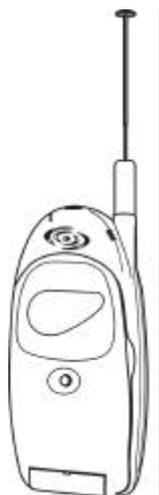


LEVEL 3 SERVICE

FA9M0476



Trium



COSMO (DUAL BAND)

| | | | | | | |
|---|--------------------------------------|---------------------|-------|-------------------|-------------------|--------------------|
| R E V I S I O N S | V E R S I O N S | A : Création D.JUET | 04/00 | Rédigé par | Verifié par | Approuvé par |
| | | | | <i>Written by</i> | <i>Checked by</i> | <i>Approved by</i> |
| | | | | D.JUET | BT.LEGORGEU | G. LEBASTARD |

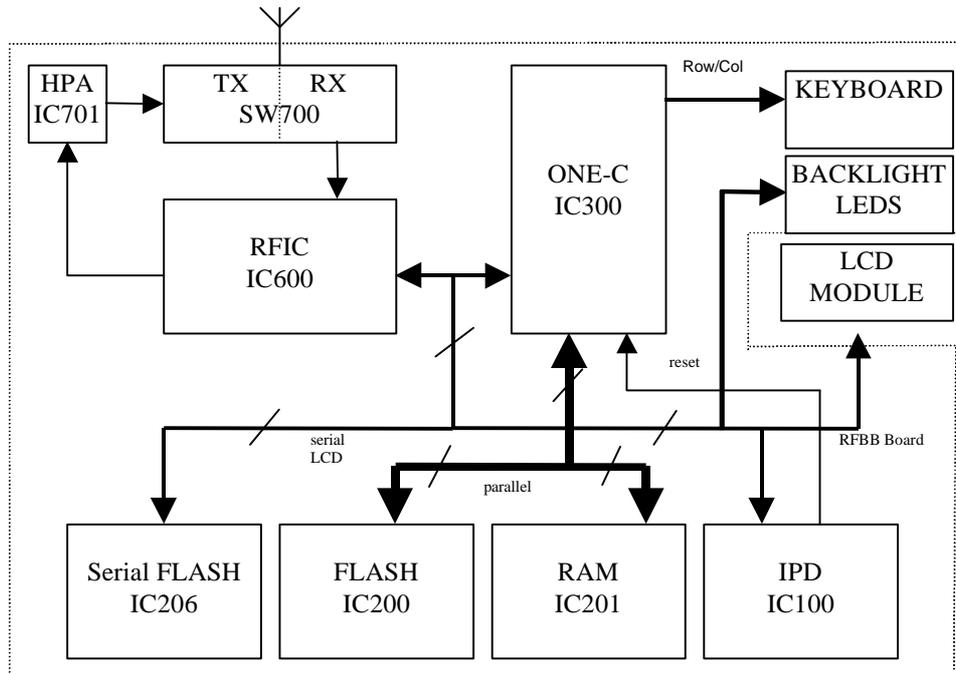
TABLE OF CONTENTS

| | |
|--|-----------|
| 1. FUNCTIONAL DESCRIPTION | 1 |
| 1.A BLOCK DIAGRAM | 1 |
| 1.B DESCRIPTION OF BLOCK DIAGRAM | 1 |
| 1.b.1 IC 300 One-C (vWS22100) | 1 |
| 1.b.2 IC100 IPD (Rohm BH6070KUT)..... | 1 |
| 1.b.3 IC600 RF-IC (Hitachi HD155121FEB)..... | 1 |
| 1.b.4 IC601 PLLs & VCOs..... | 1 |
| 1.b.5 Memory system..... | 1 |
| 1.b.6 System Clock | 2 |
| 2. BATTERY MANAGEMENT..... | 2 |
| 2.A BLOCK DIAGRAM | 2 |
| 2.B DESCRIPTION | 2 |
| 2.C CHARGING PROCESS | 3 |
| 2.D MAIN CHARACTERISTICS..... | 4 |
| 2.E AUTONOMY CONTROL..... | 4 |
| 2.F POWER ON | 5 |
| 2.f.1 POWER-Key is pressed (see a) :..... | 5 |
| 2.f.2 TESTPS is connected (see b) : | 5 |
| 2.f.3 An EXPS accessory is connected (see c) :..... | 5 |
| 2.f.4 RTC alarm interrupt:..... | 5 |
| 2.G POWER OFF | 7 |
| 2.H REAL TIME CLOCK | 7 |
| 3. RF SECTION..... | 8 |
| 3.A FREQUENCY RANGE | 8 |
| 3.a.1 E-GSM Frequency :..... | 8 |
| 3.a.2 DCS Frequency :..... | 8 |
| 3.B SYNTHESISER CIRCUIT DESCRIPTION..... | 10 |
| 3.C RF BLOCK DIAGRAM..... | 11 |
| 3.c.1 Reception Block Diagram..... | 12 |
| 3.c.2 Transmission Block Diagram..... | 13 |
| 3.c.3 Output power control..... | 14 |
| 4. SPEECH CODER..... | 15 |
| 4.A FEATURES | 15 |
| 4.B FULL RATE / HALF RATE / ENHANCED FULL RATE | 15 |
| 5. ANALOGUE AUDIO | 17 |
| 5.A BUZZER | 17 |
| 5.B SPEAKER (RX AUDIO)..... | 17 |
| 5.C MICRO (TX AUDIO)..... | 17 |
| 6. TESTMODE SOFTWARE..... | 18 |
| 6.A EQUIPMENT INSTALLATION | 18 |
| 6.B SOFTWARE (MTS) INSTALLATION..... | 19 |
| 6.b.1 Simple Setup :..... | 19 |
| 6.b.2 Complete Setup : | 19 |
| 6.C SOFTWARE (MTS) DESCRIPTION | 20 |
| 6.D ENTER IN TEST MODE:..... | 21 |
| 6.E POWER ADJUSTMENTS | 22 |
| 6.F RECEIVE ADJUSTMENTS | 23 |
| 7. BASIC ADJUSTMENT | 26 |

| | | |
|-----------|-------------------------------|-----------|
| 7.A | POWER ADJUSTMENT. | 26 |
| 7.B | RSSI CONTROL. | 29 |
| 8. | SOFTWARE VERSION | 29 |

1. FUNCTIONAL DESCRIPTION

1.a Block Diagram



1.b Description of Block Diagram

1.b.1 IC 300 One-C (vWS22100).

IC300 includes in one chipset Base Band part, DSP, CPU, A/D, D/A converters, TDMA frame counters, a TX GMSK modulator, a TX power ramping circuit, RX filters. **IC300** carries out the management of the battery charging and of the audio part. It interfaces with the radio frequency part.

1.b.2 IC100 IPD (Rohm BH6070KUT).

IC100 provides the different powers supplies to RFBB board : 2.8VRTC, PSTCXO, 2.8VANA, 2.8VAUD, 2.8VD, 2.8VP, 5VSIM. It activates all L.E.D.s (red,green,LCD & keyboard) and the vibrator inside the battery. The management of the battery charging is carried out by internal circuit of **IC100**.

1.b.3 IC600 RF-IC (Hitachi HD155121FEB).

Transceiver IC for E-GSM and DCS Dual Band cellular systems.

1.b.4 IC601 PLLs & VCOs

IC601 includes in one chipset 2 PLL, RF VCO and IF VCO.

1.b.5 Memory system.

IC200 : Flash ROM (1 M x 16 Bits) stores the CPU program code

IC201 : RAM (128 k x 16 Bits) stores data for the CPU work.

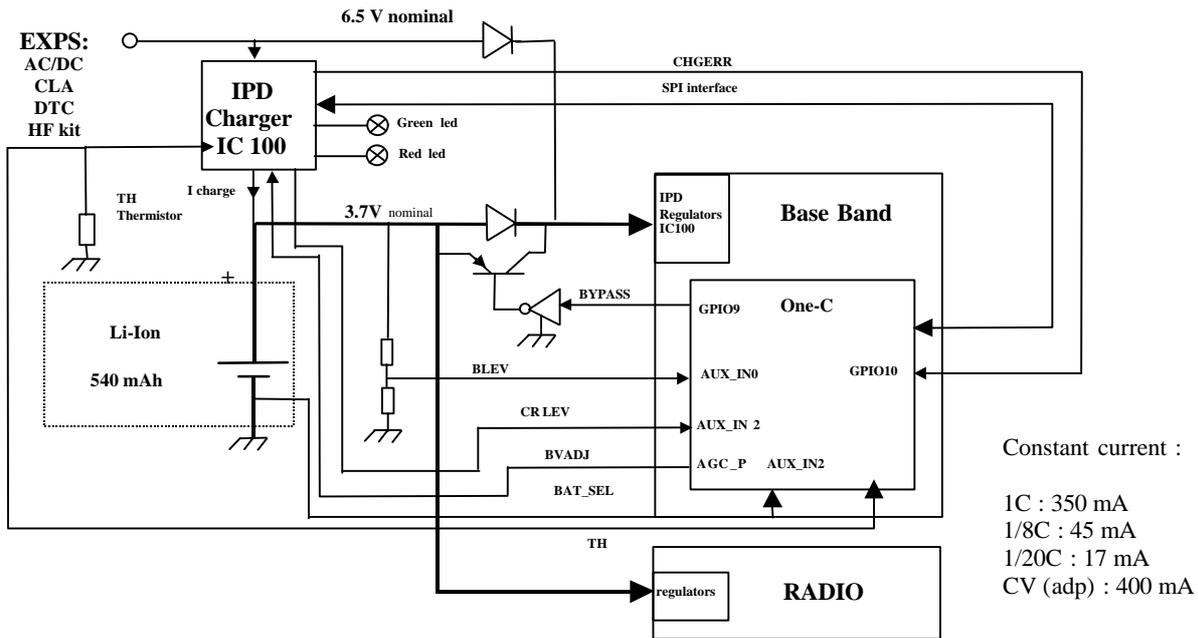
IC206 : Serial FLASH (2 M x 8 Bits) stores the user's datas and hardware adjustment datas.

1.b.6 System Clock.

The system clock for the telephone is 13 MHz TCXO, generated by X600. It is processed in IC300 to provide serial clock for LCD, serial FLASH and IC100. The clock is buffered in IC300 One-C, and then fed to IC100 IPD as "CPU CLK". It is available on pin 56 of IC100. During Stand-By mode, the system clock is not managed from X600 TCXO but from X300 ("slow clock" at 32.768 kHz).

2. Battery management

2.a Block Diagram



2.b Description.

The battery is Li-Ion 540 mAh, 3.7 V nominal for Cosmo

External power supply for charging (EXPS) comes from the I/O connector at the bottom side of the mobile (AC/DC, CLA, DTC or H/F Kit). This power supply is 6.5 V nominal. Battery presence and battery type information are accessible in CHGM IPD register (IC100).

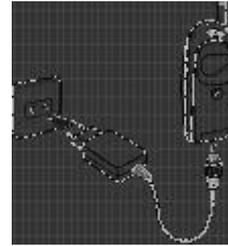
The battery temperature information (TH) implanted on PCB are given by threshold in IPD CHGM register (IC100). These information is used only for charge control.

The battery level information are accessible in an A/D converter in One-C. It is also available in CHGM IPD register (IC100), these information are given by range only for range control.

By checking CHG IPD register (IC100), we know if EXPS is present. As described in the drawing above, the power supply for Base Band (IC300) comes from EXPS. When EXPS is present because EXPS level (6.5 V/ 400 mA) is always greater than battery voltage. Power supply for the radio always comes from the battery.

The serial diode between battery and One-C (IC300) can be bypassed by software to reduce voltage headroom. Bypass is Activated when battery is less than 3.45 V.

2.c Charging process.



