RCP02 V18 Release Notes

These notes cover changes made to the RCP02 code since release V17 of 3 December 1998. If you are upgrading from an earlier release, please read those notes also.

Bug Repairs

1. Corrected a bug in which INU records would be zeroed at random, with a frequency of approximately once per hour. This could lead to angle syncing problems in a DSP that was using the RCP02's output angles on a moving platform system. This bug was introduced in Rev.9 (23 June 1998).

New Features

1. The RCP02 will now "coast" for up to one second when it receives an invalid INU Roll/Pitch/Heading bit, or until the invalid bit is cleared, which ever occurs first. The last valid report of INU parameters will be used for stabilization during this time (including computation of the earth-relative output angles). Since it is unlikely that the antenna azimuth and/or the ship attitude will move more than 30 degrees in one second, the message "DSP AZ angles exceed 30 degrees" will no longer be triggered by very short bursts of invalid INU data.

   Note that the option of continuing to use the new INU parameters for the one second interval (rather than coasting with the last valid ones) was specifically rejected for safety reasons, since there is a possibility that the new angles are truly bad.

2. The encoding of moving platform data that are output in the "RCV03" host I/O format has been modified to include the invalid angle flags from the INU. This was done by coding these flags into the Least Significant Bits (LSB's) of the corresponding velocity terms. Specifically, the LSB's of the six 16-bit velocity fields are altered as follows:

   - Roll Velocity — Invalid Roll/Pitch angle
   - Pitch Velocity — Always zero
   - Heading Velocity — Invalid Heading angle
   - East Velocity — Invalid horizontal position (lat/lon)
   - North Velocity — Always zero
   - Up Velocity — Invalid vertical position

   The 16-bit velocity terms have plenty of precision, and will not be affected by the loss of their LSBs. This encoding was chosen because it manages to move the INU bits into the RCV03 stream (and hence, into the final archived data set) without requiring any other external changes.

3. A new internal logging feature has been added to the RCP02 for recording unusual data and events during normal operation. You may choose the types of events to log, and then

view the accumulated entries at any time. For now, the options allow for logging angle glitches and invalid INU parameters; but the RCP02 log is an expandable feature, and we expect to add many new types of entries in the future.

Setup Changes

1. The "Site" setup command can now be invoked as "Site Log" to setup the internal data and event logger (See New Feature #3.). The available questions are:

```
Data and Event Logging Setups
-----------------------------
LOG glitches in AZ/EL output angles: YES           New Value:
  Maximum valid AZ/EL change:  1.00 deg / 23.3 ms  New Value:
LOG invalid/reduced INU data records: YES          New Value:
```

The angle glitch logger checks the AZ and EL output angles that are computed every 3.33ms, and makes a log entry if their change over an 8-sample interval is more than the maximum specified value. The log entry records the INU/Earth/Pedestal angle data for all eight samples, and then inhibits additional entries for the next seven samples (so that successive log entries will overlap nicely).

The following sample printout shows the AZ and EL Earth and Pedestal angles, followed by the Roll, Pitch, and Heading INU angles. If moving platform stabilization is not enabled, the printout is much simpler and only lists the AZ and EL pedestal angles.

```
AZ: 315.13  315.13   EL:  2.07   2.07   RPH:  4.72   -5.20  230.56
AZ: 315.25  315.25   EL:  2.07   2.07   RPH:  0.00    0.00    0.00
AZ: 315.25  315.25   EL:  2.02   2.04   RPH:  0.00    0.00    0.00
AZ: 185.84  315.25   EL:  2.37   2.04   RPH:  4.68   -5.17  230.64
AZ: 185.94  315.36   EL:  2.40   2.04   RPH:  4.68   -5.17  230.64
AZ: 185.94  315.36   EL:  2.37   2.01   RPH:  4.68   -5.17  230.64
AZ: 186.01  315.36   EL:  2.40   2.01   RPH:  4.63   -5.15  230.71
AZ: 186.12  315.48   EL:  2.42   2.01   RPH:  4.63   -5.15  230.71
```

When setting up the angle glitch logger, you should choose the maximum valid angle change according to the maximum scan speed that is expected; but it should never be less than the quantization of the incoming pedestal angles themselves (lest false alarms be constantly triggered). Because of this interaction, you are asked to express the maximum angle change directly as the angular change over a fixed period of time, rather than as a maximum speed. To compute this, simply multiply the maximum speed in deg/sec by 0.0233 sec, and round this angle up so that it at least exceeds the quantization of the incoming pedestal angles.

