

The PFR
Portable Field Ready radio
Preliminary manual

Hendricks Kits
KD1JV Designs

Specifications:

Bands : 40 meters, 30 meters and 20 meters
Tuning range: Full band coverage
Mode: CW only

Receiver MSD: 0.2 uV typical
Selectivity : 300 Hz
Receive current, no signal typical:
Active, 47 ma
Idle, 34 ma

Transmitter:
5 watts at 12 volts, all bands
Spurs: - 50 dBc maximum, all bands

5 to 35 wpm internal iambic keyer
Two (2) 63 character keyer memories.

Coax or balanced line output
Built in BLT (balanced line tuner)

Size: 7.3" long, 4.4" wide, 1.6" high. (18.4 x 11 x 4cm)

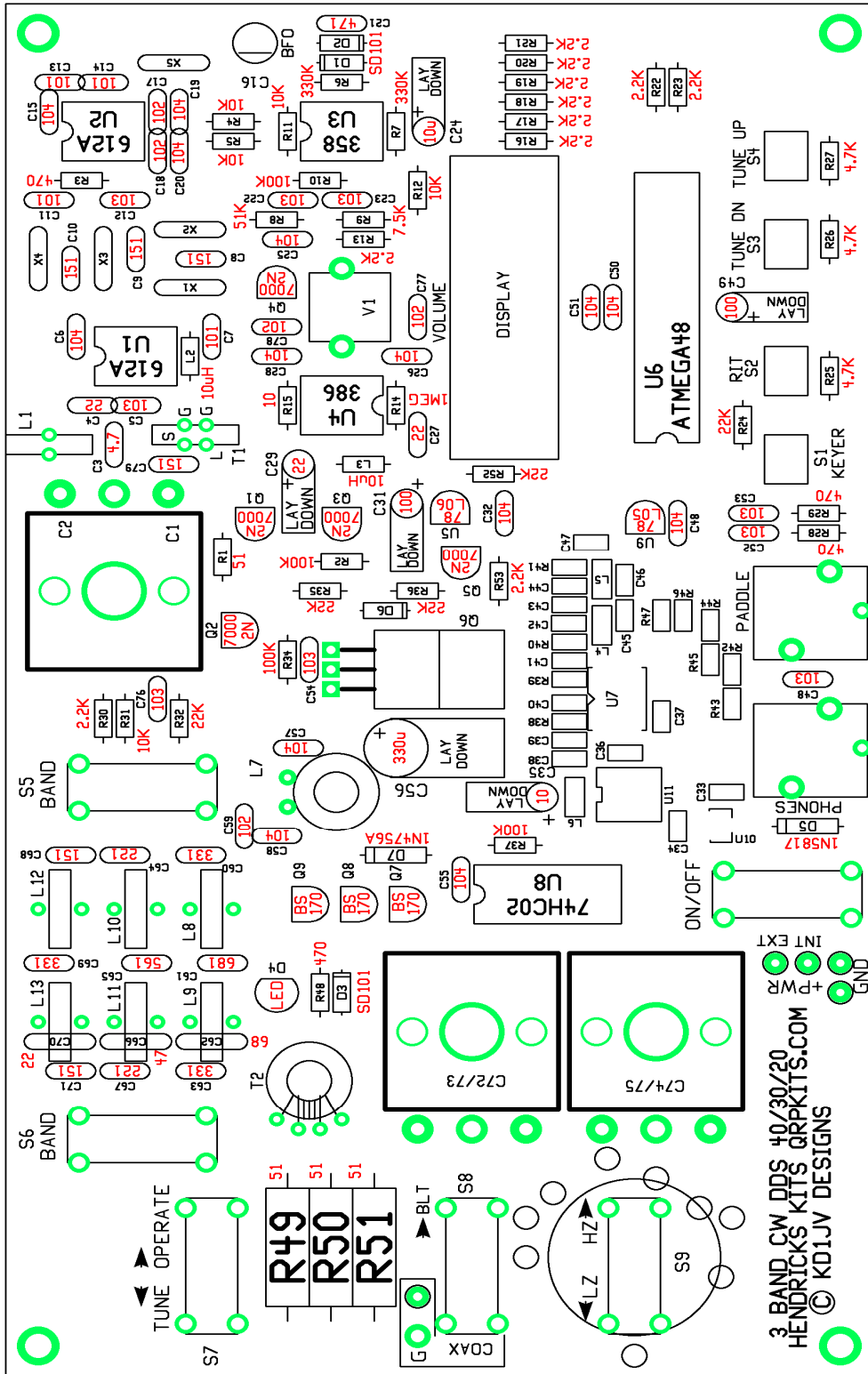
Power supply voltage: 8 volts minimum, 12.5 volts maximum. 12 to 9 volts recommend.

Parts check list:

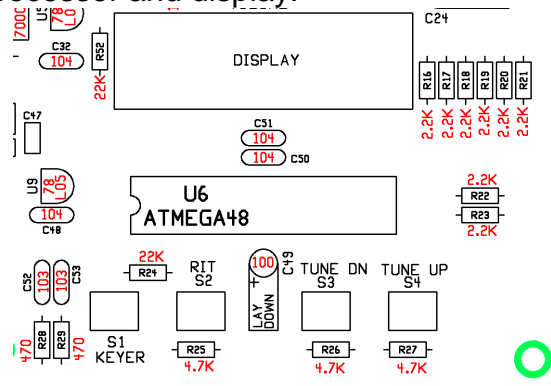
QTY	VALUE		QTY	VALUE	
1	10 ohms	Brown, black, black, gold	1	4.7 p NPO	Disk, brown, black dot on top edge
1	51 ohms	Green, brown, black, gold	3	22 p NPO	Disk, brown, black dot on top edge
4	470 ohms	Yellow, Violet, brown, gold	1	47 p C0G	Disk, brown, black dot on top edge
11	2.2 K	Red, red, red, gold	1	68 p NPO	Disk, brown, black dot on top edge
3	4.7 K	Yellow, violet, red, gold	4	100 p NPO	Disk, brown, black dot on top edge
1	7.5K	Violet, green, red, gold	6	150 p C0G	Mono, yellow
5	10 K	Brown, black, orange, gold	2	220 p C0G	Mono, yellow
1	51 K	Green, brown, orange, gold	3	330 p C0G	Mono, yellow
5	22 K	Red, red, orange, gold	1	560 p C0G	Mono, yellow
4	100 K	Brown, black, yellow, gold	1	680 p C0G	Mono, yellow
2	330 K	Orange, orange, yellow, gold	1	470 p DISK	Disk, brown
1	1 MEG	Brown, black, green, gold	5	.001 ufd disk	Disk, brown
1	50K audio	Vertical PCB mount	6	0.01 ufd X7R	Mono, yellow
3	51 ohm 2W	Green, brown, black, gold	14	0.1 ufd X7R	Mono, yellow
2	SA612AN	8 pin DIP IC	2	0.01 ufd film	Film, green
1	LM358N	8 pin DIP IC	1	30 p trimmer	Green
1	LM386N	8 pin DIP IC	3	poly-variable	Variable capacitor, dual section
1	74HC02N	14 pin DIP IC	2	10 ufd /16V	Aluminum electrolytic
1	ATMEGA48	28 pin DIP IC	1	22 ufd /16V	Aluminum electrolytic
1	78L05	TO-92 plastic	2	100 ufd /16V	Aluminum electrolytic
1	78L06	TO-92 plastic	1	330 ufd /16V	Aluminum electrolytic
1	1N5817	Plastic diode shottky rectifier, 1A	4	8 pin DIP sockets	
1	1N4756A	Larger glass diode, 47V 1W zener	1	14 pin DIP socket	
3	SD101C	Glass diode, fast shottky	1	28 pin DIP socket	
1	FQPF7P06	TO-220 plastic P MOSFET	2	FT37-43	Ferrite core, gray or black
5	2N7000	TO-92 plastic N MOSFET	6	T37-2 Red	Powdered iron core
3	BS170	TO-92 plastic N MOSFET	2	T37-6 Yellow	Powdered iron core
1	4 dig LED	4 digit multiplexed display module, hi eff	1	T100-2 Red	Powdered iron core
1	Super bright	LED clear	4	6mmx13mm tack	Push button switch
2	10 uhy rfc	Brown, black, black, gold	6	DP3T slide switch	
5	4.9152 MHz	Crystals HU-49US	2	Stereo jacks	
1	Power jack	2.1 mm pin	3	Knobs	
1	BNC jack		1	Red filter	
2	Binding posts	1 Red, 1 Black	1	PC board	
4	spacers	3/8" # 4 threaded hex spacers	3		Sets of vari-cap mounting hardware
8	1/4" 4-40 screw		4	#4 lock washers	
	#30, #28, #24	Magnet wire, #24 hook up wire	6	#4 Nylon washers	

QTY	VALUE		QTY	VALUE	
		These parts are premounted			
1	AD9834BRUZ	DDS	3	22 K	0805 chip resistor
1	50.00 MHz clk	Clock oscillator	1	22 p	0805 NPO chip resistor
1	10 uhy	1206 Choke inductor	2	8 p	0805 NPO chip capacitor
2	1.5 uhy	1206 Choke inductor	2	150 p	0805 NPO chip capacitor
1	815C35UA	3.5V low drop out regulator	1	220 p	0805 NPO chip capacitor
3	270 ohm	0805 chip resistor	4	0.01 ufd	0805 X7R chip capacitor
1	3.9 K	0805 chip resistor	3	0.1 ufd	0805 X7R chip capacitor
3	10 K	0805 chip resistor			

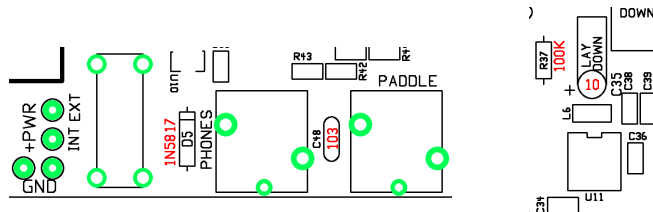
Parts placement overview. Print this page out for handy reference while building.



Group 1 assembly, Microprocessor and display:



- R16 to R23 - 8 places. 2.2K (RED/RED/RED/GLD)
- R24, R52 – 22 K (RED/RED/ORG/GLD) – be careful not to mix up the 2.2 K and 22 K !
- R25 to R27 – 4.7 K (YEL/VOL/RED/GLD)
- R28 and R29, 470 ohms (YEL/VOL/BRN/GLD)
- C32, 48, C50, C51, 0.1 ufd (104, mono, yellow)
- C52, C53 0.01 ufd (103, mono, yellow)
- C49, 100 ufd / 16V Long lead is plus. Bend leads at right angle to part and lay part flat to board along extended outline. (You will do this with all the other electrolytic caps on the board too)
- U9, 78L05. Do not mix up with the 78L06 or 2N7000 which are in same TO-92 package.
- 28 pin dip socket at U6
- LED display module. This will only go in one way, due to missing pins on display and corresponding missing holes on board. Mount extended from the surface, let pins protrude only 1/32" on the far side of the board for soldering.
- Four (4) TACT switches. These have the long red actuators.

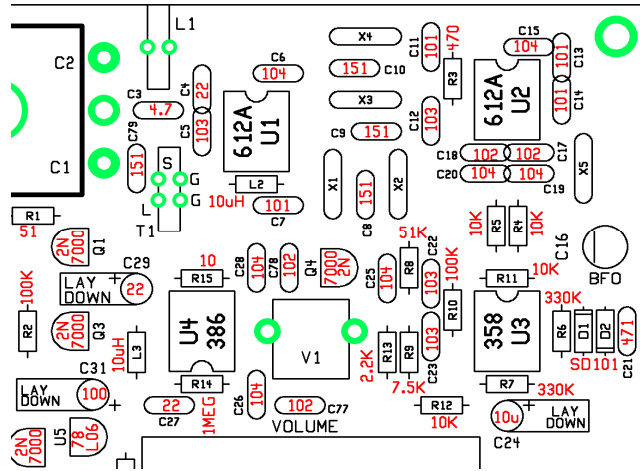


- D5, 1N5817 diode, black body. Band on part goes towards line on part outline.
- C48, 0.01 ufd (103)
- Paddle and phone jacks.
- DP3T slide switch. (ON/OFF)
- C35, 10 ufd / 16V again, long lead is plus and lay down part flat to board. Located above SMT parts, next to R37.

