U3600BM Design Hints

1. Introduction

The U3600BM is a one-chip combo IC (transceiver and baseband part) for cordless telephone applications up to 50 MHz, but can also be used for other applications such as toys, wireless keyboards, mouse devices, games, handsets, etc.

This document aims to help designers in their design activities to optimize the design faster.

The Design Hints include internal block diagrams, programmable registers, register, bit, oscillator and noise descriptions, as well as the principle of the RSSI function.

A definition of the demo board which can be purchased for different countries, such as France, China and the U.S., is provided in this document, as well as hints for 27 MHz applications and how to adjust the VCO3.

CT0 ICs

U3600BM

Design Hints

Rev. 4804A–CT0–03/06

2. Block Diagrams, Influence of the Programmable Registers

Figure 2-1. U3600BM Registers and Their Influence (Register R0 to R3)

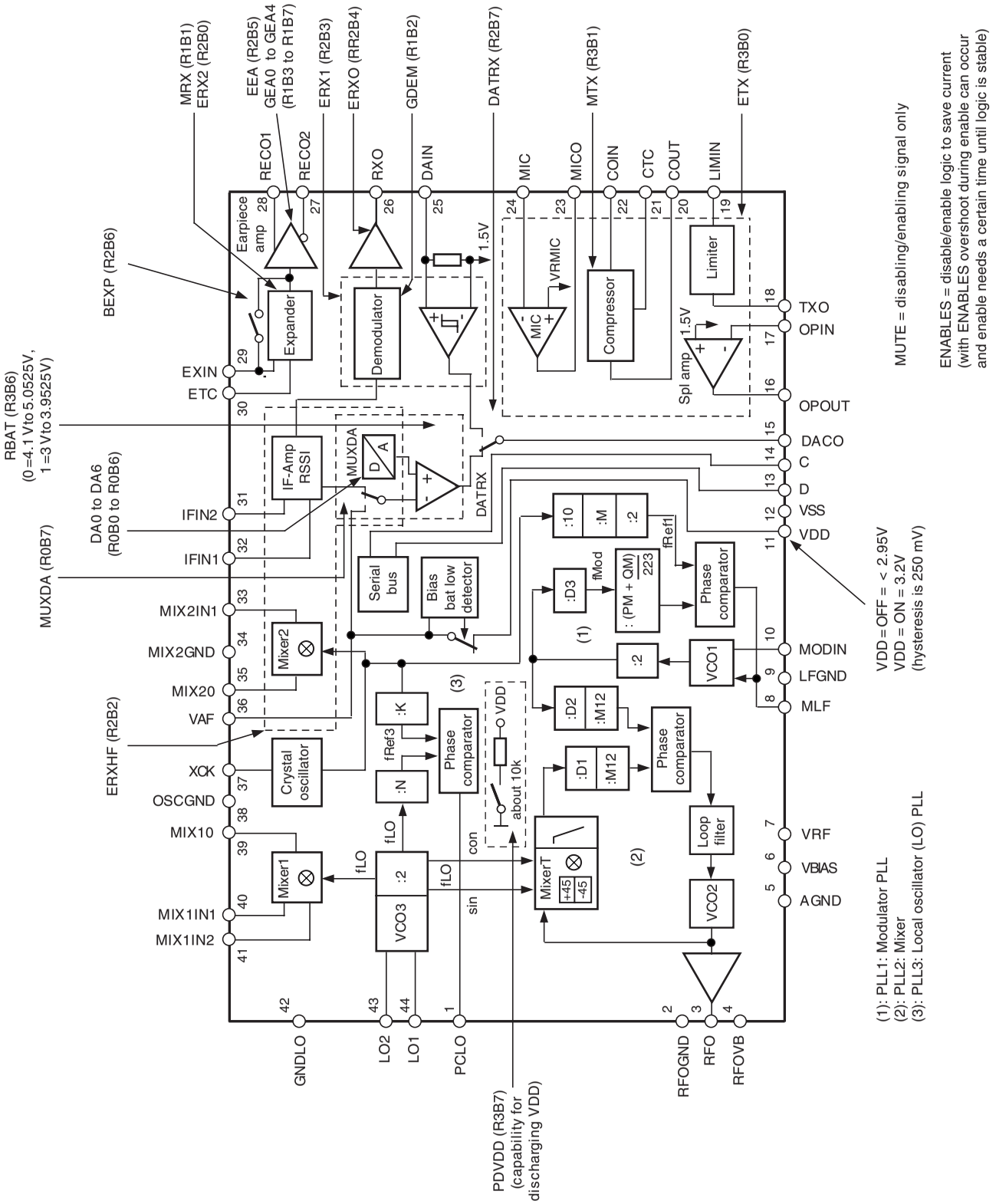


Figure 2-2. U3600BM Registers and Their Influence (Register R4 to R12)

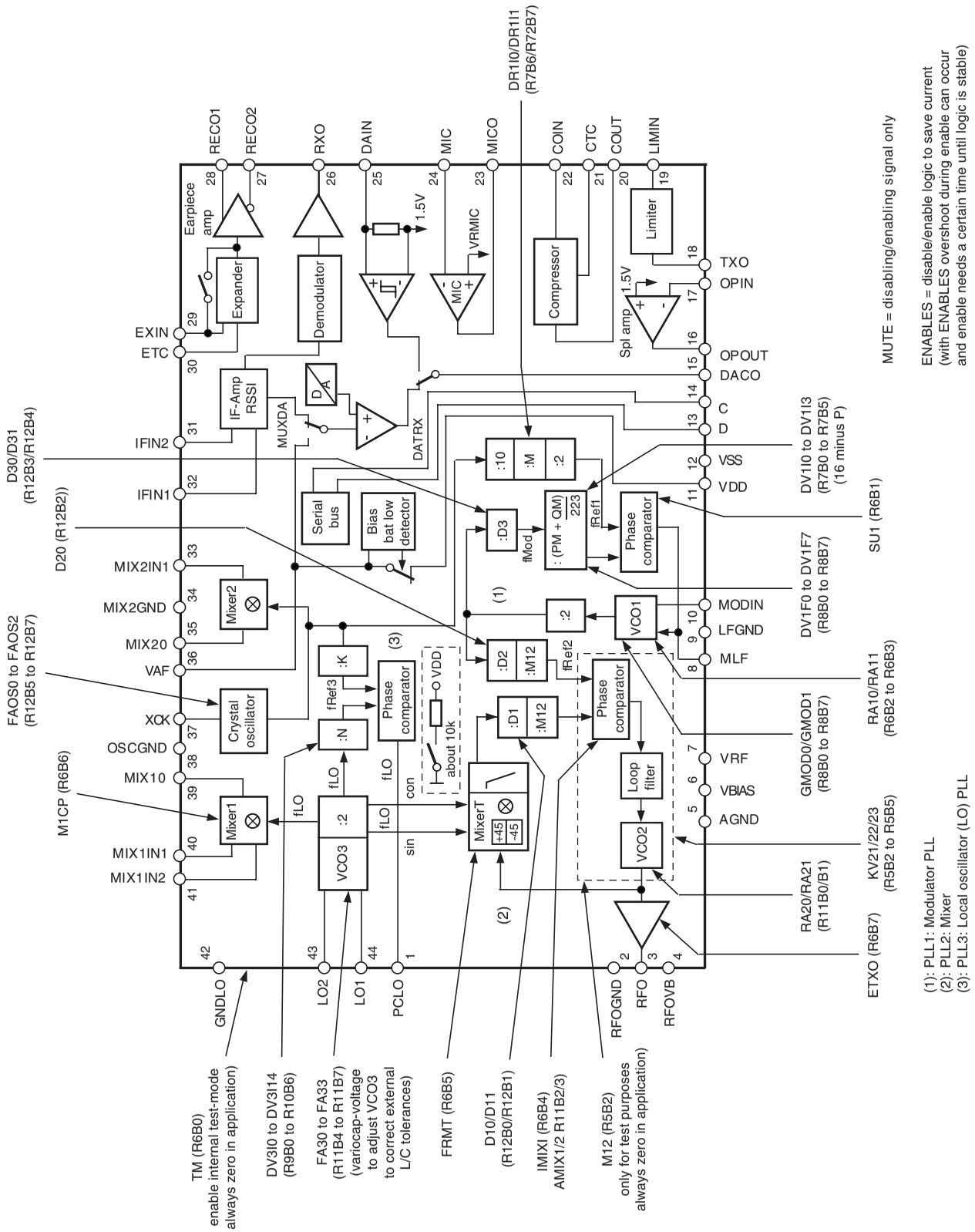


Figure 2-3. U3600BM Registers and Their Influence (Register R13 to R15)

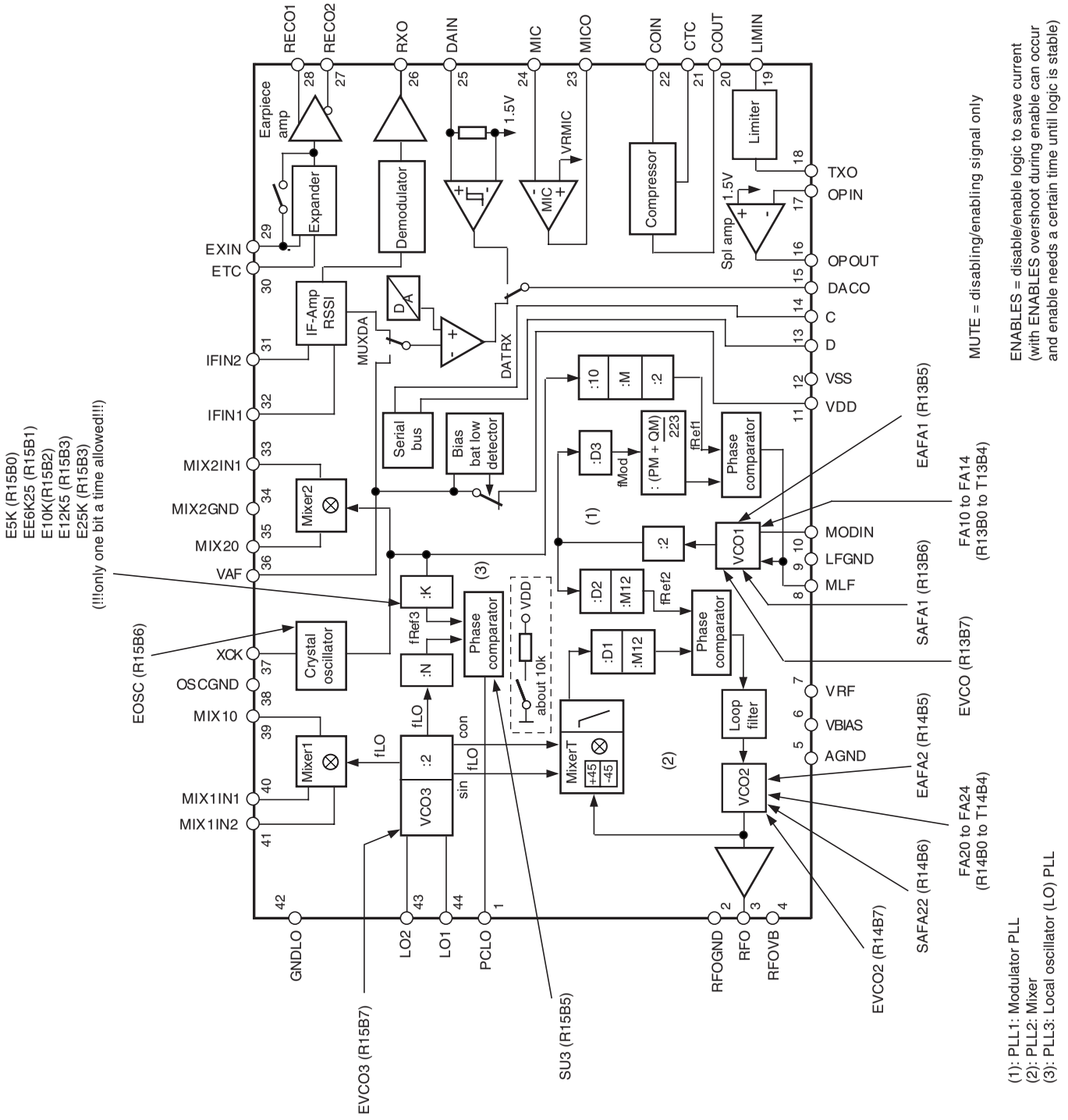


Figure 2-4. U3600BM Registers and Their Influence, ENABLES (Power Management)

