RVP7 V15 Release Notes

These notes cover changes made to the RVP7 code since release V14 of 31 May 1999. If you are upgrading from an earlier release, please read those notes also.

Bug Repairs

1. The setup question "*Burst frequency increases with increasing AFC voltage*" now also influences the Digital AFC output. Previously, only the analog AFC output was affected.
2. A noise sampling bug was repaired in which the noise measurement would fail if the current operating trigger PRT fell within the selected interval of noise sampling bins. These conditions are extremely improbable in an actual operational system; but the bug can be demonstrated using **ascope** if you really try.
3. Repaired a bug in which noise samples requested from the real-time display serial interface were not being computed properly.
4. Repaired a bug in which dBZ values would still be thresholded according to the minimum residual clutter criteria, even when the threshold control flags for Corrected Reflectivity were set to "All Pass".
5. A side effect of running the "$" (Filter Search) command in **Ps** was repaired. The command used to leave the burst window and AFC-window selections somewhat inconsistent until the chat session was exited.

New Features

The primary new feature added in this release is the RVP7's ability to simultaneously receive data from two independent receivers. For polarization diversity radars whose receivers are setup this way, simultaneous processing of each channel offers notable benefits over a single receiver system. There are many details related to this new dual-receiver capability.

i **Note: To enable the dual-receiver functions you must also upgrade your U40 PLD to RVP7-4-U40, and have all four FIR chips installed at U2, U3, U25 and U26. This is necessary only if you actually plan to use the dual-receiver modes; the PLD upgrade is not needed when installing Rev.15 (and beyond) on single-receiver systems.**

1. The burst pulse frequency analysis routines have been improved so that they can track a pair of frequencies when the RVP7 is in dual-receiver mode. The frequency reported will be the midpoint of the measured primary and secondary intermediate frequencies. The AFC loop is automatically modified to track this mid-point frequency.
2. The status line of the **Ps** plotting command no longer lists the design bandwidth of the FIR filter alongside the its actual 3dB bandwidth; only the later is now shown. This change eliminates a printed field that was sometimes confusing, and makes room on the line for additional parameters in dual-receiver mode.

3. In dual-receiver mode, the **Ps** and **Pr** plotting commands now support a new '%' sub-command to toggle between each receiver. The printed status line is prefixed with "Rx:Pri" or "Rx:Sec" according to which receiver is selected.

    - Typing '%' within **Ps** will toggle the plot of the FIR filter's frequency response, and the printout of its DC–Gain. However, the plotted spectrum and printed power levels are always based on the sum of all input signals, and thus do not change with '%'.
    - Typing '%' within **Pr** will toggle the LOG plot of the received power, and the printout of the "Total", "Filtered", and "Midpoint" powers. However, the plots of power spectra and raw IF data samples are always based on the sum of all input signals, and thus do not change with '%'.

4. In dual-receiver mode, the "$" sub-command of the **Ps** command will search for a filter that minimizes the maximum width and DC offset at both receiver's intermediate frequencies. The final filter will be the one that has the best simultaneous performance at both IFs.

5. In pulse pair time series mode with dual receivers, selecting (H+V) will result in summed time series from both channels, but spectra from the DSP will be the averaged spectra from each channel individually. This allows the **ascope** utility to display either the spectrum-of-sum or sum-of-spectra according to whether the "Spectra from DSP" button is pressed in the *Processing/Gen-Setup* window.

6. The sampled noise levels are now preserved when the RVP7 is restarted via an exit from the TTY monitor. The powerup levels are thus installed only once on initial bootup, rather than being reloaded on each minor restart.

7. A two-tone simulation has been added to the **Mb** menu's burst pulse simulator. When the burst pulse is simulated in dual-receiver mode, the pulse will be the sum of two transmit pulses at the primary and secondary intermediate frequencies. To make the simulation more realistic, the two signal strengths are unequal; the primary pulse is 3dB stronger than the secondary pulse.

8. The computation of "Total Power" in the **Pr** command is now performed using the same subset of central IF samples that are used to compute "Filtered Power". This smaller subset of IF samples comes about because filtering the data requires a convolution with the current FIR filter, and this computation does not produce results all the way to the edges of the input data. This is the same reason that the LOG plots in the **Pr** command do not extend across the full screen.

    Previously, every IF sample within the entire acquisition window contributed to a total energy sum, from which the total power would be computed. The conversion from total energy to average power over dissimilar intervals of time could lead to confusing printouts, e.g., for a pulse centered in the window, the total power could be less than the filtered power because the energy is concentrated in the middle samples.