Group 1 smoke test:

- Install the ATMEGA48 microprocessor chip into the U6 socket.
- Connect up a 9 to 12 volt power supply to the power input pads next to the on/off switch. A 9 volt radio battery would be adequate for this test.
- Apply power to the board and turn on power switch if it is not already on.
- The LED display should light up with four "8"s for a couple of seconds. This is the display test. Then the display should display "40" for another couple of seconds (indicating the band), then 030.0 (this is the frequency)
- Clicking closed the Tune UP or Tune DN switches should make the display increment or decrement.
- Clicking the RIT switch should make the left most decimal point on the display light up.
- The DDS chip should also be working at this point. This can be tested with a frequency counter connected to the R39/R41 junction at U7 or general coverage receiver tuned to about 2.114 MHz with a short pick up lead for an antenna placed near the DDS chip (U7)

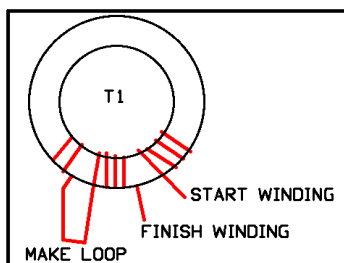
Group 2 Assembly, receiver section:



R15	10 ohm	BRN/BLK/BLK		C3	4.7 p	NPO, DISK	BROWN
R1	51 ohm	GRN/BRN/BLK		C4,C27	22 p	NPO, DISK	BROWN
R3	470 ohm	YEL/VOL/BRN		C7,11,13,14	100 p (101)	NPO, DISK	BROWN
R13	2.2 K	RED/RED/RED		C8,9,10,79	150 p (151)	NPO, DISK	BROWN
R9	7.5 K	VOL/GRN/RED		C21	470 p (471)	DISK	BROWN
R4,R5,R11,R12	10 K	BRN/BLK/ORG		C17,18,77,78	.001 u (102)	DISK	BROWN
R8	51 K	GRN/BRN/ORG		C22,23	0.01 u (103)	FILM	GREEN
				C5, C12	0.01 u (103)	MONO	YELLOW
R10	100 K	BRN/BLK/YEL		C6,15,19,20	0.1 u (104)	MONO	YELLOW
R6,R7	330 K	RED/RED/ORG		C25,28	0.1 u (104)	MONO	YELLOW
R14	1 MEG	BRN/BLK/GRN		C24	10 u/16V	LAY FLAT	ELECTRO
L2,3	10 uHy	BRN/BLK/BLK/GLD		C29	22 u/16V	LAY FLAT	ELECTRO
				C31	100 u /16V	LAY FLAT	ELECTRO
D1,2	Glass diode	SD101		U5	78L06		
U5	6V reg	78L06		Q1,2,3,4	2N7000	MOSFET	

NOTE: L2/L3 look like resistors, but the body is a little shorter and fatter. Do not mix up with 10 ohm resistor. Also, be careful not to mix up 51 ohm resistor with 1 MEG, as colors are very similar.

X1,2,3,4,5	Crystals	Tack solder case to solder pads next to crystal case. Running fine grit file along edge of crystal case will make the solder easier to stick.
C16	30 p trimmer (Green)	Make sure flat side of trimmer faces line on outline.
U1,2,3,4	8 pin sockets	
V1	50 K variable resistor	Solder mounting tabs to board.
	The following parts	mount on Bottom of board
C1/2	Poly-varicap	Mounts on bottom of board. Use 2.5mm washers between board and cap.
L1	T37-2 (red core)	40 turns, 24" of # 30 wire
T1	T37-2 (red core)	40 turns secondary, 5 turns primary see next page for winding details.



L1 and T1 are mounted on the bottom side of the board!

T1 winding: Wind with #30 wire. T1 must be wound in a specific way so that the "hot" end of each winding will end up on the same side of the core and line up with the proper holes in the board. Wind the core in a counter clockwise direction, passing the wire down into the hole from the top side of the core as you hold it. At the end of 40 turns, make a short loop and continue winding five (5) more turns. Snip the loop to separate the windings and tin the wire ends. Place into the board so one end of the four turn "link" (primary) goes into the pad marked "L" and one end of the 40 turn secondary goes into the pad marked "S". The two pads on the other side of the core are both ground.

Group 2 smoke test:

Install U1 and U2 (SA612A) into sockets

Install U3, LM358

Install U4, LM386 NOTE : U4 pin 1 faces "down", the opposite direction of U1, U2 and U3

The receiver section is now done and should now be functional. Give the BFO trimmer (C16) about a ¼ turn from its factory setting. If you look closely in the trimmer hole, you will see an arrow at one end of the screwdriver slot. When the arrow points towards the flat side of the body, it is a maximum capacitance. When it points to the round end opposite the flat end, it is at minimum. Using leads connected to the BNC connector, you can tack these wires across R1 (make the connections on the bottom of the board) in order to connect up an antenna. The end of R1 near Q1 is the signal side of the resistor. Apply power to the board and you will be receiving in the 40 meter band. Adjust the Rx tuning cap (C1/2) for best band noise or signal. **The peak should occur near full counterclockwise rotation.** Plugging in a paddle to the paddle jack and then operating the paddle should result in hearing the side tone sending dits and dahs. The Keyer function switch annunciations can now also be heard.

DDS frequency calibration and precise BFO setting adjustment:

If you have an accurate frequency counter, the DDS frequency can be calibrated. Without calibration, the operating frequency maybe off as much as +/- 200 or 300 Hz on the 20 meter band and to lesser extent on the lower bands. This is due to variations in the reference clock oscillator for the DDS chip. Calibration is done at 10.000,000 MHz, so it could be possible to zero beat WWV, but it is better left alone if an accurate frequency counter is not available. It is also possible to tweak the IF offset frequency so that it is centered in the passband of the crystal filter. This adjustment is done with the aid of an Oscilloscope, which could be a virtual one running on PC, as all you need to see is audio frequencies. The IF offset adjust mode is also used to set the BFO trimmer to match the side tone of the rig and this can be done by ear.

Entering Calibration modes:

While holding the DOT paddle and KEYER switch closed, turn power on to the board. The LED display will read [CAL.r].

Reference frequency calibration:

A frequency counter connected to the TP1 test point near the DDS chip will now read about 10 MHz. Use the Tune up and Tune down switches to adjust the frequency to be exactly 10.000,000 MHz. Once this is done, store by clicking the KEYER switch. Or you can skip this adjustment by clicking the KEYER switch. This will store the default values and advance to the offset adjustment

IF offset adjust and BFO trimmer set.

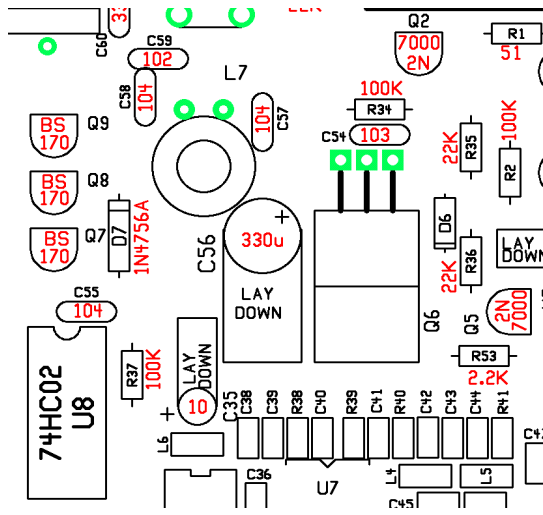
Once the KEYER switch has been clicked, the LED display will now read [CAL.o]. Connect an Oscilloscope to Pin 7 of U3. You will see the audio product detector beat note on this pin. If you do not have an Oscilloscope, do not make any adjustments to the IF offset frequency and just go do the BFO adjustment.