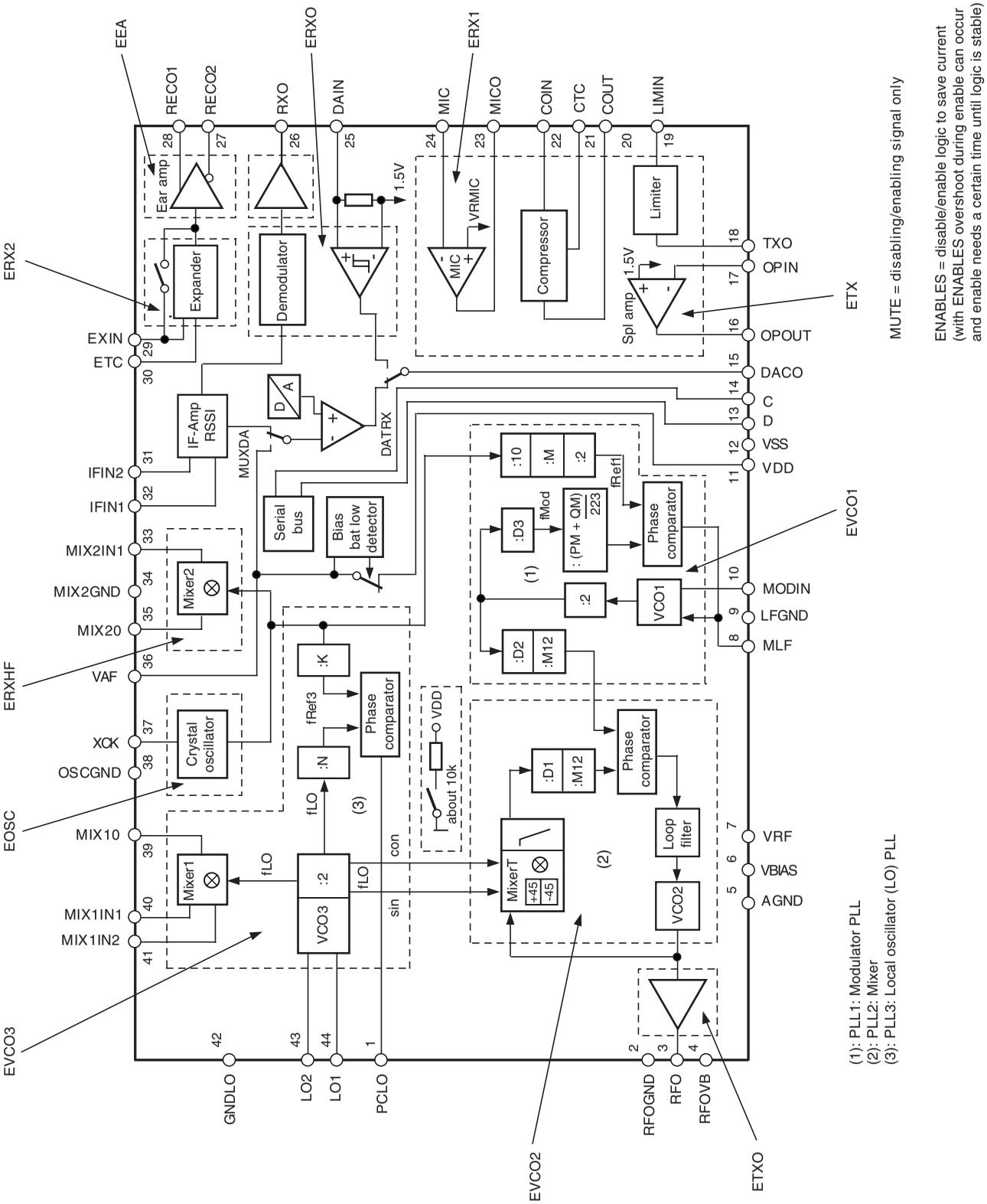


Figure 2-5. U3600BM Level and Bias Plan

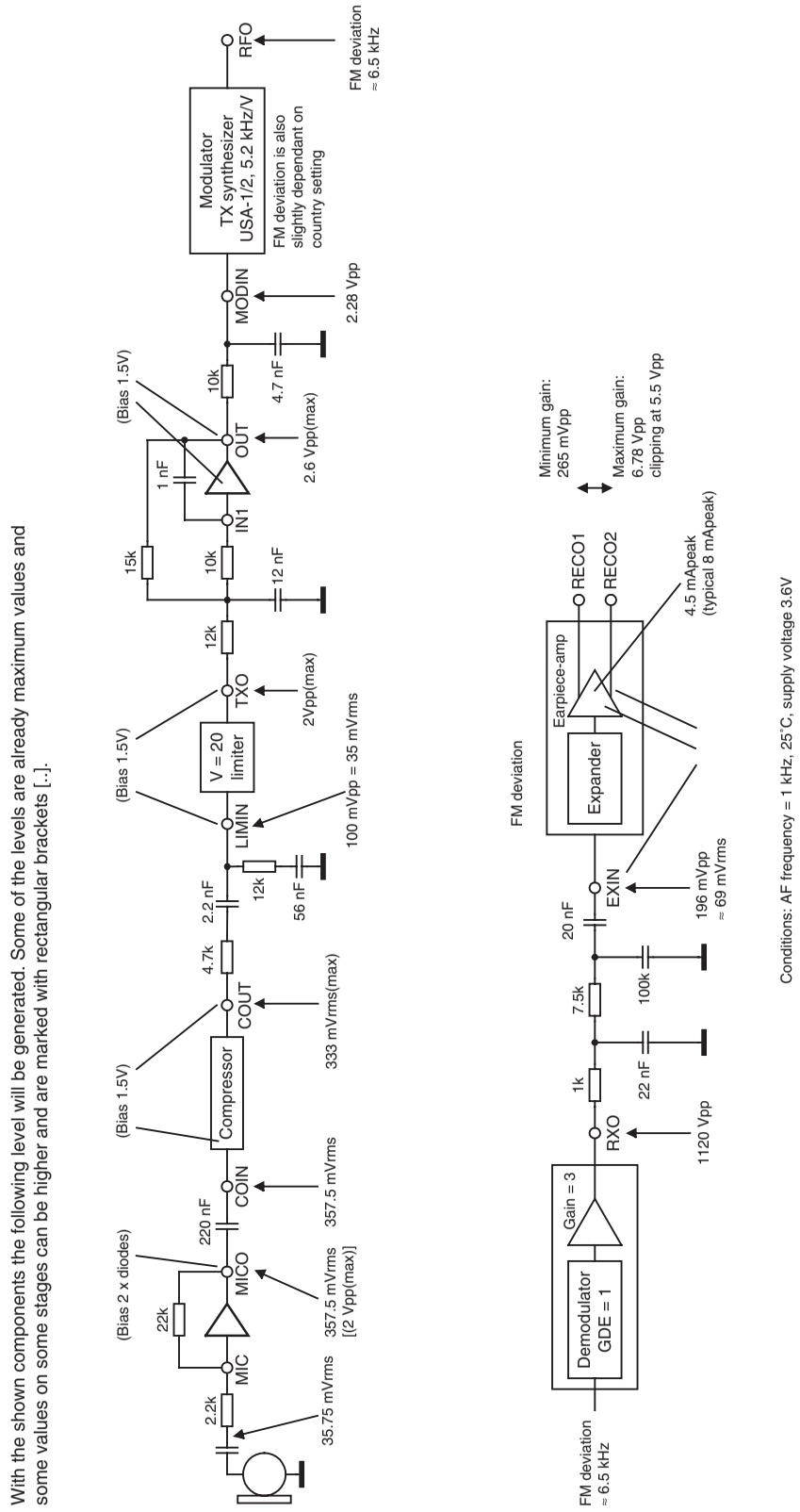


Table 2-1. Detailed Register and Register-bit Description

Address	Address + Bit	Register Name	Meaning	Country Specific
R0	R0B0	DA0	LSBit of D/A converter reference voltage	-
	R0B1	DA1	...	-
	R0B2	DA2	...	-
	R0B3	DA3	...	-
	R0B4	DA4	...	-
	R0B5	DA5	...	-
	R0B6	DA6	MSBit of D/A converter reference voltage	-
	R0B7	MUXDA	0 = RSSI selected, 1 = V_{BAT} selected	-
R1	R1B0	Free	-	-
	R1B1	Free	-	-
	R1B2	GDEM	0 = high gain, 1 = low gain	Yes
	R1B3	GEA0	LSBit of gain ear piece amplifier	-
	R1B4	GEA1	...	-
	R1B5	GEA2	...	-
	R1B6	GEA3	...	-
	R1B7	GEA4	MSBit of gain ear piece amplifier	-
R2	R2B0	ERX2	0 = disabled, 1 = enable RX low frequency part 2	-
	R2B1	MRX	0 = enabled, 1 = mute RX low frequency part	-
	R2B2	ERXHF	0 = disabled, 1 = enable mixer 2 and IF amplifier	-
	R2B3	ERX1	0 = disabled, 1 = RX low frequency part 1 enabled	-
	R2B4	ERXO	0 = disabled, 1 = RXO output enabled	-
	R2B5	EEA	0 = disabled, 1 = ear piece amplifier enabled	-
	R2B6	BEXP	0 = active, 1 = expander bypassed	-
	R2B7	DATRX	1 = switch data comparator output to DACO pin	-
R3	R3B0	ETX	0 = disabled, 1 = enable TX low frequency part	-
	R3B1	MTX	0 = enabled, 1 = mute TX low frequency part	-
	R3B2	Free	-	-
	R3B3	Free	-	-
	R3B4	Free	-	-
	R3B5	Free	-	-
	R3B6	RBAT	0 = high-range: 4.1 V to 5.0525 V, 1 = low-range: 3 V to 3.9525 V	-
	R3B7	PDVDD	0 = disabled, 1 = enable pull down transistor in power-down mode (used for fast discharge of V_{DD})	-
R4	R4B0	Free	-	-
	R4B1	Free	-	-
	R4B2	Free	-	-
	R4B3	Free	-	-
	R4B4	Free	-	-
	R4B5	Free	-	-
	R4B6	Free	-	-
	R4B7	Free	-	-

Table 2-1. Detailed Register and Register-bit Description (Continued)

Address	Address + Bit	Register Name	Meaning	Country Specific
R5	R5B0	Free	-	-
	R5B1	Free	-	-
	R5B2	M12	Always zero. Used for test purposes	Yes
	R5B3	KV21	LSBit of gain VCO2	Yes
	R5B4	KV22	...	Yes
	R5B5	KV23	MSBit of gain VCO2	Yes
	R5B6	Free	-	-
	R5B7	Free	-	-
R6	R6B0	TM	0 = disabled, 1 = enables internal test mode Always zero in application	-
	R6B1	SU1	0 = disabled, 1 = speed-up phase comparator for PLL1	-
	R6B2	GMOD0	LSBit of modulation gain VCO1	Yes
	R6B3	GMOD1	MSBit of modulation gain VCO1	Yes
	R6B4	IMIXI	1 = Invert inputs of phase comparator in PLL2	Yes
	R6B5	FRMT	Output frequency range of mixer T	Yes
	R6B6	M1CP	0 = high, 1 = low, change 1 dB compression point of mixer 1 and consumption	-
	R6B7	ETXO	0 = disable, 1 = enable RFO transmit output stage	-
R7	R7B0	DV1I0	LSBit divider setting PLL1 integer part	Yes
	R7B1	DV1I1	...	Yes
	R7B2	DV1I2	...	Yes
	R7B3	DV1I3	MSBit divider setting PLL1 integer part	Yes
	R7B4	RA10	LSBit rough adjust VCO1	Yes
	R7B5	RA11	MSBit rough adjust VCO1	Yes
	R7B6	DR1I0	Additional divider reference frequency PLL1	Yes
	R7B7	DR1I1	Additional divider reference frequency PLL1	Yes
R8	R8B0	DV1F0	LSBit divider setting PLL1 fractional part	Yes
	R8B1	DV1F1	...	Yes
	R8B2	DV1F2	...	Yes
	R8B3	DV1F3	...	Yes
	R8B4	DV1F4	...	Yes
	R8B5	DV1F5	...	Yes
	R8B6	DV1F6	...	Yes
	R8B7	DV1F7	MSBit divider setting PLL1 fractional part	Yes
R9	R9B0	DV3I0	Divider PLL3 LSByte, LSBit	Yes
	R9B1	DV3I1	...	Yes
	R9B2	DV3I2	...	Yes
	R9B3	DV3I3	...	Yes
	R9B4	DV3I4	...	Yes
	R9B5	DV3I5	...	Yes
	R9B6	DV3I6	...	Yes
	R9B7	DV3I7	Divider PLL3 LSByte, MSBit	Yes

Table 2-1. Detailed Register and Register-bit Description (Continued)

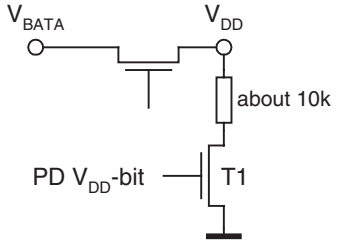
Address	Address + Bit	Register Name	Meaning	Country Specific
R10	R10B0	DV3I8	Divider PLL3 MSByte, LSBit	Yes
	R10B1	DV3I9	...	Yes
	R10B2	DV3I10	...	Yes
	R10B3	DV3I11	...	Yes
	R10B4	DV3I12	...	Yes
	R10B5	DV3I13	...	Yes
	R10B6	DV3I14	Divider PLL3 MSByte, MSBit	Yes
	R10B7	FA34	Fine adjust VCO3	-
R11	R11B0	RA20	Rough adjust VCO2	Yes
	R11B1	RA21	Rough adjust VCO2	Yes
	R11B2	AMIX1	Lengthening antibacklash signal PLL2	Yes
	R11B3	AMIX2	Lengthening antibacklash signal PLL2	Yes
	R11B4	FA30	Fine adjust of VCO3 (frequency reduction)	-
	R11B5	FA31	Fine adjust of VCO3 (frequency reduction)	-
	R11B6	FA32	Fine adjust of VCO3 (frequency reduction)	-
	R11B7	FA33	Fine adjust of VCO3 (frequency reduction)	-
R12	R12B0	D10	Setting divider D1	Yes
	R12B1	D11	Setting divider D1	Yes
	R12B2	D20	Setting divider D2	Yes
	R12B3	D30	Setting divider D3	Yes
	R12B4	D31	Setting divider D3	Yes
	R12B5	FAOS0	Fine adjust of crystal oscillator (frequency reduction)	-
	R12B6	FAOS1	Fine adjust of crystal oscillator (frequency reduction)	-
	R12B7	FAOS2	Fine adjust of crystal oscillator (frequency reduction)	-
R13	R13B0	FA10	LSBit manual fine adjustment of VCO2 (frequency reduction)	-
	R13B1	FA11	...	-
	R13B2	FA12	...	-
	R13B3	FA13	...	-
	R13B4	FA14	MSBit manual fine adjustment of VCO2 (frequency reduction)	-
	R13B5	EAFA1	0 = disable, 1 = enable automatic fine adjust of VCO1	-
	R13B6	SAFA1	Sign for automatic fine adjust of VCO1	-
	R13B7	EVCO1	0 = disable, 1 = enable VCO1	-
R14	R14B0	FA20	LSBit manual fine adjust of VCO2 (frequency reduction)	-
	R14B1	FA21	...	-
	R14B2	FA22	...	-
	R14B3	FA23	...	-
	R14B4	FA24	MSBit manual fine adjust of VCO2 (frequency reduction)	-
	R14B5	EAFA2	0 = disable, 1 = enable automatic fine adjust of VCO2	-
	R14B6	SAFA2	Sign for automatic fine adjust of VCO2	-
	R14B7	EVCO2	0 = disable, 1 = enable VCO2 and mixer-T	-

Table 2-1. Detailed Register and Register-bit Description (Continued)

Address	Address + Bit	Register Name	Meaning	Country Specific
R15	R15B0	E5K	Selection phase comparator frequency for PLL3: f_{ref3} = 5 kHz	Yes
	R15B1	E6K25	Selection phase comparator frequency for PLL3: f_{ref3} = 6.25 kHz	Yes
	R15B2	E10K	Selection phase comparator frequency for PLL3: f_{ref3} = 10 kHz	Yes
	R15B3	E12K5	Selection phase comparator frequency for PLL3: f_{ref3} = 12.5 kHz	Yes
	R15B4	E25K	Selection phase comparator frequency for PLL3: f_{ref3} = 25 kHz	Yes
	R15B5	SU3	Speed-up phase comparator for PLL3	-
	R15B6	EOSC	0 = disable, 1 = enable crystal oscillator(11.15 MHz)	-
	R15B7	EVCO3	0 = disable, 1 = enable VCO3 and mixer 1	-

3. Explanation of Special Register Bit M1CP

Figure 3-1. Reg-6 Bit-6 M1CP, PD V_{DD}-bit



If V_{BATA} is switched off from V_{DD} then the voltage slowly drops down (depending on the capacitor of V_{DD}) and this can cause problems.
To prevent slow dop of V_{DD}, the transistor T1 can be enabled so that the voltage drops faster.

