Issue Date :	**17th November 2012**

Product :	**Car2Go Head unit**
Subject :	**Hardware changes description**

Revision history table					
Rev.	***Date***	***Pages***	***Modifications***	***Author***	***Approval***
1	14/11/2012	-	First Issue	Valentino Guaragna	
2	17/11/2012	-	Test report included	Valentino Guaragna	

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1. List of changes

Following are listed all the changes on the Car2Go HU system to improve system reliability and fix bugs discovered during product validation phase.

Radio board	**Issue description**	
Board to board connector	Disconnection during vibration test	
START line	Noise while cranking	
Mainboard	**Issue description**	
Board to board connector	Disconnection during vibration test	
New horizontal kapton cable connector	Disconnection during vibration test	
New kapton cable	Disconnection during vibration test	
Pull down resistor	Dark screen issue while cranking	
Hardware watch dog	Dark screen issue while cranking	
CAN transceiver control signal change	No issue	
Location hole	No issue	

Table 1 Car2Go HU changes

2. Radio board changes

2.1. BOARD TO BOARD CONNECTOR

Kyocera connector (P/N 24_5078_050_100_861) has been replaced with Iriso (P/N 9857S-52A-GF) floating connector to prevent disconnection due to Z-axis vibration:

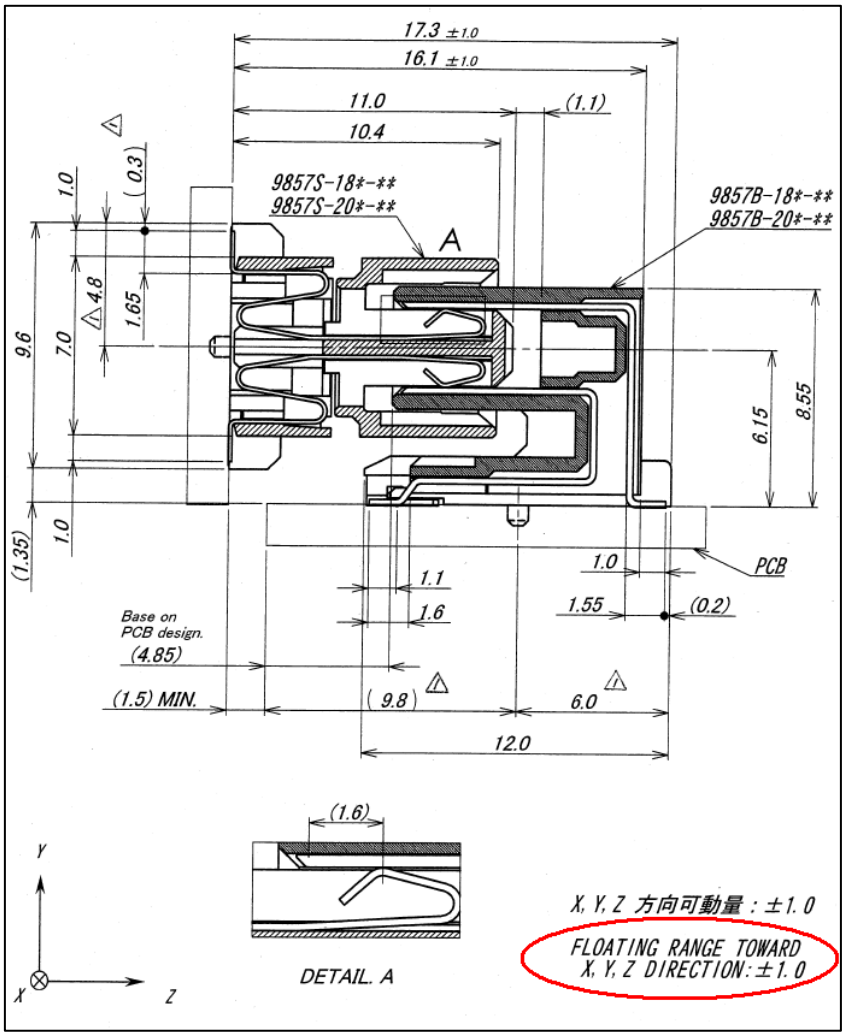

Figure 1 Floating mating up to 1 mm

2.2. START LINE

First release of radio board was not able to properly manage the START line signal of 2011 vehicles.
This input was designed to properly manage an “off” state of START line close to 0 volt.
Unfortunately on 2011 vehicle, the START line have a different behavior when not active, and the “off” state is no more close to 0 volt: this was the root cause of audio noise/mute on the FordWork audio amplifier.

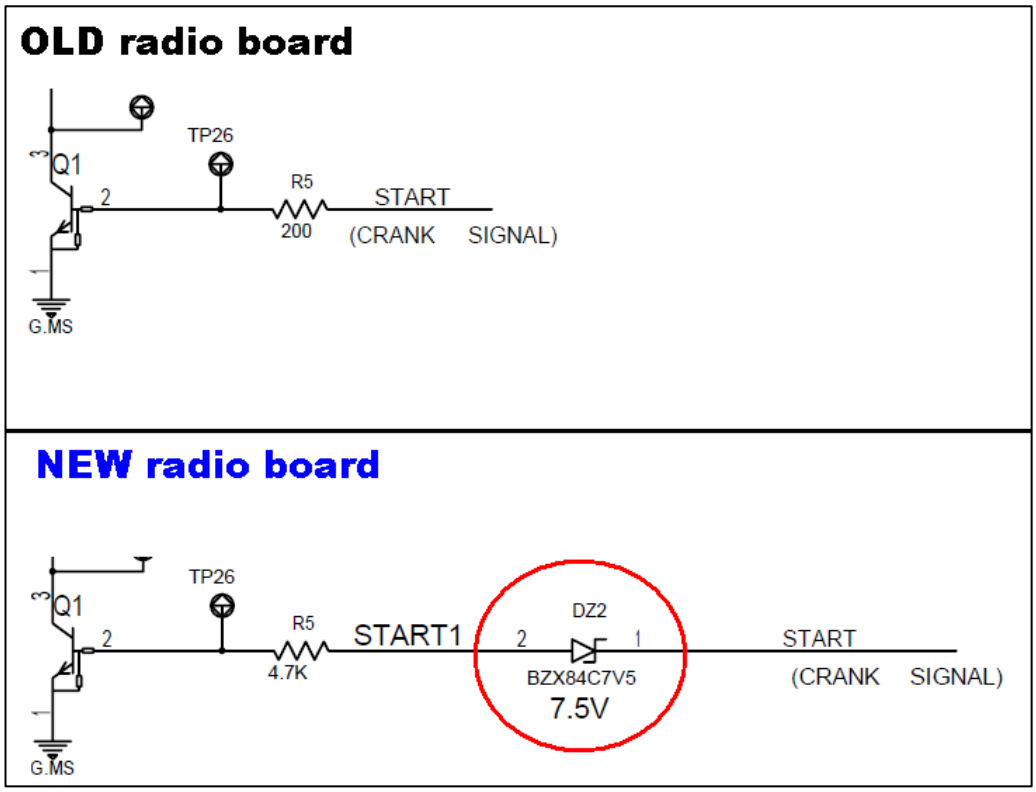

Figure 2 Crank line improvement for 2011 vehicles

On the new radio board a series Zener diode has been introduced to avoid unwanted “mute” of the audio amplifier due to different input voltage level on START line, while vehicle is not cranking.

In field tests have been performed to prove the effectiveness of changes.

3. Mainboard

3.1. BOARD TO BOARD CONNECTOR

Please refer to **2.1 List of** changes

3.2. NEW HORIZONTAL KAPTON CABLE CONNECTOR

Hirose vertical connector (FH40-60S-0.5SV) has been replaced with Hirose horizontal connector (FH28-60S-0.5) to prevent disconnection during vibration test.

The disconnection was primarily due to an Hirose wrong design that didn't guarantee the proper connection between flat cable and connector.

This connector has been disqualified from Magneti Marelli CAD libraries.

3.3. NEW KAPTON CABLE

The introduction of the new kapton cable connector (see previous paragraph) requires a new kapton cable as well.
An "S" shape flat cable has been designed to best fit the connectors which interface the motherboard with the front panel avoiding disconnection during vibration tests.

3.4. PULL-DOWN RESISTOR AND HARDWARE WATCH DOG

During low-battery crank, battery voltage can drop below 5 volt.
If this event happens on a PV1 system, the power mosfet who feed the microprocessor do not close completely and the core supply voltage can be out of range. This could generate a system hang-up with no system reset.
The system do not boot again and stay permanently with the screen in dark mode.

The only way to recover the system is via manual reset or unplugging the power-supply.

To prevent from this faulty behavior:

- a pull down resistor has been introduced on the interrupt pin of the system power supply IC (Daisy) to prevent from false boot condition due to leakage current
- an external hardware watch-dog has been enabled to prevent from unwanted system hang up

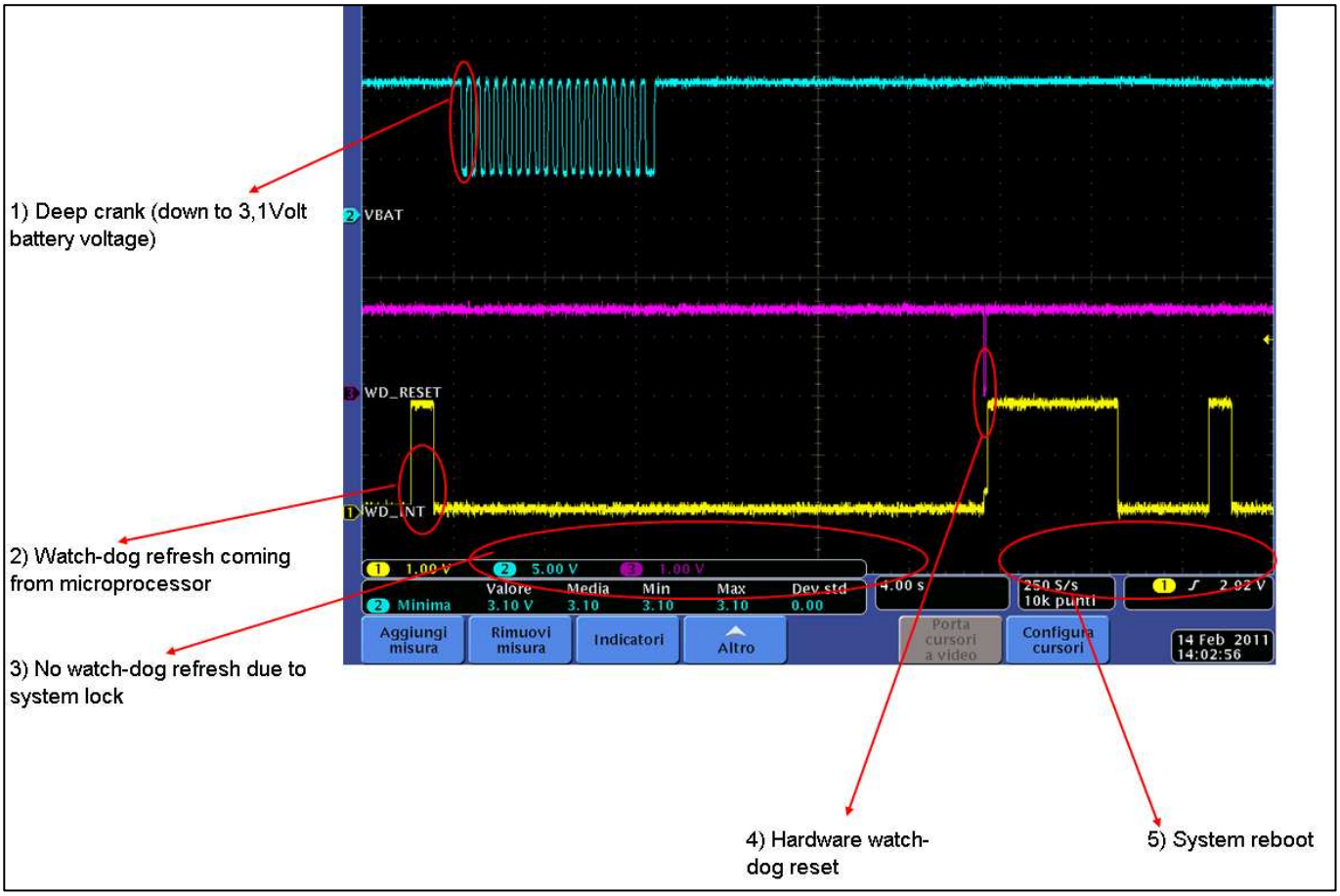

Figure 3 External watch-dog functionality

In the picture above a deep-crank has been simulated (on the bench) to reproduce system hang-up and show the external watch dog intervention:

1. battery voltage (VBAT) falls repetitively down to 3,1 volt
2. the signal coming from the microprocessor to refresh the external watch-dog (WD_INT) stops since the microprocessors hangs-up
3. the watch-dog internal counter elapses after about 25 seconds
4. a reset (WD_RESET) is asserted from the watch-dog to the system
5. system reboot

3.5. CAN TRANSCEIVER CONTROL SIGNAL CHANGE

CAN transceiver control signals have been reversed on PRS3 as depicted in the picture below:

- old control: TJA1041 is active when C-CAN2_STB and C-CAN2_EN are low
- new control: TJA1041 is active when C-CAN2_STB and C-CAN2_EN are high

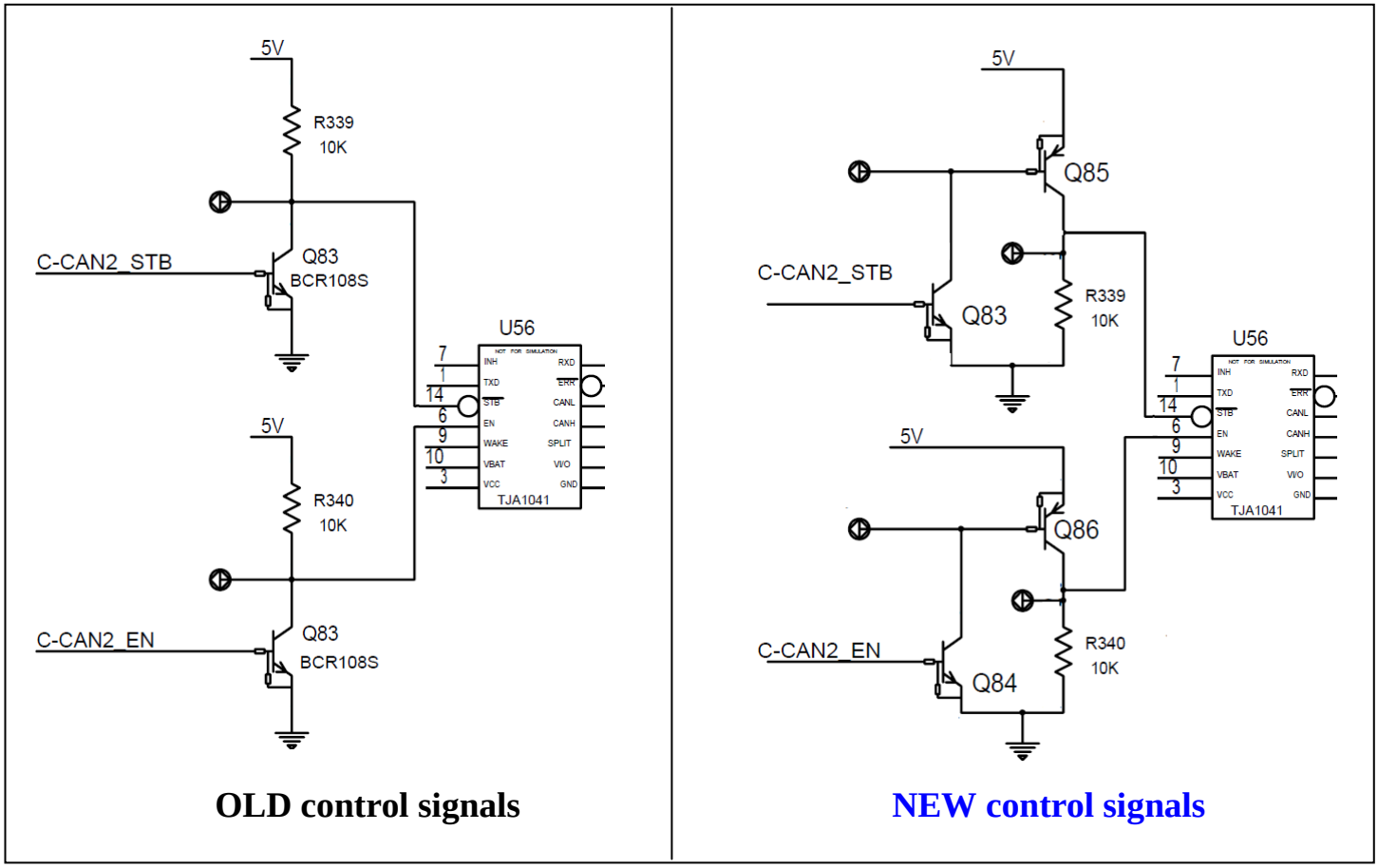

Figure 4 CAN transceiver control comparison

In the old architecture, when system is booting (5Volt is high) C-CAN2_STB and C-CAN2_EN are low then EN and nSTB pin of TJA1041 are high: the transceiver is “on”.
This mean that messages on the CAN bus go to the input of the microprocessor CAN cell, while it is booting.

Robust design rules require to properly initialize the CAN driver before receive any message from the CAN bus.

The improvement gained with the new control is that transceiver is “off” while system is booting because Q85 and Q86 are “off” then EN and nSTB pin are low also if 5Volt is high.
This solution is adopted on almost all Magneti Marelli systems.

System Can functionality is tested in the production plant at End Of Line test.

3.6. LOCATION HOLE

An additional hole has been introduced on (Lauberhorn C3 PRS4) mainboard to improve assembly/testing process reliability.

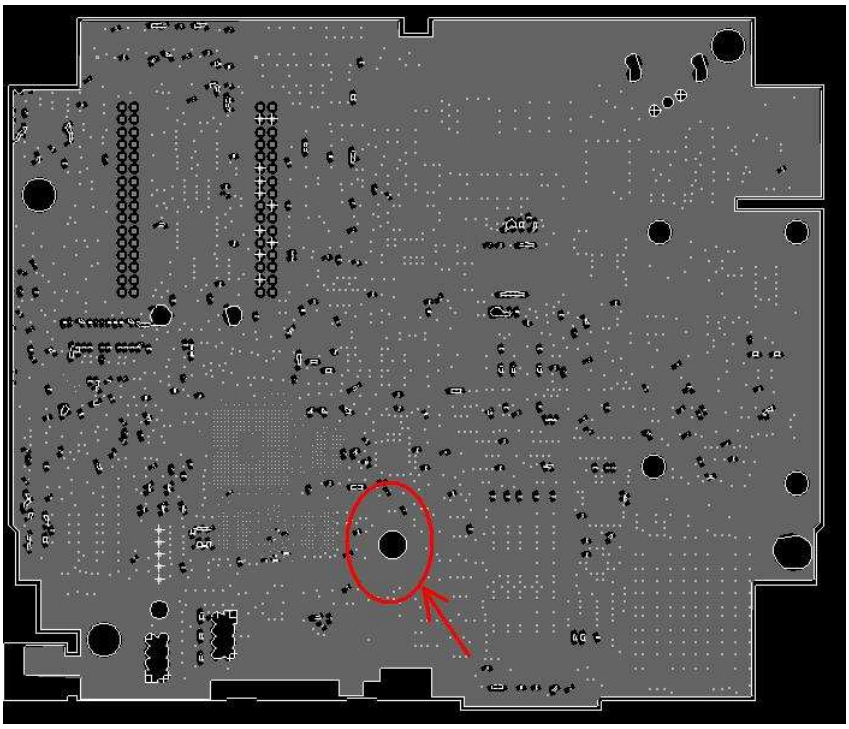

Figure 5 Additional motherboard locating hole

The additional hole do not have any impact on system performances hence do not need a specific test.