Tune through the pass band of the crystal filter using the tuning switches. You will likely see the amplitude of the signal peak a little at the edge of the pass band, just before the amplitude rolls off sharply. Tune to one end of the pass band, the point the amplitude of the signal starts to roll off. Count how many clicks of the tuning switch it takes to get to the other end of the pass band. Divide that number by 2 and tune back up or down depending on which way you went initially by that number of clicks to center the frequency in the pass band of the filter.

BFO adjustment:

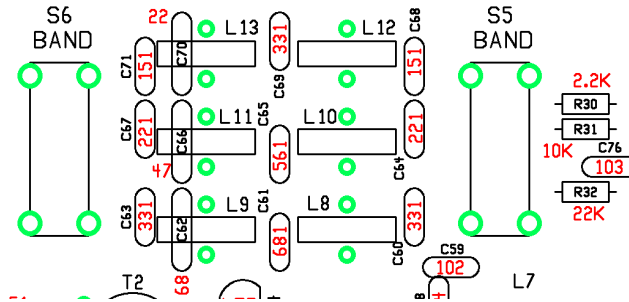
Plugging headphones into phones jack and you will hear the side tone and BFO beat note. Adjust the volume control until they have about the same volume. Adjust the BFO trimmer until both tones are the same. The tones will wobble when they get close to being equal and seem to merge when they are. This can also be seen on an Oscilloscope. Once you match the tones, store the adjusted IF offset or leave the default values in place by clicking the KEYER switch The rig will now reset.

Group 3 assembly: Transmitter section.



R53	2.2 K	RED/RED/RED
R35, 36	22 K	RED/RED/ORG
R34,R37	100 K	BRN/BLK/YEL
D6	Not used	
D7	1N4756A	Glass diode, large
C54	0.01 ufd (103)	MONO, Yellow
C55, 58, 59	0.1 ufd (104)	MONO, Yellow
C56	330 ufd/16V	Electro lay flat
Q5	2N7000	TO-92
Q5,7,8,9	BS170	TO-92
Q6	FQPF7P06	TO-220
U8	14 pin socket	74HC02A IC
L7	8 T on FT37-43	8" #28 black core

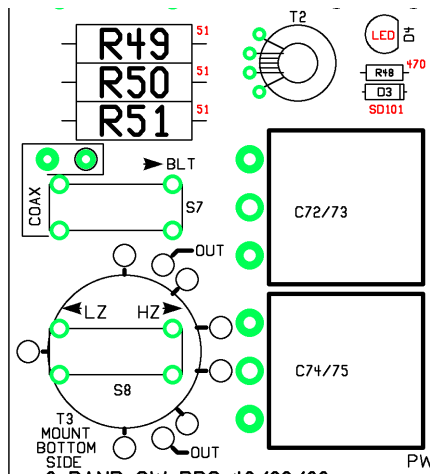
Group 4, low pass filters:



R30	2.2 K (RED/RED/RED)	
R31	10 K (BRN/BLK/ORG)	
R32	22 K (RED/RED/ORG)	
C76	0.01 ufd (103, mono)	
C68,C71	150 pfd (151, mono)	
C67,C64	220 pfd (221, mono)	
C69,C63,C60	330 pfd (331, mono)	
C65	560 pfd (561, mono)	
C61	680 pfd (681, mono)	
C62	68 pfd (68, disk)	
C66	47 pfd (47, disk)	

C70	33 pfd (33, disk)	
Low pass filter	Coils mount from bottom	Of board!
L8	17 turns on T37-2	Red core 10" #28
L9	19 turns on T37-2	Red core 10" #28
L10	13 turns on T37-2	Red core 8" #28
L11	15 turns on T37-2	Red core 8" #28
L12	14 turns on T37-6	Yellow core 8" #28
L13	18 turns on T37-6	Yellow core 10" #28
S4,5,6	DP3T slide switch	

Group 5, SWR bridge and balanced line tuner:



- R48, 470 ohm (YEL/VOL/BRN)
- R49, R50, R51 - 51 ohm, 2 watt (GRN/BRN/BLK)
- D3 - SD101, small glass diode
- D4 - clear LED - note flat side on part and outline, bottom of the led 5/16" from the surface of the pc board
- S7 - DP3T slide switch
- S8 - DP3T slide switch - this mounts above T3.
- T2 - Black FT43-37 core. Wind 25 turns as secondary and 5 turn primary in middle between ends of the secondary turns. Secondary ends go to two outside holes and primary the two middle holes.
- T3 - Mounts on bottom of board. Core is about same diameter as the mounting holes for the wire connections. See below for winding and mounting details.
- C72/73 and C74/75 Poly-variable capacitors. Mount on bottom of board with nylon washers between board and body of capacitor.

Winding T3:

- Cut a 36" (3 foot) length of the #24 wire.
- Wind 16 turns on the T100-2 core (this is the large red core)
- Start the winding of the core by passing the starting end of the wire into the hole from the top (side facing you as you hold it) and wind by passing the long end of the wire up from the bottom of the core. Wind the rest of the turns in a counter clock wise direction. Winding the core in this fashion will make the ends of the wire line up with the staggered holes in the board.
- Pull the 8th turn slightly away from the middle, outside of the core a little.
- Scrape away the insulation on the wire of this 8th turn, just a little near the middle of the core.
- Cut a 2" length of the #24 wire and tin one end.
- Attach this wire to the 8th turn on the core. Make a small, half loop on the end of the wire and lightly crimp to turn on core, then solder. See photo.
- Cut a 24" length of the #24 wire and wind 12 turns inter-weaved between the first winding and centered around the tap you just made, so there are six turns on either side of the tap.
- Now cut a 18" length of the #24 wire and wind three (3) turns on either side of the tap, for a total of six (6) turns. This winding will also be inter-weaved between the other two windings.
- The core is mounted to the bottom of the board and the wires are soldered from the top. Suspend the core slightly off the bottom of the board so that the wires do not touch the ends of the switch mounted above it. In fact, it is a good idea to snip the ends of the switch terminals flush to the board before mounting the coil. Be careful not to put the High Z winding into the pads marked "OUT", as these pads will connect to the binding posts on the cabinet.

