DB2068C Radio Module

Factory Tune-up Procedure

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1.0 Purpose

The purpose of this document is to provide the necessary information to allow a test person to tune-up a DB2068C Radio Module.

2.0 Scope

This document will provide a top level description of the DB2068C Radio Module.

3.0 Related Documents

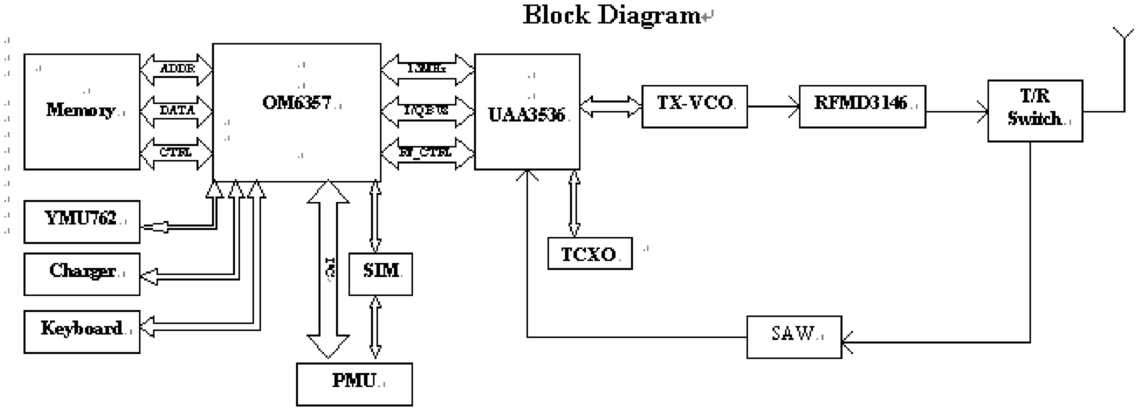
There are a number of related documents which are helpful when using this manual. They include the following.
a) DB2068C User's Manual
b) DB2068C Transceiver Data Sheet
c) GSM System Specification.
d) DB2068C Radio Circuitry Description

The DB2068C User's Manual provides the necessary information to operate a mobile. DB2068C Traceiver Data Sheet provides some information for the RF part. The DB2068C Radio Circuitry Description .Circuitry Description provides information on the circuits relevant to FCC certification.

4.0 Overview

The attached picture is DB2068C BLOCK diagram.

Block Diagram

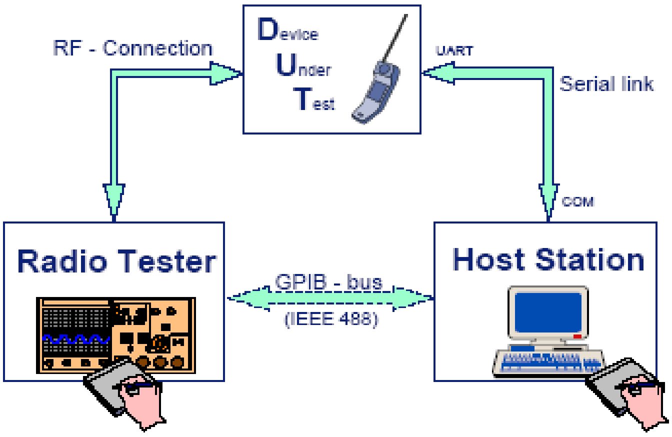


5.1 Test Equipment Requirements
The following test equipment(or equivalents) are required to properly tune the DB2068C Radio module.
1. Tested radio module needs a RF connection.
2. Personal computer(Host station) with the RF TEST test software(TAT)

3. R&S DC power supply.
4. R&S spectrum analyzer.
5. Radio tester(R&S CMU200)
6.GPIB-Bus and serial link.

5.2 Introduction

This section describes the steps to take before the actual alignment of the radio should begin. The effort in this section is to visually inspect the assembled radio part with test equipment(CMU200). Visually inspect the radio to verify all components have been installed.



