MMCR Coherent Up/Down Converter (CUDC) Replacement & Calibration

I. Purpose:

This document outlines the replacement and calibration procedures for MMCR Coherent Up/Down Converter (CUDC).

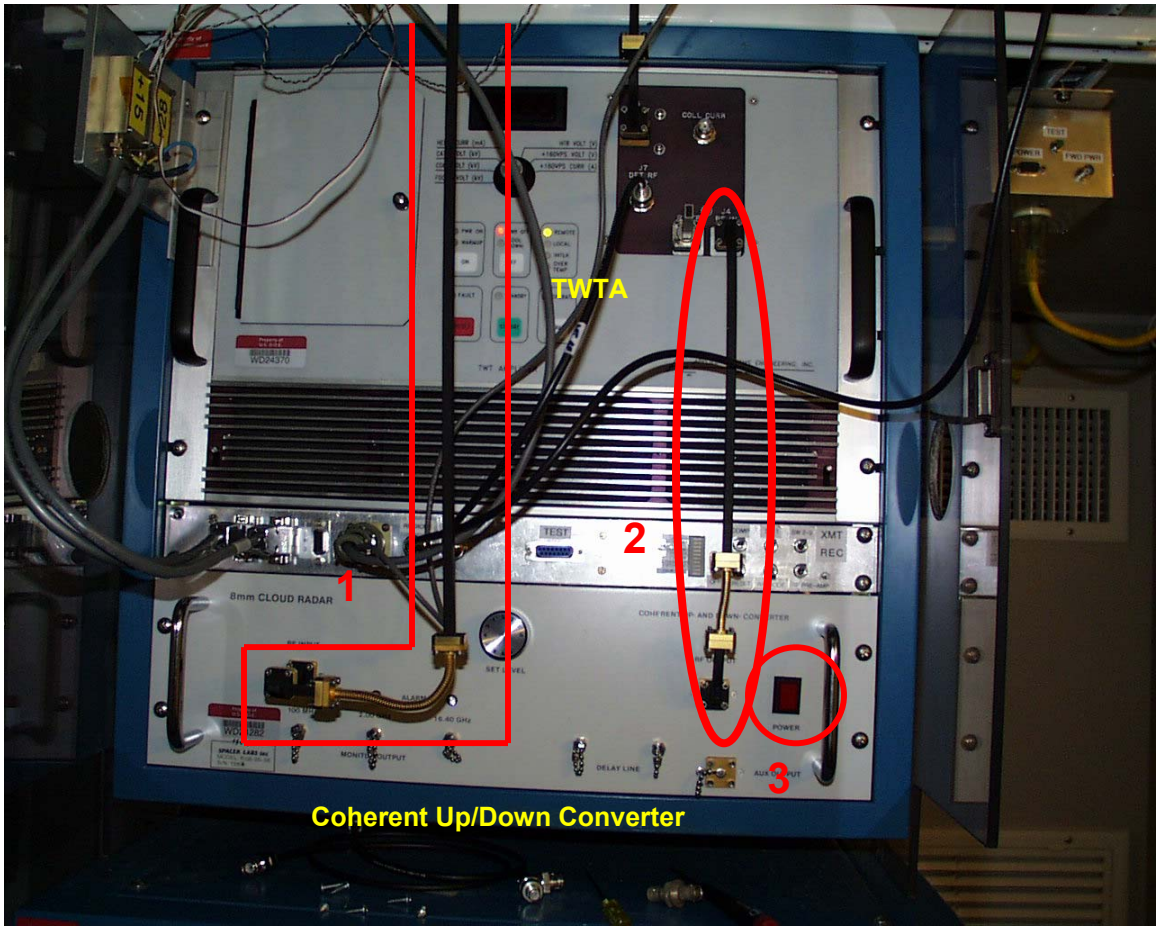
II. Cautions and Hazards:

- Make sure the TWTA is powered down.
  a) OFF LED should be illuminated.
  b) If not, open a command window on the OS/2 computer by clicking on the "OS/2" icon at the bottom of the screen. This will bring up a command line window. Type "twtoff" followed by return. This will turn off the TWTA.
- Power down the OS/2 computer.

