



# *PVRC Newsletter*

## *July*

Newsletter Editor: John K3TN [jpescatore@aol.com](mailto:jpescatore@aol.com)

Website: <http://www.pvrc.org>

Meeting Info: <http://www.pvrc.org/chapters.htm>

Facebook: <https://www.facebook.com/groups/PotomacValleyRadioClub/>

### President's Letter – Mike N4GU

#### **5M and Olympics Award Programs**

The 5 Million (5M) Award and Olympics Award programs are the backbone of PVRC's encouragement and recognition efforts to promote our success in contest club competitions. As such we do not take changes in these programs lightly.

We have seen two significant events this year that have impacted our 5M Award program. The first was the discontinuation of the NAQP Club Challenge competition between PVRC, SMC and NCCC. SMC and NCCC expressed a desire to discontinue the competition. Since this occurred at the end of 2021, the officers, with assistance from other members, have been trying to resurrect the Club Competition and hopefully include more clubs in the competition. To date, our efforts have been unsuccessful. At least one of the original clubs is still considering some proposals we have put forth, so we have not given up. We have even approached the management of the NAQP contests about creating a club competition. They were unaware of the discontinuation of the NAQP Club Competition and said they would watch activity and consider it.

Without a club competition for the NAQP contests, they do not meet the Purpose (Section I) of the 5 Million Award rules. This winter we continued to count the NAQP events for 5M and Olympics since the change occurred in the middle of our contest season. For the 2022-2023 contest season, we are removing the NAQP contests from the 5M, and by extension, the Olympics programs. If a club competition for the NAQPs can be restarted or created by the contest organizers, we will consider reinstating them in our award programs.

The second event that affected 5M is the Russian invasion of Ukraine. In protest of this aggression, PVRC chose not to participate in the Russian DX Contest in 2022. With no significant change in the situation in Ukraine, we will again not be participating in the Russian DX Contest in 2023. We intend to revisit the status of the Russian DX Contest when world events dictate.

The elimination of the NAQPs (6 contests) and Russian DX Contest (1 contest) from the 5M calendar leaves some gaps. Partially to fill those gaps we are adding the following contests to the 5M program calendar:

- Worked All Germany (WAG) (SSB/CW – Oct 15,16)
- CQMM DX Contest (CW – April 15-15)
- ARRL International Digital Contest (FTx – June 3,4)

WAG and CQMM meet the requirements of having a club competition (new in 2022 for WAG) and are growing contests. The ARRL International Digital Contest had its inaugural running this year. PVRC competes in all other ARRL HF contests, which have club competitions, so it only makes sense that we include this new contest as well.

The Olympics program flows from the 5M program, using the same set of contests. The contests that count for the 2022-2023 Olympics will be the same as those of the 5M award. Rules for both the 5M and Olympics programs will be posted on the website shortly.

### **WRTC2022 Italy**

The World Radiosport Team Championship (WRTC) will be held next July in Italy. This is the ninth WRTC, the first being in Seattle in 1990. PVRC is blessed to have nine competitors going next year. They are:

#### **Team Leaders**

W4IPC Connor Black (Youth)  
NN3W Rich Didonna (NA3)  
KD4D Mark Bailey (NA3)  
KU1CW Alex Tkatch (NA7)

#### **Teammates**

N3QE Tim Shoppa (TM of NN3W NA3)  
KE3X Ken Low (TM of KD4D NA3)  
N9NB Ted Rapaport (TM of W9RE NA4)  
N4YDU Nate Moreschi (TM of K5GN NA6)  
W2SC Tom Georgens (TM of K5ZD NA1)

A big congratulations to these PVRC'ers for qualifying! I'm sure they will represent the US and PVRC well. Good luck to all.

As in past WRTC events, the event sponsors are soliciting for station sponsorships. In past events, the stations were housed in tents, so the tents were sponsored in the name of a club or individual. Next year the stations will be in houses, so the sponsorship is to the station.

In another change, the sponsoring organization is allowing stations sponsors to choose which team they are sponsoring. The two NA3 teams are all PVRC members, so it only makes sense that we should make their sponsorship a priority. Unfortunately, The Tennessee Contest Group has already opened up their pocketbook and snagged the NA3 team of NN3W and N3QE for sponsorship! We need to step up quickly to get the remaining NA3 team. Then we can focus on other team sponsorships. Sponsorship of a

team (station) is \$1300. Elsewhere in this issue you will find an article by Ted, WA3AER, our treasurer on how to contribute to sponsoring a team. In past events PVRC has sponsored upwards of six tents.

Next month the newsletter goes on vacation. So, time to work on those antenna and station projects. See you in September.

73, Mike N4GU

|                              |                   |   |
|------------------------------|-------------------|---|
| <b><u>PVRC Officers:</u></b> |                   | <b><u>Trustees:</u></b>                               |
| President:                   | N4GU Mike Barts   | K3MM, N3OC, K2AV, K7SV, W3LPL, N3KN, W2RU, W3LL, N4RA |
| Vice President:              | K3WA Bill Axelrod |   |
| Vice President:              | AA3S Doug Hart    | <b><u>PVRC Charter Members (all SK):</u></b>          |
| Secretary:                   | N3QE Tim Shoppa   | W3GRF, W4AAV, W4KFC, N0FFZ, W4LUE, W7YS, VP2VI/W0DX,  |
| Treasurer:                   | WA3AER Ted Bauer  | W3IKN, W4KFT  |

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## More Bling for PVRC at W3LPL Open House – Doug AA3S



It is tradition that when PVRC wins a club competition that the resulting award be passed around to members or Chapters or sometimes given to an individual member or multi-op team who were important contributors to that PVRC Club win.

In the case of PVRC's win of the 2021 PA QSO Party trophy for Out-of-State participants, the team at WA3EKL station operating with the call sign K3PAX scored a close second of all participating out-of-state high power multis and easily contributed the single highest scoring log for PVRC.



At the recent W3LPL Open House meeting of PVRC members, this PVRC trophy was passed to Zory KB3VQC



ARRL Atlantic Division Director Tom W3TOM spoke to the PVRC gang at Frank's as Tim N3QE listens intently.