5.3 Tuning Procedure

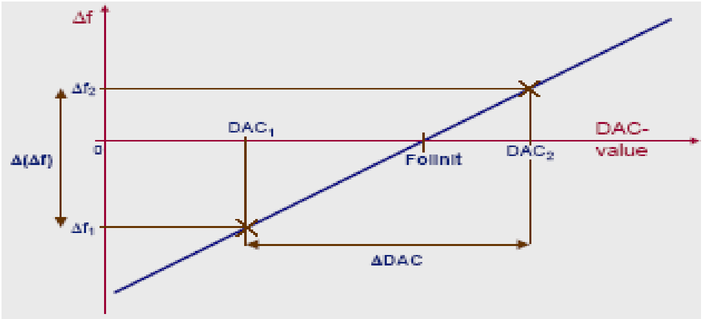
This section describes the procedure required and procedure to manually align the transmitter and receiver circuitry.

5.3.1 AFC(Auto frequency control): The TXVCO is used to drive the quadrate modulator circuit. It is necessary to tune the TCXO to align the 26MHz so that it will oscillate at with the proper tuning voltage TCXO PIN 1.Set-up the radio-tester in the GSM900, non-signaling TX-mode (e.g. *channel 62*).Set the transmission-mode to *burst*, the bit modulation *on* with *no training* sequence let the phone start random TX-bursts on channel 62 with the power level 10 (the other default values have to be present on the RAM!)

It is assumed that the relation between Δf and the DAC-value is a linear equation. So it is enough to determine two points of that curve to know the whole relation.

The first point you get when you set the DAC to a certain value (for example 1000) and measure the resulting frequency error with the radio tester.

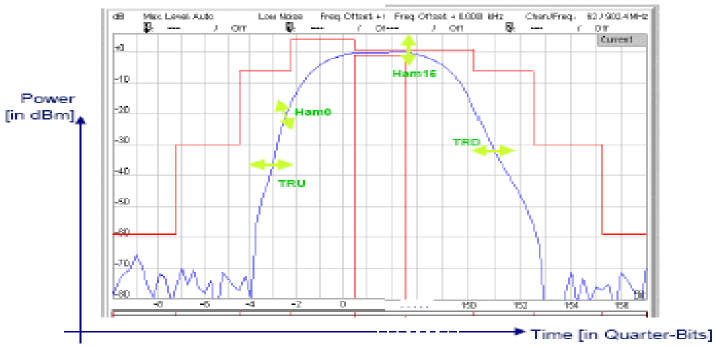
The second point you get in the same way, but with another DAC setting (for example 3000)



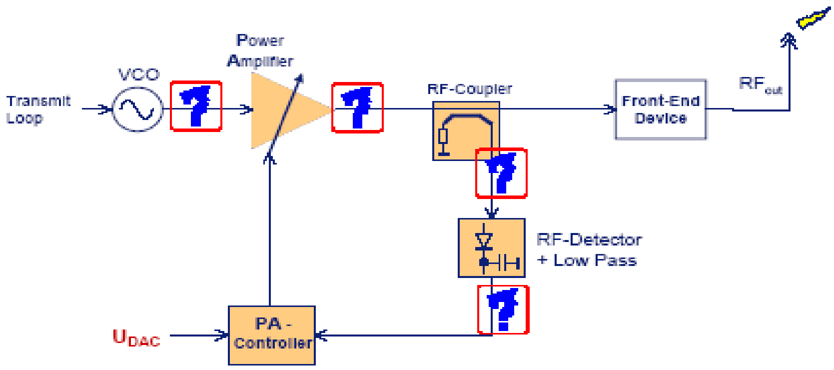
Slope:	$m = \Delta(\Delta f) / \Delta DAC$;
Zero-crossing:	FoiInit = DAC1 - Δf1/m ;

5.3.2 APC Transmit part: The task of this part is to calibrate GSM peak power and the curve of time mask(power ramping curve). Average power is the most important parameter in the TX part. Accurate timing of burst prevents the interference between adjacent slots. The stored parameters in the EEPROM include Ham0, PowH0 and Ham15, TRU and TRD and so on.

