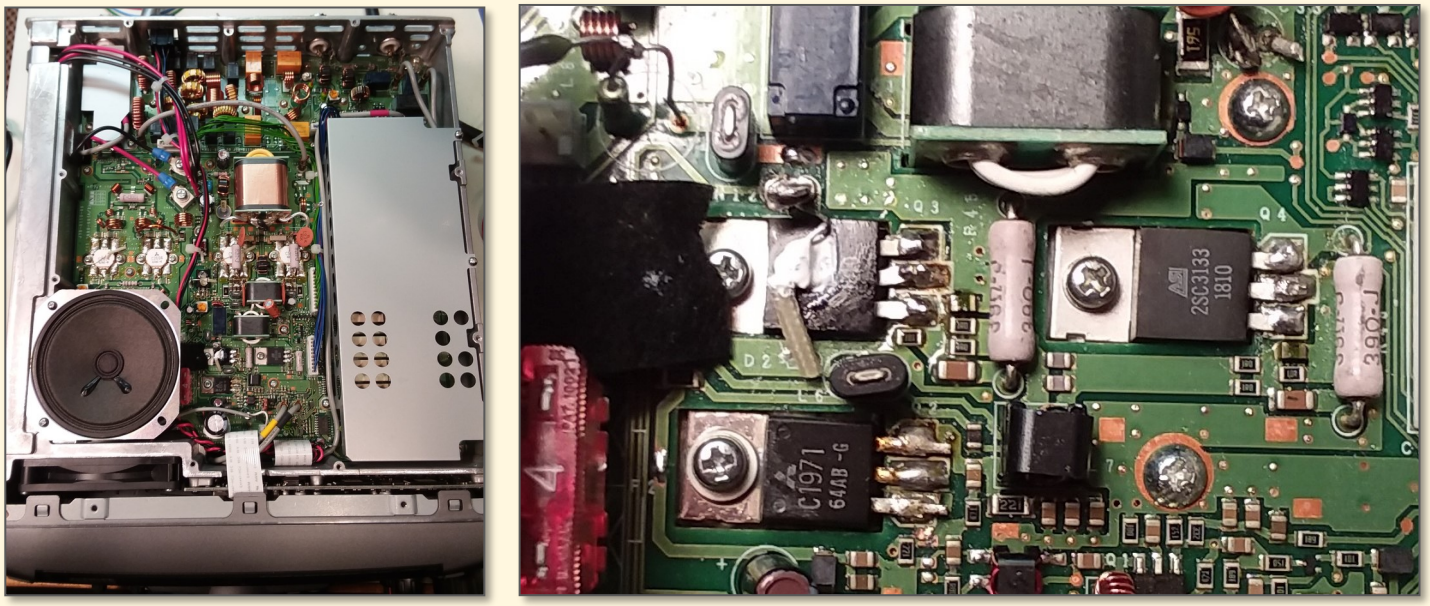

Figure 7. The two 2SC3133 equivalent replacement transistors have been installed in place of the removed 2SC1972 transistors; the temperature compensation diode was re-secured atop one of the power transistors. PHOTO: JERRY KENDRICK, NG6R

References

1. Page 6, Figure 1, http://www.n6rpv.net/n6rpvpage/pvarc/2017QRO/QROSep2017.pdf

2. https://forums.qrz.com/index.php?threads/2sc1972-source.521232/.

PVARC Club News

Consider being an ARRL member

Please consider joining the American Radio Relay League (ARRL) if not currently a member. The ARRL is the only national organization representing amateur radio and has another significance for the PVARC: We receive benefits from being an ARRL-affiliated club. But being an ARRL-affiliated club requires at least 51% of club members also be ARRL members. Annual ARRL membership costs $49 and includes your choice of the printed monthly **QST** magazine or the ARRL's new **On The Air** magazine for newer hams. Both are available electronically to all ARRL members...plus a new member benefit is free online access to ARRL's two other publications, **QEX** and **National Contest Journal**. Additionally all ARRL members can access numerous web-based materials, ARRL staff, and assistance with ham radio issues. Visit: www.arrl.org/ then click "Join/Renew."■

PVARC badges await pickup at another time

Gary Lopes, WA6MEM, has the following PVARC badges ready for distribution at our next Hesse Park meeting (which might not be until July) or by other arrangement.

