Youth on the Air

Activities for the Next Generation of
Amateur Radio Operators in the Americas

# Youth on the Air (YOTA) Region 2 Camp Handbook 2021

**Updated June 27, 2021**

**Things to do before camp:**

- ❏ Register for D-STAR
- ❏ Return all 5 forms completed with signatures
- ❏ Read the kit build instructions (click the link to access)
- ❏ Download and install the Telegram messaging app and the Google Drive app to your phone, if you have one
- ❏ If outside of the USA or Canada, bring your IARP or CEPT documentation
- ❏ Have proof of vaccination, or natural immunity from having COVID-19 in the past 6 months, or a negative COVID-19 test (less than 72 hours prior to arrival)

**Who:** Youth with a current amateur radio license ages 15-25 who are residents of North, Central, and South America (IARU Region 2)

* Applicants within 1-2 years of the age range will be considered upon recommendation

30 campers
5-6 full week staff members (1:5 ratio of adults to campers or lower)
2-3 parent volunteers
Several daily volunteers from area amateur radio clubs

**What:** A week long camp for young hams to meet other young hams, participate in unique experiences with radio related technologies that may not otherwise be viable, and build relationships with mentors and peers.

**When:** July 11-16, 2021 (postponed from 2020)

**Where**: National Voice of America Museum of Broadcasting, 8070 Tylersville Road, West Chester, OH 45069 (North Cincinnati)

Google Maps: https://g.page/VOA-Museum?share

Exit I-75 at Tylersville Road. Proceed 1 mile east of I-75. The museum is on the north side of the road. See our web page for an interactive map.
**NOTE:** If you are using GPS, you will get a much more exact location if you enter Crosley Blvd as the street address. It's the front driveway of the museum.
APRS: WC8VOA-N Grid: EM79TI75FI Lat/Lon: 39°21.34' N 84°21.39' W

Talk-in Repeater: 145.390 -600 no tone needed

**Why:** Our goal is to serve already licensed hams to enrich their amateur radio experience, add to and refine their skills, and to provide mentoring possibilities.

**Cost:** $100 per camper, plus transportation to and from Cincinnati, OH (CVG or drive to West Chester, OH), related expenses (see "other expenses" below). If you can not afford the fee or trip, you can apply for a scholarship to assist with the costs.

**Transportation:** Campers are responsible for their own transportation to and from Cincinnati, OH (CVG or drive to West Chester, OH). We will have a shuttle van run from the Cincinnati airport (CVG) to the museum once on Sunday, July 11 at 12:30 pm, and from the hotel to CVG once on Friday, July 16 at 2:30 pm. Upon arrival, you should either plan to stay in the airport until the shuttle arrives on Sunday, or get your own ride to the hotel. Similarly, you may need to stay later at the airport on Friday until your flight leaves, or get your own ride.

Dayton (DAY) airport is about the same distance to the museum as CVG, but may be more expensive and have fewer flight options and times.

Once you are at the hotel on Sunday, we will provide all transportation needs until Friday afternoon. Due to liability and insurance concerns, licensed transportation services (the hotel shuttle bus and a school bus) will be used to transport campers to and from locations designated on the camp schedule.

If you need assistance with travel, contact Marty, NN1C, our travel coordinator at travel@youthontheair.org. Requests for partial travel assistance outside of the USA and Canada can be made directly to the IARU Region 2 Organization.

**Lodging:** Lodging will be at the Holiday Inn Express, 7750 Liberty Field Drive, West Chester, Ohio 45069, which is across the street from the Voice of America campus. Campers will be placed 2 to a room, and separated by gender and age group. Campers may request a particular roommate. Parents of minors who volunteer to come along to assist with supervision may be placed with their child. Single occupancy for a camper is optional, and requires an additional payment of $250. Portable HF stations, both live and remote, will be available at the hotel for operation.

Camp staff rooms will be single occupancy unless otherwise requested. Camp staff will not be required to pay fees. Staff may receive financial assistance for travel if needed.

**Meals:** All meals from Sunday evening through Friday lunch will be provided. Participants with dietary restrictions or allergies must alert the staff in advance so that proper provisions can be made.

**T-Shirt:** All participants will receive several ham radio T-shirts, including an official camp T-shirt.

**Other expenses:** Meals, lodging, admission fees, and local transportation are provided by the camp. Souvenirs or any other purchases, outside of all meals and the provided snacks at the museum, will be the responsibility of the camper.

**Alcohol:** Alcohol is not allowed at camp functions.

**Forms:** Required forms will include code of conduct, emergency medical authorization, waiver of liability, photo/video consent, and transportation consent. **ALL staff members and volunteers working with campers will also need a background check and Youth Protection Training, which is provided by the camp.**

**Planned Activities (subject to change):**
Tour of Voice of America Museum of Broadcasting
Introduction to YOTA and Special Event Stations
Kit Building
Contesting Workshop
Eyeball Sprint Contest
Special Event Station W8Y Operating
D-STAR Workshop
APRS Workshop
High Altitude Balloon Launch
FM Contests at nearby Kings Island Amusement Park
Foxoring Competition (combination of Direction Finding and Orienteering) at the VOA Park
Satellite Operations Workshop
International Space Station Contact (ARISS)
Antenna Building Workshop/Contest

**Planned Social Activities (subject to change):**
An evening at Dave & Buster's with a buffet, unlimited video game play, and limited arcade play
Kings Island Amusement Park (with meal plan)
Pizza & Pool Party
Dinners from Cincinnati themed restaurants

**Special Event Station:** W8Y will be the callsign of the special event station. As many as 5 operating positions will be available for use at the museum throughout the week. The stations can be used between sessions, as well as a few dedicated time slots. There will also be a station available to campers at the hotel. We also plan a second station via remote from the museum to the hotel. HF rigs will be the IC-7610 at some operating positions. VHF/UHF will consist of an IC-9700 at each location. IC-705s will be used for D-STAR and Satellite Ops. ICOM HTs will be assigned to each camper for the week.

**Sponsors:** Youth on the Air Camp 2021 will be operated by Electronic Applications Radio Service, Inc. (EARS - W9EAR), a 501(c)(3) Indiana not-for-profit educational amateur radio organization. The camp is hosted by the National Voice of America Museum of Broadcasting, West Chester Township (Butler County, Ohio) and the West Chester Amateur Radio Association (WC8VOA).

**Equipment Sponsors:** All radio equipment for the camp will be provided by gracious donations from ICOM America, Heil Sound, X-Tronic, and R&L Electronics. The IC-7610 will be the radio used at some HF operating positions. Satellite operations will be on an IC-9700 and ICOM HTs. The FM contests will be using the ICOM HTs. Heil Sound will provide headsets, microphones, and headphones. X-Tronic is donating temperature controlled soldering stations. Nearby R&L Electronics will provide accessories, feed lines, and other last minute needs.

**Financial Sponsors:** At the present time, major financial support to make this camp possible and affordable is coming from: the Yasme Foundation, the World Wide Radio Operators Foundation, Orlando Hamcation and Orlando Amateur Radio Club (OARC), the Northern California DX Foundation (NCDXF), Dayton Hamvention and Dayton Amateur Radio Association (DARA), the Huntsville Hamfest, the ARRL Foundation, Southwest Ohio DX Association (SWODXA), Radio Amateurs of Canada, Steve McGrane, KM9G, and Gary West, K8DEV & Dee Dee West, KA8DXE. The remainder of the funding is from hams across the world that believe in our cause.

**Things you should bring:** A swimsuit (for the water park at Kings Island and the pool party at the hotel), sunscreen, maybe a beach towel, a laptop, comfortable clothes (NOTE: you will be getting several T-shirts to wear from the sponsors upon arrival!), running/walking shoes (especially for the transmitter hunt on Thursday), toiletries, necessary medications, a notebook and writing utensils, and a bag or backpack. Campers should bring their own laptop computer or tablet if possible, with access to Google Drive. HTs will be provided for use by ICOM America.

We will have plenty of ham gear, but you can bring your own if you wish. If you are flying, keep in mind that TSA may be an issue. If you have your own HF setup, please keep in mind that the camp provided stations may receive co-site interference from your station.

**Things you shouldn't bring:** Firearms, illegal drugs, alcohol, weapons, bed sheets, bath towels, and bad attitudes.

**Communications During Camp:** For transparency and safety, all communications between campers or between campers and staff should be conducted on the camp simplex frequency (147.550 tone 123.0) or the YOTA Camp Telegram channel. (The YOTA Discord channel will be available AFTER camp is over.)

**YouTube Coverage:** The opening and closing ceremonies and the Space Station contact will be streamed live on the Youth on the Air YouTube Channel**.** A short, recorded highlight video will be posted on YouTube each day. Impromptu live streams may also appear throughout the week.

**What is YOTA?:** This camp is heavily modeled after the Youngsters on the Air camp that has been held since 2011 in IARU Region 1 (Europe/Middle East/Africa/Northern Asia). Two of our committee members, Sterling Mann, N0SSC and Sam Rose, KC2LRC, attended the Region 1 camp in Austria in 2016 with the intent to learn about the camp in an effort to replicate it in the US. We will be working with the YOTA Region 1 organizers to coordinate our efforts, but also realize some changes will need to be made due to cultural and legal differences.

Our committee has already arranged for the workshop leaders, most of whom are also campers or under the age of 30. We have both male and female chaperones for minors.

YouthOnTheAir.org is our official website, and we have social media accounts (yotaregion2) on Facebook, Twitter, Instagram, and YouTube. We will post daily highlight videos from the camp, and have a live TV appearance in the middle of the week. The “official” hashtag is #YOTAR2.

Questions? Contact Neil Rapp, WB9VPG at director@youthontheair.org.

YOTA Region 2 Camp Committee:

Neil Rapp, WB9VPG, Director (wb9vpg@youthontheair.org)
Jocelyn Brault, KD8VRX (kd8vrx@youthontheair.org)
Sterling Mann, N0SSC (n0ssc@youthontheair.org)
Sam Rose, KC2LRC (kc2lrc@youthontheair.org)

Youth on the Air Camp 2021 is now an IARU Region 2 Organization supported activity.

**Foreign license info**

**If your license is issued in:**

Argentina, Bolivia, Brazil, Canada[1], Chile, El Salvador, Guatemala, Haiti, Mexico, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela. (IARP)

Or

Participating for France: Corsica, Guadeloupe, French Guyana, Martinique, St. Bartholomew, St. Pierre and Miquelon, St. Martin, Reunion and its Dependencies, Mayotte, French Antarctica, French Polynesia and Clipperton, New Caledonia, and Wallis and Futuna (CEPT)

You can operate independently as W8/yourcallsign while in the USA. No application is necessary. Just bring IARP or CEPT documentation with you.

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**If your license is issued in a country on this list:**
http://www.arrl.org/reciprocal-permit

You can operate independently as W8/yourcallsign while in the USA. No application is necessary. Just carry your license and proof of citizenship with you.

