RVP7 V20 Release Notes

These notes cover changes made to the RVP7 code since release V19 of 17 July 2000. If you are upgrading from an earlier release, please read those notes also.

This software release is the first to support the new Rev.D (14-bit) RVP7/IFD receiver, which will begin shipping in January 2001. If you are upgrading to this new hardware, you must also upgrade to V20 (or higher) at the same time. Of course, the Rev.B and Rev.C RVP7/IFDs also remain fully supported in this and all future code releases.

Bug Repairs

1. A minor bug was repaired in the **Pb** plotting command. Triggers that had zero width, i.e., that do not produce any pulse at all, were being drawn as a tiny pulse at the trigger start time. A flat line is now shown for such triggers.

2. A bug was repaired that would cause the **Pb** and **Ps** plots to sometimes grab Burst samples that did not have their DC offset subtracted from them; causing the plots to bounce up and down slightly. This bug was introduced in Rev.19.

3. A timing offset was repaired in the externally visible signals that are controlled by the RVP7's trigger generator, i.e., the six user trigger lines, the two polarization switch lines, and the eight phase control lines. These signals were all being generated 389ns later than their setup parameters would suggest. You could verify this by connecting one of the user trigger outputs to the RVP7/IFD Burst Input through a 40dB attenuator, and noting the IF samples shifted to the right in the **Pb** plot. This bug has been present since day one, and the repair consists of two parts.

    - All of the affected signals are now generated with proper timing relative to range zero. The start times and transition times are now correctly calibrated relative to where the RVP7/IFD Burst Input and IF Input data are being sampled.

    - When you first upgrade to Rev.20 all of the affected setup parameters will have 389ns added to their stored value, so that those numeric values now indicate the true signal timing under the previous version of code. Thus, after the upgrade, the numeric values will be different from before, but the actual hardware signal timing will remain unchanged. If you keep printed copies of your RVP7 setups, it would be a good idea to save a new copy showing the changed values in case they ever have to be re-entered by hand.

4. The *ActLow* (active low) option for the digital AFC format in the **Mb** setup section was not working. The AFC bits would always be encoded active high. Fortunately, this is generally what one wants them to be.

New Features

1. Finer control has been added to the probe for DSP chips that is performed during the RVP7's boot sequence. The goal is to be able to make use of a partially functioning

RVP7/AUX board that might have failed during crucial field operations, and for which a spare is not available. If your system works properly with the RVP7/AUX board pulled out, you may be able to restore partial functionality as follows:

- With the RVP7/AUX board removed, set the DSP count to "3" using the new setup question described in Setup Change #1. Save this selection, power down the chassis, plug in the RVP7/AUX board, and power back up.
- Get into the RVP7's TTY monitor, and type "*4" followed by carriage return. This reboots the RVP7 using only four DSP chips, i.e., the three that are on the main board, plus the first one on the RVP7/AUX board. Hopefully this boot will succeed, indicating that some RVP7/AUX functionality can be salvaged.
- Continue trying "*5", "*6", etc. to add one more DSP chip each time, up to a maximum of 13. Eventually the boot will fail when the bad RVP7/AUX DSP chip is encountered.
- Finally, type in the count of working DSPs using the new setup question, save this value, and reboot the processor. The RVP7 will share the workload among the available DSPs. Be sure to remove this DSP constraint when you later install a repaired RVP7/AUX board. To make this easier to remember, IRIS will warn you for as long as you continue running with a diminished subset of DSP chips.

2. The **Ps** plot now supports a new "|" subcommand that toggles On/Off a walking-ones bit pattern in lieu of the normal formatted AFC value. This test pattern shifts a single "1" downward through the AFC word, making a transition approximately every 4ms. It is intended to help ring out and test the wiring for digital AFC installations. While the test is running you will see, e.g., *AFC-Test:00008000* in place of the usual AFC status text. The test is unconditionally terminated upon quitting the **Ps** command.

3. GPARM word #52 now contains a 4-bit code that conveys the A/D input saturation power level for the RVP7/IFD that is currently attached to the system.

4. The RVP7 now computes the power-weighted center-of-mass (COM) of the burst pulse envelope. This allows the processor to determine the location of the "middle" of the transmitted pulse within the burst analysis window. This information is applied in several ways:

   - The **Pb** plot now displays small tick marks on the top and bottom of the burst sample window to indicate the location of the COM. These markers are only displayed when valid burst power is detected.
   - Bit #15 of GPARM word #18 will now be set when valid burst power is detected but the COM lies outside of the aperture sub-window that defines the portion of the pulse used for AFC analysis. This new error bit effectively flags when the burst pulse has drifted out of its optimal placement within the sampling window. Both IRIS/ASCOPE and IRIS/INGEST detect this bit and signal an error to alert you to the condition.

