

Hendricks QRP Kits
BITX20A SSB Transceiver
Assembly, Testing, and Operation

Part-1

Arv – K7HKL

This article documents assembly, testing and operation of the Hendricks QRP Kits BITX20A SSB transceiver. This kit is based on an original [BITX20 design by Farhan](#). Several improvements to the original design have been documented in posts on the [BITX20 Yahoo Group](#), with further BITX20A kit design refinement and testing performed by Dan Tayloe – N7VE and Jim Kortge – K8IQY.

INTRODUCTION:

Assembly is divided into functional modules with testing of each module as it is completed. This assembly and testing sequence is:

- 1.Receive AF section
- 2.Transmit AF amplifier
- 3.BFO / Carrier Oscillator and associated mixer
- 4.Receiver 2nd IF
- 5.Transmitter 1st IF
- 6.Crystal Filter
- 7.Receiver 1st IF
- 8.Transmitter 2nd IF
- 9.VFO and RF mixer
- 10.Receive and Transmit low-level RF amplifiers
- 11.RF Bandpass Filter
- 12.Transmit RF PA section.

Before starting construction, there are some techniques that should be reviewed to help insure quality of the finished kit:

Soldering will be mostly PCB based. For this you will need a 25 watt or similar soldering iron with a small tip. If your soldering iron is not temperature controlled, you might want to add a conventional full-wave lamp dimmer to it's AC socket so you can manage the temperature.



DO NOT USE ACID-CORE SOLDER.

Soldering iron tip cleaning is necessary to allow quick soldering without overheating PCB pads and components. Use a dampened sponge or coarse steel wool type tip cleaner.



Most of the resistors will be installed vertically on the PCB. To make this look professional and to help avoid shorts or damaged components, you should bend one lead of these components over the edge of a PCB to make a consistent and visually appealing shape. It helps future trouble shooting to always make this bend in the most significant digit end lead so that the color code is always read top-down.



When installing components, install a few (usually 4 to 10) and then solder these before proceeding. After each soldering session, clip any excess lead length with small wire cutters and inspect each connection for shorts, cold solder joints, or other errors. Re-solder those connections which look like they might not be adequate. It helps to use a magnifying glass to check for soldering errors.

When you unpack the kit component bags, it helps to sort and compare what you have received with the BOM (Bill Of Materials). If you have a block of Styrofoam packing material you can insert one lead of these components in that as a way to keep them separated into sorted groups. This makes it much easier to find a specific component when assembling your kit.



If you have to unsolder and re-solder components on the PCB, it is much easier if you use a wooden toothpick (the round kind work best) to re-open holes in PCB pads.

Some sort of PCB holder makes circuit assembly much easier. Hendricks QRP Kits sells one such unit (www.qrpkits.com/pcbwise.html), but you can also use other manufacturer's units, or even manufacture your own homebrew PCB vise



Next blog entry will be start of actual BITX20A construction.

=====[Leave a comment](#)



Jun. 1st, 2007 01:53 pm **BITX20A Version 1.3 Parts are here...**

Two parts bags for the BITX20A Version 1.3 arrived in today's mail. Now all I need are the 11 MHz crystals that Jim is sending separately. I will go ahead and start wiring this evening.



=====



May. 30th, 2007 11:06 am **Parts have shipped...**

Parts kit for the next BITX20A build was shipped yesterday (May 29, 2007). It should be here by this

weekend. I have cleared off space on my workbench, cleared time on my work schedule, and cleaned the soldering iron tip. I'm ready!

This next round of building will be documented here in a format that I hope can serve as basis for the Assembly, Testing, and Operating manual. Step-by-step assembly will be in a format that looks like this:

1. C-24, 10 pf
2. C-20, 47 pf
3. C-19, 10 pf
4. Solder and inspect connections

This layout provides check-boxes for marking each completed step during assembly. Procedures will be provided for testing each section as they are completed.

Arv - K7HKL



May. 8th, 2007 09:17 am **QRX...please**

Dan says that he does not have time to assemble the parts kits for this next prototype build until after he returns from the Dayton Ham Radio Convention. That means that we will not be starting the build until sometime after May 20, 2007. I will post here again when the parts kits arrives.

<http://www.hamvention.org/>

=====



May. 5th, 2007 04:33 pm **The new PCB has arrived.**

The new PCB arrived today. I looked it over using magnification and it looks very good.

Dan has added three new external connection pads to the layout. These are TX-G-RX and are connected to the +TX voltage, Ground, and the +RX voltage. This will provide a handy way to add modifications that require switching between transmit and receive modes.

Now, just waiting for parts to populate the board.