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**If your license is issued in a country not on either of the two above options**, you will have to take a US license exam in order to operate independently. You can operate W8Y with a control operator present.

http://www.arrl.org/foreign-licenses-operating-in-u-s

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**For all of the above,** when using the W8Y callsign, once an hour the station must be identified as W8Y/WB9VPG.

# CODE OF CONDUCT

Camp Faculty, Adult Staff, & Campers
Youth on the Air

The following guidelines are designed to make your experience at Youth on the Air Camp satisfying to you and to all others attending. The individual rights, safety and property of others must be respected.

**1. Respect the rights and property of others**.

- Do not touch other camper's belongings without checking first.
- Disrespectful and/or abusive language will not be a part of camp
- Do not damage or deface camp facilities or property.
- Rudeness, lack of courtesy, and disrespect for authority will not be tolerated.
- Fighting and threatening physical abuse is not acceptable behavior.
- Boys are not allowed in the girls' rooms; Girls are not allowed in the boys' rooms
- All clothing worn shall be within the bounds of decency.
- Do not take inappropriate pictures/video/audio of others or yourself
- Do not post inappropriate pictures/video/audio to social media

**2. Be concerned for the safety of campers and staff.**

- Campers under 18 cannot leave the directed areas on the camp schedule without an adult and must have the Camp Director's or staff's permission.
- Campers under 18 must have a chaperone, and should not be 1 on 1 with camp staff at any time.
- Campers should be with at least one other camper at all activities

**3. YOTA Camp is a fun experience and everyone is to participate in the planned activities.**

- Be on time and ready to participate.
- Don't spend excessive time on your phone unless part of the activity itself
- If ill, report to the camp staff.
- Be a positive team member for your group.
- "Lights Out" means quiet and in bed.
- Everyone must check in/out with the Camp Director or Staff if leaving or coming into camp is necessary.

**4. The following items and activities are not allowed** at the VOA Museum and the camp hotel: alcoholic beverages, knives, firearms, fireworks, illegal drugs, matches, and tobacco. Exception: adults may smoke in designated areas only.

Gambling or betting with money, over-display of affection between anyone, fighting, threatening/physical abuse, stealing, tampering with emergency equipment, and being under the

influence of drugs are NOT allowed at camp.  Those over 21 are not to provide alcohol to minors in any case, and alcohol is not permitted at any and all camp functions due to liability concerns.

Boys are not allowed in the girls' rooms; Girls are not allowed in the boys' rooms.

Campers, teen counselors and adult staff having or doing anything in section 4 will be sent home at the first infraction and at their own expense.

**CONSEQUENCES:** The following steps will be followed if a camper or adult staff member does not abide by the rules (except for section 4, which is immediate dismissal)

*1st Infraction:* Discuss the inappropriate behavior with an adult staff member and clarify the rule.

2nd Infraction: Camp Director or staff will discuss the inappropriate behavior and give a "time out" or appropriate consequence. Camper's appropriate attitude and/or behavior will be discussed.

*3rd Infraction or Any Behavior Listed in Rule # 4:* Camp Director or staff will request the parent to pick up the camper and take him/her home at their expense and camp fee will not be refunded. Adult Staff members will be asked to leave camp immediately. Additional consequences may include: releasing the individual to the nearest law enforcement agency, assessing the cost of damages and repairs in the event of destruction of property, and barring the individual from future YOTA activities. Parents will be notified of any action taken.

**COVID-19 Guidelines**

*All campers and volunteers will be asked to show **proof** of 1) vaccination, 2) natural immunity due to having COVID-19 in the past 6 months, or 3) a negative COVID-19 test result (no older than 72 hours prior to arrival) upon camp check in (July 11).*

*If you need a test after you arrive, 4 health care facilities (University of Cincinnati Health West Chester Hospital, The Christ Hospital Medical Center Liberty, Cincinnati Children's Liberty, and Tri-Health Liberty) are within a mile of the camp hotel and the museum. Tests are also available at CVS, Kroger, and Walgreens pharmacies. See this link for a complete list of testing sites in Butler County, Ohio.*

*All camp staff have been fully vaccinated.*

Due to the rapid fluctuation of safety guidelines concerning COVID-19, masking and distancing expectations will be communicated near the start of camp. Ohio and CDC guidelines for summer camps will be followed.

As of May 28, everyone who has been fully vaccinated will not be required to wear masks or maintain social distancing. Non-vaccinated campers and volunteers will be required to wear masks while indoors, and outdoors only when social distancing is not possible. Social distancing will be at a minimum of 3 feet within small groups, and 6 feet between the entire camp population.

Dear Parents and Campers,

The CDC would like us to share information with you.

First and foremost, we hope that you and your loved ones are safe and healthy. We have received questions from parents about if and how COVID-19 will affect Youth on the Air Camp. We know this pandemic has been stressful to many and recognize that socializing and interacting with peers can be a healthy way for children to cope with stress and connect with others, particularly after spending quite a bit of time at home. After careful thought and planning, we are excited to let you know that we plan to host camp while following CDC considerations to protect campers, families, and our community.

The health and safety of our campers and staff remain our highest priority. Below, you will find a summary of actions we are taking to help ensure we are lowering COVID-19 risk as much as possible. We are:

- Intensifying cleaning and disinfection practices within our facilities and premises by cleaning and disinfecting frequently touched surfaces, cleaning and disinfecting objects if they are shared (e.g., tools, radio controls), cleaning and disinfecting transport vehicles, and ensuring safe and correct use and storage of disinfectants.
- Keeping campers in small groups of 8 or less and spacing them out at least 6 feet from each other when outside their small group, and at least 3 feet when working within their small group when 6 feet is not otherwise possible. **Vaccinated campers will be exempt according to the CDC guidelines for summer camps effective on May 28.**
- Limiting the number of items that are shared or touched between campers and staff by providing individual supplies to each camper, keeping a camper's belongings separated from others, and using disposable utensils and dishes and pre-packaged boxes or bags when food is provided.
- Promoting healthy hygiene practices including washing their hands with soap and water for at least 20 seconds, monitoring campers to make sure they are washing their hands, providing campers with hand sanitizer with at least 60% alcohol when they don't have easy access to soap and water, encouraging children to cover their coughs and sneezes with a tissue or to use the inside of their elbow, and posting signs about these healthy habits around the camp facility.
- Requesting that unvaccinated campers wear a cloth face covering when indoors, and outdoors only during times when physical distancing is difficult. As a reminder, cloth face coverings should not be placed on children younger than 2 years of age or on anyone who has trouble breathing or is unconscious, incapacitated or otherwise unable to remove the cover without assistance. Masks should also not be worn during swimming. **Vaccinated campers will be exempt from wearing masks except in large crowds and where required by local regulation, according to the CDC guidelines for summer camps effective on May 28.**

- If a child does get sick at camp, we have identified an area where they can rest, be watched after, and safely isolate from others. We will communicate with parents or caretakers directly and, if necessary, arrange for the child to be taken to a healthcare facility for care.

We ask that you help us protect the health of campers this summer. Anyone who is sick or was sick with COVID-19 or recently in contact with someone with COVID-19 in the last 14 days— including staff, campers, and families— should not come to camp. Be on the lookout for symptoms of COVID-19, which include fever, cough, shortness of breath, chills, muscle pain, sore throat, and loss of taste or smell. Call your doctor if you think you or a family member is sick.

Unvaccinated participants will be checked with an IR thermometer and asked about possible symptoms daily while camp is in session. Vaccinated participants are exempt from the daily health screenings.

**We will ask to see proof of vaccination, natural immunity (by having and recovering from COVID-19 within the past 6 months), or a negative COVID-19 test result at check in (July 11).** The COVID-19 test can not be more than 72 hours old.

If you need a test after you arrive, 4 health care facilities (University of Cincinnati Health West Chester Hospital, The Christ Hospital Medical Center Liberty, Cincinnati Children's Liberty, and Tri-Health Liberty) are within a mile of the camp hotel and the museum. Tests are also available at CVS, Kroger, and Walgreens pharmacies. See this link for a complete list of testing sites in Butler County, Ohio.

If you have a specific question about this plan or COVID-19, please contact cam director Neil Rapp, WB9VPG at director@youthontheair.org for more information. You can also find more information about COVID-19 at www.cdc.gov/coronavirus or on CDC's website for youth and summer camps (https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/summer-camps.html).

We look forward to seeing you.

Thank you and stay healthy,

Neil Rapp, WB9VPG
YOTA Americas 2021 Camp Director

# Schedules

**Sunday, July 11, 2021**

When you arrive, check into the hotel and move into your room. Then, take the hotel's free shuttle bus to the museum anytime after 12:45 pm. Just ask for the shuttle to the museum at the hotel front desk. When you arrive at the museum, check in at the YOTA table and get your name badge and bag of goodies. You can then tour the museum until orientation begins at 4:00 pm.

| | |
|---|---|
| 12:30 pm | Airport shuttle bus picks up at Delta terminal for those flying into CVG |
| 1:00 pm | Museum opens for tours |
| | Check in begins and continues until 4:00 pm |
| 1:30 pm | Shuttle bus from airport arrives at hotel |
| 4:00 pm | Museum closes, check in ends |
| | Museum shack orientation for campers |
| 5:00 pm | Official Welcome in Haehnle Hall - Neil Rapp, WB9VPG, Camp Director |
| | (will be streamed on the Youth on the Air YouTube Channel) |
| | National Anthems |
| | Opening comments |
| | VoA Museum welcome - Jack |
| | WCARA welcome - Jocelyn |
| | Meal instructions |
| 5:20 pm | Meal begins (Montgomery Inn) |
| 6:00 pm | What's YOTA? - Neil Rapp, WB9VPG Camp Director |
| | Recognition of sponsors, staff, volunteers |
| 6:30 pm | Keynote: Tim Duffy, K3LR - WWROF, Contest University, DX Engineering, RCA |
| 7:15 pm | Rules of the Road - Neil Rapp, WB9VPG, Camp Director |
| | Code of Conduct, COVID-19 precautions, Museum Rules, Hotel Rules, Shirt days & Camp Photo, Video & Photo Booth, Ham Radio Safety |
| 7:40 pm | Ice Breakers (Livestream on YouTube will end) |
| 8:00 pm | Transportation to hotel by shuttle bus |
| | Hotel Shack Orientation at hotel |
| | Open Hotel Shack time |

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|---|---|
| 11:30 pm | Hotel shack closed |
| 12:00 am | Lights out |