M1CP:
This bit is used to increase or decrease the dynamic range of the first mixer.

0 = the dynamic range of the mixer is large, especially for countries where transmit/ receive frequencies are close together (for example, the US).

If the transmit/receive frequency distance is small and the duplex filters don't have enough suppression, some transmit signals will be seen on the mixer input and could overdrive the mixer input. Therefore, the dynamic range can be increased to prevent the transmit signal from overdriving the mixer.

Mixer overdriving would cause sensitivity reduction and other unwanted effects, for example, cross-modulation, interference, etc.

When this bit is zero, the mixer current is higher. This has the disadvantage of increasing the dynamic range.

1 = the dynamic range is low. For example, in France the transmit/receive frequency distance is large and, therefore, the duplexer can suppress more of the transmit frequency. In this case, this bit can be set to "1", with the advantage of saving some unnecessary current.
0 = 140 mV, 1 dB compression point (1 mA more for mixer)
1 = 40 mV, 1 dB compression point

4. Oscillator and Noise

Figure 4-1. Principle of U3600BM Relaxation-oscillator and Timing
(Advantage: adjustment-free and there is no need for an external L/C tank)

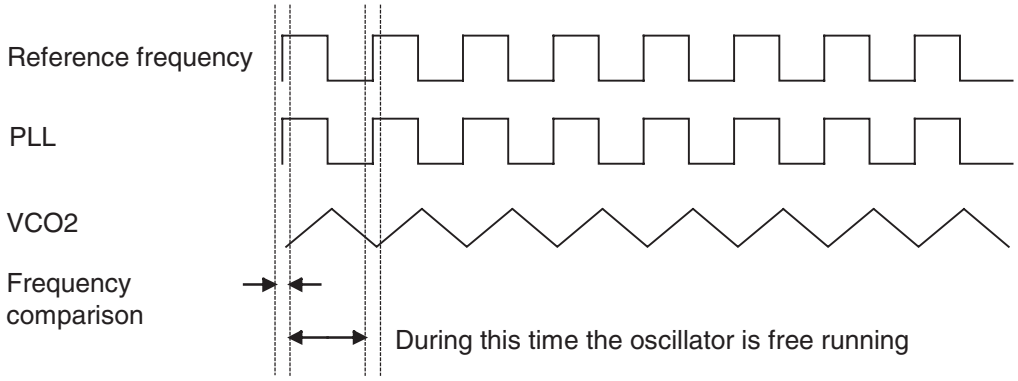


Figure 4-2. Typical Chinese Transmit Spectrum (China Mobile Channel 17), Carrier = -5.03 dBm

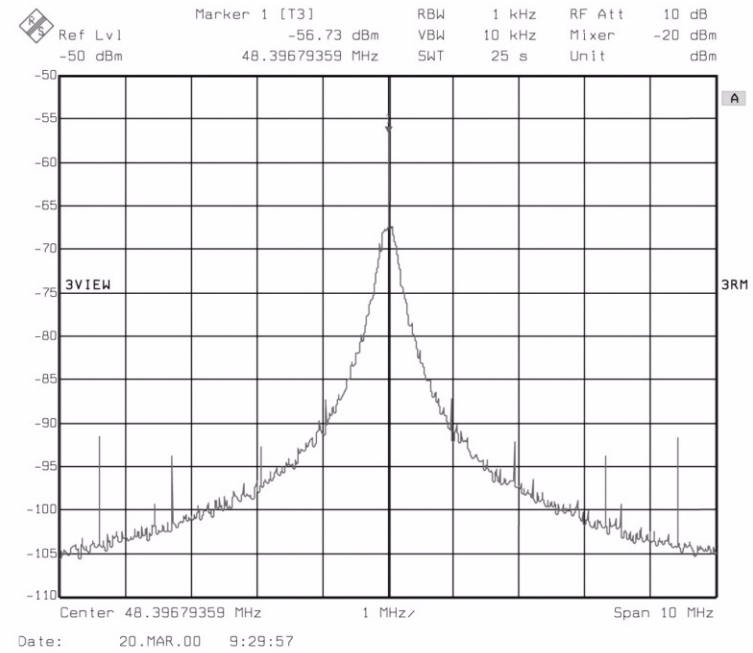
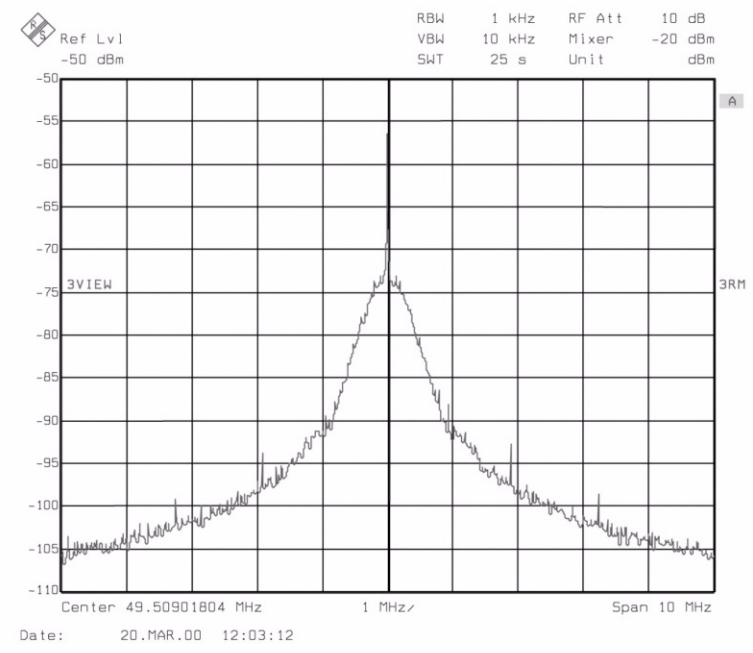


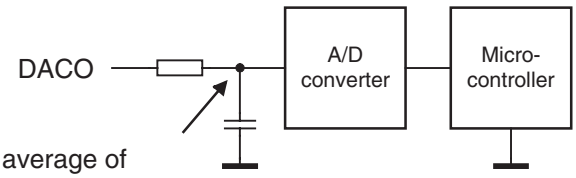
Figure 4-3. Typical US Transmit Spectrum (US-2 Mobile Channel 15), Carrier = -4.93 dBm



5. Principle of RSSI Function, RSSI Diagrams

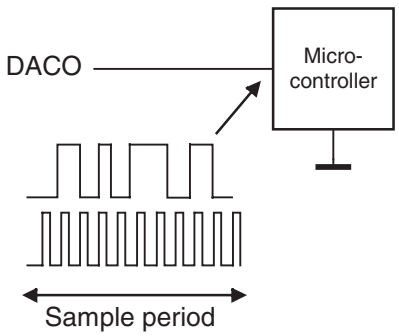
Figure 5-1. RSSI Investigation to Measure Receive Level with a Microcontroller

Solution 1



Voltage dependent on the average of ones and zeros. This voltage is measured by an A/D converter and represents receive level.

Solution 2



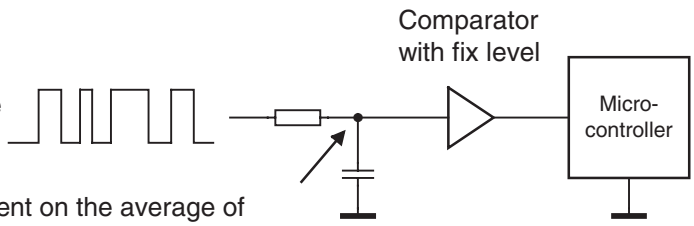
DACO-data representing the receive level

Samples taken by micro-controller during sample period

The microcontroller then calulates the average of the number of ones and zeros during a sample period and this average value represents the receive level.

Solution 3

DACO-data representing the receive level



Voltage dependent on the average of ones and zeros. This voltage is measured by an A/D converter and represents receive level.

Analyzing method:
By changing the comparison register value, the comparator switches at a certain register value. This value is then the corresponding field-strength.