Arv (May-5-2007)



Apr. 26th, 2007 09:46 pm **New Proto PCBs are ordered**

The new prototype BITX20A PCBs have been ordered. They should be distributed shortly after Doug, Dan, & Jim get back from attending Ozarkcon. We will start this next round of construction & testing just as soon as PCBs and parts kits are available.

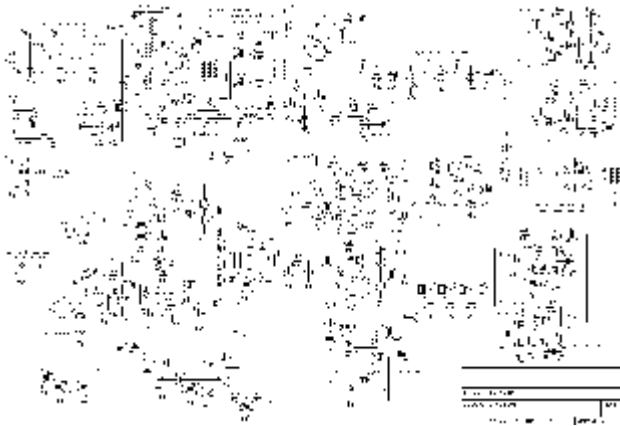
Keep watching this blog. I will post here when construction starts. The blog content format will be as close as I can come to an **Assembly and Operating Manual** layout. This way my blog can be used to build the actual documentation that will accompany the kit.

Arv



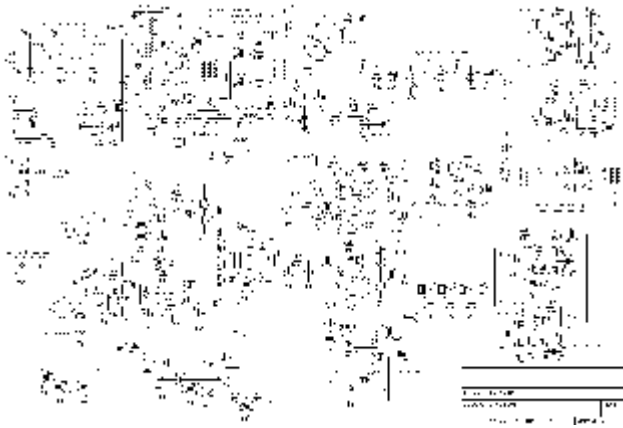
Apr. 17th, 2007 11:56 pm **New Schematic from Dan Tayloe (April 21, 2007)**

GIF Image Schematic

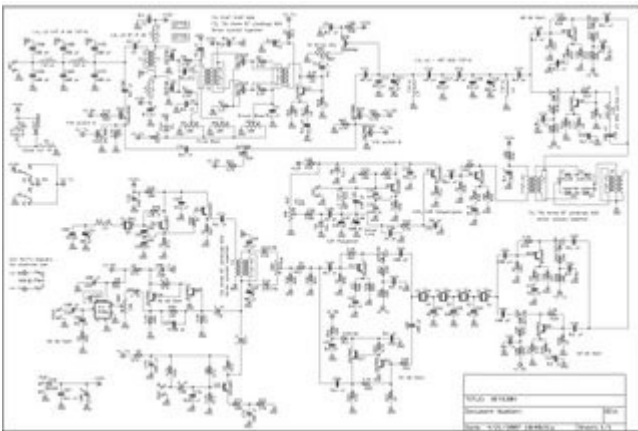


Click on the diagram to see in in higher resolution.

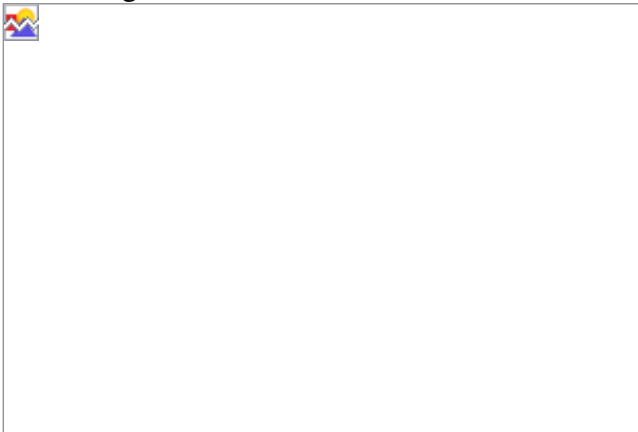
CompuServ GIF Image:



JPEG Image:



PNG Image:



un. 5th, 2007 04:08 pm

Hendricks QRP Kits
BITX20A SSB Transceiver
Assembly, Testing, and Operation

Part-1

Arv – K7HKL

This article documents assembly, testing and operation of the Hendricks QRP Kits BITX20A SSB transceiver. This kit is based on an original [BITX20 design by Farhan](#). Several improvements to the original design have been documented in posts on the [BITX20 Yahoo Group](#), with further BITX20A kit design refinement and testing performed by Dan Tayloe – N7VE and Jim Kortge – K8IQY.

