

WLAN Radios Fabrication

Arturo Montalvo Garcia

Hamburg University

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1 INTRODUCTION

The WLAN radio for the Volcano Fast Response System (VFRS) is a versatile WiFi radio, it able to operate in meshing mode or as a conventional telemetric network with repeaters (RP); access points (AP) and stations (STA).

The radio it's based on commercial components developed for wireless networks applications. This particular design uses one ALIX system board (Fig. 1.1.a) as main computing board, running under the iMedia Linux operating system or Meshing Linux. Two Compex WLM54G MiniPCI network adapters, it provides WiFi telemetry. The WLAN radio it's installed in an NEMA-67 standard aluminium box (Fig. 1.1.b).

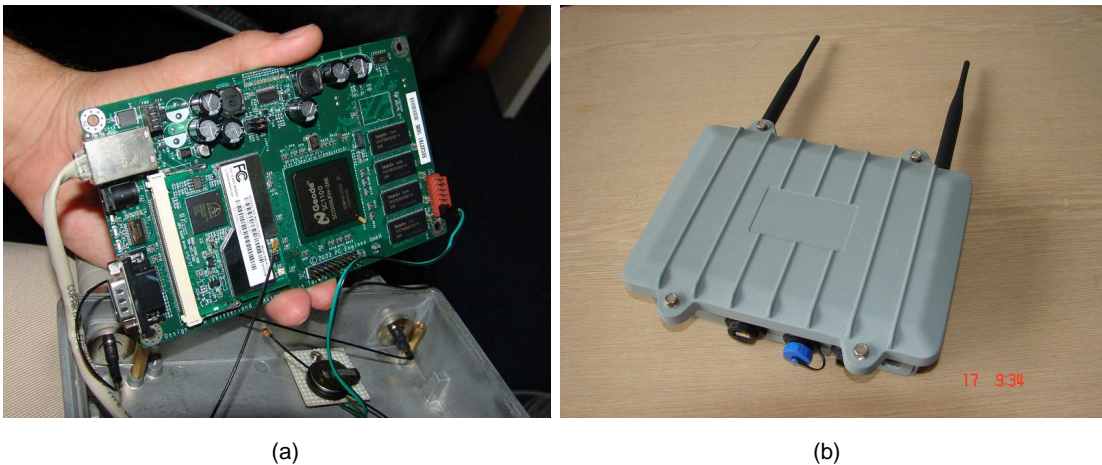


Figure 1.1 – (a) WLAN main board computer and (b) radio housing.

Its principal characteristics are:

- Low power consumption computer with Linux operative system;
- Single or dual MiniPCI network adapter radio cards (0.1 to 1W), 2.4GHz IEEE 802.11 b/g standard, 11 or 52 Mbps;
- Dynamic Frequency Selection (DFS);
- Wi-Fi Protected Access Client Support (WPA);
- Transmission Power Control (TPC);
- LAN/PoE, RS232 and USB external ports for monitoring, data acquisition and control.

This document is intended to explain the fabrication of the WLAN radio and its configuration, to be used as part of the Volcano Fast Response System.

2 WLAN RADIO HOUSING PREPARATION

The standard IP65 housings for the WLAN radio are available in two models, the 2A1E and 4A2E model (figure 2.1), fabricated by NRG Systems in Augsburg Germany. The 2A1E model has two holes for type N antenna connectors and one for Ethernet connector, and the 4A1E model has four holes for antenna and two for Ethernet.



Figure 2.1 – (a) 2A1E model and (b) 4A2E model NRG System housings.

To prepare the housing, select first the type of radio that you want to build: single or dual WiFi card. Both radios have one Ethernet, one serial and one USB connectors located at bottom. Use the drill holes mask, presented in figure 2.2, to proceed with this task.

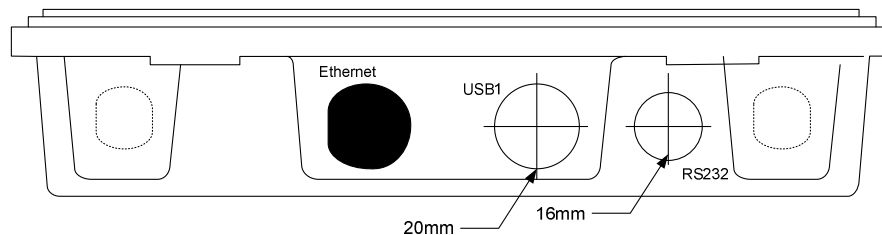


Figure 2.2 – Drill holes mask for NRG housings.