Charging process follows these successive phases :

Pre charge:

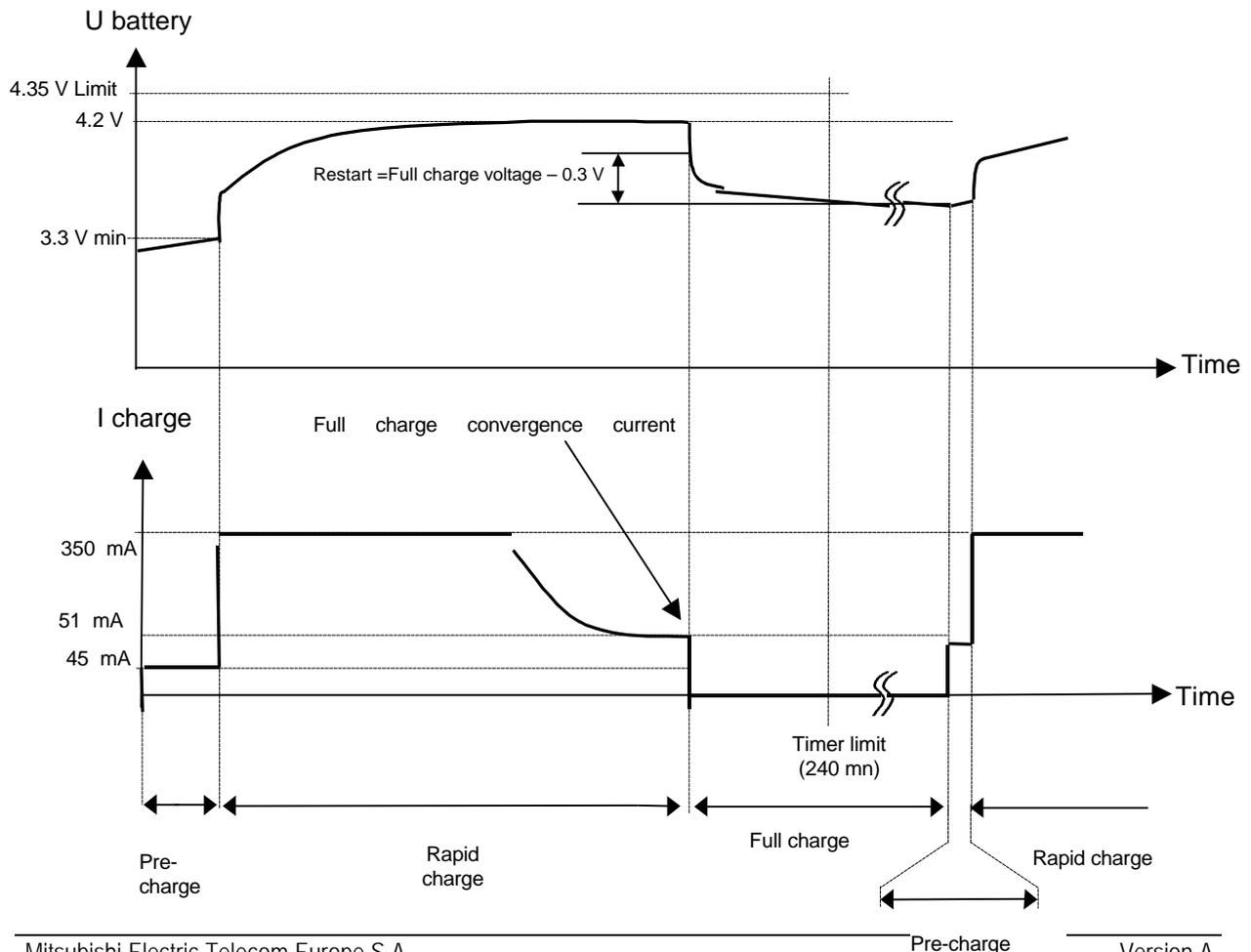
This phase is mandatory before the rapid charge to verify that battery operation is normal (normal battery voltage and temperature). Charge current during this phase is 45 mA (1/8 C). If the battery voltage is less than 3.3 V the S/W starts. IPD charger in rapid charge but only if the ambient temperature is not between 0°C and 55°C.

Rapid charge:

Charge current during this phase is 350 mA. If battery temperature becomes abnormal IPD charger change to a low current charge 17 mA (1/20 C), while temperature comes back normal (between 0°C and +55°C) during 15mn. Full charge detection ends Rapid charge. Full charge is detected by S/W when charge current falls below than 50mA (full charge convergence current)

Full charge

This phase shows that the battery is fully charged by LED Green or LCD Full charge is automatically stopped after 24 hours duration.



2.d Main characteristics.

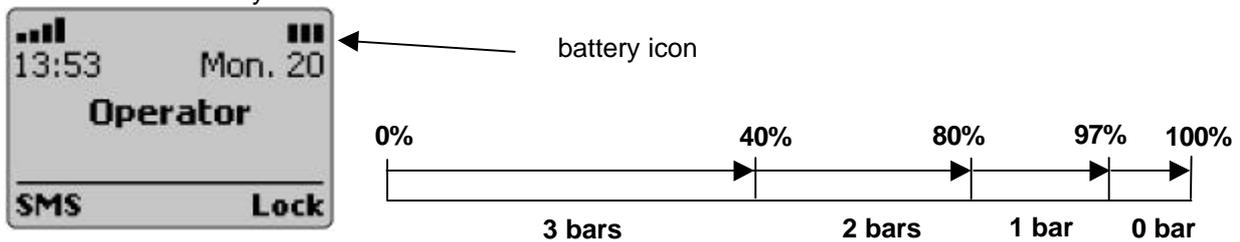
The phone transmits only if the battery is attached to it, in any configuration of power supply. When the phone is connected to H/F adapter, DTC, AC/DC, or CLA, the battery charging circuit operates. Battery voltage (+3.7 V) is applied via TR103 or from TESTPS (J103 pin3) through D124 when using Hand Free. The main power supply is fed to the phone either from the attached battery via :

- The connector J101, or from accessories :
- H/F adapter,
- Desk Top Charger DTC,
- AC/DC adapter and CLA via the external connector J103.

R120 and R121 give an internal voltage reference $Blev = (R121/R121+R120) \cdot (Vbat-Vce)$. If the battery voltage VBAT falls, then BYPASS short out the TR103 to reduce voltage drop.

2.e Autonomy Control.

The battery energy is displayed on the LCD by 3 bars . Voltage thresholds for each bar are calculated to have the autonomy time shared out:

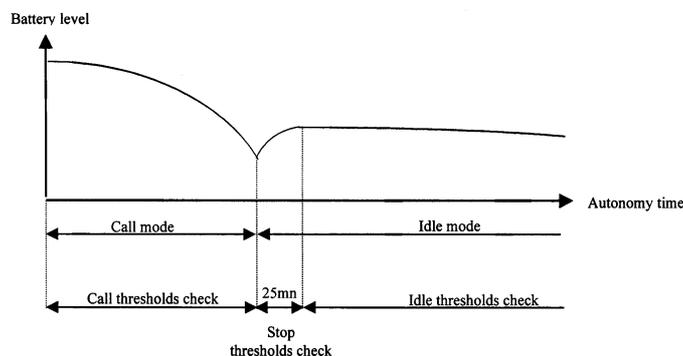


Sharing this time by 3 equals wide -is not possible because of the very stable battery voltage level between 20 % to 50 % autonomy time. In addition with these bars, a "low battery alarm" is displayed when blinks 3 bars empty.

All these thresholds are programmed in Serial FLASH by the factory and given in following thresholds table.

| | Idle Mode | Call Mode |
|--------------------|---------------|---------------|
| Initial thresholds | Battery level | Battery level |
| 3 bars → 2 bars | 3.85 V | 3.75 V |
| 2 bars → 1 bars | 3.70 V | 3.60 V |
| 1 bar → 0 bar | 3.45 V | 3.30 V |
| Power off | 3.35 V | 3.20 V |

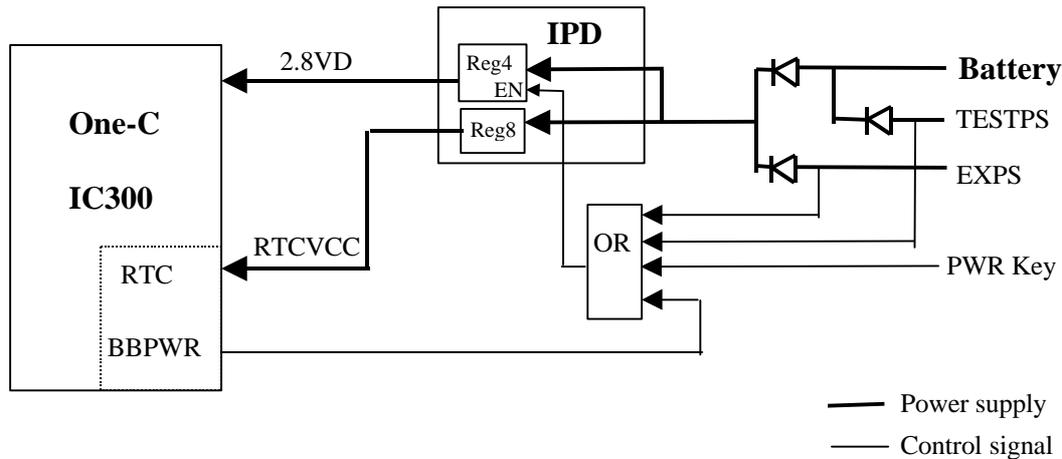
Thresholds are different according to the mode, Idle mode or Call mode. Idle mode threshold are checked by software 25 min after the end of the call.



When battery voltage is less than 3.35 V (BAT_EMPTY level saved in serial flash is true). The mobile is then powered off by BBPWR fall edge

2.f Power on.

The mobile can be powered on within 4 different events:



2.f.1 POWER-Key is pressed (see a):

One-C power supply (2.8VD) is switched on.
SW checks if POWER-key (Row[0],Col[2]) is still pressed about 500 ms later.
Then SW activates BBPWR output to maintain One-C power supply, POWER-Key can be then released.
SW starts the appropriate boot.(power on)

2.f.2 TESTPS is connected (see b):

One-C power supply (2.8VD) is switched on.
SW activates BBPWR output to maintain One-C power supply even if TESTPS is removed.
SW starts the appropriate boot. ("Mitsubishi M4 test mode" displayed)

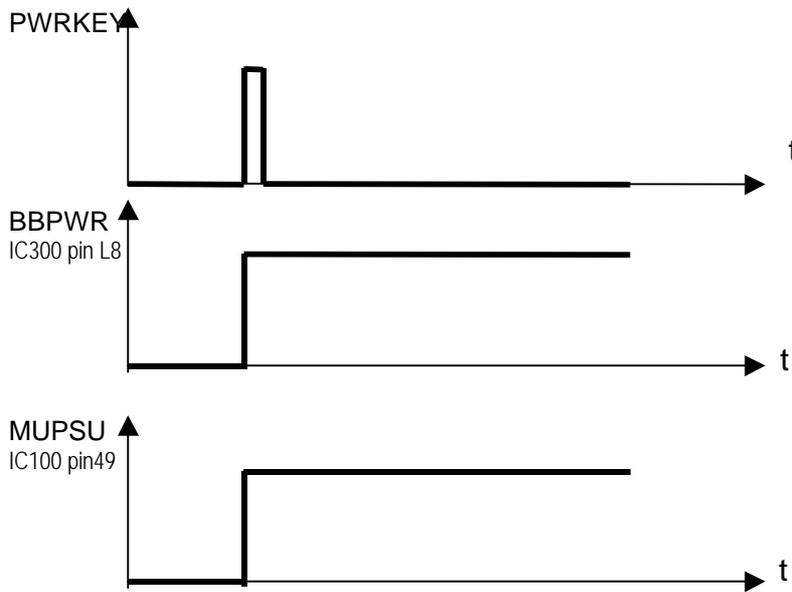
2.f.3 An EXPS accessory is connected (see c):