    With this change it becomes more meaningful to intercompare the Total and Filtered powers. The two numbers will match exactly as long as all of the incoming power falls

within the passband of the FIR filter. The difference between the two powers can be used as a measure of the "filter loss" for a given pulse shape, i.e., the portion of signal that is lost outside of the filter's passband. Note that the "Midsamp" power still retains its original meaning, and can also be compared directly with the Total and Filtered powers.

9. A new error bit has been added at Bit #13 of the GPARM Immediate Status Word #2 (Output word #18). This bit will be set whenever a valid burst signal is not present at the IFD's burst input. This bit is always valid, independent of whether AFC is enabled, i.e., it supplements the AFC information in status bits 8-10.

10. When the RVP7 is operating in Dual-PRF mode it is generally not useful to try to acquire data with a range mask that extends past the maximum range of the higher PRF. This is because there would only be valid reflectivities and widths in the far ranges during every other ray, and the velocities would never be valid there. However, if you really want to set the range mask in this way, the RVP7 now reports those far velocities as thresholded away rather than as random values.

Setup Changes

1. A new setup question "*Dual simultaneous receivers are being used*" now appears in the **Mc** section. Answer this question "Yes" if the RVP7 will be processing simultaneous signals from two separate receivers. Answering "No" will revert to normal operation with just a single receiver.

2. The single-receiver **Mb** setup question "*Receiver Intermediate Frequency*" will be replaced with the two questions "*Primary Receiver Intermediate Frequency*" and "*Secondary Receiver Intermediate Frequency*" whenever the dual-receiver mode is selected. You should enter the two intermediate frequencies for your primary and secondary (nominally horizontal and vertical polarized) receivers. Note that you can easily swap receiver channels merely by exchanging the two frequency values.

3. The filter bandwidth setup question in the **Mt<n>** section is now phrased as "*FIR–Filter prototype passband width*", to emphasize that it is the design bandwidth, and not the 3dB bandwidth, that is being specified. This change is related to New Feature #2.

4. In dual-receiver mode, when LOG video is enabled in the **Mc** section a new setup question "*Plot data from secondary receiver*" will appear. Answer "Yes" if you would like the LOG video analog output signal to be based on the data from the secondary receiver.

5. The question "*Noise Polarization– 0:Horiz, 1:Vert, 2:Alternating*" is no longer asked when the RVP7 is configured to use dual receivers. The noise levels in that case are always computed separately for the two receivers.

6. The "H" and "V" receiver powerup noise levels can now be set independently. Also, the questions to set the powerup and current noise levels for each pulsewidth have been moved out of **M*** and into **Mt<n>**, since there are separate values for each pulsewidth.

7. The cross checking of FIR length, range resolution, and single/dual receiver mode has been improved. Setup will now enforce these cross-dependencies, and will print a message whenever other parameters must be altered in the background. As an example, if a range resolution of 100-meters was selected for pulsewidth #2, and if a change from single to dual receivers was made, then the message "*PW #2 Warning: Range resolution constrained to 133.33 meters*" would be seen.

8. The trigger generator maximum timing delays in the **Mt<n>** section have been changed from 200 to 500 usec. This gives you a greater range when specifying pre-trigger and post-trigger times.

9. A "Both" option has been added to the IFD configuration setup question in the **Mb** section, so that it now reads "*IFD configuration– 0:None, 1:AFC/MFC, 2:COHO–Lock, 3:Both*". This allows both PLL clock locking and AFC/MFC to be enabled at the same time. When you choose "Both" it is understood that the AFC/MFC analog output is disabled, as the connector serves as a clock input. The AFC loop in the RVP7/Main will be enabled only if digital AFC has been assigned to the eight phase control outputs.

i **Note: The next revision of the RVP7/IFD will allow both the uplink 16-bit AFC value and the backpanel 8-bit DAFC value to be enabled, even when PLL locking is also enabled. This will allow simultaneous 16-bit digital AFC in the form of an uplink cable snooper. The current IFD code can not support this because the AFC bits would overwrite the PLL (p/q) values, which share the same serial bit slots. These changes will be made in such a way that the current serial format remains available for backward compatibility with existing uplink snoopers.**

10. In dual-polarization parameter modes, velocity and width are now computed using both the "H" and the "V" input samples. However, the corrected and uncorrected reflectivities may be computed using just the "H" channel data according to a (reworded) ZDR setup question in the **Mp** section. Previously, when "H-Only" was chosen, the velocity and width would also be computed only from "H".

11. The setup question in the **Mp** section that configures the computation of Differential Phase now allows for adding a fixed offset angle to all computed values of Φ_{dp}. The setup question now reads "*PHIdp – Filtered: NO , Negate: NO , Offset:0.0 deg*".