*(Photos by N3AM and N3JT)*

## 1X2 RF Switches at KØZR – Jeff KØZR

### Background

Over the past several months, additional yagis fixed toward the Caribbean, have been placed on my towers. A three-element 20m at 67 feet, a three-element 15m at 55 feet, and a four-element 10m at 32 feet on a second tower. What is now required is a quick means whereby the RF can be directed to one of these three antennas and quickly return to the larger rotatable arrays.

Not wanting to run even more cables out to the towers, it was decided to run DC over the center conductor of the appropriate coaxes, utilizing bias-tees to introduce and pull-off the 12 VDC. The remainder of this document details how this is performed.

### Approach

There are several solutions available, be it MFJ's 4712 2-Position Remote Antenna Switch or the remote unit from Array Solutions. Each comes with its own price tag and neither is inexpensive when switching between two or more pairs of antennas. The design can switch between four different pairs of antennas.

There are two key ingredients: a) suitable relay and b) low insertion loss bias-tees. An April 2005 QST article, "A Low-Cost Remote Antenna Switch" used American Zettler relays, AZ755-1C-12DE. The contact details are shown below in Figure 1.

#### CONTACTS

|                               |  |
|-------------------------------|--|
| <b>Arrangement</b>            | SPST (1 Form A, 1 Form B)<br>SPDT (1 Form C)   |
| <b>Ratings</b>                | Resistive load:<br>Max. switched power: 480 W or 5540 VA<br>Max. switched current: 20 A<br>Max. switched voltage: 150* VDC or 380 VAC<br><br>*Note: If switching voltage is greater than 30VDC, special precautions must be taken. Please contact the factory. |
| <b>Rated Load<br/>UL, CUR</b> | 20 A at 277 VAC N.O. resistive, 50k cycles<br>16 A at 240 VAC general use, 100k cycles<br>12 A at 277 VAC N.O. resistive., 100k cycles<br>20 A at 24 VDC resistive<br>1 HP 240 VAC<br>TV-8 120 VAC N.O. (silver tin oxide only)                                |
| <b>TÜV</b>                    | 16 A at 30 VDC, 250 VAC resistive, 30k cycles*<br>13 A at 420 VAC resistive, 30k cycles *  |
| <b>Material</b>               | *approval for form A, C, and Class F only<br>Silver cadmium oxide (silver tin oxide available)   |
| <b>Resistance</b>             | < 50 milliohms initially<br>(24 V, 1 A voltage drop method)  |

Figure 1 AZ755-1C-12DE Relay

| Frequency, MHz | Series Impedance |
|----------------|------------------|
| 1.83           | 50.6 + j1,480    |
| 3.488          | 3589 + j15,286   |
| 7.244          | 0 - j1,393       |
| 14.08          | 0 - j601         |
| 21.16          | 0 - j374         |
| 28.01          | 0 - j275         |

A general rule of thumb is to have 10X the system impedance for adequate isolation, in other words 500 Ω. The table above depicts the actual hardware isolation so in some cases a second 100 uH inductor is placed in series with the first.

At the 1,500 watt level, for a 50 Ω load, we find 273.9 V<sub>RMS</sub> and 5.48 I<sub>RMS</sub>. Fortunately, all the antennas being switched have very good VSWRs, typically around 1.3:1, rarely approaching 1.5:1.

Simplifying the bias-tee construction is the fact that they can be easily incorporated into the output of each 2 KW bandpass filter already in use. The SO-239 for input and output are already in place and in some cases, the filter is already AC coupled and does not need a separate DC block.

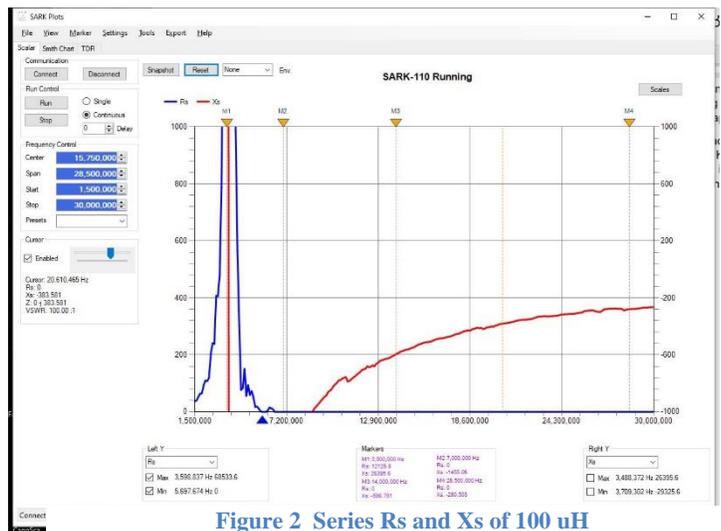
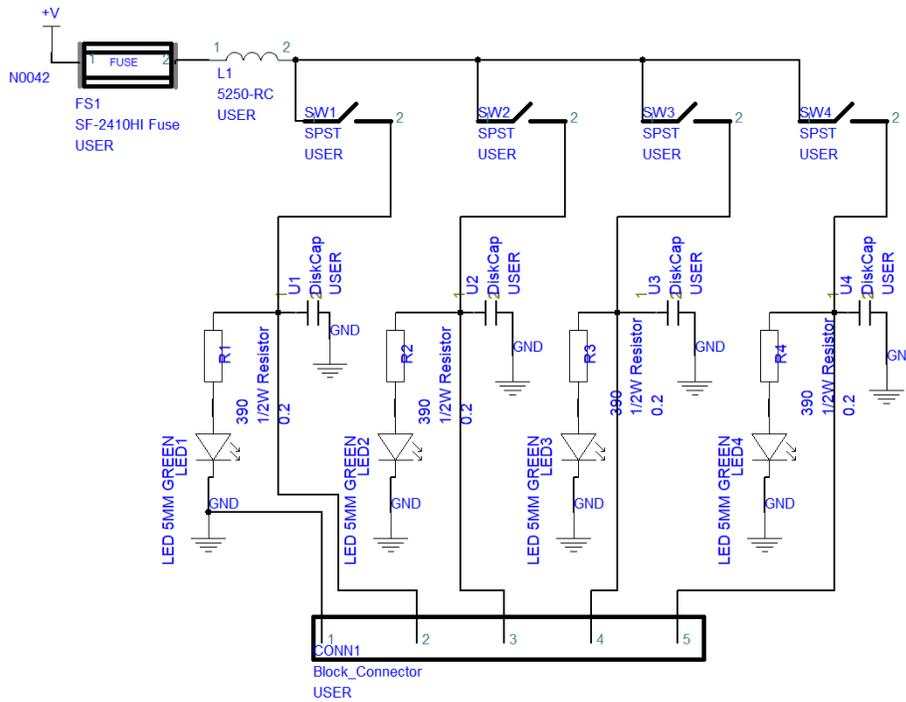


Figure 2 Series Rs and Xs of 100 uH

### Switch Controller



The actual numbering used for the outputs varies from what is shown here.

