

The NorCal QRP Club Cascade

A 20/75M SSB Transceiver

**Designed by
John Liebenrood, K7RO**



Construction Manual

Manual Edited and Written by Doug Hendricks, KI6DS

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Errata List Cascade SSB Transceiver

Guys here is a list of mistakes in the manual. I apologize for the inconvenience but I also take full responsibility. I am mailing this to the first 100 that I sent the kits to. **First of all, 35 of you received two tuning caps by mistake. These are irreplaceable and I desperately need you to return one of them. They are needed to complete kits, so if you have one please send them back as soon as possible.**

Ship to: Doug Hendricks, KI6DS
862 Frank Ave.
Dos Palos, CA 93620

Thanks to Lee Stanford, Mike Ardai, Dave Meacham and Rob Capon for their help in finding the mistakes.

- ✓ **Cascade Manual Page 4 Parts List:** C17 2-12pF Air Trimmer (number on part is 189-503-5) It is the shorter of the two. C34 2-20pF Air Trimmer (number on part is 189-509-5)
- ✓ **Cascade Manual Page 5:** R2, 22, 59, 63, 97, 98 = 10K (should have 73 instead of 63 in list of parts)
- ✓ **Cascade Manual Page 6:** U5 LM383 (part shipped is TDA2002 or UPC2002)
- ✓ **Cascade Manual Page 9:** R63 should be 1K not 4.7K (Late change as of 9-30-95)
- ✓ **Cascade Manual Page 12, Section 1:** Install R19 also. R75 is in the schematic but not used on the board.
- ✓ **Cascade Manual Page 12, Section 2 and Cascade Manual Page 8:** C23 is a 51pF not 47pF as in the cross reference list. The parts list and schematic are right.

Cascade Manual Page 13, Section 3: C18 was installed in Section 1. Make sure that you used the right screws, and connected the front left lug (facing the cap) to the pad just below it. The shorter variable cap goes to the left nearest the toroid and the taller one goes to the right, nearest the edge. Also install D1.

If you install the front panel at this time, make sure that you have the front of the tuning capacitor hang over the front edge of the board the same amount as the mike and speaker jack do. This will insure that your panel fits square. Also, you will have to file the screws to mount the front panel to the tuning capacitor, as we were unable to find any 3/16 x 4-40 screws. Make sure that the front panel screws don't touch the plates of the capacitor. You should have at least 1/16" clearance.

Don't coat the coil with Q-Dope until you are sure that you have the correct number of turns. Coat it after you have verified the VFO frequency.

Cascade Manual Page 18, Section 4: R64, a 10K trimpot, does not fit the board. Somehow the holes were not drilled large enough. We suggest that you purchase a 10K trimpot with wire leads, which will fit. Bob Cutter, KI0G, who has his Cascade on the air, was able to get the trimpot supplied to fit by squeezing and filing the leads. It is easier to buy a wire lead one.

The nonpolarized cap is C96, not C98. D11 is not mentioned in the cross-referenced table. R27 was already installed in Section 1. Also, the test where the hum drops out when the Mike PTT button is pressed does not work unless Q16, R68 and R73 are installed to provide a path to the +8TX line.

Install C99

Cascade Manual Page 18, Section 5: I dropped a line in the parts list that should be installed in this step. Add the following to the parts which should be installed at this time: C7, C68, C69, C70, C71, C72, C74,

C75, C76 C79, C88, C92, R47, R48, R51, R52, R62, R63 (1K not 4.7K) and U1. Some of the NPO ceramic disks are actually little blue monos. The square pad for C12 does go to pin 7, so it is OK. R7 was installed in Section 1. When you install the temporary jumper from W1 to W2, it is done between the round pads that are near the plugin band module. Use a piece of resistor lead.

When Testing, U6 pin 8 and Q13 Source will be 0V until PTT is pressed, then they will be 6.7 and 2V as described.

Cascade Manual Page 21, Section 6: The silk screen pattern for the 75M band module is wrong for the number of turns on L2. It shows 20 turns. It should show 23 turns, which is consistent with the schematic and parts list. Also, C13 and C14 are NOT used on the 20 meter Bandmodule, even though the parts layout and the silkscreening show them. During testing, RF gain pot has no effect, since it is not connected yet. You may also want to install the cover for the bandmodule using the two standoffs and the 4-40 screws.

