Alignment Procedure for CDPD Wireless PC Card

Uniden Data 2000

Cotents

1. Equipment needed:

■   A Laptop or PC or Palmtop with PCMCIA connector with communication software.
   ATTENTION : Please use the PC or Palmtop that is approved by FCC standard.
■   A Spectrum Analyzer.
■   A Signal Generator with GMSK Modulation.
■   A Power Monitor.
■   A DC Power capable of 6.3 to 4.0 Vdc with greater than 500 mA current capability.
■   4pcs AAA Alkaline Battery

2. PCMCIA Interface and Switch ON/OFF:

The PCMCIA Interface test must be run for both 3.3 Vdc interface Host and 5 Vdc interface Host

1.   Using a 3.3 Vdc interface Host:

1. Connect card to the Host PC, turn the switch to ON position.

The Host will recognize the Card by displaying a PC Card ICON on the bottom right corner of the screen and if the speaker is turned on by making a hop "" sound.

2. Leave the Card in the Host PC, turn the switch to OFF position.

The Host will drop the card by removing the PC Card ICON from the bottom right corner of the screen and if the speaker is turned on by making a plug out "" sound.

3. With the Card still in the Host, turn the Switch to ON position

4. Unplug the Card from the Host, turn the switch to On position while the
   Card is still out then insert it back to the Host slot

5. Plug the card to the Host, turn the Switch to ON position, open a communication software (i.e. Hyper Terminal or Procomm). While the communication software is open, type the following "AT" command.

at <Enter>
Receive an "OK" response from the Host.

2.   Using a 5 Vdc interface Host:
Procedure is same as 3.3Vdc interface Host.

3.　　Rx/Tx Mode Setting

For stop the wide scanning mode, PC Card have to set the Rx_Mode or Tx_Mode.

1.　　Rx Mode Setting

1.　Plug PC Card into PCMCIA slot and turn the PC Card on.
2.　Type: "**at$chanset *****" next type "**at reset**" to set the channel in *** and start receive mode.
3.　To change the mode to wide scanning, type :"**at$chanset 0**" next type "**at reset**".

2.　　Tx Mode Setting

1.　Plug PC Card into PCMCIA slot and turn the PC Card on.
2.　Type: "**at$syncgen 383 r"** to start transmission with random data.
3.　Type: **"at$txlevel 2"** for setting wanted TX PWR level.
4.　To change the TX PWR level type: **"at$txlevel 3~7"** .(*see comment)
5.　To change the channel type: "**at$chan *****" for setting wanted channel.
6.　To change the mode to wide scanning, type "**at reset**".
7.　When check carrier suppression Type: **"at$syncgen 383 0"** then follow step 3~6.

(* TX PWR level have 6 level step. Level 2 as highest PWR, Level 7 as lowest PWR each level is different by 4dB.　See Section 4.3)

4.　　Calibrations

For the transmit side, there are transmit power calibration and carrier suppression calibration. These two calibrations will be done at three different channels: low (channel 991), middle (channel 383) and high (channel 799).

For the Receive side, only RSSI calibration is required at channel 383 only.

1.　　RSSI Calibration

1.　　Requirements

The RSSI Calibration is to make the RSSI value(the reading power level) the same or near the real input level. Make the difference between real level and reading level meet the specification, i.e. $\pm$ 6dB.

The RSSI will be calibrated at channel 383 only. An external signal generator with GMSK modulation will be inputted to the antenna connector. The channel will be set to 383. The 13 RSSI level and their according real input power level as follow:

RSSI Level	Input Power Level (dBm)
0	-113
1	-108
2	-103
3	-98
4	-93
5	-88
6	-83
7	-78

8	-73
9	-68
10	-63
11	-58
12	-53

2.   *Procedure*

1.   Plug PC Card into PCMCIA slot and turn the PC Card on.
2.   Type "**at$chan 383"** after UnidenData 2000 turn on the receiver power.
3.   Set the external signal generator to GMSK modulation, and set the out put level(make sure the input level at the antenna connector is the same as the level in the above form).
4.   Type "**at$rssical** v" the "v" is the according RSSI Level of the input level in the above form.
5.   Repeat step 3 and step 4 for all 13 RSSI Level.
6.   type "**at$rssiwrite"** to write the new calibrated RSSI Table into EEPROM.
7.   Type: **"at$reset"** to reset the PC Card.

2.   **Reference Frequency Calibration**

1.   *Requirements*

Reference Frequency Calibration is to compensate for the TXCO initial frequency variation at room temperature. The reference frequency will be adjusted by monitoring the Tx frequency at channel 383 for 836.49MHz $\pm$ 200 Hz.

On the Reference Frequency Calibration, the TX carrier will be turned on continuously. And de-balance the I and Q signal to make the carrier level high. Then use spectrum analyzer to find the carrier frequency. Change the AFC output value to make the frequency accuracy meet the specification. This calibration is only done for channel 383.

2.   *Procedure*

1.   Plug PC Card into PCMCIA slot and turn the PC Card on.
2.   Type: "**at$syncgen 383 r"**.
3.   Type "**at$write 0x4060 1 0x05"** to bypass the I and Q, and set the AFC manually
4.   Type "**at$write 0x4061 1 0x00"**
5.   Use the "Peak Finding" function of spectrum analyzer to find the carrier frequency.
6.   Type "**at$write 0x4065 1 0x**hh**"** to adjust the Tx frequency manually. The default value for AFC is 0x94. Change the "hh" to adjust the carrier frequency until it is within 836.49MHz $\pm$ 200 Hz.
7.   Type "**at$afcwrite 0x**hh" to store the calibrated data into EEPROM.
8.   Type: **"at$reset"** to reset the PC Card.