- KN6FYW
- NA6Q

To make special arrangements with Gary (or to order a badge) contact him at: wa6mem@cox.net. ■

Embroidered PVARC patches available at monthly meetings

PVARC club patches are available at our monthly meetings or special arrangement for $4 each. They may be sewn on any cap, jacket, shirt, or bag.

The four illustrations in the patch center are emblems of the Palos Verdes Peninsula's four cities (clockwise from top left: Palos Verdes Estates, Rolling Hills Estates, Rancho Palos Verdes and Rolling Hills.) ■

Palos Verdes Amateur Radio Club

An American Radio Relay League Affiliated Club

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Palos Verdes Peninsula, CA 90274-8316

Monthly In-Person Meetings:
1st Thursday (except August and December in 2020) 7:30 pm at Fred Hesse Park, 29301 Hawthorne Blvd., Rancho Palos Verdes, CA. Visitors always welcome.

Repeaters (Open, though often listed as "Closed"):

PVARC: K6PV, 447.120 MHz
- **Analog FM:** (-), PL 100.0, CTCSS
- **Digital DMR:** 447.120 MHz (RX); 442.120 MHz (TX) Talkgroup 31060, Color Code 1, Time Slot 2

"PV-West": W6MTA, 449.980 MHz (-), PL 173.8, CTCSS

To order a Club badge:
Gary Lopes, WA6MEM, wa6mem@cox.net

To order a Club jacket or patch:
Dave Scholler, KG6BPH, 310-373-8166

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Front page photo — Pt. Vicente Lighthouse on May 9, 2019. No current photo available, Pt. Vicente Interpretive Center and adjoining grounds off-limits due to COVID-19. PHOTO: DIANA FEINBERG, AI6DF

PVARC Club News

PVARC upcoming dates in 2020

- **PVARC monthly meeting at Hesse Park, McTaggart Hall (or online if park closed)**

  1st Thursday each month, 7:30-9:30 pm, except in August and December. 6:30-7:25 pm, "What's Next?" group for newer hams and "DMR Basics".

- **HF Enthusiasts Group meetings at Palos Verdes Library, Peninsula Center main branch (or online if library closed)**

  2nd Saturday every month, 10 am to Noon, in the Purcell Room (corner behind Reference Desk.)

- **Walt Ordway, K1DFO, Technician and General amateur radio license classes at Hesse Park**

  Saturdays, Nov. 7 and 14, 2020; exams, Nov. 21.

- **Field Operating Events:**
  ARRL Field Day, June 27-28, at member homes.
  International Lighthouse & Lightship Weekend, August 22-23.

- **Public service events in 2020:**

  RHE Hills Are Alive 10K/5K run/walk, Aug. 10.
  Conquer the Bridge race, Labor Day, Sept. 7.
  Palos Verdes Half Marathon-10K-5K, Nov. 21.

- **PVARC 2020 Holiday Dinner:** Dec. 3, Los Verdes Golf Course.

Non-PVARC Events of Note:

- **W6TRW Swap Meet:** last Saturday each month, Northrop Grumman Space Park, North Redondo Beach, 7:00-11:30 am. (Unlikely in May 2020)

- **PACIFICON & ARRL Pacific Division Convention,** San Ramon, CA: Oct. 16-18. ■

All events above are subject to modification or cancellation as public health conditions warrant.