- Pin 1 Brown
- Pin 2 Green
- Pin 3 Orange
- Pin 4 Blue
- Pin 5 Ground

CAT5 cable is used for the interconnect from the controller box to the KW filters in the basement. The wires of "solid" color are as indicated above and the wires with "color-white" like brown-white are all ground.

Figure 3 Schematic of Controller

Therefore, there are four wires which go into Pin 5 as the ground connection.

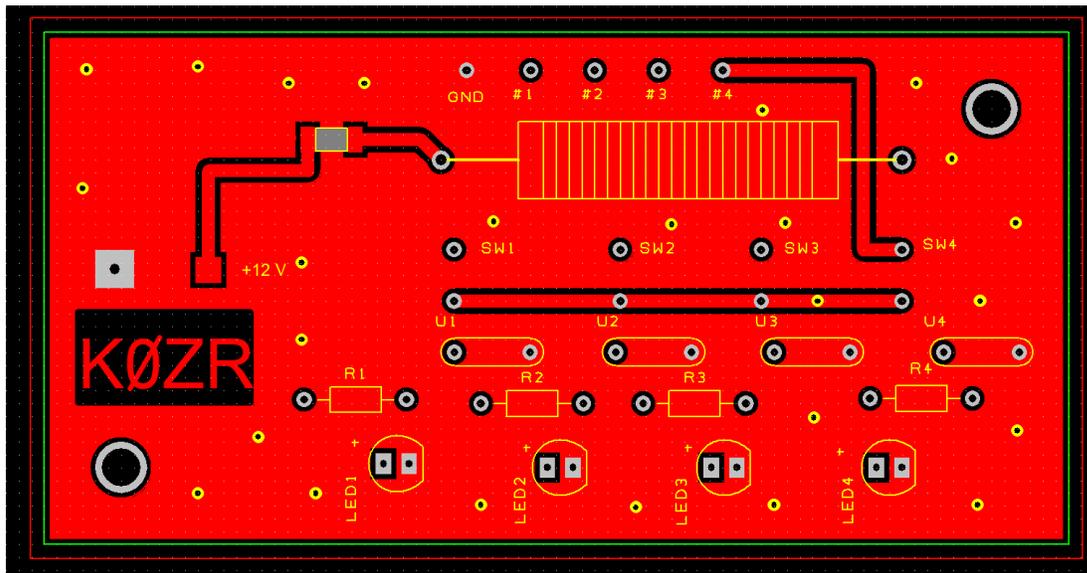


Figure 4 Top-Side of Controller Board

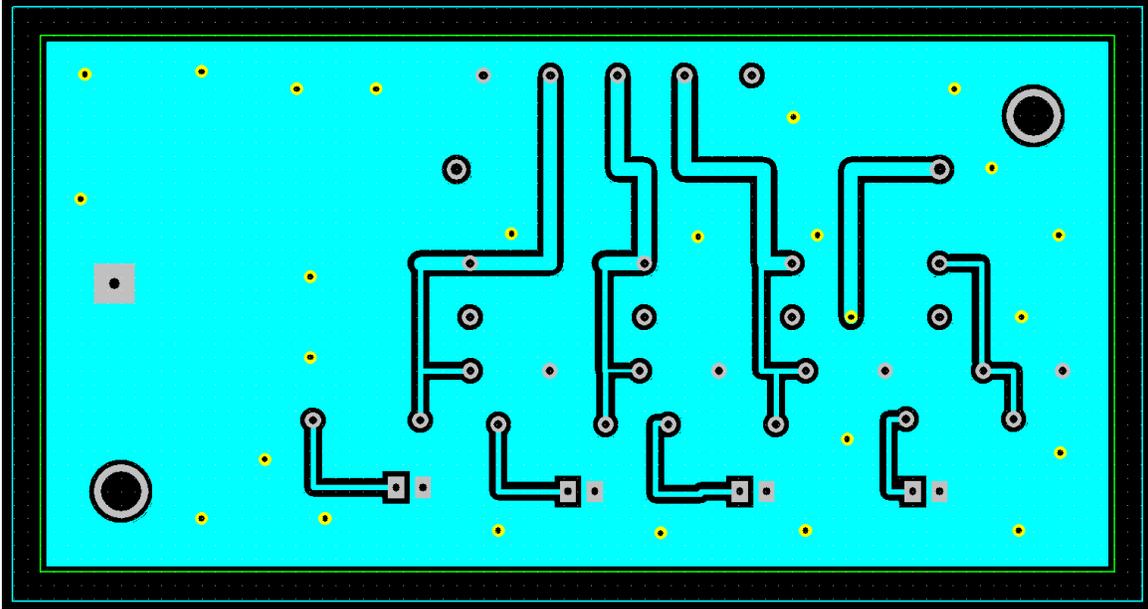


Figure 5 Bottom-Side of Controller

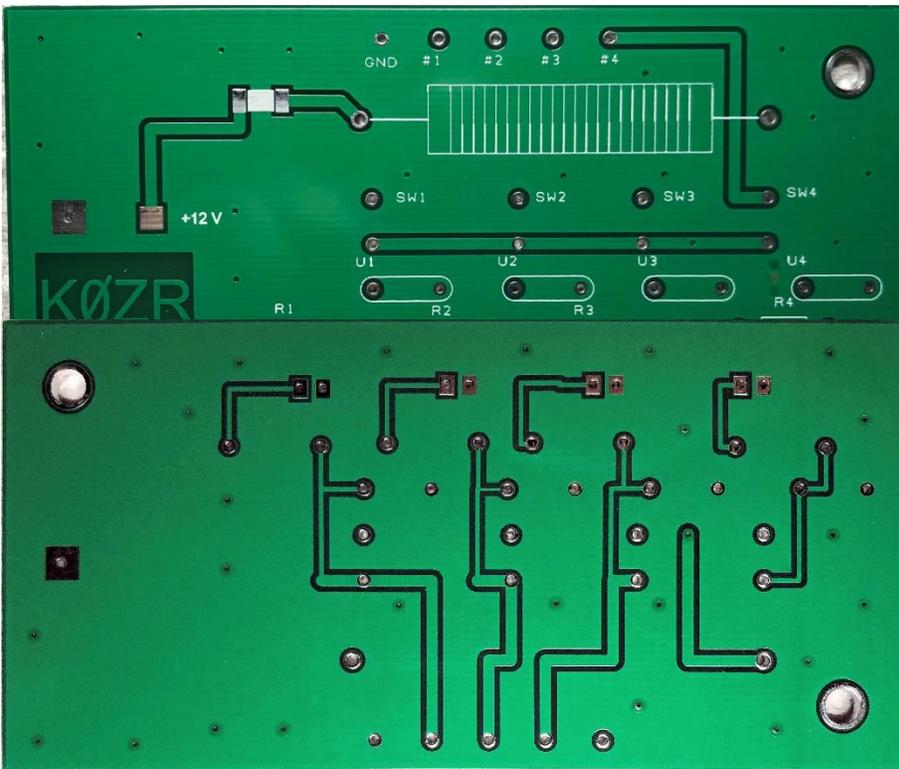


Figure 6 Top-Side Controller PCB

Figure 7 Bottom-Side Controller PCB



Figure 8 Assembled Controller

Figure 8 is the assembled controller. It uses the same 100 mH inductor to further isolate the incoming 12 VDC from RF which will be on the control lines. Only barely discernible are the LEDs which are mounted beneath each of the four switches.

### Relay RF Switch

The main part of the RF switch is the American Zettler 1 x 2 relay cited earlier. The very simple schematic is shown in Figure 9.

