RVP7 V24 Release Notes

These notes cover changes made to the RVP7 code since release V23 of 21 November 2001. If you are upgrading from an earlier release, please read those notes also.

Bug Repairs

1. The licensing for Random Phase mode was not completely removed in the V23 release. It was still not possible for a non-IRIS driver to fully access RPH mode in the RVP7.

2. A bug was introduced into the DPRT–2 parameter mode in Rev.22, causing that mode to be almost unusable. DPRT–2 time series mode was okay, however. This has been repaired.

3. A bug was repaired in the V23 release that affects Dual–PRF data collection using angle synching in FFT mode. If the number of pulses acquired between sync angles at the Hi/Lo PRFs cross a power of two, then incorrect dBZ and dBT values would be output every other pulse.

4. Two bugs were corrected in 16-bit Φ_{DP} and *KDP* output data:

   - The 16-bit Φ_{DP} data have been offset by 90-degrees when compared to the 8-bit format. This was originally done as a "feature", in which the 16-bit and 8-bit data were offset by 90 and 180 degrees respectively so that starting phases in both formats would get relocated to the middle of their numerical span (0-180, and 0-360). However, this causes confusion when intercomparing the data; so the two formats now agree exactly. As a result, your **ascope** plots of Φ_{DP} will begin at the bottom of the plot rather than at the middle. If you want to recenter them, simply set the Φ_{DP} offset to 90-degrees (its new default value) in the **Mp** menu.

   - The 16-bit *KDP* output data were incorrectly being scaled by $(2 \times \lambda)$. Also, a documentation error was corrected on page 6-16 of the *RVP7 User's Manual*: the 8-bit *KDP* numerical range is from 0.25 to 150 (not 0.50 to 300) deg*cm/km.

5. A change was made in V22 to bound the trigger PRF to 1250Hz before making noise measurements. For both internal and external triggers, this insures that the RVP7 has sufficient CPU time for the task. However, in dual-receiver mode the bound must be further reduced to half this value (625Hz). This is now done properly, so that noise measurements will always succeed in dual-receiver systems regardless of the external trigger rate.

New Features

1. Two new spectrum output options are supported in the PROC command; you can now view the "Raw Residual" spectrum for both the first and second trip. This spectrum shows the portion of the original "Raw" data that will be used to reconstruct the other trip. This is different from the "Whitened" spectrum in that the extrapolation and filling

operations have not yet been done. The Raw Residual spectrum is handy if you want to see exactly which portion of the original data survive the adaptive filtering process.

The ***IRIS/Ascope*** utility supports this new feature in its "spectrum" menu. If either "Raw" button is pressed a second successive time, then the Raw Residual spectrum will be shown instead of the Raw spectrum. Continuing to press that same button will toggle between the two selections.

2. A new command CFGPHZ has been added to configure the phase modulation output lines from the RVP7, which determine the relative phase of each transmitted pulse. In some cases the phase sequence that is chosen will also have side effects elsewhere in the processor, e.g., different algorithms may be used in Random Phase mode according to the transmit sequence that is requested.

   Two GPARM error bits have also been added. One bit indicates that the desired phase sequence could not be synthesized according to the setup information given in the **Mz** menu. The second indicates that the measured phase sequence does not match the sequence that was assumed to have been transmitted. This bit remains valid even if the RVP7 is not actually controlling the transmit phase, e.g., if the phase modulation is being imposed by hardware elsewhere in the radar.

3. The RVP7 now supports spectral whitening algorithms for systematic transmit phase codes when running in the RPH (Random Phase) major mode. In particular, a class of codes including the Sachidananda and Zrnic SZ(8/64) code can now be used for multiple trip signal recovery. These systematic codes are often more successful at separating and recovering first and second trip echoes, compared with using a truly random transmit sequence. This is especially true when the processing interval is fairly short (as little as 32-pulses).

4. The "Missing Burst" flag is now inhibited whenever simulated data are being processed via the LSIMUL command.

5. A bit has been added to the GPARM opcode that allows the command to be executed without having the side effect of clearing the latched status bits in Word #9. This gives the driver software more control over how and when those bits are read.

6. You may now configure your triggers to automatically blank (switch off) for a selectable amount of time following a pulsewidth or polarization change. This is helpful when the transmitter needs additional off-time before it can begin running in a new configuration. See also Setup Change #4.

7. The powerup diagnostics have improved to show the detailed error bits for the "Slave FIFO" and "Slave Memory" tests. These can be seen in the printout from the "**V**" command.