One-C power supply (2.8VD) is switched on.
SW activates BBPWR output to maintain One-C power supply even if EXPS is removed.
SW starts the appropriate boot ("charging" displayed)

2.f.4 RTC alarm interrupt:

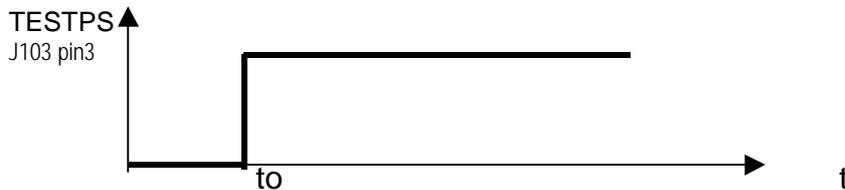
BBPWR output is activated by RTC module.
One-C power supply (2.8VD) is switched on.
SW starts the appropriate boot. ("low battery" displayed)

a) With battery



During these mode TESTPS and EXPS equal low voltage level.
 A high voltage level on MUPSU implies regulators REG 4, REG 6, REG 7, REG 8 are active.

b) With Interface and I/O connector (Testmode) :

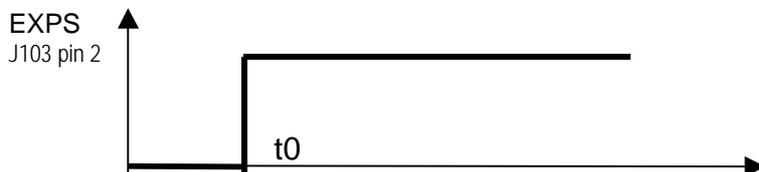


t0= connexion I/O cable

When you connect I/O connector, MUPSU and BBPWR signals have the same waveform at TESTPS.

During this condition PWRKEY and EXPS equal low voltage level.

c) With AC/DC Charger, Cigar Light Adapter and DeskTop Charger.

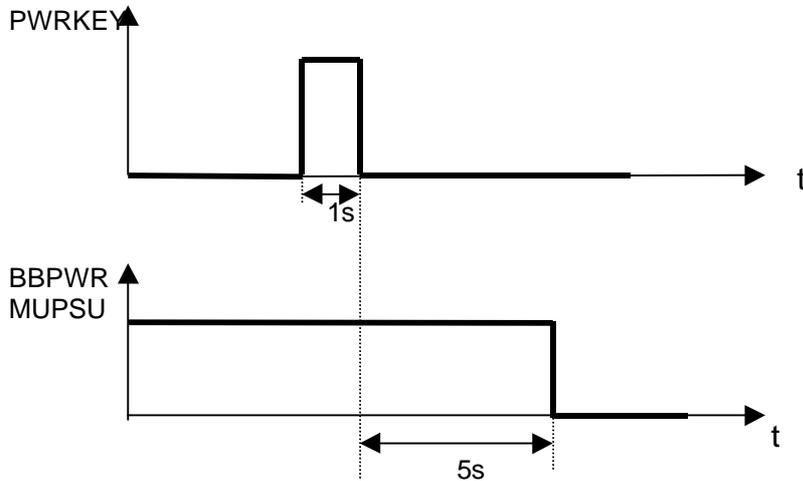


t0= connection by external power.

When you connect an accessory, MUPSU and BBPWR signals have the same waveform that TESTPS.

During this condition PWRKEY and TESTPS equal low voltage level

2.g Power off.

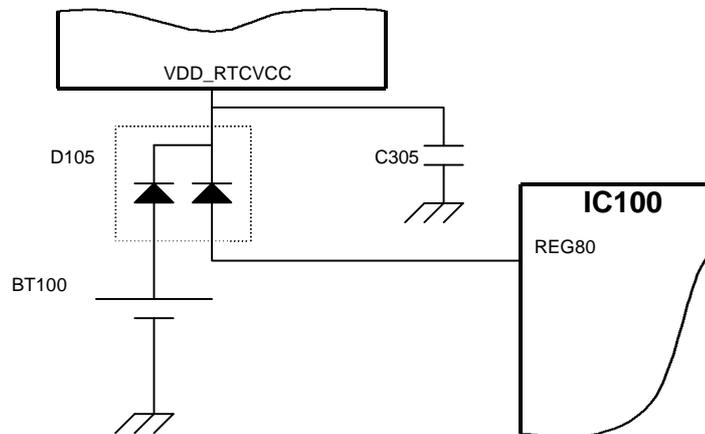


SW checks if POWER-key (Row[0],Col[2]) is pressed during 1second
 Then after 5 s, SW disactivates BBPWR output to switch One-C power supply off, then POWER-Key can be released.

2.h Real Time Clock

Real time clock is in ONE C (IC300) and energy is provided:
 By IC100 (pin 48) via D105, when the main battery is connected.
 By BT100 (back up battery) via D105, when the main battery is empty or not connected

IC300



3. RF Section.

3.a Frequency range.

3.a.1 E-GSM Frequency :

124 Channels. $1 \leq N \leq 124$ and 50 Channels. $975 \leq N \leq 1023$ and 0
 Receive frequency : 925.2~959.8 MHz
 RX frequency = $935.0 + 0.2 * N$ for ($1 \leq N \leq 124$) and $935.0 + 0.2 * (N - 1024)$ for ($975 \leq N \leq 1024$)
 Transmit frequency : 880.2~914.8 MHz
 TX frequency = $890.0 + 0.2 * N$ for ($1 \leq N \leq 124$) and $890.0 + 0.2 * N$ for ($975 \leq N \leq 1024$)

E-GSM BAND



RF-PLL E-GSM BAND

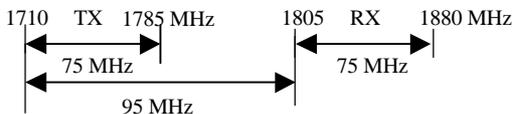


RX 1st IF is 225 MHz
 RX 2nd IF is 45 MHz

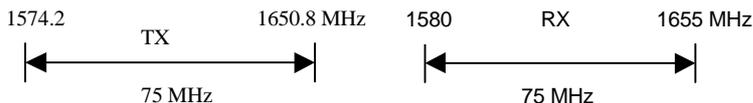
3.a.2 DCS Frequency :

374 Channels. $512 \leq N \leq 885$
 Receive frequency : 1805.2~1879.2 MHz
 RX frequency = $1805.2 + 0.2 * (N - 512)$.
 Transmit frequency 1710.2~1784.8 MHz
 TX frequency = $1710.2 + 0.2 * (N - 512)$.

DCS BAND



RF-PLL DCS BAND

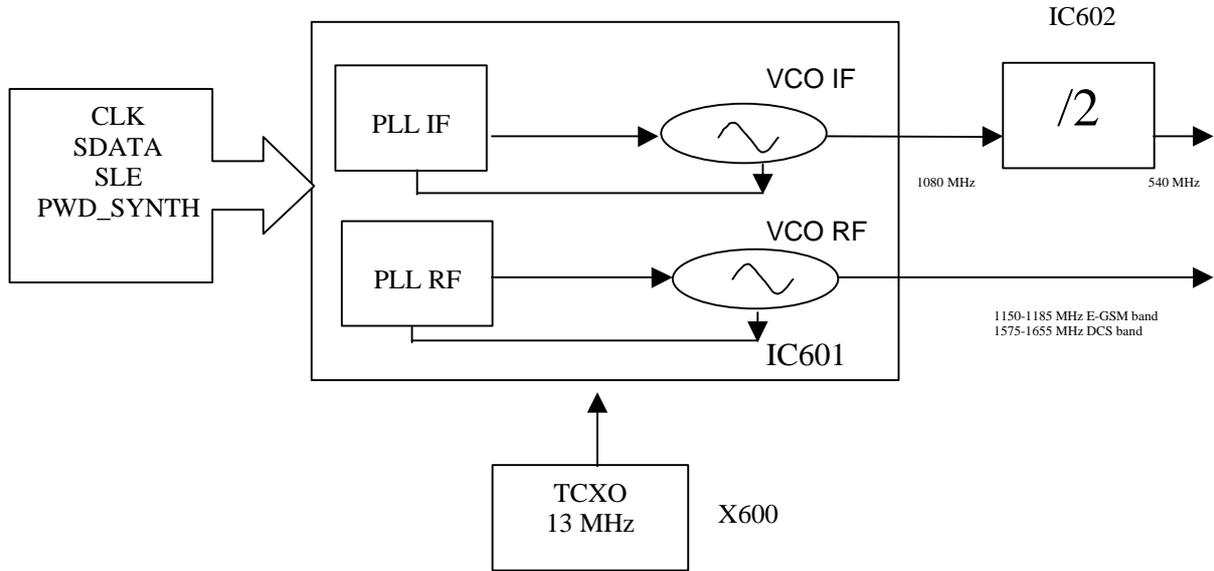


RX 1st IF is 225 MHz
 RX 2nd IF is 45 MHz

Examples with the usual channels and frequencies:

| | | RX freq | TX Freq | RF Freq RX | RF Freq TX | IF Freq RX | IF Freq TX |
|------------|------|---------|---------|------------|------------|------------|------------|
| | Unit | MHz | MHz | MHz | MHz | MHz | MHz |
| GSM | | | | | | | |
| | 1 | 935.2 | 890.2 | 1160.2 | 1162.2 | 540 | 544 |
| | 62 | 947.4 | 902.4 | 1172.4 | 1170.4 | 540 | 536 |
| | 124 | 959.8 | 914.8 | 1184.8 | 1182.8 | 540 | 536 |
| | 975 | 925.2 | 1085 | 1150.2 | 1152.2 | 540 | 544 |
| | 1000 | 930.2 | 1090 | 1155.2 | 1157.2 | 540 | 544 |
| | 1023 | 934.8 | 1094.6 | 1159.8 | 1161.8 | 540 | 544 |
| | 37 | 942.4 | 897.4 | 1167.4 | 1169.4 | 540 | 544 |
| DCS | | | | | | | |
| | 512 | 1805.2 | 1710.2 | 1580.2 | 1574.2 | 540 | 544 |
| | 698 | 1842.4 | 1747.4 | 1617.4 | 1611.4 | 540 | 544 |
| | 885 | 1879.8 | 1784.8 | 1654.8 | 1650.8 | 540 | 536 |

3.b Synthesiser Circuit Description



Switching between GSM and DCS band is performed by programming the SI4133G (IC601) with the serial data in BBE from CPU.

The serial data lines are connected directly to the serial input pin of the PLL & VCO IC (IC 601), and are used to program the 2 PLLs & 2 VCOs of the IC.

The SI4133G has two PLLs : one is variable frequency (RF PLL), and the other is fixed frequency (IF PLL).