Figure 5-2. RSSI

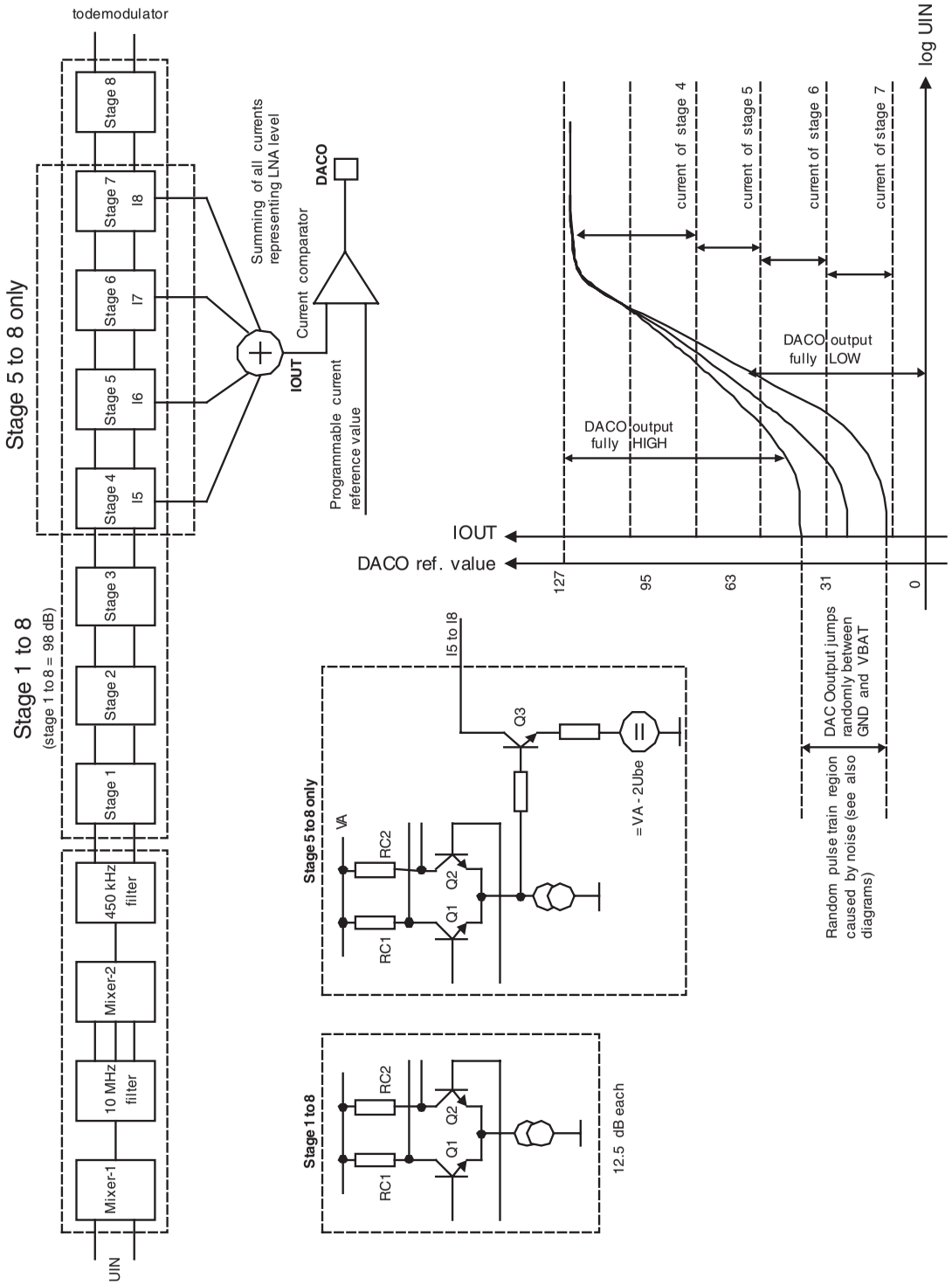


Figure 5-3. DACO Output Unfiltered

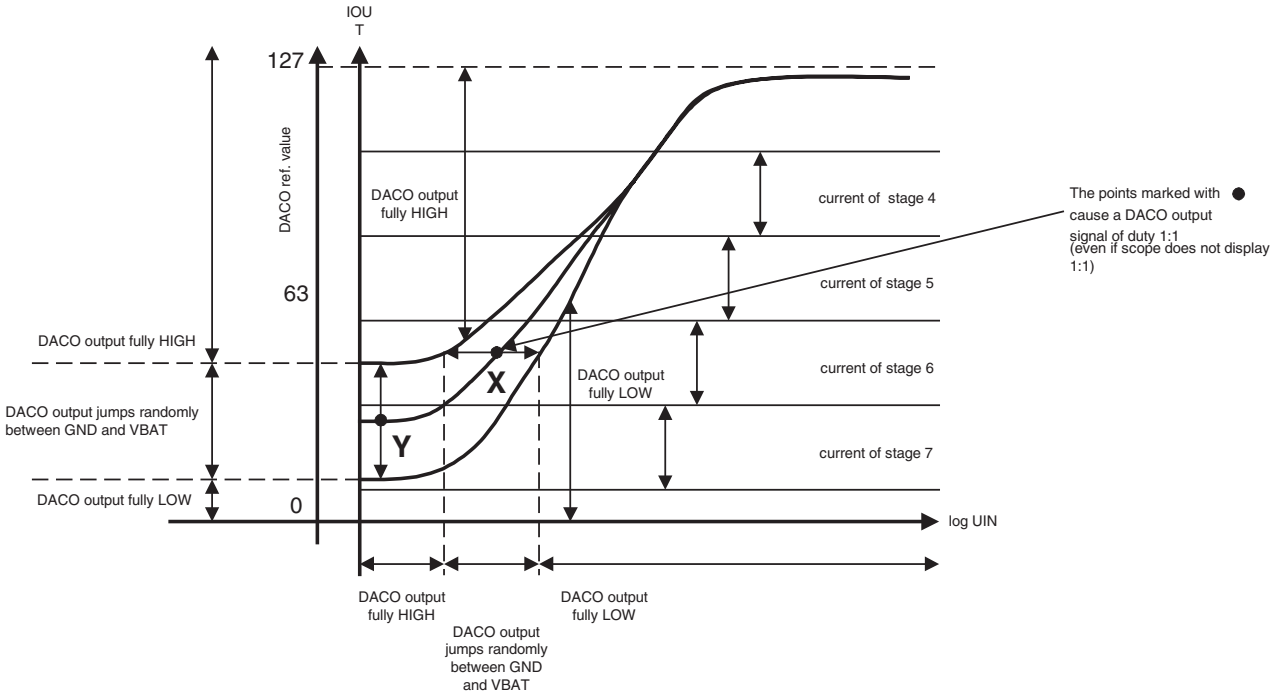


Figure 5-4. DACO Output Level Dependent on Antenna Input Level

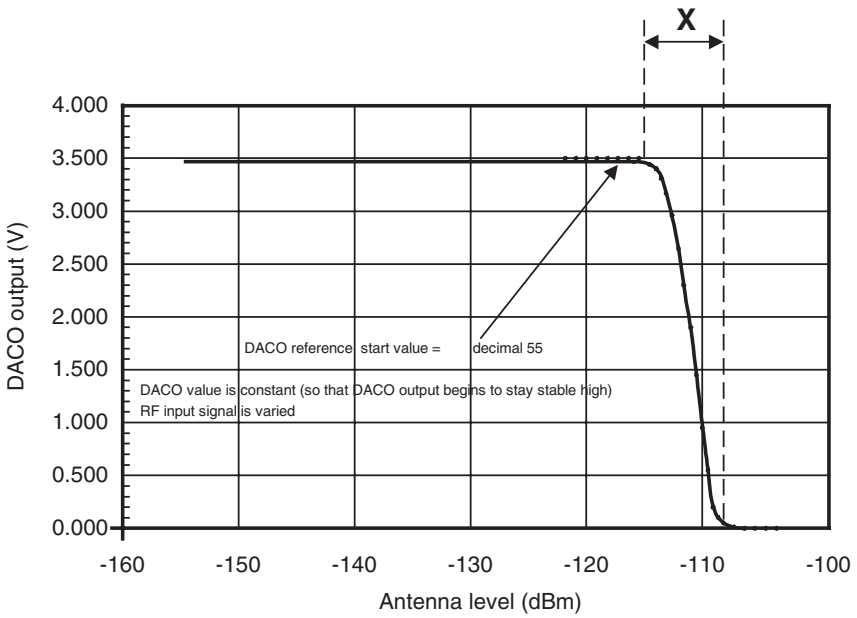


Figure 5-5. Filtered DACO Output Dependent on Reference Value

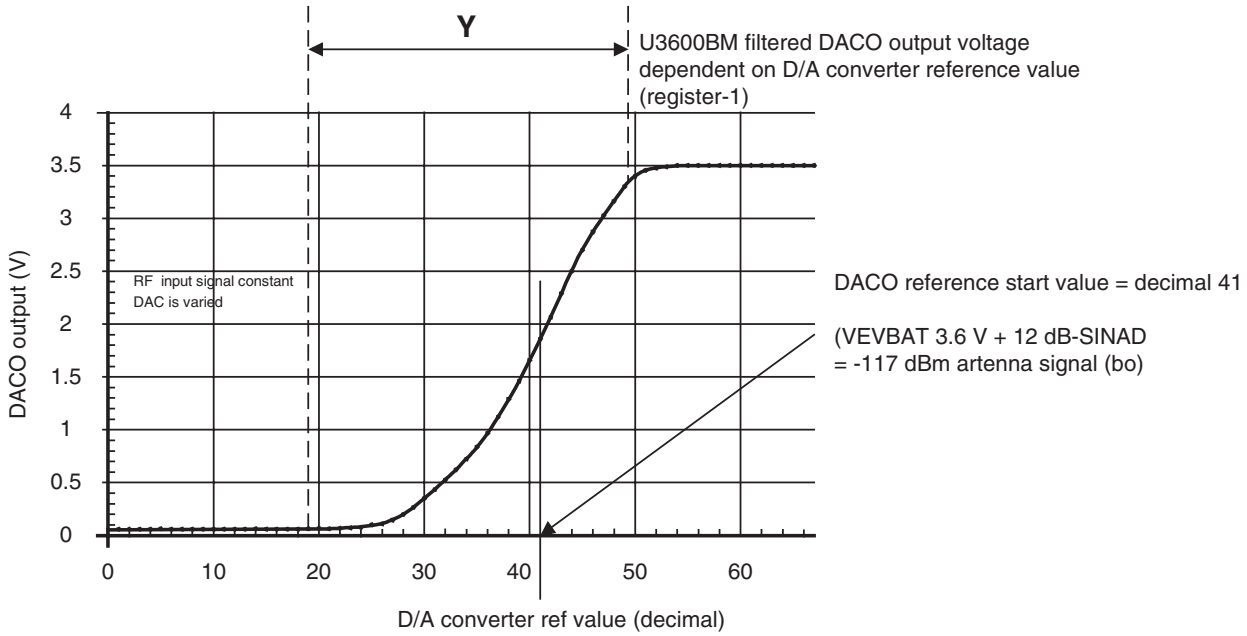
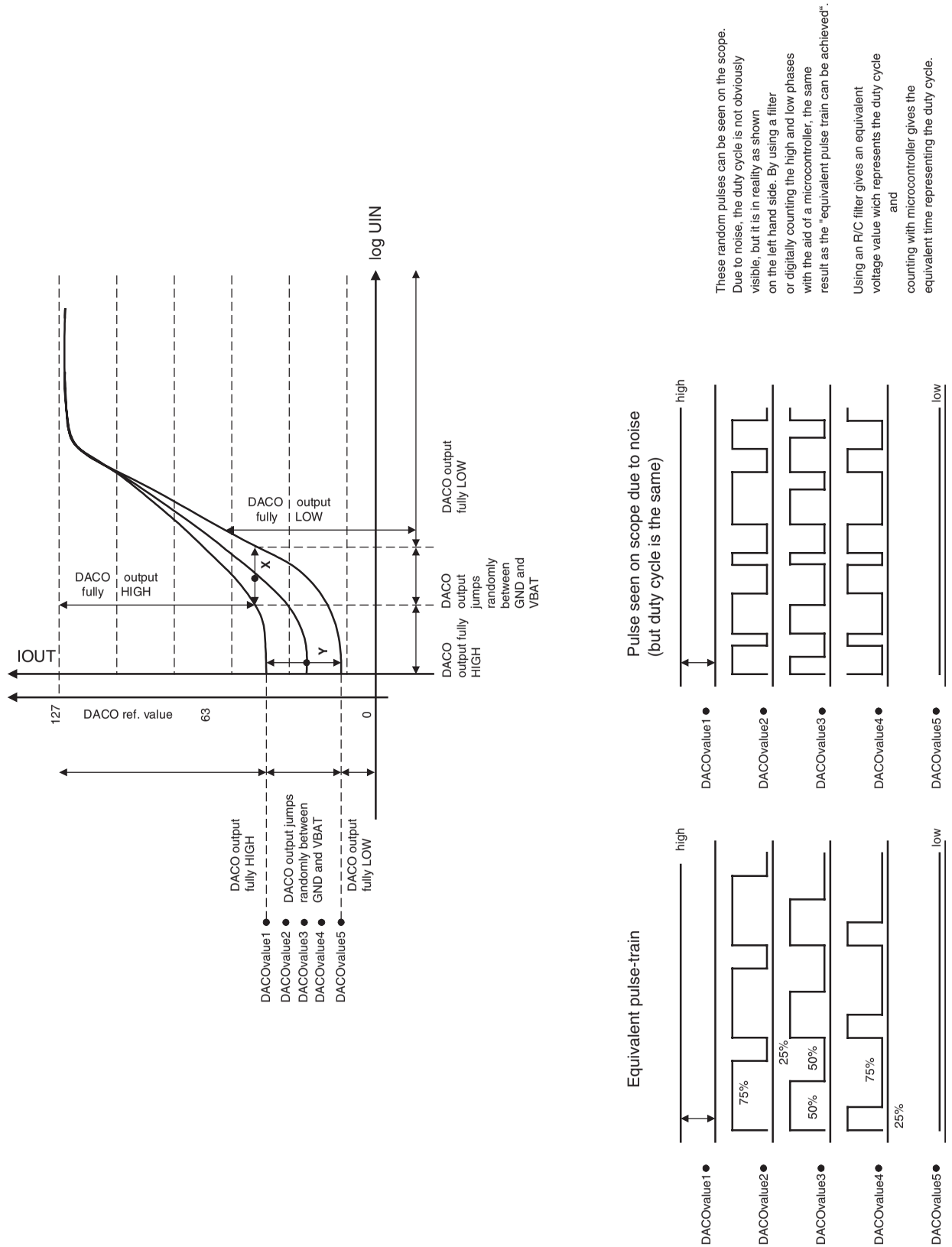


Figure 5-6. Unfiltered DACO Output with Different DACO Reference Values



6. Short Demo Board Description

Atmel provides a standard U3600BM demo board PCB which can be assembled as a base board or a mobile board depending on selection of base/mobile (handset) components.

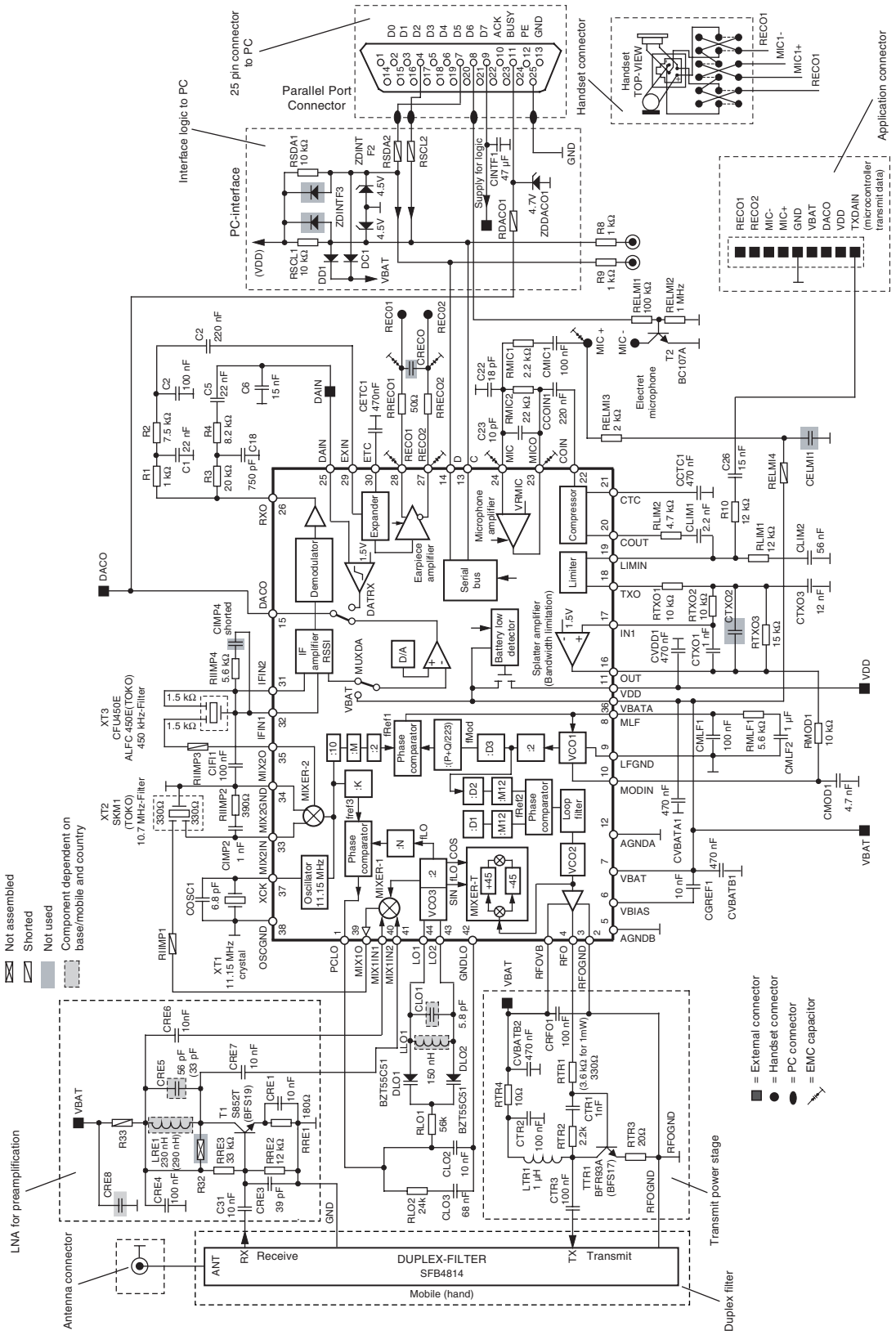
The board is a fully working CT0 base station or mobile (handset) receiver/transmitter with the following configuration:

- Connector for antenna
- Duplex filter to separate receive/transmit path
- LNA for pre-amplification
- Transmitter power amplifier stage
- U3600BM with all necessary components for receive and transmit operation
- Application connector to apply power and measurement equipment for investigation
- Connector to apply a handset
- Interface logic to PC
- Connector (25-pin) for connecting the demo board to the PC to use the demonstration software

Today, the following demo boards can be prepared for customers:

- USA
- France
- China

Figure 6-1. Demo Board



7. Board Photos

Figure 7-1. U3600BM Top View

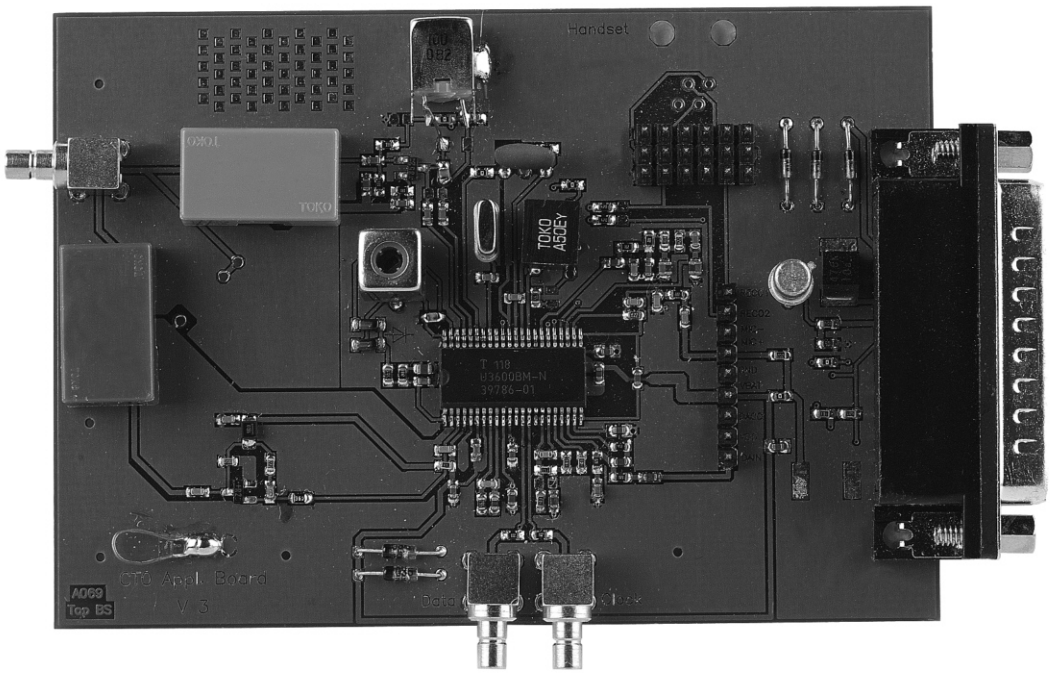
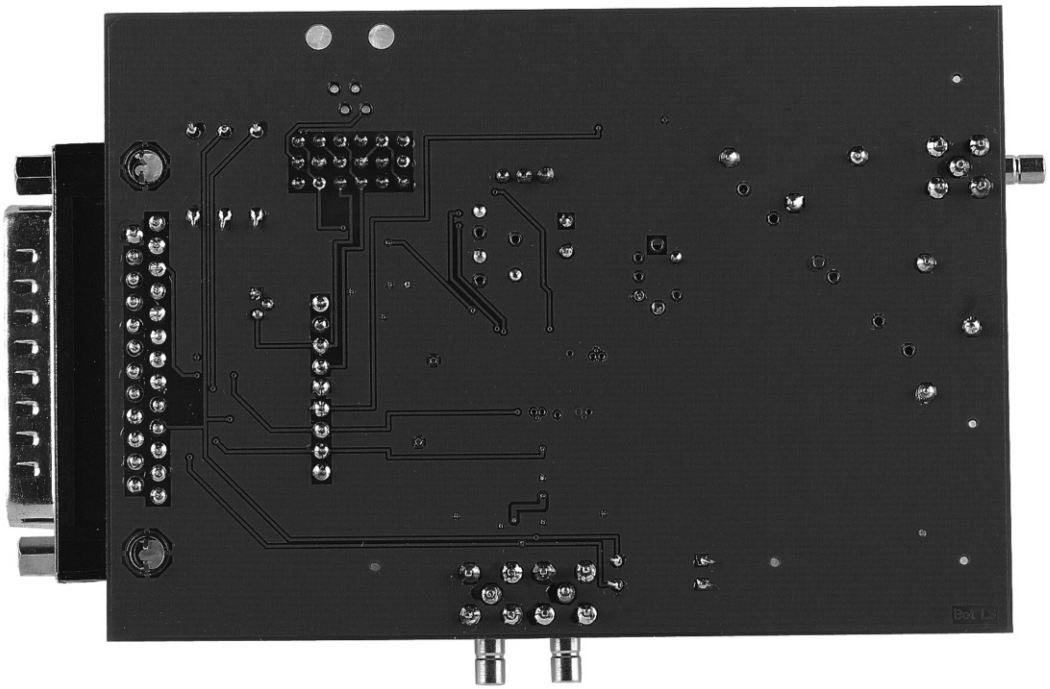


Figure 7-2. U3600BM Bottom View



8. VCO3 Adjustment with Tank Circuit on LO1 and LO2

Figure 8-1. VCO Adjust to Eliminate Tolerances of LLO1 and CLO1

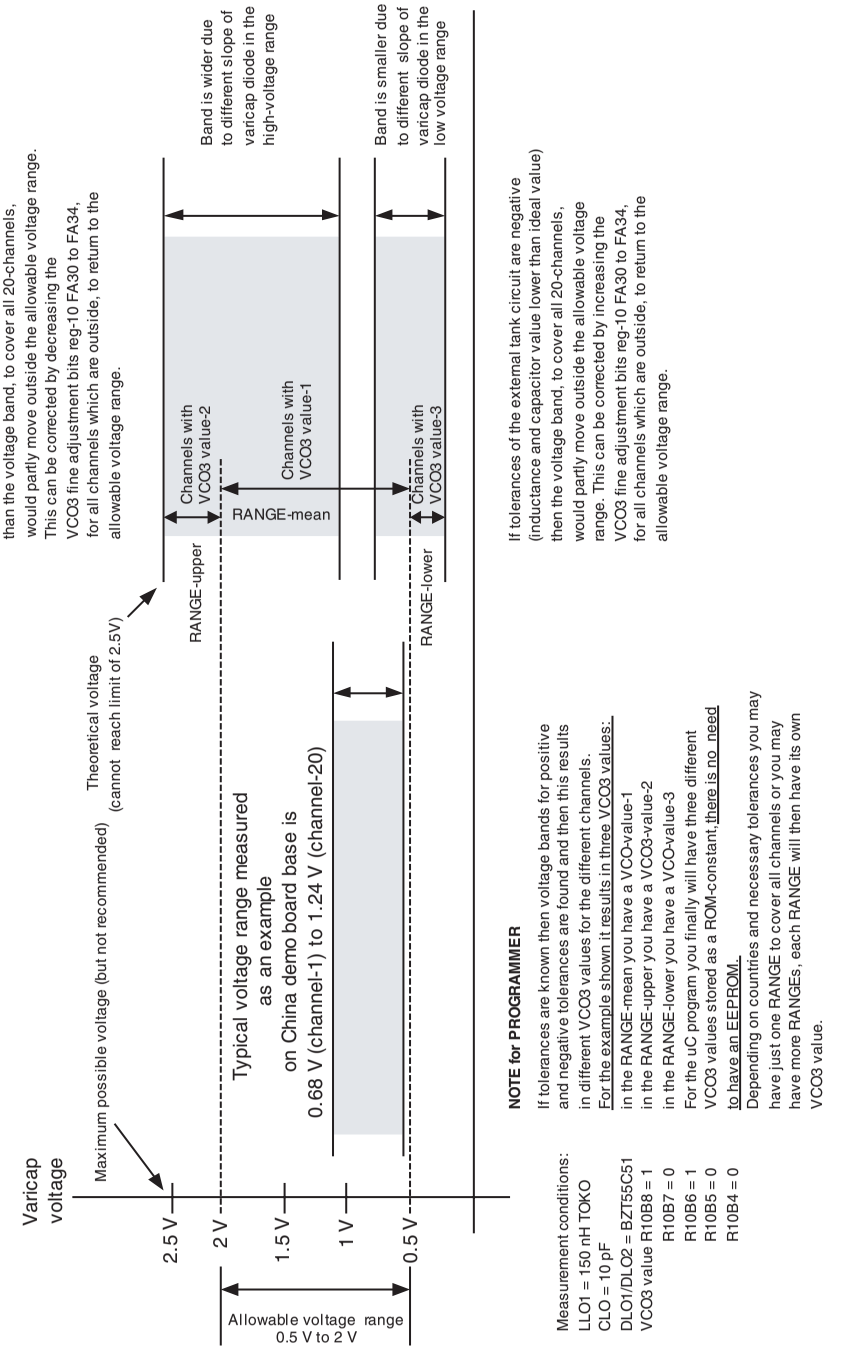


Figure 8-2. VCO Adjustment Hardware Corresponding to Figure 8-1 on page 21

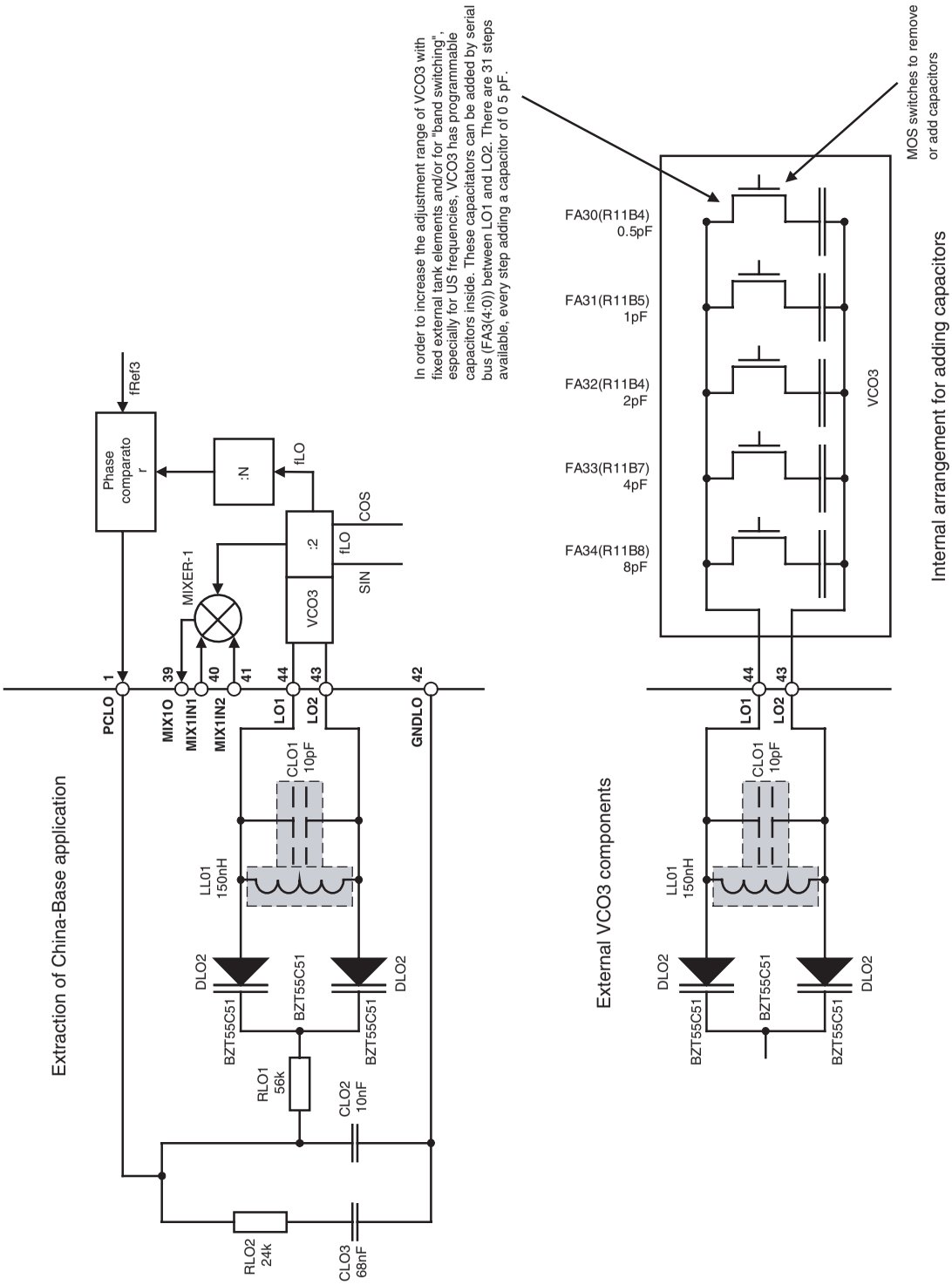


Figure 8-3. US Demo Board (US Mobile/Handset)