TX Calibration : Power Ramping Curve



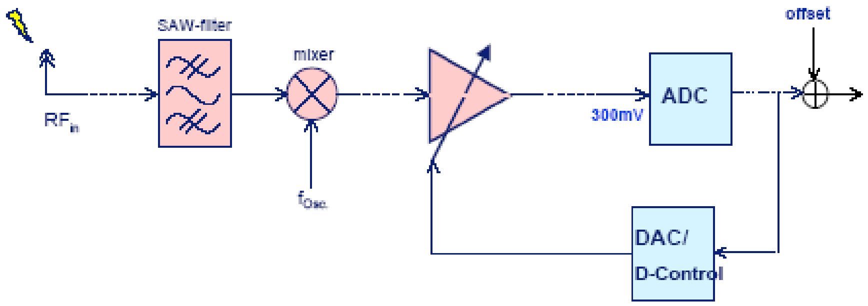
All phones have to comply this (nearly) optimal curve for every power level (and every frequency)



The Power Amplifier with the control loop

Align at least 20 boards manually (with the exact RF peak-power levels respectively, according to GSM-specification) and notice the achieved values for every board. Get the corresponding power of the Ham0-DAC-values (PowH0), first set the Ham15 (peak-power)-value equal to the Ham0-value and then measure the new power with the radio tester. Average the various obtained DAC-levels to the default DAC-levels (Ham0, PowH0 and Ham15, TRU and TRD). Now we have all values we need for alignment:-the default values for TRUand TRD-the (default) pairs of values of Ham0/PowH0and Ham15/PowPeak(PowPeakare the various peak-power levels according to GSM-spec.)

5.3.3AGC(Auto gain calibration):This part will calibrate RX parameter that stored in EEPROM to satisfy with received different signal strength. The stored parameters in the EEPROM include a_rf_FineGain and so on.



The input stage and the AGC-circuit (Automatic Gain Control) in principle

Set-up the Radio Tester (CMU) to generate RF-bursts(-> GPIB interface or by hand).Cable attenuation has to be compensated for the different frequency-bands. Set frequency to channel 62 (channel 698 for DCS). Set power level to -60 dBm. Set bit modulation to PRBS, transmission to continuous.
Read out the power reported by the phone. Calculate the difference between the measured power and the expected power (-60 dBm)(= DiffPower). Store the new value of a_rf_FineGain = (a_rf_FineGaindef-DiffPower)x 8to the RAM. Remeasure the reported power, ensure that the difference should less than 0.1Db. Set the radio tester to another frequency. Repeat the steps above for further frequencies (in our case: 5 frequencies).

6.0 Tune-up Target

PCL = 0, PWR = 29.4 ± 0.2 dBm

PCL =1, PWR = 28 ± 0.2 dBm

PCL =2, PWR = 26 ± 0.2 dBm

PCL =3, PWR = 24 ± 0.2 dBm

PCL =4, PWR = 22 ± 0.2 dBm

PCL =5, PWR = 20 ± 0.2 dBm

PCL =6, PWR = 18 ± 0.2 dBm

PCL =7, PWR = 16 ± 0.2 dBm

PCL =8, PWR = 14 ± 0.2 dBm

PCL =9, PWR = 12 ± 0.2 dBm

PCL =10, PWR = 10 ± 0.2 dBm

PCL =11, PWR = 8 ± 0.2 dBm

PCL =12, PWR = 6 ± 0.2 dBm

PCL =13, PWR = 4 ± 0.2 dBm

PCL =14, PWR = 2 ± 0.2 dBm

PCL =15, PWR = 0 ± 0.2 dBm