Final tests:

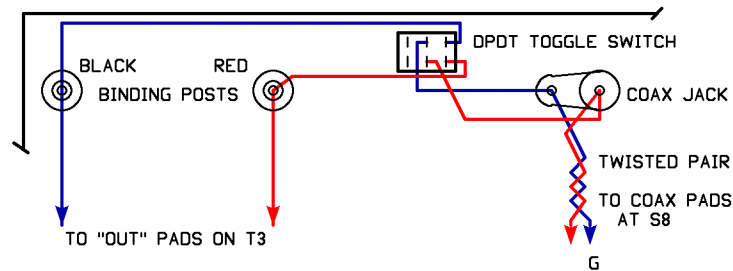
The board is now complete and the only thing left to test is the transmitter. Connect the BNC jack to the COAX terminals on the board by S9. Now connect a watt meter and dummy load to the jack. Make sure both BAND switches are set to the same band, you might as well start with 40 meters. Set the Tune / Operate switch to the operate position and the COAX / BLT switch to the coax position. Apply power to the board and send some dots. There should be some power output showing on the watt meter. If not, remove power and start looking for missing solder connections, that the insulation on the toroid coils has been soldered through and that both band switches are in the same position. If you see power output, go on and check the other two bands.

Power output

Power output is influenced by both power supply voltage and the way in which the turns on the coils are spaced around the core. To measure full power output, put the rig in straight key mode by turning power on to the board with the dash paddle closed or use a straight key. If using a paddle, the dot paddle will now key the transmitter on and off. With a 12.0 volt supply, power output should be close to 5 watts on all bands. If power output is higher than 5 watts, move some of the turns on L8, L10 or L12 (depending on the band) closer together and recheck the power output. Repeat if needed to get close to 5 watts output.

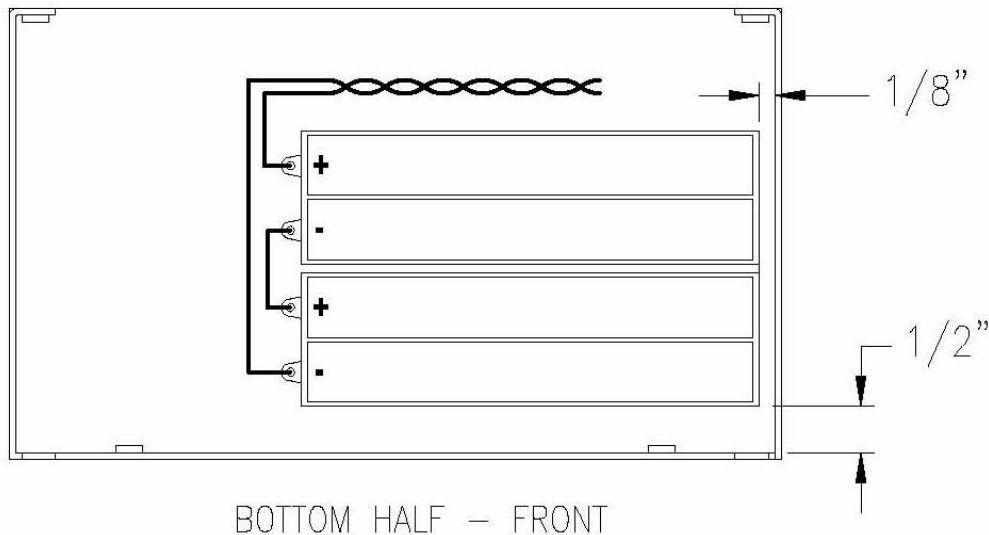
Mounting the board in the cabinet and final wiring:

- Solder the end of a 4.5" length of hook up wire to each of the pads labeled "OUT" under T3. These wires attach to the bottom side of the board. Since T3 covers these holes, the solder connections are made from the top of the board.
- Tape the red acetate filter to the inside of the led window.
- Slide the board into the top piece of the cabinet at an angle with the phone jacks at the front of the board down. To ease mounting, place all slide switches to the center position. Be careful not to bend the SWR led.
- Center the phone/paddle jacks in the chassis holes, and secure the board with the 4-40 x 1/4" screws and lock washers.
- Attach the nylon spacers to the tuning caps with the screw and 2.5mm lock washer. A small drop of super glue into the screw hole on the tuning cap will help keep the screw from coming loose.
- Place the three knobs on the tuning caps. Push the brass knob extension all the way down onto the volume control and secure the volume control knob.
- Mount the two binding posts, DPDT toggle switch, coax jack and external power jack to the rear of the cabinet.
- Wire up the binding posts, switch and coax jack as shown in the diagram below. The wires going from the coax jack back to the board should be tightly twisted together and take a direct path back to the pads on the circuit board.



- Twist two 8" lengths of hook up wire together.
- Solder to external power jack
- Solder the other end to the EXT and GND pads next to the On/Off switch
- The wire for connecting to the power jack to the board should be routed along the outside edge of the board.

Battery Mounting



Operation:

Power supply:

The PFR rig should be powered by no more than about 12 volts and no less than 8 volts. If a 13.8 volt bench supply is used to power the rig, two silicon rectifier diodes should be added in series with the positive supply lead to drop the voltage down closer to 12 volts. This will ensure the rig does not put out more than about 5 watts. 5 watt output at 12 volts was chosen as this is the typical voltage a gel-cell battery settles down to after it has been removed from its charger. Below 8 volts, the 6 volt regulator for the receiver will start to lose regulation.

Power ON:

The power switch has three positions. OFF, Internal (battery) power and External power.

When the rig is first turned on, the display will show all "8"s for a couple of seconds. This is the segment display test. Then the display will indicate the currently selected band, "20", "30" or "40". The band numbers will be displayed for another couple of seconds, then the display will change to show the operating frequency. Since only four digits are available, only the 100 kHz to 100 Hz digits are displayed. MHz digits are implied by the currently selected band. The initial operating frequencies loaded when the rig is powered on or the band is changed are 7.030,000 MHz for 40 meters, 10.110,000 MHz for 30 meters and 14.060,000 MHz for 20 meters.

Power save mode:

After about 5 minutes of no switch activity the rig will go into a power save mode by blanking the display, with the exception of the decimal point, and the processor is put to sleep. This will reduce current from 47 ma to 34 ma. Not a huge current savings, but if the rig is being run on batteries, every ma counts. The rig will "wake up" if any switch (other than Band) or the paddle is used.

Selecting operating band:

Two slide switches are used to select the operating band. Both switches MUST be in the same band position for proper operation. The band switch located near the top, center of the cabinet tells the processor which band you want to use and will indicate the selected band on the display for a second when the band is changed or on power up, as noted above. The switch located near the top, left of the cabinet is used to connect the output of the low pass filter to the antenna. If the two band switches are not in sync, there will be no signals in the receiver and the transmitter might be damaged if you transmit at this time.