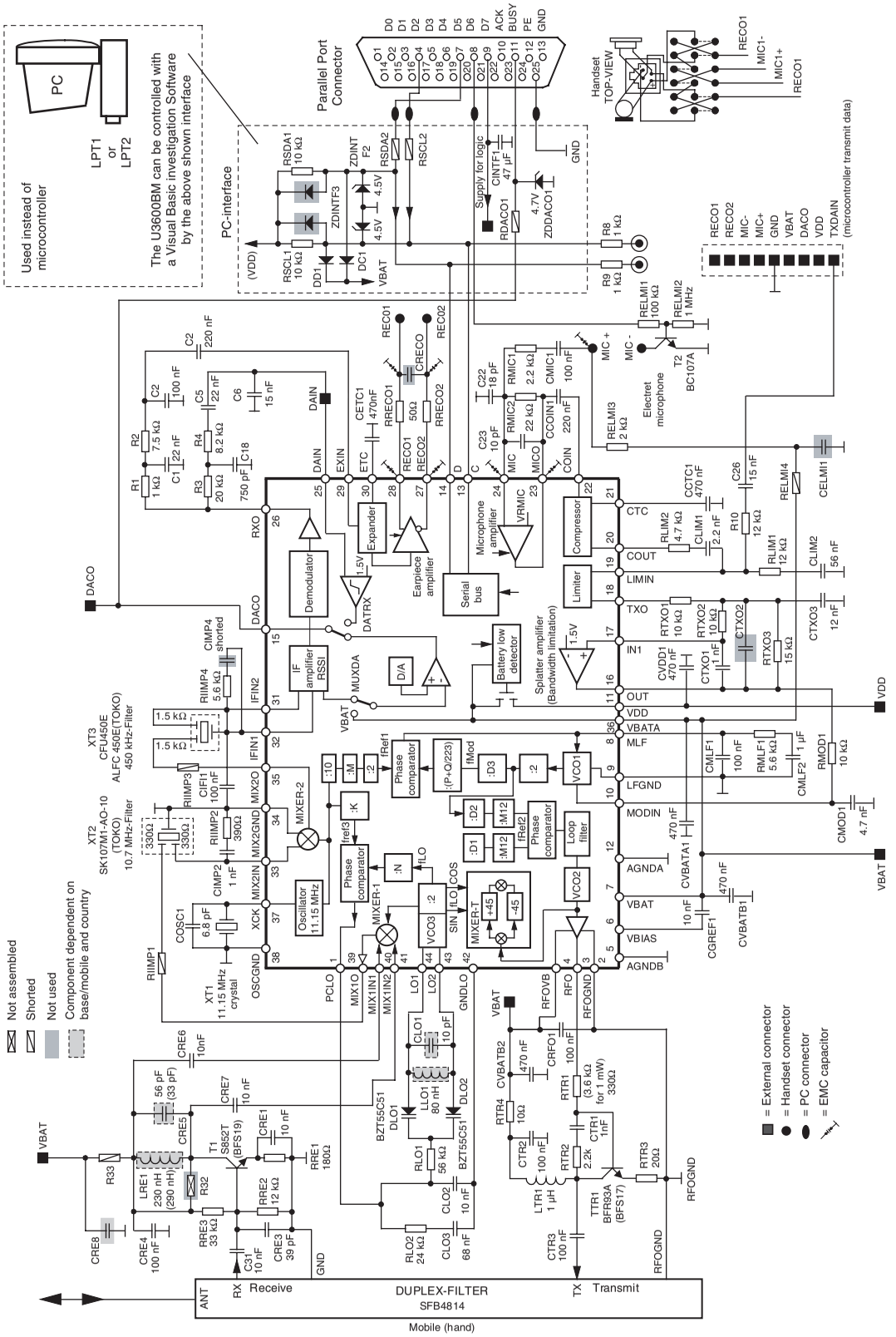
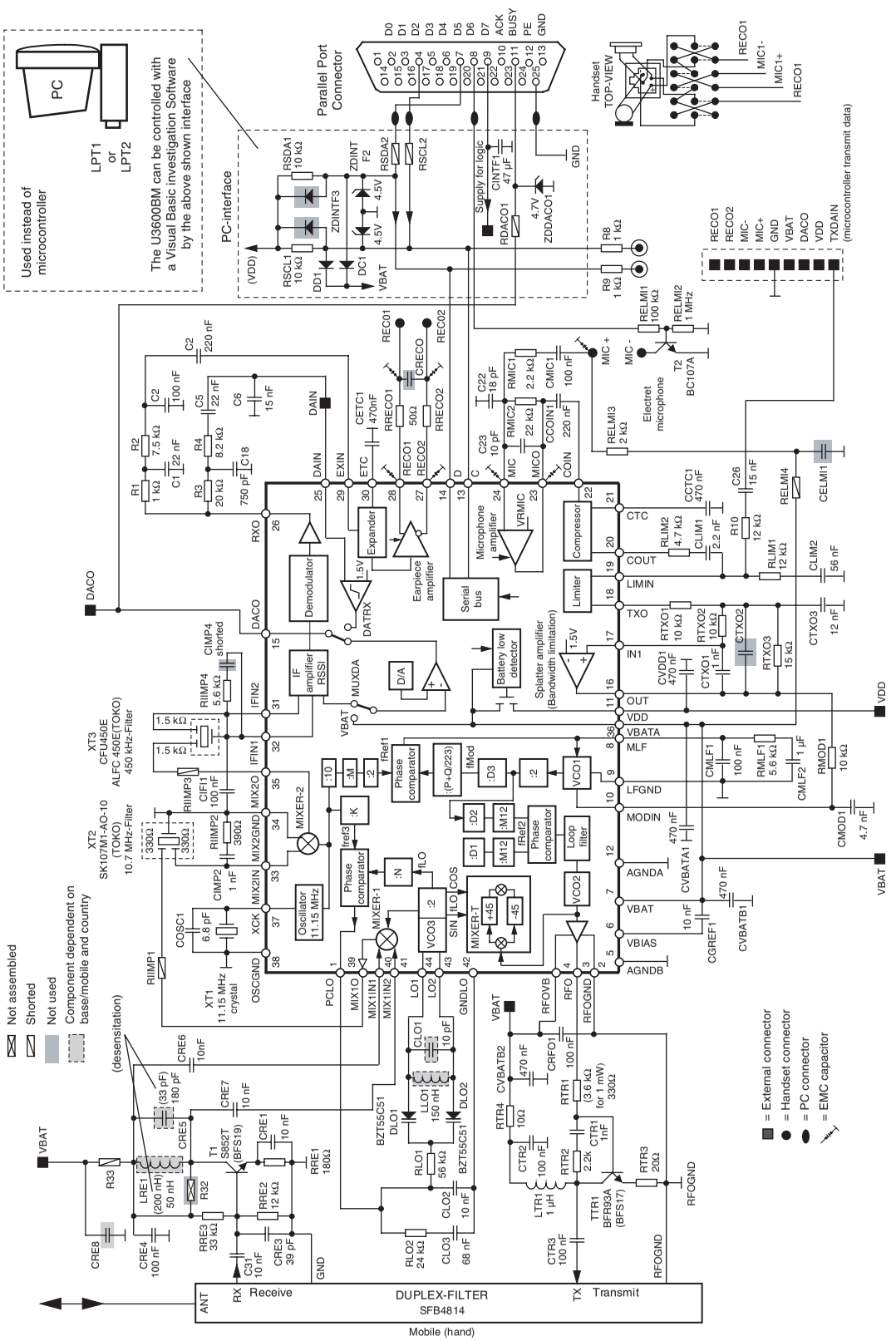


Figure 8-4. US Demo Board (US Base Station)



Please note that the US demo board is Atmel's standard demo board. Below, you will find the list of components needed. The US demo board listing is also representative of the other country applications, however, changes to values of components and other minor modifications may be possible.

Table 8-1. Component List for U3600BM CT0 Demo Board Mobile/Handset

Component	Value/Note
Resistors	
RIMP1	10.7 MHz input impedance adjustment
RIMP2	10.7 MHz output impedance adjustment
RIMP3	450 kHz input impedance adjustment
RIMP4	450 kHz output impedance adjustment
R1	De-emphasis component
R2	De-emphasis component
R3	Filter resistor for DAIN
R4	Filter resistor for DAIN
RRECO1	Ear piece frequency response (may be omitted depending on ear piece)
RRECO2	Ear piece frequency response (may be omitted depending on ear piece)
RSCL1	Pull-up for series clock
RSCL2	Protection resistor (only for demo board)
RSCL3	Protection resistor (only for demo board)
RSDA1	Pull-up for series data
RSDA2	Protection resistor (only demo board)
RDACO1	Signal to PC for calculation (only for demo board)
RMIC1	Microphone connection
RMIC2	Microphone connection
RELMI1	Electret microphone on/off control
RELMI2	Electret microphone on/off control
RELMI3	Electret microphone on/off control
RELMI4	Electret microphone supply filtering
RLIM2	Defines pre-emphasis
RLIM1	Defines pre-emphasis
RTXO1	Bandwidth limitation component
RTXO2	Bandwidth limitation component
RTXO3	Bandwidth limitation component
RTXDA1	Transmit data component
RMOD1	Modulator component
RMLF1	VCO1 loop filter component
RTR1	Transmit output stage component
RTR2	Transmit output stage component
RTR3	Transmit output stage component

Table 8-1. Component List for U3600BM CT0 Demo Board Mobile/Handset (Continued)

Component	Value/Note
RTR4	Transmit output stage component
RLO1	VCO3 loop filter component
RLO2	VCO3 loop filter component
RRE1	LNA component
RRE2	LNA component
RRE3	LNA component
RRE4	LNA component
RRE5	LNA component
Capacitors	
CCOIN1	Coupling capacitor micro-amplifier to compressor
CCT1	Compressor capacitor
CVDD1	V_{DD} filter capacitor
COSC1	Oscillator capacitor
CIFIN1	Capacitor for high frequency ground
CIMP2	AC short for RIMP2
CIMP4	AC short for RIMP4
C1	De-emphasis component
C2	De-emphasis component
C3	Coupling capacitor
C4	Filter capacitor for DAIN
C5	Filter capacitor for DAIN
C6	Filter capacitor for DAIN
CETC1	Expander time constant
CRECO1	Ear piece frequency response (may be omitted depending on ear piece)
CINTF1	Auxiliary supply from PC
CMIC1	Microphone adaptation
CMIC2	Microphone adaptation
CELMI1	Electret microphone supply filtering
CLIM1	Defines pre-emphasis
CLIM2	Defines pre-emphasis
CTXO1	Bandwidth limitation component
CTXO2	Bandwidth limitation component
CTXO3	Bandwidth limitation component
CTXDA2	Transmit data component
CMOD1	Modulator component
CMLF1	VCO1 loop filter component
CMLF2	VCO1 loop filter component
CVBATA1	Filtering supply-A
CVBATB1	Filtering supply-B
CGREF1	Bias capacitor
CTR1	Transmit output stage component

Table 8-1. Component List for U3600BM CT0 Demo Board Mobile/Handset (Continued)

Component	Value/Note
CTR2	Transmit output stage component
CTR3	Transmit output stage component
C7	RFOVB filtering
CLO1	VCO3 loop filter tank component
CLO2	VCO3 loop filter component
CLO3	VCO3 loop filter component
CRE1	LNA component
CRE2	LNA component
CRE3	LNA component
CRE4	LNA component
CRE5	LNA tank component
CRE6	LNA component
CRE7	LNA component
CRE8	LNA component
CRFO1	Transmit output stage component
Coils	
LTR1	Transmit output stage component
LLO1	VCO3 loop filter tank component
LRE1	LNA tank component
Transistors	
T1	LNA amplifier
T2	Microphone supply on/off control
TTR1	Transmit output stage component
Diodes	
DD1	Protection interface (only for demo board)
DD2	Protection interface (only for demo board)
DC1	Protection interface (only for demo board)
DC2	Protection interface (only for demo board)
DSCL1	Clamping diode (only for demo board)
DSDA1	Clamping diode (only for demo board)
ZDINTF3	Input protection (only for demo board)
ZDINTF2	Input protection (only for demo board)
ZDDACO1	Protection for PC (only for demo board)
DLO1	VCO3 varicap
DLO2	VCO3 varicap
ICs	
IC1	U3600BM, single-chip cordless telephone controller
Crystal and Resonators	
XT1	Oscillator, 11.15 MHz
XT2	IF1-filter, 10.7 MHz filter SKM1 (TOKO®)
XT3	IF2-filter, 450 kHz filter ALFC-450E (TOKO) or CFU450E (MURATA®)

Figure 8-5. China Demo Board (China Base Station)

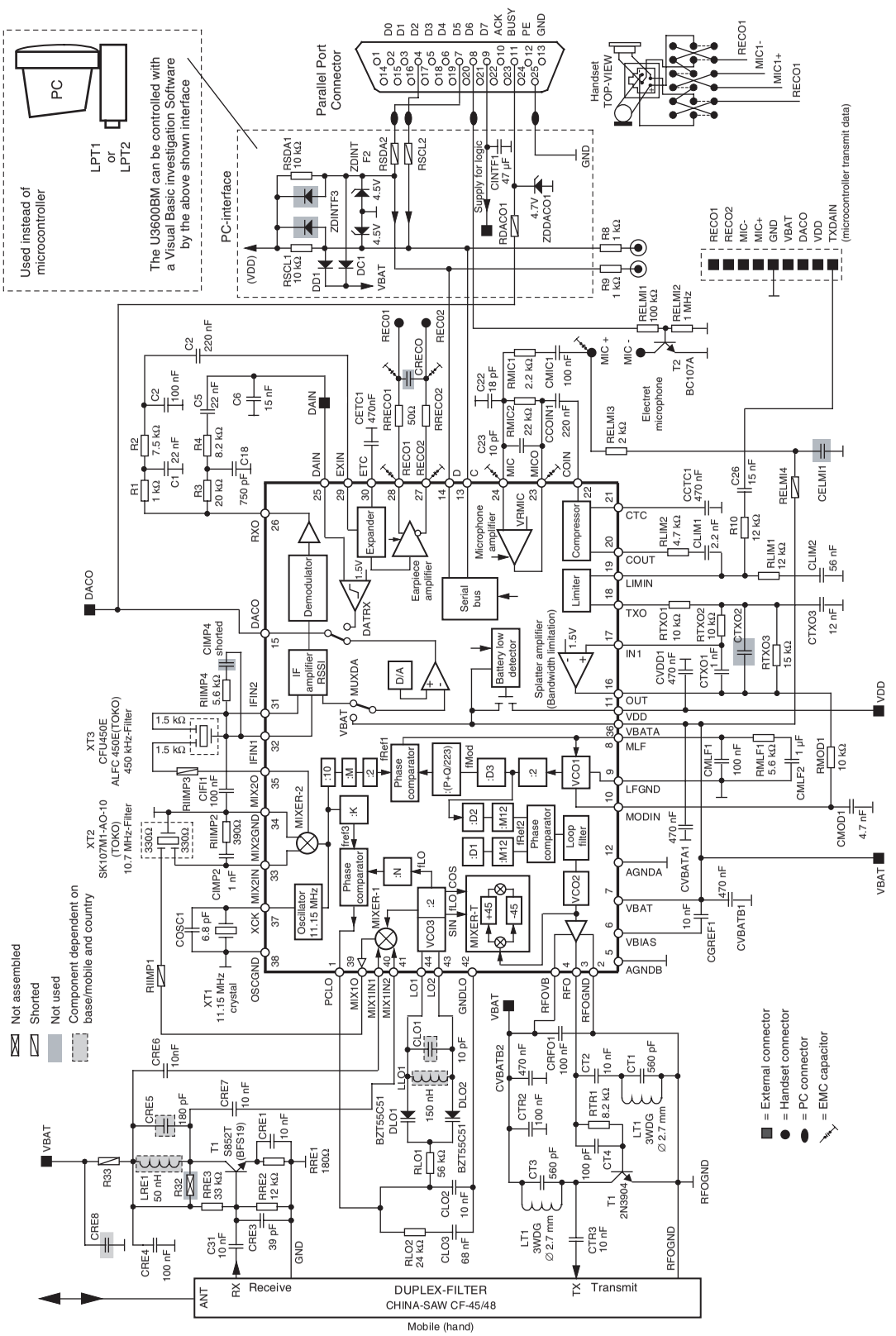
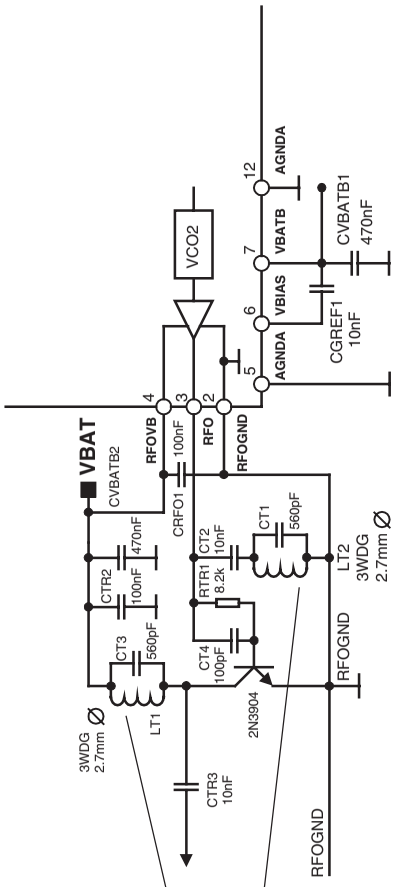


Figure 8-6. Transmit Noise Reduction



In our prototpye we used air-coils with three windings and a diameter of about 0.7 mm. The air-coils are in resonance with the transmit frequency.