**Monday, July 12, 2021 - Kit Building and Contesting**

| | |
|---|---|
| 8:00 am | Everyone should be awake by now!<br>Breakfast in the hotel lobby |
| 8:45 am | Hotel bus begins shuttling everyone to the museum |
| 9:00 am | Session 1 - Kit Building - VoA Museum East Garage<br>Led by: Sam Rose, KC2LRC |
| 12:00 pm | Lunch break in Haehnle Hall (Jimmy John's) |
| 3:00 pm | Session 2 - Contesting - Haehnle Hall<br>Led by: Marty Sullaway, NN1C and Bryant Rascoll, KG5HVO |
| 6:00 pm | Dinner in Haehnle Hall (Skyline Chili) |
| 7:00 pm | Eyeball Sprint<br>Led by: Bryant Rascoll, KG5HVO |
| 7:30 pm | Operating time in Museum Shack |
| 10:00 pm | Shuttle starts back to hotel |
| 11:30 pm | Hotel shack closed |
| 12:00 am | Lights out |

**Tuesday, July 13, 2021 - Digital Modes**

| | |
|---|---|
| 7:00 am | Hotel Shack Opens |
| 8:00 am | Everyone should be awake by now!<br>Breakfast in the hotel lobby |
| 8:45 am | Hotel bus begins shuttling everyone to the museum |
| 9:00 am | Session 3 - D-STAR - Haehnle Hall<br>Led by: Will Jourdain, AA4WJ, ICOM America |
| 11:00 am | Session 4 - APRS - Haehnle Hall<br>Led by: Jack McElroy, KM4ZIA |
| 12:00 pm | High Altitude Balloon Launch<br>Led by: Jack McElroy, KM4ZIA |
| 1:00 pm | Lunch break in Haehnle Hall (Chick-Fil-A) |
| 2:00 pm | Tracking of the high altitude balloon by APRS & guiding chase team |
| 5:30 pm | Bus leaves museum for Dave & Buster's |
| 6:00 pm | Arrive at Dave & Buster's<br>Dinner buffet<br>Unlimited video games<br>Limited carnival games |
| 10:00 pm | Bus leaves Dave & Buster's for hotel |
| 11:30 pm | Hotel shack closed |
| 12:00 am | Lights out |

**Wednesday, July 14, 2021 VHF Contesting SLEEP IN TODAY!**

8:00 am Hotel Shack Opens

9:30 am Everyone should be awake by now!
Breakfast in the hotel lobby

10:30 am Bus leaves hotel for Kings Island *** delayed if ARISS is today

11:00 am Arrive at Kings Island *** delayed if ARISS is today
Eat on your own schedule
FREE unlimited soft drinks all day
FREE entree & side every 90 minutes

11:03 am Possible ARISS Contact *** if we have a Wednesday contact, the Kings Island trip will take place after the ARISS Contact

2:00 pm VHF Sprint #1

7:00 pm VHF Sprint #2

9:45 pm Gather near Main Gate

10:00 pm Bus leaves Kings Island for the hotel

11:30 pm Hotel shack closed

12:00 am Lights out

**Thursday, July 15, 2021 - Satellites & Direction Finding**

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|---|---|
| 7:00 am | Hotel Shack Opens |
| 8:00 am | Everyone should be awake by now!<br>Breakfast in the hotel lobby |
| 8:45 am | Hotel bus begins shuttling everyone to the museum |
| 9:00 am | Session 5 - Satellite Basics - Haehnle Hall & Front Lawn<br>Led by: Ruth Willet, KM4LAO |
| 10:16 am | Possible ARISS Contact |
| 12:00 pm | Lunch break in Haehnle Hall (McAlister's Deli) |
| 1:00 pm | Session 6 - Direction Finding: Fox-oring - Haehnle Hall<br>Led by: Robert (Bob) Frey, WA6EZV |
| 3:00 pm | Fox-oring Competition - VOA Museum Front Lawn<br>Led by: Robert (Bob) Frey, WA6EZV and Jocelyn Brault, KD8VRX/VA2VRX |
| 5:45 pm | Bus leaves museum for hotel |
| 6:00 pm | Pizza & Pool Party at Hotel (LaRosa's) |
| 9:00 pm | Ham Talk Live! interview |
| 11:30 pm | Hotel shack closed |
| 12:00 am | Lights out |

**Friday, July 16, 2021 - Satellites & Antenna Building**

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|---|---|
| 7:00 am | Hotel Shack Opens |
| 8:00 am | Everyone should be awake by now!<br>Breakfast in the hotel lobby |
| 8:45 am | Hotel bus begins shuttling everyone to the museum |
| 9:00 am | Session 7 - Crazy Antenna Building Contest - Haehnle Hall & Front Lawn<br>Led by: Andy Milluzzi, KK4LWR and Tony Milluzzi, KD8RTT |
| | Satellite operating |
| 12:00 pm | Lunch break in Haehnle Hall (Chipotle) |
| 1:00 pm | Closing Ceremony - Haehnle Hall<br>Led by: Neil Rapp, WB9VPG<br>(will be streamed on the Youth on the Air YouTube Channel) |
| | Prizes - R&L Electronics |
| 2:00 pm | Camp Dismissed, Hotel bus **and** Airport bus will both shuttle to hotel |
| 2:30 pm | Airport Bus leaves hotel for airport |
| 2:31 pm | Staff collapses from exhaustion |
| 2:32 pm | Staff Clean Up and Pack Up |
| 3:30 pm | Airport Bus arrives at CVG from hotel |

HAVE A SAFE TRIP HOME!

| | Sun 7/11/2021 | Mon 7/12/2021 | Tue 7/13/2021 | Wed 7/14/2021 | Thu 7/15/2021 | Fri 7/16/2021 |
|---|---|---|---|---|---|---|
| 8am | Arrivals | Breakfast | Breakfast | Sleep in! | Breakfast | Breakfast |
| 9am | | 80m receiver build for Fox Hunt - KC2LRC | Digital FM Modes D-STAR - AA4WJ | Breakfast | Satellite Basics - KM4LAO | Antenna Build/Contest KK4LWR & KD8RTT |
| 10am | | | | Travel time - leave at 10:30 am | | |
| 11am | | | APRS - KM4ZIA | ARISS Contact BACKUP 11:03 am | Satellite Ops and ARISS Contact 10:16 am | |
| 12pm | CVG shuttle 12:30 pm | Lunch | High Altitude Balloon launch - KM4ZIA | | Lunch between passes | Lunch (sat passes) |
| 1pm | VoA Museum Tour | Build, continued | Lunch (chasers tracking) | | ARDF workshop - WA6EZV | Closing Cermony |
| 2pm | | | HAB tracking/chasing (adult chase team) | FM Contest at KI | | Departures |
| 3pm | (Late Arrivals) | Contesting Skills - NN1C & KG5HVO | | | 80m Foxoring WA6EZV & KD8VRX | CVG shuttle 2:30 pm |
| 4pm | W8Y VoA Station Intro | | Leave at 5:30 pm | | | Tear Down |
| 5pm | Opening Ceremony | | | | | |
| 6pm | Dinner - Speaker K3LR | Dinner - Skyline | Dinner - Dave & Busters | | Dinner - La Rosa's & Pool Party | |
| 7pm | | Eyeball Sprint - KG5HVO | | FM Contest at KI | | |
| 8pm | Hotel W8Y Intro | W8Y Station Time | | | | |
| 9pm | Hotel W8Y time | | | | Ham Talk Live! | |
| 10pm | | | | Travel time - leave at 10:00 pm | Hotel W8Y time | |
| 11pm | | Hotel W8Y time | Hotel W8Y time | Hotel W8Y time | | |

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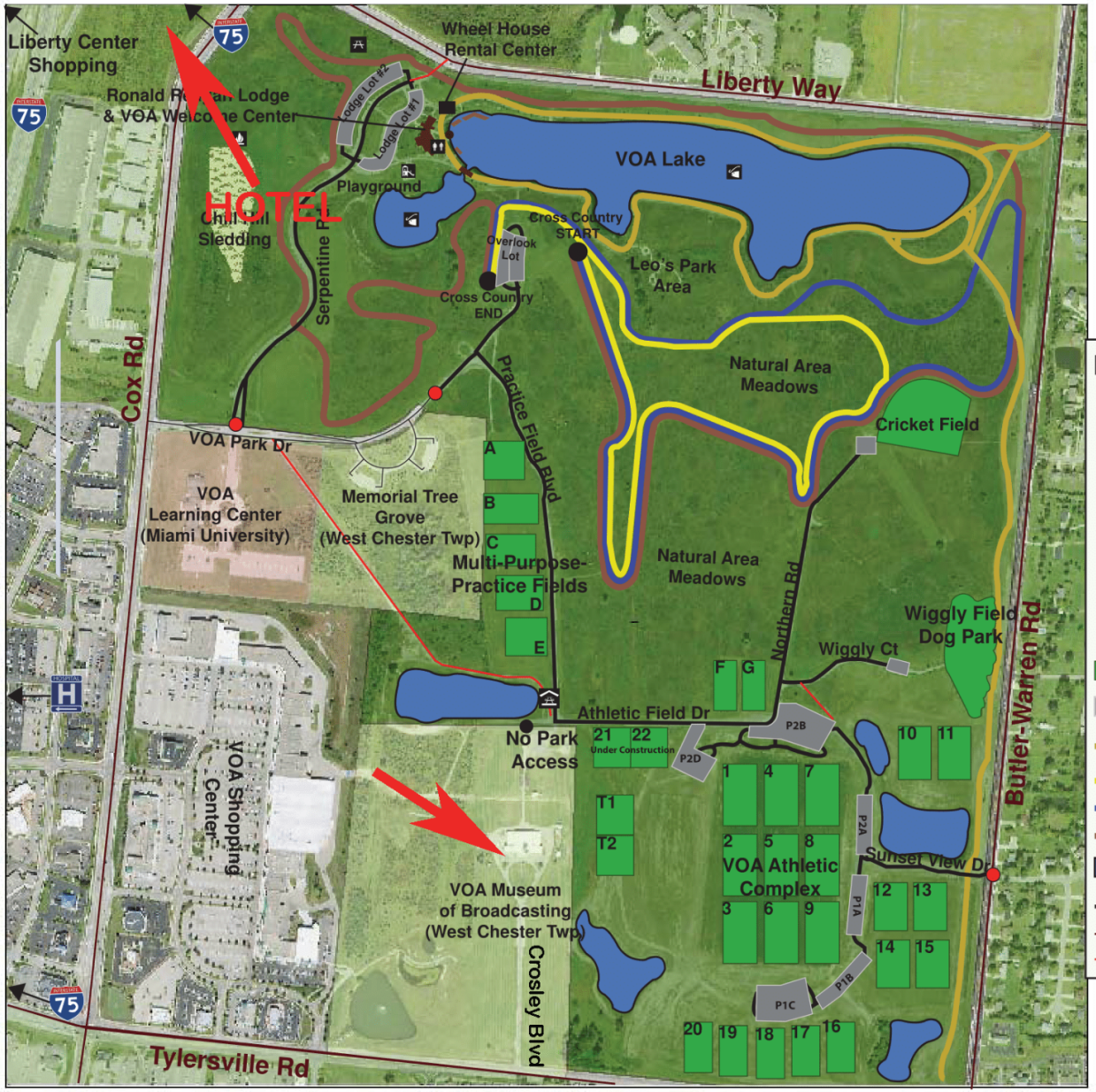
|---|---|---|---|
| Hotel W8Y Open/Flex | | | |
| VoA W8Y Open/Flex | | | |
| Activity at VoA | as people finish projects | VoA W8Y is open | so not everyone is there at once |
| Activity at Hotel | | | |
| Social/Flex | | | |


