DIFFERENCES BETWEEN THE T41
V011 and V012 Hardware and The Available K9HZ Options
January 29, 2024

Background

The T41 Transceiver is an excellent radio, loaded with hardware and software features from the start that make it a great platform for beginners and experimenters alike. The unmodified T41 Version 011 platform (or V011) provides a person wanting to build their own radio with a transceiver able to transmit and receive CW, SSB, and digital modes on the amateur bands 80M-15M. With a simple modification, that operation can expand to 12M and 10M as well. The end user is also able to experiment with the open hardware and software to make enhancements for a customized radio to meet the needs of the individual.

The new Version 012 boards (or V012) improve on/ expand the RF capabilities, options, and extraneous RF noise suppression.

The new V012 Main and RF boards have been released and the Gerbers and BOM are posted in the Files section of the SoftwareControlledHamRadio forum (group buy/sales will take place shortly), and on the Github site: DRWJSCHMIDT/T41 (github.com)

There are two ways to get to a T41 V012 radio. You can:

1. Start from an existing V010/V011 radio that is working… and do the following:
    a. Discard the power supply board.
    b. Replace the V010/V011 Main board with a V012 board.
    c. Replace the V010/V011 QSD and QSE boards with a single RF board.
    d. The rest of the boards all play together.

2. Build a V012 radio from a new set of V012 boards (includes some of the older V011 boards like Switch matrix, filter board, and PA board).

The differences between MAIN V012 vs. V011 boards are:

1. si5351 has moved off the main board to the RF board.
2. Two IC2 busses are now available through connectors to operate a number of add-ons.
3. The voltage regulators on the main board only power the main board...
4. The display voltage can now be selected on the main board via a jumper.
5. The Band signals have been MUX-ed (4 bits) to correspond to the existing Elecraft/ Kenwood/ Yaesu band signals for using external devices.
6. The ethernet connector now is available.
7. The front panel rework/ board works flawlessly with the new main board.
8. New signals/ connectors are available for RF-mode and switching.

9. A/D and D/A chips are now placed directly on the board and optimized (filters) for the I/Q streams.
10. LEDs are provided for the 3 voltages and PTT for visual confirmation of same.
11. A soft-start, push-on/off circuit has been added that allows the processor to run a "shutdown" routine before the power goes off to the processor.
12. Display buffer has been removed (generated RFI).
13. Both sides of the board are utilized for components. Board is same size as previous.
14. Audio amplifier is now user supplied/ off board.
15. Option to add a shut-down controller to run routines prior to power off.
16. Lower power/ less heat generation.
17. Onboard power regulators just for Main board.
18. On-board power switch for rest of radio power distribution.
19. 100% compatible with V011 hardware (requires V012 RF board).

The differences between RF V012 vs. V011 QSD+QSE boards are:

1. Functions of the QSE and QSD combined into one board for synergy.
2. Si5351 LO is on-board to keep RF lines short.
3. Quadrature LOs are generated in the si5351 directly allowing much greater frequency span of base-level transceiver, now covers 3.5MH-100MHz+.
4. Improved anti-aliasing filters.
5. Feedback line for auto-calibration.
6. New RF front-end gives flat gain over entire receive range and better than 0.5uV sensitivity.
7. New CW key-shaping circuitry for perfect keying.
8. Option for RF gain control on front end.
9. Option for TCXO for less than 1ppm frequency drift.
10. Option for extended low frequency coverage – 400kC-3.5MHz for MF coverage.
11. Option for precision-adjustable RF output from exciter.
12. 100% compatible with V011 hardware (requires V012 Main board).
13. 4-layer board for reduced cross-talk and IMD.
14. Built only what you need concept.
15. Same size as Main board.
16. Single 12V connection. Onboard voltage regulators just for RF board.
17. Works with either V011 LPF and PA boards, or with enhanced hardware below.

Also available as options to enhance the base-level T41 V012 (and other QRP radios):

1. **K9HZ** front panel and encoder boards. Makes the install of the switch matrix and encoders orderly and functional. No switch calibration ever needed.
    a. Dual stacked switch board connects to main board via encoder connector.
    b. Encoders connect to switch board.

c. Controls driven by hardware digital expanders for robust operation.