III. Requirements:

- Ball head hex driver for waveguide screws

IV. Procedure:



The most difficult aspect of replacing the Coherent Up/Down Converter (CUDC) requires removing two pieces of waveguide (#1 and #2 in the picture above). #1 waveguide goes from the receive input to the Low Noise Amplifier. #2 waveguide connects the CUDC rf output to the TWTA. Once removed, there are a few connectors on the rear of the CUDC that must be removed. Then the CUDC can be removed for replacement.

A. Removing CUDC:

1. Turn the CUDC off by depressing the power switch at the lower right hand corner of the front panel (3 in Figure 1).
2. Remove the following cables from the back of the CUDC. (See Figure 2):
   - Power cable

- Control Interface cable (25 pin “D” connector)
- IF INPUT (BNC connector)
- IF OUTPUT (BNC connector)

Figure 2: Back of CUDC unit

3. Remove the 4 screws that mount the CUDC to the rack. There is an aluminum spacer on each side of the CUDC behind the screws.
4. Remove the waveguide between the CUDC and the TWTA.
   - Remove the 4 hex head screws attaching the waveguide to the CUDC. (See Figure 3)

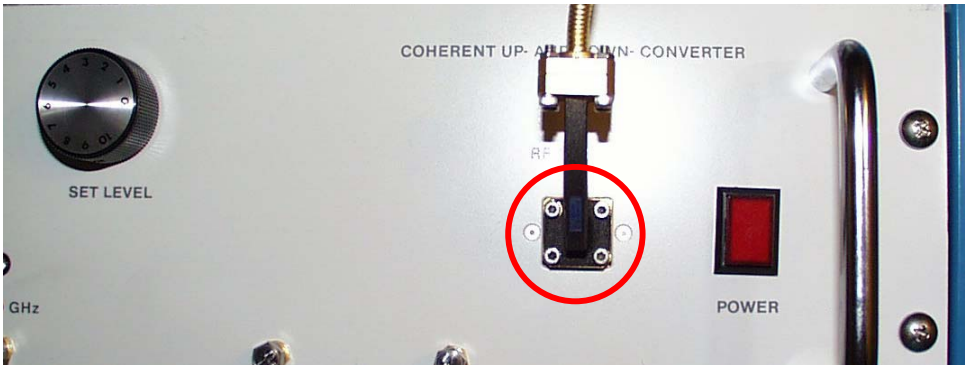


Figure 3

- Remove the 4 hex head screws attaching the waveguide to the TWTA. (See Figure 4)

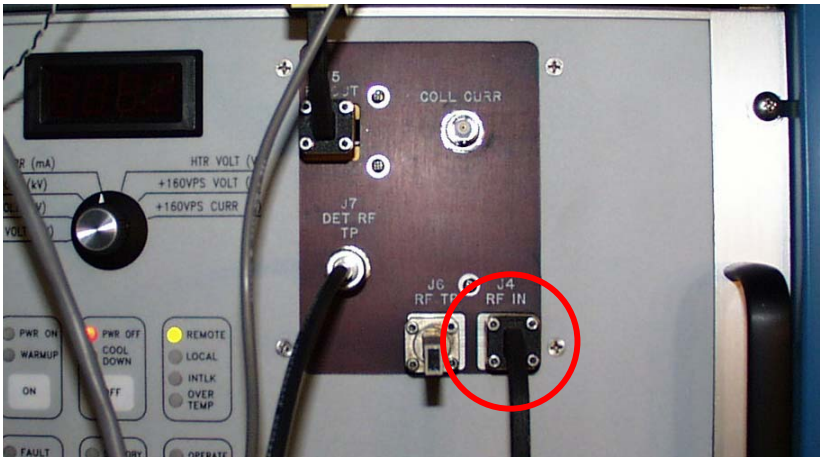


Figure 4

- Carefully set aside the waveguide so that it is not inadvertently damaged.