RF-PLL : variable frequency PLL for RX and TX for both GSM and DCS bands.
 Oscillation Frequency Ranges
 For E-GSM Band / 1150 – 1185 MHz
 For DCS TX / 1575 – 1650 MHz
 For DCS RX / 1580 – 1655 MHz

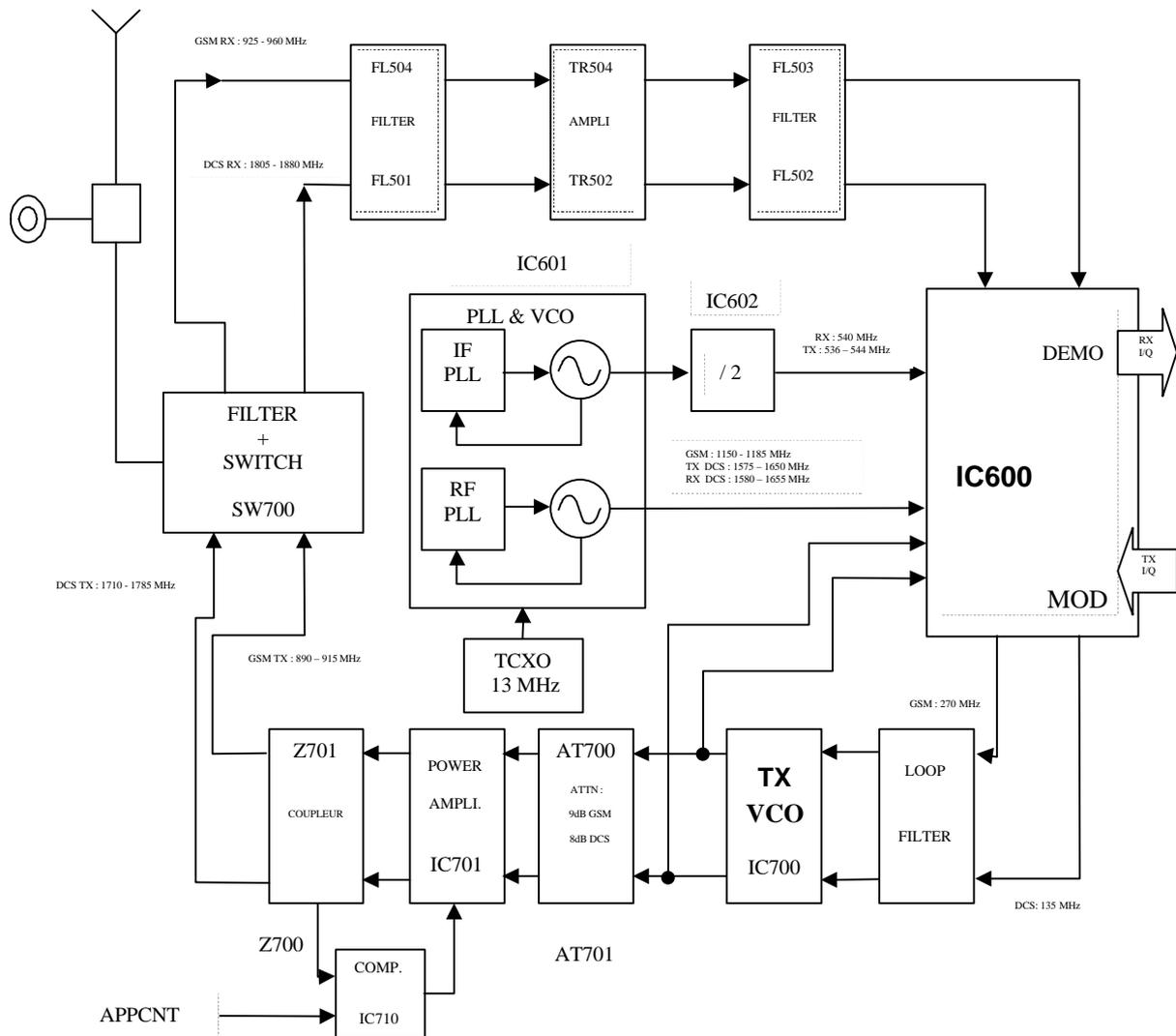
IF-PLL : Fixed frequency 1080 MHz (C Version) for IF of RX and 1072 or 1088 MHz for IF of TX for both E-GSM and DCS bands.

The signal BANDSW controls the E-GSM/DCS Band switching.

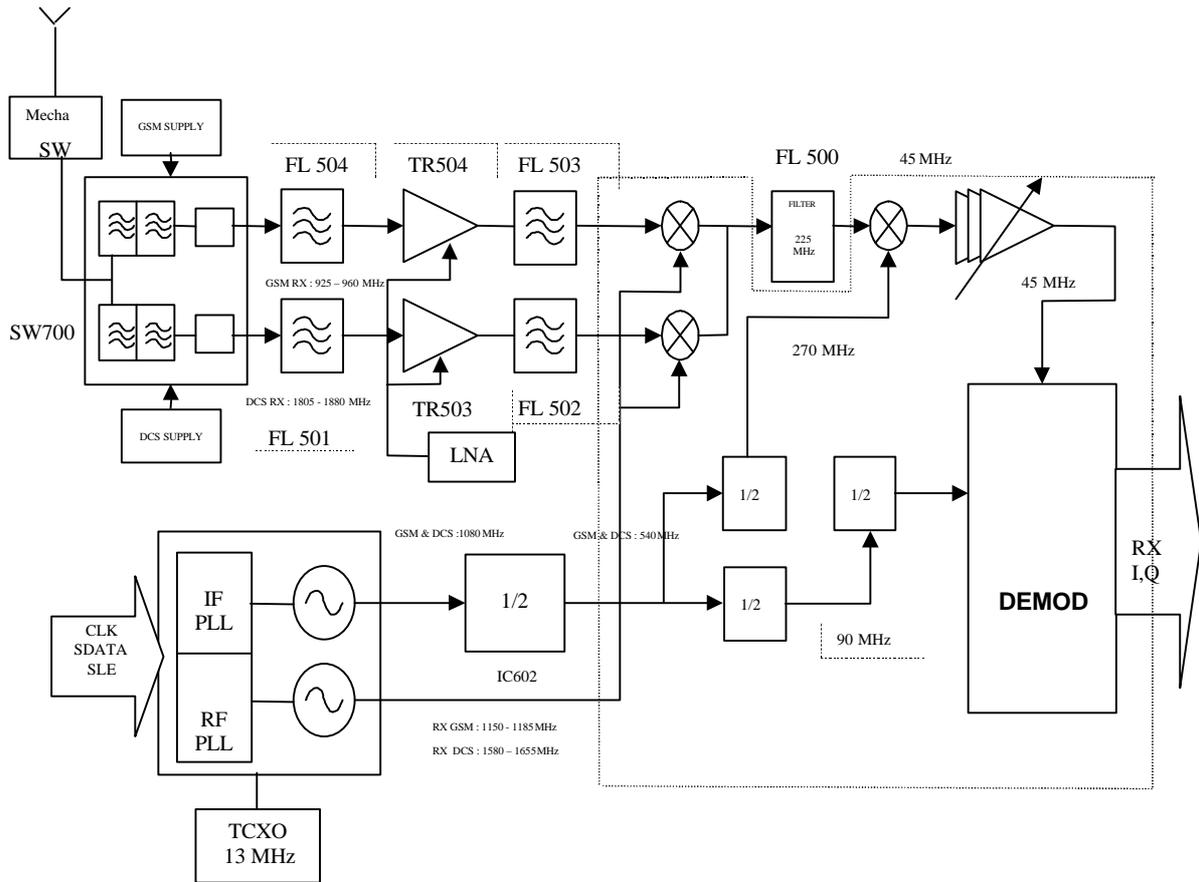
| BANDSW | RF BAND |
|--------|---------|
| 0 | E-GSM |
| 1 | DCS |

In order to achieve the channel spacing, the reference frequency is set to 200 kHz.

3.c RF Block Diagram.



3.c.1 Reception Block Diagram.



Description of Reception Block Diagram.

E-GSM band (925-960 MHz).

Incoming RF signal from aerial is filtered and switched to the RX GSM path through SW700 . The signal is filtered by FL504 , before being amplified by TR504 , and is further filtered by FL503. Then, the signal input sent to RF-IC (IC600) in a first mixer stage. The RF signal (925-960 MHz) is mixed with the RF-PLL Frequency (1150-1185 MHz) coming from IC601 (PLLs & VCOs). For the channel 1, the output signal of the mixer is 225 MHz (1150 - 925 = 225 MHz), and is filtered by FL500.

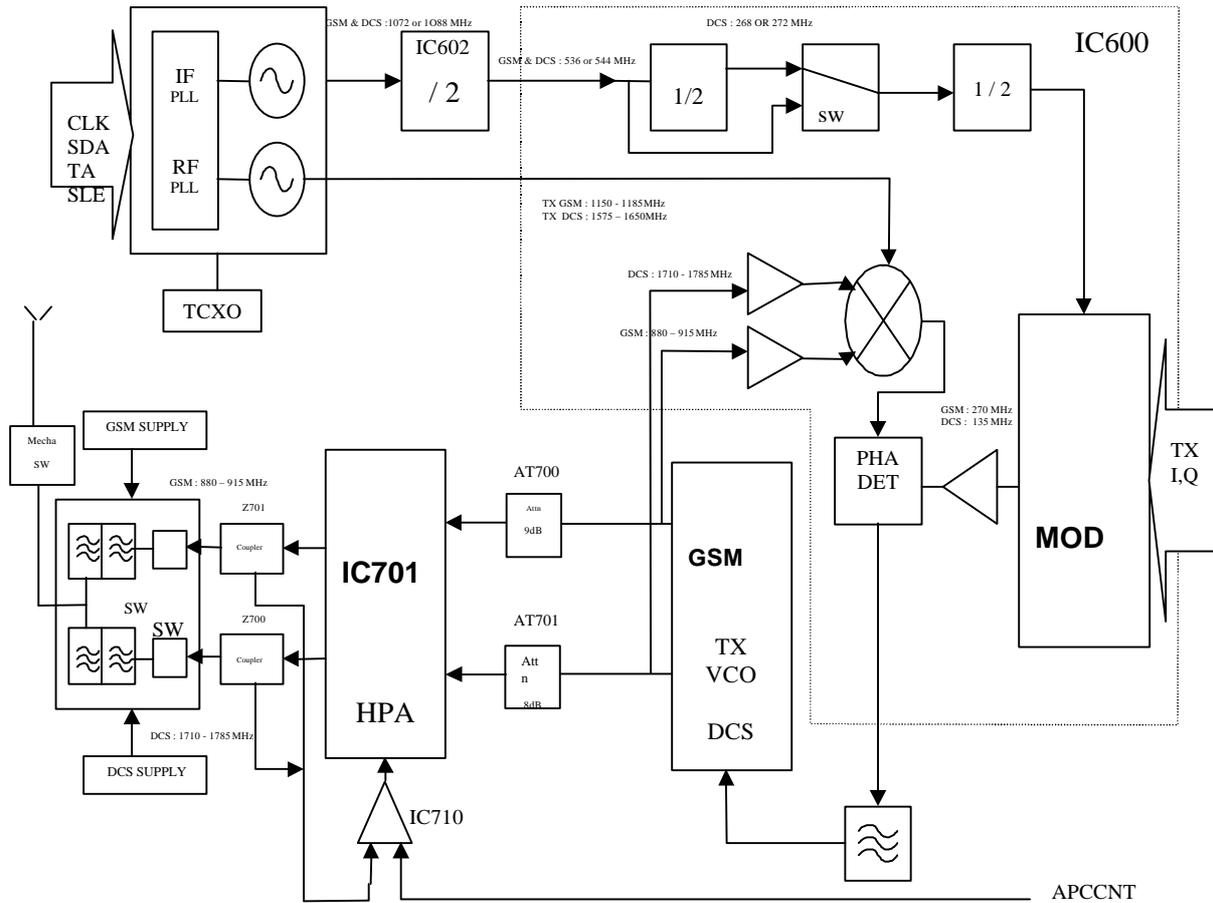
DCS band (1805-1880 MHz).

Incoming RF signal from aerial is filtered and is switched to the RX DCS path through SW700 . The signal is filtered by FL501 , before being amplified by TR503 , and is further filtered by FL502. Then, the signal input to RF-IC (IC600) in a first mixer stage. The RF signal (1805-1880 MHz) is mixed with the RF-PLL Frequency (1580-1655 MHz) coming from IC601 (PLLs & VCOs) via IC602 (RF-VCO). For the channel 1, the output signal of the mixer is 225 MHz (1805 Mhz-1575 MHz = 225 MHz), and is filtered by FL500.

For the E-GSM and DCS bands.

