RT-21 REVISION HISTORY

VERSIONS 1.nn use PIC18F2550 CPU with software USB implementation
VERSIONS 3.nn use PIC18F2520 CPU with FTDI chip USB implementation
VERSIONS 4.nn use PIC18F26K22 CPU with support for new UART channel (WiFi)

1.0 – Initial Release

1.01 - Sept 15 2007
Various command fixes that allow the serial communications to work correctly with remote commands and release of RT-21 Setup Utility. Limit settings and calibration settings weren't calculated correctly. It was OK with SETUP from front panel.

1.02 – Sept 28 2007
Fixes the DCU-1 protocol as implemented in some programs. WriteLog and Logger32 were found not to work with RT-21 due to extra <cr> character used by these programs. 1.02 ignores these <cr> characters. Tested WL and Logger 32.

1.03 – Nov 5 2007
Changed the TIC Option to become TIC-PST to include Prosistel rotors into the same POT-RANGE testing and errors scenarios. Included into rev 1.1 of the manual. Also checks for this error all the time instead of just when the motor is running.

1.03.1 – Dec 11, 2007
Fix bug that can revert to an old heading when using SETUP program to change settings if rotor has also been moved during SETUP session. (Real Heading not saved!!!) Could be dangerous to Alfa-Spid users.

1.04 – Jan 22, 2008 [INCLUDES VERSION 1.13 of SETUP UTILITY]

1. Adds a short ramp down on CANCEL or computer stop command. Manual button release ramp downs are longer also.

2. Quick tap of CW or CCW button begins RAMPDOWN NOW, but will continue toward target at MIN SPEED.

3. Improved the USB enumeration process that fixes the USB on real fast computers.

4. Alfa-Spid rampdowns start later to reduce "creep in".

5. Allows 5 digit pulse divider settings from SETUP UTILITY. Largest Pulse Divider = 23593.

6. Errors no longer force a reboot of the controller EXCEPT for a Low Voltage detect. This allows much faster responses for the new SETUP utility as it changes values AND allows SETUP to detect that an error has occurred. The controller responds with a '999' heading for the 2 seconds following a NO MOTION FAIL.

7. New QUICK CAL routines now work with SETUP UTILITY. See the SETUP UTILITY readme file for information.

8. A separate HEX file for RT-20 upgraded units is now provided that includes the "NoUSB" in the file name. This hex file should be used with all controllers that DO NOT have a USB connector on the rear panel. It will disable the USB connection of a controller that DOES have a USB connector if loaded.

1.04.1 – Feb 22, 2008 [INCLUDES VERSION 1.14 of SETUP UTILITY]

Expanded size of vanity message to 1 line. Added some robustness to 232 port code. Fixed NoUSB version 232 port code that was not initializing correctly.

RT-21 Version 1.06.2

(Inbetween versions were all Beta)

1.06.2 – Feb 5, 2010 [INCLUDES VERSION 1.21 of SETUP UTILITY]

1. When running with Speed = 11 (full speed, no ramp) then the SETUP/RAMP parameter will shut down the motor early by (Ramp X 2) degrees on Computer and Point and shoot commands in order to reduce overshoot. This was in the older RT-20, but got left out of the first RT-21 releases.
2. The Maximum Pulse Divide Ratio is now > 50,000. You must use SETUP Utility in order to set anything above 9999.
3. Some options will increase the default motor timeout a bit. This is still settable in SETUP Utility. The Motor Timeout now keys off how many seconds we've been running before we move at least 2 degrees. (Used to be 1 degree) This prevents a noisy pot line or a poor resolution pot scheme that oscillates the heading 1 degree from NOT triggering a Motor Timeout ERROR.
4. New SETUP/MODE = OFFSET – Allows users to set two alternate beam OFFSET values and to toggle heading displays to them sequentially by tapping the CANCEL button. (2$^{nd\ or\ 3rd}$ antenna offset 90 degrees from main antenna on same mast. Also works with rotary

dipoles or other bi-directional schemes including StepIRs. Use SETUP Utility version 1.20 or higher to set the alternate OFFSET values for use with this feature.

5. We now allow all computer commands to be either upper, or lower case. This makes it easier to "Hyperterminal" commands.
6. HAM_x and T2X rotors now do not require any calibration. When setting the OPTION = HAM or T2X, values are set into the calibration parameters automatically that will result in accurate readings to within a couple of degrees. You may overwrite these values if you need to for any reason by using SETUP utility.
7. Computer communications now continues to work while in SETUP mode.
8. Fixed a bug where we were off by 1/10th degree when CCW from the nominal CCW limit (Overtravel) on counter systems only.
9. New computer commands to run motor CW or CCW for 1.5 seconds Motor continues to ramp up and run as long as the commands are sent again before the 1.5 seconds, then ramps down and stops. Will obey soft limits and motor timeouts.
   a. AAn; = CCW
   b. ABn; = CW
10. Optional 12 Bit A/D (extra cost) can increase resolution on POT based systems up to 1/10th degree.

