Chapter 2

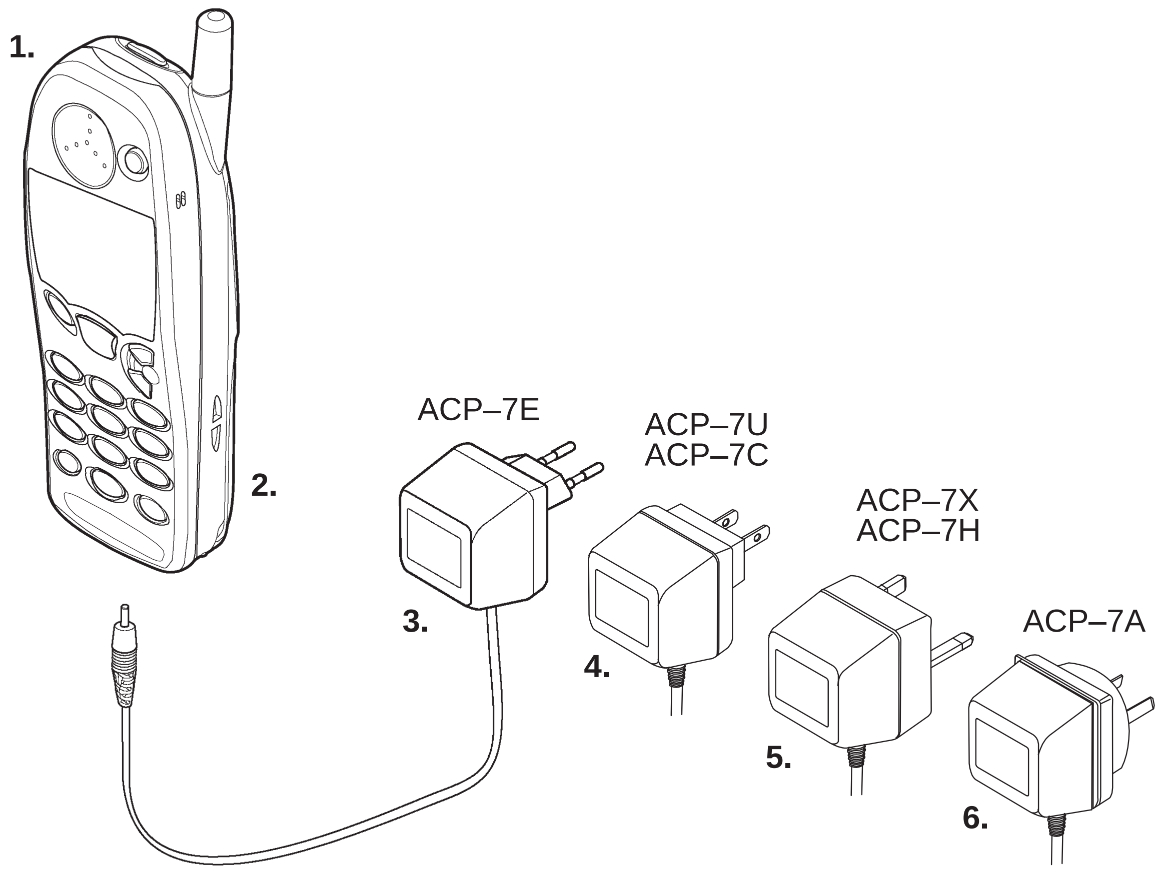
General Information

CONTENTS

Product Selection

Handportables

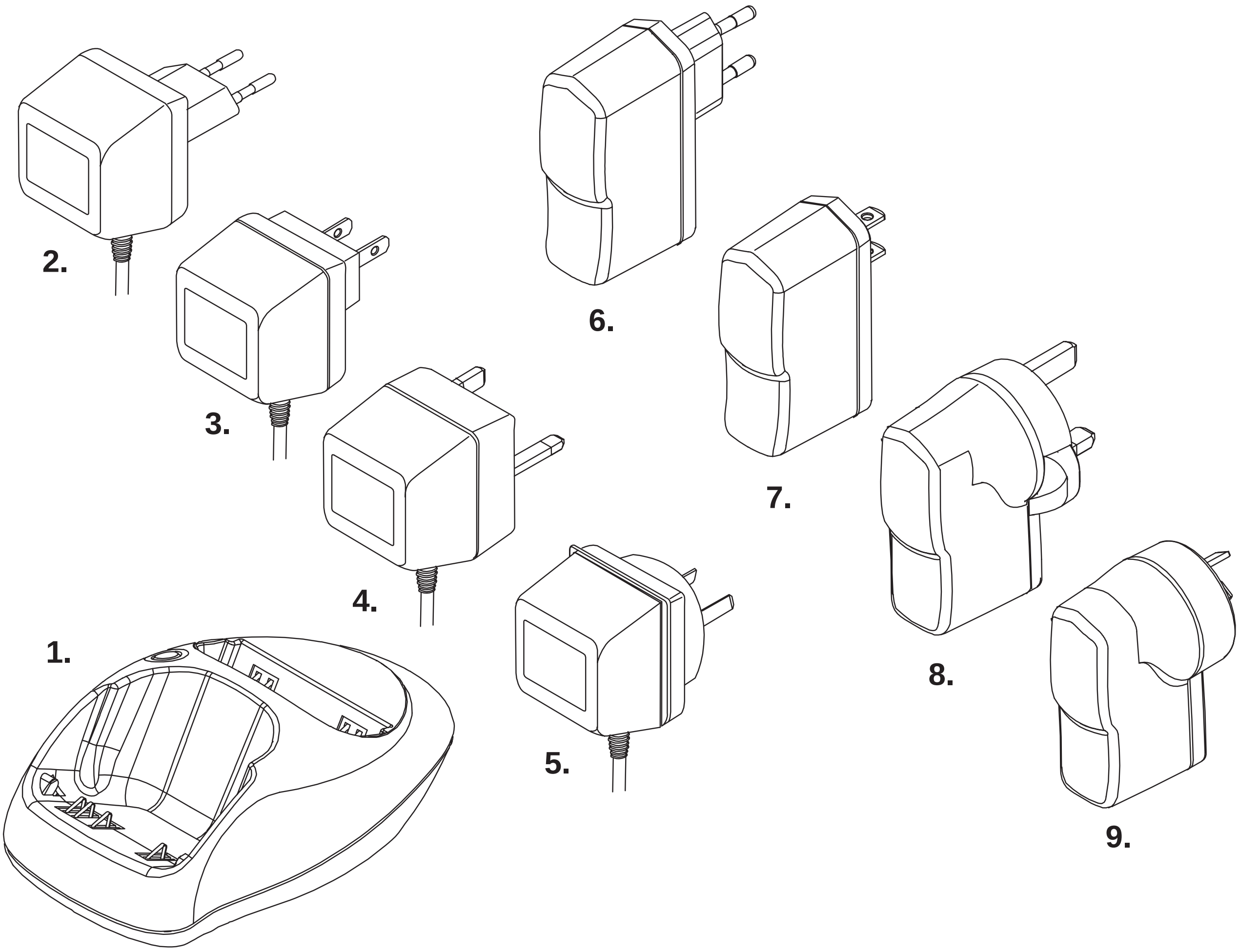
The NSE–1 is a handportable mobile telephone for the GSM network.



Item	Name:	Type code:	Material code:
1.	Transceiver	(See variant Appendices)	
2.	Standard battery (NiMH 900 mAh)	BMS–2	0670203
3.	AC Travel Charger (Euro plug) 207–253 Vac	ACP–7E	0675144
4.	AC Travel Charger (US plug) 108–132 Vac	ACP–7U	0675143
	AC Travel Charger (US plug) 198–242 Vac	ACP–7C	0675158
5.	AC Travel Charger (UK plug) 207–253 Vac	ACP–7X	0675145
	AC Travel Charger (UK plug) 180–220 Vac	ACP–7H	0675146
6.	AC Travel Charger (Australia) 216–264 Vac	ACP–7A	0675148

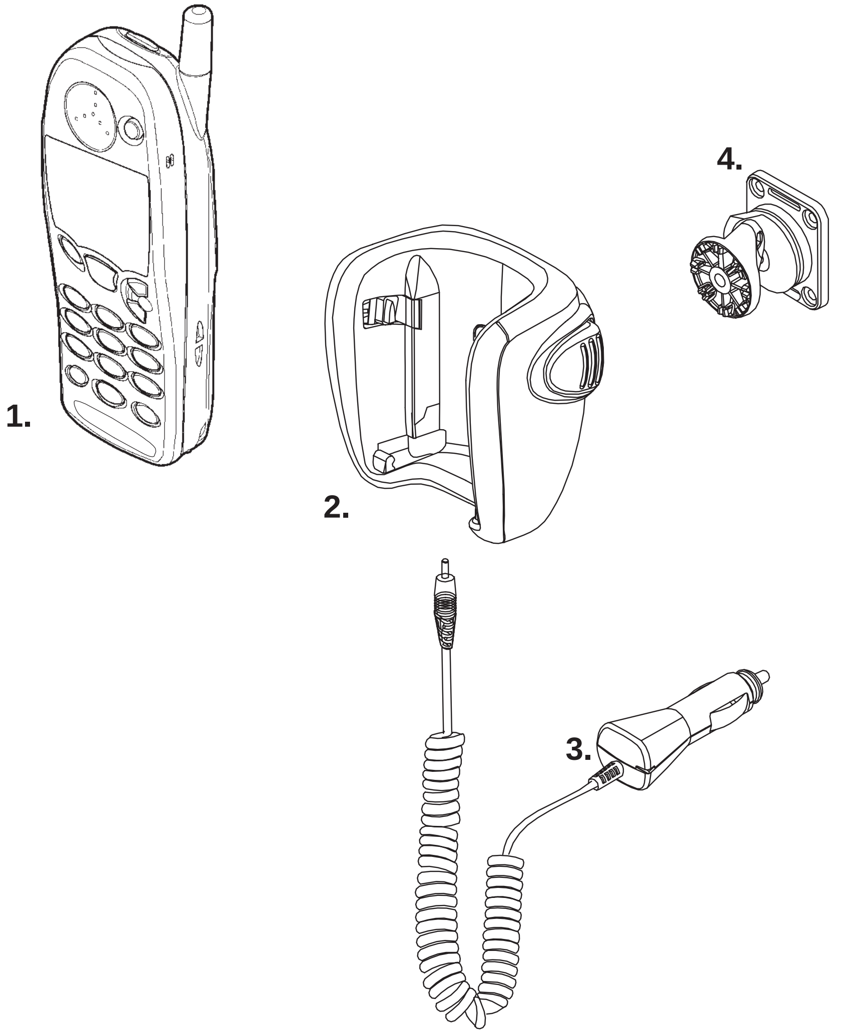
Desktop Option

The desktop option allows the user to charge the handportable and spare battery from mains.



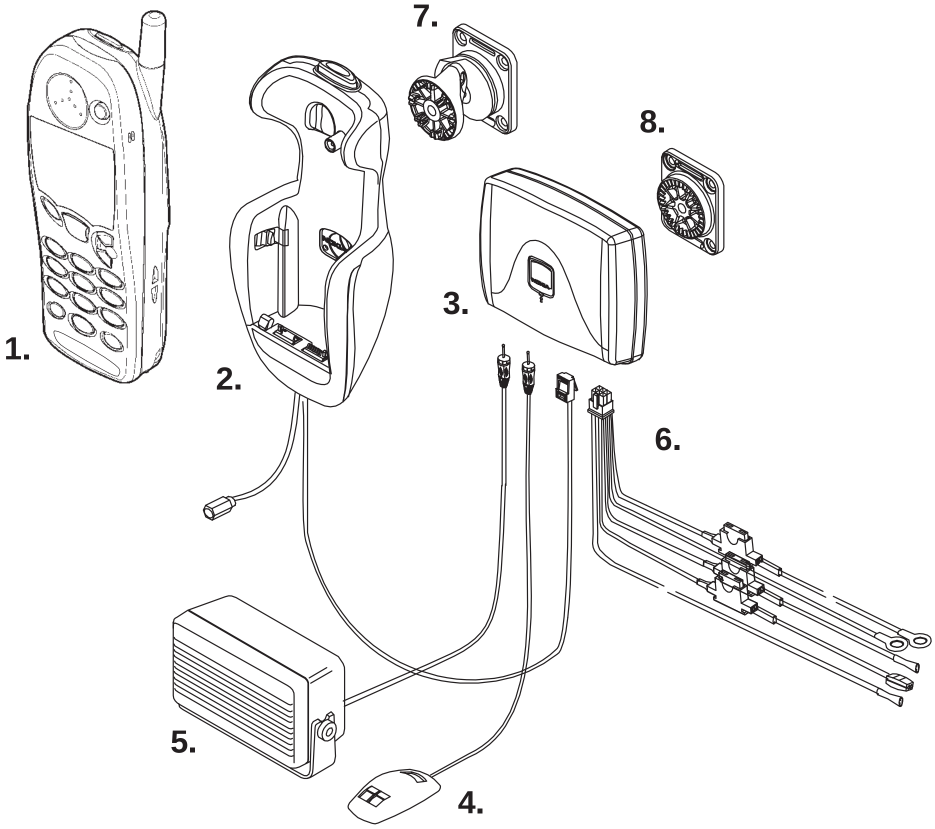
Item	Name:	Type code:	Material code:
1.	Desktop stand	DCH–9	0700049
2.	AC Travel Charger (Euro plug) 207–253 Vac	ACP–7E	0675144
3.	AC Travel Charger (US plug) 108–132 Vac	ACP–7U	0675143
	AC Travel Charger (US plug) 198–242 Vac	ACP–7C	0675158
4.	AC Travel Charger (UK plug) 207–253 Vac	ACP–7X	0675145
	AC Travel Charger (UK plug) 180–220 Vac	ACP–7H	0675146
5.	AC Travel Charger (Australia) 216–264 Vac	ACP–7A	0675148
6.	Fast Travel Charger (Euro plug) 90–264 Vac	ACP–9E	0675149
7.	Fast Travel Charger (US plug) 90–264 Vac	ACP–9U	0675151
8.	Fast Travel Charger (UK plug) 90–264 Vac	ACP–9X	0675150
9.	Fast Travel Charger (Australia) 90–264 Vac	ACP–9A	0675152

Basic Car Kit (CARK–64) Options



Item	Name:	Type code:	Material code:
1.	Transceiver	(See variant Appendices)	
2.	Mobile Holder	MBC–1	0700060
3.	Cigarette Lighter Charger	LCH–9	0657120
4.	Swivel Mount	HHS–9	0620037

Advanced Hands Free Car Installation (CARK–91) Options



Item	Name:	Type code:	Material code:
1.	Transceiver	(See variant Appendices)	
2.	Mobile Holder	MCC–1	0620043
3.	Hands Free Unit	HFU–2	0694049
4.	Hands Free Microphone	HFM–8	0690016
5.	Hands Free Speaker	HFS–12	0692008
6.	Power Cable	PCH–4J	0730055
7.	Swivel Mount	HHS–9	0620037
8.	Mounting Plate	MKU–1	0620036

Product and Module List

Unit/type:	Product code:
Transceiver NSE–1	See variant Appendixes
Slim Battery BLS–2 900 mAh	0670206
Standard Battery BMS–2 900 mAh	0670203
Standard Battery BMS–2S 900 mAh NiMH	0670225
Vibrator Battery BMS–2V 900 mAh	0670204
Extended Battery BLS–4 1500 mAh	0670207
AC Travel Charger ACP–7E (EUR) 207–253 Vac	0675144
AC Travel Charger ACP–7U (US) 108–132 Vac	0675143
AC Travel Charger ACP–7C (US) 198–242 Vac	0675158
AC Travel Charger ACP–7X (UK) 207–253 Vac	0675145
AC Travel Charger ACP–7H (UK) 180–220 Vac	0675146
AC Travel Charger ACP–7X (AUS) 216–264 Vac	0675148
Fast Travel Charger ACP–9E (EUR) 90–264 Vac	0675149
Fast Travel Charger ACP–9U (US) 90–264 Vac	0675151
Fast Travel Charger ACP–9X (UK) 90–264 Vac	0675150
Fast Travel Charger ACP–9A (AUS) 90–264 Vac	0675152
Cigarette Lighter Charger LCH–9	0675120
Desktop Stand DCH–9	0700049
Mobile Holder MBC–1	0700060
Mobile Holder MCC–1	0620043
Handsfree Unit HFU–2	0694049
Power Cable PCH–4J	0730055
HF Microphone HFM–8	0690016
HF Speaker HFS–12	0692008
Mounting Plate MKU–1	0620036
Swivel Mount HHS–9	0620037
Headset HDC–9	0694053
Belt Clip BCH–12	0720098
External Antenna Cable XRC–1	0730103
Data Adapter Cable DAC–2	0730106

Technical Specifications

General Specifications of Transceiver NSE–1

Parameter	Unit
Cellular system	GSM
RX frequency band	935 ... 960 MHz
TX frequency band	890 ... 915 MHz
Output power	+5 ...+33 dBm / 3.2 mW ... 2 W
Duplex spacing	45 MHz
Number of RF channels	124
Channel spacing	200 kHz
Number of TX power levels	15
Sensitivity, static channel	–102 dBm/ BER < 2.439 %
Frequency error, static channel	< 0.1 ppm
RMS phase error	< 5.0 ^{o}
Peak phase error	< 20.0 ^{o}

Chapter 3

System Module

CONTENTS

Transceiver NSE–1

Introduction

The NSE–1 is a radio transceiver unit designed for the GSM network. It is a GSM phase 2 power class 4 transceiver providing 15 power levels with a maximum output power of 2 W. The transceiver is a true 3 V transceiver.

The transceiver consists of System/RF module (UP8S/UP8R), User interface module (UE4S) and assembly parts.

The transceiver has full graphic display and one soft key based user interface.

The antenna is a fixed helix. External antenna connection is provided by rear RF connector

Functional Description

There are six different operation modes:

– power off mode

– idle mode

– NSPS mode

– active mode

– charge mode

– local mode

In the power off mode only the circuits needed for power up are supplied.

In the idle mode circuits are powered down and only sleep clock is running.

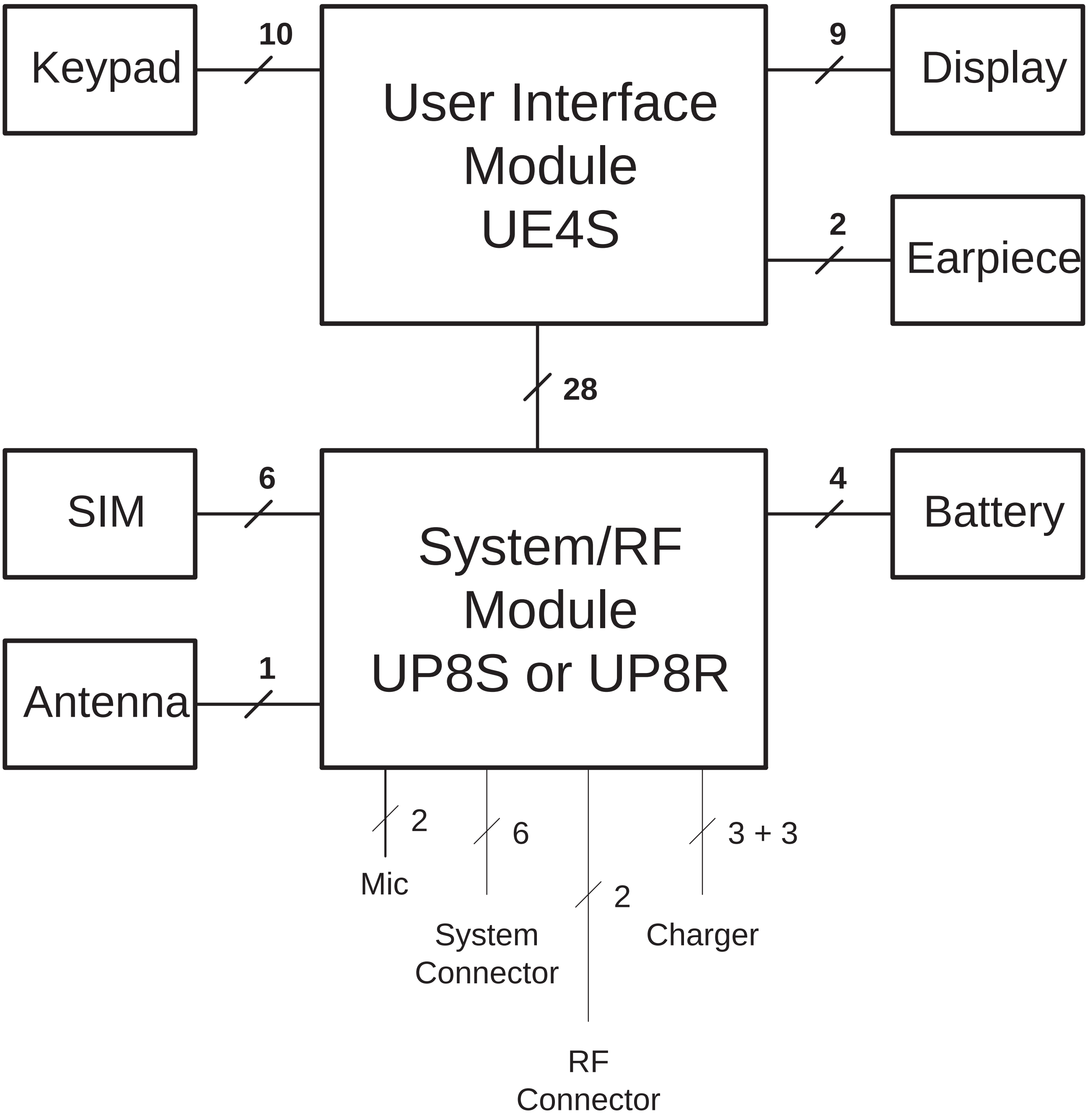
In the No Serve Power Save mode circuits are powered down, and only sleep clock is running if no carrier is found during the scanning period. The purpose of this mode is to reduce power consumption in the non–network area.

In the active mode all the circuits are supplied with power although some parts might be in the idle state part of the time.

The charge mode is effective in parallel with all previous modes. The charge mode itself consists of two different states, i.e. the charge and the maintenance mode.

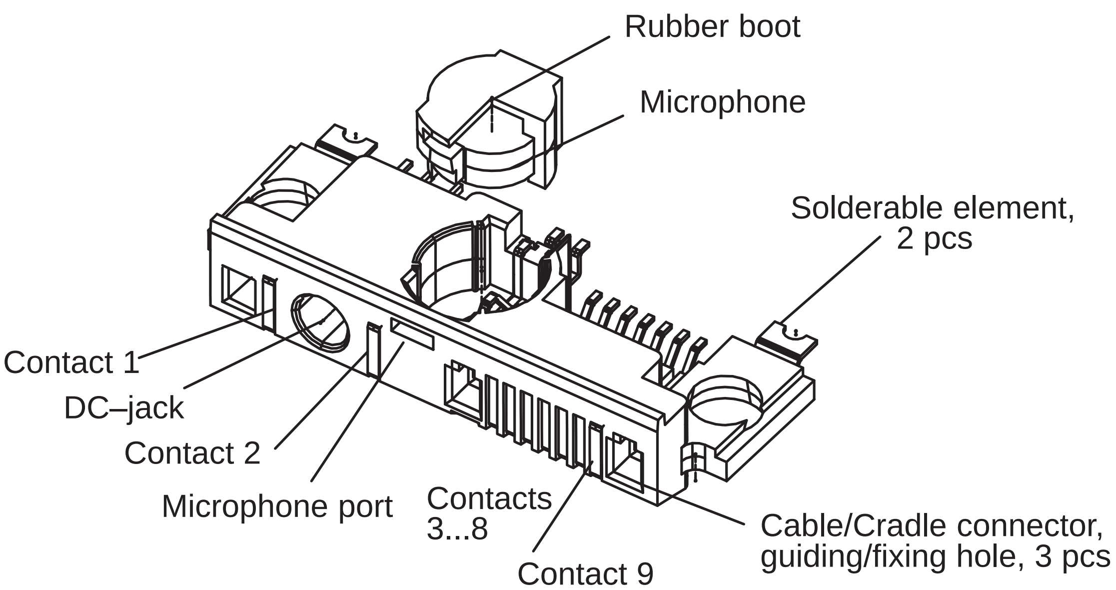
The local mode is used for alignment and testing.

Interconnection Diagram



System Module

External and Internal Connectors



System Connector Contacts

Contact	Line Symbol	Parameter	Minimum	Typical / Nominal	Maximum	Unit / Notes
1	VIN	Charger input voltage Charger input current	7.1 720 7.24 320	8.4 800 7.6 370	9.3 850 16.0 420	V/ Unloaded ACP–9 Charger mA/ Supply current V/ Unloaded ACP–7 Charger mA/ Supply current
DC–JACK	L_GND	Charger ground input	0	0	0	V/ Supply ground
DC–JACK	VIN	Charger input voltage Charger input current	7.1 720 7.24 320	8.4 800 7.6 370	9.3 850 16.0 420	V/ Unloaded ACP–9 Charger mA/ Supply current V/ Unloaded ACP–7 Charger mA/ Supply current
DC–JACK	CHRG CTRL	Output high voltage PWM frequency output low voltage	2.0 0	32	2.8 0.5	V/ Charger control (PWM) high Hz /PWM frequency for charger V
2	CHRG CTRL	Output high voltage PWM frequency	2.0	32	2.8	V/ Charger control (PWM) high Hz /PWM frequency for charger
Mic ports		Acoustic signal	N/A	N/A	N/A	Microphone sound ports
3	XMIC	Input signal voltage		60	1 Vpp	mVrms
4	SGND	Signal ground	0		0	mVrms
5	XEAR	Output signal voltage		80	1 Vpp	mVrms
6	MBUS	I/O low voltage I/O high voltage	0 2.0		0.8 2.8	Serial bidirectional control bus. Baud rate 9600 Bit/s
7	FBUS_RX	Input low voltage Input high voltage	0 2.0		0.8 2.8	V/ Fbus receive. V/ Serial Data, Baud rate 9.6k–230.4kBit/s
8	FBUS_TX	Output low voltage Output high voltage	0 2.0		0.8 2.8	V/ Fbus transmit. V/ Serial Data, Baud rate 9.6k–230.4kBit/s
9	L_GND	Charger ground input	0	0	0	V/ Supply ground

RF Connector Contacts

Con-tact	Line Symbol	Parameter	Mini-mum	Typical / Nomi-nal	Maxi-mum	Unit / Notes
1	EXT_ANT	Impedance		50ohm		External antenna connec-tor, 0 V DC
2	GND					

Supply Voltages and Power Consumtion

Connector	Line Symbol	Minimum	Typical / Nominal	Maximum/ Peak	Unit / Notes
Charging	VIN	7.1	8.4	9.3	V/ Travel charger, ACP–9
Charging	VIN	7.25	7.6	16.0	V/ Travel charger. ACP–7
Charging	I / VIN	720	800	850	mA/ Travel char-ger, ACP–9
Charging	I / VIN	320	370	420	mA/ Travel char-ger, ACP–7

Functional Description

The transceiver electronics consist of the Radio Module ie. RF + System blocks, the UI PCB, the display module and audio components. The key-pad and the display module are connected to the Radio Module with a connectors. System blocks and RF blocks are interconnected with PCB wiring. The Transceiver is connected to accessories via a bottom system connector with charging and accessory control.

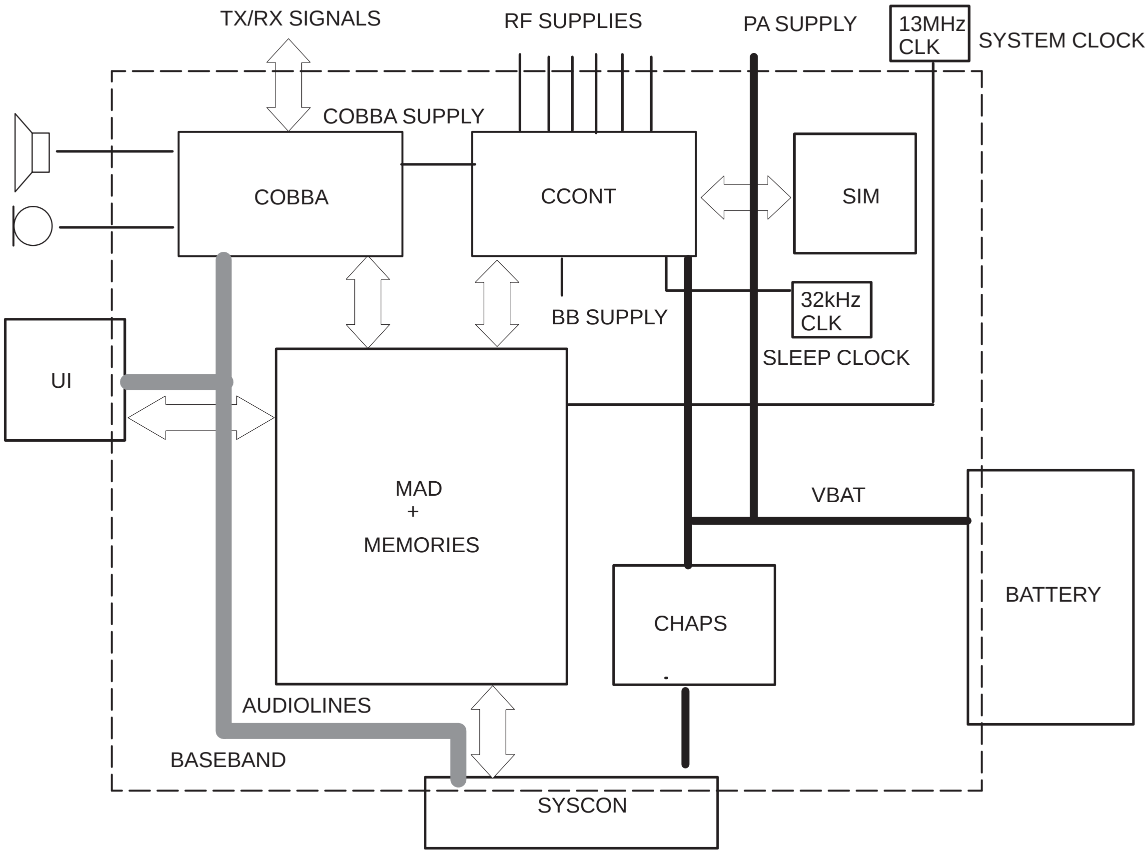
The System blocks provide the MCU, DSP and Logic control functions in MAD ASIC, external memories, audio processing and RF control hard-ware in COBBA ASIC. Power supply circuitry CCONT ASIC delivers oper-ating voltages both for the System and the RF blocks.

Charging control ASIC CHAPS is integrated power switch for battery charging.

The RF block is designed for a handportable phone which operates in the GSM system. The purpose of the RF block is to receive and demodulate the radio frequency signal from the base station and to transmit a modu-lated RF signal to the base station. The PLUSSA ASIC is used for VHF and PLL functions. The CRFU ASIC is used at the front end.

Baseband Module

Block Diagram



Technical Summary

The baseband module consists of four asics, CHAPS, CCONT, COBBA–GJ and MAD2, which take care of the baseband functions of NSE–1.