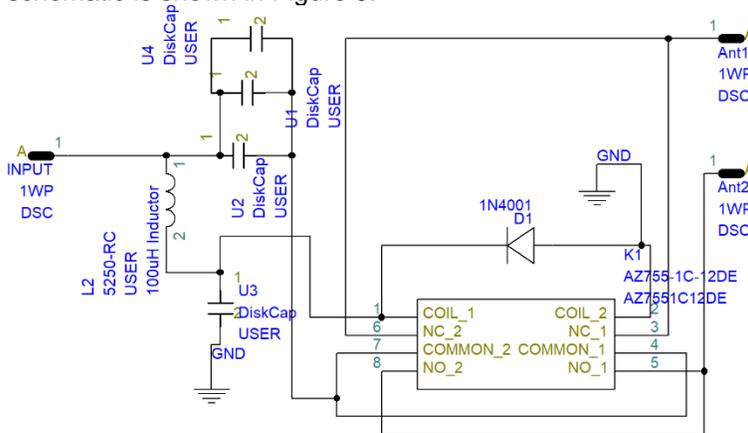


Figure 9 Schematic of Relay RF Switch

The schematic indicates three disk capacitors in use as blocking capacitors. As a matter of documentation, remote units #1, #2, and #3 use only two disc capacitors in parallel while #4 does use all three. The disc capacitor U3 is a 1 KV, 0.1 ufd as are the DC blocking capacitors. And as indicated, a flyback diode is used across the relay coil; a 1N4004 in the actual design build. This diode has a higher reverse breakdown voltage than a 1N4001.



Figure 10 Top-Side Relay Board

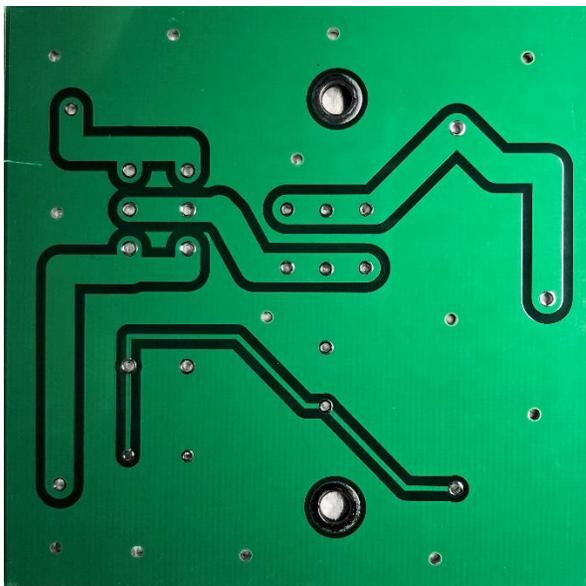


Figure 11 Bottom-Side Relay Board



**Figure 11 Assembled Relay Board RF Switch**

Shown to the left is the assembled remote relay/RF transfer switch. This is unit #4 since there are three DC blocking capacitors in use. The conductors used for RF ground and RF connectivity are actually copper solder-wick lengths. The PCB is mounted using 3/8 inch standoffs. Standard SO-239 female connectors are used for the input and two output ports. The weatherproof boxes are from Lowes and Home Depot.