5. Most of the burst pulse analysis routines, including the AFC feedback loop, are now inhibited from running immediately after making a pulsewidth change. The COM calculations are held off according to the value of *Settling time (to 1%) of burst frequency estimator*, and the AFC loop is held off by the *Wait time before applying AFC*. This change prevents introducing transients into the burst analysis algorithms each time the pulsewidth changes.

i **Note: New Features #4. and #5. , and Setup Change #3. , lay the groundwork for a burst pulse servo feedback loop that will be added to the RVP7 in a future release. The idea is that the RVP7 will be able to detect and correct long-term drift of the transmit pulse relative to the system triggers.**

6. It is now possible to control the rate at which the RVP7 processes free-running rays in the FFT, DPRT, and Random Phase modes. Previously, these rays would be produced at the full CPU limit or I/O limit of the processor (whichever was slower); which could result in highly overlapping data being output at an unusably fast rate. Note that this behavior will only occur when one of these non-PPP modes is chosen, and is then allowed to run without angle syncing. Such is likely the case for IRIS manual scans or during Passive IRIS mode.

   To make these free-running modes more useful, you may now establish a minimum holdoff between successive rays, expressed as a percentage of the number of pulses contributing to each ray. Choosing 100% (the new default) will produce rays whose input data do not overlap at all, i.e., whose rate will be exactly the PRF divided by the sample size. Choosing 0% will give the old behavior in which no minimum overlap is enforced and rays may be produced very quickly.

Documentation Changes

1. The entire *RVP7 User's Manual* has been updated to refer to the new Rev.D (14-bit) RVP7/IFD receiver. Section 2.1 includes a write–up of the differences between each hardware version.
2. Additional documentation has been added to Section 5.9.3 of the *RVP7 User's Manual* to describe optimal tuning of the Random Phase processing algorithms.
3. Section 2.1.3 of the *RVP7 User's Manual* has been completely rewritten to include a discussion of the tradeoff between receiver sensitivity and dynamic range. You may want to recheck you receiver's IF gain to be sure that your system really is operating the way you expect.

Setup Changes

1. A new question, *Number of slave DSPs to use (0=ALL)*, has been added to the **M+** (Debug Options) section.
   - The default value of zero means to probe for additional RVP7/AUX boards, and then use as many DSPs as could be found. The RVP7 powerup diagnostics will

flag an error (Bit #12 of GPARM Word #12) if the DSP count was not 3, 13, or 23. This helps detect a partially failed RVP7/AUX board that is reporting back fewer than its full complement of ten DSP chips.

- A non-zero value means to probe for exactly that many chips, ignoring others that may be further down the chain. Bit #14 of GPARM Immediate Status #2 will be set in this case to indicate that the RVP7 may not be utilizing the full quota of available DSP chips. In addition, the powerup diagnostics will flag an error if the DSP count does not exactly match the requested value.

2. A new question, *IFD built–in noise dither source: –43.0dBm*, has been added to the **Mp** (Processing Options) section. This question will only appear if the processor is attached to a Rev.D RVP7/IFD that includes an out-of-band noise generator to supply dither power for the A/D converters. The available power levels are OFF, and (approximately) –63dBm, –43dBm, –38dBm, –33dBm, –28dBm, and –25dBm. The closest available level to your typed-in value will be used. For standard operation, we recommend running at –43dBm. You can observe the band-limited noise easily in the **Pr** plot to confirm its amplitude and spectral properties.

3. The display of burst power in the **Pb** and **Ps** plots has changed. The power is now computed by averaging over the full burst window, rather than over the inner aperture window as it used to be. This may cause the reported powers to decrease by a dB or two, depending on your window settings.

   Also, the "(dBm*μsec)" printout of energy has been removed from the TTY line because it was confusing and not terribly useful. The format is now *Pwr:–4.0 dBm*, rather than *Pwr:–4.0 dBm(–1.0*us)*. This change also affects one line of the **V** command printout, as well as the *Burst Pulse Power* text of the *Real Time TTY Monitor.*

4. The TTY setup interface supports a new "~" command, whose function is to swap the Burst and IF inputs at the RVP7/IFD. Requests to toggle the state are made from the top level as follows:

```
RVP7> ~
IFD Burst/IF Inputs are SWAPPED
RVP7> ~
IFD Burst/IF Inputs are NORMAL
```

   The selection remains in effect for the duration of the setup session, but then returns to NORMAL upon exiting the TTY monitor. The "~" command is very handy because it allows the **Pb**, **Pr**, and **Ps** plotting commands to easily run with one input or the other. Here are two examples of how this might be useful.

   - When checking the range alignment on a Klystron system, the **Pb** plot can not be used in the usual way to center the Tx burst because a continuous-wave COHO (rather than a burst pulse) is typically used as the phase reference in these systems. However, if you swap the Burst and IF inputs, you can then use the **Pb** command to view and center the received leakage of the Tx pulse, and thus locate range zero.

- When setting up the AFC loop, you can use your RF signal generator to simulate the transmitter's frequency, and then run the loop with swapped RVP7/IFD inputs. The AFC servo will then hunt and follow the siggen frequency supplied via the receiver. You can then make step changes in that frequency to verify that the loop responds properly.

Note that the same input swapping function has always been available via the RVP7/IFD toggle switches. However, those switches may be located far away from the operator's terminal; hence, the command interface is still a valuable addition. The "~" command can only be used with the new Rev.D RVP7/IFD; the command is unimplemented, and will not even show up in the "Help" list, when earlier receivers are connected.

5. The new question *Minimum freerunning ray holdoff: 100% of dwell* has been added to the **Mp** setup section. Please see the description for New Feature #6.