After you change bands, you must re-peak the receiver input with the Rx peak control.

Tuning:

Tuning is done with two push button switches. These switches are operated best by "clicking" them to the side, rather than pushing straight down. Tuning steps are in 50 Hz increments. A momentary click of the switch will change the frequency by 50 Hz. Since the display only has 100 Hz resolution, it will take two clicks of the switch to see a change of frequency on the display. Holding one of the tuning switches closed for longer than about one (1) second will start an auto tune mode, where the frequency will change in 100 Hz steps at a rate of about 10 steps per second, so long as the switch is held closed. When the switch is released, normal 50 Hz "one click" tuning is restored.

Tuning limits:

Tuning is restricted to be within the currently selected ham band. This is to prevent out of band transmission. Full band coverage is available. 7.000,000 to 7.300,000 on 40, 10.100,000 to 10.150,000 on 30 and 14.000,000 to 14.350,000 on 20. SSB signals can be copied on 40 meters but not on 20, as receive is always lower sideband. Even on 40M where the sideband modes match, SSB signals will be hard to copy due to the narrow CW filter used.

RIT (receiver incremental tuning)

Clicking the RIT switch will activate RIT. The left most decimal point on the display will light when you are in RIT mode. When in RIT mode, the receive frequency is changed by the tuning switches and the transmit frequency stays where it was when RIT was activated. Clicking the RIT switch again will exit RIT mode and restore the original receive frequency.

DFE mode (direct frequency entry)

This mode allows you to go directly to a specific frequency by entering it in with the paddle. Clicking and holding closed the RIT switch for longer than one (1) second will activate this mode. The display will blank when DFE mode is enabled. Enter the frequency you wish to go to, starting with the 100 kHz digit and finishing with the 100 Hz digit. As each digit is entered, it will be shown on the display and shift from right to left as additional digits are entered. If a number is not recognized, a "?" will

be sent by the side tone. Once the 100 Hz digit is entered, the rig will re-tune to that frequency provide it is within the normal tuning limits of the current band. If it's outside the band, the frequency at which the rig was tuned to when DFE was enabled will be restored. If you make a mistake or wish to exit the DFE mode at anytime before the 100 Hz digit is entered, you can escape by clicking any of the switches.

Note: DFE mode is not available in straight key mode or if RIT is on.

KEYER switch:

The keyer switch is used to access various keyer functions. Which function is selected is determined by how long the switch is held closed. Keyer functions are selected in this order: send message, change keyer speed, enter messages and select iambic A or B mode of operation. Note: When in straight key mode, none of the keyer switch functions are available, with the exception of sending keyer message 1, assuming a message is already stored in that location.

Sending a Message:

Two, 63 character (including word spaces) Morse messages can be stored in memory. One of these messages can be sent by first clicking and releasing the KEYER switch and then tapping the DOT paddle to send message one, or tapping the DASH paddle to send message two. This must be done within 1 second of releasing the switch or the change code speed mode will be activated. Once a message has started sending, it can be terminated by closing the DOT paddle. If a character is being sent at the time of dot or dash closure, it must be held closed until that character has finished being sent.

When in straight key mode, only message 1 is available, as the DASH input is always grounded by the straight key plug.

Changing keyer code speed:

If sending a message has not been selected using the paddle after clicking and releasing the KEYER switch, speed change mode will be activated. The current code speed is shown on the display as [C xx], where xx is the current speed. Keyer speed is changed by closing either the DOT paddle to increase speed or closing the DASH paddle to decrease speed. The selected speed is shown on the display. Once the desired speed is indicated on the display, release the paddle and wait about two (2) second and speed select mode is automatically exited.

Storing a message:

Holding closed the KEYER switch for two (2) seconds will active the message entry mode. Release the switch when the letter "M" is annunciated by the side tone. The receiver is then muted and you can now start to enter your message by using the paddle. If you accidentally activate this mode and do not wish to enter a message, click the KEYER switch to abort before touching the paddle. The Letter "X" will be annunciated and the rig will go back to normal operation.

Up to 63 characters (including word spaces) may be entered. If you exceed this limit, the letters "EM" will be annunciated by the side tone and you will have to start again. Note that "ideal" letter and word timing is used to determine letter element groups and word groups. Of these two, the letter timing is most critical. If do not pause long enough before starting a new letter, a letter space will not be detected. If you pause too long, it will be interpreted as a word space. It may take some practice to enter a message correctly. I ensure a word space is inserted, it is best to pause somewhat longer than you normally would between word letter groups.

When you have finished entering the message, click the KEYER switch. The message you have entered will be sent by the side tone so you can check the accuracy of the message. If it sounds good, store it by closing either the DOT or DASH paddle. DOT will store it into message location 1 and DASH into location 2. If you wish to redo the message, click the KEYER switch again. "EM" will be annunciated by the side tone and you can now re-enter the message.

Selecting Iambic A or B modes.

Iambic A mode is the default keyer mode. To switch to B mode or back to A mode, hold the keyer switch closed for about four (4) seconds until the letter A or b appears on the display (b looks like a 6 on the display) then release the switch. The letter which appears on the display will be the mode the keyer will be set to when you release the switch.

The difference between A and B modes:

In A mode, if both paddles are closed at the same time, alternating code elements are sent. If you close the dash paddle first and then hold both the dash and dot paddle closed, the keyer will send dah-dit-dah-dit-dah so long as the paddles are held closed. When the paddles are released, the keyer will simply stop sending at the end of the code element which might be being sent at the time the paddles are released, if any.

In B mode, alternating code elements are also sent when both paddles are closed, but this time an extra and opposite code element will be tacked on the end of the string when the paddles are released. Therefore, to send a letter such as "K", you just have to close the dash paddle first, then tap the dot paddle and dah-dit-dah will be automatically sent. In A mode to send this same letter you would have to keep the dash paddle closed until the second dash started to be sent before releasing the paddle.

In a strict implementation of B mode, any time both paddles are sensed to be closed at the same time would generate this extra element. This can lead to the extra element being sent when you don't intend one to be sent because it is easy to get ahead of yourself. Therefore, the B mode implementation used in the PFR only senses if both paddles are closed during the inter-element space. This makes controlling whether you want an extra element or not easier to control. It is also easier to implement in software.

Both A and B modes have dot and dash memory while an element is being sent. So, if you tap the dot paddle while a dash is being sent, the dot will be sent after the dash is finished and vice-a-versa.

Straight key mode:

If a monaural plug is in the paddle jack at power up (the sleeve grounds the dash input pin), the rig will power up in straight key mode. This allows using either a straight key or external keyer. While in straight key mode, none of the keyer switch functions will be available. If a message has been previously stored in the keyer memories, only memory location 1 will be available, as this is selected with the dot input pin, now controlled by the straight key.