The following are new features that may be turned on or off using the SETUP Utility version 1.20 or higher:

These are accessed via the top menu bar "Advanced Options"

- Instead of freezing the display at idle, you may set the display to Slow Update instead. (Default slow update) Debug still runs display full speed at idle.
- You may set the Brake Delay to Fast Off instead of following the Reverse Delay setting. (for relay control systems)
- Auto Go Back – when running with CCW and CW buttons, if you let go but then tap the button again during the ramp down process, the controller will automatically send the rotor back to the spot it was at the moment you let go of the button. It will wait to finish the ramp down and wait for the reversal delay before returning to that heading.
- Elevation/Polarity array mode. Headings CCW from 0 degrees will display as negative numbers. This will work for up to –99.9 degrees. Only the RT-21 display will reflect these negative numbers. This will only work with units that have displays built after April 2009.
- You may now turn off the Automatic Dimming of the display. If you use feature 9 to slow update, this will disable Auto Dimming on older displays. Newer displays will still auto dim, but the auto dim can be turned OFF.

- Analog Output – Enables a DC voltage proportional to the heading to be available on a rear terminal. This will require a field mod on boards Rev 2.1 or earlier. Rev 2.2 will output this signal on Pin 9 of the D-sub RS-232 connector. (designed to drive VBI-360 display panels)
- EME-Mode disables pulse counter after "Delays" time until motor starts again. Designed to help extra counts caused by very large arrays rocking in the wind and moving any reed switch type unit.
- Port 9600 allows configuring the RS-232 port from the default 4800, to 9600 bps. SETUP Utility and many DCU-1 applications require 4800 and are not settable to higher speeds.

RT-21 Version 1.07 or 3.07 for v3 units

(Inbetween versions were all Beta)

1.07 – Oct 7, 2010 Coincides with 1st shipment of RT-21 v3 (FTDI USB)

- Removed the sometimes confusing 5 and 10 degree early limits imposed on HAM-x rotators.
- Add COUNTER RANGE ERROR to protect against corrupted counter values. Add EE value 'U' to allow over-travel between 0 and 180 degrees. Default = 90. Next SETUP Utility will support.
- Improved the EME mode to ensure we don't stop on a magnet position if we can help it.
- Fixed bug that "bumped" rotator even if we were at a soft limit.
- Fixed the COAST function for relay control systems that we broke in an earlier version somewhere.
- Improved Counter Rotation by implementing a Counter Rotate Delay that paces Commands from the Master to the slave for the delay in seconds. EE value 'V'. Default = 10 seconds. Goes into the Master unit only. Next version of SETUP Utility will support.
- Increased max pulse counter to 32,600.
- Changed default Orion Divide Ratio to current shipping 4015 (from 3960).
- Fixed bugs in Shortest Route Logic.

RT-21 Version 3.08 for v3 units

(No planned updates for < v3 units)

3.08 Dec, 2012 RT-21 SETUP Utility 2.0 Manual rev 3.4

- New ADVANCED OPTION – "Use Encoder" Support for relative quadrature encoders first used with LUSO rotators. Uses add-in 2 bit encoder board and supports direction detection with RC3. Index mark is in hardware, but not implemented in firmware.
- Advanced Option Analog Output RC1 changes: (also a bug fix)
    a. Added additional output on rev 3.1 boards at J13-4. (internal header) 0-10 VDC and has a low impedance op-amp output.
    b. When Advanced Option is OFF the output tracks the motor speed control for running external Motor Drives.
    c. When Advanced Option is ON, the output tracks the Heading with center voltage equal to center of rotation for driving devices like the VBI-360EADING output devices like the VBI-360. Range includes 360 degrees plus additional 90 degrees overlap in both directions.
    d. Heading Output now has better than one degree of resolution compared to about 4 degrees in previous versions.
- Reversed sense of Advanced Option (un)Freeze Display so that freeze display is now optional, slow update is default.
- Eliminate the test for MAX COUNT in firmware. 32600 is max that allows full over-travel, but some EME systems needed more, and they will work up to 65,200 and still support 360 degrees.
- Add DEMO mode (Advanced Option) runs a counter in a counter Option Rotator. Unit then .acts as a rotator simulator. When used with a Potentiometer Option rotator, DEMO will always seek and return to the position indicated by the front panel knob. First use was to auto-correct for a large antenna that turned through the rotator. Could be very useful for TR44 and other Hy-Gains that did not have a brake.
- Cal to CCW Limit Switch button works ONLY when the same name 'Advanced Option 'Allow Cal to CCW Limit' is also selected and the Option is a Counter rotator other than Spid. Finds the CCW limit switch and cals the rotator to the position as defined with the CCW Limit Switch Position value. (THIS IS NOT THE SAME AS Orion Auto-Cal and intended for custom systems only. Would only be appropriate for a pulse system with known position CCW Limit switch.
- Front Panel Orion Auto-Cal – Hold CANCEL for 10 seconds to access feature. Turns rotator CCW at slow speed until it detects the CCW Limit switch, then sets the rotator calibration correctly based on the OFFSET value. Only active if OPTION = Orion. Also available from SETUP Utility as an external command of "!>n;" (Exclamation, greater than, n, semi-colon)
- Changed Orion default back to 3960 counter divide ratio to match current production OR-2800 units.