The first intermediate frequency is 225 MHz. Then, this frequency is filtered by FL 500 before input to the second mixer stage. The first IF (225 MHz) is mixed with the 270 MHz (Fixed Frequency PLL 540 /2 = 270 MHz), to a second IF 45 MHz. The second IF is demodulated to Base Band (IC300) I/Q phase demodulated signals. RF-IC (IC600) provides automatic gain control. IC600 includes a quadrature demodulator. The second IF signal (45 MHz) is demodulated to I, Q balanced signals for One-C.

3.c.2 Transmission Block Diagram.



Description of Transmission Block Diagram

The direct and phase shifted signals are then fed to I and Q modulators inside the IC600. I and Q data components are fed into the IC600. The output from the two modulators is summed and fed out of pin 11. The GMSK signal leaves the modulator of IC 600, and is amplified also inside IC600.

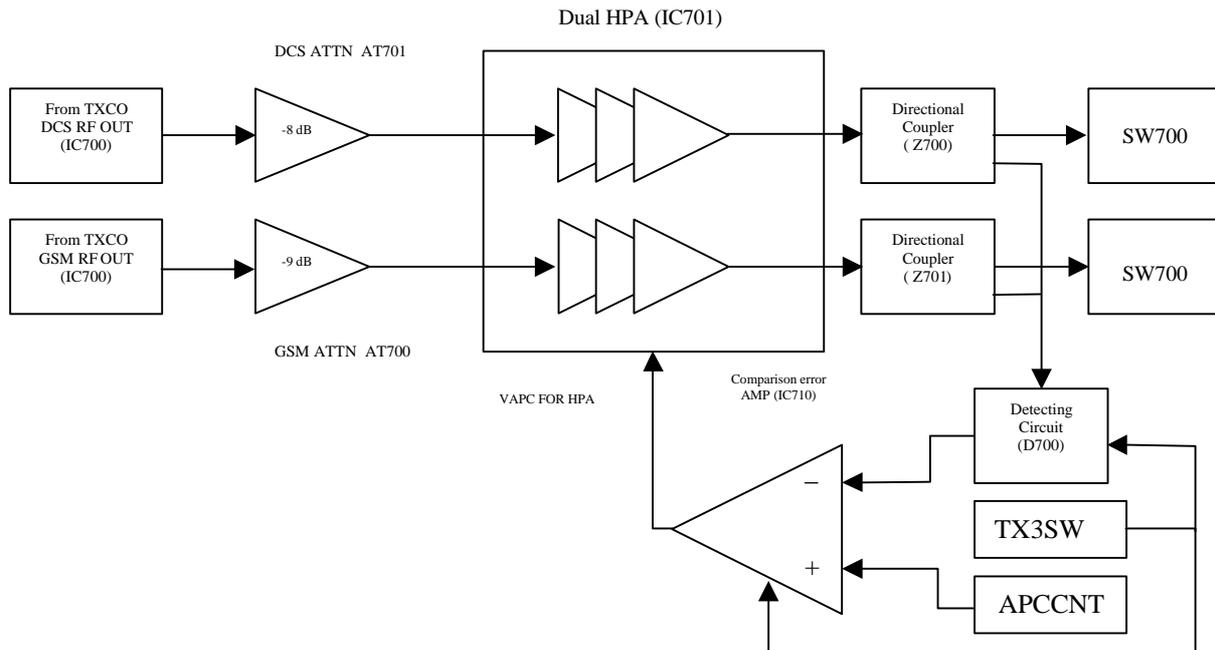
E-GSM Band (880-915 MHz).

A phase locked loop is created around the TXVCO IC700. The output is fed into IC600 and converted to 270 MHz (135 MHz on DCS) by mixing with RFVCO at 1150-1185 MHz . This 270 MHz signal is compared with the 270 MHz signal from the modulators, and the error signal is used to control the TXVCO. Note that the error signal on TP700 will have a DC component to control frequency, and an AC component at approx 270 kHz to control phase changes. Then the signal is filtered, amplified by TR702, and further filtered before input to the power amplifier (IC702).From the PA, the output goes through coupler Z701, is switched to the TX path and is filtered by SW700. The signal then goes up to the antenna.

DCS Band (1710-1785 MHz).

A phase locked loop is created around the TXVCO IC700. The output is fed into IC600 and converted to 135 MHz (270 MHz on GSM) by mixing with RFVCO at 1575-1650 MHz. This 135 MHz signal is compared with the 135 MHz signal from the modulators, and the error signal is used to control the TXVCO. Note that the error signal on TP700 will have a DC component to control frequency, and an AC component at approx 270 kHz to control phase changes. Then the signal is filtered, amplified by TR712, and further filtered before input to the power amplifier (IC702). From the PA, the output goes through coupler Z700, is switched to the TX path and is filtered by SW700. The signal then goes up to the antenna.

3.c.3 Output power control.



APCCNT: is the reference waveform voltage for a TX burst (provided by IC300).

TX3SW: This control signal is used to switch on/off the operational amplifier of the APC Loop (IC710).

H Level: Detecting Circuit and comparison Error AMP is active.

L Level: Detecting Circuit and comparison Error AMP is not active.

RF signal is rectified by voltage doubler Schottky barrier diodes D700. This level is compared with APCCNT. The result of the comparison is used to vary the gain of the HPA IC701.

The APCCNT signal input from the base band circuit (IC300) contains the burst shaping information and the power level to be set among the 15 power levels defined by the GSM, or the 16 power levels defined by the DCS specifications. It controls the output power level by a feed-back loop (Automatic Power Control)

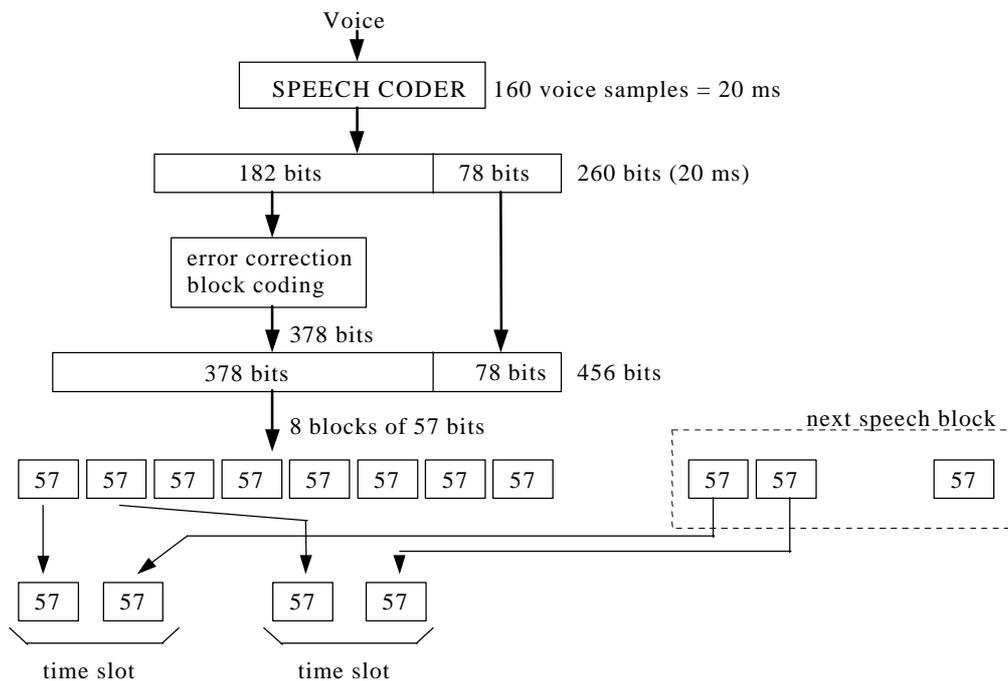
| E-GSM | DCS |
|-------------------|------------------|
| PCL 05 → + 33 dBm | PCL 00 → + 30dBm |
| PCL 19 → + 5 dBm | PCL15 → + 0 dBm |

4. Speech coder.

4.a Features

Audio is sampled at 8 kHz rate, and divided into 20 ms blocks of 160 samples per block. Each 20 ms block is characterised by 260 bits i.e. 13 kbits/sec. The resulting signal is processed by a regular pulse excitation - long term predictor (RPE - LTP) codec. This yields a digital representation of vocal chord vibrations, together with the filter characteristics which must be applied to them to make voice sounds.

The most significant block of 182 bits will go through error correction and become 378 bits. The less critical group of 78 bits will not go through error correction and will just be summed with the 378 bits which will yield 456 bits.



These 456 bits are then separated in 8 blocks of 57 data bits.

These blocks are interleaved with adjacent blocks to guard against burst errors and broken up into blocks of 114 bits for transmission. This block of 114 bits are the data bits of the timeslot.

Timing data is added, and the resulting bit stream is fed to the Gaussian Minimum Shift Keying (GMSK) modulator, where the bits are taken two at a time and used to smoothly change the phase of an RF carrier according to bit combination.

4.b Full rate / Half rate / Enhanced full rate.

The data rate of 13 kbits/s (**full rate**) is considerably lower than for direct speech digitising as in PCM. Now more advanced voice coders cut this to 5.6 kbits/s (**half rate coding**).

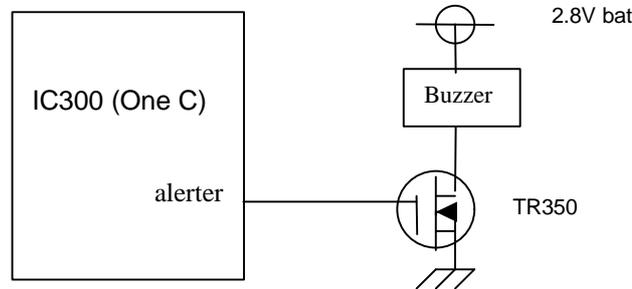
The **enhanced full rate**, is just a full rate with a different speech coder which improves the transmission quality.

5. Analogue Audio.

The audio part is managed by the One-C circuit (IC300).

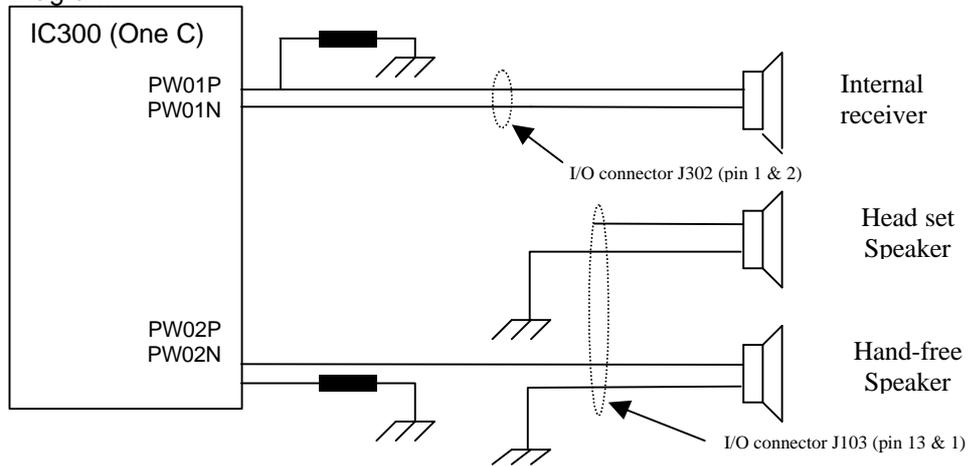
5.a Buzzer.