Liberty Center
OLD NAVY
Dillard's
DICK'S SPORTING GOODS
KONA GRILL
The Cheesecake Factory
Kroger
Cincinnati Children's Medical Center
Cabela's
CINCINNATI-DAYTON RD
MASON RD
Voice of America MetroPark
UC Health West Chester Hospital
COX RD
West Chester Plaza
Kroger
Pizza Hut
TAZIKIS
meijer
TYLERSVILLE RD
LOWE'S
ALDI
THE HOME DEPOT
KOHL'S
THE FRESH MARKET
TARGET
PETSMART
Office DEPOT
Michaels
T.J.maxx
42
West Chester
Walmart SUPERCENTER
Hopewell Junior School
75
BARRET RD
Walgreens




MetroParks
of Butler County, OH

www.YourMetroParks.net
info@YourMetroParks.net

**Voice of America MetroPark**
7850 VOA Park Drive
West Chester, OH 45069

## Legend

- Restroom
- Shelter
- Picnic Area
- Playground
- Fishing
- Fire Pit
- Vehicle Entrance/ Exit Gate
- Athletic Fields
- Parking Lot
- Paved Bike-Pedestrian Path (2.4 mi)
- XC Route (1.5 mi) Nat. Surface
- XC Route (2 mi) Nat. Surface
- XC Route (3.1 mi) Nat. Surface
- Lakes/Ponds
- Park Roadways
- Public Roads
- Inactive Service Road

0 120 240 480 720 Feet

N

Map updated September 11,,2015
AK

Some things to do if you are in the area before or after camp:

http://entertrainmentjunction.com/
http://www.liberty-center.com/
https://www.iflyworld.com/cincinnati/
http://www.junglejims.com/
https://www.mainevent.com/location/ohio/west-chester-township/45069?utm_source=googlemb&utm_medium=organic&utm_campaign=west_chester&utm_term=website
http://www.randl.com/

A little further away:
https://www.newportaquarium.com/
http://cincinnatizoo.org/
https://bbriverboats.com/

# R3500D ARDF Receiver
# Assembly Manual
**by**
**CR KITS**


by
Jack Purdum, W8TEE
Al Peter, AC8GY
for
Youth On The Air
YOTA Region 2 Camp
June 21-26, 2020

## Introduction

This assembly manual is written with the goal that it will help you to properly build the receiver. We hope you will follow our suggestions for construction as you read through this manual. We encourage you to read the manual through completely before starting to build the R3500D receiver (the “kit”).

# Parts Inspection

The kit comes packaged in its own case, as shown in Figure 1. The magnetic rod, the PC board, and

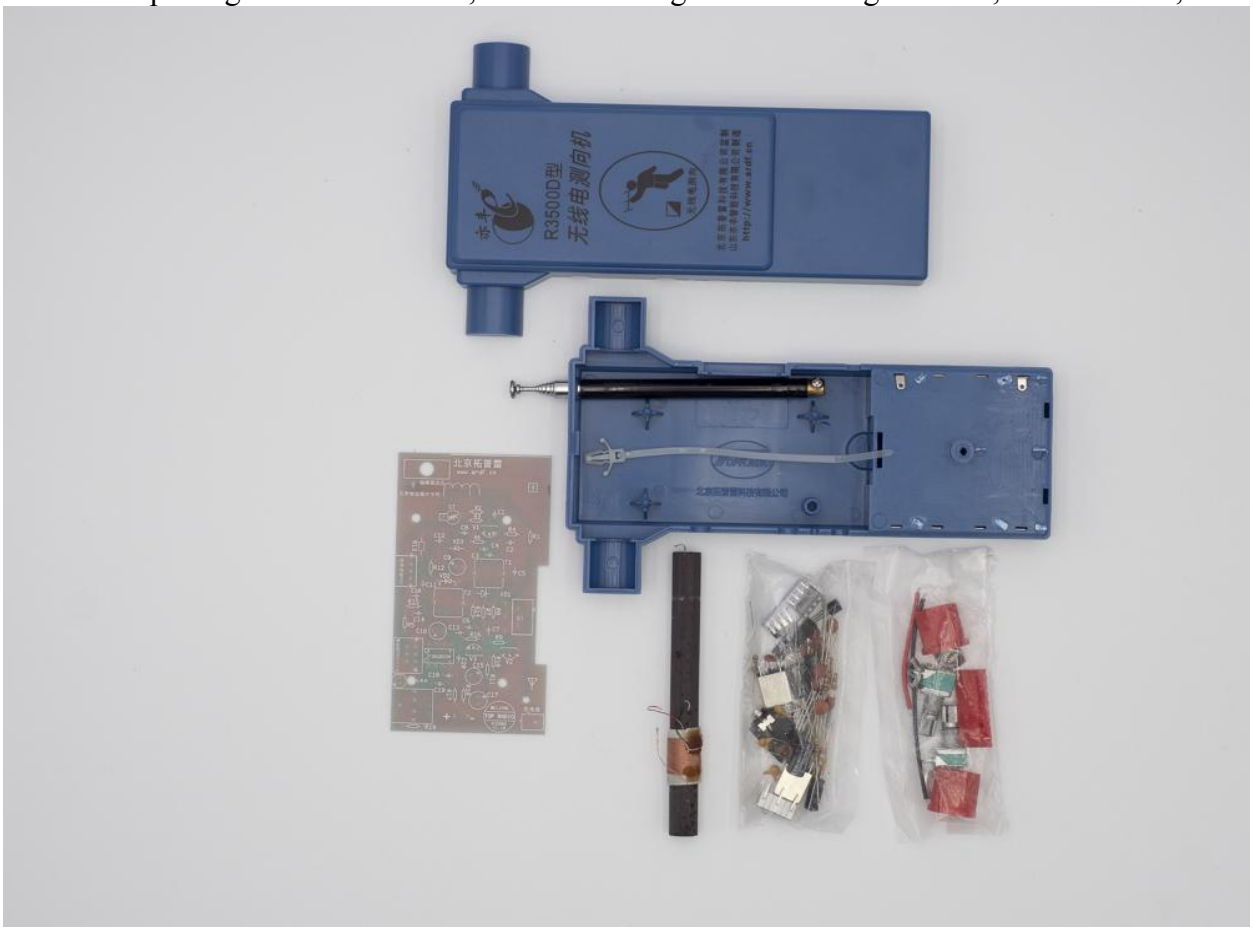



*Figure 1. The packaged parts removed from their case.*

two bags of parts are all contained within the blue plastic case. Opening the two bags and arranging all of the components for the kit is shown in Figure 2. The actual parts count is relatively small, so we can call this a beginners-to-intermediate builder's kit. The reason we increased it out of the beginners category is because the instructions range from non-existent to horrible. The kit did come with instructions, Unfortunately, my Mandarin is a little rusty, hence this manual.

Figure 2 was taken after all of the kit's components are spread out for display. The Printed Circuit Board (PCB) is of good quality and its top has the part numbers silk screened on it, which makes parts placement fairly easy. The kit uses three transistors (all the same), one IC, two variable potentiometers, various capacitors and resistors, and additional hardware.

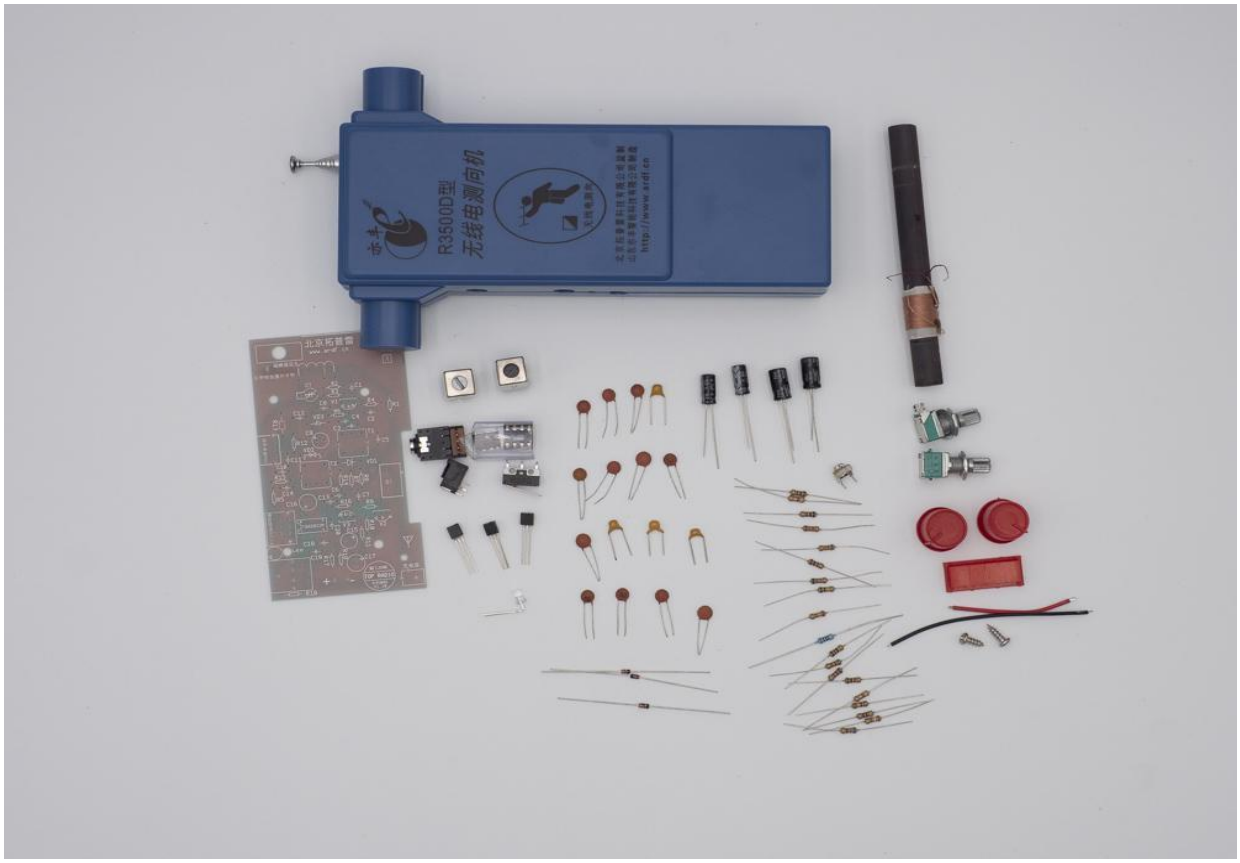



*Figure 2. All of the components laid out for viewing.*

## Parts Identification

If you are new to electronic kit building, great! We think you will find it enjoyable. Figure 3 shows you some of the basic circuit components you will be using. Each transistor has a “flat” side to it and the