- Add Rotator Type (Option) for Yaesu DC rotators, including all 800, 1000, 2700 and 2800 models, and the AC versions that use all three pot wires. Sets Yaesu defaults for the normal Yaesu configuration of CCW limit at South, CW limit at 270 and pre-calibrates values to match this standard configuration.
- DEBUG mode now disables all computer and knob generated motion commands in order to add one more level of protection against a costly over-turn operator error while troubleshooting an installation problem.
- DEBUG now allows CW and CCW button turns to go beyond soft limit settings. (Not allowed on rotators without limit switches, PST, TIC, and SPID) This will allow easier recalibrations or testing where some users had trouble realizing why the controller would only allow one direction when it was up against a soft limit. This feature is only included in the standard RT-21 version. (Not OEM versions)
- Reaction time for Point and Shoot knob turns is now a user setting from Front Panel. Knob Time = 1 to 80, default at 40, in 50 ms increments. (We removed the little needed Cal Range from the front panel SETUP selections so the Cal Range is now an Advanced Option and only accessible from SETUP Utility.)
- We're removing SETUP Utility detail from the RT-21 manual. SETUP Utility 2.0.zip on the website will now include the documentation for the software.

3.08.1

- New Status Command R2n; Reads heading includes a status byte for running or stopped.
- Manual update 3.5 and SETUP Utility 2.2 SETUP Utility supports Az/El

3.08.2

- Add external control for Alt Offset when PIN_B5 (J18-8) grounded. Works when NOT MODE=OFFSET. – PY5MN
- Polls display to keep alive for compatibility with LCD 1.2

3.08.3

- 3.08.2 Accidently disabled USB – Fixed now.

3.08.4..3.08.6

- More improvements with 1.2 display (prevents blanking in certain situations, including Orion Auto-Cal
- Improve knob pot noise filter
- Fixed missing State Display in front panel (M/S, OF1 etc)

3.08.7

- Knob Time = 0 disables the Point-and-Shoot functionality. Useful for remote station operation to make sure unused/noisy P&S pots cannot accidently turn antennas.

3.08.8

- Relaxed the Pot Out-of-Range for TIC and PST rotators to within 3% of the end of pot. (was 5%)

RT-21 v4 Controllers
Sept 19, 2015

New Features in v4 and initial release - new display 1.2 and SETUP Utility 4.0

Version 4.00

- New 2x size CPU with 2nd UART PIC18F26K22
- Version 3.5 Main PCB, version 1.2 LCD display firmware
- Optional internal WiFi embedded webserver
- Firmware updates through SETUP Utility 4.0
- Adds other Yaesu models to SETUP->Rotor Types
- Improves Factory and Rotor Type resets
- Changed SETUP->"New Value=" to "Change To:" (maybe this will be clearer
- Improved brownout/power glitch responses
- Improved Status reporting in R2n; command and in SETUP Utility
- Maintain data communications while in fatal ERROR conditions
- Vanity Message reset to factory with front panel 3 button only.

Version 4.01

- Fix missing Menu Item "BRIGHTNESS"

Version 4.02 – Aug 9, 2016

- Removed "R31;" (CPU Reset) external command as unnecessary
- Fixed Selection of Advanced Modes M/S, M/C, S/C and Alt Offsets, introduced error in 4.0
- Increased noise filtering on internal pot settings

Version 4.03 – Aug 26, 2016

- Add Command "R4n;" to read last abnormal CPU RESET. 12 is Normal Reset. Last abnormal clears after a read.

- Re-instate the “R31;” and added the EE Write counter ahead of programmed CPU Resets.
- Allow WiFi polling even if USB is plugged in and powered

Version 4.04…4.06 – October 10, 2016

- PWM changed to 3.2 KHz
- Lowered boot message delay, some 1.2 displays would miss the reset and stay blank.
- Fix blanking display on Orion Auto-Cal

Version 4.07 - Knob Time = 0 disables the Point-and-Shoot functionality. Useful for remote station operation to make sure unused/noisy P&S pots cannot accidently turn antennas.

Version 4.08 – Relaxed the Pot Out-of-Range for TIC and PST rotators to within 3% of the end of pot. (was 5%)

Version 4.09 – Fixed a bug with setting the Vanity Message at boot that was accidently introduced in 4.03.