Using the SWR bridge and BLT tuner:

Note that S8, S9 and S10 are three position switches but only two positions are used. The two positions to the left are the same. When mounted in the case, only two positions will work.

Sliding S8 to the TUNE position switches in the SWR bridge. The LED will now indicate the relative amount of SWR. The brighter the LED, the higher the SWR is. When the LED is not lit or is very dim indicates 1:1 SWR.

S9 is used to switch between a direct coax connection to the BNC jack or the BLT (balanced line tuner). The Coax position is of course used if you are using a resonate, coax feed antenna or an external tuner. The BLT position is used when the built in tuner is desired and is normally used with ladder line feed antennas, but can also be used for end feed antennas or matching coax feed antennas which need a little tweaking.

Before transmitting, adjust the TUNE and LOAD capacitors for best band noise or signal strength. Now switch from Operate to Tune mode with S8, if your not already in the tune position. Now transmit (there is no "always on" tune mode, so just send a string of dits or dahs) and fine tune the TUNE and LOAD capacitors so that the SWR LED gets very dim. It may not be possible to make the LED go out completely do to leakage and minor unbalances in the bridge. The tuning of the two capacitors are interactive. If you can not get a good SWR null, try using low impedance setting of S10.

Using the BLT with end feed wire antennas or coax.

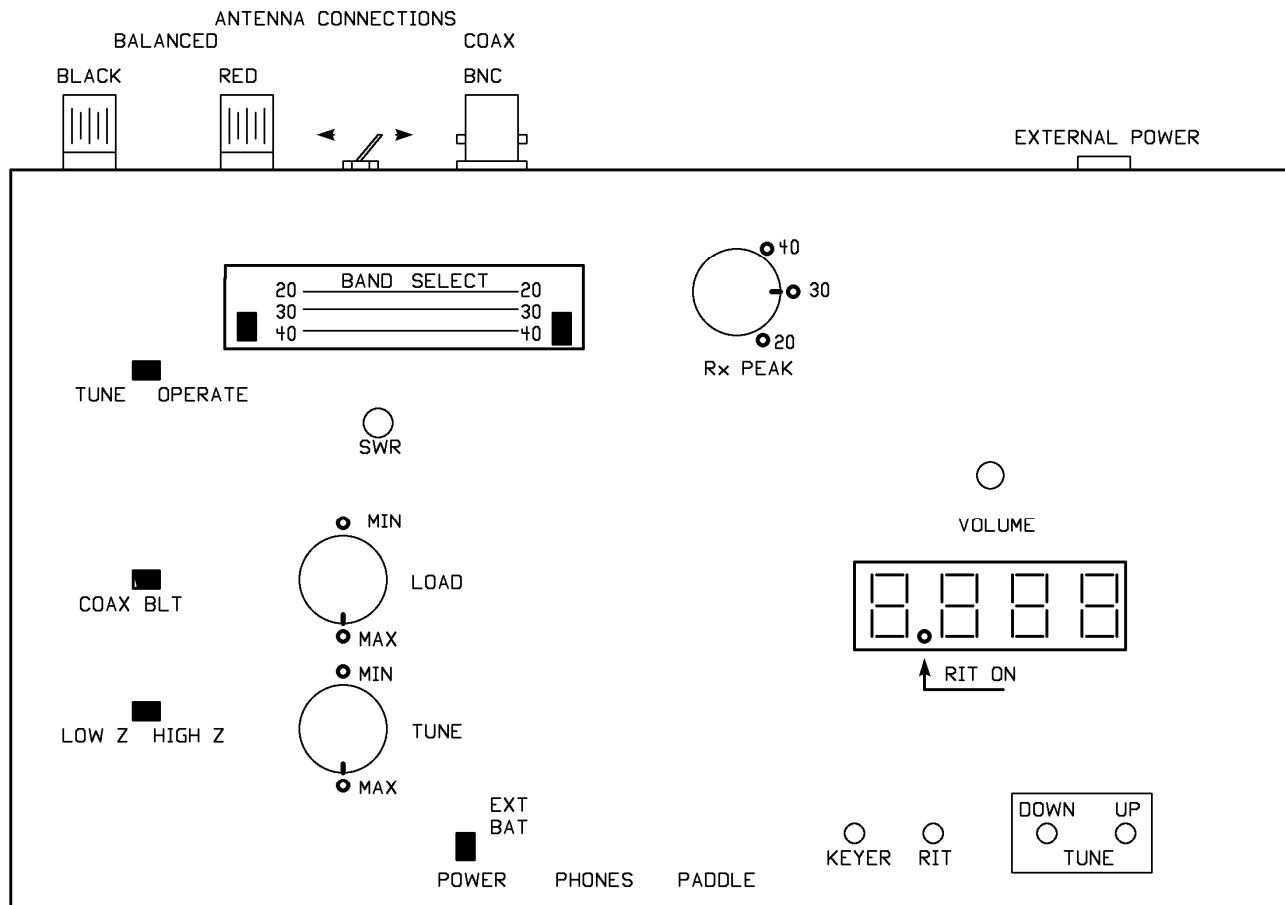
The DPDT switch on the back of the enclosure is wired so it will ground the black balanced line binding post and connect the Red post to the coax jack. End feed wire antennas can now be connected to the Red binding post and a counter pose to the Black post. Use the High Z position of S10 if the wire is near a 1/2 wave in length. Use the Low Z position if the wire is near a ¼ wave or less in length. The Low Z position is also used when using the BLT to match a coax feed antenna.

Using a speaker instead of headphones:

The amount of current the audio amplifier can deliver to a speaker is limited by the current available from the 78L06 regulator. A small, efficient speaker at low or modest volume should be alright. However, it would be a good idea to use an amplified speaker such as those used for PC sound, as this would keep the load on the PFR audio amplifier to a minimum.