The baseband is running from a 2.8V power rail, which is supplied by a power controlling asic. In the CCONT asic there are 6 individually controlled regulator outputs for RF–section and two outputs for the baseband. In addition there is one +5V power supply output VCP for RF–part. The CCONT contains also a SIM interface, which supports both 3V and 5V SIM–cards. A real time clock function is integrated into the CCONT, which utilizes the same 32kHz clock supply as the sleep clock. A backup power supply is provided for the RTC, which keeps the real time clock running when the main battery is removed. The backup power supply is a rechargable polyacene battery. The backup time with this battery is minimum of ten minutes.

The interface between the baseband and the RF section is handled by a specific asic. The COBBA asic provides A/D and D/A conversion of the in–phase and quadrature receive and transmit signal paths and also A/D and D/A conversions of received and transmitted audio signals to and from the UI section. The COBBA supplies the analog TXC and AFC signals to rf section according to the MAD DSP digital control and converts analog AGC into digital signal for the DSP. Data transmission between the COBBA and the MAD is implemented using a parallel connection for high speed signalling and a serial connection for PCM coded audio signals. Digital speech processing is handled by the MAD asic. The COBBA asic is a dual voltage circuit, the digital parts are running from the baseband supply VBB and the analog parts are running from the analog supply VCOBBA.

The baseband supports three external microphone inputs and two external earphone outputs. The inputs can be taken from an internal microphone, a headset microphone or from an external microphone signal source. The microphone signals from different sources are connected to separate inputs at the COBBA asic.

The output for the internal earphone is a dual ended type output capable of driving a dynamic type speaker. Input and output signal source selection and gain control is performed inside the COBBA asic according to control messages from the MAD. Keypad tones, DTMF, and other audio tones are generated and encoded by the MAD and transmitted to the COBBA for decoding. A buzzer and an external vibra alert control signals are generated by the MAD with separate PWM outputs.

EMC shieding is implemented using a metallized plastic B–cover with a conductive rubber seal on the ribs. On the other side the engine is shielded with a frame having a conductive rubber on the inner walls, which makes a contact to a ground ring of the engine board and a ground plane of the UI–board. Heat generated by the circuitry will be conducted out via the PCB ground planes.

Bottom Connector External Contacts

Contact	Line Symbol	Function
1	VIN	Charger input voltage
DC–jack side contact (DC–plug ring)	L_GND	Charger ground
DC–jack center pin	VIN	Charger input voltage
DC–jack side contact (DC–plug jacket)	CHRG_CTRL	Charger control output (from phone)
2	CHRG_CTRL	Charger control output (from phone)
Microphone acoustic ports		Acoustic signal (to phone)
3	XMIC	Accessory microphone signal input (to phone)
4	SGND	Accessory signal ground
5	XEAR	Accessory earphone signal output (from phone)
6	MBUS	MBUS, bidirectional flash programming clock signal
7	FBUS_RX	FBUS, unidirectional flash programming serial data input (to phone)
8	FBUS_TX	FBUS, unidirectional flash programming serial data output (from phone)
9	L_GND	Charger ground

Bottom Connector Signals

Pin	Name	Min	Typ	Max	Unit	Notes
1,3	VIN	7.25	7.6	7.95	V	Unloaded ACP–7 Charger (5kohms load)
				16.9	V	Peak output voltage (5kohms load)
		3.25	3.6	3.95	V	Loaded output voltage (10ohms load)
		320	370	420	mA	Supply current
		7.1	8.4	9.3	V	Unloaded ACP–9 Charger
		3.25	3.6	3.95	V	Loaded output voltage (10ohms load)
		720	800	850	mA	Supply current
2	L_GND	0		0	V	Supply ground
4,5	CHRG_ CTRL	0		0.5	V	Charger control PWM low
		2.0		2.85	V	Charger control PWM high
			32		Hz	PWM frequency for a fast charger
		1		99	%	PWM duty cycle
6	MICP		N/A			see section Internal microphone
7	MICN		N/A			see section Internal microphone

Pin	Name	Min	Typ	Max	Unit	Notes
8	XMIC	2.0		2.2	kΩ	Input AC impedance
				1	Vpp	Maximum signal level
		1.47		1.55	V	Mute (output DC level)
		2.5		2.85	V	Unmute (output DC level)
		100		600	μA	Bias current
			58	490	mV	Maximum signal level
	HMIC	0	3.2	29.3	mV	Microphone signal Connected to COBBA MIC3P input
9	SGND		47		Ω	Output AC impedance (ref. GND)
			10		μF	Series output capacitance
			380		Ω	Resistance to phone ground
10	XEAR		47		Ω	Output AC impedance (ref. GND)
			10		μF	Series output capacitance
		16		300	Ω	Load AC impedance to SGND (Head-set)
		4.7	10		kΩ	Load AC impedance to SGND (Acces-sory)
			1.0		Vpp	Maximum output level (no load)
			22	626	mV	Output signal level
			10		kΩ	Load DC resistance to SGND (Acces-sory)
		16		1500	Ω	Load DC resistance to SGND (Head-set)
			2.8		V	DC voltage (47k pull–up to VBB)
	HEAR		28	626	mV	Earphone signal (HF– HFCM) Connected to COBBA HF output
11	MBUS	0 2.0	logic low logic high	0.8 2.85	V	Serial bidirectional control bus. Baud rate 9600 Bit/s Phone has a 4k7 pullup resistor
12	FBUS_RX	0 2.0	logic low logic high	0.8 2.85	V	Fbus receive. Serial Data Baud rate 9.6k–230.4kBit/s Phone has a 220k pulldown resistor
13	FBUS_TX	0 2.0	logic low logic high	0.5 2.85	V	Fbus transmit. Serial Data Baud rate 9.6k–230.4kBit/s Phone has a 47k pullup resistor
14	GND	0		0.3	V	Supply ground

Battery Connector

Pin	Name	Min	Typ	Max	Unit	Notes
1	BVOLT	3.0	3.6	4.5	V	Battery voltage
				5.0		Maximum voltage in call state with charger
				5.3		Maximum voltage in idle state with charger
2	BSI	0		2.85	V	Battery size indication Phone has 100kohm pull up resistor. SIM Card removal detection (Treshold is 2.4V@VBB=2.8V)
		2.2		18	kohm	Battery indication resistor (Ni battery)
		20	22	24	kohm	Battery indication resistor (service battery)
		27		51	kohm	Battery indication resistor (4.1V Lithium battery)
		68		91	kohm	Battery indication resistor (4.2V Lithium battery)
3	BTEMP	0		1.4	V	Battery temperature indication Phone has a 100k (+–5%) pullup resistor, Battery package has a NTC pulldown resistor: 47k+–5%@+25C , B=4050+–3%
		2.1		3	V	Phone power up by battery (input)
		5	10	20	ms	Power up pulse width
		1.9		2.85	V	Battery power up by phone (output)
		90	100	200	ms	Power up pulse width
		0		1	kohm	Local mode initialization (in production)
		20	22	25	kHz	PWM control to VIBRA BATTERY
4	BGND	0		0	V	Battery ground

SIM Card Connector

Pin	Name	Parameter	Min	Typ	Max	Unit	Notes
4	GND	GND	0		0	V	Ground
3, 5	VSIM	5V SIM Card 3V SIM Card	4.8 2.8	5.0 3.0	5.2 3.2	V	Supply voltage
6	DATA	5V Vin/Vout 3V Vin/Vout	4.0 0 2.8 0	”1” ”0” ”1” ”0”	VSIM 0.5 VSIM 0.5	V	SIM data Trise/Tfall max 1us
2	SIMRST	5V SIM Card 3V SIM Card	4.0 2.8	”1” ”1”	VSIM VSIM	V	SIM reset
1	SIMCLK	Frequency Trise/Tfall		3.25	 25	MHz ns	SIM clock

Internal Microphone

Pin	Name	Min	Typ	Max	Unit	Notes
6	MICP		0.55	4.1	mV	Connected to COBBA MIC2N input. The maximum value corresponds to1 kHz, 0 dBmO network level with input amplifier gain set to 32 dB. typical value is maximum value – 16 dB.
7	MICN		0.55	4.1	mV	Connected to COBBA MIC2P input. The maximum value corresponds to1 kHz, 0 dBmO network level with input amplifier gain set to 32 dB. typical value is maximum value – 16 dB.

RTC Backup Battery

The RTC block in CCONT needs a power backup to keep the clock running when the phone battery is disconnected. The backup power is supplied from a rechargable polyacene battery that can keep the clock running minimum of 10 minutes. The backup battery is charged from the main battery through CHAPS.

Signal	Parameter	Min	Typ	Max	Unit	Notes
VBACK	Backup battery charging from CHAPS	3.02	3.15	3.28	V	
	Backup battery charging from CHAPS	100	200	500	uA	Vout@VBAT–0.2V
VBACK	Backup battery supply to CCONT	2		3.28	V	Battery capacity 65uAh
	Backup battery supply to CCONT		80		uA	

Buzzer

Signal	Maximum output current	Input high level	Input low level	Level (PWM) range, %	Frequency range, Hz
BuzzPWM / BUZZER	2mA	2.5V	0.2V	0...50 (128 linear steps)	440...4700

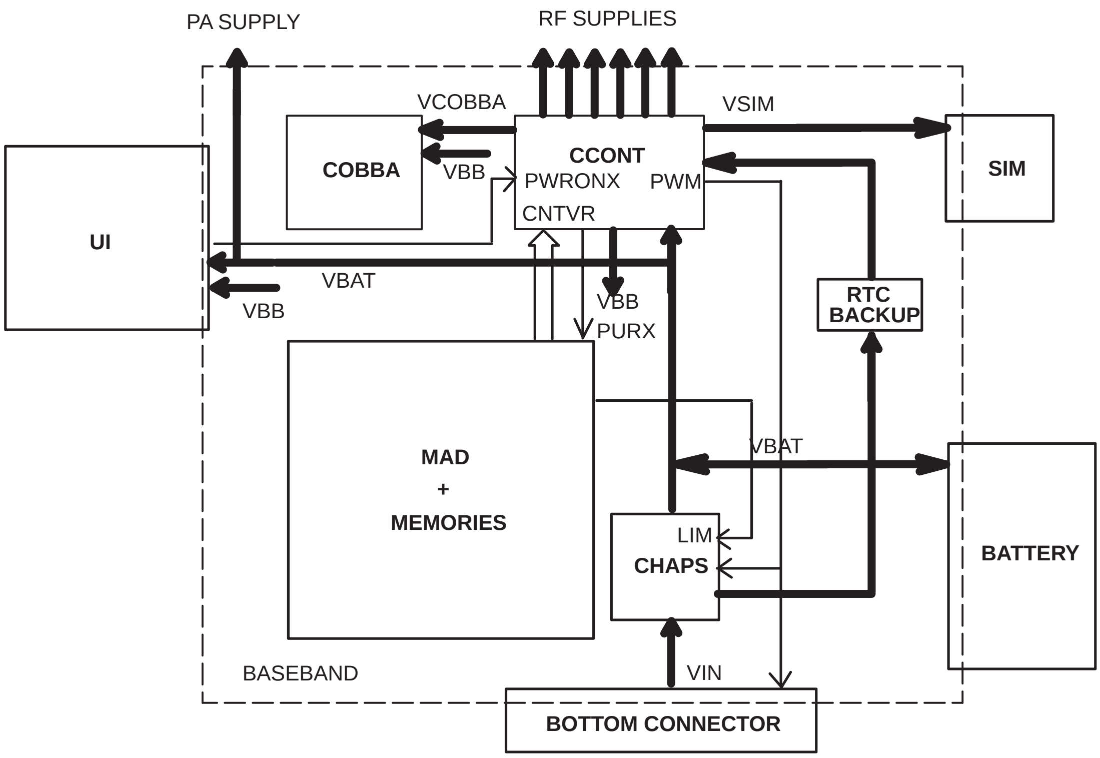
Functional Description

Power Distribution

In normal operation the baseband is powered from the phone‘s battery. The battery consists of one Lithium–Ion cell. There is also a possibility to use batteries consisting of three Nickel Metal Hydride cells. An external charger can be used for recharging the battery and supplying power to the phone. The charger can be either a standard charger that can deliver around 400 mA or so called performance charger, which can deliver supply current up to 850 mA.

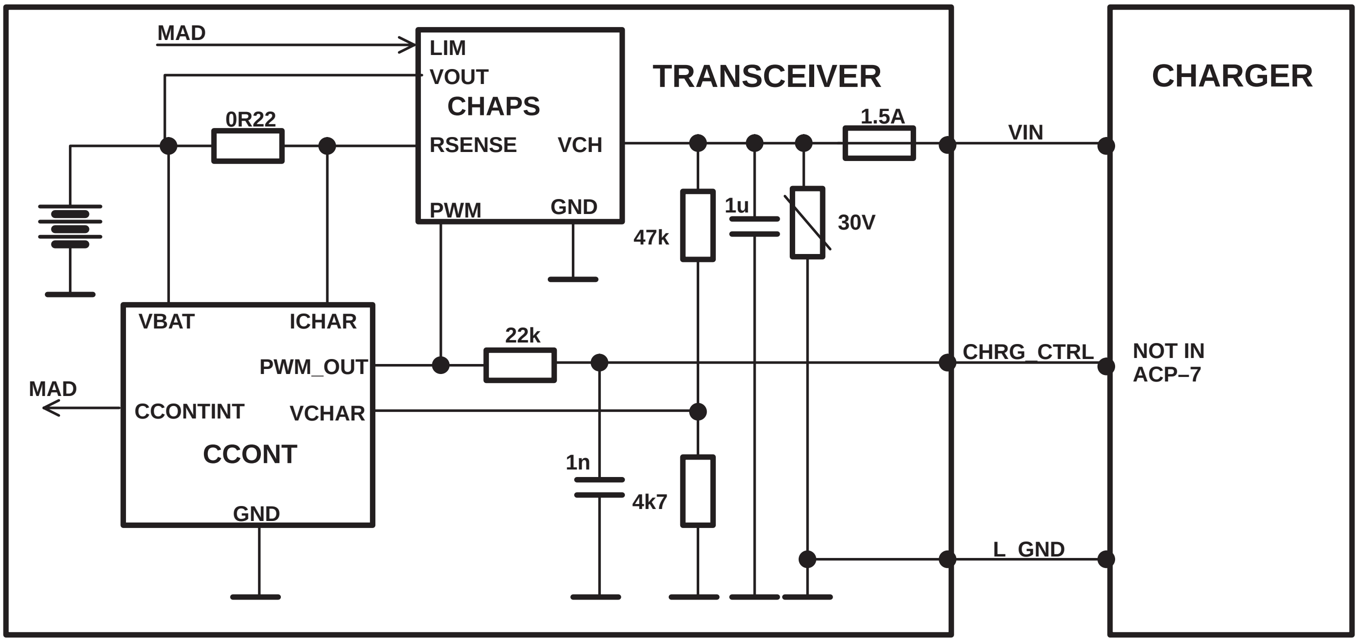
The baseband contains components that control power distribution to whole phone excluding those parts that use continuous battery supply. The battery feeds power directly to three parts of the system: CCONT, power amplifier, and UI (buzzer and display and keyboard lights). Figure below shows a block diagram of the power distribution.

The power management circuit CHAPS provides protection agains overvoltages, charger failures and pirate chargers etc. that would otherwise cause damage to the phone.



Battery charging

The electrical specifications give the idle voltages produced by the acceptable chargers at the DC connector input. The absolute maximum input voltage is 30V due to the transient suppressor that is protecting the charger input. At phone end there is no difference between a plug–in charger or a desktop charger. The DC–jack pins and bottom connector charging pads are connected together inside the phone.



Startup Charging

When a charger is connected, the CHAPS is supplying a startup current minimum of 130mA to the phone. The startup current provides initial charging to a phone with an empty battery. Startup circuit charges the battery until the battery voltage level is reaches 3.0V (+/– 0.1V) and the CCONT releases the PURX reset signal and program execution starts. Charging mode is changed from startup charging to PWM charging that is controlled by the MCU software. If the battery voltage reaches 3.55V (3.75V maximum) before the program has taken control over the charging, the startup current is switched off. The startup current is switched on again when the battery voltage is sunken 100mV (nominal).

Parameter	Symbol	Min	Typ	Max	Unit
VOUT Start– up mode cutoff limit	Vstart	3.45	3.55	3.75	V
VOUT Start– up mode hysteresis NOTE: Cout = 4.7 uF	Vstarthys	80	100	200	mV
Start–up regulator output current VOUT = 0V ... Vstart	Istart	130	165	200	mA

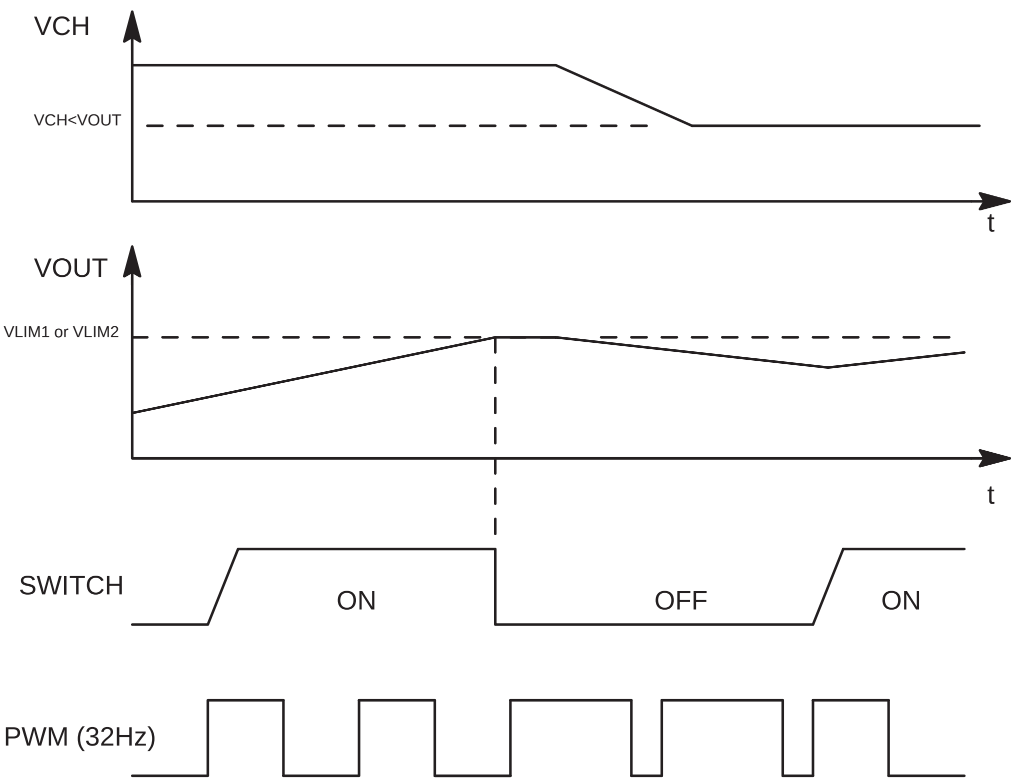
Battery Overvoltage Protection

Output overvoltage protection is used to protect phone from damage. This function is also used to define the protection cutoff voltage for different battery types (Li or Ni). The power switch is immediately turned OFF if the voltage in VOUT rises above the selected limit VLIM1 or VLIM2.

Parameter	Symbol	LIM input	Min	Typ	Max	Unit
Output voltage cutoff limit (during transmission or Li–battery)	VLIM1	LOW	4.4	4.6	4.8	V
Output voltage cutoff limit (no transmission or Ni–battery)	VLIM2	HIGH	4.8	5.0	5.2	V

The voltage limit (VLIM1 or VLIM2) is selected by logic LOW or logic HIGH on the CHAPS (N101) LIM– input pin. Default value is lower limit VLIM1.

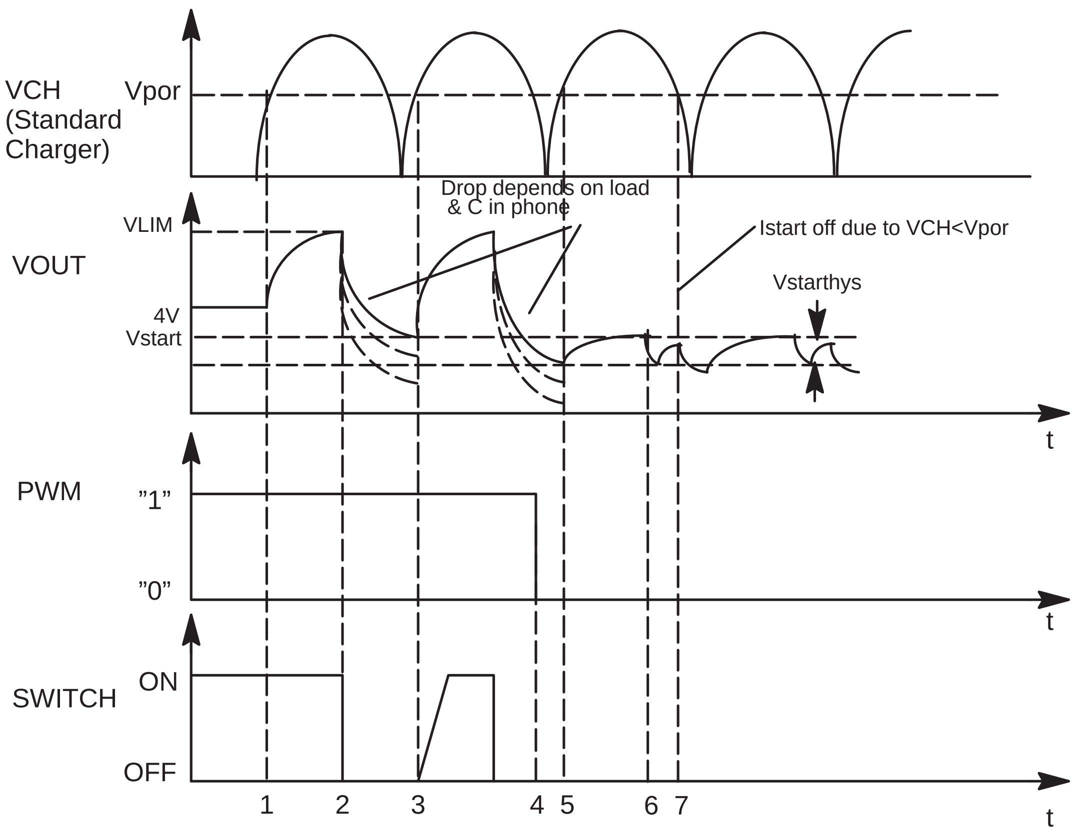
When the switch in output overvoltage situation has once turned OFF, it stays OFF until the the battery voltage falls below VLIM1 (or VLIM2) and PWM = LOW is detected. The switch can be turned on again by setting PWM = HIGH.



Battery Removal During Charging

Output overvoltage protection is also needed in case the main battery is removed when charger connected or charger is connected before the battery is connected to the phone.

With a charger connected, if VOUT exceeds VLIM1 (or VLIM2), CHAPS turns switch OFF until the charger input has sunken below Vpor (nominal 3.0V, maximum 3.4V). MCU software will stop the charging (turn off PWM) when it detects that battery has been removed. The CHAPS remains in protection state as long as PWM stays HIGH after the output overvoltage situation has occured.

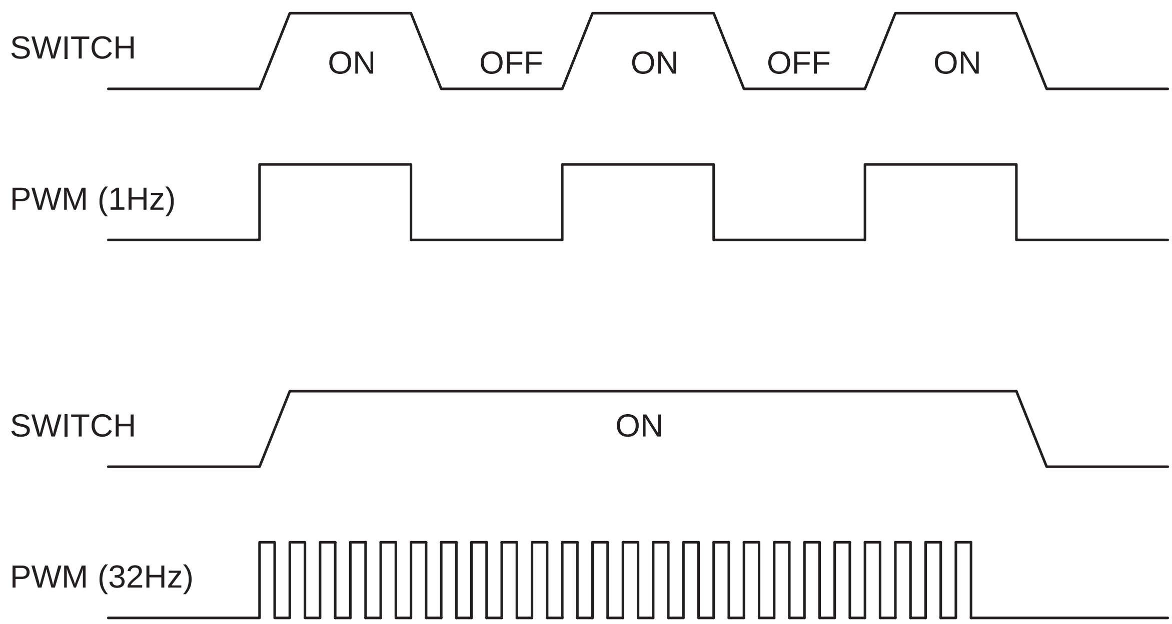


1. Battery removed, (standard) charger connected, VOUT rises (follows charger voltage)
2. VOUT exceeds limit VLIM(X), switch is turned immediately OFF
3. VOUT falls (because no battery) , also VCH<Vpor (standard chargers full–rectified output). When VCH > Vpor and VOUT < VLIM(X) –> switch turned on again (also PWM is still HIGH) and VOUT again exceeds VLIM(X).
4. Software sets PWM = LOW –> CHAPS does not enter PWM mode
5. PWM low –> Startup mode, startup current flows until Vstart limit reached
6. VOUT exceeds limit Vstart, Istart is turned off
7. VCH falls below Vpor

Different PWM Frequencies (1Hz and 32 Hz)

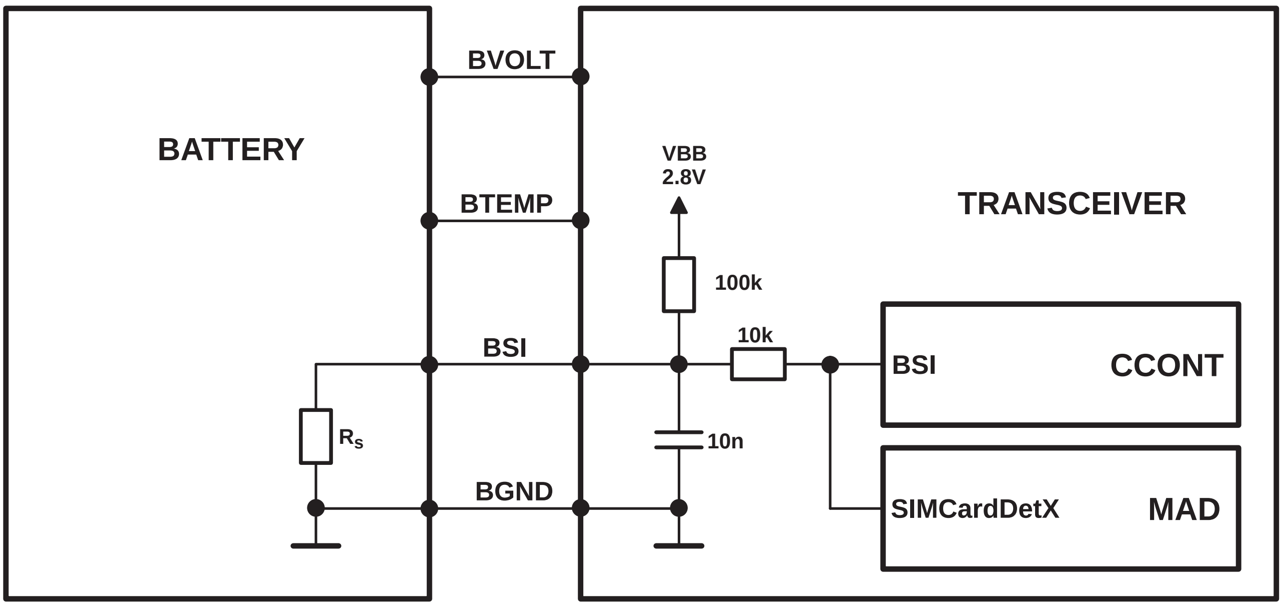
When a travel charger (2– wire charger) is used, the power switch is turned ON and OFF by the PWM input when the PWM rate is 1Hz. When PWM is HIGH, the switch is ON and the output current Iout = charger current – CHAPS supply current. When PWM is LOW, the switch is OFF and the output current Iout = 0. To prevent the switching transients inducing noise in audio circuitry of the phone soft switching is used.

The performance travel charger (3– wire charger) is controlled with PWM at a frequency of 32Hz. When the PWM rate is 32Hz CHAPS keeps the power switch continuously in the ON state.

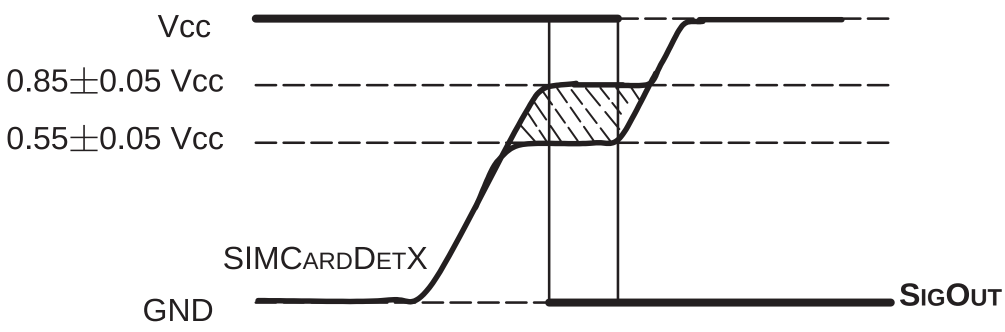


Battery Identification

Different battery types are identified by a pulldown resistor inside the battery pack. The BSI line inside transceiver has a 100k pullup to VBB. The MCU can identify the battery by reading the BSI line DC–voltage level with a CCONT (N100) A/D–converter.