Diagram



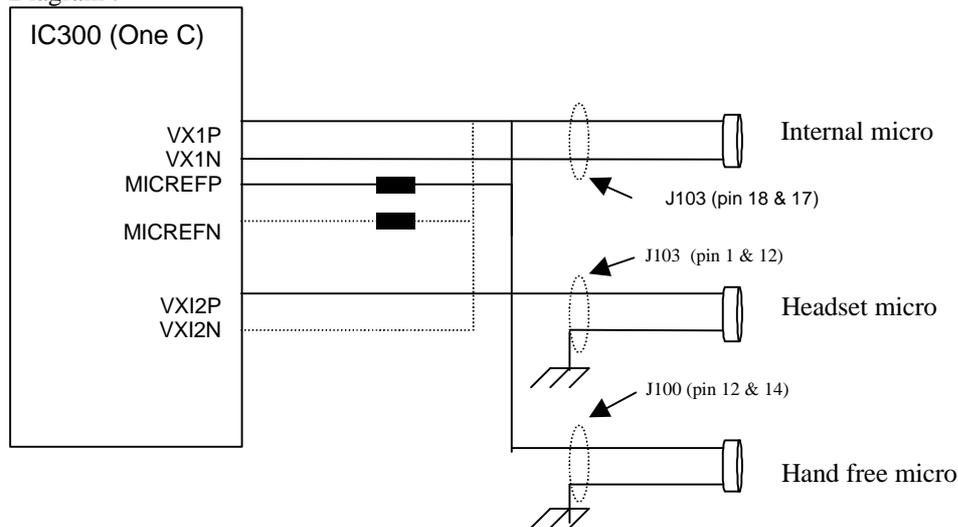
5.b Speaker (RX audio).

Diagram :



5.c Micro (TX audio).

Diagram :



6. Testmode Software

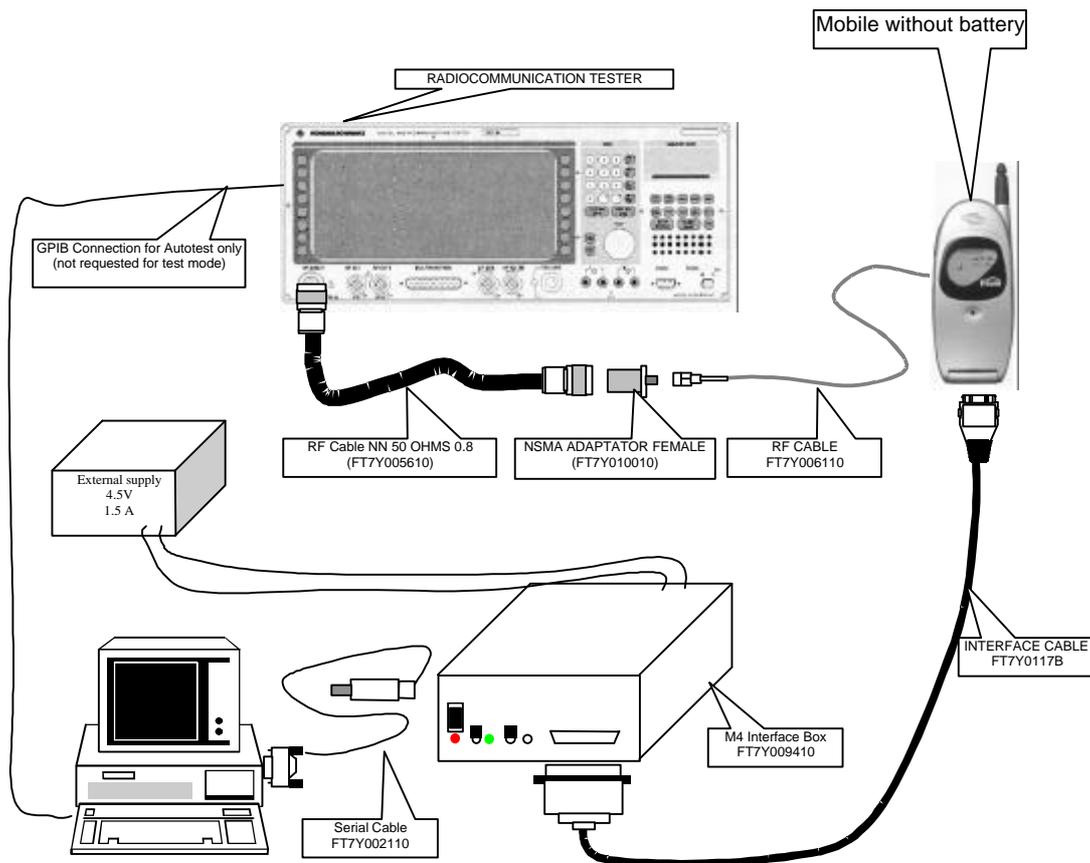
For M4 family, test mode is not directly possible from the mobile, indeed relevant software is available on PC only.

Basic test mode functions (delete data user, print labels, download of settings) are available in MStools (7.00 and more) software (see level 2 service manual), download of mobile software is available with IPLTrium software (see level 2 service manual).

More advanced testmode functions to test the mobile are available in MTS software. This software can be used only with a runtime engine TEST STAND.

When making measurement on the board itself, it is possible to power the board from the M4 interface box

6.a Equipment installation



The test mode is used to control or adjust mobile parameters.

You must have the following requirements :

- Radio-communication tester
- Cosmo RF cable
- Cosmo Interface cable
- M4 Interface Box
- Serial Cable
- Computer under Windows 95 or 98 (PII 350 MHz 64 Mb recommended)
- Resolution min: 800*600 Pixels

If you want to use autotest function which is included in MTS, then your Radio-communication tester must be a Rohde & Schwarz CMD55 (with firmware 3.6 and GPIB interface) and your computer must have GPIB interface. The result of autotest (measurement values) is displayed as HTML file.

6.b Software (MTS) installation

This part describes how to install the different components of MTS depending of the functions of MTS you want to use.

6.b.1 Simple Setup :

If you want to have only the test mode functions (control and adjust RF parameters), follow this procedure:

Launch Setup.exe on MTS CD ROM root.

Select the **Custom** Setup Type in Setup Type selection window and click on

Next >

Select the component as follow :

- MTS Application
- Test Stand Engine
- GPIB Software
- NI-VISA Software
- Internet Explorer

Then continue the 3 setup programs before, reboot.

MTS after sale service is now available in  Start >  Program >  MTS After Sale Service

6.b.2 Complete Setup :

If you want to have all the functions of MTS (control and adjust the RF parameters, execute and parameter the autotests), follow this procedure :

Launch Setup.exe on MTS CD ROM root.

Select the **Typical** Setup Type in Setup Type selection window and click on

Next >

Then continue the setup program until Reboot information window and reboot.

MTS after sale service is now available in  Start >  Program >  MTS After Sale Service

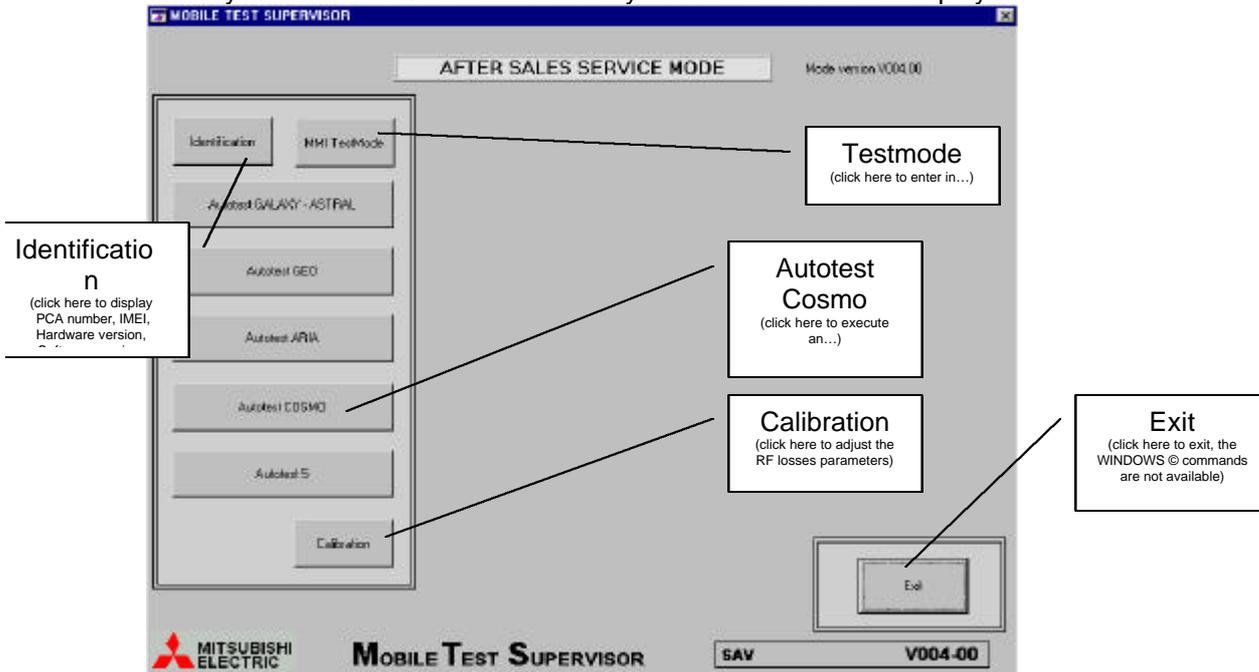


Before you launch an autotest, you must invalidate the step : **4301 DIO initialisation**

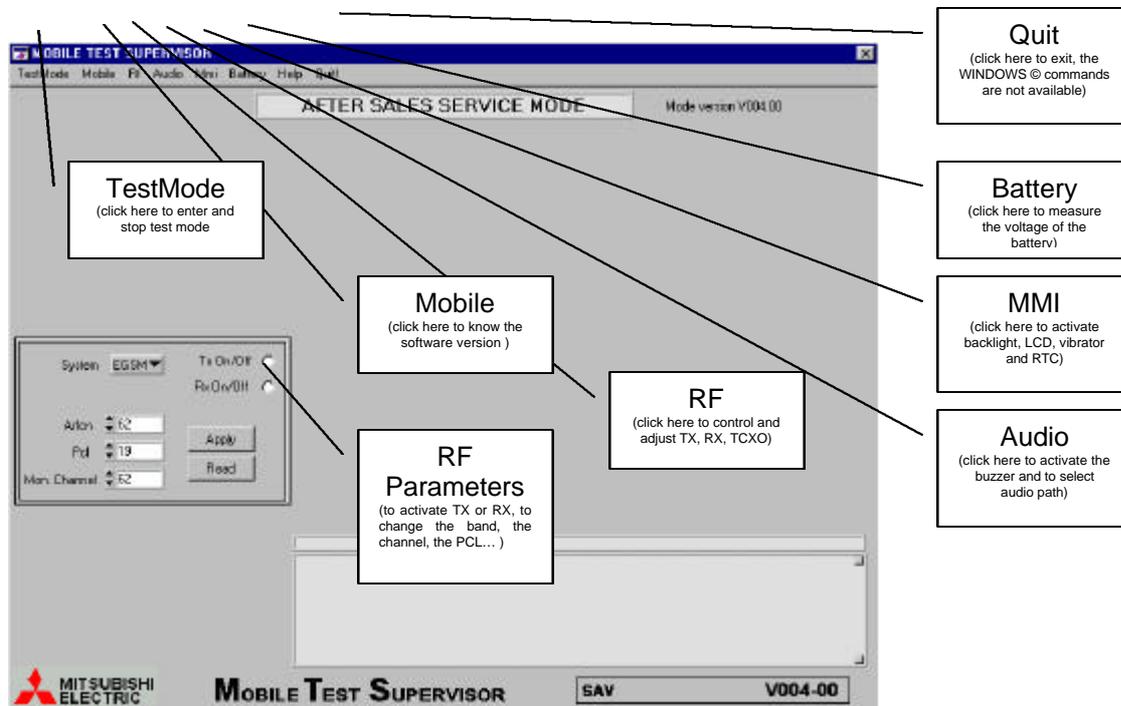
For that you have to turn the **Execution mode** switch on **run selected step** in the autotest page.