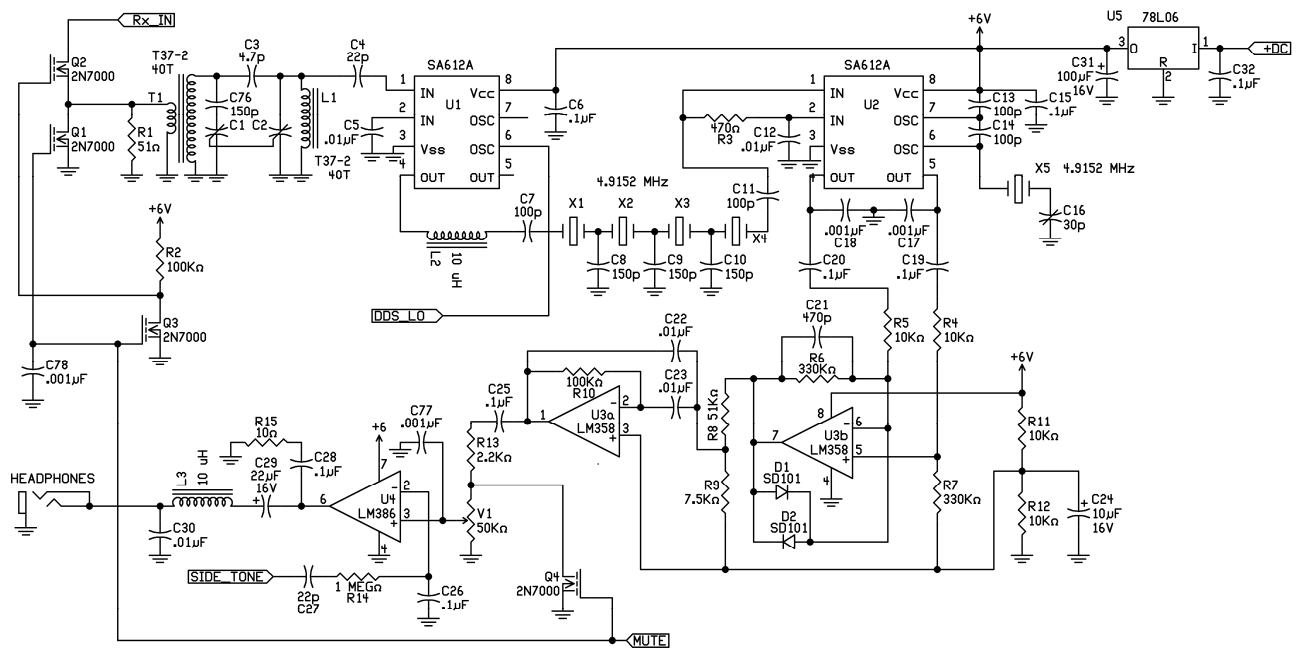
Also, since the PFR does not have AGC, be careful when using in the ear "ear bud" type headphones. Turn the volume control down when tuning across the band so that if you run across a strong station, it does not blow your ears off!

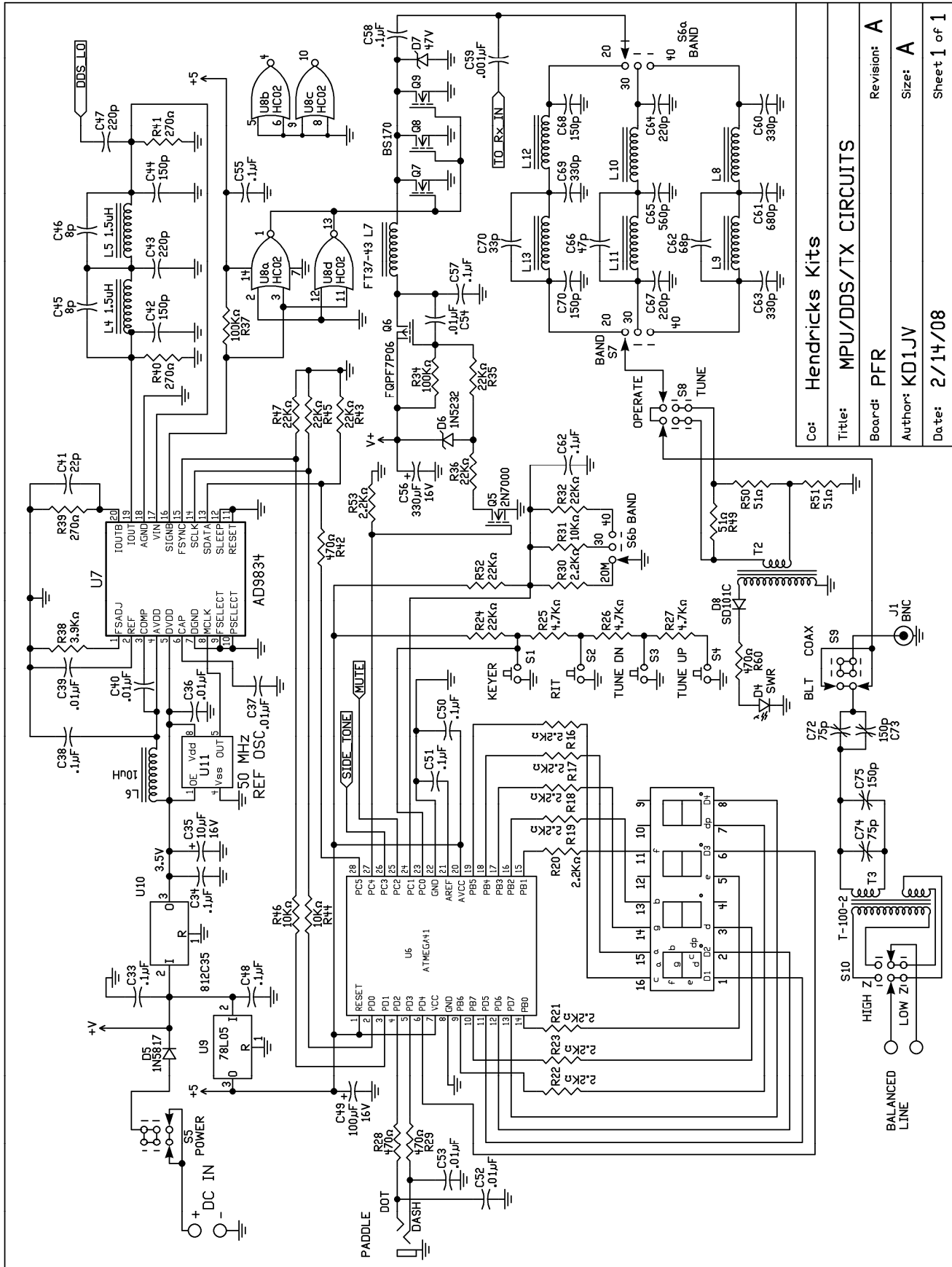
PFR front panel controls and rear panel connectors.



- HOLD FOR DFE MODE
- SHORT - KEYSPEED/ SEND MESSAGE — DASH-M1
- HOLD - ENTER MESSAGE (M) — DOT-M2
- HOLD - IAMBIC A/B MODE TOGGLE

Schematics:
Receiver audio





Co:	Hendricks Kits
Title:	MPU/DDS/TX CIRCUITS
Board:	PFR
Author:	KD1JV
Date:	2/14/08
Revision:	A
Size:	A
Sheet	1 of 1