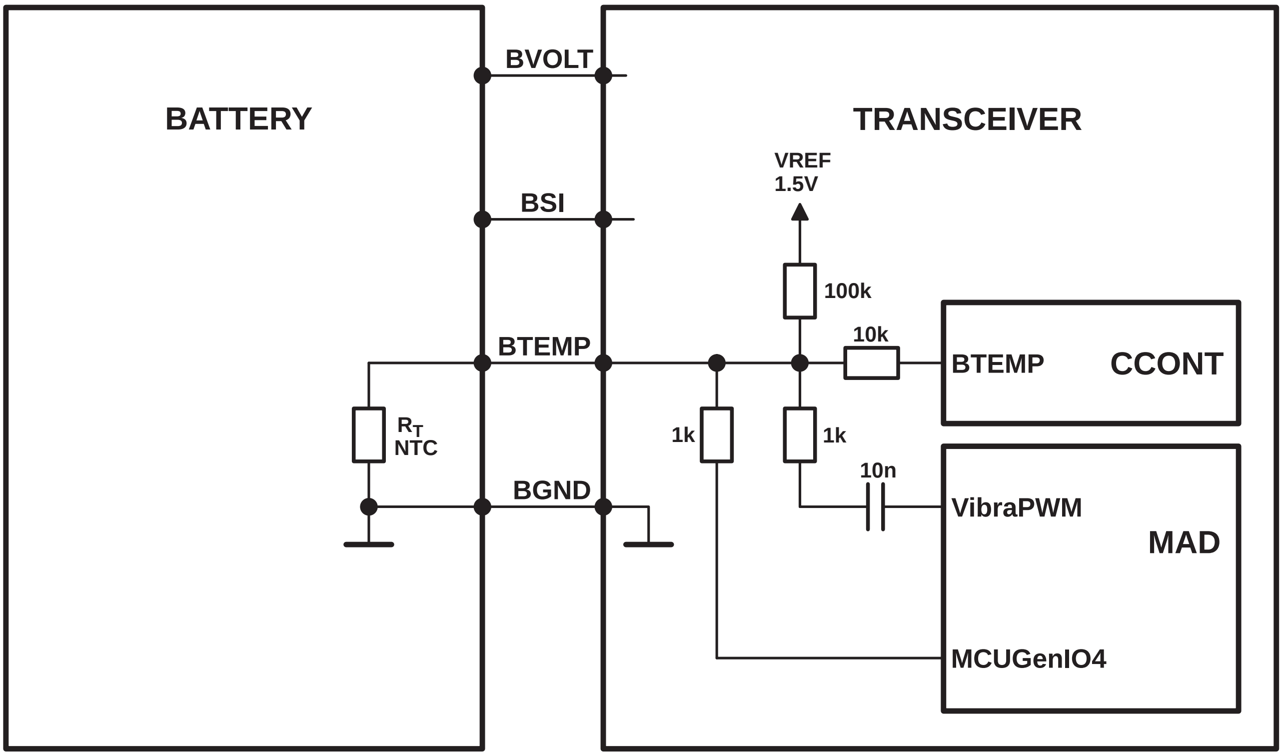


The battery identification line is used also for battery removal detection. The BSI line is connected to a SIMCardDetX line of MAD2 (D200). SIMCardDetX is a threshold detector with a nominal input switching level 0.85xVcc for a rising edge and 0.55xVcc for a falling edge. The battery removal detection is used as a trigger to power down the SIM card before the power is lost. The BSI contact in the battery pack is made 0.7mm shorter than the supply voltage contacts so that there is a delay between battery removal detection and supply power off.



Battery Temperature

The battery temperature is measured with a NTC inside the battery pack. The BTEMP line inside transceiver has a 100k pullup to VREF. The MCU can calculate the battery temperature by reading the BTEMP line DC–voltage level with a CCONT (N100) A/D–converter.



Supply Voltage Regulators

The heart of the power distrubution is the CCONT. It includes all the voltage regulators and feeds the power to the whole system. The baseband digital parts are powered from the VBB regulator which provides 2.8V baseband supply. The baseband regulator is active always when the phone is powered on. The VBB baseband regulator feeds MAD and memories, COBBA digital parts and the LCD driver in the UI section. There is a separate regulator for a SIM card. The regulator is selectable between 3V and 5V and controlled by the SIMPwr line from MAD to CCONT. The COBBA analog parts are powered from a dedicated 2.8V supply VCOBBA. The CCONT supplies also 5V for RF. The CCONT contains a real time clock function, which is powered from a RTC backup when the main battery is disconnected.

The RTC backup is rechargable polyacene battery, which has a capacity of 50uAh (@3V/2V) The battery is charged from the main battery voltage by the CHAPS when the main battery voltage is over 3.2V. The charging current is 200uA (nominal).

Operating mode	Vref	RF REG	VCOB-BA	VBB	VSIM	SIMIF
Power off	Off	Off	Off	Off	Off	Pull down
Power on	On	On/Off	On	On	On	On/Off
Reset	On	Off VR1 On	On	On	Off	Pull down
Sleep	On	Off	Off	On	On	On/Off

NOTE:

CCONT includes also five additional 2.8V regulators providing power to the RF section. These regulators can be controlled either by the direct control signals from MAD or by the RF regulator control register in CCONT which MAD can update. Below are the listed the MAD control lines and the regulators they are controlling.

- TxPwr controls VTX regulator (VR5)
- RxPwr controls VRX regulator (VR2)
- SynthPwr controls VSYN_1 and VSYN_2 regulators (VR4 and VR3)
- VCXOPwr controls VXO regulator (VR1)

CCONT generates also a 1.5 V reference voltage VREF to COBBA, PLUSSA and CRFU. The VREF voltage is also used as a reference to some of the CCONT A/D converters.

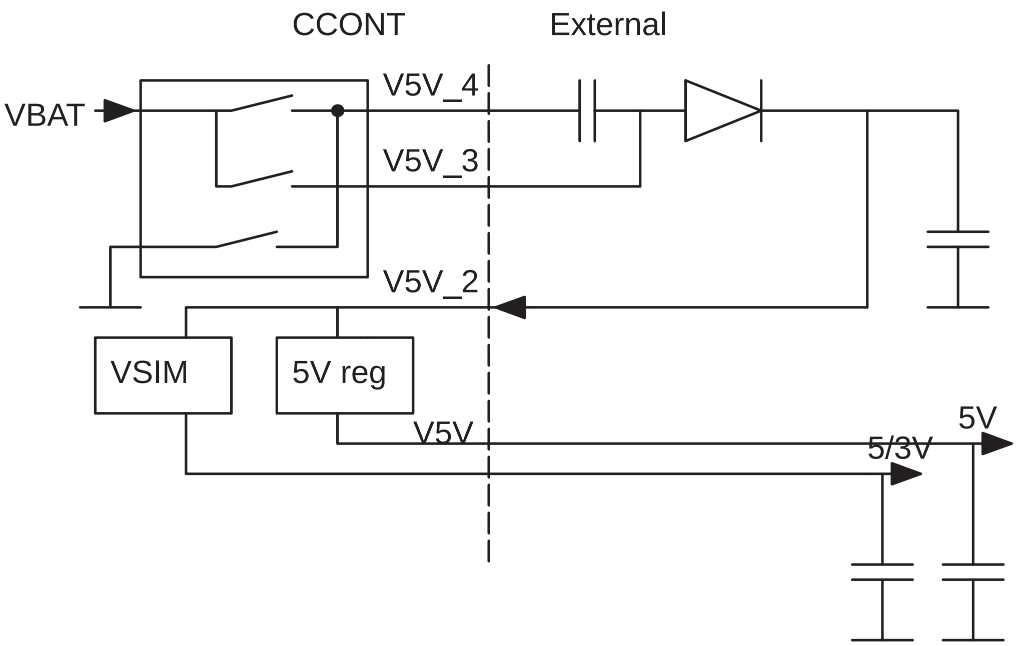
In additon to the above mentioned signals MAD includes also TXP control signal which goes to PLUSSA power control block and to the power amplifier. The transmitter power control TXC is led from COBBA to PLUSSA.

Switched Mode Supply VSIM

There is a switched mode supply for SIM–interface and 5V regulator, which supplies to RF section. SIM voltage is selected via serial IO. The 5V SMR can be switched on independently of the SIM voltage selection, but can’t be switched off when VSIM voltage value is set to 5V.

NOTE: VSIM and V5V can give together a total of 30mA.

In the next figure the principle of the SMR / VSIM–functions is shown.



Power Up

The baseband is powered up by:

1. Pressing the power key, that generates a PWRONX interrupt signal from the power key to the CCONT, which starts the power up procedure.
2. Connecting a charger to the phone. The CCONT recognizes the charger from the VCHAR voltage and starts the power up procedure.
3. A RTC interrupt. If the real time clock is set to alarm and the phone is switched off, the RTC generates an interrupt signal, when the alarm is gone off. The RTC interrupt signal is connected to the PWRONX line to give a power on signal to the CCONT just like the power key.
4. A battery interrupt. Intelligent battery packs have a possibility to power up the phone. When the battery gives a short (10ms) voltage pulse through the BTEMP pin, the CCONT wakes up and starts the power on procedure.

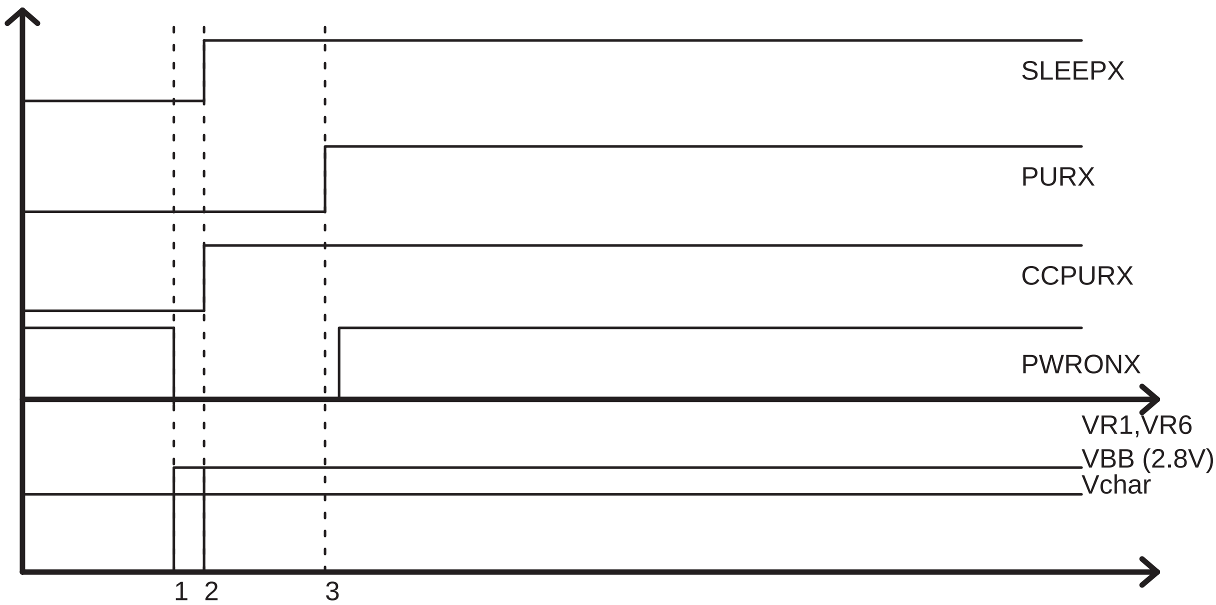
Power up with a charger

When the charger is connected CCONT will switch on the CCONT digital voltage as soon as the battery voltage exeeds 3.0V. The reset for CCONT’s digital parts is released when the operating voltage is stabilized (50 us from switching on the voltages). Operating voltage for VCXO is also switched on. The counter in CCONT digital section will keep MAD in reset for 62 ms (PURX) to make sure that the clock provided by VCXO is stable. After this delay MAD reset is relased, and VCXO –control (SLEEPX) is given to MAD. The diagram assumes empty battery, but the situation would be the same with full battery:

When the phone is powered up with an empty battery pack using the standard charger, the charger may not supply enough current for standard powerup procedure and the powerup must be delayed.

Power Up With The Power Switch (PWRONX)

When the power on switch is pressed the PWRONX signal will go low. CCONT will switch on the CCONT digital section and VCXO as was the case with the charger driven power up. If PWRONX is low when the 64 ms delay expires, PURX is released and SLEEPX control goes to MAD. If PWRONX is not low when 64 ms expires, PURX will not be released, and CCONT will go to power off (digital section will send power off signal to analog parts)



1:Power switch pressed ==> Digital voltages on in CCONT (VBB)
2: CCONT digital reset released. VCXO turned on
3: 62 ms delay to see if power switch is still pressed.

Power Up by RTC

RTC (internal in CCONT) can power the phone up by changing RTCPwr to logical ”1”. RTCPwr is an internal signal from the CCONT digital section.

Power Up by IBI

IBI can power CCONT up by sending a short pulse to logical ”1”. RTCPwr is an internal signal from the CCONT digital section.

Acting Dead

If the phone is off when the charger is connected, the phone is powered on but enters a state called ”acting dead”. To the user the phone acts as if it was switched off. A battery charging alert is given and/or a battery charging indication on the display is shown to acknowledge the user that the battery is being charged.

Active Mode

In the active mode the phone is in normal operation, scanning for channels, listening to a base station, transmitting and processing information. All the CCONT regulators are operating. There are several substates in the active mode depending on if the phone is in burst reception, burst transmission, if DSP is working etc..

Sleep Mode

In the sleep mode, all the regulators except the baseband VBB and the SIM card VSIM regulators are off. Sleep mode is activated by the MAD after MCU and DSP clocks have been switched off. The voltage regulators for the RF section are switched off and the VCXO power control, VCXOPwr is set low. In this state only the 32 kHz sleep clock oscillator in CCONT is running. The flash memory power down input is connected to the ExtSysResetX signal, and the flash is deep powered down during the sleep mode.

The sleep mode is exited either by the expiration of a sleep clock counter in the MAD or by some external interrupt, generated by a charger connection, key press, headset connection etc. The MAD starts the wake up sequence and sets the VCXOPwr and ExtSysResetX control high. After VCXO settling time other regulators and clocks are enabled for active mode.

If the battery pack is disconnect during the sleep mode, the CCONT pulls the SIM interface lines low as there is no time to wake up the MCU.

Charging

Charging can be performed in any operating mode. The charging algorithm is dependent on the used battery technology. The battery type is indicated by a resistor inside the battery pack. The resistor value corresponds to a specific battery capacity. This capacity value is related to the battery technology as different capacity values are achieved by using different battery technology.

The battery voltage, temperature, size and current are measured by the CCONT controlled by the charging software running in the MAD.

The power management circuitry controls the charging current delivered from the charger to the battery. Charging is controlled with a PWM input signal, generated by the CCONT. The PWM pulse width is controlled by the MAD and sent to the CCONT through a serial data bus. The battery voltage rise is limited by turning the CHAPS switch off when the battery voltage has reached 4.2V (LiIon) or 5.2V (NiMH, 5V in call mode). Charging current is monitored by measuring the voltage drop across a 220mohm resistor.

Power Off

The baseband is powered down by:

1. Pressing the power key, that is monitored by the MAD via keyboard line (row 4), which starts the power down procedure.
2. If the battery voltage is dropped below the operation limit, either by not charging it or by removing the battery.
3. Letting the CCONT watchdog expire, which switches off all CCONT regulators and the phone is powered down.
4. Setting the real time clock to power off the phone by a timer. The RTC generates an interrupt signal, when the alarm is gone off. The RTC interrupt signal is connected to the PWRONX line to give a power off signal to the CCONT just like the power key.

The power down is controlled by the MAD. When the power key has been pressed long enough or the battery voltage is dropped below the limit the MCU initiates a power down procedure and disconnects the SIM power. Then the MCU outputs a system reset signal and resets the DSP. If there is no charger connected the MCU writes a short delay to CCONT watchdog and resets itself. After the set delay the CCONT watchdog expires, which activates the PURX and all regulators are switched off and the phone is powered down by the CCONT.

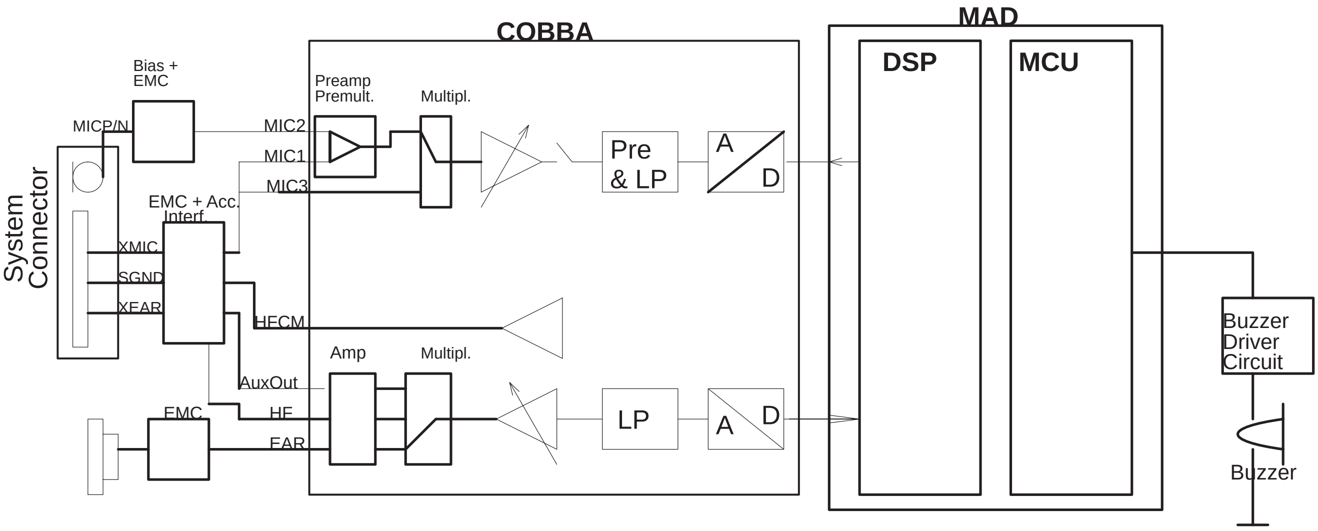
If a charger is connected when the power key is pressed the phone enters into the acting dead mode.

Watchdog

The Watchdog block inside CCONT contains a watchdog counter and some additional logic which are used for controlling the power on and power off procedures of CCONT. Watchdog output is disabled when WDDisX pin is tied low. The WD-counter runs during that time, though. Watchdog counter is reset internally to 32s at power up. Normally it is reset by MAD writing a control word to the WDReg. Watchdog counter can be disabled b grounding CCONT (N100) pin 29.

Audio control

The audio control and processing is taken care by the COBBA–GJ, which contains the audio and RF codecs, and the MAD2, which contains the MCU, ASIC and DSP blocks handling and processing the audio signals. A detailed audio specification can be found from document



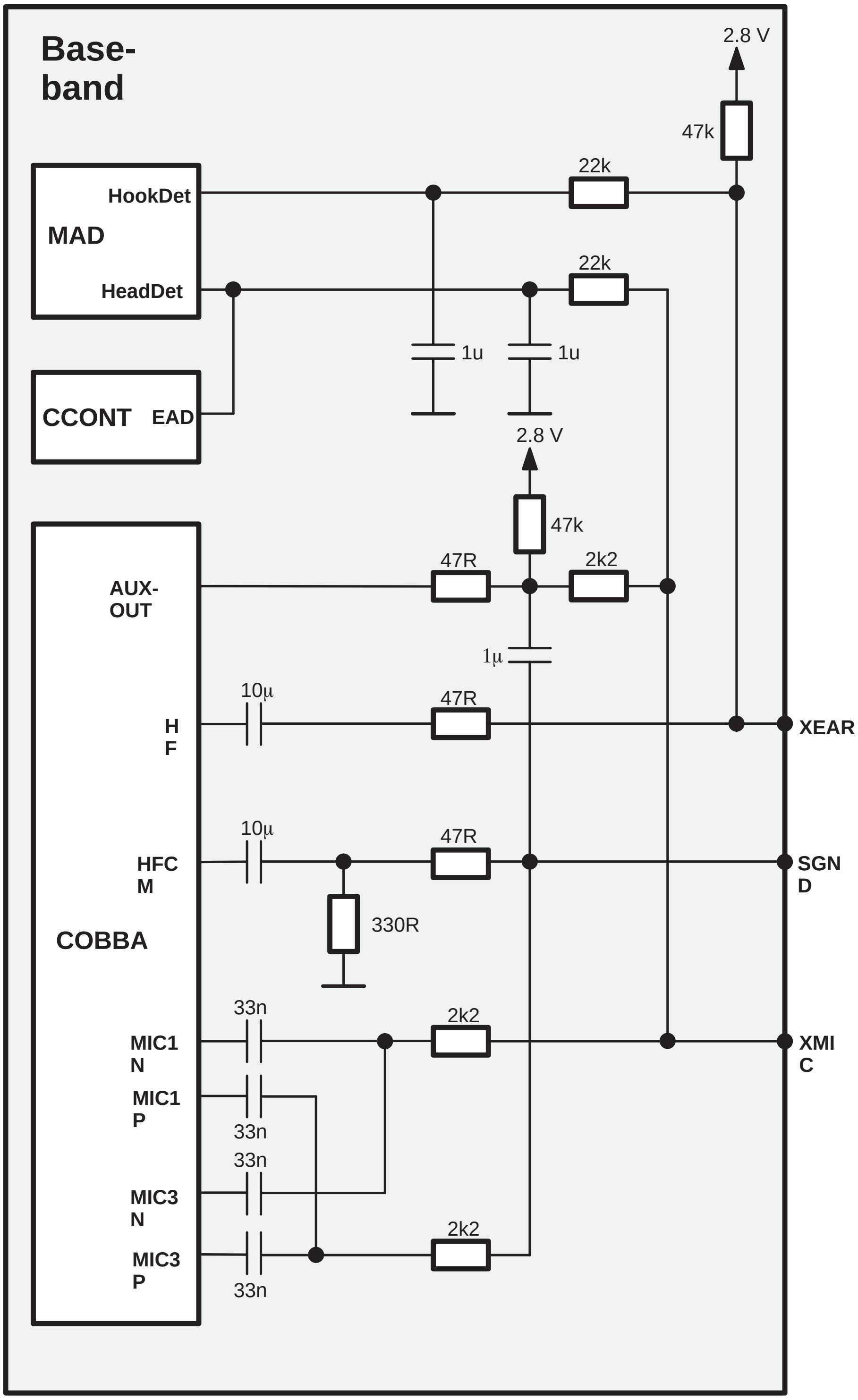
The baseband supports three microphone inputs and two earphone outputs. The inputs can be taken from an internal microphone, a headset microphone or from an external microphone signal source. The microphone signals from different sources are connected to separate inputs at the COBBA–GJ asic. Inputs for the microphone signals are differential type.

The MIC1 inputs are used for a headset microphone that can be connected directly to the system connector. The internal microphone is connected to MIC2 inputs and an external pre–amplified microphone (handset/handfree) signal is connected to the MIC3 inputs. In COBBA there are also three audio signal outputs of which dual ended EAR lines are used for internal earpiece and HF line for accessory audio output. The third audio output AUXOUT is used only for bias supply to the headset microphone. As a difference to DCT2 generation the SGND (= HFCM at COBBA) does not supply audio signal (only common mode). Therefore there are no electrical loopback echo from downlink to uplink.

The output for the internal earphone is a dual ended type output capable of driving a dynamic type speaker. The output for the external accessory and the headset is single ended with a dedicated signal ground SGND. Input and output signal source selection and gain control is performed inside the COBBA–GJ asic according to control messages from the MAD2. Keypad tones, DTMF, and other audio tones are generated and encoded by the MAD2 and transmitted to the COBBA–GJ for decoding.

External Audio Connections

The external audio connections are presented in figure below. A headset can be connected directly to the system connector. The headset microphone bias is supplied from COBBA AUXOUT output and fed to microphone through XMIC line. The 330ohm resistor from SGND line to AGND provides a return path for the bias current.



Analog Audio Accessory Detection

In XEAR signal there is a 47 kΩ pullup in the transceiver and 6.8 kΩ pull–down to SGND in accessory. The XEAR is pulled down when an accessory is connected, and pulled up when disconnected. The XEAR is connected to the HookDet line (in MAD), an interrupt is given due to both connection and disconnection. There is filtering between XEAR and HookDet to prevent audio signal giving unwanted interrupts.

External accessory notices powered–up phone by detecting voltage in XMIC line. In Table 23 there is a truth table for detection signals.

Accessory connected	HookDet	HeadDet	Notes
No accessory connected	High	High	Pullups in the transceiver
Headset HDC–9 with a button switch pressed	Low	Low	XEAR and XMIC loaded (dc)
Headset HDC–9 with a button switch released	High	Low *)	XEAR unloaded (dc)
Handsfree (HFU–1)	Low	High	XEAR loaded (dc)

Headset Detection

The external headset device is connected to the system connector, from which the signals are routed to COBBA headset microphone inputs and earphone outputs. In the XMIC line there is a (47 + 2.2) kΩ pullup in the transceiver. The microphone is a low resistance pulldown compared to the transceiver pullup.

When there is no call going, the AUXOUT is in high impedance state and the XMIC is pulled up. When a headset is connected, the XMIC is pulled down. The XMIC is connected to the HeadDet line (in MAD), an interrupt is given due to both connection and disconnection. There is filtering between the XMIC and the HeadDet to prevent audio signal giving unwanted interrupts (when an accessory is connected).

In the XEAR line there is a 47 kΩ pullup in the transceiver. The earphone is a low resistance pulldown compared to the transceiver pullup. When a remote control switch is open, there is a capacitor in series with the earphone, so the XEAR (and HookDet) is pulled up by the phone. When the switch is closed, the XEAR (and HookDet) is pulled down via the earphone. So both press and release of the button gives an interrupt.

During a call there is a bias voltage (1.5 V) in the AUXOUT, and the HeadDet cannot be used. The headset interrupts should to be disabled during a call and the EAD line (AD converter in CCONT) should be polled to see if the headset is disconnected.

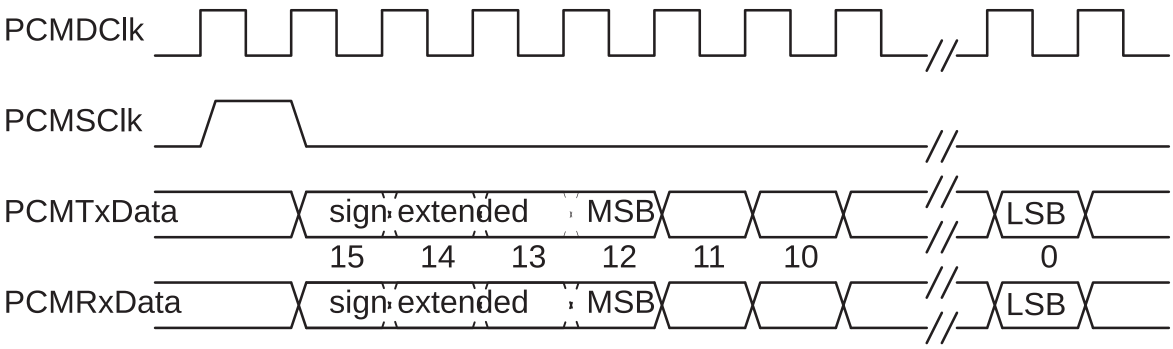
Internal Audio Connections

The speech coding functions are performed by the DSP in the MAD2 and the coded speech blocks are transferred to the COBBA–GJ for digital to analog conversion, down link direction. In the up link direction the PCM coded speech blocks are read from the COBBA–GJ by the DSP.

There are two separate interfaces between MAD2 and COBBA–GJ: a parallel bus and a serial bus. The parallel bus has 12 data bits, 4 address bits, read and write strobes and a data available strobe. The parallel interface is used to transfer all the COBBA–GJ control information (both the RFI part and the audio part) and the transmit and receive samples. The serial interface between MAD2 and COBBA–GJ includes transmit and receive data, clock and frame synchronisation signals. It is used to transfer the PCM samples. The frame synchronisation frequency is 8 kHz which indicates the rate of the PCM samples and the clock frequency is 1 MHz. COBBA is generating both clocks.

4–wire PCM Serial Interface

The interface consists of following signals: a PCM codec master clock (PCMDClk), a frame synchronization signal to DSP (PCMSClk), a codec transmit data line (PCMTX) and a codec receive data line (PCMRX). The COBBA–GJ generates the PCMDClk clock, which is supplied to DSP SIO. The COBBA–GJ also generates the PCMSClk signal to DSP by dividing the PCMDClk. The PCMDClk frequency is 1.000 MHz and is generated by dividing the RFIClk 13 MHz by 13. The COBBA–GJ further divides the PCMDClk by 125 to get a PCMSClk signal, 8.0 kHz.



Alert Signal Generation

A buzzer is used for giving alerting tones and/or melodies as a signal of an incoming call. Also keypress and user function response beeps are generated with the buzzer. The buzzer is controlled with a BuzzerPWM output signal from the MAD. A dynamic type of buzzer must be used since the supply voltage available can not produce the required sound pressure for a piezo type buzzer. The low impedance buzzer is connected to an output transistor that gets drive current from the PWM output. The alert volume can be adjusted either by changing the pulse width causing the level to change or by changing the frequency to utilize the resonance frequency range of the buzzer.

A vibra alerting device is used for giving silent signal to the user of an incoming call. The device is controlled with a VibraPWM output signal from the MAD2. The vibra alert can be adjusted either by changing the pulse width or by changing the pulse frequency. The vibra device is not inside the phone, but in a special vibra battery.

Digital Control

The baseband functions are controlled by the MAD asic, which consists of a MCU, a system ASIC and a DSP.

MAD2

MAD2 contains following building blocks:

- ARM RISC processor with both 16–bit instruction set (THUMB mode) and 32–bit instruction set (ARM mode)
- TI Lead DSP core with peripherials:
  - API (Arm Port Interface memory) for MCU–DSP communication, DSP code download, MCU interrupt handling vectors (in DSP RAM) and DSP booting
  - Serial port (connection to PCM)
  - Timer
  - DSP memory
- BUSC (BusController for controlling accesses from ARM to API, System Logic and MCU external memories, both 8– and 16–bit memories)
- System Logic
  - CTSI (Clock, Timing, Sleep and Interrupt control)
  - MCUIF (Interface to ARM via BusC). Contains MCU BootROM
  - DSPIF (Interface to DSP)
  - MFI (Interface to COBBA AD/DA Converters)

– CODER (Block encoding/decoding and A51&A52 ciphering)
– AccIF(Accessory Interface)
– SCU (Synthesizer Control Unit for controlling 2 separate synthesizer)
– UIF (Keyboard interface, serial control interface for COBBA PCM Codec, LCD Driver and CCONT)
– SIMI (SimCard interface with enhanced features)
– PUP (Parallel IO, USART and PWM control unit for vibra and buzzer)

The MAD2 operates from a 13 MHz system clock, which is generated from the 13Mhz VCXO frequency. The MAD2 supplies a 6,5MHz or a 13MHz internal clock for the MCU and system logic blocks and a 13MHz clock for the DSP, where it is multiplied to 52 MHz DSP clock. The system clock can be stopped for a system sleep mode by disabling the VCXO supply power from the CCONT regulator output. The CCONT provides a 32kHz sleep clock for internal use and to the MAD2, which is used for the sleep mode timing. The sleep clock is active when there is a battery voltage available i.e. always when the battery is connected.