6.c Software (MTS) description

When you launch MTS from start menu you the main screen is displayed :



MMI Testmode interface : description of functions

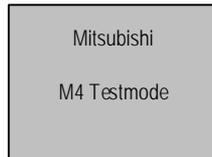


6.d Enter in test mode:

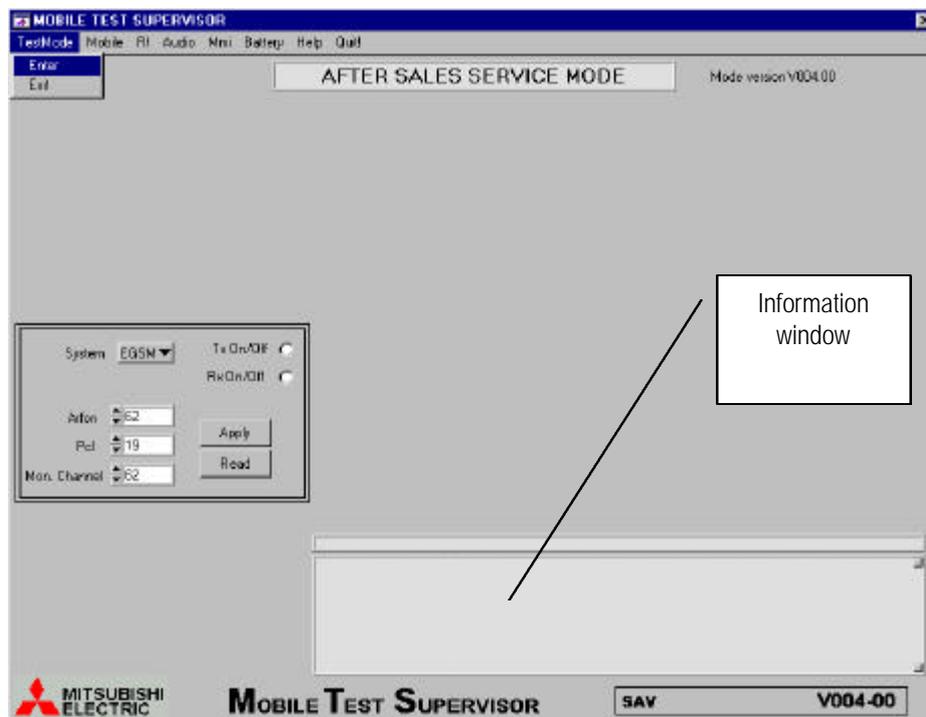
The mobile can be turned in test mode from two different ways :
Using test mode code (hold the * and enter 5472) and PC cable (FZA0056A)
or

Using the M4 interface box (FT7Y009410) and Cosmo interface cable (FT7Y0117B)
With the "Alimentation mobile" switch up & "boot RI" switch down.

When the mobile displays:



You can enter in Testmode, for that, choose **Testmode> Enter** menu as follow.

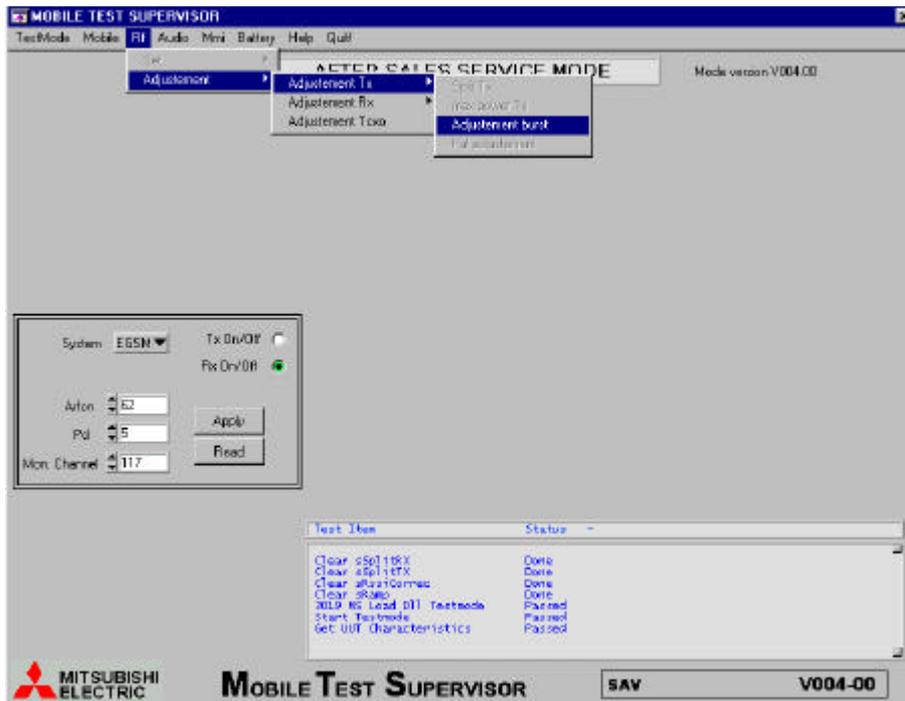


When the communication is established between mobile and computer the information window displays

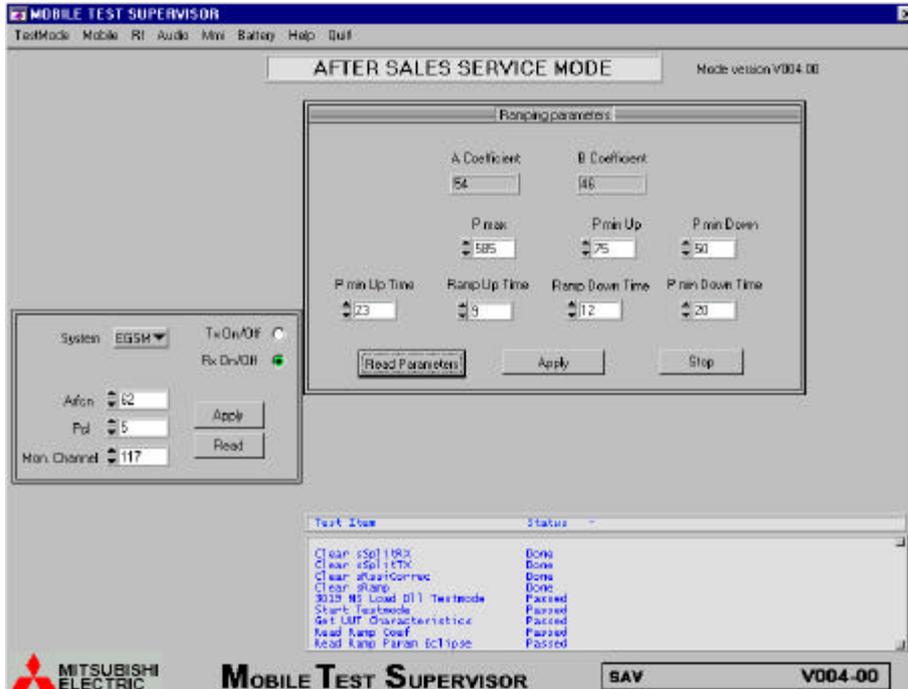


6.e Power adjustments

To enter in Power adjustments, choose **RF** menu, **Adjustment**, **Adjustment TX**, **Adjustment burst** as follow :



Then, the Ramping parameters Window is displayed as follow :



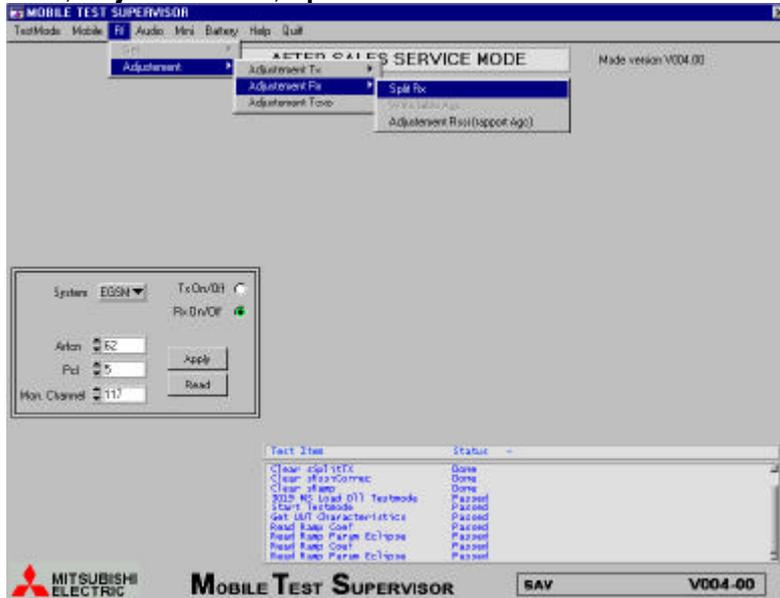
6.f Receive adjustments

To adjust RSSI (if RX level is not good, for example), you have to process to different steps :

RX SPLIT and RSSI ADJUSTMENT

For RX Split we choose :

RF menu, Adjustment, Adjustment RX, Split RX as follow :

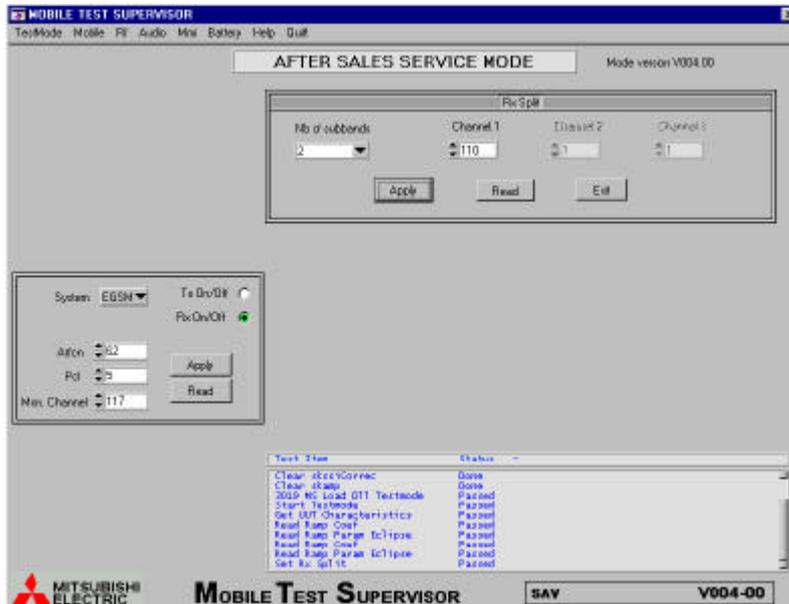


Then we fix RX split at the right value :

For the E-GSM band the number of sub-bands is 2

L range: 975 to 110
 H range: 110 to 124

Adjustments on Channels 55 and 117, the RX split window should be as follow :



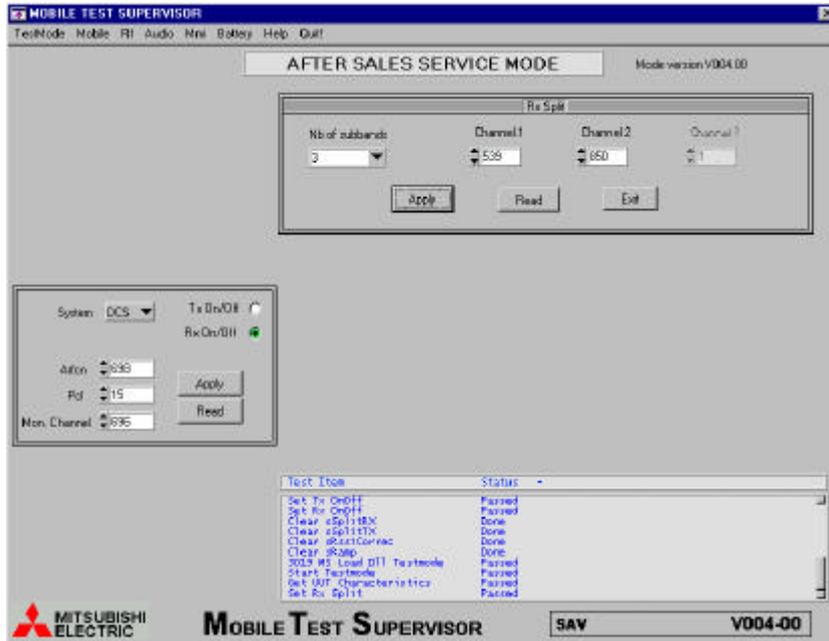
DCS band is split in 3 sub-bands is

We split the DCS band as follow :