**Figure 12 Four Remote RF Switch Units**

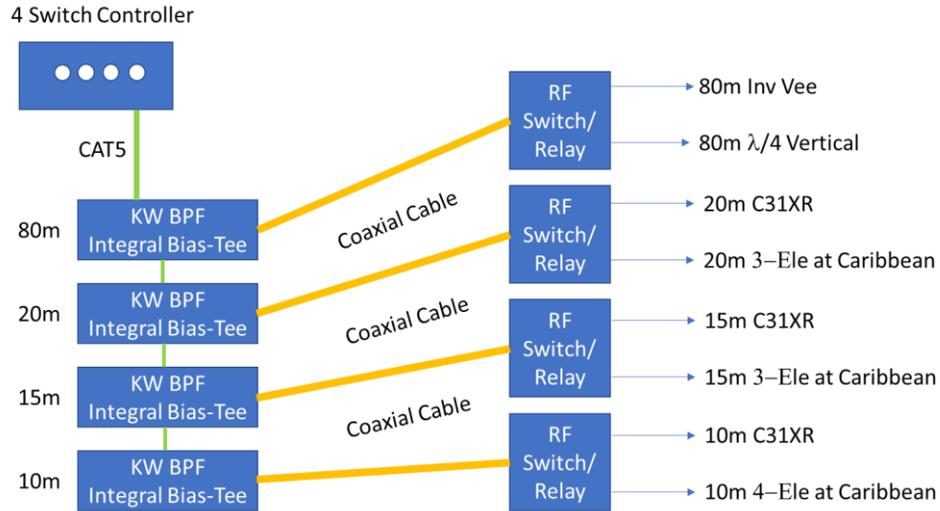


Figure 13 System Layout



Figure 14 Controller Activating All Four Alternate Antennas

**Operational Proof**

These four 1x2 switches have been in use since September 2020. The modes of operation are exclusively CW and RTTY. Generally, I do not exceed ~ 1,300 watts in either mode. These switches have weathered two CQWWs, two ARRL DX CWs, and a myriad of other contests. On the RTTY side the switches have seen several 24-hour contests and several other short duration events. To date there have been no anomalies of any kind.

**CW Weekend in No VA – John N3AM**



Friday night at The Italian Oven in McLean, VA: John N3AM, Don W4ZYT, Asa W5FB

**Want to Be a Referee at the next WRTC in Italy in July 2023?**

After having published the list of Team Leaders and Team Mates qualified at WRTC2022 it is now time for the referees.

A referee will be on site at each of the 65 competing stations to verify compliance with the rules and make decisions on any rule questions by the teams. Referees require excellent knowledge of CW, and SSB skills, as well as the ability to stay awake for the entire duration of the test (24 hours). Referees must know and apply the WRTC2022 rules when they are published.

If you want to participate in the next WRTC as a referee, find the online application [here](#) or visit [www.wrtc2022.it](http://www.wrtc2022.it) Competition --> Referees

- 1) fill in and submit your application form **and**
- 2) send an email to referees at [wrtc2022.it](mailto:wrtc2022.it) with your CV (max 1000 char) and a close-up photo (JPEG, GIF, BMP, PNG Max 500KB)

Please submit your application no later than 2359 UTC 10 July 2022

The selected referees will receive a further confirmation.

73 de WRTC2022 Organizing Committee

## Why I Went to Law School – Jim N3JT

Alright, I am an electrical engineer, degreed from the prestigious Moore School of Electrical Engineering at the University of Pennsylvania. I chose engineering because of my ham radio upbringing, and I certainly knew electronics from having built many amplifiers and set up multiple ham stations prior to college. Engineering school is not just electronics, however, as those who have engineering degrees know, but I managed the advanced math, physics and chemistry courses -- and secured employment with Western Union (which at the time provided secure color television and data links between the Joint Chiefs of Staff). But ultimately, largely because my employer closed its Philadelphia office), I finished my MBA studies and then (because there was a recession) went on for a law degree. I figured I was inherently more skilled in writing and legal analysis than in dealing with seriously complicated technical issues. I offer this background information only to show how right I was in shifting away from engineering. What I will relate here is not the only example I can offer on this theme, but it is the most recent!

I have had an Elecraft K4D for some months but did not really begin using it until a couple of weeks ago, mostly because my K3S and K3/0 provided me with the remote capability I need to use my Virginia directional antennas from Florida, and the K4D in Florida just wasn't as much fun with a vertical antenna. But on returning to Virginia for the summer I installed the K4D as the primary station transceiver, setting it up with the assistance of N3AM, who had had his K4D for some months and knew the desired settings for a CW operator.

Some days ago, I turned on the K4D to find the SWR on all 3 WARC bands near infinity. As I recall, the amplifier also reported a problem. But all the other bands were fine. The first thing I did was to check the delicate wiring on the back of my TopTen antenna switch. That clever box, designed by N3RD, decodes band data from the K4D and automatically switches antennas at the tower so that just one coaxial cable is needed. But its setup requires some challenging 16-pin carrier wiring and multiple jumpers and diodes on a 25-pin connector on the rear of the box. Historically I have had problems with the integrity of the latter wiring but recently I succeeded in making it virtually bomb-proof.

So was the JK-WARC antenna (30m, 17m, 12m) itself at fault, like from an open coax feedpoint, or was it something else? I climbed the ladder propped against the tower and opened the weather-proof box that houses the TopTen relays in order to measure resonance of the WARC antenna with an MFJ-259B analyzer. Resonances were good, so I knew the antenna was okay – a huge relief! I then relearned how the TopTen switch applies voltage to the relays at the tower and checked the voltage on the WARC antenna relay. It went from 15 volts to about 2 volts, which meant that the TopTen switch was working correctly. I was stumped after 3 hours of troubleshooting this problem. The only good news so far was that I didn't seem to have broken anything that had been working before, something I have been known to accomplish!

Back in the shack, I looked closely at the front panel of my K4D. N3AM and I had set the antenna choice to ANT1 for all bands. But I saw to my horror that on the WARC bands ANT2 was selected! There is no ANT2 connected to the K4D, and I definitely did

not change the setting from ANT1 for all 3 WARC bands! The moment I tapped ANT1 on the interactive screen on 30m the radio came to life with a low SWR reading. I did the same for the other two WARC bands. All was working correctly.

I should have checked the ANT setting at the outset because looking back it seems so obvious. Instead, I wasted 3 hours troubleshooting antenna and antenna switch systems. And this, ladies and gentlemen, proves why I was right to pursue law school instead of continuing on as an engineer!