Pin N:o	Pin Name	Pin Type	Connected to/from	Drive req. mA	Reset State	Note	Explanation
1	MCUGenOut5	O	Audio	2	0		MCU General purpose output port
2	MCUGenOut4	O	N101	2	0		MCU General purpose output port
3	*LEADGND*						Lead Ground
4	MCUGenOut3	O		2	0		MCU General purpose output port
5	**VCC**					IO VCC in 3325c10	Power
6	MCUGenOut2	O		2	0		MCU General purpose output port
7	MCUGenOut1	O	MCU memory	2	0		MCU General purpose output port
8	MCUGenOut0	O		2	1	LoByteSelX in 16–bit mode	MCU General purpose output port
9	Col4	I/O	UIF	2	Input	programmable pullup PR0201	I/O line for keyboard column 4

Pin N:o	Pin Name	Pin Type	Connected to/from	Drive req. mA	Reset State	Note	Explanation
10	Col3	I/O	UIF	2	Input	program-mable pullup PR0201	I/O line for key-board column 3
11	**GND**						Ground
12	Col2	I/O	UIF	2	Input	program-mable pullup PR0201	I/O line for key-board column 2
13	Col1	I/O	UIF	2	Input	program-mable pullup PR0201	I/O line for key-board column 1
14	Col0	I/O	UIF	2	Input	program-mable pullup PR0201	I/O line for key-board column 0
15	LCDCSX	I/O	UIF	2	Input	external pullup/down	serial LCD driver chip select, par-allel LCD driver enable
16	*LEADVCC*						Lead Power
17	Row5LCDCD	I/O	UIF	2	Input, pullup	pullup PR0201	Keyboard row5 data I/O , serial LCD driver com-mand/data indi-cator, parallel LCD driver read/ write select
18	**VCC**					Core VCC in 3325c10	Power
19	Row4	I/O	UIF	2	Input, pullup	pullup PR0201	I/O line for key-board row 4, par-allel LCD driver register selection control
20	Row3	I/O	UIF	2	Input, pullup	pullup PR0201	I/O line for key-board row 3, par-allel LCD driver data
21	Row2	I/O	UIF	2	Input, pullup	pullup PR0201	I/O line for key-board row 2, par-allel LCD driver data
22	Row1	I/O	UIF	2	Input, pullup	pullup PR0201	I/O line for key-board row 1, par-allel LCD driver data
23	Row0	I/O	UIF	2	Input, pullup	pullup PR0201	I/O line for key-board row 0, par-allel LCD driver data

Pin N:o	Pin Name	Pin Type	Connected to/from	Drive req. mA	Reset State	Note	Explanation
24	JTDO	O		2	Tri–state		JTAG data out
25	**GND**						Ground
26	JTRst	I			Input, pull-down	pulldown PD0201	JTAG reset
27	JTClk	I			Input	pulldown PD0201	JTAG Clock
28	JTDI	I			Input, pullup	pullup PR0201	JTAG data in
29	JTMS	I			Input, pullup	pullup PR0201	JTAG mode se-lect
30	**VCC**					IO VCC in 3325c10	Power
31	CoEmu0	I/O		2	Input, pullup	pullup PR0201	DSP/MCU emulation port 0
32	CoEmu1	I/O		2	Input, pullup	pullup PR0201	DSP/MCU emulation port 1
33	MCUGenIO7	I/O		2	Input, pull-down	pulldown PD1001	General purpose I/O port
34	MCUGenIO6	I/O	UI	2	Input, pull-down	pulldown PD1001	Lights
35	*LEADGND*						Lead Ground
36	MCUGenIO5	I/O	UI	2	Input, pull-down	pulldown PD1001	LCD reset
37	*ARMGND*						ARM Ground
38	MCUAd0	O	MCU MEMORY	2	0		MCU address bus
39	*ARMVCC*						ARM Power
40	MCUAd1	O	MCU MEMORY	2	0		MCU address bus
41	MCUAd2	O	MCU MEMORY	2	0		MCU address bus
42	**GND**						Ground
43	MCUAd3	O	MCU MEMORY	2	0		MCU address bus
44	MCUAd4	O	MCU MEMORY	2	0		MCU address bus
45	MCUAd5	O	MCU MEMORY	2	0		MCU address bus

Pin N:o	Pin Name	Pin Type	Connected to/from	Drive req. mA	Reset State	Note	Explanation
46	MCUAd6	O	MCU MEMORY	2	0		MCU address bus
47	**VCC**					IO VCC in 3325c10	Power
48	MCUAd7	O	MCU MEMORY	2	0		MCU address bus
49	MCUAd8	O	MCU MEMORY	2	0		MCU address bus
50	MCUAd9	O	MCU MEMORY	2	0		MCU address bus
51	MCUAd10	O	MCU MEMORY	2	0		MCU address bus
52	**GND**						Ground
53	MCUAd11	O	MCU MEMORY	2	0		MCU address bus
54	MCUAd12	O	MCU MEMORY	2	0		MCU address bus
55	MCUAd13	O	MCU MEMORY	2	0		MCU address bus
56	MCUAd14	O	MCU MEMORY	2	0		MCU address bus
57	MCUAd15	O	MCU MEMORY	2	0		MCU address bus
58	MCUAd16	O	MCU MEMORY	2	0		MCU address bus
59	**VCC**					Core VCC in 3325c10	Power
60	MCUAd17	O	MCU MEMORY	2	0		MCU address bus
61	MCUAd18	O	MCU MEMORY	2	0		MCU address bus
62	MCUAd19	O	MCU MEMORY	2	0		MCU address bus
63	MCUAd20	O	MCU MEMORY	2	0		MCU address bus
64	MCUAd21	O	MCU MEMORY	2	0		MCU address bus
65	ExtMCUDa0	I/O	MCU MEMORY	2	Input		MCU data bus
66	**GND**						Ground
67	ExtMCUDa1	I/O	MCU MEMORY	2	Output		MCU data bus
68	ExtMCUDa2	I/O	MCU MEMORY	2	Output		MCU data bus

Pin N:o	Pin Name	Pin Type	Connected to/from	Drive req. mA	Reset State	Note	Explanation
69	ExtMCUDa3	I/O	MCU MEMORY	2	Output		MCU data bus
70	ExtMCUDa4	I/O	MCU MEMORY	2	Output		MCU data bus
71	ExtMCUDa5	I/O	MCU MEMORY	2	Output		MCU data bus
72	ExtMCUDa6	I/O	MCU MEMORY	2	Output		MCU data bus
73	**VCC**					IO VCC in 3325c10	Power
74	ExtMCUDa7	I/O	MCU MEMORY	2	Output		MCU data bus
75	MCUGenIO8	I/O		2	Input	MCU Data in 16–bit mode	General purpose I/O port
76	MCUGenIO9	I/O		2	Input	MCU Data in 16–bit mode	General purpose I/O port
77	MCUGenIO10	I/O		2	Input	MCU Data in 16–bit mode	General purpose I/O port
78	MCUGenIO11	I/O		2	Input	MCU Data in 16–bit mode	General purpose I/O port
79	**GND**						Ground
80	MCUGenIO12	I/O		2	Input	MCU Data in 16–bit mode	General purpose I/O port
81	MCUGenIO13	I/O		2	Input	MCU Data in 16–bit mode	General purpose I/O port
82	MCUGenIO14	I/O		2	Input	MCU Data in 16–bit mode	General purpose I/O port
83	MCUGenIO15	I/O		2	Input	MCU Data in 16–bit mode	General purpose I/O port
84	MCURdX	O	MCU MEMORY	2	1		MCU Read strobe
85	**VCC**					Core VCC in 3325c10	Power
86	MCUWrX	O	MCU MEMORY	2	1		MCU write strobe
87	ROM1SelX	O	MCU ROM	2	1		ROM chip select
88	RAMSelX	O	MCU RAM	2	1		RAM chip select
89	ROM2SelX	O	MCU ROM2	2	1		Extra chip select, can be used as MCU general output
90	MCUGenIO1	I/O		2	Input, pullup	pullup PR0201	General purpose I/O port
91	DSPXF	O		2	1		External flag

Pin N:o	Pin Name	Pin Type	Connected to/from	Drive req. mA	Reset State	Note	Explanation
92	*SCVCC*						Special cell Power
93	RFClk	I	VCXO		Input		System clock from VCTCXO
94	RFClkGnd				Input		System clock reference ground input
95	SIMCardDetX	I			Input		SIM card detection
96	*SCGND*						Special cell Ground
97	BuzzPWM	O	BUZZER	2	0		Buzzer PWM control
98	*LEADVCC*						LEAD Power
99	VibraPWM	O	VIBRA	2	0		Vibra PWM control
100	**GND**						Ground
101	MCUGenIO3	I/O	EEPROM	2	Input, pullup	pullup PR1001	WP
102	MCUGenIO2	I/O	EEPROM	2	Input, pullup	pullup PR1001	SCL
103	EEPROMSelX	O	MCU EEPROM	2	1		Not used, can be used as MCU general output
104	AccTxData	I/O		4	Tri–State	external pullup	Accessory TX data, Flash_TX
105	**VCC**					IO VCC in 3325c10	Power
106	GenDet	I			Input		General purpose interrupt
107	HookDet	I			Input		Non–MBUS accessory connection detector
108	HeadDet	I			Input		Headset detection interrupt
109	AccRxData	I			Input		Accessory RX data, Flash_RX
110	**GND**						Ground
111	MCUGenIO4	I/O		2	Input, pulldown	pulldown PD1001	General purpose I/O port, BATTI/O
112	MBUS	I/O		2	Input, external pullup	external pullup	MBUS, Flash clock

Pin N:o	Pin Name	Pin Type	Connected to/from	Drive req. mA	Reset State	Note	Explanation
113	VCXOPwr	O	CCONT	2	1		VCXO regulator control
114	SynthPwr	O	CCONT	2	0		Synthesizer regulator control
115	**VCC**					Core VCC in 3325c10	Power
116	GenCCONTCSX	O	CCONT	2	1		Chip select to CCONT
117	*LEADGND*						LEAD Ground
118	GenSDIO	I/O	CCONT, UIF	2	Input, external pullup/down	external pullup/down depending on how to boot	Serial data in/out
119	GenSClk	O	CCONT, UIF	2	0		Serial clock
120	SIMCardData	I/O	CCONT	2	0		SIM data
121	**GND**						Ground
122	PURX	I	CCONT		Input		Power Up Reset
123	CCONTInt	I	CCONT		Input		CCONT interrupt
124	Clk32k	I	CCONT		Input		Sleep clock oscillator input
125	**VCC**					IO VCC in 3325c10	Power
126	SIMCardClk	O	CCONT	2	0		SIM clock
127	SIMCardRstX	O	CCONT	2	0		SIM reset
128	SIMCardIOC	O	CCONT	2	0		SIM data in/out control
129	SIMCardPwr	O	CCONT	2	0		SIM power control
130	*LEADVCC*						LEAD Power
131	RxPwr	O	CCONT	2	0		RX regulator control
132	TxPwr	O	CCONT	2	0		TX regulator control
133	TestMode	I			Input, pulldown	pulldown PD0201	Test mode select
134	ExtSysResetX	O		2	0		System Reset
135	PCMTxData	O	COBBA	2	0		Transmit data, DX
136	**VCC**					IO VCC in 3325c10	Power

Pin N:o	Pin Name	Pin Type	Connected to/from	Drive req. mA	Reset State	Note	Explanation
137	PCMRxData	I	COBBA		Input		Receive data, RX
138	PCMDClk	I	COBBA		Input		Transmit clock, CLKX
139	PCMSClk	I	COBBA		Input		Transmitframe sync, FSX
140	COBBADAX	I	COBBA		Input		Data available acknowledge
141	**GND**						Ground
142	COBBAWrX	O	COBBA	2	1		COBBA write strobe
143	COBBARdX	O	COBBA	2	1		COBBA read strobe
144	COBBAClk	O	COBBA	4	1		COBBA clock, 13 MHz
145	COBBAAd3	O	COBBA	2	0		COBBA address bit
146	COBBAAd2	O	COBBA	2	0		COBBA address bit
147	COBBAAd1	O	COBBA	2	0		COBBA address bit
148	COBBAAd0	O	COBBA	2	0		COBBA address bit
149	COBBADa11	I/O	COBBA	2	0		COBBA data bit
150	**VCC**					Core VCC in 3325c10	Power
151	COBBADa10	I/O	COBBA	2	0		COBBA data bit
152	COBBADa9	I/O	COBBA	2	0		COBBA data bit
153	COBBADa8	I/O	COBBA	2	0		COBBA data bit
154	COBBADa7	I/O	COBBA	2	0		COBBA data bit
155	COBBADa6	I/O	COBBA	2	0		COBBA data bit
156	**GND**						Ground
157	COBBADa5	I/O	COBBA	2	0		COBBA data bit
158	COBBADa4	I/O	COBBA	2	0		COBBA data bit
159	COBBADa3	I/O	COBBA	2	0		COBBA data bit
160	COBBADa2	I/O	COBBA	2	0		COBBA data bit
161	COBBADa1	I/O	COBBA	2	0		COBBA data bit
162	COBBADa0	I/O	COBBA	2	0		COBBA data bit
163	DSPGenOut5	O	RF	2	0		DSP general purpose output, COBBA reset

Pin N:o	Pin Name	Pin Type	Connected to/from	Drive req. mA	Reset State	Note	Explanation
164	**VCC**					IO VCC in 3325c10	Power
165	DSPGenOut4	O		2	0		DSP general purpose output
166	DSPGenOut3	O	IR	2	0		IR ON
167	DSPGenOut2	O		2	0		DSP general purpose output
168	DSPGenOut1	O		2	0		DSP general purpose output
169	DSPGenOut0	O		2	0		DSP general purpose output
170	MCUGenIO0	I/O	EEPROM	2	Input, pullup	pullup PR0201	EEPROM serial data SDA
171	FrACtrl	O	RF	2	0		SDATX0
172	**GND**						Ground
173	SynthEna	O	PLUSSA	2	0		Synthesizer data enable
174	SynthClk	O	PLUSSA	2	0		Synthesizer clock
175	SynthData	O	PLUSSA	2	0		Synthesizer data
176	TxPA	O	PLUSSA, power amplifier	2	0		Power amplifier control

Memories

The MCU program code resides in an external flash program memory, which size is 8 Mbits (512kx16bit). The MCU work (data) memory size is 512kbits (64kx8bit). A serial EEPROM is used for storing the system and tuning parameters, user settings and selections, a scratch pad and a short code memory. The EEPROM size is 16kbits (2kx8bit).

The BusController (BUSC) section in the MAD decodes the chip select signals for the external memory devices and the system logic. BUSC controls internal and external bus drivers and multiplexers connected to the MCU data bus. The MCU address space is divided into access areas with separate chip select signals. BUSC supports a programmable number of wait states for each memory range.

Program Memory

The MCU program code resides in the program memory. The program memory size is 8 Mbits (512kx16bit).

The flash memory has a power down pin that should be kept low, during the power up phase of the flash to ensure that the device is powered up in the correct state, read only. The power down pin is utilized in the system sleep mode by connecting the ExtSysResetX to the flash power down pin to minimize the flash power consumption during the sleep.

SRAM Memory

The work memory is a static ram of size 512k (64kx8) in a shrink TSOP32 package. The work memory is supplied from the common baseband VBB voltage and the memory contents are lost when the baseband voltage is switched off. All retainable data should be stored into the EEPROM (or flash) when the phone is powered down.

EEPROM Memory

An EEPROM is used for a nonvolatile data memory to store the tuning parameters and phone setup information. The short code memory for storing user defined information is also implemented in the EEPROM. The EEPROM size is 2kbytes. The memory is accessed through a serial bus and the default package is SO8.

MCU Memory Map

MAD2 supports maximum of 4GB internal and 4MB external address space. External memories use address lines MCUAd0 to MCUAd21 and 16–bit databus. The BUSC bus controller supports 8– and 16–bit access for byte, double byte, word and double word data. Access wait state 2 and used databus width can be selected separately for each memory block.

Flash Programming

The preprogrammable phone has to be connected to the flash loading adapter (FLA–5) via service cable SCH–5. The power supply should be taken from service battery BBD–3 via flash loading adapter FLA–5. When FLA–5 switches supply voltage to the service battery (BBD–3), the service battery generates a short pulse (IBI pulse) to the power supply circuit (CCONT pin 63) via BTEMP line (X102 pin 2).
The power supply circuit (N100) switches power on and releases MCU (MAD2) from reset state (power up reset, PURX rises up to 1 (2.8 V).

The program execution starts from the internal boot ROM of MAD2 and MCU investigates the status of the MBUS line. Normally this line is high (2.8 V) because of pull up resistor R203, but when the flash program adapter is connected, the MBUS line is forced low. When MCU has recognized the flash loading adapter (MBUS line is low), it gives program start (MCU boot) information to the flash loading adapter by forcing flash_tx (FBUS_TX) line low (X100 pin 13).
The flash prommer sends all needed data for flash programming to phone via flash_rx (FBUS_RX) line (X100 pin 12). The phone (MCU) sends all programming acknowlegment signals for flash prommer via flash_tx (FBUS_TX) line (X100 pin 13). The acknowlegment information (rising and falling edge of flash_tx line) signal is sent to flash prommer when each step of flash programming is passed. Flash_tx line is also used to send hardware configuration information (flash type etc.) to the flash prommer. Flash_tx and flash_rx data is synchronized to flash clock signal, which is sent from the flash prommer to phone via flash clock line (MBUS, X100 pin 11).

The flash programming voltage (VPP) is generated internally. Switchable voltage regulator N201 (or N202) is used to generate flash programming voltage for the program memory (D211). The regulator is controlled by MCU (MAD2) via MCUGenOutput pin 7. The input voltage for the flash programming voltage regulator is taken from output of charger pump (pin 33) of power supply circuit CCONT (N100). The programming voltage (3 V +/– 10 %) is supplied via UI connector X300 (pins 12,13) to the program memory D211. Thus the flash programming voltage (VPP) is switched on only during the flash erasing and programming states.

COBBA–GJ

The COBBA–GJ provides an interface between the baseband and the RF–circuitry. COBBA–GJ performs analogue to digital conversion of the receive signal. For transmit path COBBA_GJ performs digital to analogue conversion of the transmit amplifier power control ramp and the in–phase and quadrature signals. A slow speed digital to analogue converter will provide automatic frequency control (AFC).

The COBBA asic is at any time connected to MAD asic with two interfaces, one for transferring tx and rx data between MAD and COBBA and one for transferring codec rx/tx samples.

Real Time Clock

Requirements for a real time clock implementation are a basic clock (hours and minutes), a calender and a timer with alarm and power on/off –function and miscellaneous calls. The RTC will contain only the time base and the alarm timer but all other functions will be implemented with the MCU software. The RTC needs a power backup to keep the clock running when the phone battery is disconnected. The backup power is supplied from a rechargable polyacene battery that can keep the clock running some ten minutes. If the backup has expired, the RTC clock restarts after the main battery is connected. The CCONT keeps MCU in reset until the 32kHz source is settled (1s max).

The CCONT is an ideal place for an integrated real time clock as the asic already contains the power up/down functions and a sleep control with the 32kHz sleep clock, which is running always when the phone battery is connected. This sleep clock is used for a time source to a RTC block.

RTC backup battery charging

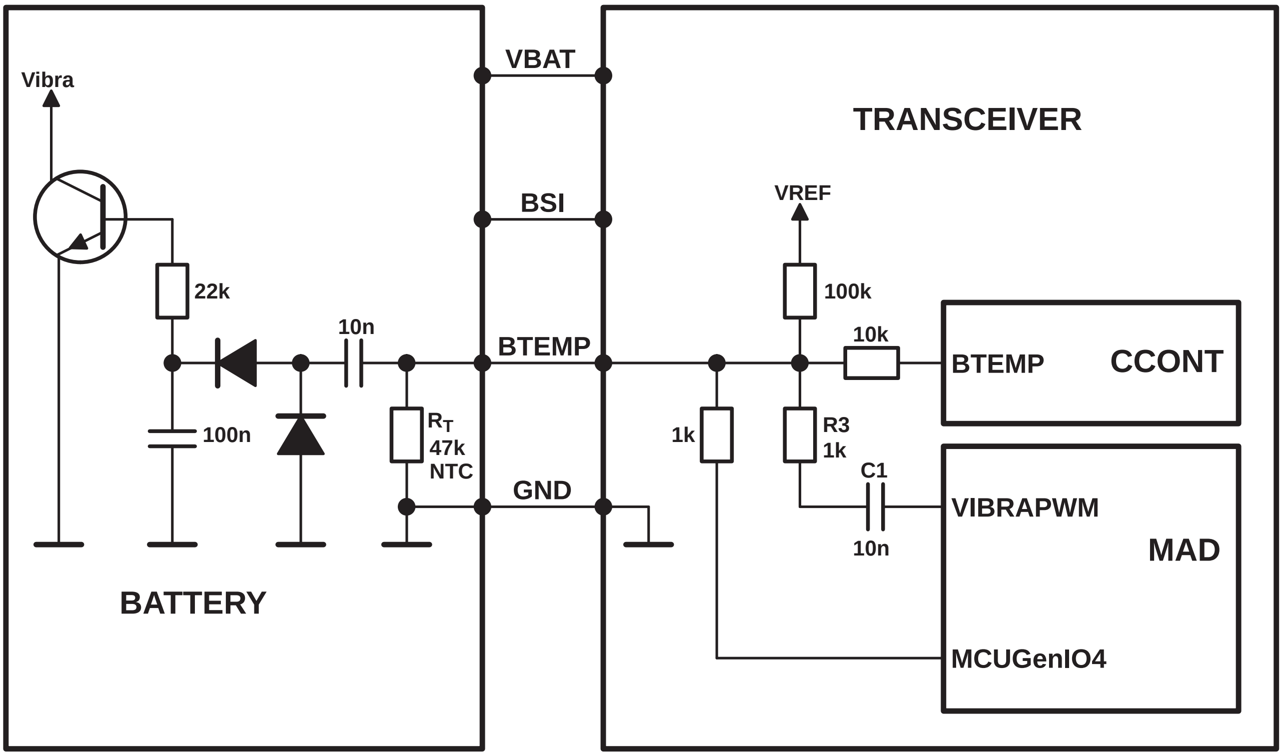
CHAPS has a current limited voltage regulator for charging a backup battery. The regulator derives its power from VOUT so that charging can take place without the need to connect a charger. The backup battery is only used to provide power to a real time clock when VOUT is not present so it is important that power to the charging circuitry is derived from VOUT and that the charging circuitry does not present a load to the backup battery when VOUT is not present.

It should not be possible for charging current to flow from the backup battery into VOUT if VOUT happens to be lower than VBACK. Charging current will gradually diminish as the backup battery voltage reaches that of the regulation voltage.

Vibra Alerting Device

A vibra alerting device is used for giving silent signal to the user of an incoming call. The device is not placed in the phone but it will be added to a special battery pack. The vibra is controlled with a PWM signal by the MAD via the BTEMP battery terminal.

A 15kohm BSI resistor is needed to detect the vibra battery. It is only used to enable vibra selection in user menu. When alerting, VibraPWM signal is delivered to battery.



IBI Accessories

All accessories which can be connected between the transceiver and the battery or which itself contain the battery, are called IBI accessories.

Either the phone or the IBI accessory can turn the other on, but both possibilities are not allowed in the same accessory.

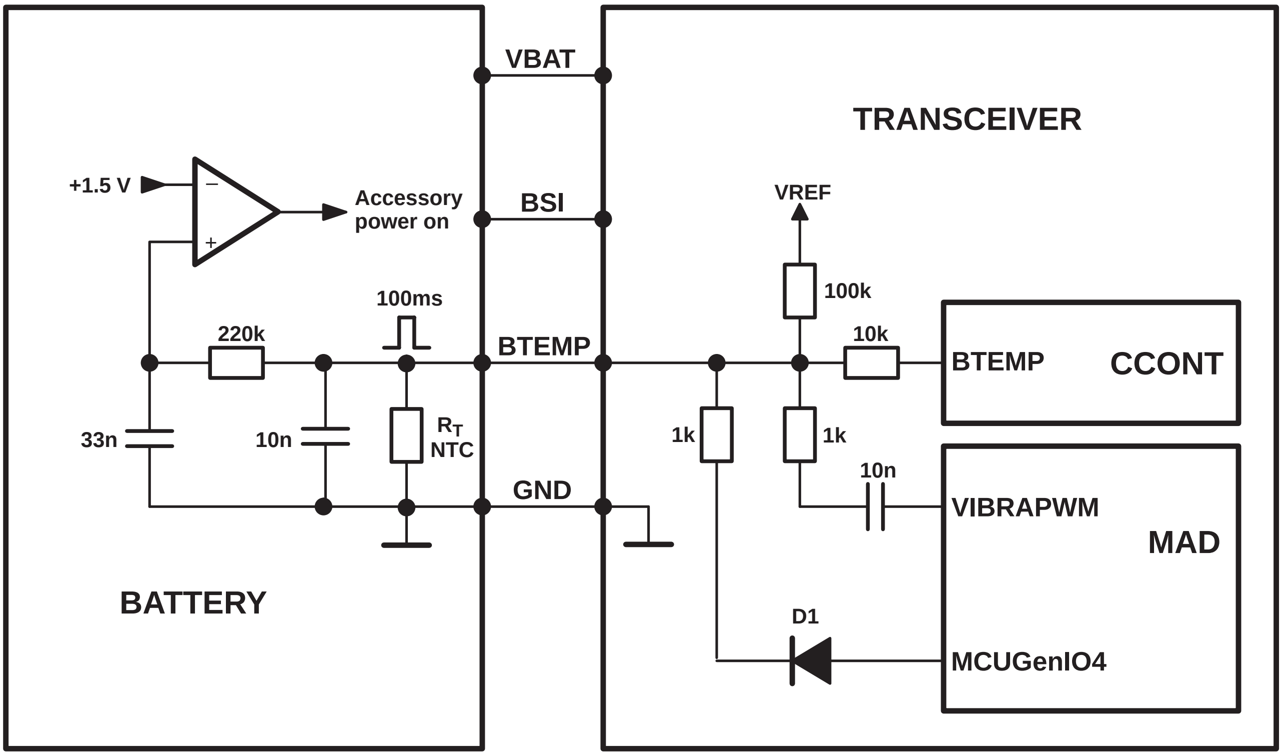
Phone Power–on by IBI

IBI accessory can power the phone on by pulling the BTEMP line up to 3 V.

IBI power–on by phone

Phone can power the IBI accessory on by pulling the BTEMP line up by MCUGenIO4 of MAD2. BTEMP measurement is not possible during this time.

The accessory is commanded back to power–off by MBUS message.

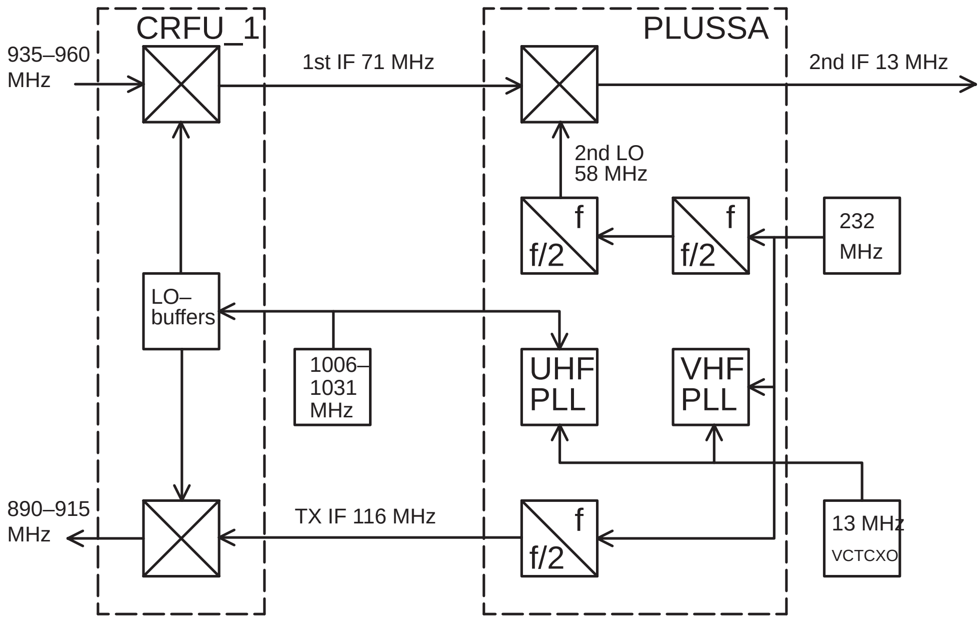

VBAT
TRANSCEIVER
+1.5 V
Accessory
power on
BSI
VREF
100ms
100k
220k
10k
BTEMP
BTEMP
CCONT
33n
10n
R_T
NTC
1k
1k
10n
GND
VIBRAPWM
MAD
BATTERY
D1
MCUGenIO4

RF Module

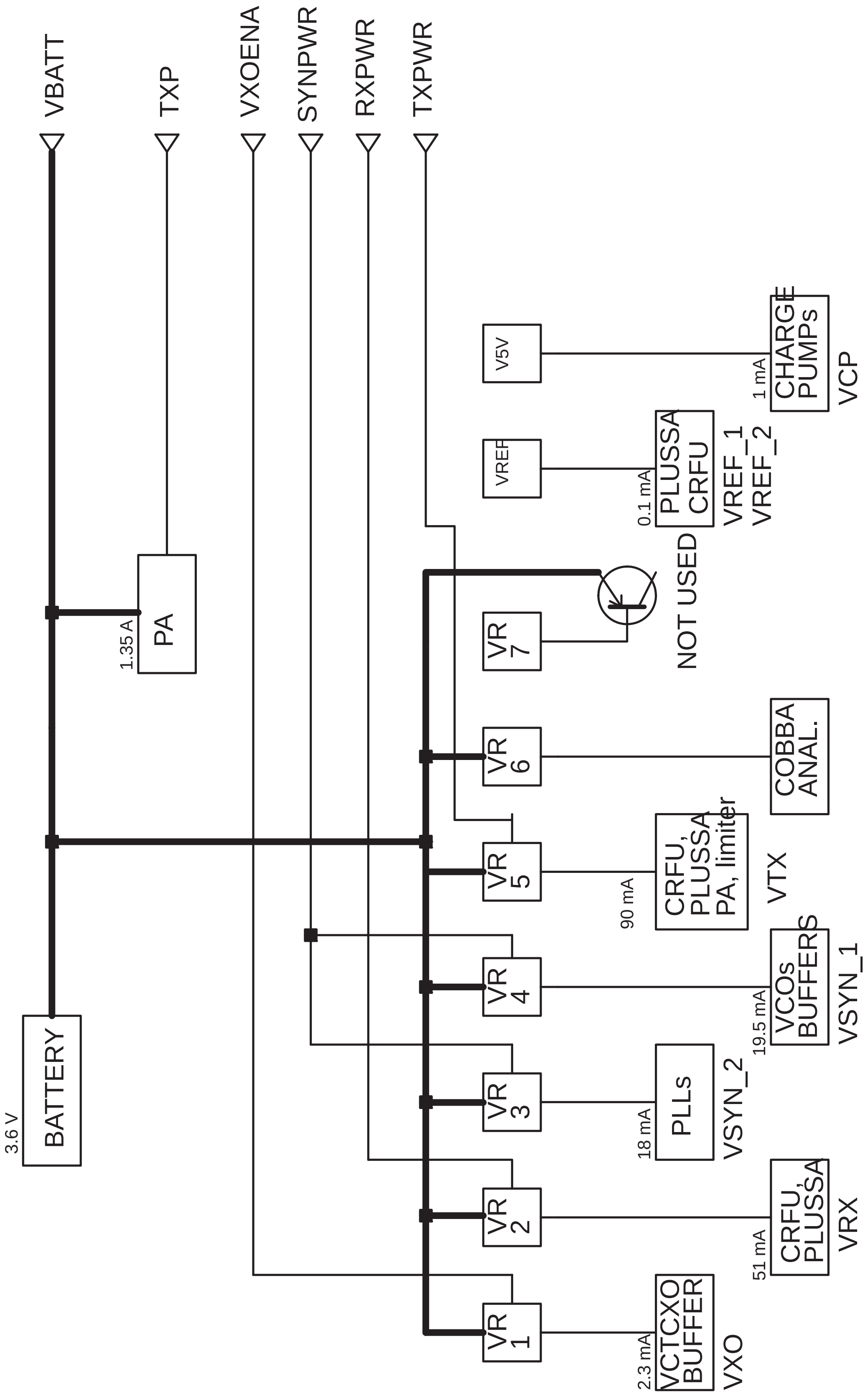
Maximum Ratings

Parameter	Rating
Battery voltage, idle mode	6.0 V
Battery voltage during call, highest power level	5.0 V
Regulated supply voltage	2.8 +/– 3% V
Voltage reference	1.5 +/– 1.5% V
Operating temperature range	–10...+55 deg. C

RF Frequency Plan



Power Distribution Diagram



DC Characteristics

Regulators

Transceiver has got a multi function power management IC, which contains among other functions, also 7 pcs of 2.8 V regulators. All regulators can be controlled individually with 2.8 V logic directly or through control register. In GSM direct controls are used to get fast switching, because regulators are used to enable RF–functions.