After cleaning all metallic residual, install all cables and connectors, using a good quality silicone; please wait a couple of hours before continue. With all connectors and cables fixed, and the silicone dry, please connect each Mini-SMT connector to

its respective Complex WLM54G card. Antennas identification (Figure 2.3), Mini-PCI connector and WLAN cards are related and must be connected as follow:

- Antenna A and B, to main and auxiliary outputs of the WLAN card one respectively, and connected to Mini-PCI connector number J5 at the PC board;
- Antenna C and D, to main and auxiliary outputs of the WLAN card two respectively. and connected to Mini-PCI connector number J14 at the PC board.

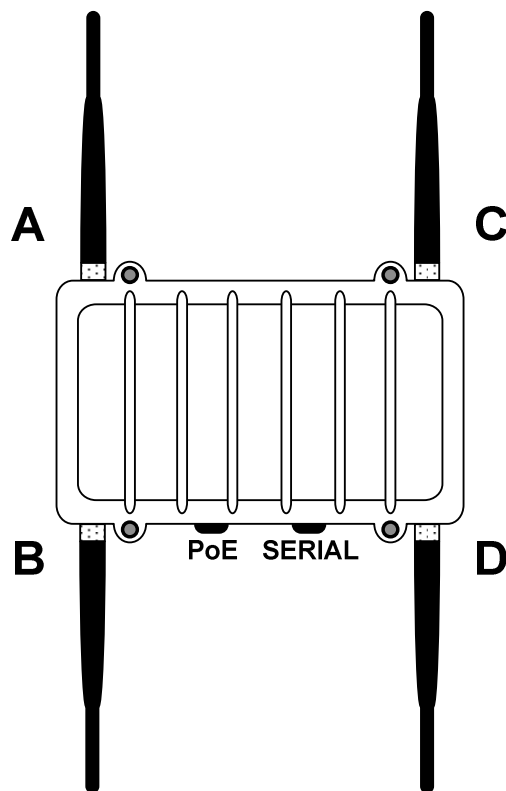


Figure 2.3 – Antennas identification.

3 PC ENGINES ALIX.1C PREPARATION

In a conventional application, the ALIX1C computer needs no preparation, but, due the necessity of USB implementation, this PC must to be modified. The USB connectors at the main board (figure 3.1) need to be removed and replaced by one 10 pins 2.54mm, IDC connector.

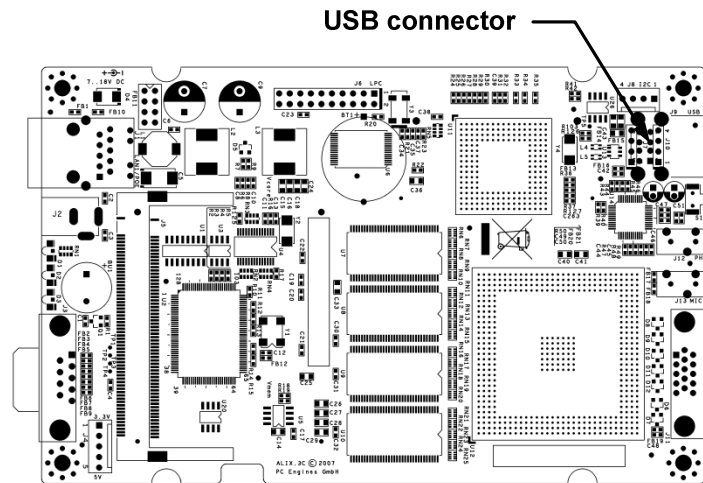


Figure 3.1 – PC engines ALIX.1C USB connector localization.

Before install the IDC terminal connector, remove the 4 pins shown at figure 3.2.a, this allows the use of the fixation hole. The result of this operation can be seen in the figure 3.2.b.

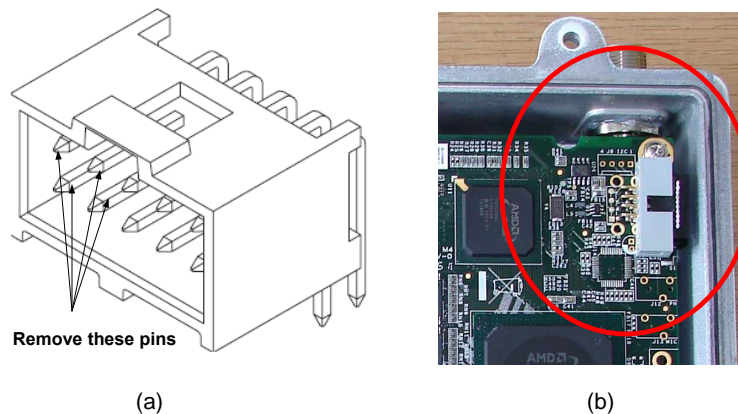


Figure 3.2 – (a) IDC terminal, pins to remove and (b) result of the replacement.