*[Editor's note: Believe it or not, Jim has published several technical articles in QST and CQ magazines, so he is not without some technical skill despite having gone to law school!]*

### **New RBN Website Launches – Pete N4ZR via the ARRL Letter.**

At 0500 UTC (1 AM EDT) on Thursday, June 16, the Reverse Beacon Network (RBN) launched their updated [website](#). The intent of the revised website was to replace the original and beta websites and to include a Secure Sockets Layer (SSL) to enhance security for users of the site.

The RBN is a network of stations that listen to the bands and report what stations they hear, including when and how well. The website's database of past spots allows operators to instantly find what stations (from any given country or zone) have been heard, at what times, and on what frequencies. Operators can also see when they have been spotted, who spotted them, and how loud the contact was.

There is an option to compare your signal with those of friends and competitors, in near real time, or look at historical data of previous transmissions. If you wonder how your signal compared to others' during a previous contest, the website's Signal Comparison Tool will provide real, quantitative data. For an instant report, query what stations you want to compare, based on signals heard by a given reverse beacon on a certain band at a certain time.

In 2009, Pete Smith, N4ZR, and Felipe Ceglia, CT7ANO, worked to get the first version of RBN online. The work of Mark Glenn, K7MJG, on the website and Dave Pascoe, KM3T, on connecting the servers, contributed to RBN as a resource for listening and tracking signals. The new version is the first major upgrade for the site.

A guide to the website's new features is available on the [beta site](#), as well as on the new site under the 'about' tab.



**PVRC Site Sponsorships WRTC 2022 – Ted WA3AER**

The WRTC 2022 committee is soliciting funds for station sponsorship of the WRTC 2022 competition. PVRC will be collecting donations for station sponsorships. For the first time, the event organizers are allowing sponsors to designate specific teams for sponsorship on a first come basis. PVRC will be focusing on raising funds to sponsor our NA3 teams, which are composed of all PVRC members, first. Additional funds will go to sponsor additional teams.

The cost for each site/team sponsorship is \$1300.00. Our goal is to raise at least \$2600.00

Donations for sponsorships will begin on 1 August 2022 and conclude on 1 December 2022. All donations shall be made via PayPal to treasurer@pvrc.org. When you make your PayPal donation for site sponsorship, **please note** in the Merchant’s Comment area that your donation is for WRTC2022. If you do not do that, we will not know that your donation is for sponsoring our WRTC2022 teams.

Yes, we are aware that one of our NA-3 teams has already been sponsored/sniped by the Tennessee Group; but that does not stop us from sponsoring our other all-PVRC team (hopefully!) and others manned by PVRC members. If you have questions, please let me know.

**PVRC 6 Meter DXCC Standings – Frank W3LPL**

Below are the 6M DXCC totals for PVRC members, transcribed from the ARRL DXCC data as of the 20<sup>th</sup> of each month or so. Thanks to Frank for the data each month to make this a regular feature. Please report any omissions or errors to [Frank](#).

| Call  | DXCC | Call  | DXCC | Call  | DXCC |
|-------|------|-------|------|-------|------|
| W3BTX | 167  | KG7H  | 130  | W3XY  | 109  |
| W4DR  | 167  | AB3CV | 129  | W4PK  | 109  |
| K1HTV | 166  | W3KX  | 128  | K3KO  | 108  |
| AE3T  | 154  | WX4G  | 127  | W3DF  | 107  |
| W3LPL | 154  | K3SX  | 124  | N4VA  | 106  |
| W3UR  | 153  | NW5E  | 123  | W2YE  | 106  |
| N4MM  | 152  | N4TL  | 121  | K3ZO  | 103  |
| N4BAA | 142  | AK3E  | 120  | N3DB  | 103  |
| W3LL  | 136  | K3XA  | 119  | W3OR  | 103  |
| N2QT  | 135  | N4JQQ | 113  | N4PY  | 102  |
| K4SO  | 135  | K5VIP | 111  | W4FQT | 102  |
| K4CIA | 134  | W3EKT | 111  | K3WC  | 101  |
| K2PLF | 133  | N4DB  | 111  | W3XO  | 100  |
| K5EK  | 132  | K3AJ  | 110  | W4TJ  | 100  |
| K4SN  | 131  | W3IP  | 110  |       |      |

**Membership News – Tim N3QE**

Chapter leaders please remember to complete the [Meeting Attendance Report](#).  
Members can check and update their roster details via the [Roster Lookup](#).

**Upcoming Contests – from [WA7BNM](#)**

| July 2022                        |  |
|----------------------------------|--|
| + RAC Canada Day Contest         | 0000Z-2359Z, Jul 1                           |
| + NZART Memorial Contest         | 0800Z-1100Z, Jul 2 and<br>0800Z-1100Z, Jul 3 |
| + DL-DX RTTY Contest             | <b>Cancelled for 2022</b>                    |
| + IARU HF World Championship     | 1200Z, Jul 9 to 1200Z, Jul 10                |
| + North American QSO Party, RTTY | 1800Z, Jul 16 to 0559Z, Jul 17               |
| + CQ Worldwide VHF Contest       | 1800Z, Jul 16 to 2100Z, Jul 17               |

**Editor’s Last Word – John K3TN**

Thanks to Doug AA3S, Jeff K0ZR, John N3AM, Jim N3JT, Ted WA3AER and Frank W3LPL for contributions to this issue of the PVRC newsletter.

I know it is not really a contest, but Field Day has always been one of my favorite “operating events.” Various issues kept me housebound this year, so I powered up the portable generator and did a 1E effort. I like the new 100w max rule – the sheer volume of stations that get on the air and the domestic nature of contest make amps unnecessary.

Field Day is probably the biggest entry point for new contesters and for phone and digital ops to give CW a try. We all have our stories of sloppy operating in FD on CW (took me several tries to realize the W8 sending “ZZ” for section was sending MI twice, and I’m still not sure about those two Class H stations I worked...) but we all went through that when we first tried contesting.

Many PVRCers who are also members of more general-purpose ham clubs did their operating with those clubs – a great way for PVRC to help fill the contesting op pipeline.

The quality and usefulness of the PVRC newsletter depends on contributions from members. If you have photos from club meetings, screen shots of new contest software, or brief writeups on station improvements or contest war stories, send them in any format to [jpescatore at aol dot com](mailto:jpescatore@aol.com).