Use of the regulators can be seen in the power distribution diagram.

CCONT also provides 1.5 V reference voltage for PLUSSA and CRFU1a (and for DACs and ADCs in COBBA too).

Control Signals

All control signals are coming from MAD and they are 2.8 V logic signals.

Functional Description

RF block diagram has conventional dual conversion receiver and in transmitter there is a upconversion mixer for the final TX–frequency.

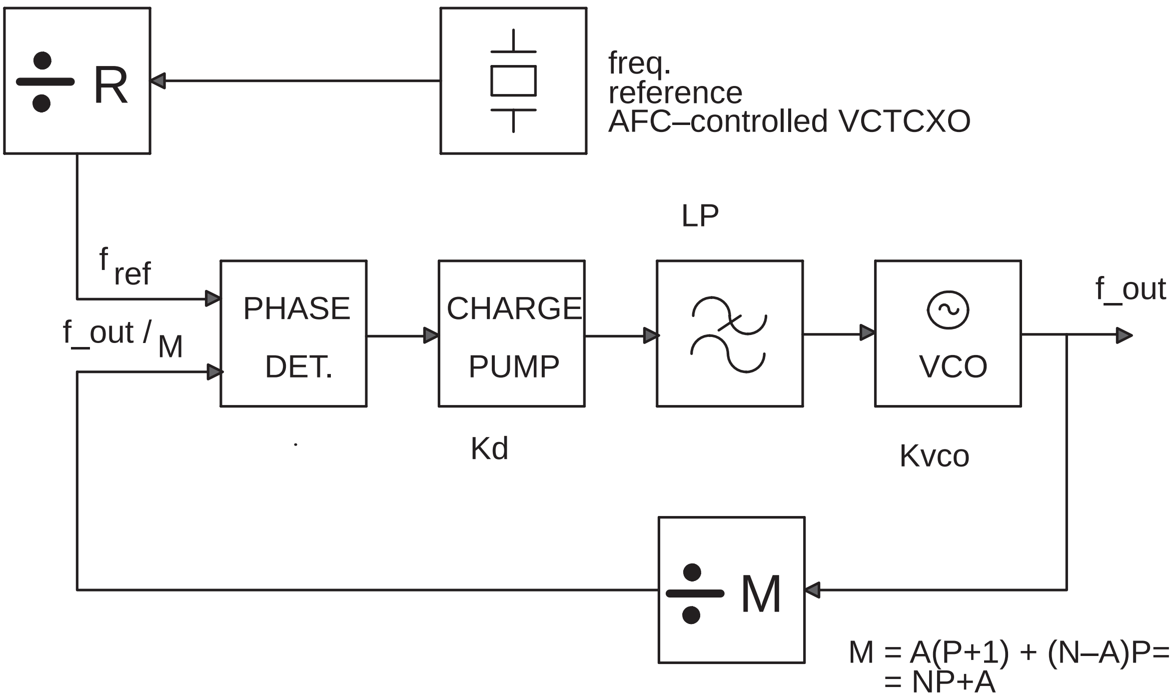
Architecture contains three ICs. Most of the functions are horizontally and vertically integrated. UHF functions except power amplifier and VCO are integrated into CRFU_1a, which is a BiCMOS–circuit suitable for LNA– and mixer–function. Most of the functions are in PLUSSA, which also is a BiCMOS–circuit. PLUSSA is a IF–circuit including IQ–modulator and PLLs for VHF– and UHF–synthesizers.

Power amplifier is also an ASIC, it is a so called MMIC (monolithic microwave integrated circuit). It has three amplifier stages including input and interstage matchings. Output matching network is external. Also TX gain control is integrated into this chip.

Frequency synthesizers

Both VCOs are locked with PLLs into stable frequency source (see figure 3), which is a VCTCXO–module (voltage controlled temperature compensated crystal oscillator). VCTCXO is running at 13 MHz. Temperature effect is controlled with AFC (automatic frequency control) voltage, VCTCXO is locked into frequency of the base station. AFC is generated by baseband with a 11 bit conventional DAC in COBBA.

UHF PLL is located into PLUSSA. There is 64/65 (P/P+1) prescaler, N– and A–divider, reference divider, phase detector and charge pump for the external loop filter. UHF local signal is generated by a VCO–module (VCO = voltage controlled oscillator) and sample of frequency of VCO is fed to prescaler. Prescaler is a dual modulus divider. Output of the prescaler is fed to N– and A–divider, which produce the input to phase detector. Phase detector compares this signal to reference signal, which is divided with reference divider from VCTCXO output. Output of the phase detector is connected into charge pump, which charges or discharges integrator capacitor in the loop filter depending on the phase of the measured frequency compared to reference frequency. Loop filter filters out the pulses and generates DC to control the frequency of UHF–VCO. Loop filter defines step response of the PLL (settling time) and effects to stability of the loop, that's why integrator capacitor has got a resistor for phase compensation. Other filter components are for sideband rejection. Dividers are controlled via serial bus. SDATA is for data, SCLK is serial clock for the bus and SENA1 is a latch enable, which stores new data into dividers. HF–synthesizer is the channel synthesizer, so the channel spacing is 200 kHz. 200 kHz is reference frequency for the phase detector.



VHF PLL is also located into PLUSSA. There is 16/17 (P/P+1) dual modulus prescaler, N– and A–dividers, reference divider, phase detector and charge pump for the loop filter. VHF local signal is generated with a discrete VCO–circuit. VHF PLL works in the same way as UHF–PLL. VHF–PLL is locked on fixed frequency, so higher reference frequency is used to decrease phase noise.

Receiver

Receiver is a dual conversion linear receiver.
Received RF–signal from the antenna is fed via the duplex filter to LNA (low noise amplifier) in CRFU_1a. Active parts (RF–transistor and biasing and AGC–step circuitry) are integrated into this chip. Input and output matching networks are external. Gain selection is done with PDATA0 control. Gain step in LNA is activated when RF–level in antenna is about –45 dBm. After the LNA amplified signal (with low noise level) is fed to bandpass filter, which is a SAW–filter (SAW, surface acoustic wave). Duplex filter and RX interstage bandpass filters together define, how good are the blocking characteristics against spurious signals outside receive band and the protection against spurious responses, mainly the image of the first mixer.

This bandpass filtered signal is then mixed down to 71 MHz, which is first intermediate frequency. 1st mixer is located into CRFU_1a ASIC. This integrated mixer is a double balanced Gilbert cell. All active parts and biasing are integrated and matching components are external. Because this is an axtive mixer it also amplifies IF–frequency. Also local signal buffering is integrated and upper side injection is used. First local signal is generated with UHF–synthesizer.

First IF–signal is then bandpass filtered with a selective SAW–filter. From the mixer output to IF–circuit input signal path is balanced. IF–filter provides selectivity for channels greater than +/–200 kHz. Also it attenuates image frequency of the second mixer and intermodulating signals. Selectivity is required in this place, because of needed linearity and adjacent channel interferers will be on too high signal level for the stages following.

Next stage in the receiver chain is AGC–amplifier. It is integrated into PLUSSA–ASIC. AGC has analog gain control. Control voltage for the AGC is generated with DA–converter in COBBA in baseband. AGC–stage provides accurate gain control range (min. 60 dB) for the receiver. After the AGC there is second mixer, which generates second intermediate frequency, 13 MHz. Local signal is generated in PLUSSA by dividing VHF–synthesizer output (232 MHz) by four, so the 2nd LO–frequency is 58 MHz.

2nd IF–filter is a ceramic bandpass filter at 13 MHz. It attenuates adjacent channels, except for +/– 200 kHz there is not much attenuation. Those +/– 200 kHz interferers are filtered digitally by the baseband . So RX DACs are so good, that there is enough dynamic range for the faded 200 kHz interferer. Also the whole RX has to be able to handle signal levels in a linear way. After the 13 MHz filter there is a buffer for the IF–signal, which also converts and amplifies single ended signal from filter to balanced signal for the buffer and AD–converters in COBBA. Buffer in PLUSSA has got voltage gain of 36 dB and buffer gain setting in COBBA is 0 dB. It is possible to set gainstep (9.5 dB) into COBBA via control bus, if needed.

Transmitter

Transmitter chain consists of IQ–modulator, upconversion mixer, power amplifier and there is a power control loop.

I– and Q–signals are generated by baseband also in COBBA–ASIC. After post filtering (RC–network) they go into IQ–modulator in PLUSSA. It generates modulated TX IF–frequency, which is VHF–synthesizer output divided by two, meaning 116 MHz. There is also an AGC–amplifier in PLUSSA, but it is not used in GSM. Output is set to maximum with a 5–bit message in control register. AGC–amplifier is used in other digital systems, because PLUSSA is a core IC. After PLUSSA signal is attenuated and filtered for upconversion into final TX–frequency in CRFU_1a. Upconversion mixer in CRFU_1a is a so called image reject mixer. It is able to attenuate unwanted sideband in the upconverter output. Mixer itself is a double balanced Gilbert cell. Phase shifters required for image rejection are also integrated. Local signal needed in upconversion is generated by the UHF–synthesizer, but buffers for the mixer are integrated into CRFU_1a. Output of the upconverter is buffered and matching network makes a single ended 50 ohm impedance.

Next stage is TX interstage filter, which attenuates unwanted signals from the upconverter, mainly LO–leakage and image frequency from the upconverter. Also it attenuates wideband noise. This bandpass filter is a SAW–filter.

After TX SAW–filter, there is a discrete transistor stage. Function of this block is to reduce the AM–content. This feature is realized with saturated operation of the V640 transistor. Typical input level into this amplifier is higher than output level.

UP8R:

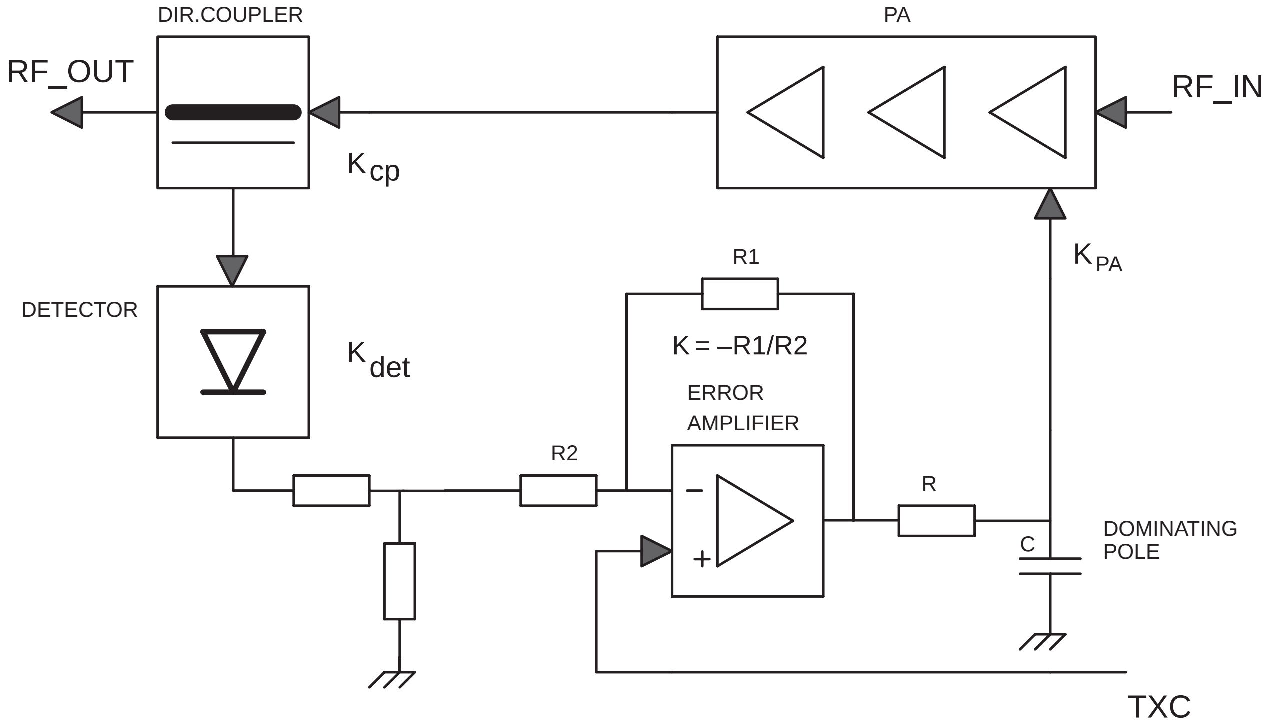
The final amplication is realized with third IC, power amplifier is a MMIC. It has a 50 ohm input, output requires an external matching network. MMIC contains three amplifier stages and interstage matchings. Also there is a gain control, which is controlled with a power control loop. PA has over 35 dB power gain and it is able to produce 2.5 W into output with 0 dBm input level. Gain control range is over 35 dB to get desired power levels and power ramping up and down.
Harmonics generated by the nonlinear PA (class AB) are filtered out with the matching network and lowpass/bandstop filtering in the duplexer. Bandstop is required because of wideband noise located on RX–band.

UP8S:

The power amplifier on this module is a 3–stage hybrid which has all matching networks and gain control fuction integrated in.
Power control circuitry consists of power detector in the PA output and error amplifier in PLUSSA. There is a directional coupler connected between PA output and duplex filter. It takes a sample from the forward going power with certain ratio. This signal is rectified in a schottky–diode

and it produces a DC–signal signal after filtering. This peak–detector is linear on absolute scale, except it saturates on very low and high power levels – it produces a S–shape curve.

This detected voltage is compared in the error–amplifier in PLUSSA to TXC–voltage, which is generated by DA–converter in COBBA. Because also gain control characteristics in PA are linear in absolute scale, control loop defines a voltage loop, when closed. Closed loop tracks the TXC–voltage quite linearilly. TXC has got a raised cosine form ($\cos^4$ – function), which reduces switching transients, when pulsing power up and down. Because dynamic range of the detector is not wide enough to control the power (actually RF output voltage) over the whole range, there is a control named TXP to work under detected levels. Burst is enabled and set to rise with TXP until the output level is high enough, that feedback loop works. Loop controls the output via the control pin in PA MMIC to the desired output level and burst has got the waveform of TXC–ramps. Because feedback loops could be unstable, this loop is compensated with a dominating pole. This pole decreases gain on higher frequencies to get phase margins high enough.



AGC strategy

AGC–amplifier is used to maintain output level of the receiver almost constant. AGC has to be set before each received burst, this is called pre–monitoring. Receiver is switched on roughly 150 ms before the burst begins, DSP measures received signal level and adjusts RXC, which controls RX AGC–amplifier or it switches off the LNA with PDATA0 control line. This pre–monitoring is done in three phases and this sets the settling times for RX AGC. Pre–monitoring is required because of linear receiver, received signal must be in full swing, no clipping is allowed and because DSP doesn’t know, what is the level going to be in next burst.

There is at least 60 dB accurate gain control (continous, analog) and one digital step in LNA. It is typically about 30...35 dB.

RSSI must be measured on range –48...–110 dBm. After –48 dBm level MS reports to base station the same reading.

Because of RSSI–requirements, gain step in LNA is used roughly on –45 dBm RF–level and up to –10 dBm input RF–level accurate AGC is used to set RX output level. LNA is ON below –45 dBm. from –45 dBm down to –95 dBm this accurate AGC in PLUSSA is used to adjust the gain to desired value. RSSI–function is in DSP, but it works out received signal level by measuring RX IQ–level after all selectivity filtering (meaning IF–filters, ΣΔ±converter and FIR–filter in DSP). So 50 dB accurate AGC dynamic range is required. Remaining 10 dB is for gain variations in RX–chain (for calibration). Below –95 dBm RF–levels, output level of the receiver drops dB by dB. At –95 dBm level output of the receiver gives 50 mVpp differentially. This is the target value for DSP. Below this it drops down to ca. 9 mVpp differentially @ –110 dBm RF–level.

This strategy is chosen because we have to roll off the AGC in PLUSSA early enough, that it won’t saturate in selectivity tests. Also we can’t start too early, then we will sacrifice the signal to noise ratio and it would require more accurate AGC dynamic range. 50 mVpp target level is set, because RX–DAC will saturate at 1.4 Vpp. This over 28 dB headroom is required to have margin for +/– 200 kHz faded adjacent channel (ca. 19 dB) and extra 9 dB for pre–monitoring.

Production calibration is done with two RF–levels, LNA gain step is not calibrated. Gain changes in the receiver are taken off from the dynamic range of accurate AGC. Variable gain stage in PLUSSA is designed in a way, that it is capable of compensating itself, there is good enough margin in AGC.

AFC function

AFC is used to lock the transceivers clock to frequency of the base station. AFC–voltage is generated in COBBA with 11 bit AD–converter. There is a RC–filter in AFC control line to reduce the noise from the converter. Settling time requirement for the RC–network comes from signalling, how often PSW (pure sine wave) slots occur. They are repeated after 10 frames , meaning that there is PSW in every 46 ms. AFC tracks base station frequency continously, so transceiver has got a stable frequency, because changes in VCTCXO–output don't occur so fast (temperature). Settling time requirement comes also from the start up–time allowed. When transceiver is in sleep mode and "wakes" up to receive mode , there is only about 5 ms for the AFC–voltage to settle. When the first burst comes in system clock has to be settled into +/– 0.1 ppm frequency accuracy. The VCTCXO–module requires also 5 ms to settle into final frequency. Amplitude rises into full swing in 1 ... 2 ms, but frequency settling time is higher so this oscillator must be powered up early enough.

Receiver blocks

RX interstage filter

Parameter	Min.	Typ.	Max.	Unit
Passband	935 – 960			MHz
Insertion loss			3.8	dB
Maximum drive level			+10	dBm

1st mixer in CRFU_1a

Parameter	Min.	Typ./ Nom.	Max.	Unit/Notes
Supply voltage	2.7	2.8	2.85	V
RX frequency range	935		960	MHz
LO frequency range	1006		1031	MHz
IF frequency		71		MHz
Output resistance (balanced)	10 k			ohm

1st IF–filter

Parameter	min.	typ.	max.	unit
Operating temperature range	–20		+75	deg.C
Center frequency , fo		71		MHz
Maximum ins. loss at 1dBBW			11	dB

Transmitter Blocks

TX interstage filter

Parameter	Min.	Typ.	Max.	Unit
Passband	890 – 915			MHz
Insertion loss			3.8	dB

Power amplifier MMIC

Parameter	Symbol	Test condition	Min	Typ	Max	Unit
Operating freq. range			880		915	MHz
Supply voltage	Vcc		3.1	3.5	5.0	V
Gain control range (overall dynamic range)		Vpc= 0.5 ... 2.2 V	45			dB

Synthesizer blocks

VHF VCO and low pass filter

Parameter	Min.	Typ.	Max.	Unit/Notes
Supply voltage range	2.7	2.8	2.58	V
Current consumption		4	7	mA
Control voltage	0.5		4.0	V
Operation frequency		232		MHz
Output level	–13	–10		dBm (output after the lowpass filter)

UHF PLL

UHF PLL block in PLUSSA

Parameter	Min.	Typ.	Max.	Unit/notes
Input frequency range	650		1300	MHz
Reference input level	100			mVpp
Reference input frequency			30	MHz
Reference input impedance		tbd.		

UHF VCO module

Parameter	Conditions	Rating	Unit/ Notes
Supply voltage, Vcc		2.8 +/– 0.1	V
Supply current, Icc	Vcc = 2.8 V, Vc= 2.25 V	< 10	mA
Control voltage, Vc	Vcc = 2.8 V	0.8... 3.7	V
Oscillation frequency	Vcc = 2.8 V Vc = 0.8 V Vc = 3.7 V	 < 1006 > 1031	 MHz MHz
Tuning voltage in center frequency	f = 1018.5 MHz	2.25 +/– 0.25	V
Tuning voltage sensitivity in operating frequency range on each spot freq.	Vcc = 2.8 V f=1006...1031 MHz	14 +/– 2	MHz/V
Output power level	Vcc=2.7 V f=1006...1031 MHz	–6.0 min.	dBm

UHF local signal input in CRFU_1a

Parameter	Min.	Typ.	Max.	Unit/Notes
Input frequency range	990		1040	MHz
Input level	200		700	mVpp

Connections

RF connector and antenna switch

Parameter	Min.	Typ.	Max.	Unit/Notes
Operating frequency range	890		960	MHz
Insertion loss, COM to INT			0.2	dB
Insertion loss, COM to EXT			0.4	dB
Nominal impedance		50		ohm
Return loss			15	

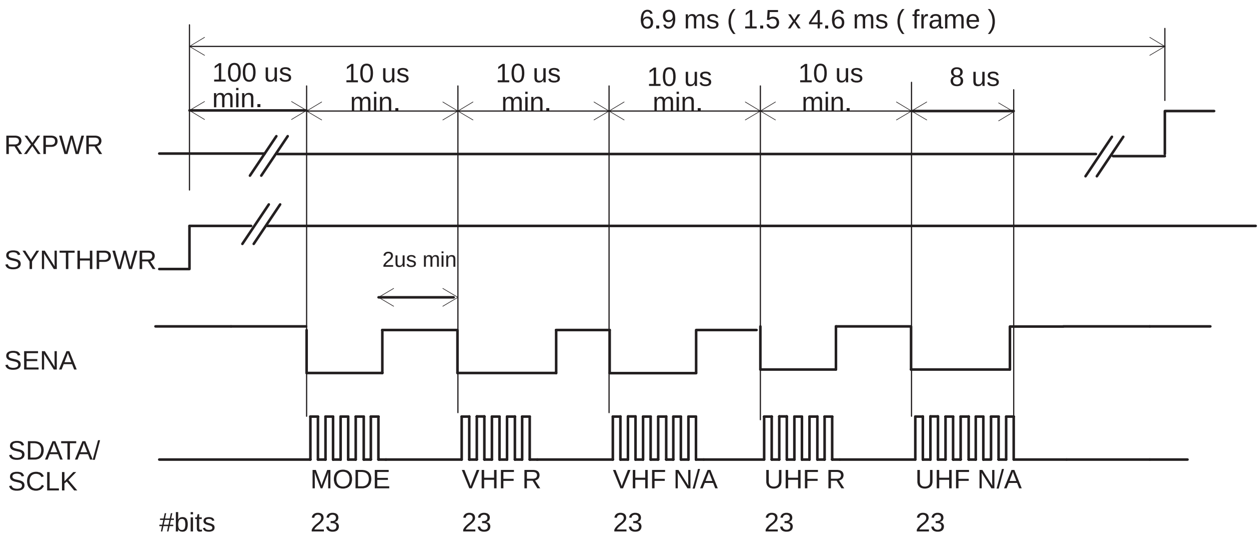
Signal name	From	To	Parameter	Mini- mum	Typi- cal	Maxi- mum	Unit	Function
VBATT	Battery	RF	Voltage	3.0	3.6	5.0/6.0	V	Supply voltage for RF
VXOE- NA	MAD	CCONT	Logic high ”1”	2.0		2.85	V	VR1, VR6 in CCONT ON
			Logic low ”0”	0		0.8	V	VR1, VR6 in CCONT OFF

Signal name	From	To	Parameter	Mini- mum	Typi- cal	Maxi- mum	Unit	Function
SYNP WR	MAD	CCONT	Logic high ”1”	2.0		2.85	V	VR3, VR4 in CCONT ON
			Logic low ”0”	0		0.8	V	VR3,VR4 in CCONT OFF
RXPW R	MAD	CCONT	Logic high ”1”	2.0		2.85	V	VR2, VR5 in CCONT ON
			Logic low ”0”	0		0.8	V	VR2, VR5 in CCONT OFF
TXPW R	MAD	CCONT	Logic high ”1”	2.0		2.85	V	VR7 in CCONT ON
			Logic low ”0”	0		0.8	V	VR7 in CCONT OFF
VREF	CCON T	PLUSSA	Voltage	1.478	1.5	1.523	V	Reference voltage for PLUSSA and CRFU1a
PDA- TA0	MAD	CRFU_1 a	Logic high ”1”	2.0		2.85	V	Nominal gain in LNA
			Logic low ”0”	0		0.8	V	Reduced gain in LNA
SENA1	MAD	PLUSSA	Logic high ”1”	2.0		2.85	V	PLL enable
			Logic low ”0”	0		0.8	V	
SDATA	MAD	PLUSSA	Logic high ”1”	2.0		2.85	V	Synthesizer data
			Logic low ”0”	0		0.8	V	
SCLK	MAD	PLUSSA	Logic high ”1”	2.0		2.85	V	Synthesizer clock
			Logic low ”0”	0		0.8	V	
AFC	COB- BA	VCTCX O	Voltage	0.046		2.254	V	Automatic fre- quency control signal for VC(TC)XO
RFC	VCTCX O	MAD	Frequency		13		MHz	High stability clock signal for the logic circuits
			Signal amplitude	0.5	1.0	2.0	Vpp	
RXIP/ RXIN	PLUS- SA	COBBA	Output level		50	1344	mVp p	Differential RX 13 MHz signal to baseband
TXIP/ TXIN	COB- BA	PLUSSA	Differential voltage swing	0.75 x 1.022	0.75 x 1.1	0.75 x 1.18	Vpp	Differential in–phase TX base- band signal for the RF modulator
			DC level	0.784	0.8	0.816	V	
TXQP/ TXQN	COB- BA	PLUSSA	Differential voltage swing	0.75 x 1.022	0.75 x 1.1	0.75 x 1.18	Vpp	Differential quad- rature phase TX baseband signal for the RF modu- lator
			DC level	0.784	0.8	0.816	V	

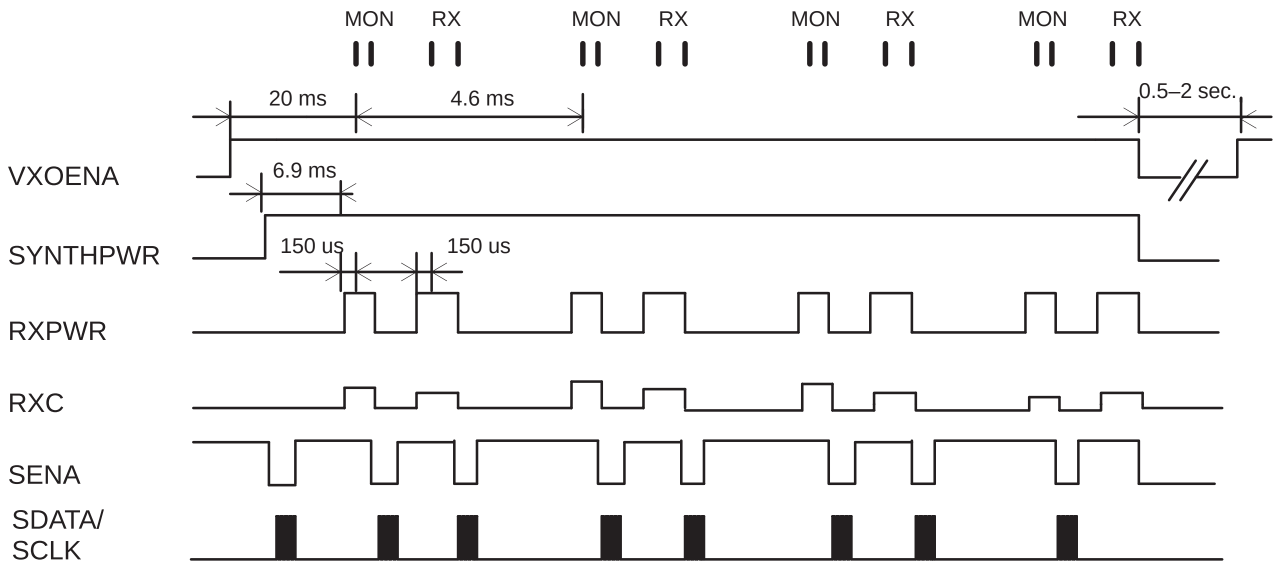
Signal name	From	To	Parameter	Mini-mum	Typi-cal	Maxi-mum	Unit	Function
TXP	MAD	PLUSSA	Logic high ”1”	2.0		2.85	V	Transmitter power control enable
			Logic low ”0”	0		0.8	V	
TXC	COB-BA	PLUSSA	Voltage Min	0.12		0.18	V	Transmitter power control
			Voltage Max	2.27		2.33	V	
RXC	COB-BA	PLUSSA	Voltage Min	0.12		0.18	V	Receiver gain control
			Voltage Max	2.27		2.33	V	

Timings

Synthesizer control timing

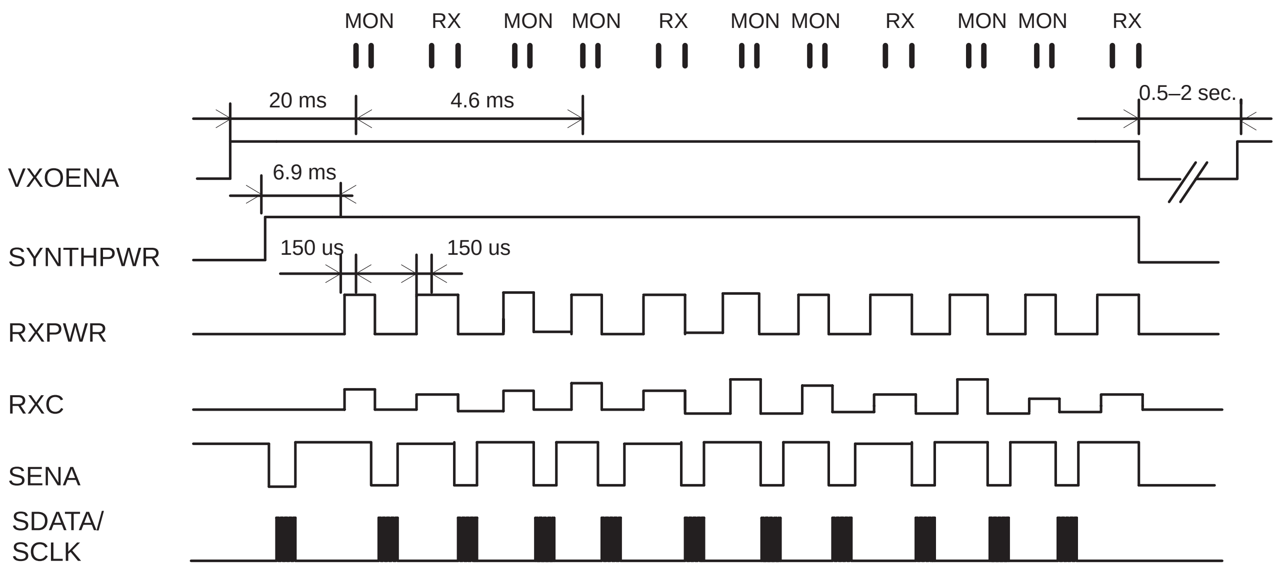


Synthesizer Start–up Timing / clocking

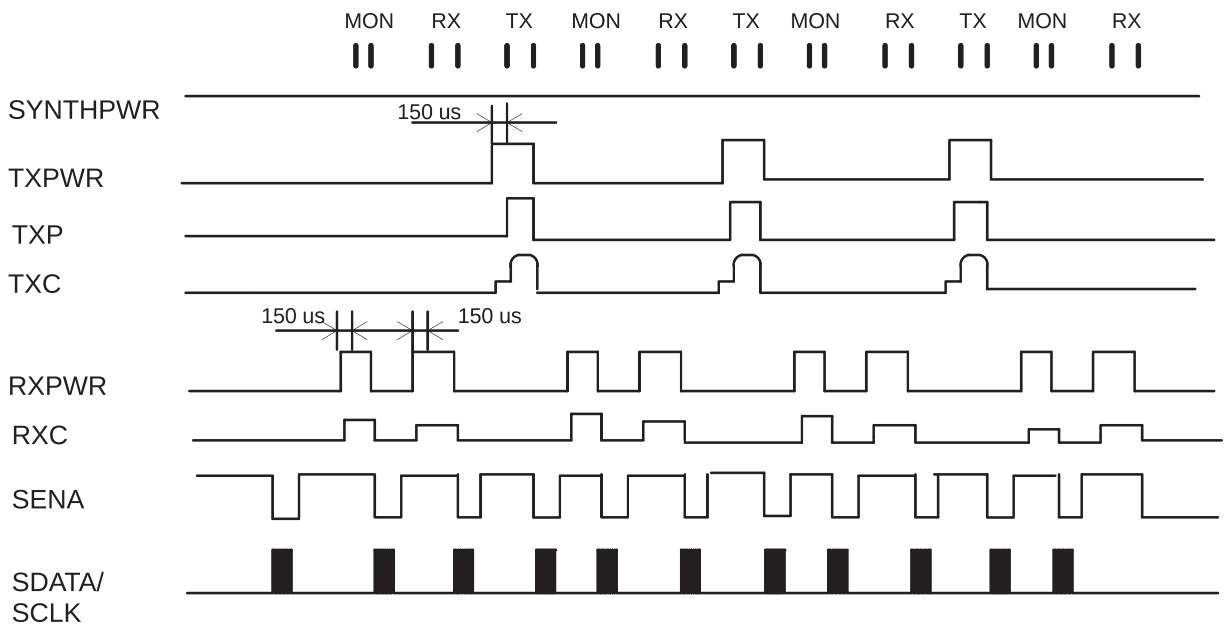


Synthesizer Timing / IDLE,
one monitoring frame,
frame can start also from RX–burst

In case of long list of adjacent channels, there might be two monitoring–bursts/frame. Extra monitoring ”replaces” TX–burst.