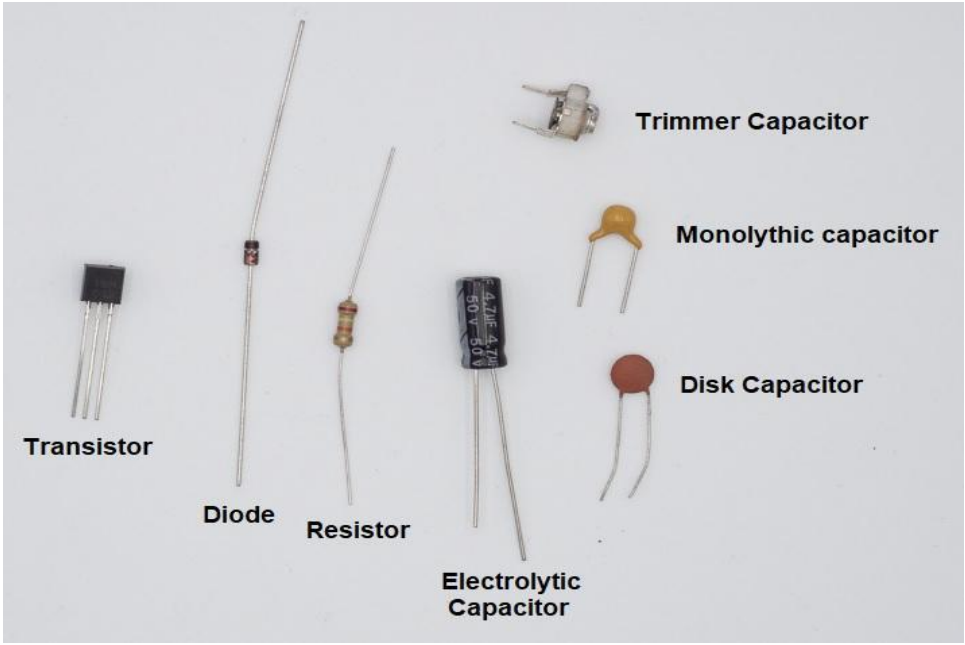


*Figure 3. Component types.*

silk screen on the PCB uses that flat side of the transistor to make sure you place it on the board with the correct orientation. If you get the base, collector, and emitter (B, C, E silk screened on the PCB) leads wrong, the circuit won't work properly, so pay close attention when you place the transistor leads into the PCB holes.

There are three diodes in the kit and they look very similar. All three have a glass body with a black band around one end, but they are all different parts. One of them is a Zener diode which behave differently, too. The black band is used to identify the cathode end of the diode and is the "vertical bar"

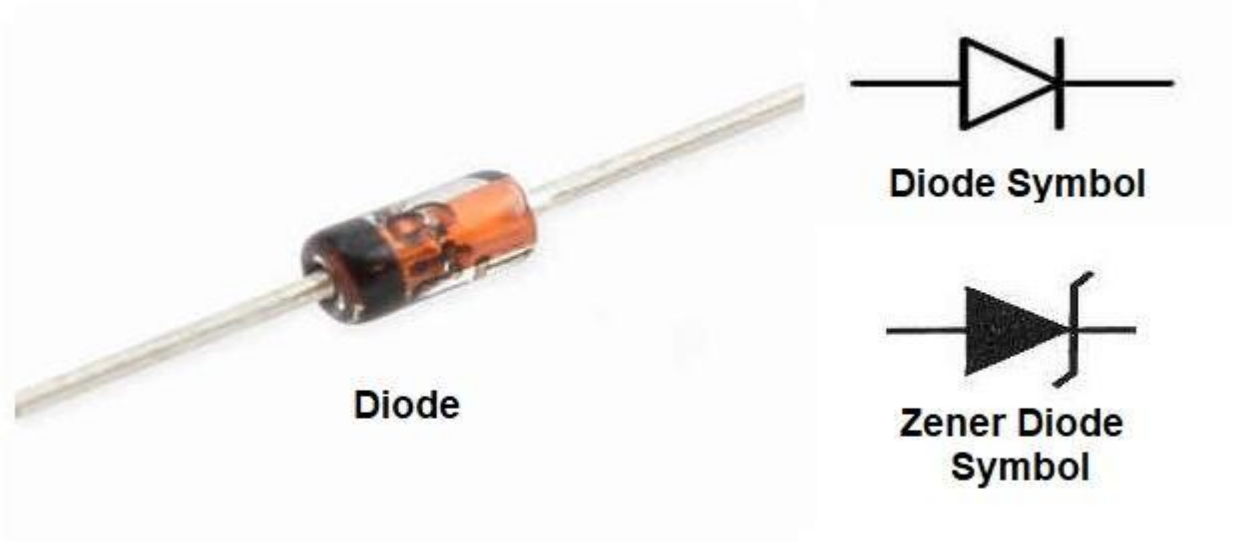



*Figure 4. Diodes and their circuit symbols.*

end of the diode symbol. The band can be seen in diode image on the left side of Figure 4. A zener diode looks the same, but its cathode symbol uses a "broken" bar in its symbol. The type of diode is written on the diode body, but can be difficult to read. Ask the instructors for help if you are not absolutely sure of a diode's identifying part number.

The remaining component types look sufficiently different that they probably do not need clarification.

# Kit Assembly

We have arranged for the assembly steps to be performed in a specific order. There are a number of reasons for following the assembly sequence used in this manual. First, it places the "easiest" parts on the board first. We mean "easiest" in the sense there is plenty of room to place the parts without other parts getting in the way. Second, the component placement begins with the resistors and capacitors, and those are easy to identify. And finally, some parts cannot be placed into position until some other part is its proper position first (e.g., the Press To Talk (PTT) switch and the PTT button).

## *Resistors*

As you can see in Figure 3, the resistors are like small cylinders with painted bands on them. The color of each band corresponds to a number. Table 1 shows the part number, its resistance value, and its associated color code. Notice that R1 and R13 have asterisks after them. The reason is because those resistors may have values that vary in the kit. We suggest that you place those two resistors on the PCB last, as it will make it easy to determine which of the two remaining resistors are the correct ones for

R1 and R13. So far, their color codes appear to agree with Table 1.
Although you may not be able to tell it, look closely at the resistors in Figure 5. From this viewpoint,

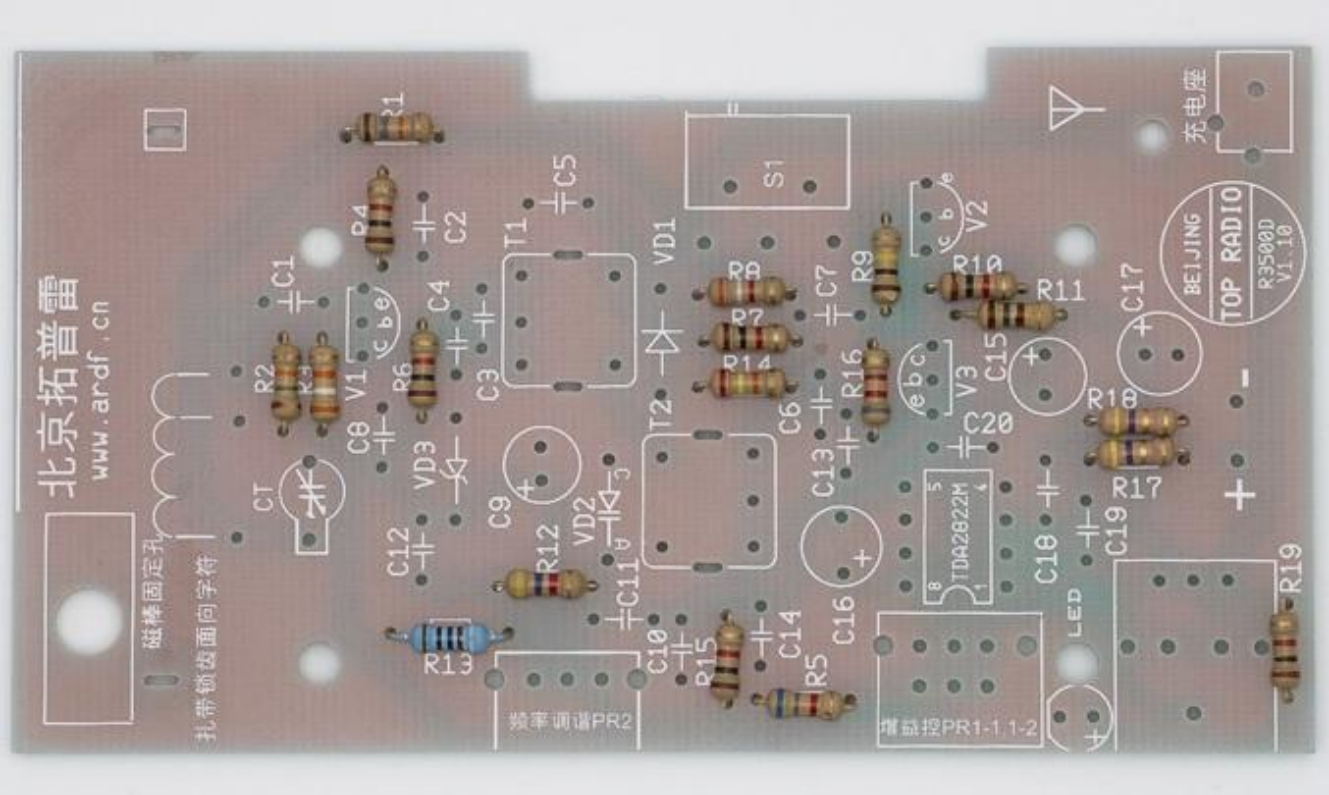


*Figure 5. Resistor placement. Note that R13 is the only blue resistor on the board.*

note how all of the color bands read from left to right for all of the horizontal resistors. If you stand the board on its right edge, those resistors that appear as vertical resistors in Figure 5 are now horizontal and also read the color bands from left to right. Given that resistors are symmetrical (i.e., both leads are identical in a circuit), why bother? Three reasons: 1) it makes it easier to read values should the need arise, 2) it looks neater, and 3) because I can. It's just a way of showing that you care about what you're doing.

## Placing Resistors on the PCB

There is a seven-step process we want you to use when placing a resistor on the PCB.