After this operation, please install the CompactFlash card with the operative system and continue with the fabrication.

4 CABLES AND CONNECTORS

4.1 Serial Port to Power box cable

Seven poles power connector from Hirschmann CA 6 LS (figure 4.1.b), Conrad code 739359 – 62, and one Switchcraft EN3C9M26 connector (figure 4.1.b), RS code 2508953722; with a 7.5m length audio cable, connect according Table I.

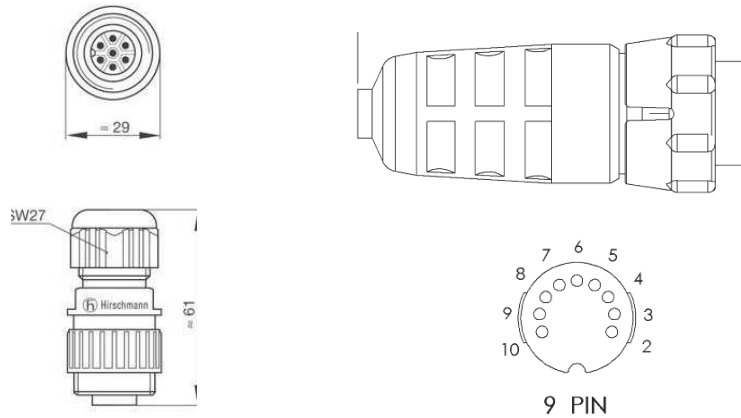


Figure 4.1 – (a) CA 7 connector and (b) EN3 connector and pin connections (rear view).

Table I – Serial port to power box cable.

CA 7 Cable Pin ID	Cable ID	EN 3 Cable Pin ID
1	Red	2
2	Black	3
5	Green	7
6	White	8
GND	Shield	5

4.2 Serial Port connector

One Switchcraft EN3P9F26 panel connector (figure 4.2.a) RS code 2508953750, one Sub D 9 pins female for ribbon cable connector (figure 4.2.b) Conrad code 742443, with a 15cm length of 10 way ribbon cable. First mount the Sub D connector following the next steps:

- Remove the cable number ten from the ribbon cable;
- Assemble taking care that pin number one and cable number one coincides.

Connect according table II.

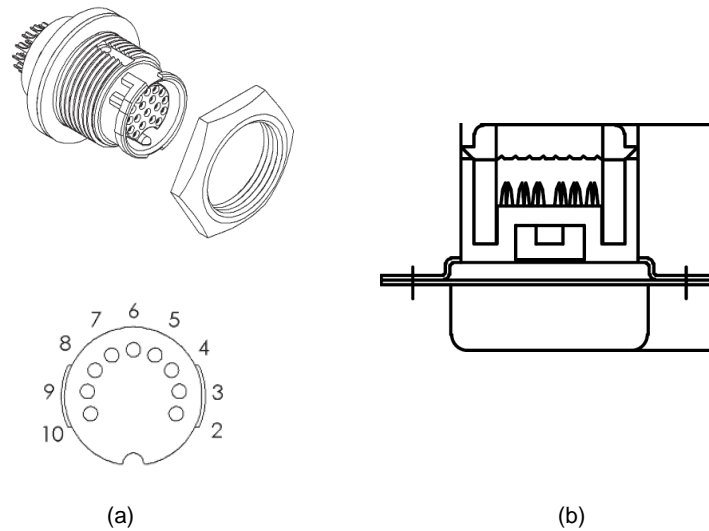


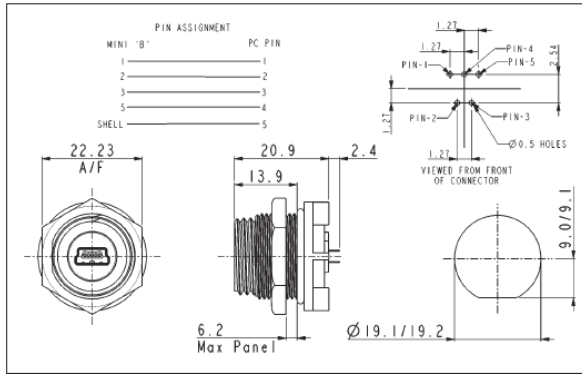
Figure 4.2 – (a) EN 3 connector and pin connections (front view), and (b) Sub D 9 pins connector.