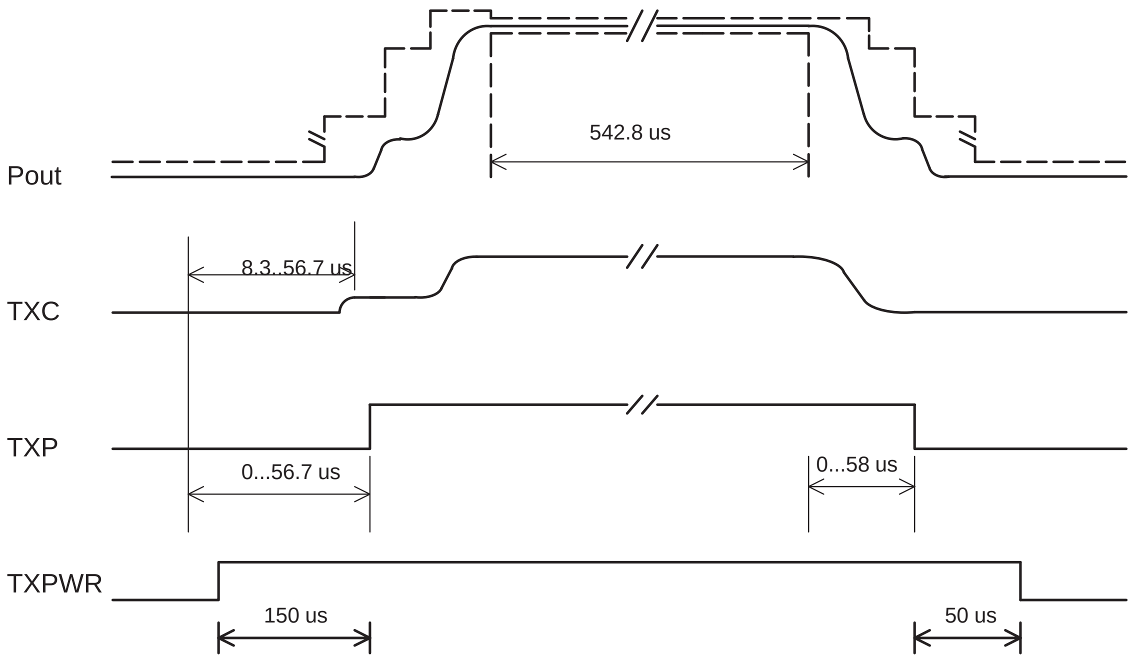


Synthesizer Timing / IDLE 2, frame can start from RX–burst



Sunthesizer Timing / traffic channel

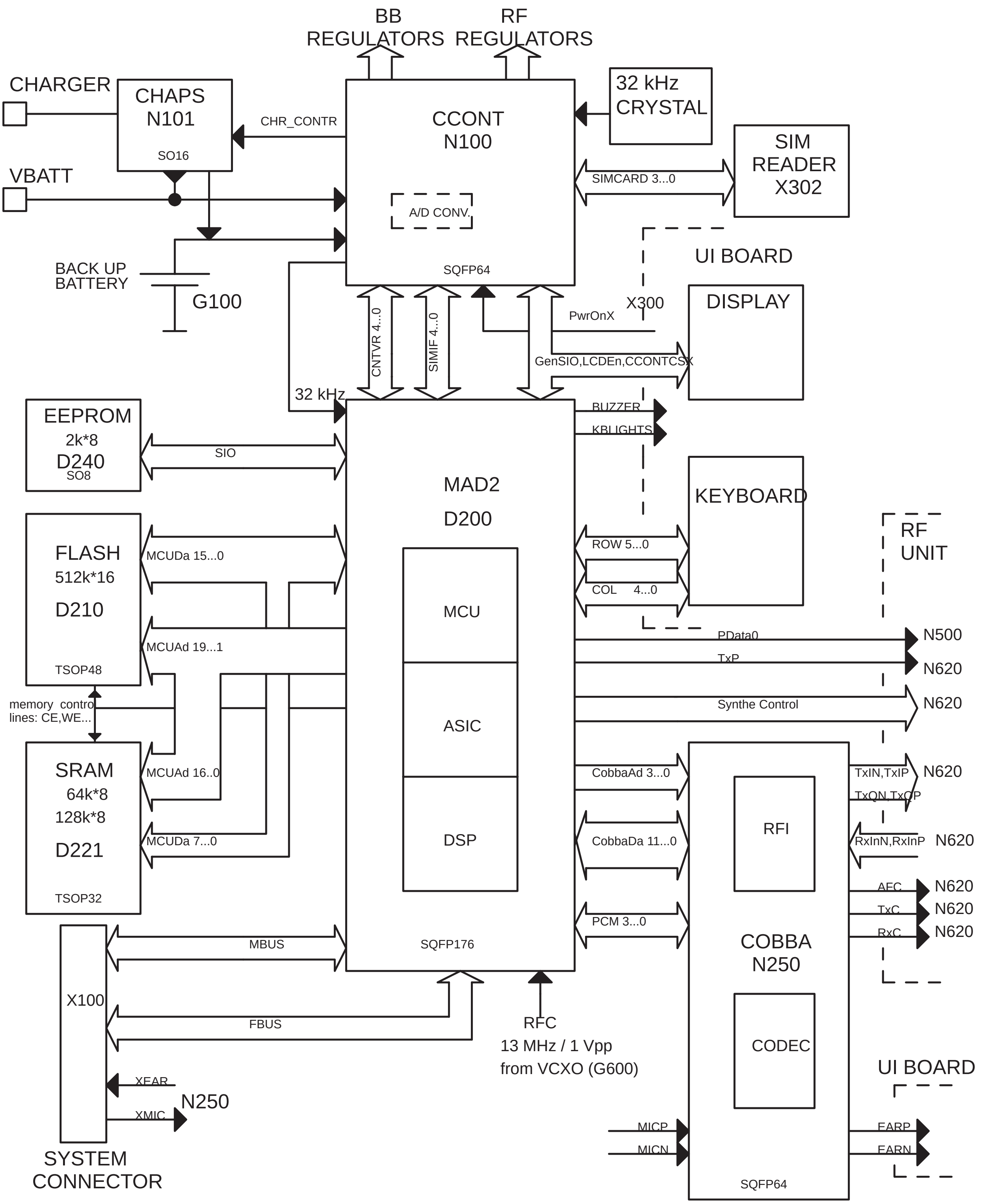
Transmitter power switching timing diagram



Synthesizer clocking

Synthesizers are controlled via serial control bus, which consists of SDATA, SCLK and SENA1 signals. These lines form a synchronous data transfer line. SDATA is for the data bits, SCLK is 3.25 MHz clock and SENA1 is latch enable, which stores the data into counters or registers.

Block Diagram of Baseband Blocks



Parts list of UP8S (EDMS Issue 7.1) Code: 0200952

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R100	1430826	Chip resistor	680 k	5 % 0.063 W 0402
R102	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R103	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R104	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R109	1620017	Res network 0w06 2x100r j	0404	0404
R113	1430726	Chip resistor	100	5 % 0.063 W 0402
R116	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R118	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R120	1620025	Res network 0w06 2x100k j	0404	0404
R122	1620019	Res network 0w06 2x10k j	0404	0404
R124	1620027	Res network 0w06 2x47r j	0404	0404
R127	1620031	Res network 0w06 2x1k0 j	0404	0404
R128	1430718	Chip resistor	47	5 % 0.063 W 0402
R131	1422881	Chip resistor	0.22	5 % 1 W 1218
R136	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R140	1430690	Chip jumper		0402
R142	1430690	Chip jumper		0402
R143	1430834	Chip resistor	3.3 M	5 % 0.063 W 0402
R152	1430690	Chip jumper		0402
R154	1430122	Chip resistor	4.7 M	5 % 0.063 W 0603
R201	1430812	Chip resistor	220 k	5 % 0.063 W 0402
R202	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R203	1620029	Res network 0w06 2x4k7 j	0404	0404
R211	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R213	1430690	Chip jumper		0402
R215	1620023	Res network 0w06 2x47k j	0404	0404
R252	1430740	Chip resistor	330	5 % 0.063 W 0402
R254	1620027	Res network 0w06 2x47r j	0404	0404
R256	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R257	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R259	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R260	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R261	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R263	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R265	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R267	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R268	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R270	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R271	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R301	1620031	Res network 0w06 2x1k0 j	0404	0404
R303	1620031	Res network 0w06 2x1k0 j	0404	0404
R305	1620031	Res network 0w06 2x1k0 j	0404	0404
R307	1620031	Res network 0w06 2x1k0 j	0404	0404

R308	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R309	1620031	Res network 0w06 2x1k0 j	0404	0404
R500	1430700	Chip resistor	10	5 % 0.063 W 0402
R501	1430700	Chip resistor	10	5 % 0.063 W 0402
R502	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402
R504	1620019	Res network 0w06 2x10k j	0404	0404
R507	1430740	Chip resistor	330	5 % 0.063 W 0402
R530	1430700	Chip resistor	10	5 % 0.063 W 0402
R531	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R533	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R550	1430752	Chip resistor	820	5 % 0.063 W 0402
R551	1430740	Chip resistor	330	5 % 0.063 W 0402
R552	1430740	Chip resistor	330	5 % 0.063 W 0402
R553	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R554	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R555	1430726	Chip resistor	100	5 % 0.063 W 0402
R556	1412286	Chip jumper		0805
R570	1430726	Chip resistor	100	5 % 0.063 W 0402
R572	1820031	NTC resistor	330	10 % 0.12 W 0805
R574	1430744	Chip resistor	470	5 % 0.063 W 0402
R580	1430706	Chip resistor	15	5 % 0.063 W 0402
R581	1430832	Chip resistor	2.7 k	5 % 0.063 W 0402
R582	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R584	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R585	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R586	1430738	Chip resistor	270	5 % 0.063 W 0402
R588	1430744	Chip resistor	470	5 % 0.063 W 0402
R589	1430710	Chip resistor	22	5 % 0.063 W 0402
R600	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R620	1620029	Res network 0w06 2x4k7 j	0404	0404
R621	1430744	Chip resistor	470	5 % 0.063 W 0402
R622	1430758	Chip resistor	1.5 k	5 % 0.063 W 0402
R623	1430714	Chip resistor	33	5 % 0.063 W 0402
R625	1430714	Chip resistor	33	5 % 0.063 W 0402
R626	1430740	Chip resistor	330	5 % 0.063 W 0402
R627	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R628	1430744	Chip resistor	470	5 % 0.063 W 0402
R629	1430730	Chip resistor	150	5 % 0.063 W 0402
R630	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R631	1430700	Chip resistor	10	5 % 0.063 W 0402
R632	1430848	Chip resistor	12 k	1 % 0.063 W 0402
R634	1430848	Chip resistor	12 k	1 % 0.063 W 0402
R635	1430851	Chip resistor	15 k	2 % 0.063 W 0402
R636	1430848	Chip resistor	12 k	1 % 0.063 W 0402
R638	1430848	Chip resistor	12 k	1 % 0.063 W 0402
R640	1430734	Chip resistor	220	5 % 0.063 W 0402
R641	1820031	NTC resistor	330	10 % 0.12 W 0805

R660	1430726	Chip resistor	100	5 % 0.063 W 0402
R662	1430714	Chip resistor	33	5 % 0.063 W 0402
R664	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402
R666	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R668	1430732	Chip resistor	180	5 % 0.063 W 0402
R670	1430726	Chip resistor	100	5 % 0.063 W 0402
R672	1430706	Chip resistor	15	5 % 0.063 W 0402
R706	1430812	Chip resistor	220 k	5 % 0.063 W 0402
R708	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R710	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
C100	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C101	2320548	Ceramic cap.	33 p	5 % 50 V 0402
C102	2320538	Ceramic cap.	12 p	5 % 50 V 0402
C103	2604127	Tantalum cap.	1.0 u	20 % 35 V 3.5x2.8x1.9
C104	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C105	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C106	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C107	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C108	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C109	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C110	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C112	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C113	2320508	Ceramic cap.	1.0 p	0.25 % 50 V 0402
C114	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C115	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C116	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C117	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C118	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C119	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C120	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C121	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C122	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C127	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C128	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C129	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C130	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C131	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C132	2312403	Ceramic cap.	2.2 u	10 % 10 V 1206
C133	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C140	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C142	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C143	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C146	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C160	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C161	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C201	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C202	2320620	Ceramic cap.	10 n	5 % 16 V 0402

C203	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C204	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C205	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C206	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C207	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C208	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C209	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C211	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C212	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C213	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C221	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C231	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C247	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C248	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C249	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C251	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C252	2312296	Ceramic cap.		Y5 V 1210
C253	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C254	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C255	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C256	2312296	Ceramic cap.		Y5 V 1210
C257	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C258	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C260	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C261	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C262	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C263	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C266	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C268	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C269	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C271	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C272	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C301	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C302	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C303	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C304	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C305	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C306	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C307	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C308	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C309	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C310	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C311	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C312	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C313	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C500	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C501	2320546	Ceramic cap.	27 p	5 % 50 V 0402

C502	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C504	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C505	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C506	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C507	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C511	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C512	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C513	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C514	2320540	Ceramic cap.	15 p	5 % 50 V 0402
C515	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C516	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C518	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C520	2320602	Ceramic cap.	4.7 p	0.25 % 50 V 0402
C530	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C531	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C532	2320554	Ceramic cap.	56 p	5 % 50 V 0402
C535	2310181	Ceramic cap.	1.5 n	5 % 50 V 1206
C540	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C541	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C550	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C553	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C554	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C560	2320516	Ceramic cap.	1.5 p	0.25 % 50 V 0402
C570	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C572	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C574	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C575	2320522	Ceramic cap.	2.7 p	0.25 % 50 V 0402
C582	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C583	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C585	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C586	2320540	Ceramic cap.	15 p	5 % 50 V 0402
C587	2310248	Ceramic cap.	4.7 n	5 % 50 V 1206
C588	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C590	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C592	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C600	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C601	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C602	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C603	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C604	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C610	2610013	Tantalum cap.	220 u	10 % 10 V 7.3x4.3x4.1
C611	2610013	Tantalum cap.	220 u	10 % 10 V 7.3x4.3x4.1
C612	2610013	Tantalum cap.	220 u	10 % 10 V 7.3x4.3x4.1
C613	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C614	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
C621	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C622	2320522	Ceramic cap.	2.7 p	0.25 % 50 V 0402

C623	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C627	2320738	Ceramic cap.	470 p	10 % 50 V 0402
C630	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C632	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C633	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C635	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C636	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C638	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C639	2320592	Ceramic cap.	2.2 n	5 % 50 V 0402
C640	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C641	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C642	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C643	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C644	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C649	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C652	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C653	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C655	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C660	2320548	Ceramic cap.	33 p	5 % 50 V 0402
C662	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C695	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C700	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
L103	3203701	Ferrite bead 33r/100mhz	0805	0805
L104	3203701	Ferrite bead 33r/100mhz	0805	0805
L105	3203701	Ferrite bead 33r/100mhz	0805	0805
L106	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
L107	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
L108	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
L500	3643039	Chip coil	220 n	5 % Q=35/100 MHz 0805
L501	3643039	Chip coil	220 n	5 % Q=35/100 MHz 0805
L550	3640069	Filt 47pf 25v 0r01 6a	1206	
L554	3646001	Chip coil	3 n	Q=7/100M 0402
L580	3645161	Chip coil	150 n	5 % Q=14/100 MHz 0603
L581	3643025	Chip coil	56 n	5 % Q=40/200 MHz 0805
L600	3641206	Chip coil		10% Q=25/7.96 MHz 1008
L621	3641300	Chip coil	330 n	5 % Q=30/25 MHz 1008
L623	3641626	Chip coil	220 n	2 % Q=30/100 MHz 0805
L624	3641626	Chip coil	220 n	2 % Q=30/100 MHz 0805
B100	4510159	Crystal	32.768 k	+–20PPM
G530	4350099	Vco 1006–1031mhz 2.8v 10ma gsm		
G600	4510153	VCTCXO	13.0 M	+–5PPM 2.8V GSM
F101	5119019	SM, fuse f 1.5a 32v	0603	
Z500	4511017	Saw filter	947.5+–12.5 M	/3.8DB 4X4
Z505	4511015	Saw filter	902.5+–12.5 M	/3.8DB 4X4
Z550	4512005	Dupl 890–915/935–960mhz	20x14	20x14
Z620	4510009	Cer.filt 13+–0.09mhz	7.2x3.2	7.2x3.2
Z621	4511029	Saw filter	71+–0.09 M	/1.5DB 14X8

V100	1825005	Chip varistor vwm14v vc30v	0805	0805
V101	4113651	Trans. supr.	QUAD	6 V SOT23–5
V102	4113651	Trans. supr.	QUAD	6 V SOT23–5
V103	4113601	Emi filter emif01–5250sc5 sot23–5		SOT23–5
V104	4113651	Trans. supr.	QUAD	6 V SOT23–5
V116	4110067	Schottky diode	MBR0520L	20 V 0.5 A SOD123
V250	4210100	Transistor	BC848W	npn 30 V SOT323
V550	4110014	Sch. diode x 2	BAS70–07	70 V 15 mA SOT143
V580	4110062	Cap. diode	BB535	30 V 2.1/18.7PFSOD323
V581	4210066	Transistor	BFR93AW	npn 12 V 35 mA SOT323
V640	4210066	Transistor	BFR93AW	npn 12 V 35 mA SOT323
V705	4210100	Transistor	BC848W	npn 30 V SOT323
D200	4370279	Mad2 rom3 f711604 c12	tqfp176	TQFP176
D210	4340261	Te28f800 flashm 512kx16 120ns		
D221	4340273	IC, SRAM		STSOP32
D240	4343280	IC, EEPROM		2kx8 bit SO8S
N100	4370047	Ccont 2f dct3 bb asic	tqfp64	TQFP64
N101	4370165	Uba2006t chaps charg.control so16		SO16
N201	4340423	IC, regulator	TK11230M	3.0 V SOT23L
N250	4370317	Cobba_gj b07 bb asic dct3 tqfp64		TQFP64
N500	4370253	Crfu1a rx+tx uhf gsm v5 sot401–1		SOT401–1
N550	435X049	Use code 4350139		
N620	4370273	Plussa txmod+rxif+2pll	tqfp64	TQFP64
X100	5469061	SM, system conn 6af+3dc+mic+jack		
X101	5469069	SM, batt conn 2pol spr p3.5 100v		100V2A
X102	5469069	SM, batt conn 2pol spr p3.5 100v		100V2A
X300	5460021	SM, conn 2x14m spring p1.0 pcb/p		PCB/PCB
X302	5400085	Sim card reader 2x3pol p2.54 sm		SM
X540	5429007	SM, coax conn m sw 50r 0.4–2ghz		
A500	9517012	SM, d rf shield dmc00422 hd940 u		UP8
	9380753	Bar code label dmd03311	27x6.5	27x6.5
	9854231	PCB UP8S 123.3X41.0X0.9 M6 4/PA		

Parts list of UP8R (EDMS Issue 3.2) Code: 0201190

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R100	1430826	Chip resistor	680 k	5 % 0.063 W 0402
R102	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R103	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R104	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R109	1620017	Res network 0w06 2x100r j	0404	0404
R113	1430726	Chip resistor	100	5 % 0.063 W 0402
R116	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R118	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R120	1620025	Res network 0w06 2x100k j	0404	0404
R122	1620019	Res network 0w06 2x10k j	0404	0404
R124	1620027	Res network 0w06 2x47r j	0404	0404
R127	1620031	Res network 0w06 2x1k0 j	0404	0404
R128	1430718	Chip resistor	47	5 % 0.063 W 0402
R131	1422881	Chip resistor	0.22	5 % 1 W 1218
R136	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R140	1430690	Chip jumper		0402
R142	1430690	Chip jumper		0402
R143	1430834	Chip resistor	3.3 M	5 % 0.063 W 0402
R152	1430690	Chip jumper		0402
R154	1430122	Chip resistor	4.7 M	5 % 0.063 W 0603
R201	1430812	Chip resistor	220 k	5 % 0.063 W 0402
R202	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R203	1620029	Res network 0w06 2x4k7 j	0404	0404
R211	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R213	1430690	Chip jumper		0402
R215	1620023	Res network 0w06 2x47k j	0404	0404
R252	1430740	Chip resistor	330	5 % 0.063 W 0402
R254	1620027	Res network 0w06 2x47r j	0404	0404
R256	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R257	1430820	Chip resistor	470 k	5 % 0.063 W 0402
R259	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R260	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R261	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R263	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R265	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R267	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R268	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R270	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R271	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R301	1620031	Res network 0w06 2x1k0 j	0404	0404
R303	1620031	Res network 0w06 2x1k0 j	0404	0404
R305	1620031	Res network 0w06 2x1k0 j	0404	0404
R307	1620031	Res network 0w06 2x1k0 j	0404	0404

R308	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R309	1620031	Res network 0w06 2x1k0 j	0404	0404
R500	1430700	Chip resistor	10	5 % 0.063 W 0402
R501	1430700	Chip resistor	10	5 % 0.063 W 0402
R502	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402
R504	1620019	Res network 0w06 2x10k j	0404	0404
R507	1430740	Chip resistor	330	5 % 0.063 W 0402
R530	1430700	Chip resistor	10	5 % 0.063 W 0402
R531	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R533	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R550	1430752	Chip resistor	820	5 % 0.063 W 0402
R551	1430740	Chip resistor	330	5 % 0.063 W 0402
R552	1430740	Chip resistor	330	5 % 0.063 W 0402
R553	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R554	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R555	1430726	Chip resistor	100	5 % 0.063 W 0402
R580	1430706	Chip resistor	15	5 % 0.063 W 0402
R581	1430832	Chip resistor	2.7 k	5 % 0.063 W 0402
R582	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R584	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R585	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R586	1430738	Chip resistor	270	5 % 0.063 W 0402
R588	1430744	Chip resistor	470	5 % 0.063 W 0402
R589	1430710	Chip resistor	22	5 % 0.063 W 0402
R600	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R620	1620029	Res network 0w06 2x4k7 j	0404	0404
R621	1430744	Chip resistor	470	5 % 0.063 W 0402
R622	1430758	Chip resistor	1.5 k	5 % 0.063 W 0402
R623	1430714	Chip resistor	33	5 % 0.063 W 0402
R624	1430714	Chip resistor	33	5 % 0.063 W 0402
R625	1430714	Chip resistor	33	5 % 0.063 W 0402
R626	1430740	Chip resistor	330	5 % 0.063 W 0402
R627	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R628	1430744	Chip resistor	470	5 % 0.063 W 0402
R629	1430730	Chip resistor	150	5 % 0.063 W 0402
R630	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R631	1430700	Chip resistor	10	5 % 0.063 W 0402
R632	1430848	Chip resistor	12 k	1 % 0.063 W 0402
R634	1430848	Chip resistor	12 k	1 % 0.063 W 0402
R635	1430851	Chip resistor	15 k	2 % 0.063 W 0402
R636	1430848	Chip resistor	12 k	1 % 0.063 W 0402
R638	1430848	Chip resistor	12 k	1 % 0.063 W 0402
R640	1430734	Chip resistor	220	5 % 0.063 W 0402
R641	1820031	NTC resistor	330	10 % 0.12 W 0805
R660	1430726	Chip resistor	100	5 % 0.063 W 0402
R662	1430714	Chip resistor	33	5 % 0.063 W 0402
R664	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402

R666	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R668	1430732	Chip resistor	180	5 % 0.063 W 0402
R670	1430726	Chip resistor	100	5 % 0.063 W 0402
R706	1430812	Chip resistor	220 k	5 % 0.063 W 0402
R708	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R710	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
C100	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C101	2320548	Ceramic cap.	33 p	5 % 50 V 0402
C102	2320538	Ceramic cap.	12 p	5 % 50 V 0402
C103	2604127	Tantalum cap.	1.0 u	20 % 35 V 3.5x2.8x1.9
C104	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C105	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C106	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C107	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C108	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C109	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C110	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C112	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C113	2320508	Ceramic cap.	1.0 p	0.25 % 50 V 0402
C114	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C115	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C116	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C117	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C118	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C119	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C120	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C121	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C122	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C127	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C128	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C129	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C130	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C131	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C132	2312403	Ceramic cap.	2.2 u	10 % 10 V 1206
C133	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C140	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C142	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C143	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C146	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C160	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C161	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C201	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C202	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C203	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C204	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C205	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C206	2320620	Ceramic cap.	10 n	5 % 16 V 0402

C207	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C208	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C209	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C211	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C212	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C213	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C221	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C231	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C247	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C248	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C249	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C251	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C252	2312296	Ceramic cap.		Y5 V 1210
C253	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C254	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C255	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C256	2312296	Ceramic cap.		Y5 V 1210
C257	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C258	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C260	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C261	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C262	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C263	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C266	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C268	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C269	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C271	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C272	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C301	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C302	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C303	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C304	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C305	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C306	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C307	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C308	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C309	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C310	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C311	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C312	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C313	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C500	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C501	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C502	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C504	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C505	2320550	Ceramic cap.	39 p	5 % 50 V 0402
C506	2320544	Ceramic cap.	22 p	5 % 50 V 0402

C507	2320550	Ceramic cap.	39 p	5 % 50 V 0402
C511	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C512	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C513	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C514	2320540	Ceramic cap.	15 p	5 % 50 V 0402
C515	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C516	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C518	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C520	2320602	Ceramic cap.	4.7 p	0.25 % 50 V 0402
C530	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C531	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C532	2320554	Ceramic cap.	56 p	5 % 50 V 0402
C535	2310181	Ceramic cap.	1.5 n	5 % 50 V 1206
C540	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C550	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C553	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C554	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C555	2320618	Ceramic cap.	4.7 n	5 % 25 V 0402
C559	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C562	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C563	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C564	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C565	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C566	2320538	Ceramic cap.	12 p	5 % 50 V 0402
C567	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C568	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C570	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C571	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C572	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C574	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C575	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C576	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C582	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C583	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C585	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C586	2320540	Ceramic cap.	15 p	5 % 50 V 0402
C587	2310248	Ceramic cap.	4.7 n	5 % 50 V 1206
C588	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C590	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C592	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C600	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C601	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C602	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C603	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C604	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C610	2610013	Tantalum cap.	220 u	10 % 10 V 7.3x4.3x4.1
C611	2610013	Tantalum cap.	220 u	10 % 10 V 7.3x4.3x4.1

C612	2610013	Tantalum cap.	220 u	10 % 10 V 7.3x4.3x4.1
C613	2320538	Ceramic cap.	12 p	5 % 50 V 0402
C614	2320526	Ceramic cap.	3.9 p	0.25 % 50 V 0402
C621	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C622	2320514	Ceramic cap.	1.2 p	0.25 % 50 V 0402
C623	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C624	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C627	2320738	Ceramic cap.	470 p	10 % 50 V 0402
C630	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C632	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C633	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C635	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C636	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C638	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C639	2320592	Ceramic cap.	2.2 n	5 % 50 V 0402
C640	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C641	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C642	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C643	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C644	2320540	Ceramic cap.	15 p	5 % 50 V 0402
C649	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C652	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C653	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C655	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C656	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C660	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C662	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C695	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C700	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
L103	3203701	Ferrite bead 33r/100mhz 0805		0805
L104	3203701	Ferrite bead 33r/100mhz 0805		0805
L105	3203701	Ferrite bead 33r/100mhz 0805		0805
L106	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
L107	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
L108	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
L500	3643039	Chip coil	220 n	5 % Q=35/100 MHz 0805
L501	3643039	Chip coil	220 n	5 % Q=35/100 MHz 0805
L550	3640069	Filt 47pf 25v 0r01 6a 1206		
L552	3645157	Chip coil	100 n	10 % Q=12/100 MHz 0603
L554	3645157	Chip coil	100 n	10 % Q=12/100 MHz 0603
L580	3645161	Chip coil	150 n	5 % Q=14/100 MHz 0603
L581	3643025	Chip coil	56 n	5 % Q=40/200 MHz 0805
L600	3641206	Chip coil		10% Q=25/7.96 MHz 1008
L621	3641300	Chip coil	330 n	5 % Q=30/25 MHz 1008
L623	3641626	Chip coil	220 n	2 % Q=30/100 MHz 0805
L624	3641626	Chip coil	220 n	2 % Q=30/100 MHz 0805
B100	4510159	Crystal	32.768 k	+–20PPM