8. The RVP7 uplink protocol is now friendlier to third party equipment that is also listening to the transmissions. Whenever a Rev.D IFD is being used, the uplink data may happen to include the newer IFD/Pinmap (CMD=1,2,3) and IFD/Option (CMD=4) packets; some of which may not be handled properly by older equipment. To help in such cases, these packets are now transmitted only when absolutely necessary.

If the "AFC Uplink Protocol" in the **Mb** menu is set to "Off" or "Normal", then the IFD/Pinmap packets will never appear on the uplink, and the IFD/Option packet will be sent just once in the following cases:

- When the RVP7/Main board is first powered up.
- Two seconds after the fiber signal from the RVP7/IFD reappears after being missing (this refreshes the IFD following a remote power cycle).
- Whenever the IFD Dither Power is changed in the **Mp** menu, or the Burst and IF inputs are exchanged in the main menu. An additional packet will also be sent upon exiting the menus if it is necessary to return the IFD to non-swapped mode for normal operation.

When the "AFC Uplink Protocol" is set to "PinMap" then none of these optimizations will be done, and all of the packet types will be freely sent.

9. The range mask spacing in centimeters for the current pulsewidth is now available in GPARM Word #58. Likewise, the RBACK command with DataType=10 now returns the range mask spacing (also in cm.) for all four pulsewidths. These additions allow driver software to verify the range mask choices from the **Mt<n>** setup menus.

10. The **Mt<n>** menu now asks for the "Range Mask Spacing" of the processor using those words, rather than "Range Resolution". This is to emphasize the difference between the fundamental spacing of the (I,Q) data from the FIR filter chips (the range mask spacing), versus the bin spacing that results after those data are selected and averaged in range. The same change of wording was made in the **iris/setup/rvp** setup window.

11. The Secondary IF for Dual-Receiver mode may now be set to a negative number in the **Mb** setup menu. You should do this if the two receivers are not being mixed down from the same sideband of the transmit frequency. For example, if the transmitter operates at 2500Mhz, and the horizontal and vertical STALOs are 2530MHz and 2476MHz, then the horizontal and vertical IFs should be set to 30MHz and –24MHz. Doing so will produce the correct Doppler sign and phase unwinding for each channel.

12. The thresholding of the RVP7's polarization parameters has been changed to allow research customers to keep all of their data. If the *NoiseCorrected* setup question in the **Mp** menu is set to *NO*, and if the ZDR threshold control flags are set to *all-pass*, then no thresholding will be applied to any of the parameters: *LDRH*, *LDRV*, Φ_H, Φ_V, ρ_H,, ρ_V, Φ_{DP}, *KDP*, ρ_{HV}, and *ZDR*.

Setup Changes

1. The **Mz** menu has a new question which controls the phase modulation of the radar transmitter: *Modulation – 0:None, 1:Random, 2:Custom, 3:SZ(8/64)*. You may enter the power-up modulation here, as well as check which type is currently running according to the most recent CFGPHZ command from the host computer.

2. Additional questions have been added to the **Mf** menu to control the SZ(8/64) whitening algorithm:

```
Whitening Parameters for Tx:SZ(8/64)
------------------------------------
Max power mismatch across octants: 4.0db
High power rejection threshold: 8.0db
Maximum KEY phase error: 12.0 deg
Allow reverting to RPH algorithms: YES
```

3. The two questions in the **Mt** menu that configure the POLAR0 and POLAR1 lines now let you specify the line level for *Simultaneous* Tx mode separately from the *Horizontal*, *Vertical*, and *Alternating* modes. Previously, the lines would merely default to the *Horizontal* state whenever *Simultaneous* was selected.

```
POLAR0 is high for Vertical:NO, Simultaneous:NO
POLAR1 is high for Vertical:NO, Simultaneous:NO
```

4. Additional trigger blanking questions (plus follow-up questions) have been added to the **Mt** menu:

```
Blank output triggers after pulsewidth change: YES
  Remain blanked for 0.50 seconds
Blank output triggers after polarization change: YES
  Remain blanked for 0.50 seconds
```

   Note that Bit #12 of GPARM Immediate Status Word #2 will be forced high whenever you answer "Yes" to either question. This indicates to the driver software that the RVP7 triggers are blankable.

5. The two questions in the **Mt** menu that configure the POLAR0 and POLAR1 lines now let you specify the line level for *Simultaneous* Tx mode separately from the *Horizontal*, *Vertical*, and *Alternating* modes. Previously, the lines would merely default to the *Horizontal* state whenever *Simultaneous* was selected.

```
POLAR0 is high for Vertical:NO, Simultaneous:NO
POLAR1 is high for Vertical:NO, Simultaneous:NO
```