3. Tx Power Calibration

1. Requirements

The PC Card UnidenData 2000 is a class III CDPD MES, its output power must operate over 11 levels as follow:

Level	CDPD output Power spec (dBm)	Calibration goals (dBm)
0	28, +2 / -4	27 ± 0.5
1	28, +2 / -4	27 ± 0.5
2	28, +2 / -4	27 ± 0.5
3	24, +2 / -4	23 ± 0.5
4	20, +2 / -4	19 ± 0.5
5	16, +2 / -4	15 ± 0.5
6	12, +2 / -4	11 ± 0.5
7	8, +2 / -4	7 ± 0.5
8	8, +2 / -4	7 ± 0.5
9	8, +2 / -4	7 ± 0.5
10	8, +2 / -4	7 ± 0.5

Even though there are 11 levels but actually only 6 different settings. And they are calibrated over three channels 991, 383, and 799. On the calibration, the TX carrier will be turned on continuously and is modulated with M2 random data. A power meter will be used to measure the TX power and the setting of the power control DAC (register 0x4044) will be stored for each level for each of the three frequencies.

2. Procedure

1.   Plug PC Card into PCMCIA slot and turn the PC Card on.
2.   Type: "**at$syncgen 991 r"** to start transmission.
3.   Type: "**at$write 0x4044 1 0x**hh" to adjust tx power while monitoring power meter for different level as shown in calibration goals column. Record the "hh" numbers for each level to enter them in the next steps.
4.   Type: "**at$txcal 991 0 0x**hh". Use the "hh" number that was obtained above for level 0 (27dBm).
5.   Type: "**at$txcal 991 1 0x**hh". Use the "hh" number that was obtained above for level 3 (23dBm).
6.   Type: "**at$txcal 991 2 0x**hh". Use the "hh" number that was obtained above for level 4 (19dBm).
7.   Type: "**at$txcal 991 3 0x**hh". Use the "hh" number that was obtained above for level 5 (15dBm).
8.   Type: "**at$txcal 991 4 0x**hh". Use the "hh" number that was obtained above for level 6 (11dBm).
9.   Type: "**at$txcal 991 5 0x**hh". Use the "hh" number that was obtained above for level 7 (7dBm).
10.   Type: "**at$txwrite 991**" to write calibration data into EEPROM. This finishes the calibration for channel 991.
11.   Type: "**at$chan 383**" and repeat step 5 to 12 for channel 383.
12.   Type: "**at$chan 799**" and repeat step 5 to 12 for channel 799.
13.   Type: **"at$reset"** to reset the PC Card.

4. Carrier Suppression Calibration

1. Requirements

Carrier Suppression Calibration is to balance the I and Q power level so that make the suppressed carrier level meet the specification, i.e. 30dB.

On the Carrier suppression calibration the TX carrier will be turned on continuously, and will be modulated with all "0" data. A spectrum analyzer will be used to monitor the TX output. The TX output power level 0 will be set. There are two registers which control the carrier suppression. Their addresses are **0x4061** and **0x4063**. Their default value are **2C**Hex. Initially one of the register will be fixed at **2C**Hex while the other is adjusted up or down until the maximum suppression is obtained. Then it will be fixed at that new value and the other register will be adjusted up or down until the carrier suppression is further maximized. The two values are then written into EEPROM. The procedure is repeated for all three channel 991, 383, 799.

2. Procedure

1. Plug PC Card into PCMCIA slot and turn the PC Card on.
2. Type: "**at$syncgen 991 0"** to start transmission with all '0' data.
3. Type: "**at$write 0x4061 1 0x**ii" to adjust the suppressed carrier level. Adjusting for maximum carrier suppression or better than 30dB. Then record the "ii".
4. Type: "**at$write 0x4063 1 0x**qq" to adjust the suppressed carrier level. Adjusting for maximum carrier suppression or better than 30dB. Then record the "qq".
5. Type: "**at$chan 383**" and repeat step 4 and 5 for channel 383.
6. Type: "**at$chan 799**" and repeat step 4 and 5 for channel 799.
7. Type: "**at$iqwrite 0xii 0xqq 0xii 0xqq 0xii 0xqq**" use the "ii" and "qq" obtained above for channel 991, channel 383, channel 799, accordingly.
8. Type: **"at$reset"** to reset the PC Card.

5. IFR Auto-test

Use the IFR uCell-100 to test the Unidata 2000.(According to the user menu of IFR)
The Procedure as follow:
1. Do the cable test, with the uCell-100.
2. Hook up the PC Card use the tested cable connects from the uCell-100 to the antenna connector
3. Plug PC Card into PCMCIA slot and turn the PC Card on.
4. Type: **"at$ifrtest"**
5. On the IFR, select "menu", select "9", i.e. the "CDPD Test", select "1",i.e. the "Auto-test" then press START.

6. RX Radiation Measurement

UnidenData2000 have test mode for RX radiation measurement as follow:

First you must use the laptop PC to send commands to PC Card to set it up. Send the following commands to PC Card while it's in operational mode:

1. "AT DLMODE 0". This to make PC Card run automatically at powerup.
2. "AT$CHANSET ***". This to keep PC Card from scanning at powerup.
   3. "AT SAVECFG UDT". To save the setting.

4.   "AT RESET".
5.   Plug PC Card out from PC, and turn PC Card off.
6.   Turn PC off.
7.   PCCARD extender JIG(#) to plug PC Card into.
8.   Supply 5V to the extender card, turn PC Card's switch ON.
9.   Then PC Card get active without PC.

It should be ready for you to take the measurement. This mode is for getting active PC Card stand alone without PC.
But if you don`t care the radiation from PC, you can use RX setting mode(See Section.3) without Extender JIG.

(#): In uniden use the PCCARD extender that SYCARD TECHNOLOGY/PCCextend 100.