*Table 1. Resistors*

| PCB Part Number | Resistance Value | Color Codes |
|---|---|---|
| R1* | 18k, 5~20k | BRN-GRY-ORG-GLD |
| R2 | 15k | BRN-GRN-ORG-GLD |
| R3 | 39k | ORG-WHT-ORG-GLD |
| R4 | 1k | BRN-BLK-RED-GLD |
| R5 | 6.8k | BLU-GRY-RED-GLD |
| R6 | 1k | BRN-BLK-RED-GLD |

| | | |
|---|---|---|
| R7 | 1k | BRN-BLK-RED-GLD |
| R8 | 3.9k | ORG-WHT-RED-GLD |
| R9 | 100k | BRN-BLK-YEL-GLD |
| R10 | 1k | BRN-BLK-RED-GLD |
| R11 | 150 ohm | BRN-GRN-BRN-GLD |
| R12 | 4.7k | YEL-VIO-RED-GLD |
| R13* | 910 ohm, 300~1.5k | WHT-BRN-BRN-GLD |
| R14 | 24k | RED-YEL-ORG-GLD |
| R15 | 1k | BRN-BLK-RED-GLD |
| R16 | 8.2k | GRY-RED-RED-GLD |
| R17 | 4.7 ohm | YEL-VIO-GLD-GLD |
| R18 | 4.7 ohm | YEL-VIO-GLD-GLD |
| R19 | 1k | BRN-BLK-RED-GLD |
| RP1 | 10k | two gang pot |
| RP2 | 10k | single gang pot |

Step 1. Using the color code listed in Table 1, locate the resistor to place on the board (i.e., your first resistor will be R2, color code Brown, Green, Orange, Gold).

Step 2. Use the VOM to measure the resistors value and compare what you read to the values shown in Column 2 of Table 1. It should be within +/- 10% of the value in the table. If not, have one of the instructors check the value for possible replacement.

Step 3. Take the resistor and gently bend both leads so they form 90° angles to the resistor body. This will make it easier to mount the resistor on the PCB.

Step 4. Locate the silk screen part number (e.g., R2) on the PCB that corresponds to the resistor you are about to mount on the PCB. The part number should be centered on the two holes for the resistor leads.

Step 5. Guide the two resistor leads into the two mounting holes allocated for the resistor. Push the resistor all the way down to the PCB so it sits flat on the PCB.

Step 6. Flip the board over and bends the two leads of the resistor you just mounted towards the board. This will help keep the resistor tight to the PCB as you mount the remaining resistors.

Step 7. Go back and repeat the steps until you have mounted all of the resistors EXCEPT resistors R1 and R13. Eventually, you will be left with only two resistors left. It should be clear from their color bands which is R1 and which is R13. If that is not clear, ask for help from one of the instructors.

### *Resistor R13*

Resistor R13 is a little different from the rest of the resistors because of the role it plays in aligning the receiver. To make alignment a little easier, we want you to mount that resistor as shown below in Figure 6. For all other resistors, we want you to snug the resistor down so it touches the PCB. However,

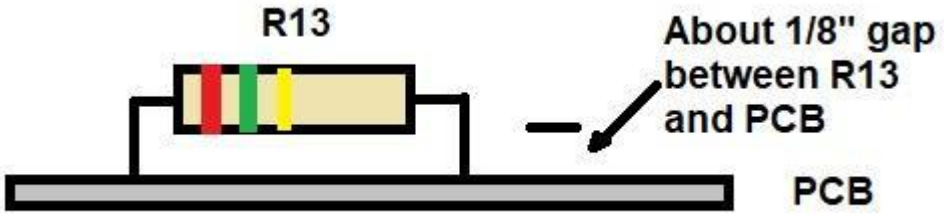



*Figure 6. The placement of R13 on the PCB.*

for R13, we want you to leave about 1/8” between the body of R13 and the PCB. The reason is because, during the alignment process, we may need to either remove R13 and replace it with a different resistor, or we may have to tack-solder a second resistor in parallel with R13 to get the correct alignment. Mounting R13 with the gaps shown makes this process easier.

When you have completed all of the steps above, you should not have any resistors left except RP1 and RP2. You will place those on the board later.

## The 3-1-3 Soldering Method

Now, flip the board over and solder the resistors in place. We use the 3-1-3 Method for soldering components to a PCB. That is, place the soldering iron tip on the PCB pad to be soldered and also touching the wire coming through the board so the soldering iron tip touches both the pad and the lead for about 3 seconds. That should be enough heat to melt the solder. Now touch the solder to the spot where the wire and the pad come together, but *not* touching the soldering iron tip. It should take about 1 second for the solder to melt into the connection. Next, remove the remaining solder, but continue to hold the soldering iron tip where it is for 3 more seconds. This keeps the connection hot enough for the solder to wick-up towards the top side of the PCB. This is more important for multilayered PCB boards, but it doesn't hurt to practice here.

Now, visually inspect the solder connection. The solder should be shiny, silver, color and not granular or sand-like on the surface.

After the connection is soldered and has cooled, take your thumbnail and “pluck” the end of the lead. It should have an almost musical note. If you hear a “thunk” instead, touch the soldering iron tip to the connection again to reheat it. Let it cool again, and then pluck it again to see if it's a good connection. Al doesn't like the “pluck check” that Jack's been using for four decades of kit building. He prefers that you check the joint to make sure the solder coats both the lead and the pad and that its appearance is a shinny and silver in color with no grainy appearance. Doing both checks pretty much assures the solder connection it good.

After all of the connections are soldered, plucked, and inspected, use wire trimmers to remove the excess lead length. Dispose of the clipped leads now, as they are a short circuit waiting to happen.

## Capacitors

Arrange all of the capacitors at the top of your work area. Capacitors CT, C9, C15, C16, and C17 are placed on the board last. When you place the capacitors, insert them into the PCB so that you can easily

*Table 2. Capacitors*

| PCB Part Number | Capacitance Value | Capacitor Codes |
|---|---|---|
| CT | 5-20p | Trimmer capacitor |
| C1 | 0.01µ | 103 |
| C2 | 4700p | 472 |
| C3 | 47-68p | 50 |
| C4 | 4700p | 472 |
| C5 | 0.01µ | 103 |
| C6 | 0.01µ | 103 |
| C7 | 0.1µ | 104 |
| C8 | 0.01µ | 103 |
| C9 | 470µ | electrolytic |
| C10 | 100p | 101, monolithic |
| C11 | 200p | 201, monolithic |
| C12 | 1000p | 102 |
| C13 | 1000p | 102, monolithic |
| C14 | 2200p | 222, monolithic |
| C15 | 470µ | electrolytic |
| C16 | 10µ | electrolytic |
| C17 | 470µ | electrolytic |
| C18 | 0.1µ | 104 |
| C19 | 0.1µ | 104 |
| C20 | 0.01µ | 103 |

see their value markings and that those marking are not obscured by some larger component. Use the following sequence for placing the part.

***NOTE:*** The larger electrolytic capacitors (C9, C15, C16,and C17) must be placed on the boards according to the polarity of their leads. The negative lead is the shorter of the two leads and it usually marked on the case, too, as a grey-colored stripe with a minus sign ('-') on it.

Step 1. Using the capacitor codes listed in Table 2, locate a capacitor to place on the board (i.e., your first capacitor is C1, not CT).

Step 2. If you cannot read the part number (they are pretty small), ask one of the instructors to help you. We do have a capacitance meter that can be used to check its value.

Step 3. Locate the silk screen part number (e.g., C1) on the PCB that corresponds to the capacitor you are about to mount on the PCB. The part number should be silk screened near the two holes for the capacitor leads. If it is an electrolytic capacitor, pay close attention to its polarity when placing it on the PCB.

Step 4. Guide the two capacitor leads into the two mounting holes allocated for the capacitor. Push the capacitor as far as you can until you feel some resistance. Pushing the capacitor any further runs the risk of fracturing the capacitor.

Step 5. Flip the board over and bends the two leads of the capacitor you just mounted towards the board. This will help keep the capacitor tight to the PCB while you mount the remaining capacitors.

Step 7. Go back and repeat the steps until you have mounted all of the capacitors EXCEPT resistors CT and C9, C15, C16, and C17 . Eventually, you will be left with only those five capacitors left. Now mount those capacitors in their proper place.

When you are finished, your board should look similar to Figure 7. Now flip the board over to the backside and solder, pluck, trim, and dispose the capacitor leads.


*Figure 7. Capacitor placement.*

# Diodes, Tranformers, IC socket, and Transistor Placement

## *Diodes*

First, locate the three diodes (see Figure 4) and determine their identities. Their parts numbers are:

| | |
|---|---|
| VD1 | 1N60 |
| VD2 | FV1043 |
| VD3 | 3.5-4.4V Zener diode |

If you have trouble reading their part numbers, ask an instructor for help.

Note that the cathode end with the black band on it corresponds to the vertical bar in the diode symbol printed on the PCB. If you look near the middle of Figure 7, you can see the diode symbol for VD1. The symbol tells you that the black band should be near the top of Figure 7 after placing it on the board. Fan out the diode leads on the back side of the PCB just like you did for the resistors and capacitors. Again, you want the diodes close to the PCB.

Some care is needed when soldering diodes as they are a little more fragile than resistors or capacitors. Too much heat can destroy them. Al likes to mount the diodes a little above the PCB (1/16”) to promote air flow and also transfer less contact heat to the diode. For that reason, we suggest you solder one diode lead, move to the second diode and solder one lead, and then move to the last diode lead and solder one lead. Now go back and solder the remaining unsoldered leads. This sequence gives the diode body a chance to cool down a bit before the opposite lead is soldered.

## *Transistors*

The three transistors are all the same, so just pick the transistor components as depicted in Figure 3. Their location on the PCB is silk screened using a “half circle” shape. Match the flat side of the transistor with the flat side of the half circle silk screened on the PCB and gently push the three leads through the appropriate holes. Because the mounting holes are spaced further apart than the leans on the transistor, do NOT try to force the transistor body to be flush with the PCB. The spacing difference means the transistor will be about 1/4” above the PCB surface. Once all three leads are in place, flip over and gently fan the leads enough that the transistor won't fall out of its holes.

Once again, transistors are less fragile than diodes, but moreso that resistors. We use the one-lead-at-a-time sequence for transistors just like we did for the diodes. Probably overkill, but it only takes a few seconds more. Strum the leads and listen for a musical note-like sound. Reheat if necessary and then trim the leads. You did throw the leads away, right?

## *IC Socket*

Now locate the IC socket, which looks similar to Figure 8. Notice how the right edge of the socket

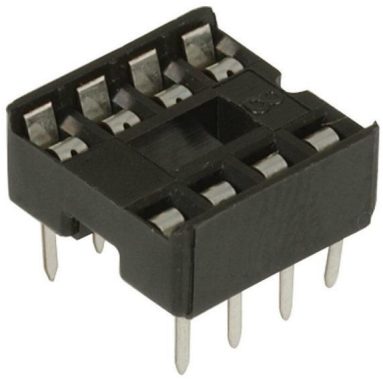


*Figure 8. The IC socket.*

has a notch in it. Now look in Figure 7 and locate the location where the socket is to be solder in place (i.e., towards the lower-right area of the PCB). Note that the silk screen also has a notch. Align the IC socket so the notches match up and push the socket pins through their mounting holes. While holding the socket in place with a finger, flip the board over and with your thumbnail, bend one of the corner socket pins over towards the surface of the PCB. Now do the same to the pin on the opposite corner of the socket. This will hold the socket in place while you solder the pins.