2. **K9HZ** BPF. 11 band BPF used as a preselector on receive and a extra filter for RF output pre-PA amplification for better signal quality with lower harmonics.
    a. Can be used as a stand-alone option in any QRP radio, or pared with K9HZ 11 band LPF.
    b. Board size is the same as the Main, RF boards.
    c. Includes filtering for 160M-6M with bypass.
    d. Separate connectors for RX and TX lines in-out with switching as option.
    e. Switching signals compatible with Main board "BAND" connector.
    f. No additional power needed.
    g. Small T37 cores for easy assembly.
    h. Build only what you need concept.

3. **K9HZ** 11 Band LPF.
    a. Fits on two interconnected boards the same size as the Main and RF boards.
    b. Works with any QRP radio up to 100W
    c. 11 Band coverage, 160M-6M and a bypass position.
    d. Enhanced W3NQN filter design technology.
    e. Option for four separate antennas.
    f. Optional PIN diode or Relay TR switching modules.
    g. Optional KEY-OUT connection for amplifier.
    h. Optional connections for **K9HZ** 20W PA.
    i. Optional connections for **K9HZ** 100W PA.
    j. Optional 1.8MHz high-pass filter.
    k. Optional Line section for power and SWR determination.
    l. Optional AD8307 Log amps of diodes for FOR and REF power.
    m. Optional analog signals or 2-channel I2C A/D for FOR and REF.
    n. Optional I2C control or digital/ analog signal controls.
    o. Optional output of industry standard "Bands word" for external switching.
    p. Optional transverter connections.
    q. Optional BPF connections and management.
    r. Connects directly to T41 Main "Bands" connector.
    s. 12V power connection only. Onboard voltage regulators just for LPF board.
    t. Build only what you need concept.

4. **K9HZ** 20W PA.
    a. Small sized, 50mm x 140mm.
    b. Works with any QRP radio.
    c. 12V power connection only. Onboard voltage regulators just for PA board.
    d. Broad banded 160-6M flat gain.
    e. 20W PEP output with 1-5mW Input.

f. Uses real RF transistors – RD16HHF1 pair.
g. Indestructible. Runs cool at any SWR.
h. Positive going PTT 3-12 volts for transmit.
i. Pre-driver for 100W PA.
j. Pad provided for matching and input power reduction.
k. Easy two pot bias adjustment.
l. Easy to build kit.

5. **K9HZ** 100W PA.
   a. Same basic Works with any QRP radio.
   b. 12V power connection only. Onboard voltage regulators just for PA board.
   c. Broad banded 160-6M flat gain.
   d. 110W PEP output with 8W Input.
   e. Indestructible. Runs cool at any SWR.
   f. Uses real RF transistors – RF100HHF1 pair.
   g. Positive going PTT 3-12 volts for transmit.
   h. Easy two pot bias adjustment.
   i. Easy to build kit.

6. **K9HZ** Antenna Tuner (prototyping stage).
   a. Works with any QRP radio.
   b. Able to tune wide range of antennas from 4 ohms to 1200 ohms.
   c. Works on theory of finding a transform between radio and antenna computations for starting point (eg no click-clack tuning).
   d. 100W continuous power.
   e. 12V power connection only. Onboard voltage regulators just for PA board
   f. Integrates with K9HZ LPF board for seamless operation.
   g. Command line for requesting “low power” for tune.
   h. Diagnostics and parameters communicated to processor via I2C.
   i. Stores up to 100 segments per band for ultra-fast tuning once learned.
   j. Has bypass mode.
   k. Easy to build kit.

7. **K9HZ** VHF/UHF Transverter (conceptual stage)
   a. True SDR design.
   b. Same size as T41 RF board (100mm x 100mm).
   c. Covers 144-148MHz, 420-440MHz, and 900
   d. Uses si570 LO.
   e. High performance PSA-8+ RF front end.
   f. Simple design.
   g. Generates I/Q signals that connect where the HF I/Q lines did when active.
   h. 100% compatible with V012 Main board.
   i. TBD watts per band.

j. LPFs included onboard.
k. Separate antenna connectors for each band.
l. Line section for FOR and REF power.
m. Easy to build kit.

8. **K9HZ** Second/ Sub-Receiver (conceptual stage)
    a. Two independent SDR receivers.
    b. Uses second RF board with only RX section populated.
    c. Second channel I/Q to main board for processing*.
    d. Uses si5351 with secondary I2C address.
    e. Identical performance to existing receiver.