G530	4350099	Vco 1006–1031mhz 2.8v 10ma gsm	
G600	4510153	VCTCXO 13.0 M+–5PPM 2.8V GSM	
F101	5119019	SM, fuse f 1.5a 32v 0603	
Z500	4511017	Saw filter 947.5+–12.5 M	/3.8DB 4X4
Z505	4511015	Saw filter 902.5+–12.5 M	/3.8DB 4X4
Z550	4512005	Dupl 890–915/935–960mhz 20x14	20x14
Z620	4510009	Cer.filt 13+–0.09mhz 7.2x3.2	7.2x3.2
Z621	4510137	Saw filter 71+–0.09 M	14.2x8.4
V100	1825005	Chip varistor vwm14v vc30v 0805	0805
V101	4113651	Trans. supr. QUAD	6 V SOT23–5
V102	4113651	Trans. supr. QUAD	6 V SOT23–5
V103	4113601	Emi filter emif01–5250sc5 sot23–5	SOT23–5
V104	4113651	Trans. supr. QUAD	6 V SOT23–5
V116	4110067	Schottky diode MBR0520L	20 V 0.5 A SOD123
V250	4210100	Transistor BC848W	npn 30 V SOT323
V550	4110014	Sch. diode x 2 BAS70–07	70 V 15 mA SOT143
V580	4110062	Cap. diode BB535	30 V 2.1/18.7PFSOD323
V581	4210066	Transistor BFR93AW	npn 12 V 35 mA SOT323
V640	4210066	Transistor BFR93AW	npn 12 V 35 mA SOT323
V705	4210100	Transistor BC848W	npn 30 V SOT323
D200	4370279	Mad2 rom3 f711604 c12 tqfp176	TQFP176
D211	4340261	IC, flash mem.	TSO48
D220	4340273	IC, SRAM	STSOP32
D240	4343280	IC, EEPROM	2kx8 bit SO8S
N100	4370047	Ccont 2f dct3 bb asic tqfp64	TQFP64
N101	4370165	Uba2006t chaps charg.control so16	SO16
N201	4340423	IC, regulator TK11230M	3.0 V SOT23L
N250	4370317	Cobba_gj b07 bb asic dct3 tqfp64	TQFP64
N500	4370253	Crfu1a rx+tx uhf gsm v5 sot401–1	SOT401–1
N550	4370319	Rf9106 pw amp 880–915mhz psop2–16	PSOP2–16
N620	4370273	Plussa txmod+rxif+2pll tqfp64	TQFP64
X100	5469061	SM, system conn 6af+3dc+mic+jack	
X101	5469069	SM, batt conn 2pol spr p3.5 100v	100V2A
X102	5469069	SM, batt conn 2pol spr p3.5 100v	100V2A
X300	5460021	SM, conn 2x14m spring p1.0 pcb/p	PCB/PCB
X302	5400085	Sim card reader 2x3pol p2.54 sm	SM
X540	5429007	SM, coax conn m sw 50r 0.4–2ghz	
A500	9517012	SM, d rf shield dmc00422 hd940 u	UP8
A510	9517013	SM, d rf shield pa–can dmc00455	
	9380753	Bar code label dmd03311 27x6.5	27x6.5
	9850051	PCB UP8 123.25X41.0X1.0 M6 4/PA	

Chapter 4

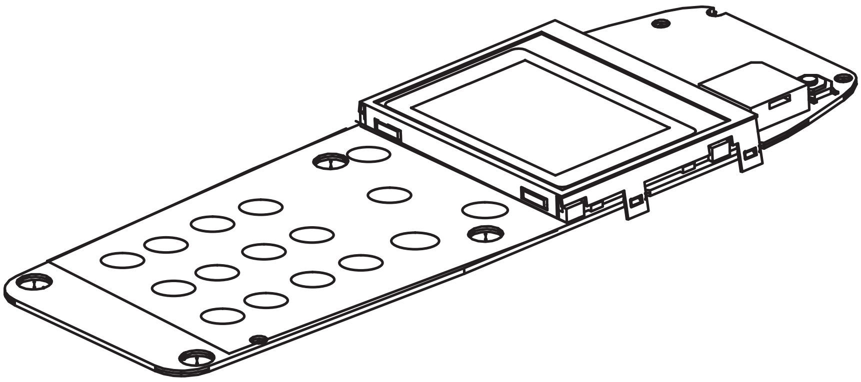
UI Module UE4S

CONTENTS

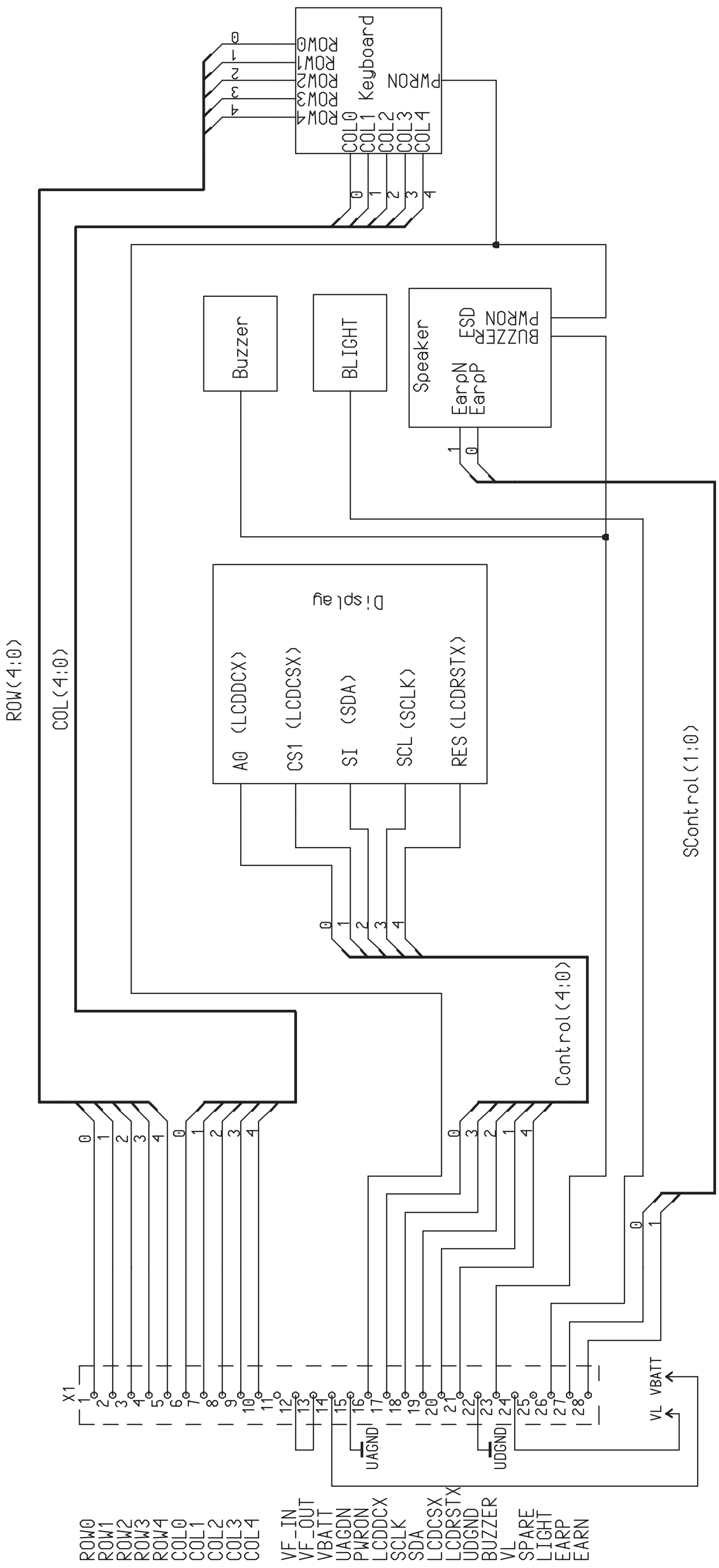
UIF Module

Introduction

The UI module UE4S is a four layer PCB, which is connected to the system/RF PCB with a 28–pin spring connector.



Baseband Block Diagram

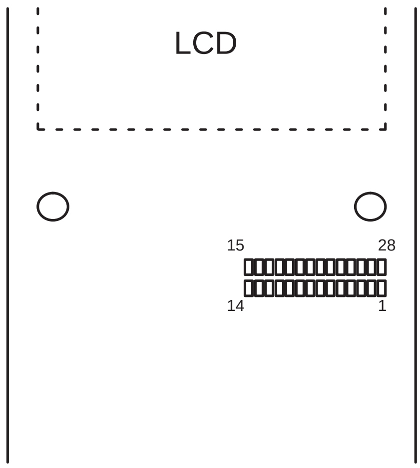


The Engine Interface

Pin	Line Sym-bol	Parameter	Min	Typ	Max	Unit	Notes
1	ROW0	Keyboard matrix row 0	0 0.7xVBB		0.3xVBB VBB	V	Low High
2	ROW1	Keyboard matrix row 1	0 0.7xVBB		0.3xVBB VBB	V	Low High
3	ROW2	Keyboard matrix row 2	0 0.7xVBB		0.3xVBB VBB	V	Low High
4	ROW3	Keyboard matrix row 3	0 0.7xVBB		0.3xVBB VBB	V	Low High
5	ROW4	Keyboard matrix row 4	0 0.7xVBB		0.3xVBB VBB	V	Low High
6	COL0	Keyboard matrix column 0, used for flip identification	0 0.7xVBB		0.3xVBB VBB	V	Flip Open Flip Closed
7	COL1	Keyboard matrix column 1	0 0.7xVBB		0.3xVBB VBB	V	Low High
8	COL2	Keyboard matrix column 2	0 0.7xVBB		0.3xVBB VBB	V	Low High
9	COL3	Keyboard matrix column 3	0 0.7xVBB		0.3xVBB VBB	V	Low High
10	COL4	Keyboard matrix column 4	0 0.7xVBB		0.3xVBB VBB	V	Low High
11	Signal1	Flip interrupt, not used	0 0.7xVBB		0.3xVBB VBB	V	
12	VF_IN	Flash in	4.8	5.0	5.2	V	Connected #13
13	VF_OUT	Flash out	4.8	5.0	5.2	V	Connected #12
14	VBATT	Battery voltage	3.0		5.1	V	
			60	75	100	mA	For lights
				110	300	mA	For buzzer
15	UAGND*	Analog ground		0		V	
16	PWRON	Power on key	0 0.7xVBB		0.3xVBB VBB	V	Low / Power on High
17	LCDCDX	LCD driver code/data selection	0 0.7xVBB		0.3xVBB VBB	V	Low High
18	SCLK	LCD driver serial clock	0 0.7xVBB		0.3xVBB VBB	V	Low High

Pin	Line Symbol	Parameter	Min	Typ	Max	Unit	Notes
			0		4.0	MHz	
19	SDA	LCD driver serial data	0 0.7xVBB		0.3xVBB VBB	V	Low High
20	LCDCSX	LCD driver chip select	0 0.7xVBB		0.3xVBB VBB	V	Low / Active High
21	LCDRSTX	LCD driver reset	0 0.7xVBB		0.3xVBB VBB	V	Low / Active High
22	UDGND*	Digital ground		0		V	
23	BUZZER	Buzzer PWM control	0		2.85	V	
24	VL	Supply voltage	2.7	2.8	2.85 300	V uA	
25	SPARE	Call indicator LED	0 0.7xVBB		0.3xVBB VBB	V	Not used in UI
26	LIGHT	Illumination control	0 0.7xVBB		0.3xVBB VBB	V	Low High / Active
27	EARN	Speaker neutral	0		1.78	V_{pp}	
28	EARP	Speaker positive	0		1.78	V_{pp}	

* Ground position is on connector NOT BATTERY.



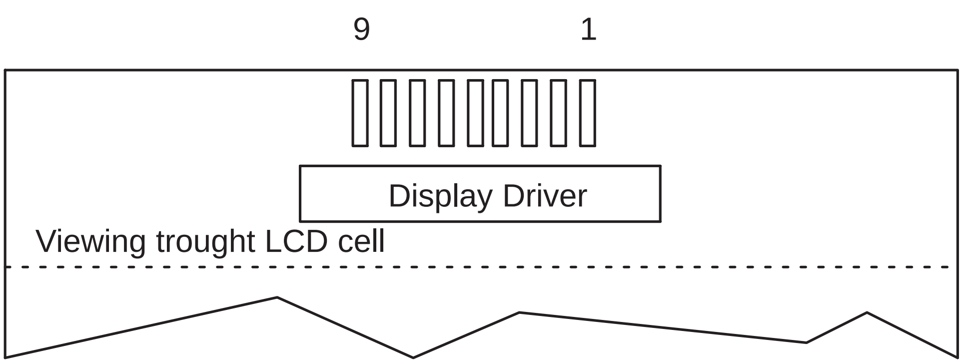
UIM connector pads viewed from the GND side

The LCD Module Interface

Pin	Line Symbol	Parameter	Mini-mum	Typical / Nomi-nal	Maxi-mum	Unit	Notes
1	VL	Supply voltage	2.7	2.8	2.85	V	
					300	uA	
2	SCLK	Serial clock input	0		4.0	MHz	VBB = 2.7V
			0		VBB	V	
3	SDA	Serial data input	0		0.3xVBB		
			0.7xVBB		VBB		
4	LCDCDX	Control/display data flag input	0		0.3xVBB		Control
			0.7xVBB		VBB		Data
5	LCDCSX	Chip select input	0		0.3xVBB		Active
			0.7xVBB		VBB		
6	OSC**	External clock for LCD	30.4	32.0	33.6	kHz	Connected to VBB on UI
7	UDGND*	Ground		0		V	
8	VOUT	DC/DC voltage converter output			9		
9	LCDRSTX	Reset	0		0.3xVBB		Active
			0.7xVBB		VBB		

* Ground position is on connector NOT BATTERY.

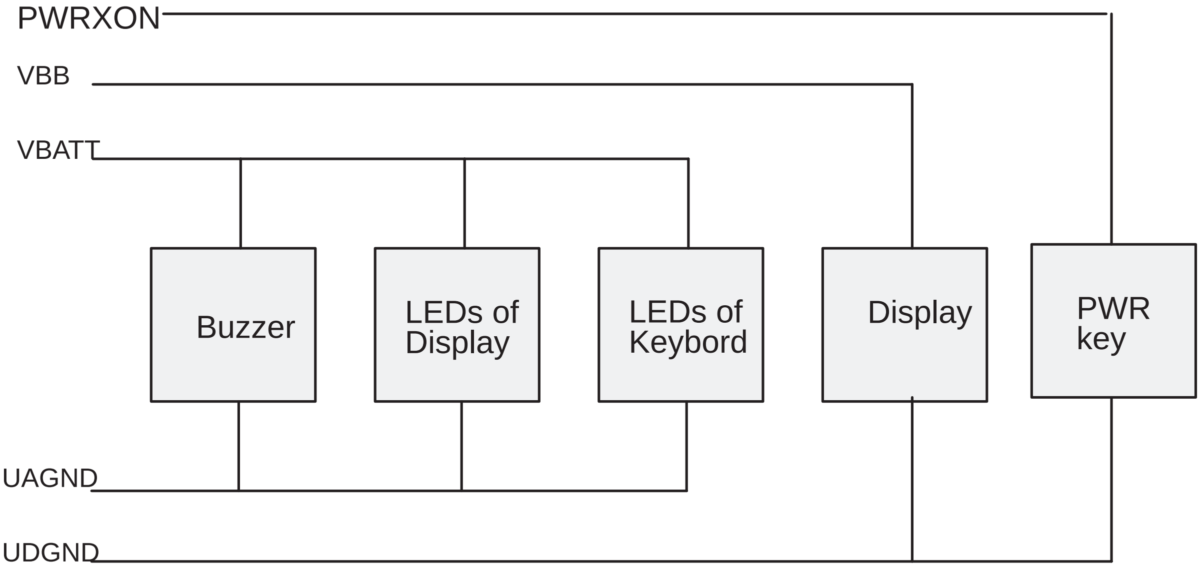
** External oscillator is not used in UE4S.



LCD Module Interface

Functional Description

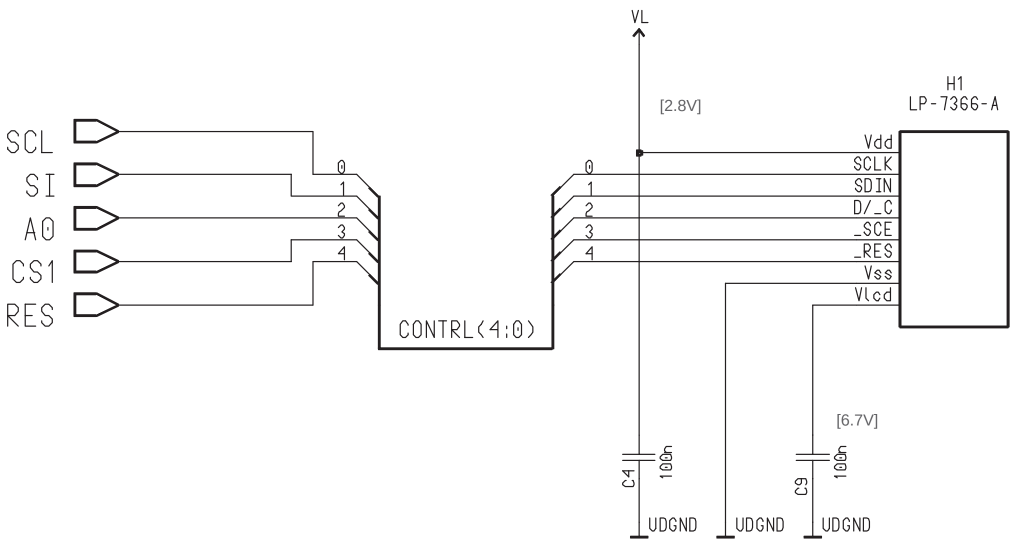
Power Distribution Diagram



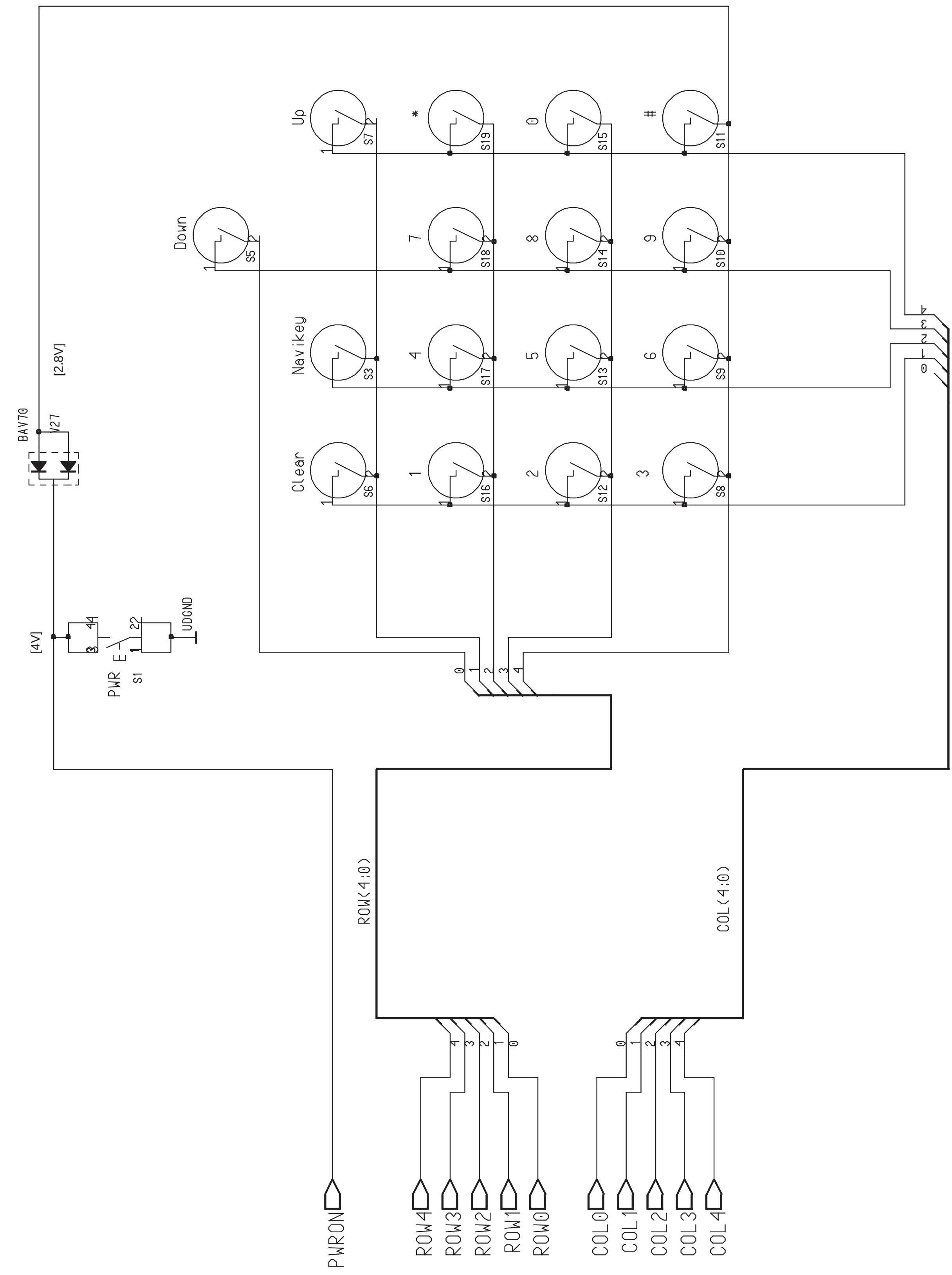
Display Circuit

The display circuit includes LCD module GD40 and two capacitors. The LCD module is COG (Chip on Glass) technology. The connection method for chip on the glass is ACF, Adhesive Conductive Film. The LCD module is connected to UI board with gold wired elastomer. Capacitors are placed on UI PCB.

The display driver includes hw–reset, voltage tripler or quadrupler which depends on temperature, temperature compensating circuit and low power control. Driver includes 84x48 RAM memory which is used when some elements are create on display. Elements can be create with software. Driver doesn't include CG–ROM. One bit in RAM is same as one pixel on display.



Keyboard

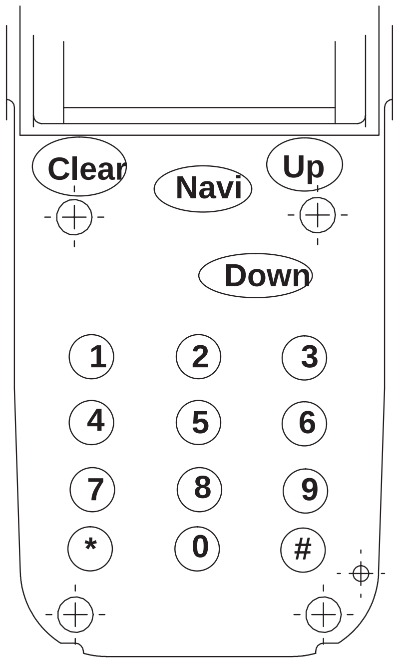


Typical value for node is marked with black when circuit is not active
Typical value for node is marked with gray when circuit is active

Keyboard Matrix

ROW/COL	0	1	2	3	4
0	NC	NC	NC	Down	NC
1	NC	Clear	Navikey	NC	Up
2	NC	1	4	7	*
3	NC	2	5	8	0
4	PWR switch	3	6	9	#

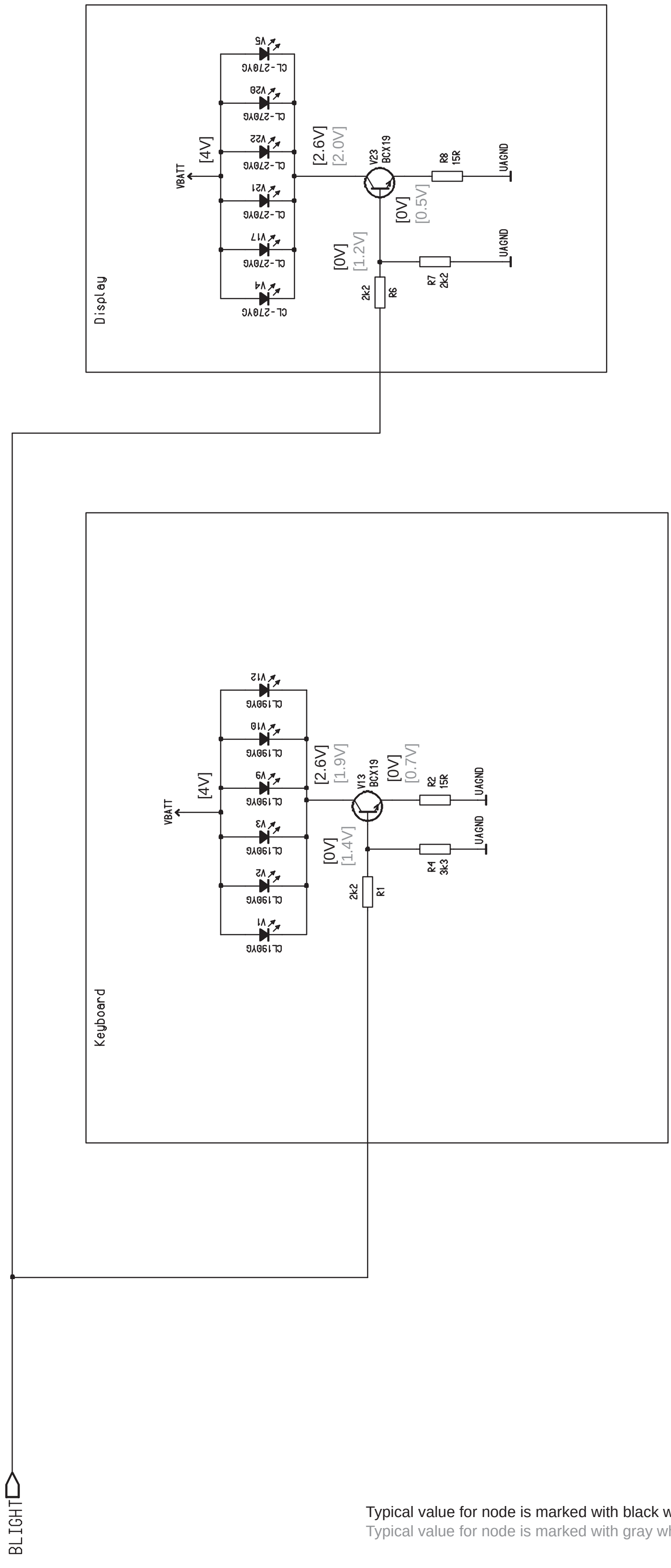
NC = Not Connected



Power Key

Micro switch is used as a power key on UI module. Circuitry includes micro switch and two diodes which is needed for MAD interface. Power key is connected to CCONT. Power switch is active in LOW state. The power key circuit can be seen from the Display Circuit diagram on page 8.The power key is connected to ROW4.

Backlighting



Typical value for node is marked with black when circuit is not active
Typical value for node is marked with gray when circuit is active

Display

Backlighting is provided by LEDs, three LED on right and three on left side of display. LEDs are compatible with CL270–YG and those are side illuminating. Light is on when LIGHT–signal is in HIGH state.

Color of LED is for

Pin	Line Symbol	Parameter	Mini-mum	Typical / Nomi-nal	Maxi-mum	Unit	Notes
14	VBAT	Battery voltage	3.0		5.1	V	Same supply for Buzzer & Keyboard
			43.4	51.4	59.6	mA	LEDs

Keyboard

In keyboard backlighting is made by 6 LEDs. LEDs are compatible with CL190–YG. Backlighting is on when LIGHT–signal is on HIGH state.

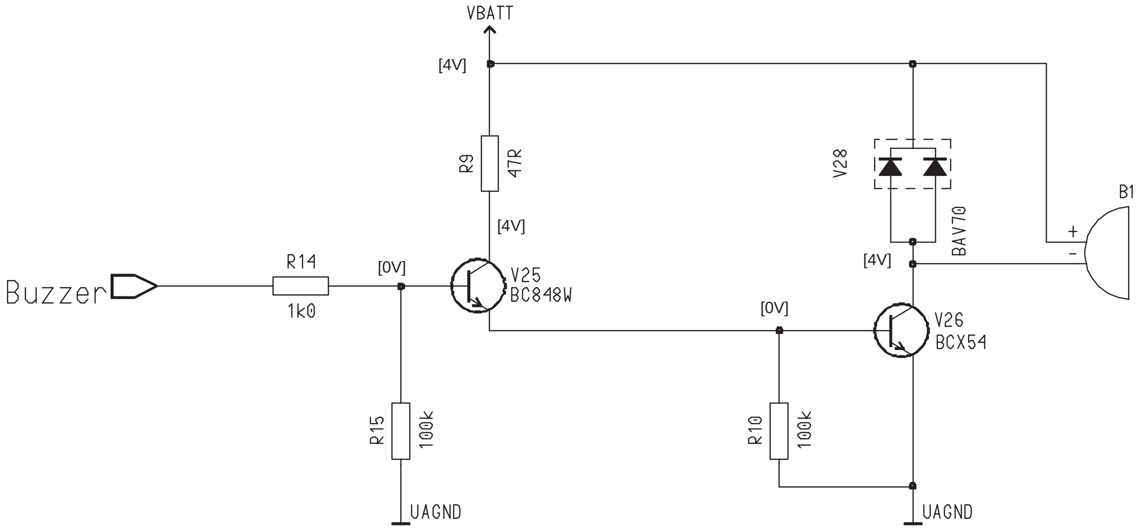
Color of LED is for

– Keyboard : yellow–green, λ = 570nm

Pin	Line Symbol	Parameter	Mini-mum	Typical / Nomi-nal	Maxi-mum	Unit	Notes
14	VBAT	Battery voltage	3.0		5.1	V	Same supply for Buzzer & Display
			55.3	62.4	69.9	mA	LEDs

Buzzer

Buzzer for DCT3 generation phone is SMD type.

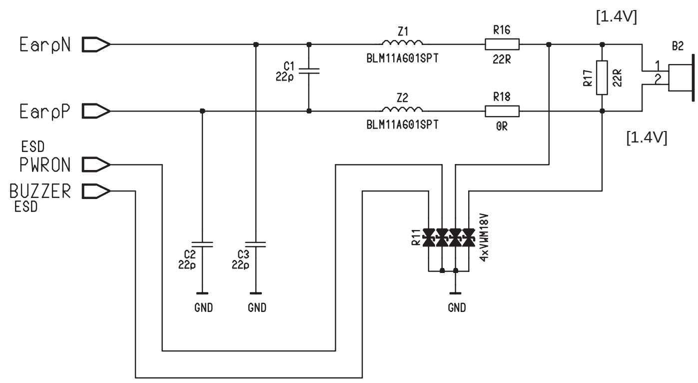


Typical value for node is marked with black when circuit is not active
Typical value for node is marked with gray when circuit is active

Speaker

The speaker is sealed to A–cover and UI PCB with silicon gasket. With that the frequency response is more constant. Speaker needs 6pcs of 1.2mm holes under component for leaking sound pressure into RF–section through UI module and 7pcs of 0.9mm holes left corner of UIM to leak from RF–section back to up cavity of phone. RF–section between UI module and engine acts like sound cage which is known. This gives better sound quality for Ultra and Santra phone and it can be estimated in several environments.