Cascade Manual Page 24, Section 7: Also install C10. At this point, all components except R13, R8, C15 (by mike jack) and R58 (in BFO) in front of the band module connector should be installed.

Cascade Manual Page 28, Section 10: When you mount the pcboard to the spacers, you will find that the screws are too long. File them off so that the screw is only 1/2" long. The screws go through J4 and then through the board and then into the standoffs.

CASCADE MOD #1

by Dave Meacham, W6EMD

Cascade builders, here are some mods to improve your rig: 1) Reduce R63 to 1K Ohm to cure overmodulation. 2) Increase R25 to 22 Ohms to reduce audio gain (if you prefer) 3) These changes are for the 75 meter band module. They improve the low-pass filter match for the PA while maintaining proper harmonic rejection. Output power goes from about 6W to about 9W PEP.

L2 = L3 = 2.1uH, 23 T #26 on T37-2 Core (red). Measure if you can, and adjust spacing of turns for 2.1uH. I had to use 22T on one core!

C12 = 680pF

C15 = 1200pF

C16 = 560pF

C14 = 150pF

These mods came from my work on the final prototype rig I built. Enjoy!

72, Dave, W6EMD (NorCal #339)

These are the errata for now. Give me a call at 209-392-3522 to see if there are any new ones before you start building. 72, Doug

Thank you for purchasing the Cascade. The NorCal QRP Club is very proud of its line of kits, and think that the Cascade will be another in the line of NorCal Kit successes. Literally hundreds of hours of work have gone into the development of the Cascade. Every effort was made to provide the best possible kit with the greatest chance of successful completion by the builder. John Liebenrood, K7RO, was the designer of the Cascade but he would be the first to admit that he has walked on the shoulders of the many hams who have gone before.

This kit came about due to many requests by members for a SSB kit. After the success of the NorCal 40 and the Sierra, both CW kits designed by Wayne Burdick, N6KR, many of our members wanted to move on to SSB. John and Doug Hendricks, KI6DS took a trip to British Columbia over Veteran's Day weekend to see the SSB homebrew rigs that the BC QRP Club had designed. The BC QRP Club is unique in that they don't produce kits, and each of the members has his own ideas about building a SSB transceiver. They have been experimenting with SSB for over 10 years, with the original impetus being to have reliable communications for travel in the back country of British Columbia. We found that 3 of the members, Derry Spittle, VE7QK, Bruce Gellatly, VE7ZM, and Joe Stipek, VE7TX, were the main movers and shakers of the group. They each have developed their own versions of SSB transceivers, all of which have been published in QRPP, The Journal of the Northern California QRP Club. Derry's is the Epiphyte, Bruce's is the California Board, and Joe's is the Neomyte. John and Doug were both impressed with the rigs, and John mentioned on the way back to Seattle that he had always wanted to design a SSB rig, but that he would need some help with the packaging. It was decided to go with the project using several of the ideas from the BC group. The transceiver would be packaged in a Sierra style case, and would even use the same idea for switching bands of plug in band modules.

Jim Cates, WA6GER, the co-founder of the NorCal Club, and Doug discussed the idea of a SSB rig for a club project. They agreed to pursue

it but the project would have to conform to NorCal standards, and John readily agreed.

Wayne Burdick gave permission to use his design for the case, and John began the design portion of the project. It was decided to follow the same tested procedure that NorCal had used in their previous projects. The first step would be for John to produce a working model using ugly construction. Then, a circuit board model would be designed and 4 prototypes would be built to see if the design could be duplicated. If the second stage was successful, orders would be taken for kits, and the project would be a go.

Needless to say, the project did pass all of the tests. Orders were taken and parts were ordered. The goal was to have the kits shipped by August 15th, but this was not reached due to back orders of parts by suppliers.

After the Rev. A circuit boards were built, John decided to do a Rev. B, as there were several changes that were made. Dave Meacham, W6EMD, was brought in at this time as a consultant, and Dave was a tremendous asset to the project. He also spent hundreds of hours on the project and deserves a lot of credit for his work. There were 24 parts changes between Rev. A and Rev. B, so you can see that it was necessary to do the Rev. B. In every instance, parts changes were made to improve the kit, not for economic savings.