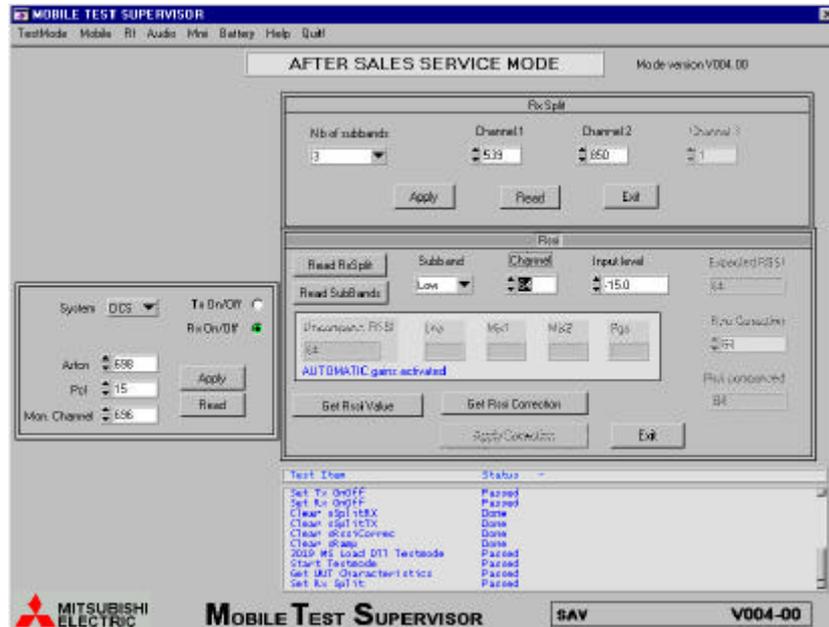
| | |
|-----------|------------|
| L range : | 512 to 539 |
| M range : | 539 to 850 |
| H range : | 850 to 885 |

Adjustments on Channels 525, 698 and 870

The RX split window should be as follow :

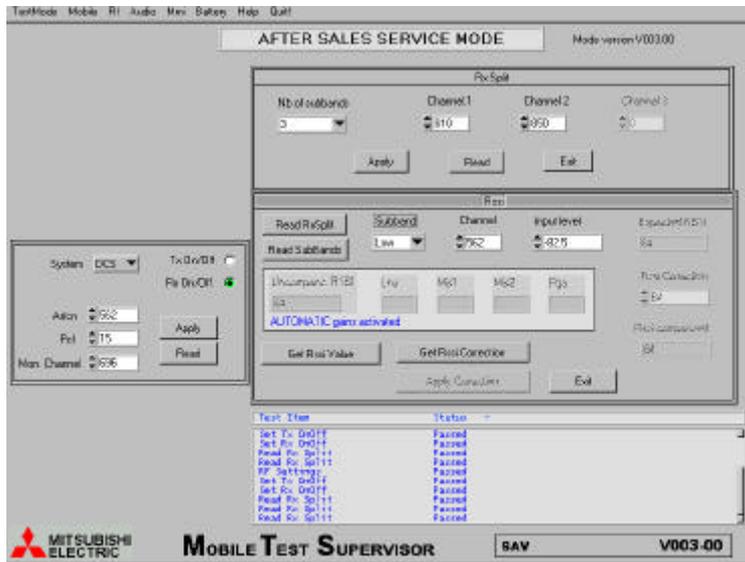


Now we can adjust RSSI for each sub band



For RSSI ADJUSTMENT, we choose :
RF menu, Adjustment, Adjustment RX, Adjustment RSSI (rapport AGC).

Then we get the RSSI window :



To adjust RSSI, we input a GMSK modulated signal (67.7 kHz shifted) at level and channel as follow:

| Step | Channel | Level |
|------|---------|-------|
| 1 | 55 | -82.5 |
| 2 | 55 | -31.5 |
| 3 | 117 | -82.5 |
| 4 | 117 | -31.5 |
| 5 | 525 | -82.5 |
| 6 | 525 | -31.5 |
| 7 | 698 | -82.5 |
| 8 | 698 | -31.5 |
| 9 | 870 | -82.5 |
| 10 | 870 | -31.5 |

If the RX level measurement is not good in E-GSM we adjust only the E-GSM band (step 1 and 2)
If the RX level measurement is not good in DCS we adjust only the DCS band (step 3 to 8).

7. Basic Adjustment.

7.a Power Adjustment.

For the COSMO, Mitsubishi uses only IC701. Each mobile is adjusted in the factory and the TX parameters (Power Control Level values and ramping values) are stored in the Serial Flash (IC 206)

About the adjustment value of TX Power, see the following table.

| E-GSM | | | DCS | | |
|--------------|----------------------|-----------|---------------|----------------------|-----------|
| Ch-62 PCL | Power Level (dBm) | tolerance | Ch-698 PCL | Power Level (dBm) | tolerance |
| 5 | 32.5 | +/-2dB | 0 | 30 | +/-2dB |
| 6 | 31 | +/-3dB | 1 | 28 | +/-3dB |
| 7 | 29 | +/-3dB | 2 | 26 | +/-3dB |
| 8 | 27 | +/-3dB | 3 | 24 | +/-3dB |
| 9 | 25 | +/-3dB | 4 | 22 | +/-3dB |
| 10 | 23 | +/-3dB | 5 | 20 | +/-3dB |
| 11 | 21 | +/-3dB | 6 | 18 | +/-3dB |
| 12 | 19 | +/-3dB | 7 | 16 | +/-3dB |
| 13 | 17 | +/-3dB | 8 | 14 | +/-3dB |
| 14 | 15 | +/-3dB | 9 | 12 | +/-4dB |
| 15 | 13 | +/-3dB | 10 | 10 | +/-4dB |
| 16 | 11 | +/-5dB | 11 | 8 | +/-4dB |
| 17 | 9 | +/-5dB | 12 | 6 | +/-4dB |
| 18 | 7 | +/-5dB | 13 | 4 | +/-4dB |
| 19 | 5 | +/-5dB | 14 | 2 | +/-5dB |
| | | | 15 | 0 | +/-5dB |

Example of adjustment :

E-GSM Table:

| TX ramp adjustment for EGSM band | | | | | | | |
|---|--------------|--------------------|---------|-----------------|-----------------|-----------------|-----------------|
| PCL_Threshold = PCL5 | | | | | | | |
| | Level DBm | Pmin up | Pmin Dn | Pmin time up | Ramp time up | Pmin dn time | Ramp time dn |
| PCL5 | 32.5 | (Pmax of PCL15)-36 | 50 | 23 | 9 | 20 | 12 |
| PCL6 | 31 | (Pmax of PCL15)-36 | 50 | 22 | 10 | 20 | 12 |
| PCL7 | 29 | (Pmax of PCL15)-37 | 50 | 22 | 10 | 20 | 12 |
| PCL8 | 27 | (Pmax of PCL15)-37 | 50 | 22 | 10 | 19 | 12 |
| PCL9 | 25 | (Pmax of PCL15)-39 | 50 | 22 | 10 | 19 | 12 |
| PCL10 | 23 | (Pmax of PCL15)-42 | 50 | 22 | 10 | 19 | 12 |
| PCL11 | 21 | (Pmax of PCL15)-44 | 50 | 22 | 10 | 19 | 12 |
| PCL12 | 19 | (Pmax of PCL15)-44 | 50 | 22 | 10 | 19 | 12 |
| PCL13 | 17 | (Pmax of PCL15)-45 | 50 | 23 | 8 | 19 | 12 |
| PCL14 | 15 | (Pmax of PCL15)-47 | 50 | 23 | 9 | 19 | 12 |
| PCL15 | 13 | (Pmax of PCL15)-49 | 50 | 22 | 10 | 19 | 12 |
| PCL16 | 11 | (Pmax of PCL15)-52 | 50 | 21 | 11 | 19 | 12 |
| PCL17 | 9 | (Pmax of PCL15)-56 | 50 | 17 | 13 | 19 | 12 |
| PCL18 | 7 | (Pmax of PCL15)-58 | 50 | 17 | 11 | 19 | 12 |
| PCL19 | 5 | (Pmax of PCL15)-58 | 50 | 15 | 12 | 19 | 12 |

DCS Table:

| TX ramp adjustment for DCS band | | | | | | | |
|--|--------------|--------------------|---------|-----------------|-----------------|-----------------|-----------------|
| | Level DBm | Pmin up | Pmin Dn | Pmin time up | Ramp time up | Pmin dn Time | Ramp time dn |
| PCL0 | 29.5 | (Pmax of PCL12)-24 | 50 | 23 | 9 | 20 | 11 |
| PCL1 | 28 | (Pmax of PCL12)-24 | 45 | 23 | 9 | 20 | 11 |
| PCL2 | 26 | (Pmax of PCL12)-24 | 45 | 23 | 9 | 20 | 11 |
| PCL3 | 24 | (Pmax of PCL12)-24 | 45 | 22 | 10 | 19 | 11 |
| PCL4 | 22 | (Pmax of PCL12)-26 | 45 | 22 | 10 | 19 | 12 |
| PCL5 | 20 | (Pmax of PCL12)-27 | 45 | 22 | 10 | 19 | 12 |
| PCL6 | 18 | (Pmax of PCL12)-28 | 45 | 22 | 10 | 19 | 12 |
| PCL7 | 16 | (Pmax of PCL12)-28 | 45 | 22 | 10 | 19 | 12 |
| PCL8 | 14 | (Pmax of PCL12)-29 | 45 | 24 | 8 | 19 | 12 |
| PCL9 | 12 | (Pmax of PCL12)-29 | 45 | 24 | 8 | 19 | 12 |
| PCL10 | 10 | (Pmax of PCL12)-31 | 45 | 23 | 9 | 19 | 12 |
| PCL11 | 8 | (Pmax of PCL12)-32 | 45 | 23 | 9 | 19 | 12 |
| PCL12 | 6 | (Pmax of PCL12)-33 | 45 | 22 | 9 | 19 | 12 |
| PCL13 | 4 | (Pmax of PCL12)-34 | 45 | 21 | 10 | 19 | 12 |
| PCL14 | 2.5 | (Pmax of PCL12)-36 | 45 | 18 | 11 | 19 | 12 |
| PCL15 | 1 | (Pmax of PCL12)-36 | 45 | 17 | 11 | 19 | 12 |

7.b RSSI control.

To control RSSI go back to page 22 of the manual.

Set your radiocommunication tester at a given reference and check RSSI:

| REF Gene | RSSI |
|-----------|----------|
| -83.5 dBm | 27 +/- 4 |
| -60.5 dBm | 50 +/- 4 |

8. Software Version .

The software version is coded with 8 digits, evolving in the following order : 0, 1, 2, ...,9, A, B, ...,Z, a, b, ...,z.

| | | | | | | | |
|---|---|---|---|---|----|----|----|
| F | H | S | V | E | Vf | Ef | Vc |
|---|---|---|---|---|----|----|----|

F : Family ex : 1 M3, 2 M4,

H : Hardware ex : 1 GALAXY, 5 GEO, 3 ARIA,E WAP,J COSMO....

S : Software ex :

V : Version ex :

E, Vf, Ef, Vc are Mitsubishi Code.

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