The newsletter takes August off - see you in September!

## From the PVRC Treasurer – Ted WA3AER

PVRC has chosen not to implement an annual dues requirement. We depend on the generosity of all our club members to finance our annual budget. In addition, active PVRC members are expected to participate and submit logs for at least two PVRC Club Competition contests per year.

When contemplating your donation to PVRC, each member should consider the benefit you are receiving from PVRC and its many opportunities for your personal growth in our wonderful hobby, then donate accordingly.

Direct donations to PVRC via Credit Card or PayPal may be made by clicking this "Donate" button and clicking the next Donate button that appears on your screen:



**Donations to PVRC are not tax deductible**

## Eyeball QSO Directions

The latest info on local club meetings and get togethers will always be sent out on the [PVRC reflector](#) and posted on the PVRC [web site](#).



**Green: ARRL VHF Circle**  
175 mile radius  
Around 38.075N,  
78.171W

**Red: ARRL HF Circle**  
175 mile radius  
Around 37.43168N,  
77.858482W

**Blue: CQ HF Circle**  
250 mile radius  
Around 37.43168N,  
77.858482W



**Now a Word From Our Sponsors**

*PVRC doesn't ask for dues, but the Club does have expenses. You can also support the Club by buying from the firms listed who advertise in the newsletter!*



**Your source for DX News!**

Get a free two week trial of The Daily DX and The Weekly DX by sending a request to [bernie@dailydx.com](mailto:bernie@dailydx.com).

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Phone: 410-489-651



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- Great circle maps

---

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---

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- Amphenol RF connectors






# Get Ready for SOTA, POTA, YOTA, and 13 Colonies!

## Coaxial Cable Assemblies

These low-loss cable assemblies are available in standard lengths with DX Engineering's revolutionary patented PL-259 connector. Use the online Custom Cable Builder at [DXEngineering.com](http://DXEngineering.com) to build assemblies made to your exact specs. DX Engineering's coaxial cable is also available by the foot or in bulk spools. Enter "DXE Assemblies" at [DXEngineering.com](http://DXEngineering.com).



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## Wire Antennas

If you're looking for the precise wire antenna to meet your operating needs, you'll find it at DX Engineering! Our lineup includes DX Engineering's own rugged and lightweight Multi-Band Dipole Antenna Kits that come with wire elements, ladder feedline, center-T support, and end insulators; 47 models of Kelemen Trap Dipole Antennas; Par End-Fedz® End-Fed Half-Wave Antennas; and Chameleon wire antennas, including MPAS Backpack Antenna Systems. Enter "Wire Antenna" at [DXEngineering.com](http://DXEngineering.com) for more details, manufacturers, and models.



## Headsets and Headphones

DX Engineering carries a great selection of hands-free headsets and state-of-the-art headphones from bhi, Heil, INRAD and other top brands. Don't accept anything less than clear, intelligible speech fidelity whether you're doing the speaking or listening. Enter "Audio" at [DXEngineering.com](http://DXEngineering.com).



ICO-LC-192



ICO-AH-705



ICOM IC-705

## IC-705 HF/50/144/430 Portable Transceiver

With the features and functionality of the IC-7300, IC-7610, and IC-9700, this popular Icom QRP rig is like owning a base transceiver you can hold in one hand. It boasts SDR Direct Sampling technology for stellar transmit and receive performance; 4.3" color touchscreen; real-time spectrum scope and waterfall display; built-in Bluetooth®; wireless LAN; and full D-STAR capabilities. IC-705 accessories include backpack (ICO-LC-192) and compact automatic tuner (ICO-AH-705). Enter "IC-705" at [DXEngineering.com](http://DXEngineering.com).

## Premier Telescoping Carbon Fiber Masts



When you demand superior long-lasting performance, these high-strength masts make an excellent choice for portable and temporary antenna supports. Lighter than aluminum and fiberglass and stiffer than steel of the same thickness, these masts feature short section lengths designed for low-cost shipping and easy transport. UV- and corrosion-resistant, they include adjustable lever-action clamps that secure the next smaller tube in place and allow for fast and simple raising and lowering. Enter "DXE Carbon Fiber" at [DXEngineering.com](http://DXEngineering.com).



|               |   |          |
|---------------|---|----------|
| DXE-TCFP-24   | 24' Mast, 4 Clamps, 5 Sections, Collapses to 69" ...              | \$299.99 |
| DXE-TCFP-33   | 33' Mast, 6 Clamps, 7 Sections, Collapses to 69" ...              | \$469.99 |
| DXE-TCFP-33HD | Heavy-Duty 33' Mast, 6 Clamps, 7 Sections, Collapses to 69" ..... | \$599.99 |
| DXE-TCFP-49   | 49' Mast, 9 Clamps, 10 Sections, Collapses to 81" .....           | \$849.99 |

## AlexLoop

### AlexLoop HamPack Portable Magnetic Loop Antenna System

PY1AHD, Alexandre Grimberg brings more than five decades of Amateur Radio experience to the new AlexLoop HamPack, the ultimate magnetic loop antenna solution for portable operating. The HamPack comes with the widely acclaimed transceiver QRP 40-10M AlexLoop antenna; reinforced, full-size backpack that accommodates the antenna, accessories, and any size QRP rig; and upgraded, easy-to-use tuner. Enter "AlexLoop" at [DXEngineering.com](http://DXEngineering.com).



Tripod not included



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# ELECRAFT K4

## High-Performance Direct-Sampling SDR



### A direct-sampling SDR you'll love to use

Our new K4 transceiver harnesses advanced signal processing while retaining the best aspects of the K3S and P3. It features a 7" touch display, plus a rich set of dedicated controls. Per-VFO transmit metering makes split mode foolproof. Band-stacking registers and per-receiver settings are versatile and intuitive. Control usage information is just one tap away thanks to a built-in help system.