Due to the priciple of our transmitter stage, which is adjustment free, we have a certain amount of noise. If the frequency distance from transmit to receive is large, then the noise causes no reduction of receive sensitivity (e.g. in France, where the frequency distance is about 15 MHz); if the frequency distance from transmit to receive is quite close then transmitter noise can be in the receive region and can cause a sensitivity reduction (e.g. in China where transmit receive distance is just 3 MHz).

With the help of two tank circuits, one in the base of the transmit stage and one in the collector of the transmit stage, we can eliminate most of the noise and in this way we can improve sensitivity.

With the help ot the above circuitry we get -114.5 dBm sensitivity with 12 dB SINAD with 17 mW output power.

As can be seen on our prototype, it is important to locate the transmit stage as close as possible to the three transmit-stage pins-2/3/4.

Table 8-2. China Setup Base Station

Reg 0 - 15 for Chinese Base Station
00000000
01100100
01111101
00000001
00000000
00110000
10110100
00100011
10110101
10001000
10010111
00010000
01100101
11100000
11100000
11000010

Typical results for China demo board:

Transmit power: 12 mW
Sensitivity tr-on: –114.5 dBm at 12 dB-SINAD

Figure 8-7. France Demo Board (France Mobile/Handset)

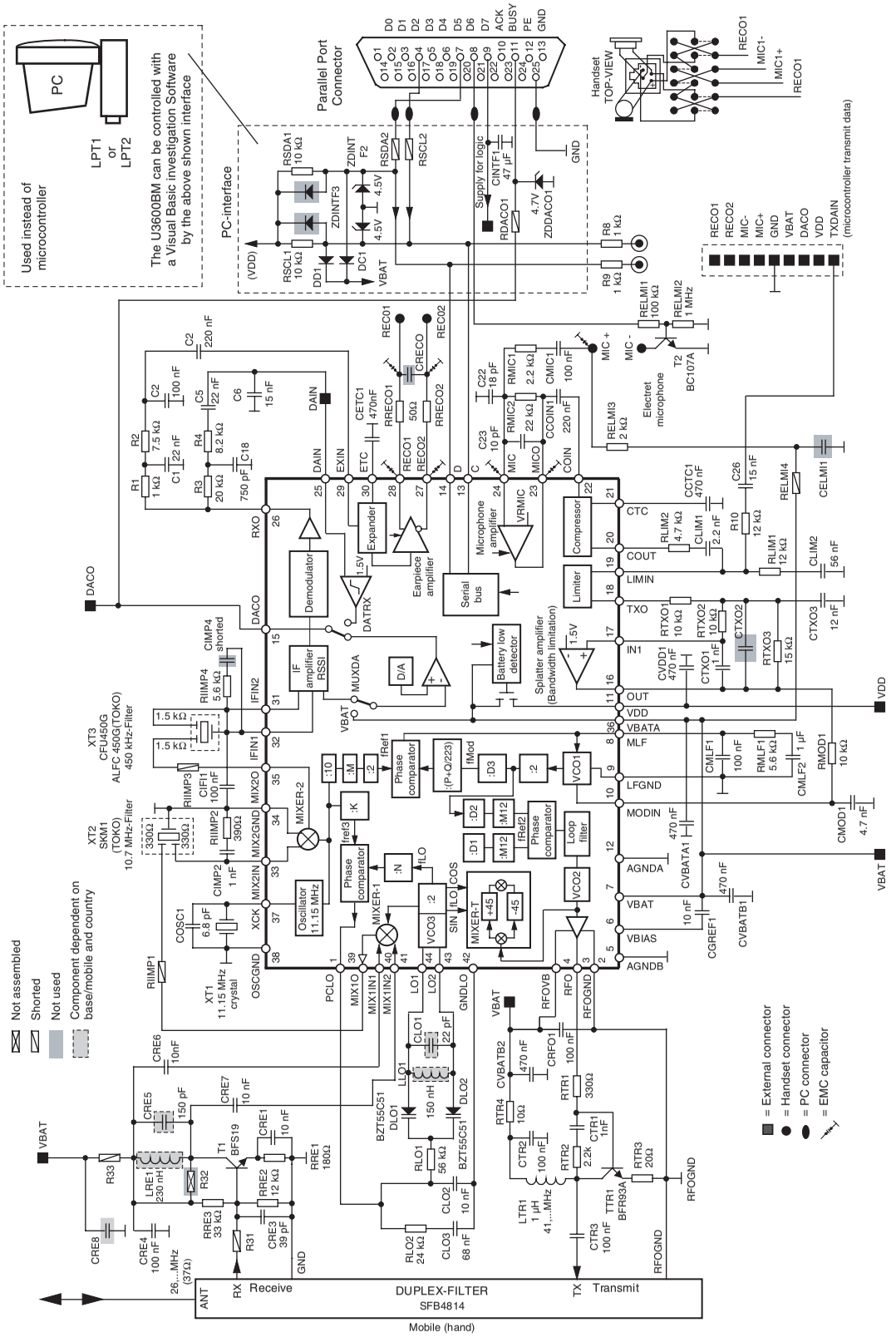


Figure 8-8. France Demo Board (France Base Station)

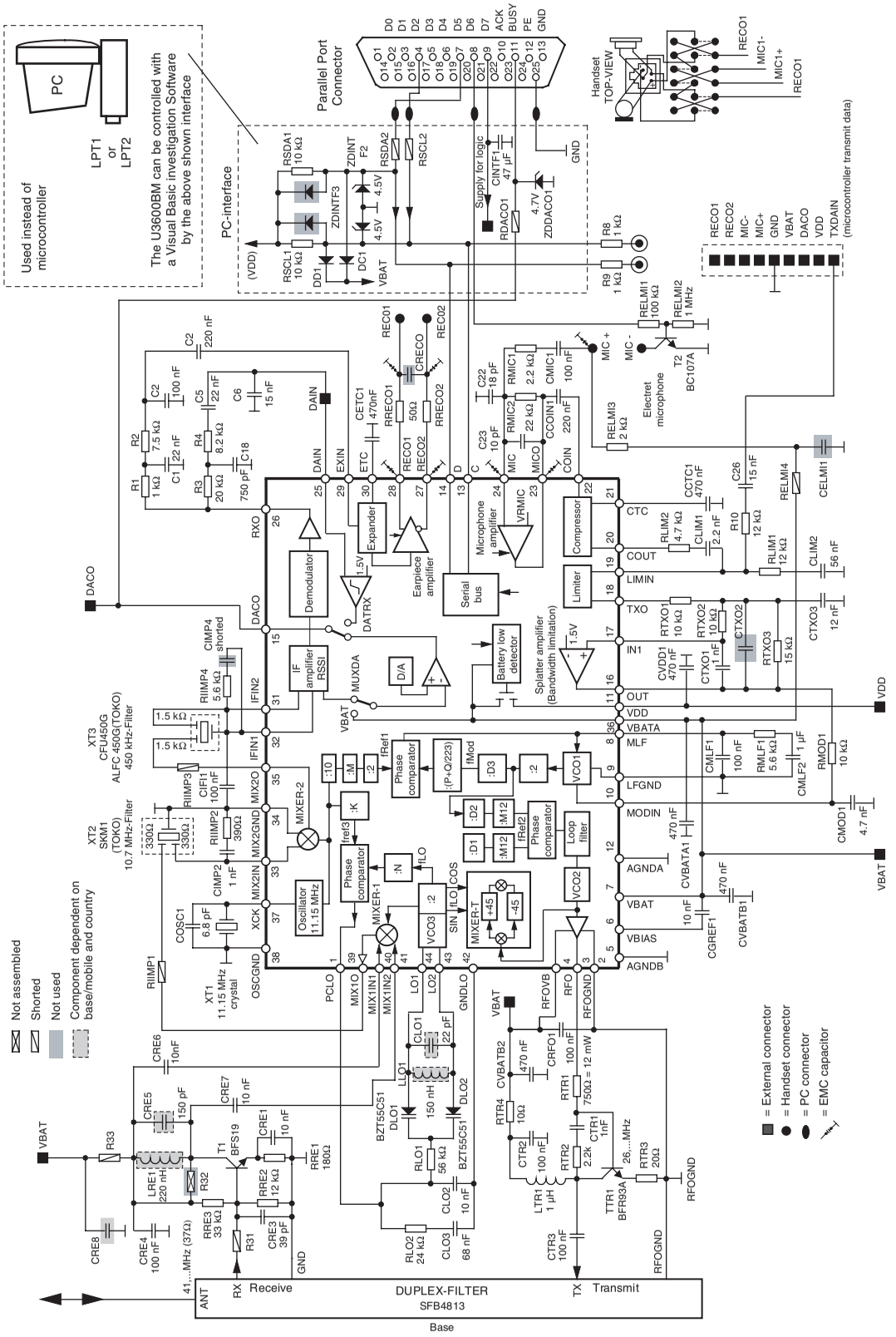


Table 8-3. France Setup Mobile/Handset

Reg 0 - 15 for France Handset
00000000
01111000
01111101
00000001
00000000
00101000
10010100
00001001
10011111
00110000
00010111
11000001
01001111
11100000
11100000
11000010

Table 8-4. France Setup Base Station

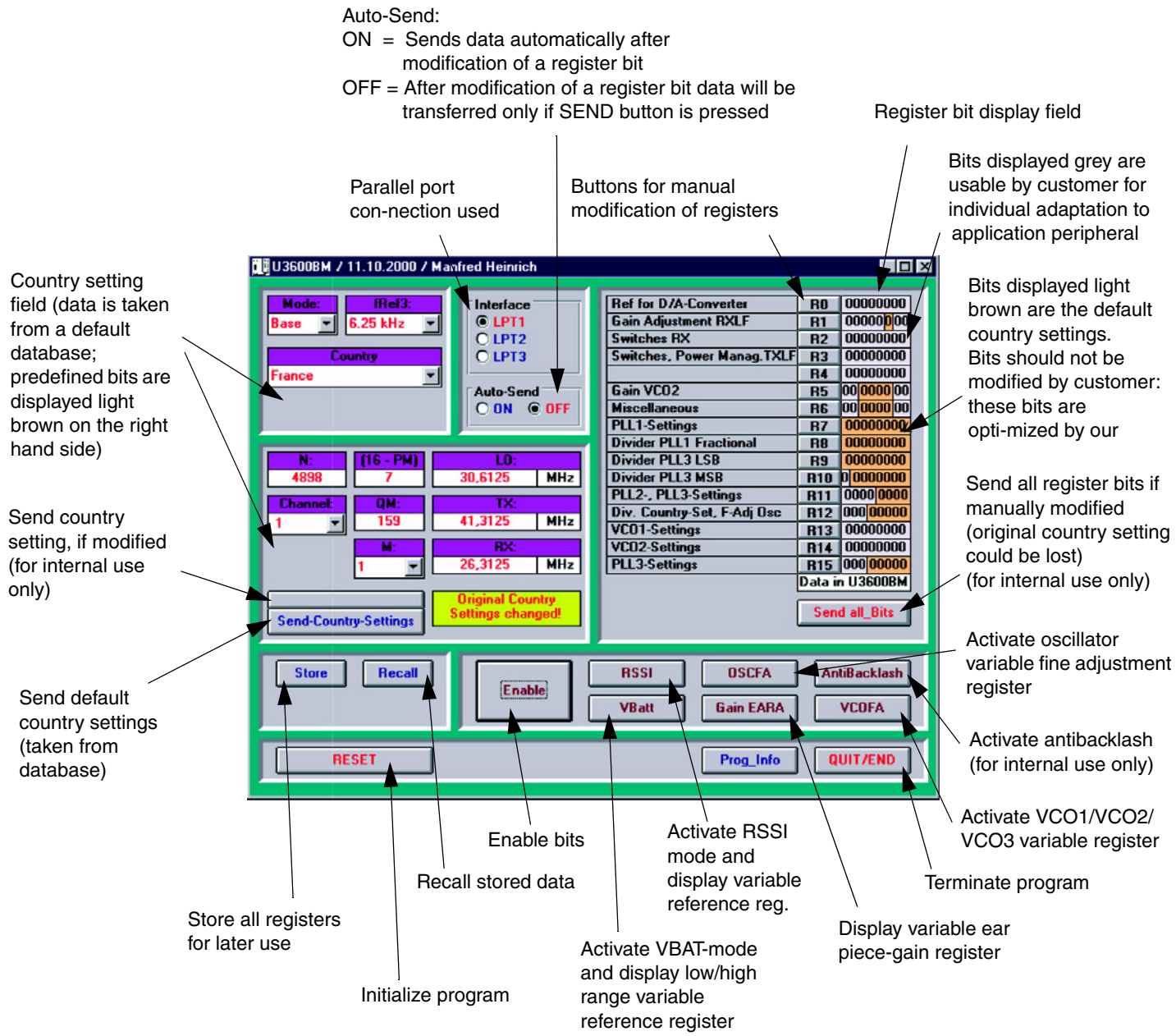
Reg 0 - 15 for France Base Station
00000000
01111000
01111101
00000001
00000000
00100000
10000100
00001001
10011111
00111110
10010011
01010011
01001111
11100000
11100000
11000010

Typical results for France demo board:

Transmit power: 12 mW
Sensitivity: –113.4 dBm 20 dB-SINAD

9. Demonstration Software

Figure 9-1. Demonstration Software



10. Installation Procedure

For demonstration of these integrated circuits, use the U3600BM demo board.

As the U3600BM is controllable via a serial bus (to load all the internal registers), Atmel provides demonstration and development software.

The software is written in Visual Basic and replaces the previously used microcontroller.