5. Remove the waveguide between the CUDC and the LNA.

- Remove the 4 hex head screws attaching the waveguide to the CUDC. (See Figure 5)

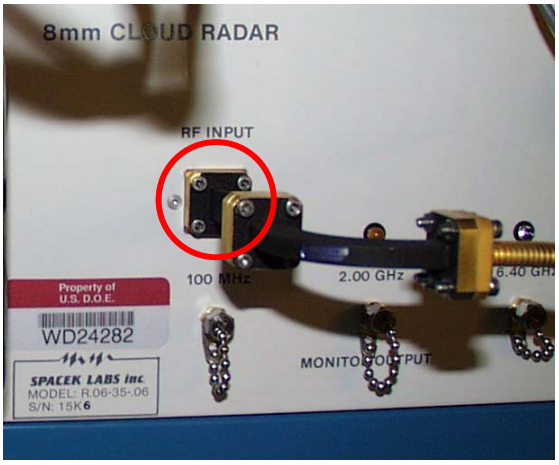


Figure 5

- Remove the 4 hex head screws attaching the waveguide to the LNA. (See Figure 6)
- Carefully set aside the waveguide so that it is not inadvertently damaged.

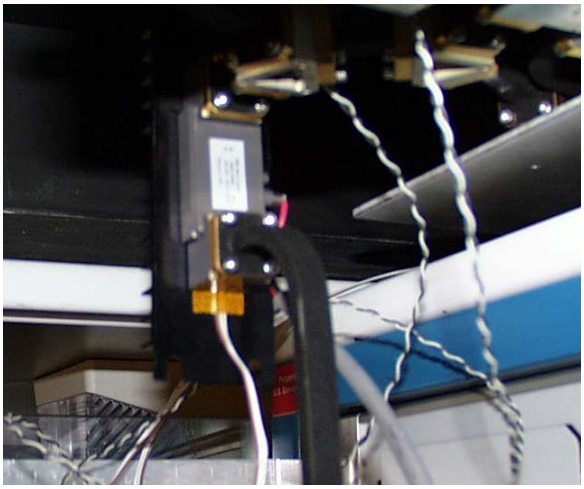


Figure 6

6. Remove the CUDC by removing the 4 screws (2 on each side). Gently slide the CUDC out while watching for the aluminum spacers to drop out.

B. Installing CUDC:

1. Gently slide the CUDC into the rack aligning the aluminum spacers when the CUDC is within a few centimeters of being in.
2. Hook up the cables on the rear of the CUDC. Make sure that the IF OUTPUT and IF INPUT cables are plugged in correctly and not reversed. Both cables are marked.
3. Connect the waveguide from the LNA to the CUDC. It is easiest to first screw the waveguide (using 4 screws) into the LNA first. This supports the weight while screwing it into the CUDC.
4. Connect the waveguide from the TWTA to the CUDC. It is easiest to first screw the waveguide (using 4 screws) into the TWTA first. This supports the weight while screwing it into the CUDC.
5. Power up the OS/2 computer.
6. Proceed to the next section to perform calibration for the new CUDC.

C. Performing Level Calibration for CUDC

1. cc
2. Press the F8 key to bring up the display (see Figure 7).