### *Transformers*

There are two transformers in the kit that look like small rectangular metal boxes. You can see the tops of the transformers in Figure 9. One of them has a dark adjustment screw in the middle of the box while the other has a silver adjustment screw. Locate the two transformers and mount them on the PCB. Pay attention to the color of the adjustment screw as you mount them on the board.

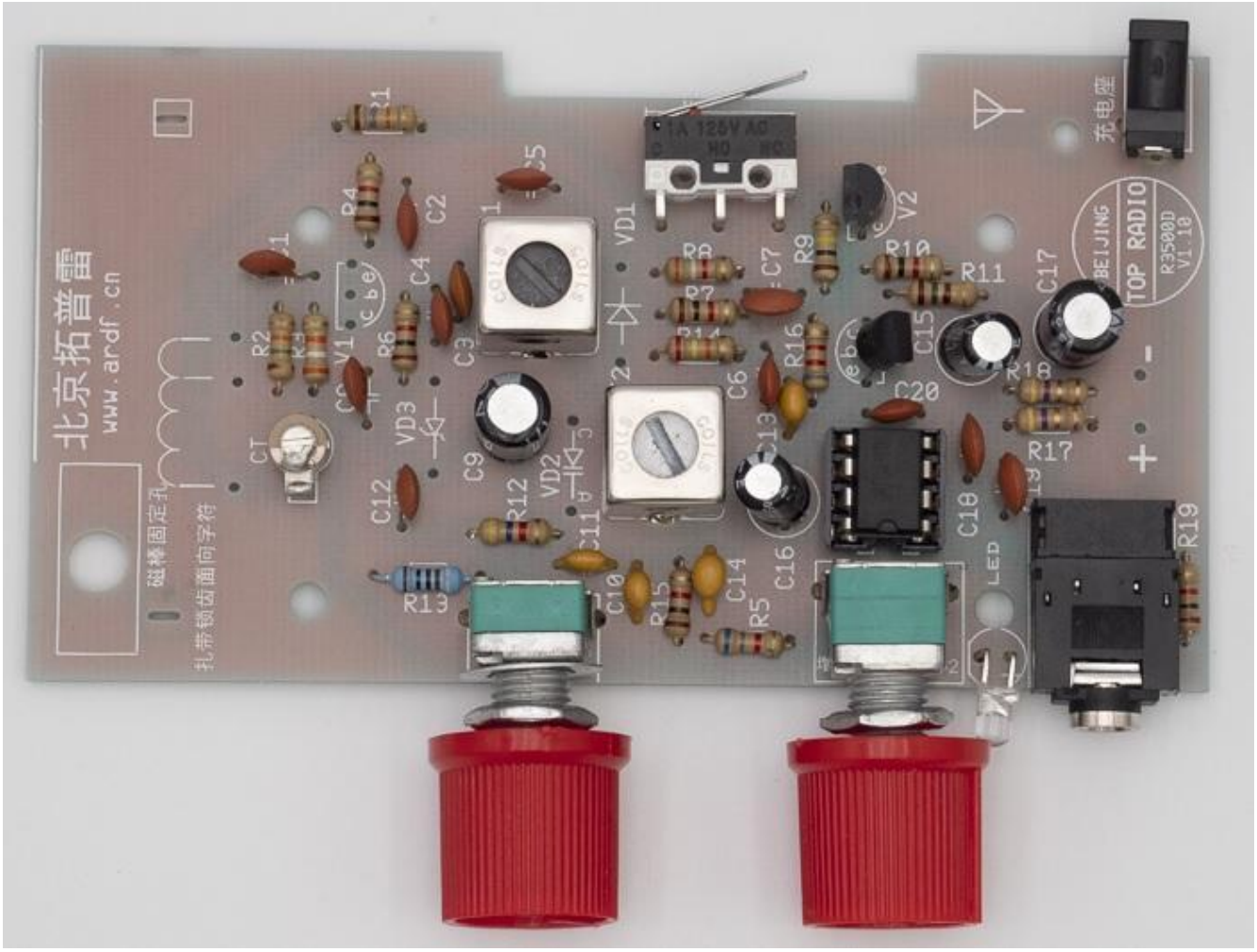



*Figure 9. The board with the transistors and hardware in place.*

There is only one orientation that allows all of the pins to protrude through to the back of the PCB. If the transformer doesn't seem to cooperate, check to make sure all of the pins are straight and try again. After both transformers are mounted in place, flip the PCB over and solder the pins that are sticking out from the back side of the PCB.

### *Remaining Hardware*

Now mount the micro switch (near the cutout at the top of Figure 9), the power connector (top-right of Figure 9), the two potentiometers and knobs (bottom edge), the ear bud jack (lower right of Figure 9), and the LED indicator (between the two-ganged pot and the ear bud jack).

Locate the short red and black pieces of wire. Place the red wire in the + hole on the PCB and the black wire in the – hole on the PCB. (The holes are marked on the right edge of the PCB. See Figure 10.) Hold the two wires in place while you flip the board over and place it on your work table. The tension in the wires should hold them in place while you solder them.

When you mount the LED, place it so it faces outwards from the PCB and mount it with about an 1/8” clearance between the bottom of the LED and the PCB. (LED's require paying attention to polarity. However, facing the LED outward will have the correct polarity provided you have its flat side mounted as shown on the PCB's silk screen.) This position aligns better with the hole that lets the LED

shine through the case. Solder and trim the leads that protrude through the PCB.

### *Magnetic Rod*

The magnetic rod is the black rod you can see towards the left side of Figure 11. On the rod is a sleeve of coiled wire with 3 leads coming from it. Looking at Figure 11, a white-ish wire is coming from the bottom of the sleeve coil, a black wire from the middle of the coil, and a red wire from the top of the coil. Loosely place the rod towards the left edge of the PCB. Now look for the holes on the PCB for the 3 wires. They are near the left edge of the PCB and look like Figure 10. We have also labeled Figure 10 where each of the 3 wires are to be attached to the PCB.

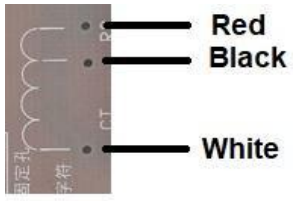



*Figure 10. Magnetic Rod coil wires.*

Thread the three wires through the appropriate holes, carefully turn the board over.  Only pull enough

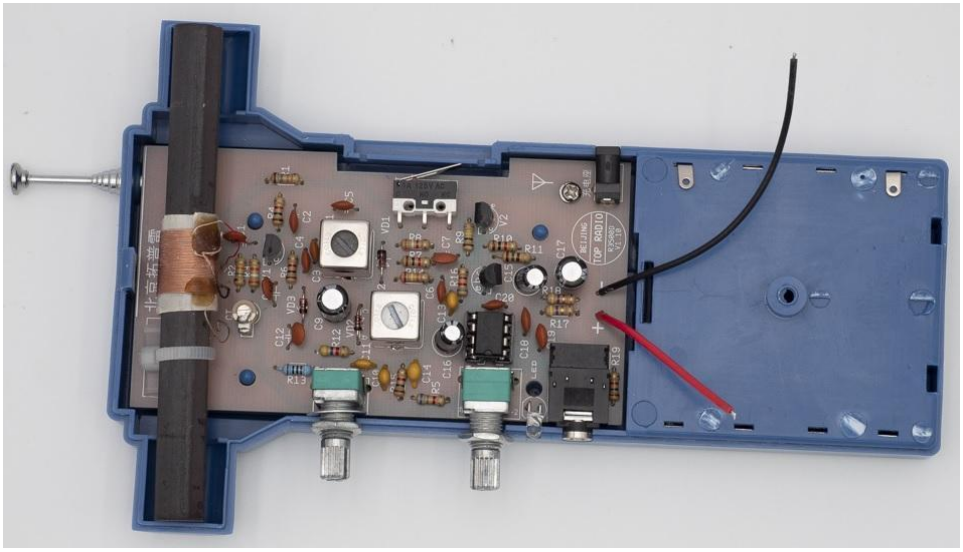


*Figure 11. PCB in position within the case.*

of the wire lead through to allow you to solder the ends of the wires to the pads. You will need some slack in the wires after they are soldered to mount the rod to the plastic case. Now solder the ends of the wires to their respective pads.

There is a special type of twist-tie in the kit that is used to secure the magnetic rod to the PCB. Inspect the twist-tie carefully, as there is only one way to feed the tie into the latch that allows the strap to remain tight. The twist-tie has a special fitting on it that feeds a plug through a hole in the PCB and snaps to lock it in place. (You  can see the large mounting hole for the locking plug in the lower-left corner of Figure 9. You can see the twist-tie strap in place on the magnetic rod in Figure 11.)  Push the mounting plug on the twist-tie into the hole in the PCB until it snaps into place. Take the loose end of the twist tie strap and push it partway into the twist-tie lock. Leave it loose enough that you can slide the rod into the loop.

Now slide the coil sleeve to approximately the middle of the rod and thread the rod into the twist-tie loop that is formed by the strap. Once you have the assembly centered similar to that shown in Figure 11, pull the twist tie snug around the rod. Snip off the excess part of the twist tie.

### *Antenna Whip*

As you can see at the top of Figure 12, there is a collapsible whip antenna protruding out of the left side of the case. Inside the case, that whip antenna has a small screw and lock washer attached to the end of it. (If you look closely at Figure 1, you can see the screw at the right end of the whip antenna.) Carefully remove the screw and lock washer.