INTRODUCTION:

Assembly is divided into functional modules with testing of each module as it is completed. This assembly and testing sequence is:

- 1.Receive AF section
- 2.Transmit AF amplifier
- 3.BFO / Carrier Oscillator and associated mixer
- 4.Receiver 2nd IF
- 5.Transmitter 1st IF
- 6.Crystal Filter
- 7.Receiver 1st IF
- 8.Transmitter 2nd IF
- 9.VFO and RF mixer
- 10.Receive and Transmit low-level RF amplifiers
- 11.RF Bandpass Filter
- 12.Transmit RF PA section.

Before starting construction, there are some techniques that should be reviewed to help insure quality of the finished kit:

Soldering will be mostly PCB based. For this you will need a 25 watt or similar soldering iron with a small tip. If your soldering iron is not temperature controlled, you might want to add a conventional full-wave lamp dimmer to it's AC socket so you can manage the temperature.



DO NOT USE ACID-CORE SOLDER.

Soldering iron tip cleaning is necessary to allow quick soldering without overheating PCB pads and components. Use a dampened sponge or coarse steel wool type tip cleaner.

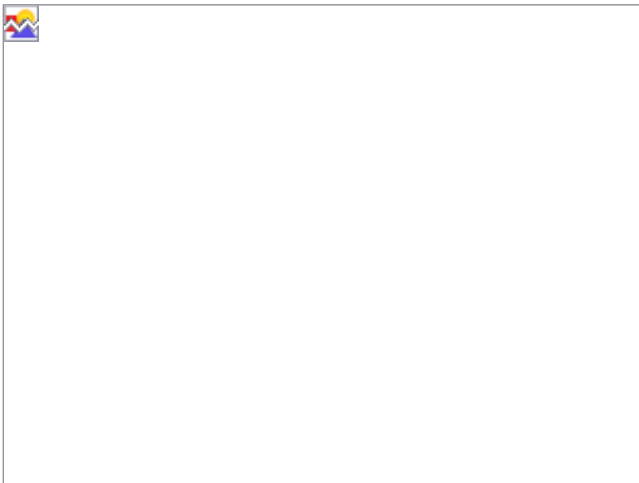


Most of the resistors will be installed vertically on the PCB. To make this look professional and to help avoid shorts or damaged components, you should bend one lead of these components over the edge of a PCB to make a consistent and visually appealing shape. It helps future trouble shooting to always make this bend in the most significant digit end lead so that the color code is always read top-down.



When installing components, install a few (usually 4 to 10) and then solder these before proceeding. After each soldering session, clip any excess lead length with small wire cutters and inspect each connection for shorts, cold solder joints, or other errors. Re-solder those connections which look like they might not be adequate. It helps to use a magnifying glass to check for soldering errors.

When you unpack the kit component bags, it helps to sort and compare what you have received with the BOM (Bill Of Materials). If you have a block of Styrofoam packing material you can insert one lead of these components in that as a way to keep them separated into sorted groups. This makes it much easier to find a specific component when assembling your kit.



If you have to unsolder and re-solder components on the PCB, it is much easier if you use a wooden toothpick (the round kind work best) to re-open holes in PCB pads.

Some sort of PCB holder makes circuit assembly much easier. Hendricks QRP Kits sells one such unit (www.qrpkits.com/pcbwise.html), but you can also use other manufacturer's units, or even manufacture your own homebrew PCB vise



Next blog entry will be start of actual BITX20A construction.

=====[Leave a comment](#)



Jun. 1st, 2007 01:53 pm **BITX20A Version 1.3 Parts are here...**

Two parts bags for the BITX20A Version 1.3 arrived in today's mail. Now all I need are the 11 MHz crystals that Jim is sending separately. I will go ahead and start wiring this evening.



=====



May. 30th, 2007 11:06 am **Parts have shipped...**

Parts kit for the next BITX20A build was shipped yesterday (May 29, 2007). It should be here by this

weekend. I have cleared off space on my workbench, cleared time on my work schedule, and cleaned the soldering iron tip. I'm ready!