### Modular, hybrid architecture adapts to your needs

The basic K4 covers 160-6 m, with dual receive on the same or different bands. The K4D adds diversity receive, with a full set of band-pass filters for the second receiver. (Thanks to direct RF sampling, there's no need for crystal filters in either the K4 or K4D.) The K4HD adds a dual superhet module for extreme-signal environments. Any K4 model can be upgraded to the next level, and future enhancements—such as a planned internal VHF/UHF module—can be added as needed.

### Single or dual panadapter, plus a high-resolution tuning aid

The main panadapter can be set up as single or dual. Separate from the main panadapter is our per-receiver *mini-pan* tuning aid, with a resampled bandwidth as narrow as +/- 1 kHz. You can turn it on by tapping either receiver's S-meter or by tapping on a signal of interest, then easily auto-spot or fine tune to the signal.

### Comprehensive I/O, plus full remote control

The K4's rear panel includes all the analog and digital I/O you'll ever need. All K-line accessories are supported, including amps, ATUs, and our K-Pod controller. The USB display output supports its own user-specified format. Via Ethernet, the K4 can be 100% remote controlled from a PC, notebook, tablet, or even another K4, with panadapter data included in all remote displays. Work the world from anywhere—in style!

### K4 KEY FEATURES

Optimized for ease of use

Modular, upgradeable design

7" color screen with touch and mouse control

ATU with 10:1+ range, 3 antenna jacks

Up to 5 receive antenna sources

Full remote control via Ethernet



The K4 interfaces seamlessly with the KPA500 and KPA1500 amplifiers

*'The performance of their products is only eclipsed by their service and support. Truly amazing!'* Joe - W1GO

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### FTDX101MP | 200W HF/50MHz Transceiver

- Hybrid SDR Configuration • Unparalleled 70 dB Max. Attenuation VC-Tune • New Generation Scope Display 3DSS • ABI (Active Band Indicator) & MPVD (Multi-Purpose VFO Outer Dial) • PC Remote Control Software to Expand the Operating Range • Includes External Power With Matching Front Speaker



### FTDX10 | HF/50MHz 100 W SDR Transceiver

- Narrow Band and Direct Sampling SDR • Down Conversion, 9MHz IF Roofing Filters Produce Excellent Shape Factor • 5" Full-Color Touch Panel w/3D Spectrum Stream • High Speed Auto Antenna Tuner • Microphone Amplifier w/3-Stage Parametric Equalizer • Remote Operation w/optional LAN Unit (SCU-LAN10)



### FT-991A | HF/VHF/UHF All Mode Transceiver

- Real-time Spectrum Scope with Automatic Scope Control • Multi-color waterfall display • State of the art 32-bit Digital Signal Processing System • 3kHz Roofing Filter for enhanced performance • 3.5 Inch Full Color TFT USB Capable • Internal Automatic Antenna Tuner • High Accuracy TCXO



### FTDX101D | HF + 6M Transceiver

- Narrow Band SDR & Direct Sampling SDR • Crystal Roofing Filters Phenomenal Multi-Signal Receiving Characteristics • Unparalleled -70dB Maximum Attenuation VC-Tune • 15 Separate (HAM 10 + GEN 5) Powerful Band Pass Filters • New Generation Scope Displays 3-Dimensional Spectrum Stream



### FT-891 | HF+50 MHz All Mode Mobile Transceiver

- Rugged Construction in an Ultra Compact Body • Stable 100 Watt Output with Efficient Dual Internal Fans • 32-Bit IF DSP Provides Effective and Optimized QRM Rejection • Large Dot Matrix LCD Display with Quick Spectrum Scope • USB Port Allows Connection to a PC with a Single Cable • CAT Control, PTT/RTTY Control



### FTM-300DR | C4FM/FM 144/430MHz Dual Band

- 50W Reliable Output Power • Real Dual Band Operation (V+V, U+U, V+U, U+V) • 2-inch High-Res Full Color TFT Display • Band Scope • Built-in Bluetooth • WIRELESS-X Portable Digital Node/Fixed Node with HRI-200



### FT-2980R | Heavy-Duty 80W 2M FM Transceiver

- Massive heatsink guarantees 80 watts of solid RF power • Loud 3 watts of audio output for noisy environments • Large 6 digit backlit LCD display for excellent visibility • 200 memory channels for serious users



### FT-818ND | HF/6M/2M/440 All Mode Portable Xcvr

- Ultra-Compact/Portable • Multi-Color Easy to See LCD • 208 Memory Channels/10 Memory Groups • Built-in Electronic Keyer • Internal Battery Operation Capability • Two Antenna Connectors • Built-in High Stability Oscillator ±0.5 ppm



### FTM-400XD | 2M/440 Mobile

- Color display-green, blue, orange, purple, gray • GPS/APRS • Packet 1200/9600 bd ready • Spectrum scope • Bluetooth • MicroSD slot • 500 memory per band

### FT-70DR C4FM/FM 144/430MHz Xcvr

- System Fusion Compatible • Large Front Speaker delivers 700 mW of Loud Audio Output • Automatic Mode Select detects C4FM or FM Analog and Switches Accordingly • Huge 1,105 Channel Memory Capacity • External DC Jack for DC Supply and Battery Charging



### FT-5DR C4FM/FM 144/430 MHz Dual Band

- High-Res Full-Color Touch Screen TFT LCD Display • Easy Hands-Free Operation w/Built-In Bluetooth® Unit • Built-In High Precision GPS Antenna • 1200/9600bps APRS Data Communications • Supports Simultaneous C4FM Digital • Micro SD Card Slot



### FT-65R | 144/430 MHz Transceiver

- Compact Commercial Grade Rugged Design • Large Front Speaker Delivers 1W of Powerful Clear Audio • 5 Watts of Reliable RF Power Within a compact Body • 3.5-Hour Rapid Charger Included • Large White LED Flashlight, Alarm and Quick Home Channel Access



### FTM-6000R | 50W VHF/UHF Mobile Transceiver

- All New User Operating Interface-E20-III (Easy to Operate-III) • Robust Speaker Delivers 3W of Clear, Crisp Receive Audio • Detachable Front Panel Can Be Mounted in Multiple Positions • Supports Optional Bluetooth® Wireless Operation Using the SSM-BT10 or a Commercially Available Bluetooth® Headset



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