RVP7 V08 Release Notes

These notes cover changes made to the RVP7 code since release V07 of 20 April 1998. If you are upgrading from an earlier release, please read those notes also.

Bug Repairs

There were no bugs reported from V07.

New Features

1. The RVP7 now supports trigger blanking. Any combination of the six output triggers can be blanked in response to the input signal at TAG Bit #0. The polarity of the input signal is selectable. When trigger blanking is enabled, the On/Off state of the trigger during each ray is encoded into the LSB of the ending azimuth for that ray. Note that the LSB of the starting azimuth still retains its original special meaning, i.e., the Low/Hi PRF state during dual PRF processing.

2. The RVP7's response to a missing external trigger has been improved. When configured to use the external trigger input, the processor will insert fake (software) "triggers" at a rate of 250Hz whenever the external trigger is missing for more than 0.100 seconds. These fake triggers will keep the RVP7's internal code and external outputs running in spite of the missing input (the data values will all be zero, and the "no trigger" bit will be set in GPARM immediate status word #1). Normal operation automatically resumes as soon as the external trigger is restored. Additional related changes are:

   - The "Pb", "Ps", and "Pr" commands will report "No Trigger" on the TTY status line whenever the external trigger is expected but missing.
   - The PRT's reported in the GPARM output array will now be forced to 0xFFFF (the maximum unsigned value) whenever the external trigger is expected but missing. The same is also true of the PRT's reported in the extended headers controlled by the CFGHDR command.
   - The Real Time Monitor's PRF display will now show the measured PRF or "NoTrig" when the RVP7 is configured for an external trigger. The monitor still shows the desired PRF (and possible dual–PRF alternate rate) when the internal trigger generator is enabled.

3. It is now possible to independently choose the interval of burst pulse samples that are used by the burst frequency estimator for AFC. Previously the AFC feedback loop was constrained to use the same set of samples that are chosen for the FIR filter window. The FIR window typically is longer than the actual transmitted pulse, and thus, the samples contributing to the frequency estimate would include the leading and trailing edges of the pulse. These edges tend to have severe chirps and sidebands, compared to the more pure center portion of the pulse. The AFC frequency estimate (which is power weighted) would sometimes be mislead by these edges and would not tune to the optimum center frequency.

4. The energy level that previously was computed over the full burst pulse window has been replaced with a mean power level computed within the narrower set of samples that are used for AFC burst frequency estimation. There were several reasons for making this change. The narrower AFC window will contain only the active portion of the burst, and thus a mean power measurement is meaningful. The full window includes the leading and trailing pulse edges and does not lend itself to a meaningful power computation. This is why total energy had been computed before. The valid burst threshold has also been changed to a power level rather than an energy level. Since radar peak power tends to be independent of pulse width, a single threshold value for qualifying the burst pulse can now be used.

5. A new version of the trigger generator PLD (U69) is now available. The part differs from the previous version by having one bit of hysteresis to properly handle external triggers that are synchronous with the RVP7's acquisition clock. If the external trigger edge happens to fall (or drift onto) an edge of the acquisition clock, then the hysteresis bit will flip and the other clock edge will be used for synchronization. This insures that the external trigger will be consistently latched on a clock edge that is some safe distance (i.e., approx 15ns) from its active edge.

   The new part is labeled RVP7–3–U69, and will begin shipping in all new units. You only need to install this upgrade if 1) you are using an RVP7 with a Rev.C (Klystron version) RVP7/IFD module, 2) the RVP7/IFD is phase locked to an external source, and 3) the RVP7 external trigger input is being driven by the radar's timing chain.

6. The RVP7 now supports Digital Automatic Frequency Control (DAFC). This is in addition to the analog AFC (driven by a voltage level from the RVP7/IFD) that has always been available. The addition of DAFC makes the RVP7 compatable with newer STALOs that use digital frequency synthesis (rather than a VCO) as their method of tuning.