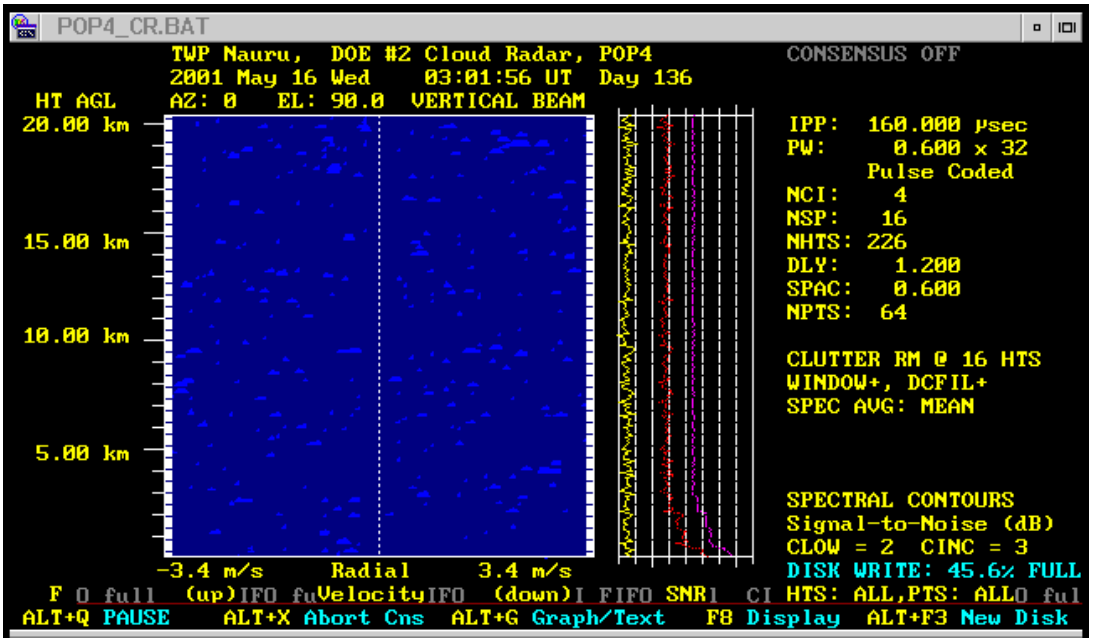


Figure 7

3. When the radar is in a mode where the IPP is 160 usec and the PW is 600, press Alt-Q (‘Alt’ key and ‘Q’ key at the same time) to pause the mode.

4. Make sure that the ‘A’ channel of the oscilloscope is set at 20 mv/div. (See Figure 8).

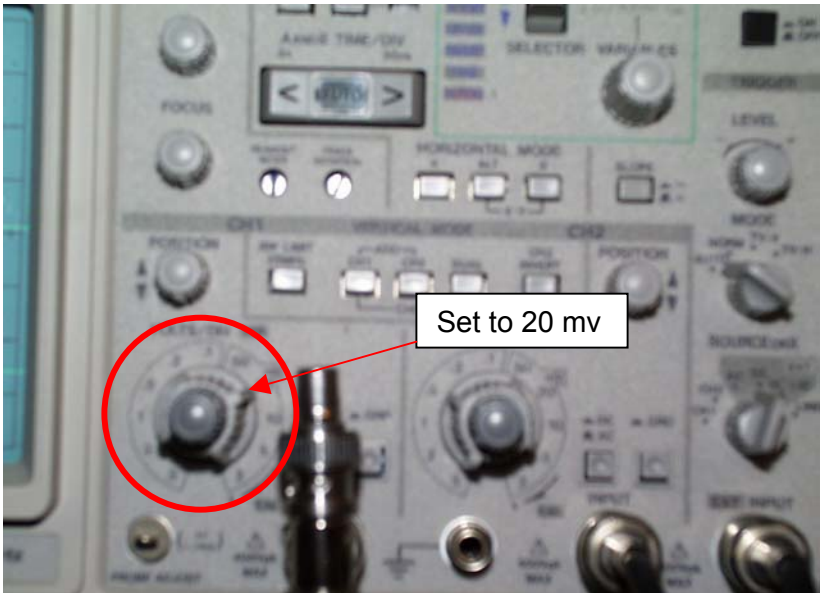


Figure 8

5. Adjust the “SET LEVEL” knob on the CUDC to ‘6’.
6. There is a coaxial cable hooked from the TWTA J7 DET RF TP to Channel ‘A’ of the oscilloscope. You should see the following display on the oscilloscope. (See Figure 9)