One thing that was interesting about this project was that almost all of the communication was done over the internet, via email. John received input and ideas from many NorCal members including Dave Meacham, W6EMD, Eric Swartz, WA6HHQ, Wayne Burdick, N6KR, Vern Wright, W6MMA, Derry Spittle, VE7QK, John Koenig, NB7W, Doug Hendricks, KI6DS, Jim Cates, WA6GER, and Jeanette Hayes, who did the PCB layout and artwork. NorCal is deeply indebted to these individuals for providing the support and information that was invaluable. I doubt very much if this project would have been possible without internet and the "helpful spirit" of NorCal hams. Thank you.

The first thing that you should do when you decide to produce a kit or club project is set pa-

rameters. John and Doug came up with the following goals for the Cascade:

1. Simple to build.
2. Stable, VFO controlled, 200 kHz coverage.
3. Small in size, easily adapted to portable operation or bike hiking.
4. NorCal type packaging (No wires to connectors, easily accessible case.)
5. Inexpensive (Less than \$200 for complete kit.)
6. Dual Band Coverage 20/75 Meters. 20 Meters for daytime use, 75 Meters for night.
7. Homebrew SSB filter using common, cheap, easily obtainable computer crystals.
8. Meet FCC specifications for spectral purity.

Hopefully these goals have been met. We want your input on the successes or failures that you have with the kit. Let us know how we can improve, what we did right, and what we forgot to include. If you have modifications that you develop, please write them up for QRPp, the Journal of the NorCal QRP Club. John has left lots of room in the case for mods. We want you to modify and improve this rig. That is one reason that NorCal does kits, so that its members can experiment and learn by building.

Now for a word about NorCal. The Northern California QRP Club was founded in 1993 by Jim Cates, WA6GER and Doug Hendricks, KI6DS on a plane ride home from the Dayton Hamvention. While at the Hamvention they attended a forum presented by Jim Fitton, W1FMR. His subject was how to form a local QRP club. They liked the idea and decided to form NorCal. The club has grown beyond their wildest dreams and now has a membership of over 1300 (Sept. 95).

The purpose of NorCal is to promote QRP. Period. We want to help others enjoy what we have discovered, the thrill of using low power, often with home brew rigs. NorCal has produced 2 major kits, the NorCal 40 and the Sierra, along with several smaller offerings. The NorCal 40 has been improved to the NorCal 40A and is currently offered as a commercial kit by Wilderness Radio. The Sierra will be offered in December by Wilderness also.

We have shipped over 500 NorCal 40's and 120 Sierras. No one makes any profit on the kits, as any money left over is poured back into R & D for the next kit. That is why NorCal sells kits at such a reasonable price, no one is taking a profit. We are not doing this to put any kit vendor out of business. That is the farthest thing from our mind. In fact, we think that we are helping the kit vendors, as we are encouraging a whole new set of builders to buy and build kits. There have been many builders of the NorCal kits who have tasted success with the soldering iron and gone after bigger and better game with a commercial kit.

We also want our kits to work. That is why you will find that this manual is very extensive. If you have trouble with one of our Cascade kits, contact us and we will help you get it up and running. One of the advantages of belonging to a club like NorCal is that we have literally hundreds of members who are outstanding builders and trouble shooters and even more important, are eager and willing to help.

Great pains have been taken to insure the successful completion of your kit. If you use the step-by-step, test-as-you build method, we are quite certain that most major problems will be avoided. If you do have problems, they will be easily isolated. Most problems can be related to two areas, misidentified parts, and poor soldering techniques.

One of the main reasons to build is to learn. John has included a section that explains how and why the radio works. We suggest that you turn to that section and read it until you understand it. Also, this manual has been designed to be easy to use. The schematics are broken down into sections, and they are placed with the descriptive text so that they can easily be referred to as you build. We have also used graphics to represent ideas that needed clarification. And we have included a section that lists which schematic page the part is located on. Hopefully it will help you as you build. Good luck and enjoy your kit.

72,

NorCal QRP Club