The INU data quality logger can be enabled to catch changes in the reported "Invalid" and "Reduced" flags for the attitude and motion parameters. Each log entry consists of the flag word, and the current Roll/Pitch/Heading. A new entry is made whenever any bits in the flag word change.

This sample printout shows the Reduced/Invalid flags for Horizontal, Vertical, Heading, and combined Roll and Pitch data. A zero indicates "okay". The actual Roll, Pitch, and Heading angles reported from the same INU record are also shown.

```
Hor:0/0  Vrt:0/0  Hed:0/0  Rol:0/0      RPH:–10.42    0.03  249.32
```

2. The “Monitor” command can now be invoked as “Monitor Log” to view the internal log of data and events. If log entries already exist when the command is typed, you will see a message resembling:

```
RCP02 System and Event LOG
––––––––––––––––––––––––––
There are 27 saved entries – DELETE ?
```

You may type “Yes” to delete the old entries if they have already been seen, or if they are known to be unimportant. But beware — deleted entries can not be recovered and will never be seen again. In general, you should simply type <Enter> to view and preserve the saved entries. If you want a permanent record of the log, be sure that you can archive the printed lines from the X–Terminal that is running, for example, “antcheck –chat”. After printing these old log entries you will see the message:

```
Flush this saved LOG and enter live update mode? n
```

Typing “Yes” will delete the entries that were just printed, and the monitor will enter its live update mode in which new log entries are printed (and discarded) immediately. Typing any key during live update mode will return to the top level “RCP>” prompt.

The depth of the log is eighty entries; when the log fills up, additional entries can not be added and are discarded. If this has happened, you will see an initial message such as:

```
WARNING: There have been 58 missed LOG entries
```

Each entry of the printed log begins with a banner such as:

```
––––– # 27   Time: 4626.554 sec ––––– (Angle Glitch)
```

This indicates that we have the twenty-seventh log entry, the time of the entry (in seconds since the RCP02 was booted), and the type of entry. One or more additional lines will follow with the specific data for this type of log entry.

3. Added the ”reboot” command to the online help menu. Removed the undocumented ”support” command, as that information is available via ”Help Support”.

4. The “Control Variables” and “Site Log” listings have been added to the summary printout of “Help Listall”.

5. The header lines for each category of “Help Listall” now include a handy reminder of the command that gets you to that section. For example, the heading for the printout of the logic equation section is:

```
(Control Logic) – Boolean Control Equations
–––––––––––––––––––––––––––––––––––––––––––
```

indicating that “Control Logic” is the command needed to access these parameters.

6. Eight new logic equation control variables named **csgen0** through **csgen7** have been added. These variables represent bits zero through seven of the signal generator level that is being requested by the host computer. Having access to these bits makes it

possible to remap the level bits in cases where the signal generator is not controlled via the default HPIB interface.

7. Two new logic equation control variables named **trig_normal** and **trig_blank** have been added. These can be used to override the protected sector trigger blanking that is defined in the "Site Custom" menu. These new variables operate as follows:

   - When **trig_blank** is FALSE and **trig_normal** is FALSE, the trigger is blanked whenever the antenna is within one of the designated sectors. This is the normal operating mode. You can disable all eight of the sectors if you don't want to use the trigger blanking feature at all.
   - When **trig_blank** is FALSE and **trig_normal** is TRUE, the trigger is always generated, no matter where the antenna is.
   - When **trig_blank** is TRUE, the trigger is always blanked, no matter where the antenna is. The assignment to **trig_normal** is ignored in this case.

   As an example of how these variables might be useful, consider a hypothetical farmhouse that is close enough to the radar that if the antenna is pointing at it, and the antenna is stationary, we would exceed the allowable microwave radiation limit. However, we are also allowed to average the power exposure over longer periods, so that if the antenna is moving we can radiate at the farmhouse as we sweep past it. We don't want to inhibit the trigger whenever the antenna stops; only when it stops within one of the protected sectors.

   In summary, we want to stop transmitting while the antenna is stationary and is within one of the designated sectors, but we also want the radar to transmit whenever the antenna is moving. This is accomplished using the single equation:

   ```
   TRIG_NORMAL = !ANTSTOP
   ```

   For a related application in which we want to stop transmitting whenever the antenna becomes stationary, simply use:

   ```
   TRIG_BLANK = ANTSTOP
   ```

   Note that the built-in timers could also be used to permit brief antenna stoppings without producing the trigger side effects right away.