   The RVP7's eight RS422 "phase control" outputs can be redefined to function as DAFC control lines. This represents an efficient use of these hardware lines, i.e., a magnetron (non synchronous) radar needs AFC/DAFC but can not modulate phase; whereas a klystron (or other synchronous) radar may need to modulate phase but does not need to control frequency. Thus, the two functions tend to be mutually exclusive. Note that the DAFC control cable must run between the STALO and the RVP7/Main chassis, not the RVP7/IFD box. This is likely to be a longer cable run, but the RS422 signals are specified for distances up to 100–meters.

   As an example, suppose that we have a digital STALO with BCD input in 100kHz steps, an upper sideband 30MHz IF, and a magnetron that needs to be tracked in the range 5605–5609 MHz. Our STALO must therefore cover the range 5635–5639MHz. This can be done by selecting BCD DAFC outputs, and wiring the two 4–bit decimal digits to the units and tenths MHz STALO inputs. Configure [–100%,+100%] to map into [50,90], and hardwire the remaining STALO inputs to "563x.x" Finally, set the AFC hysteresis limits to something like 55KHz/70KHz. During tracking, the DAFC will request a correction whenever the frequency error is greater than 70KHz. But since the nearest 100kHz click will always be within 50KHz of center, the inner limit will eventually be reached and the loop will lock. All other AFC time constants should still be adjusted in their usual manner.

Setup Changes

1. There are new setup questions in the “Mt” section to control trigger blanking based on the TAG0 input line. You first select whether the trigger blanking feature is enabled; and then optionally choose the polarity of TAG0 that will result in blanking, and which subset of the six user definable triggers are to be blanked.
2. It is now possible to control the exact quantization of the PRT of the internal trigger generator. Normally the trigger PRT is chosen as the closest multiple of AQ (the acquisition clock period) that approximates the requested period. A new question in the ”Mt” section allows the possible PRT’s to be constrained to ((N x AQ) + M) clock cycles. This feature can be useful for synchronous receiver systems in which the trigger period must be some exact multiple of the COHO period.
3. An additional line of text has been added to the printout from the ”V” command. The serial line input character count, input error count, and output character count are shown, as well as the current AZ and EL angles (from whatever source is supplying them). This new status line is handy for debugging the serial interface in general — and especially for checking out the reception of serial TAG angles. Using ”Vz” will reset the various counts to zero and make subsequent changes easier to see.
4. There are new commands to select the burst sample interval from which the AFC frequency estimates are derived. In the ”Pb” plot, use the new subcommands ”A/a” and ”S/s” to raise/lower the aperture/start of the subwindow of burst pulse samples for AFC. If you never use these new commands, then the full FIR window will be shown and the RVP7 will work exactly as before. However, shortening the AFC interval will result in two sample windows being drawn on the plot. The smaller AFC window should be positioned into the center portion of the transmitted pulse, where the amplitude and frequency are fairly stable. Use the ”Ps” plot (with the same new subcommands) to verify that the burst frequency estimate lines up with the peak of the plotted burst spectrum.
5. The printout of the burst signal level now contains two numbers rather than just one. The new format of the text string is: ”**`Pwr:–61.8 dBm(–58.2*us)`**”. The first number represents the mean power within the (possibly narrowed) subset of strong burst pulse samples that contribute to the AFC frequency estimator. The peak power of the transmitter is effectively captured by this first quantity, whose units are in dBm. The second number represents the integral of the measured power over the entire burst pulse window, i.e., the total energy in the pulse. It is this quantity that used to be displayed as the sole burst level indicator in earlier code versions. The energy units are dBm*μsec — abbreviated ”**`*us`**” in the printout.
6. There is a new setup question in the ”Mc” section to choose how the RVP7’s eight RS422 ”phase control” outputs are to be assigned. Choices are ”Unused”, ”Transmit Phase

Control”, and ”Digital AFC”. If DAFC is selected, then additional questions will appear in the ”Mb” setup section where the AFC parameters are configured. DAFC works by linearly mapping the existing [–100%,+100%] AFC control span onto some interval of 8–bit values. Output format is either binary or BCD, and either active high or active low logic. When DAFC is enabled, the TTY printout of the AFC level will contain an additional number in square brackets showing the corresponding DAFC level, e.g., ”**`AFC:0.00% [128] (NoBurst)`**”