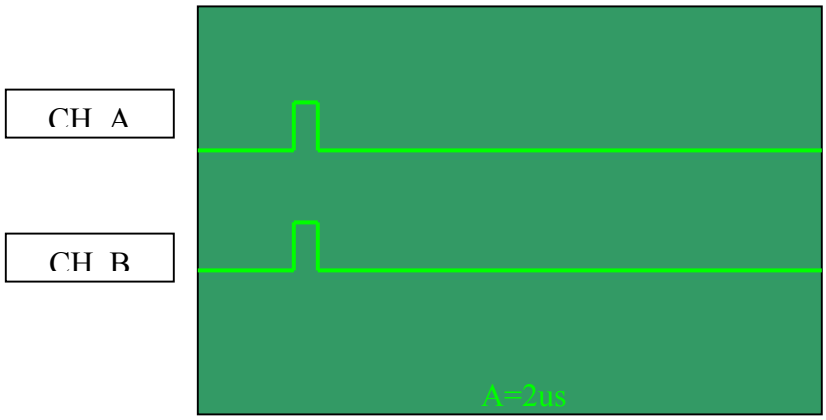


Figure 9

7. Adjust the “SET LEVEL” knob on the CUDC to ‘5’ and observe that the size of the pulse on Channel A increases. Now continue lowering the “SET LEVEL” until the pulse starts to decrease. Once this happens, increase the setting back by 2. For example the pulse might continue to increase until setting ‘3’ and then decrease in size when set to ‘2’. At this point you would adjust the “SET LEVEL” knob to ‘4’.
8. Remove the coax cable between the TWTA J7 DET RF and Channel A of the oscilloscope.
9. Install a coax cable between the TWTA J7 DET RF and DET RF coaxial connector on the front panel of the pulse controller (just above the CUDC).

D. Performing System Calibration for MMCR

1. Open a terminal window on the MMCR DMS (Solaris) computer by clicking on the terminal icon (4th icon from the left at the bottom of the screen).
2. Type **cd/home/pds/bin** followed by hitting the Enter key.
3. Type **Cal** followed by hitting the Enter key.
4. A Calibration window should open up that has the following option buttons:
   - System Parameters
   - Parameter Sets

- Exit

5. Click the **Parameter Sets** button. This will open a Parameter Sets window.
6. Each line must be deleted by clicking on the line and then clicking the Delete button. When all lines are deleted, click the **Cancel** button.
7. Turn the switch on the "ABC Switch" to select the OS/2 computer. Press on the red push button on the "ABC Switch" to unlock the keyboard.
8. Open an OS/2 command window by clicking the OS/2 icon (3rd from the right) at the bottom of the screen.
9. Type **cd/commands** followed by the Enter key.
10. Type **calflag** followed by the Enter key. This will start a receiver calibration the next time that POP4 exits (on the half hour). You should see the POP4 software start and stop frequently while it undergoes receiver calibration.
11. After about a half hour check the Cal program on the MMCR DMS (Solaris) computer by clicking the **Parameter Sets** button to be sure all four of the table entries are there. This indicates the receiver cal ran successfully. If not wait another half hour and check again.
12. After Step 11 is completed, click on the first line in the Parameter Sets window until it is highlighted and then click on the **Tables** button.
13. Click on the **Coded Pulse Loss** button in the Tables window.
14. Set the coded pulse loss to **0** for all entries (2Bits, 4 Bits, 8 Bits, etc) and click the **Commit** key on the screen. Click the **Close** button.
15. Click the **Cancel** button on the Tables window.
16. Click the **Parameter Sets** button and then click the next line in the Parameter Sets window. Do Steps 13 through 15 until all the lines of the Parameter Sets window have had their respective Coded Pulse Loss values set to 0.
17. Check each parameter table entry in the Parameter Sets window, click the **Parameter Check Table** button and record the values for the following:

    - Receiver Noise Figure
    - Peak Trans. Power
    - System Gain
    - RF Noise Diode Off
    - Minimum Sys. Noise

- Antenna Temperature
- Receiver Temperature
- Radar Constant

18. Send an e-mail message the four sets of numbers from Step 17 to Kevin Widener at kevin.widener@pnl.gov
19. Click the **Exit** button in the Calibration window.

V. References:

None.

VI. Attachments:

None.