Table II – Serial port panel connector

EN 3 Pannel Pin ID	Cable ID 10 way ribbon	SUB D9 Pin ID
	1 (colour mark)	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10		

4.3 USB Port connector

One Mini B USB IP68 Bulgin PX0447 panel connector (figure 4.3.a) RS code 252-078, one 10ways male IDC connector for ribbon cable (figure 4.3.b) RS code 625-7369 with a 15cm length of 10way ribbon cable. First mount the IDC connector and soldering cables according table III.



(a)



(b)

Figure 4.3 – (a) Mini B USB connector and pin connections; and (b) IDC ribbon cable connector.

Table III – USB port panel connector

J6/J9 IDC	Flat Cable	Mini 'B' type connector (fig. xx)	Signal
1	9	NC	VCC switched +5V supply
2	8	NC	DATA4- negative data
3	7	NC	DATA4+ positive data
4	6	NC	GND ground
5	4	1	VCC switched +5V supply
6	3	2	DATA3- negative data
7	2	3	DATA3+ positive data
8	1	4,5	GND ground

4.3 Power Bow to WLAN radio cable (PoE cable)

Two RJ45 male connectors (figure 4.4.a) RS code 331-6386, two 8P8C plug for cable assembly connector (figure 4.4.b) and 7.5m of UNITRONIC® ETHERLINE-H FLEX C5 4X2X26AWG cable.

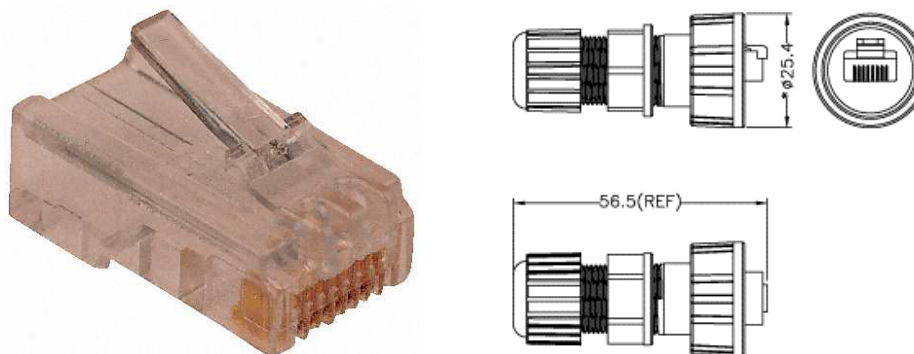
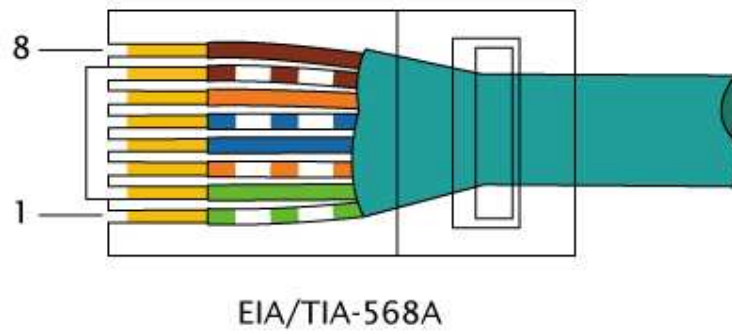
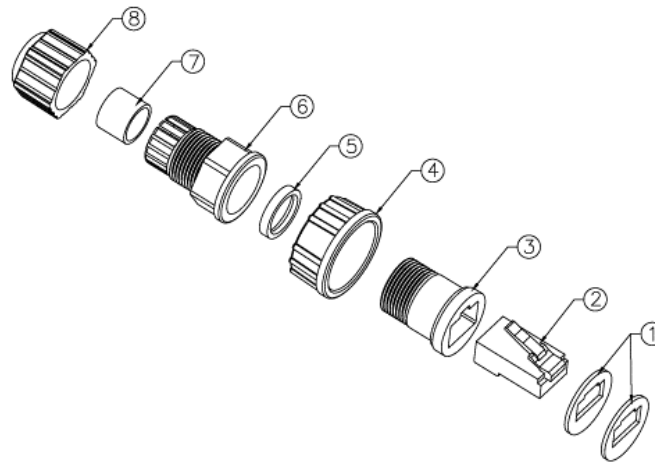


Figure 4.4 – (a) RJ45 male connector and (b) 8P8C plug for cable assembly connector.

The PoE cable is a straight cable (pin to pin), to assemble this cable follow connections at figure 4.5.a. To assembly the 8P8C connector follow figure 4.5.b.



(a)



(b)

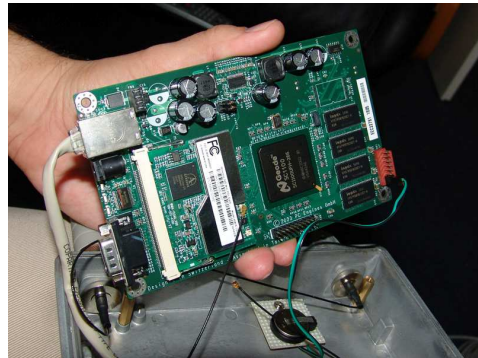
Figure 4.5 – (a) Direct Ethernet connection, and (b) 8P8C connector assembly.

5 FINAL ASSEMBLY PROCEDURE

Once cables, connectors and housing have been prepared, carefully connect each WiFi cards to the PC at J5 and J14 connectors (figure 5.1.a). Connect USB, LAN and Serial connectors (figure 5.1.b) into its respective input and fix the radio into the housing (figure 5.1.c). Before closing, please verify that the WLAN radio works properly.



(a)



(b)



(c)



(d)

Figure 5.1 – (a) WiFi cards insertion, (b) connecting cables into its proper connector, (c) fixing PC into housing and (c) preparing sealing gasket ring.

Radio Closing:

- Put the sealing gasket ring into its guides, use a good quality silicone in both sides (figure 5.1.d);
- Put the cover carefully and begin to screw;
- Screw all four points in alternate way.

6 COMPONENTS LIST

Q.	Description	Code	Provider
1	PC Engines ALIX.3C2 System Board	800013C2	NRG Systems
1	CR2032/1HFE — PANASONIC — Lithium	1298246	FARNELL
1	Outdoor Alu-Gehäuse 4A2E für ALIX.3C1/2/3 und WRAP.2E	801005	NRG Systems
4	Pigtail Kabel U.FL/Mini-SMT auf N-Stecker female	405016	NRG Systems
2	Compex WLM54G 54 MBit/s Wireless MiniPCI-Karte	403027	NRG Systems
1	Kingston Compact Flash Karte 1 GByte	301100	NRG Systems
1	PC Engines Wandbefestigung für Outdoor-Gehäuse 4 N	801014	NRG Systems
1	SUB D BUCHSENLEISTE 9 POL SCHNEIDKLEMM	742443-62	CONRAD
0.25	(metre) FLACHKABEL 3365 3M POLZAHL 10	601922 - 62	CONRAD
1	IP68 LP-Einbaubuchse USB Mini B	252-078	RS
1	Dichtungskappe Buccaneer PCB	494-4437	RS
1	Einbaubuchse Steckerkontakt	2508953750	RS
1	PS/2 Splitter	365-7069	RS
1	Schutzkappe EN3 IP68-Buchse EN3CAP-RS	216-7537	RS
1	Stiftleiste IDC 2,54mm 14-polig 90°	473-8355	RS
1	IDC-Buchse codiert 10-polig	625-7369	RS
1	IP68 Kabel 4,5m Mini USB B zu Std USB A	252-056	RS
1	Kappe für USB Kabel PX0441/442	252-163	RS
1	USB Adapter A Buchse auf B Stecker	495-5342	RS
4	Connector RF type N for cable RG-213	42006	WiMo
6	(metre) KOAXKABEL RG213 50 OHM (FIL.940007)	285099 - 62	CONRAD
7.5	100m UNITRONIC® ETHERLINE-H FLEX C5 4X2X26AWG	600893 - 62	CONRAD
1	Connector LTW cable	RJ45-002M-IN	COMPONA
1	Leitungsstecker 9pins	2508953722	RS
7.5	(m) GESCHIRMTES AUDIO- & MSR KABEL	600807 - 62	CONRAD
1	USB 2.0 Adapter A Buchse auf A Buchse	495-5336	RS
1	Conector de datos macho 8/8 RJ45	331-6386	RS
1	Wifi Omni directional antennas GP-2400-12	18590.12	WiMo
0.5	Wifi solid Grid Dish 2.4	18685.24	WiMo
0.5	Antenna YAGUI 18dbi YA-2400-18	YA-2400-18	WiMo
2	Dummy Loads 50 ohms N	21002	WiMo
2	Lightning arrestors	21043	WiMo
2	N-N male adaptor, 2x plug N	42029	WiMo