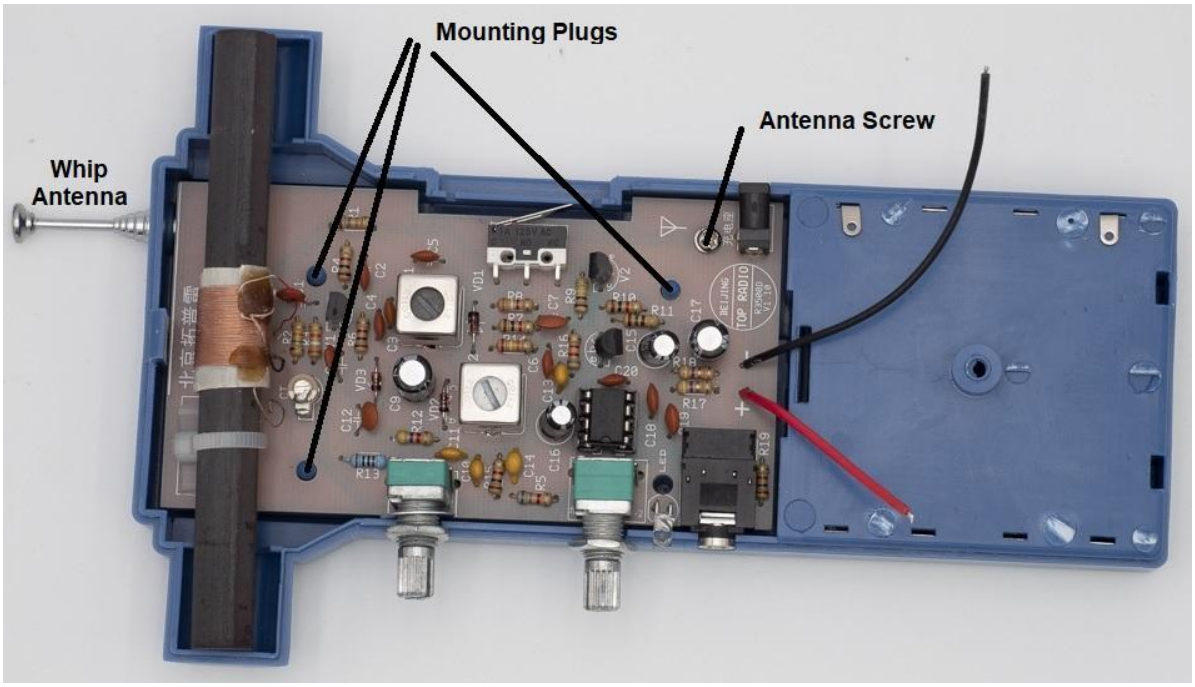



*Figure 12. Completed Parts Placement*

Now tilt the PCB and its case up on its side enough that you can move the antenna whip inside the case. You need to align the hole in the bottom of the whip with the mounting hole for the antenna screw in the PCB so you can re-insert the screw through the PCB and back into the antenna whip. Make sure you thread the lock washer back onto the screw before securing it to the PCB and the antenna whip.

Once the antenna screw is secure, find the plastic mounting plugs that are molded into the case and place the PCB so it aligns with the mounting plugs. Gently push the PCB so it seats tightly on the mounting plugs. If you've done this correctly, all of the external components will align perfectly with their mounting holes that are molded into the plastic case.

## Batteries

The kit provides a compartment designed to hold 4 AA batteries to power the radio. If you look at the top-right in Figure 13, you can see two solder tabs. The long black wire is soldered to the right-most tab and the shorter red wire is soldered to the remaining tab. This provides about 6V to the receiver.

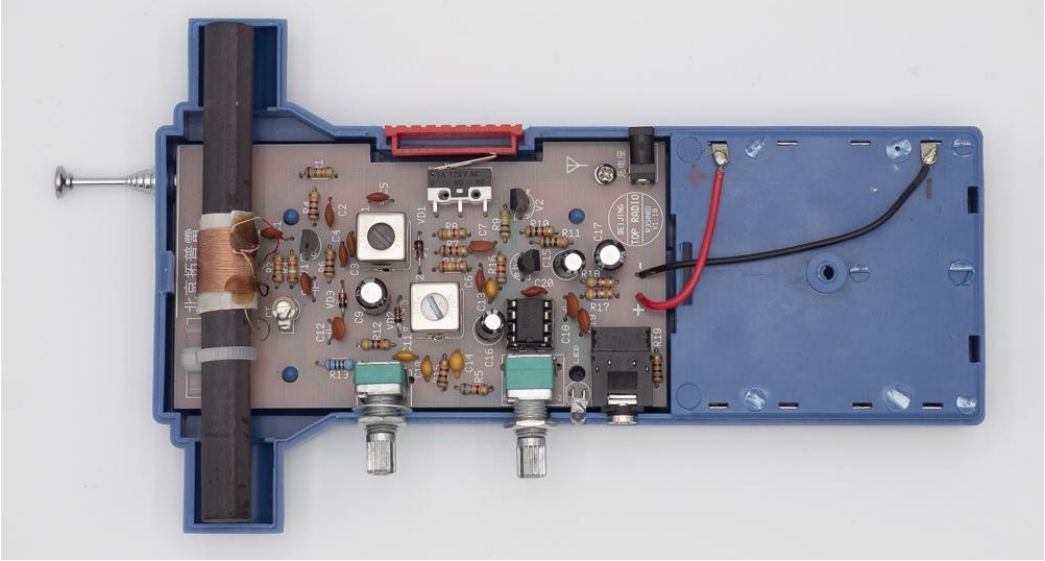


*Figure 13. Connecting red and black power wires to battery tabs.*

## Radio Power Switch

So where's the power switch to turn the battery power on and off? Well, it's sort of hidden. The kit comes with a set of ear buds wired to a headphone connector that plugs into the headphone jack. (The headphone jack is the black square object just below the red wire in Figure 12.) When you plug the ear buds into the jack, it completes a circuit to the battery pack, resulting in voltage being applied to the receiver. Unplug the ear buds and the radio is powered down. As a result of the circuit arrangement, you need to have the ear buds plugged in if you want the receiver activated. This also means you need to unplug the ear buds when the radio is not in use to avoid draining the batteries.

The battery compartment is accessed by removing the battery pack cover, which is a small plastic door on backside of case as seen in Figure 14. Place your fingernail into the “half-moon” cutout and gently push the door towards the opposite edge while pulling the door upward. Place the batteries into the battery pack compartment, paying attention to the polarity of the batteries as molded into the bottom of the battery compartment.

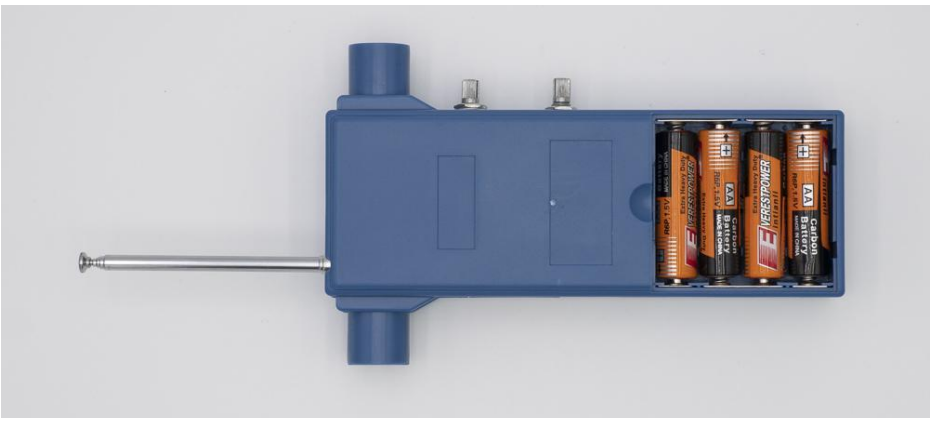


*Figure 14. Battery compartment.*

There is a small hole in the middle of the battery compartment. A machine screw eventually is used to secure the two plastic halves of the case together. However, that is not done until the very last step of the assembly process.

## Alignment

The instructors need to perform the radio's alignment. The instructors have a signal generator that is used to align the receiver. Essentially, this requires coupling the output from the signal generator to a simple wire loop wrapped around the magnetic rod. We tune the signal generator to about 3.5 - 3.6 MHz. (The actual transmitter will be on 3.579 Mhz .) A tone should be heard in the ear buds.

Now set the signal generator to 3.55 MHz and adjust T2 (using the white screw on its top) until the tone is heard again. The tuning is very sensitive, so make the adjustments slowly. Also, your body capacitance can affect the circuit, so use a non-conductive (plastic) tool to make the adjustments. Once T2 is set, you should be able to set the signal generator to a frequency between 3.5 MHz and 3.6 MHz and, by adjusting the RP2 potentiometer, you should be able to hear the new signal generator tone.

If adjusting RP2 does not find the new tone, the value of R13 (discussed earlier) needs to be adjusted. Once the proper value of R13 is determined, the instructors will fine tune the radio using the trimmer capacitor CT.

Finally, T2 is adjusted to peak the tone heard in the ear buds.

## Final Assembly

You can now attach the two halves of the receiver case together. You need to remove the batteries first. Now place the plastic switch plate (look for the piece of red plastic near the top of Figure 13) into position using the two slots cut into the case. Position the interior edge of the switch plate between the arm of the switch and the plastic case. How carefully fit the other half of the plastic case in place. The external power connector and LED may need some coaxing to get the two halves to fit together. You may also need to remove the lock washers and nuts from the two potentiometers.

Once the two case halves are in the proper position, put the small metal tapping screw into the hole in the middle of the battery compartment and tighten to hold the case together. Don't over-tighten as you don't want to strip the plastic holding the screw. Now replace the batteries and snap the battery compartment cover in place.

Your receiver is now ready to use.

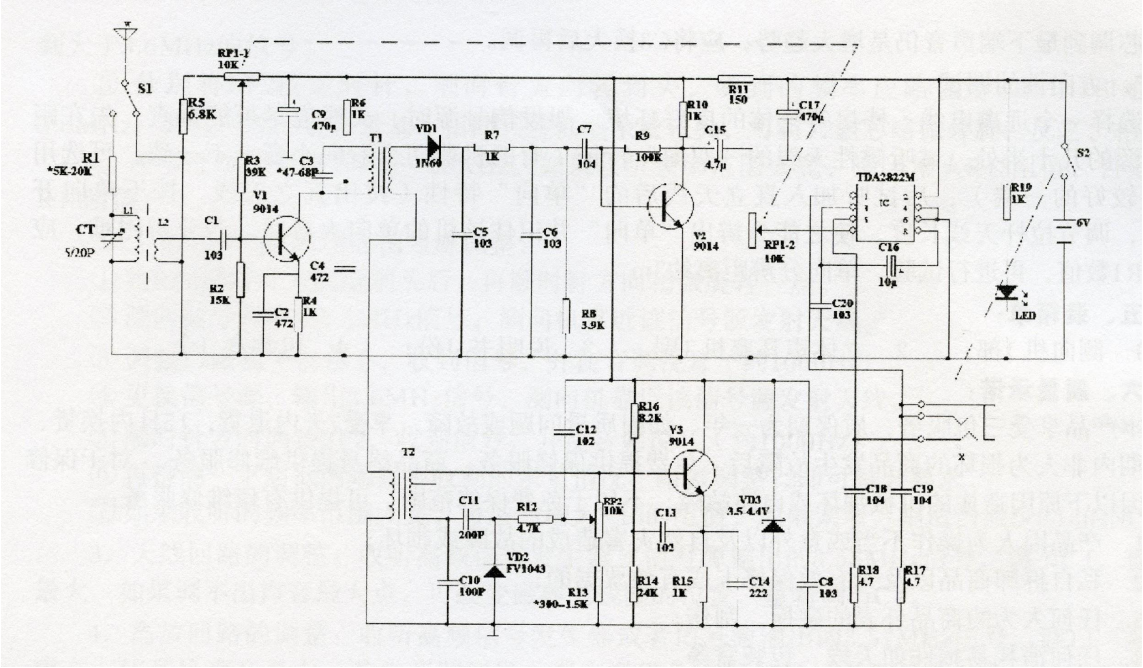



*Figure 15. Schematic*