APPENDIX II

Assembling of Soekris

1. Purchase Information

In this section, I give you an example of a purchase order of Soekris. Because we installed two MiniPCI wireless adapter modules per Soekris, the number of MiniPCIs, Cables, and Antennas should be two times of the number of Soekrises.

1.1. Soekris

- ✓ Name : Soekris net4826-50: 266 MHz CPU, 128 Mbyte SDRAM, 1 Ethernet, 1 Serial, 128 Mbyte CF Flash, 2 Mini-PCI sockets, PoE
- ✓ Web-page : http://www.soekris.com/how_to_buy.htm
- ✓ P/N : 10482650 (net4826-50 Board and Case)

1.2. MiniPCI (Atheros chipset)

- ✓ Name : 5004 MP Atheros 4G: 802.11a/b/g miniPCI Card [5004 MP ATHEROS 4G]
- ✓ Web-page:http://www.netgate.com/product_info.php?cPath=26_34&products_id=126

1.3. Cable

- ✓ Name : U.FL to RP-TNC Panel Mount Pigtail 18" 1.78mm cable[PIG-UFL-PM-RPTNC-178]
- ✓ Web-page:http://www.netgate.com/product_info.php?cPath=21&products_id=33

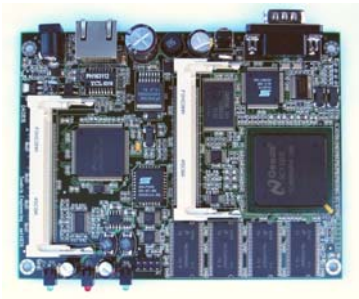
1.4. Antenna

- ✓ Name : TriBand 5dBi RubberDuck Omni APXtender (Connector : RP-TNC type)
- ✓ Web-page:http://www.fab-corp.com/product.php?productid=3146&cat=271&page=1

2. Information of Each Part

2.1. Soekris (net4826)

We can order net4826 board and its case together. On the case of Soekris, there are two holes to mount antennas and the type of each hole is RP-TNC type by default. So, we chose antenna and cable which have the RT-TNC mount type. You can use different mount type such as RP-SMA for antenna and cable, but you have to use same mounting type for both antenna and cable so that antenna and cable can be assembled together.



Soekris net4826 mainboard

2.2. MiniPCI (5004 MP Atheros 4G)

We use MiniPCI with Atheros chipset so that we can utilize the open source Linux MAC driver, *Madwifi driver*. There are a lot of different versions of Atheros chipset, but Madwifi driver supports most of current Atheros chipsets. The Atheros chipset we are currently using is named *5004 MP Atheros 4G*, and this provides 802.11a/b/g over 2.4Ghz and 5.8Ghz radio frequency. When you select a MiniPCI wireless adapter, you may check the transmission power. Our adapter uses up to 200mW for transmission power which supports maximum 18dBm. There is a different MiniPCI adapter with 400mW and we expected that MiniPCI with 400mW can support better transmission range. However, a researcher in UC, Riverside reported that maximum number of dBm with 400mW adapter and Soekris can be achieved up to 20dBm. This means we cannot utilize the full performance of 400mW wireless module with Soekris, which might be because of power consumption limitation. So, we decided to use 200mW MiniPCI adapter modules considering the price of each adapter module and the density of each node in EBII (we actually don't need to have very long transmission range).

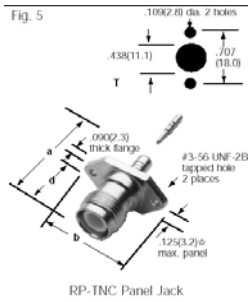
MiniPCI wireless adapter module and Antenna

2.3. Antenna (TriBand 5dBi RubberDuck Omni)

When you select an antenna for Soekris, there are two things you need to consider. One is that higher gain would be better, and the other one is that the antenna has to support both 2.4 and 5.8 GHz together if you are planning to use 802.11a/b/g enabled adapter. The latter is more important because if you don't consider it, you may not be able to use your 802.11a/b/g adapter module properly.

2.4. Cable (U.FL to RP-TNC Panel Mount Pigtail 18" 1.78mm)

For the cable, we actually considered only mounting type. However, one expert said that if we would use 802.11 a/b/g together, because the data transfer rate is very high, we have to use thick cable to prevent data loss inside cable (I'm not sure that this expression is correct in terms of engineering). So, we chose 1.78mm which was thicker than other cables we could choose.



RPTNC type of cable mounting part

3. Images of assembled Soekris

Above pictures show the assembled Soekris. You need to use a screw driver and long-nose pliers. One thing you should be careful is 3 LED modules. This LED module is fixed on main-board, and the wire which connects between LED module and main-board can get bent easily. So, once the wire gets bent, the LED would not come out of each LED hole on the case when you assemble the cover case.