WELCOME NEW MEMBERS OF THE PALOS VERDES AMATEUR RADIO CLUB IN 2019-2020

Georgiann Keller, KM6YGM

Annalise Little, KM6YGS

Tim Couture, KM6QWA

Frank Brown, KM6YGQ

Charlie Hansen, AJ6HZ

Diana DiDomenico, KM6IQN

William McClure, W7QLI

Rick Shigio, K6RTS

David Calloway, K6DKC

Jon Kuroyama, K6LDQ

Ray Grace, WA6OWM

Robert Keller, K9BGC

Alex Marko, KD6LPA

Erin Okada, KN6FYV

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Ikue Duncan, KN6FYW

Judy Frankel, KN6FYU

Robert Sawyer, KG6SFQ

Heidi Gransar, KN6HVG

Bruce Ward, KN6HVI

David Salazar, KE6GFR

Ed Jenkins, K6EXY

David Hostetler, W6OQ

Robert Rodriguez, KN6FQL

PVARC Calendar May 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5 PVARC analog FM weekly net on K6PV repeater & 2m cross-band 7:30-7:55 pm	6 PVARC digital DMR weekly net on K6PV repeater 7:30-7:55 pm	7 PVARC Monthly Meeting 7:30-8:30 pm via Webex video conference	8	9 PVARC HF Enthusiasts Group, 10 am to Noon via Webex video conference
10	11	12 PVARC analog FM weekly net on K6PV repeater & 2m cross-band 7:30-7:55 pm	13 PVARC digital DMR weekly net on K6PV repeater 7:30-7:55 pm	14	15	16 PVARC EmComm Interest Group, 10:00-11:00 am via Webex video conference
17	18	19 PVARC analog FM weekly net on K6PV repeater & 2m cross-band 7:30-7:55 pm	20 PVARC digital DMR weekly net on K6PV repeater 7:30-7:55 pm	21	22	23
24	25	26 PVARC analog FM weekly net on K6PV repeater & 2m cross-band 7:30-7:55 pm	27 PVARC digital DMR weekly net on K6PV repeater 7:30-7:55 pm	28	29	30
31						

Our May 2020 ham license classes have been canceled...please tell your friends and family about our November 2020 classes scheduled at Hesse Park.

Two Free Amateur Radio Courses

FCC "Technician" course (entry level)
FCC "General" course (2nd level)
Each course is 2 sessions
The sessions will be on 7 and 14 November 2020
Technician 9:30 AM to 1:30 PM both Saturdays (bring your lunch)
General 1:45 PM to 5:00 PM both Saturdays
The FCC tests will be 10:00 AM to noon on 21 Novmber 2020

At the start of the 7 November Technician course, a member of the Palos Verdes Amateur Radio Club will give a 30 minute presentation on how to get further involved with amateur radio.

The class location is at Fred Hesse Community Park,
29301 Hawthorne Blvd., Rancho Palos Verdes, CA 90275
Confirm your attendance to Walt, K1DFO at waltordway@juno.com

There is no fee for either course.
Taking the FCC test is $15.

Optional Material (sold at cost)
Gordon West books with all the FCC test questions,
$26 for the Technician and $26 for the General
Paper copy of Walt's Power Point charts,
$22 for the Technician and $20 for the General

For courses sponsored by the Palos Verdes Amateur Radio Club, students thru grade 12 who pass their examination at a PVARC VE test session will, upon application to the Club, be eligible for reimbursement up to a maximum of $50 to cover the cost of materials and the examination fee.

Everyone who obtains their first ham radio license through a PVARC VE test session, regardless of age, will receive a free membership in the Palos Verdes Amateur Radio Club for the remainder of the current calendar year.

Palos Verdes Amateur Radio Club
P.O. Box 2316
Palos Verdes Peninsula, CA 90274
www.k6pv.org

NEW MEMBER & 2020 MEMBERSHIP RENEWAL FORM

NEW: _____ or RENEWAL: _____ MEMBERSHIP DATE: _____

Last Name: _____ First Name: _____Spouse: _____

Street Address: _____

City: _____ Zip: _____

Phone: Home _____ Work _____Cell_____

Email address: _____
(Unless otherwise noted emails will be sent to the applying member only)

License Call: _____ License Class: _____ARRL Member?____Birth Mo./Day: _____

Other amateur radio groups you belong to:_____

Additional Household and/or Family Members (if Applicable):

Name_____ Call _____ Class_____ ARRL____ Birth Mo./Day: _____

Name_____ Call _____ Class_____ ARRL____ Birth Mo./Day: _____

Name_____ Call _____ Class_____ ARRL____ Birth Mo./Day: _____

Individual membership ($20.00) $_____

Household and/or Family membership ($25.00) $_____

Additional donation to support PVARC activities $_____

PayPal:_____Cash: _____ or Check #: _____ Date_____ TOTAL $_____

Please make checks payable to: Palos Verdes Amateur Radio Club; Dues based on January 1st to December 31st year.

PayPal payment: Go to www.paypal.com, enter recipient name: PVARC90274@gmail.com

All New and Renewal Member applications must be signed below.

I am applying for a new or renewal membership in the Palos Verdes Amateur Radio Club and understand that by accepting membership I agree to abide by the Club's constitution and by-laws (available on-line at: http://www.k6pv.org or upon request.)

Signature:_____ Date: _____

Family Member Signature: _____ Date: _____

Family Member Signature: _____ Date: _____