Please note that the Visual Basic program controls all of the U3600BM's registers, but it does not work as a complete telephone processor to handle all protocols needed to communicate between base station and handset or vice versa.

11. Software Installation

1. Copy *U3600in.exe* to your PC and remove the CD-ROM. (Saving the executable in a new directory will make later clean-up easier, as the directory of temporary files can be deleted following install.)
2. Execute *U3600in.exe* to unpack all necessary files.
3. Execute *setup.exe* to install the demonstration software. You will be asked for a directory in which to put the executable.
4. Start the software by double-clicking on *U3600.exe*.

12. System Requirements

- IBM®-compatible PC x386 or higher
- Windows® 3.xx or higher (Visual Basic software runs only under Windows®. The demo software does not run under Windows NT®.)
- Printer port 1, 2 or 3 (port is selectable via software)

To connect the demo board to the personal computer, see Figure 21-2 on page 41

13. Configuration of the U3600BM Demonstration Software

After following the instructions to load the software, the following options may be selected depending on your configuration and needs.

1. *Interface* (*LPT1*/*LPT2*/*LPT3*)

   The PC's parallel port is used for the communication between PC and demo board. Use the radio buttons *LPT1*/*LPT2*/*LPT3* to select the parallel port in use.

2. Auto-Send ON/OFF

   After modification of a register bit, the modified bit can be transmitted automatically or manually.

   To transmit a bit to the U3600BM register via the serial bus immediately after modification, select the *ON* radio button.

   If the *OFF* radio button is selected and one or more bits are modified, the bits are not transferred until the *Send* button, located below the register bits, is pressed.

14. Country-specific Selections

Depending on the country specifications, CT0 applications vary regarding transmit/ receive frequencies for base or mobile stations, channel spacing, number of channels and the frequency range, as well as the distance for base or mobile stations.

The corresponding data for each country is predefined by Atmel to provide maximum performance. The country-specific data are stored in a default database and will be used according to the *Country* selection.

Due to these country differences, the following buttons are needed.

1. *Mode*

   Choose either *Base* or *Mobile* from this drop-down list to define (according to the specific country) the necessary transmit/receive frequencies.

2. *Country*

   Select the appropriate country from this drop-down list.

3. *Channel*

   Each country has different frequencies and a different number of channels. From this drop-down list, select the country and the corresponding channel and frequencies.

If the predefined default country-specific database data is used, then only *Mode*, *Country* and *Channel* need to be specified; default values can be used for *fRef* and *M*.

15. Manual Country Selections

There are selections that can be made manually. These selected data are not stored in the predefined database and must be loaded with the unlabeled button (see (Unlabeled Button), below). If *Send-Country-Settings* is pressed, the manually set values will be overwritten by the predefined database values.

1. *fRef*

   Use this drop-down list to modify the reference frequency.

2. *M*

   Use this drop-down list to modify the M-value.

16. Buttons to Transmit the Default Database Country Data

1. *Send-Country-Settings*

   After selecting the country-specific information with the *Mode*/*Country*/*Channel* drop-down lists, the country data can be transmitted to the U3600BM demo board by pressing the *Send-Country-Settings* button.

2. (Unlabeled Button)

   If a manual selection of value for *M* or *fRef3* is made, press this button to transfer the manually modified data. (If a manual modification is made and the *Send-Country-Settings* button is pressed instead of the unlabeled button, the predefined default database data will overwrite the manual settings.)

17. Register Display Area and Buttons

In the register display area, all registers (R0 to R15) are displayed in binary form. Next to each register is a button to open a window in which all 8 bits of the register can be modified.

Bits with a grey background are application-specific bits, and can be modified depending on the application environment.

Bits with a light-brown background are country-specific predefined data and should not be modified because they have already been optimized by Atmel.

1. *R0* to *R15*

   These buttons are used to open a register window for bit-wise modification of the specific register.

2. Send all_Bits

   Normally, a transfer of all registers is done by pressing the *Send-Country-Settings* button, but if a manual modification was done which includes the light-brown bits (changes from the default country settings) the *Send all_Bits* button must be used.

18. *Store* and *Recall*

1. *Store*

   If you have defined a specific setup and would like to be able to recall it later, press this button to save it on the hard drive (you will be prompted to enter a filename).

2. *Recall*

   Press this button to load previously stored data from the hard drive.

19. Buttons for Special Functions

1. Enable

   The U3600BM contains several internal function blocks that can be switched on and off by enable/disable bits to save current during certain CT0 operating modes.

   There are also signals which can mute a signal path. Muting means that the signal will be disabled but the logic still consumes current.

   Press *Enable* to open a window to enable/disable certain functional blocks or to mute signals.

2. RSSI

   Activates RSSI-signal (field strength signal) to A/D converter and also opens a window where the A/D converter reference value can be adjusted for comparison with the RSSI signal.

3. VBatt

   Activates VBAT-signal (battery voltage) to A/D converter and also opens a window where the A/D converter reference value can be adjusted to find the battery voltage.

4. OSCFA

   This button opens a window to fine tune the oscillator frequency by switching three internal, binary-weighted capacitors.

5. Gain EARA

This button opens a window to adjust ear piece gain for adapting acoustic to electric parts.

6. AntiBacklash

   Opens a window to tune antibacklash of VCO2. Antibacklash bits (two bits) are set to zero and should not be changed by the customer. This adjustment possibility is reserved for the possibility of correction during the development phase.

   (Antibacklash means: in the case where VCO2 is locked, the correction pulses for locking would be zero without antibacklash. With antibacklash, however, there is a positive/negative pulse of equal length even in the lock condition. Small corrections would normally not come through with the duty-cycle of reference frequency, due to propagation delay, but with the antibacklash function, these small corrections become active with the cycle of the reference frequency. Without antibacklash, undesired spurious would occur).

   VCO1 and VCO3 incorporate fixed internal antibacklash lengths.

7. VCOFA

   This button opens a window for adjusting VCO1/VCO2/VCO3. Normally, VCO1 and VCO2 are predefined for a certain country and should be used only for test purposes.

   VCO3 adjustment is used in conjunction with the tank circuit connected to pin-LO1 and pin-LO2.

20. Others

1. RESET

   This button is used to initialize the demonstration software and reset all register bits to zero so that a defined starting condition is available.

2. Prog_Info

   Phone number to call in case of any problems concerning the U3600BM application.

3. QUIT/END

   Termination of the U3600BM demonstration program.

Figure 20-1. 27.12 MHz Transmit/Receive Application

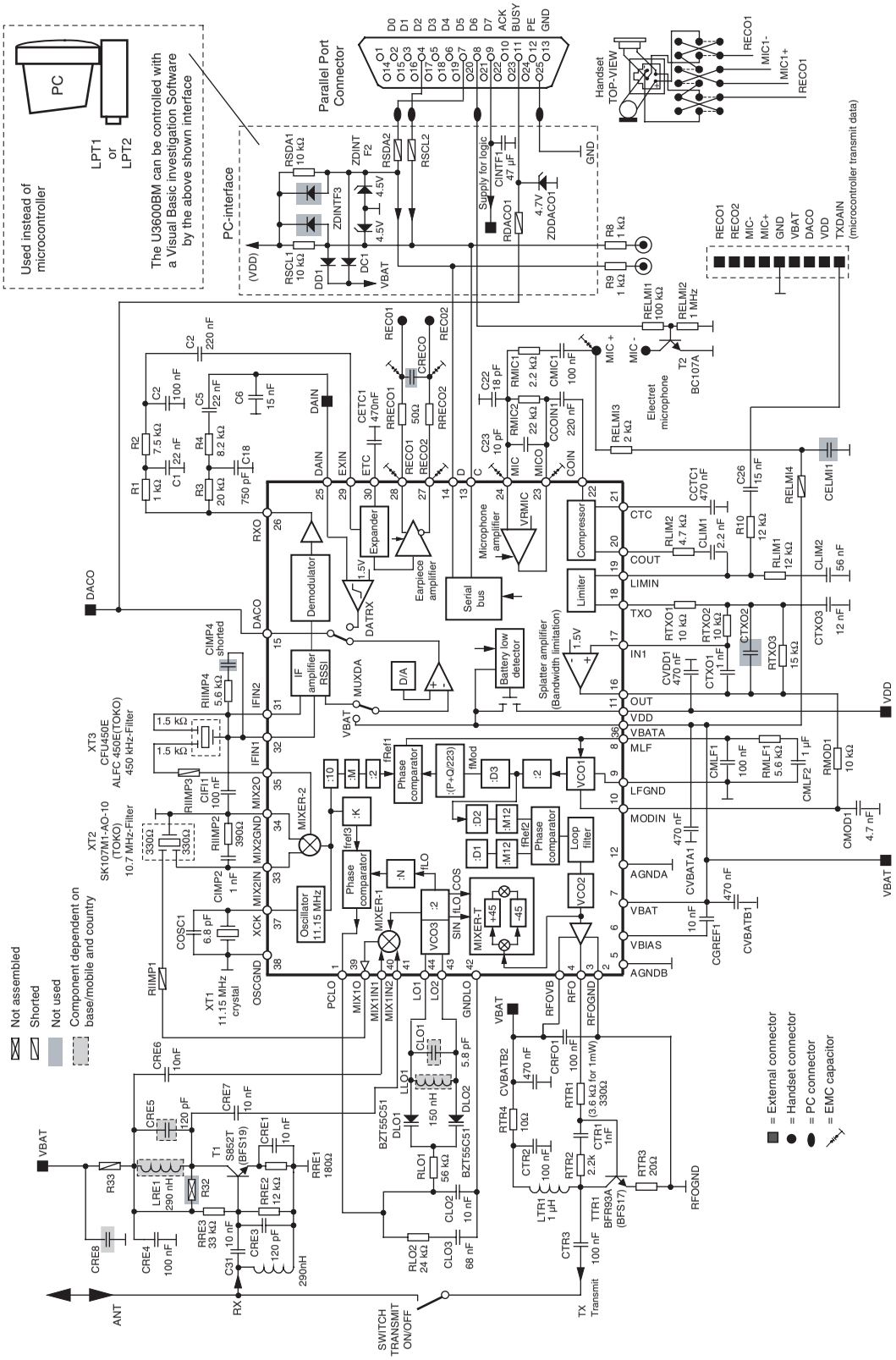


Table 20-1. Reg 0 - 15 for 27 MHz Application

27-MHz Setup Transmit	27-MHz Setup Receive
00000000	00000000
10000100	10000100
00111101	00111101
00000000	00000000
00000000	00000000
00100000	00100000
10100000	00100000
00000010	00000010
01011000	01011000
10001100	10001100
10011101	10011101
01000011	01000011
01000001	01000001
11100000	11100000
11100000	01100000
11000001	11000001

21. Demo Board and PC Connection for Demonstration

Figure 21-1. PC Connection to Demo Board

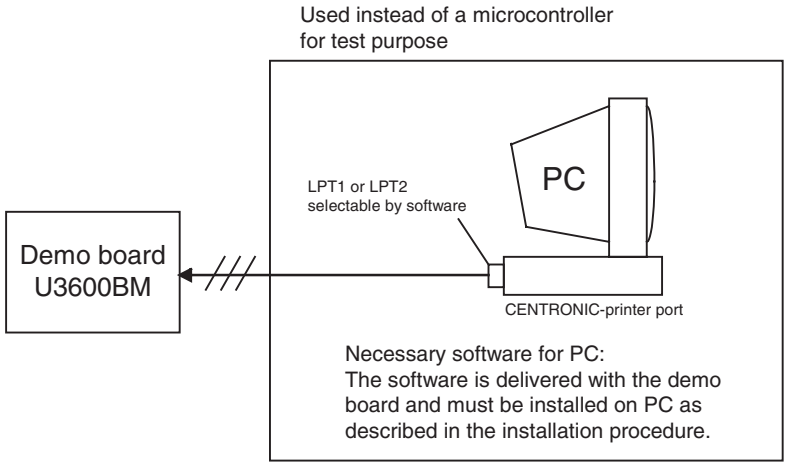
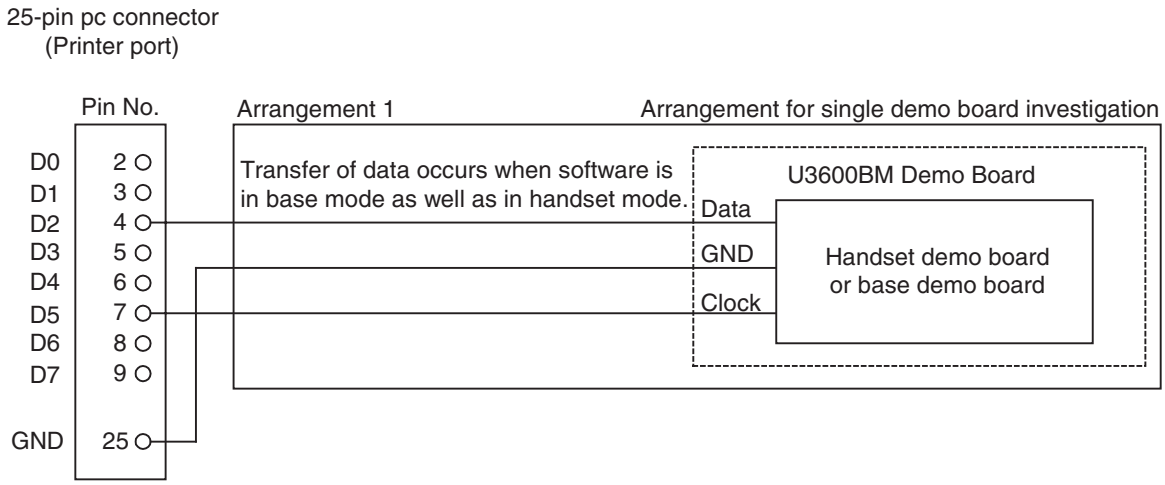


Table 21-1. Printer Port Connection

Pin	Description
2	Data input to U3600BM only for handset. Transfer only if software is in handset mode.
3	Clock input to U3600BM only for handset. Transfer only if software is in handset mode.
8	Data input to U3600BM only for base station. Transfer only if software is in base mode.
9	Clock input to U3600BM only for base station. Transfer only if software is in base mode.
4	Data input to U3600BM for handset and base station. Transfer in base mode as well as in handset mode.
7	Clock input to U3600BM for handset and base station. Transfer in base mode as well as in handset mode.
25	GND

Figure 21-2. Connection the Demo Board to the PC



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