This next round of building will be documented here in a format that I hope can serve as basis for the Assembly, Testing, and Operating manual. Step-by-step assembly will be in a format that looks like this:

1. C-24, 10 pf
2. C-20, 47 pf
3. C-19, 10 pf
4. Solder and inspect connections

This layout provides check-boxes for marking each completed step during assembly. Procedures will be provided for testing each section as they are completed.

Arv - K7HKL



May. 8th, 2007 09:17 am **QRX...please**

Dan says that he does not have time to assemble the parts kits for this next prototype build until after he returns from the Dayton Ham Radio Convention. That means that we will not be starting the build until sometime after May 20, 2007. I will post here again when the parts kits arrives.

<http://www.hamvention.org/>

=====



May. 5th, 2007 04:33 pm **The new PCB has arrived.**

The new PCB arrived today. I looked it over using magnification and it looks very good.

Dan has added three new external connection pads to the layout. These are TX-G-RX and are connected to the +TX voltage, Ground, and the +RX voltage. This will provide a handy way to add modifications that require switching between transmit and receive modes.

Now, just waiting for parts to populate the board.

Arv (May-5-2007)



Apr. 26th, 2007 09:46 pm **New Proto PCBs are ordered**

The new prototype BITX20A PCBs have been ordered. They should be distributed shortly after Doug, Dan, & Jim get back from attending Ozarkcon. We will start this next round of construction & testing just as soon as PCBs and parts kits are available.

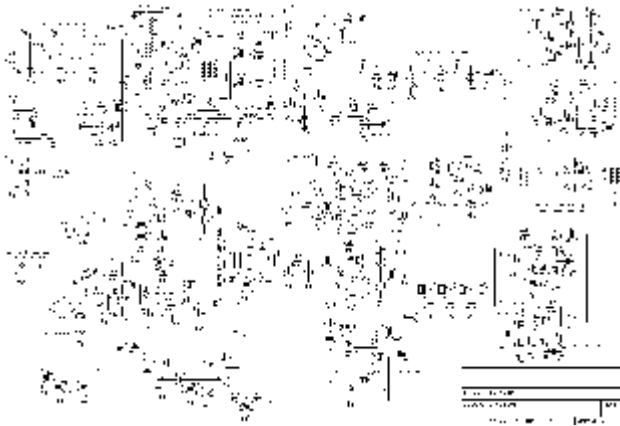
Keep watching this blog. I will post here when construction starts. The blog content format will be as close as I can come to an **Assembly and Operating Manual** layout. This way my blog can be used to build the actual documentation that will accompany the kit.

Arv



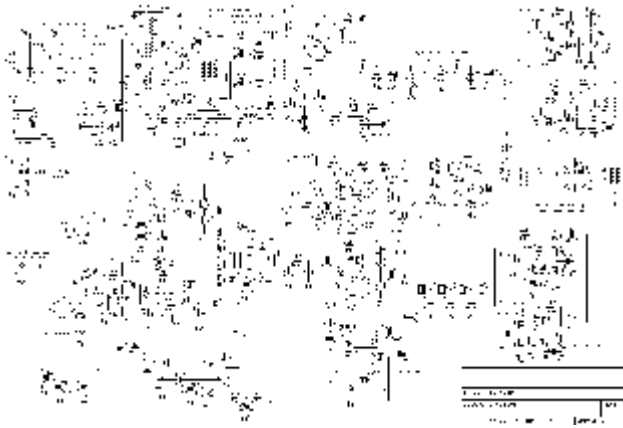
Apr. 17th, 2007 11:56 pm **New Schematic from Dan Tayloe (April 21, 2007)**

GIF Image Schematic

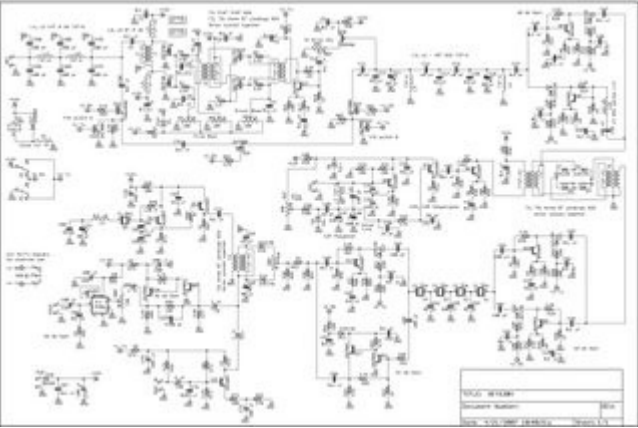


Click on the diagram to see in in higher resolution.

CompuServ GIF Image:



JPEG Image:



PNG Image:

