Memorandum

To	John Charters, TRL Compliance Services Ltd.
cc	Marion Campbell
Prepared by	T R Davies

Subject: Circuit differences between H1a and H1b transceiver boards

1 Introduction

The TM describes the circuit differences between the H1a and H1b transceiver boards. The differences arise for two reasons.

1. The PA used on H1a was made by Raytheon and is now obsolete. It is not possible or wise to attempt to procure a drop-in replacement.
2. The H1b board is used in the Daytona LBT as well as in the H1b handset. There are a number of minor differences in the requirement for use in an LBT, such as the need to start up and shut down reliably when power is applied and removed, and the need to interface to external devices.

2 References

[1] C7032-S-003. Architecture description. This includes material describing the reason for the H1 architecture, with numerous references to the (obsolete) Laguna design.

[2] C7032-DREP-002, Radio Design Description, Release H1, H1b and Daytona

[3] C7032-CD-012 Issue e. H1b circuit diagram.

[4] C7032-CN-051. Change note with various component value changes for production build.

3 Circuit differences

Each section gives the sheet number for the circuit diagram, reference [3].

3.1 Transmitter

Sheet 9

An active bias circuit has been added for Q8 to give improved thermal stability and lower dependence on device characteristics (Q20 and Q21).

Sheet 10

The main difference between H1a and H1b is the new Power Amplifier used on H1b. The circuit differences that surround the new PA are:-

- The new PA does not need the –5V or +5V bias supplies, but uses instead a +3 V bias supply. As a result the –5V supply is no longer routed to the PA and the positive three-terminal regulator (RG5) is changed for a different part from the same family.
- The Buck Converter that supplies the main PA dc power now uses two inductors in series (L20 and L93). The resistors that define the voltage range available have been changed to meet the higher supply voltage requirements of the new PA (R58, R59 and R60).
- The gain distribution ahead of the PA has been changed, with the temperature-compensated attenuator (R153, R154, R155 etc) moved ahead of the driver amplifier and a matching network added at the PA input (C471, C472 and L95).
- The attenuator feeding the power detector has been simplified and adjusted for the coupled port output level (R157, R158 and R159).

3.2 Receiver

Sheet 2

The attenuator feeding the 214.6 MHz buffer amplifier has been simplified (R47, R49).

Sheets 3, 5 and 11

The 600 kHz differential amplifiers now operate directly from VRF2. On H1a they were powered from a switched supply which caused high current draw when the IF chip was disabled. The dc feed impedance at the LC filter has been reduced so that buffer amplifiers are no longer needed at the ADC inputs (Sheet 11).

3.3 Power supply

Sheet 17

A smaller –5V supply has been used (U64).

The CP power-on signal is now open-drain, and is pulled-up to the +1.6 V supply via R412. This prevents the back-up battery being drained when the transceiver is turned off by removing power.

3.4 Battery Charging

Sheet 17

Whenever the battery charging pass transistor is turned on there is a current peak at the start of the pulse. This can cause a premature transition from pre-charge to fast charge. A compensation circuit is used on H1b to remove the effect of the current peak (D8, D9, R385, R386, R387 and C460).

A trickle-charge path has been added (D10, R413) to recover a battery that has disabled itself as a result of under-voltage.

3.5 External interface signals protection

Sheet 18

Various signals on the Accessory Connector have had isolation devices fitted so that CP and FPGA signals do not connect directly to external devices. On serial data inputs non-inverting logic gates have been used (U66 and U67), and on the DPL serial output a series resistor has been added (R408).

3.6 Auxiliary ADCs and DACs

Sheet 13

The allocation of auxiliary ADCs has been changed to avoid a design weakness in the CP.

The auxiliary DAC that tunes the TCVCXO frequency standard has a buffer that provides an output correctly referenced to the VCTCXO ground (U65).

3.7 Audio

Sheet 19

A filter inductor at the external headset connector introduced a ground impedance common to both microphone and speaker signals. This caused an audio echo and has been removed.