Silicon gasket and speaker itself acts like water proofing elements in that area. Water can come in speaker space between speaker and A–cover but not further from there into the phone. On A–cover is 3pcs of leaking holes which are not located top of the speaker. This holes gives better sound quality and less sensitive for how well phone is pressed against of head.



Typical value for node is marked with black when circuit is not active
Typical value for node is marked with gray when circuit is active

Parts list of UE4S (EDMS Issue 4.1)

Code: 0201144

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R001	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R002	1430155	Chip resistor	15	5 % 0.063 W 0603
R004	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R006	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R007	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R008	1430155	Chip resistor	15	5 % 0.063 W 0603
R009	1430167	Chip resistor	47	5 % 0.063 W 0603
R010	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R011	1825009	Varistor network 4xvwm18v	1206	1206
R014	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R015	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R016	1430159	Chip resistor	22	5 % 0.063 W 0603
R017	1430159	Chip resistor	22	5 % 0.063 W 0603
C001	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C002	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C003	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C004	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C009	2310784	Ceramic cap.	100 n	10 % 25 V 0805
B001	5140087	Buzzer 85db 2600hz 3.6v 10x10x3.		10x10x3.5
Z001	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
Z002	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
H001	0200921	Gd40 lcd module		
V001	4864388	Led	Green	0603
V002	4864388	Led	Green	0603
V003	4864388	Led	Green	0603
V004	4860005	Led	Green	0603
V005	4860005	Led	Green	0603
V009	4864388	Led	Green	0603
V010	4864388	Led	Green	0603
V012	4864388	Led	Green	0603
V013	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V017	4860005	Led	Green	0603
V020	4860005	Led	Green	0603
V021	4860005	Led	Green	0603
V022	4860005	Led	Green	0603
V023	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V025	4210100	Transistor	BC848W	npn 30 V SOT323
V026	4200875	Transistor	BCX54–16	npn 45 V 1.5 A SOT89
V027	4100278	Diode x 2	BAV70	70V 200mA COM CAT.SOT23
V028	4100278	Diode x 2	BAV70	70 V 200 mA COM CAT.SOT23
S001	5200120	Push button switch 6.4x5.2 smd		

9795044	Keydomes	DMC01289	NSE–1NX
9854259	PCB UE4S 41.0X121.0X0.8 M4 4/PA		

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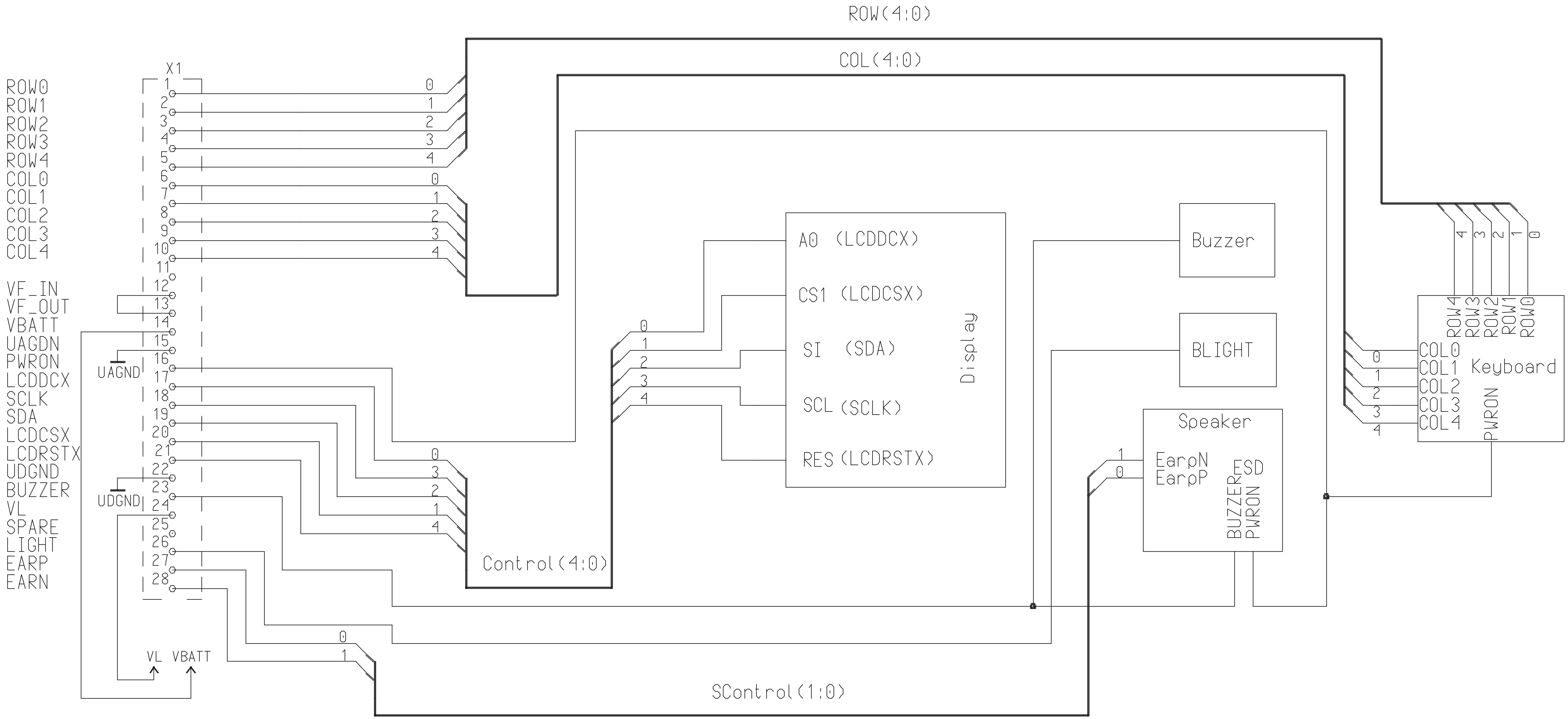
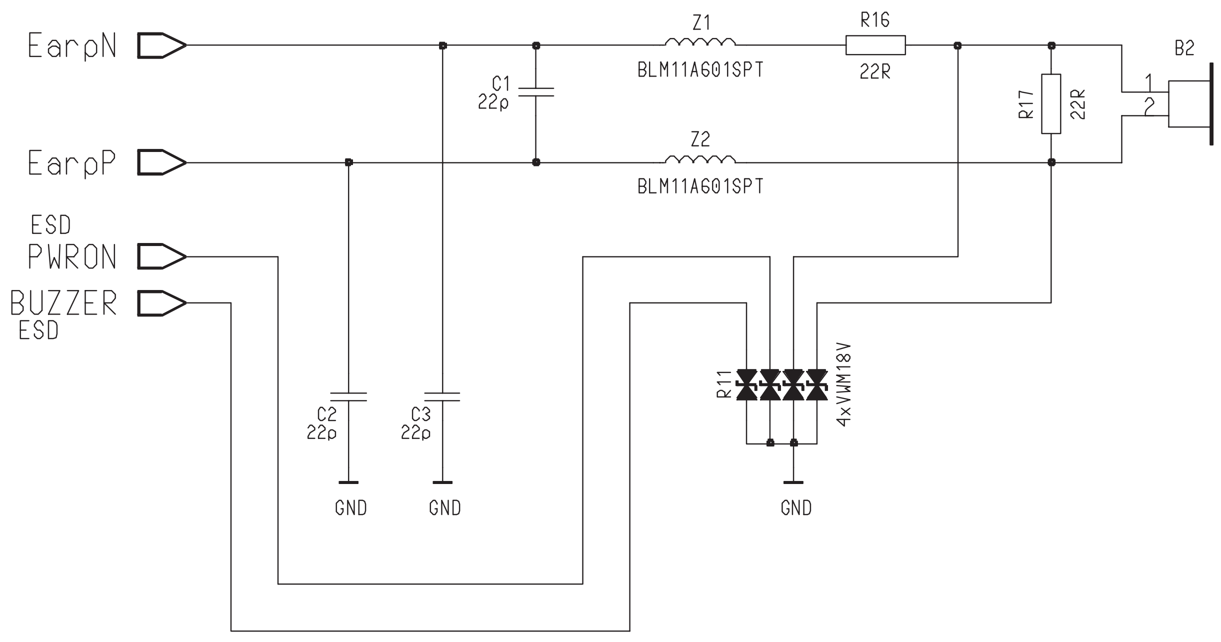
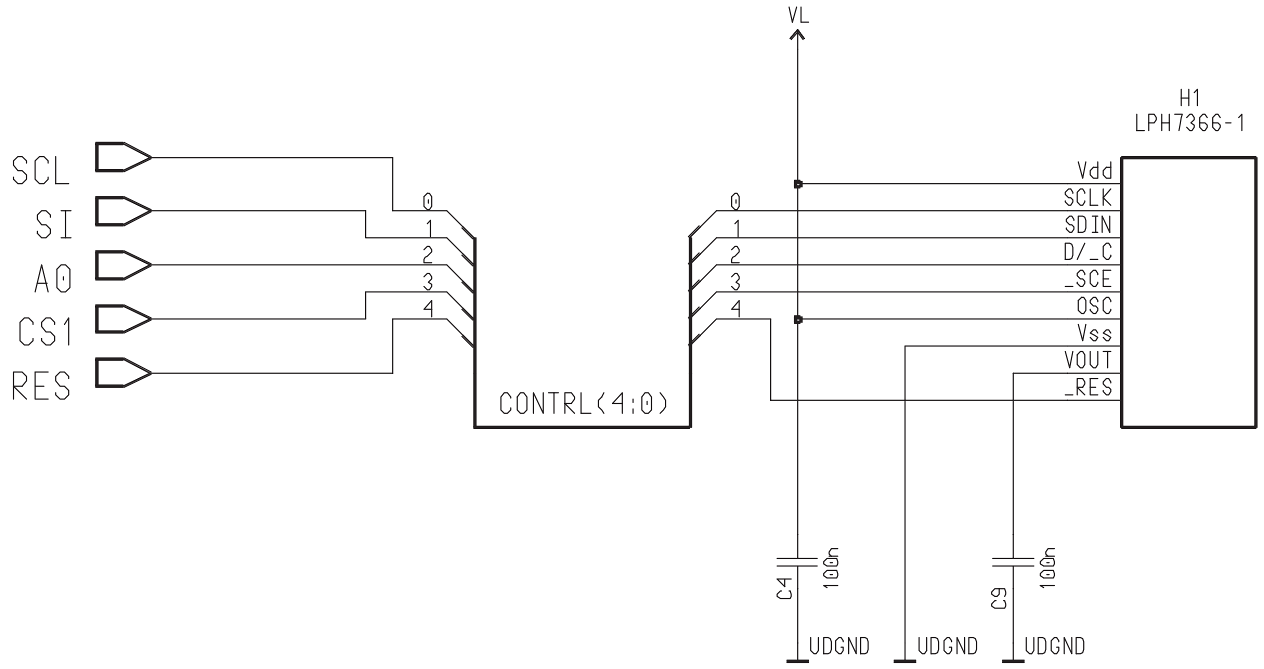
Circuit Diagram of UIF Module (Version 3 Edit 49) for layout version 03



Circuit Diagram of Speaker and LCD Modules for layout version 03

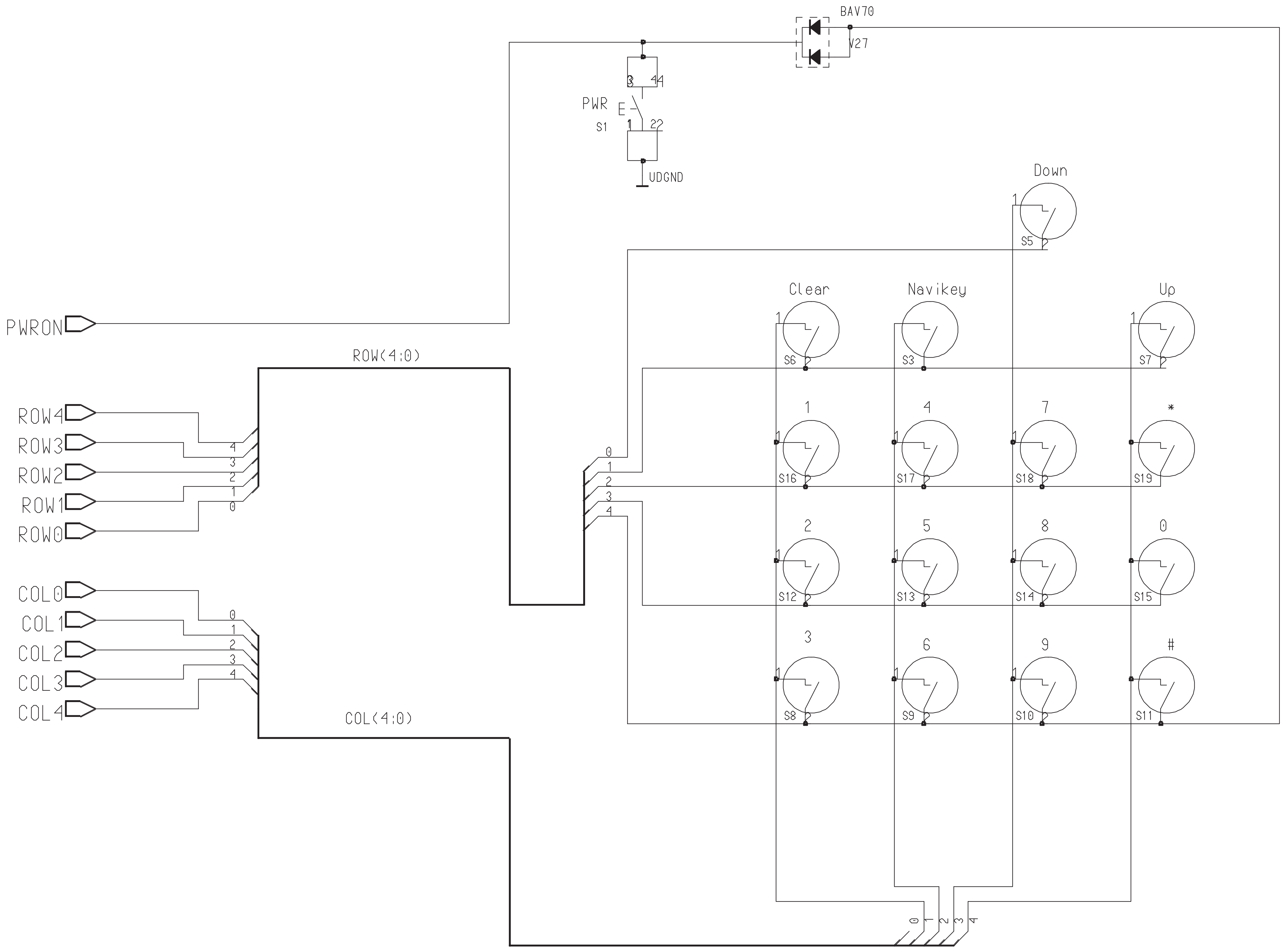


Speaker (Versio 3 Edit 29)

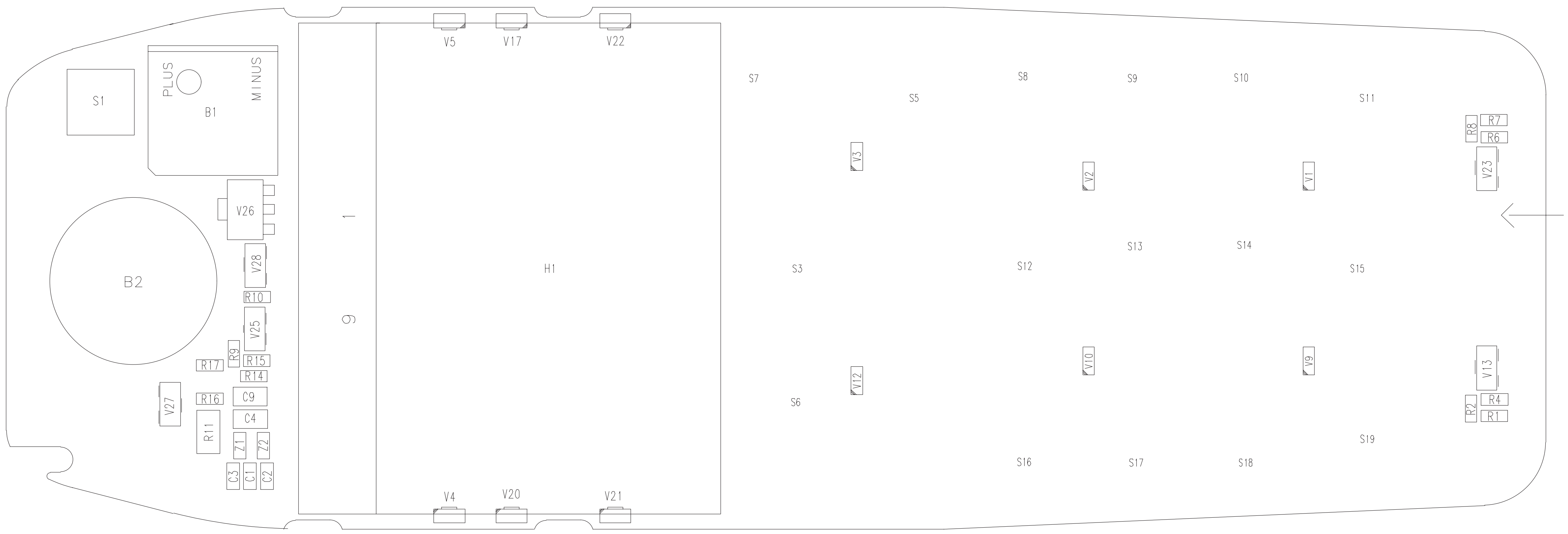


LCD (Versio 3 Edit 22)

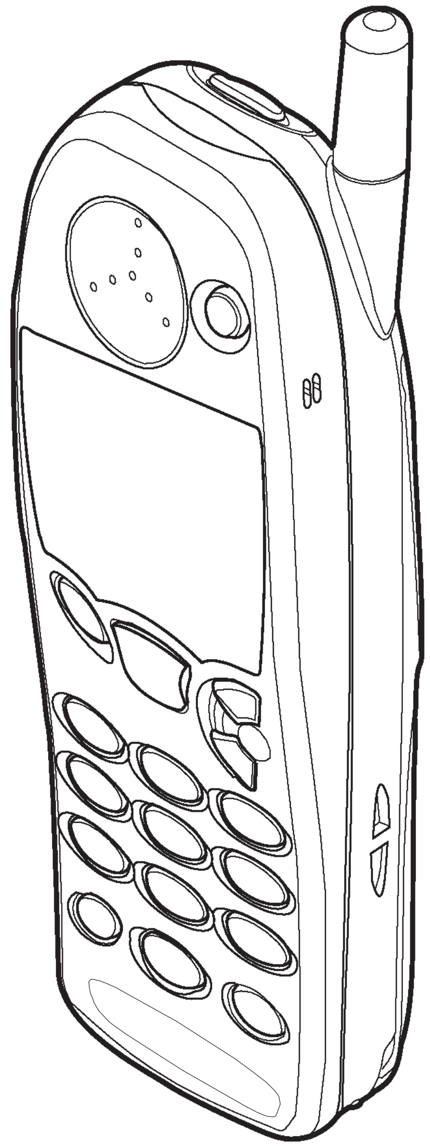
Circuit Diagram of Keyboard (Version 3 Edit 45) for layout version 03



Layout Diagram of UE4S (Version 03)



Appendix 1
TRANSCEIVER NSE–1NX



CONTENTS

Appendix 1

Foreword

This section of the service manual (Appendix) contains specific details for the NSE–1NX handportable telephone.

The appendix comprises chapters as follows: Chapter 1, Foreword (this chapter); Chapter 2, Transceiver NSE–1NX, containing an exploded view of the NSE–1NX variant (including a list of assembly parts) plus component parts lists covering the system module and the display module.

NOTE: The Service Manual is intended for use by qualified service personnel only.

Transceiver NSE–1NX

Functional Description

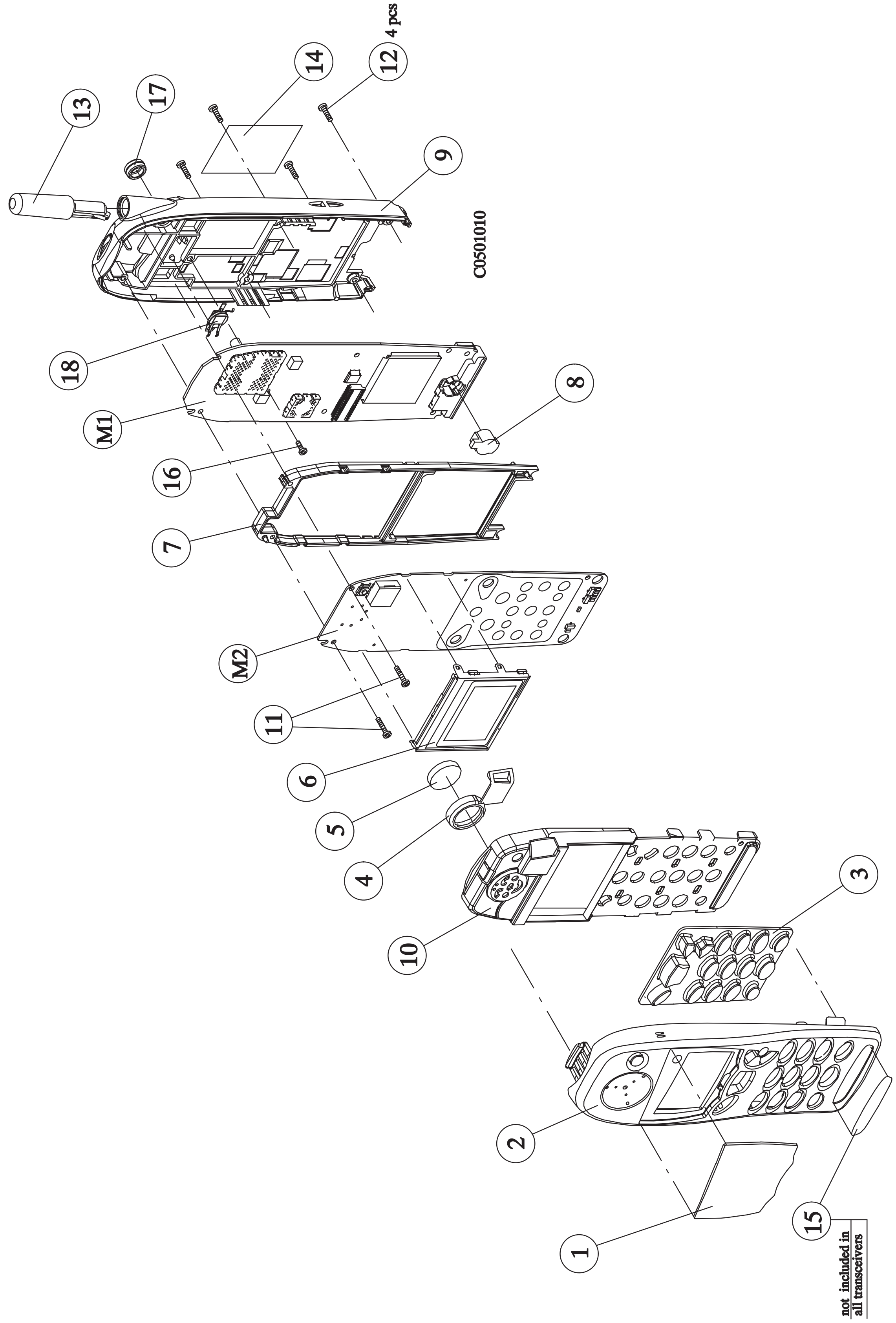
The NSE–1 is a radio transceiver unit designed for the GSM network. It is a GSM phase 2, power class 4 transceiver providing 15 power levels with a maximum output power of 2 W. The transceiver a is true 3 V transceiver.

The transceiver consists of System/RF module, User interface module (UE4S) and assembly parts. The System/RF module used in NSE–1NX is either UP8R or UP8S. The baseband part is exactly the same but the transmitter circuitry and it's layout differs depending which one of the two different power amplifiers is used.

Modules

Transceiver NSE–1NX	Nokia Euro–A	0501010
Transceiver NSE–1NX	Nokia Euro–A (Activa)	0502061
Transceiver NSE–1NX	Nokia Euro–A (Continua)	0502060
Transceiver NSE–1NX	Nokia Euro–A (Vodacom)	0502057
Transceiver NSE–1NX	Nokia Euro–B	0501900
Transceiver NSE–1NX	Nokia Euro–B (Era)	0502056
Transceiver NSE–1NX	Nokia Euro–B (Panafon)	0502059
Transceiver NSE–1NX	Nokia Euro–B (Pannon)	0502055
Transceiver NSE–1NX	Nokia Euro–B (Telestet)	0502058
Transceiver NSE–1NX	Nokia Euro–B (Westel)	0502054
Transceiver NSE–1NX	Nokia APAC, K	0501635
Transceiver NSE–1NX	Nokia APAC	0501636
Transceiver NSE–1NX	Nokia Omnitel	0501637
Transceiver NSE–1NX	Nokia CHINA, E off	0501903
• system module UP8R		0201036 or
• system module UP8S		0201841
• display module UE4S		0200860
• A–cover night blue		9456132
• mechanics MNSE1		0261284
Transceiver NSE–1NX	Nokia TIM	0501638
Transceiver NSE–1NX	Nokia Movistar	0501639
Transceiver NSE–1NX	Nokia Airtel	0501640
Transceiver NSE–1NX	Nokia Plus	0501641
Transceiver NSE–1NX	Nokia D2	0501901
• system module UP8R		0201634 or
• system module UP8S		0201842
• display module UE4S		0200860
• A–cover night blue	(logo recess)	9456147
• mechanics MNSE1		0261284
Transceiver NSE–1NX	Nokia Euro–A (Olla)	0502063
• system module UP8S		0502062
• display module UE4S		0200860
• mechanics MNSE–1		0261284

Exploded View of Transceiver NSE–1NX



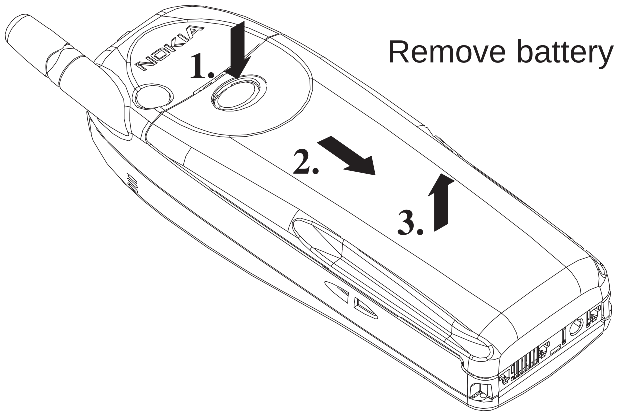
Assembly Parts of NSE–1NX

ITEM	Q'TY	CODE	DESCRIPTION	VALUE, TYPE
1		9456132	Window NSE–1NX	DMC00937
2		9456132	A–cover	(See module list)
3		9790300	Keymat	DMC00911
4		9790256	Power Keymat	
5		5140067	Speaker + Spring	
6		0200921	GD40 LCD Module	
M2		0201144	UI Module UE4S	
7		9460208	Frame	DMD02411
8		5140101	Microphone + Boot	DMC00955
M1		0200951	System/RF Module UP8T	
9		9457851	B–Cover	DMC00945
		9457853	C–Cover	DMC00946
10		4700057	RTC Battery	
11	2	6190015	Screw M1.6x10 T6	
12	4	6190013	Screw M1.6x7 T6	
13		0660160	Antenna 890 – 960 MHz	
14		9380529	Type Label – continuous sheet	
15			Logo Label	
16	1	6190023	Screw M1.6x4 T6	
17		9451139	Dust Cap	DMD02859
18		9460215	Transducer gasket	DMD02687

Disassembly & Troubleshooting Instructions

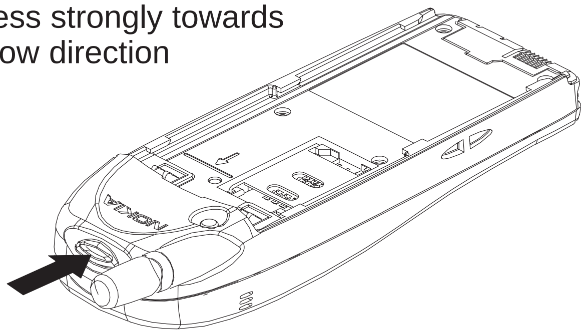
CONTENTS

Disassembly

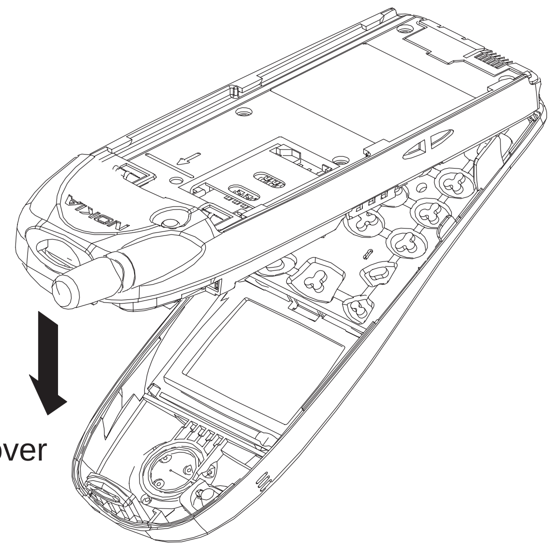


Remove battery

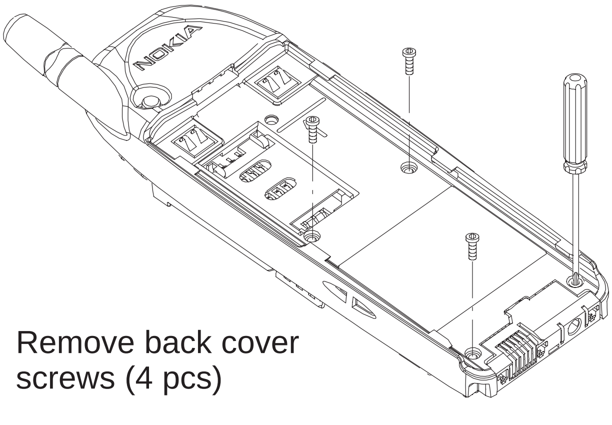
Remove dust cap by fingernail



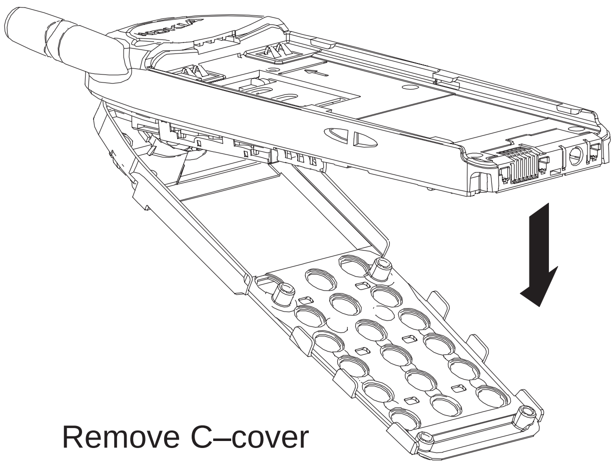
Press strongly towards arrow direction



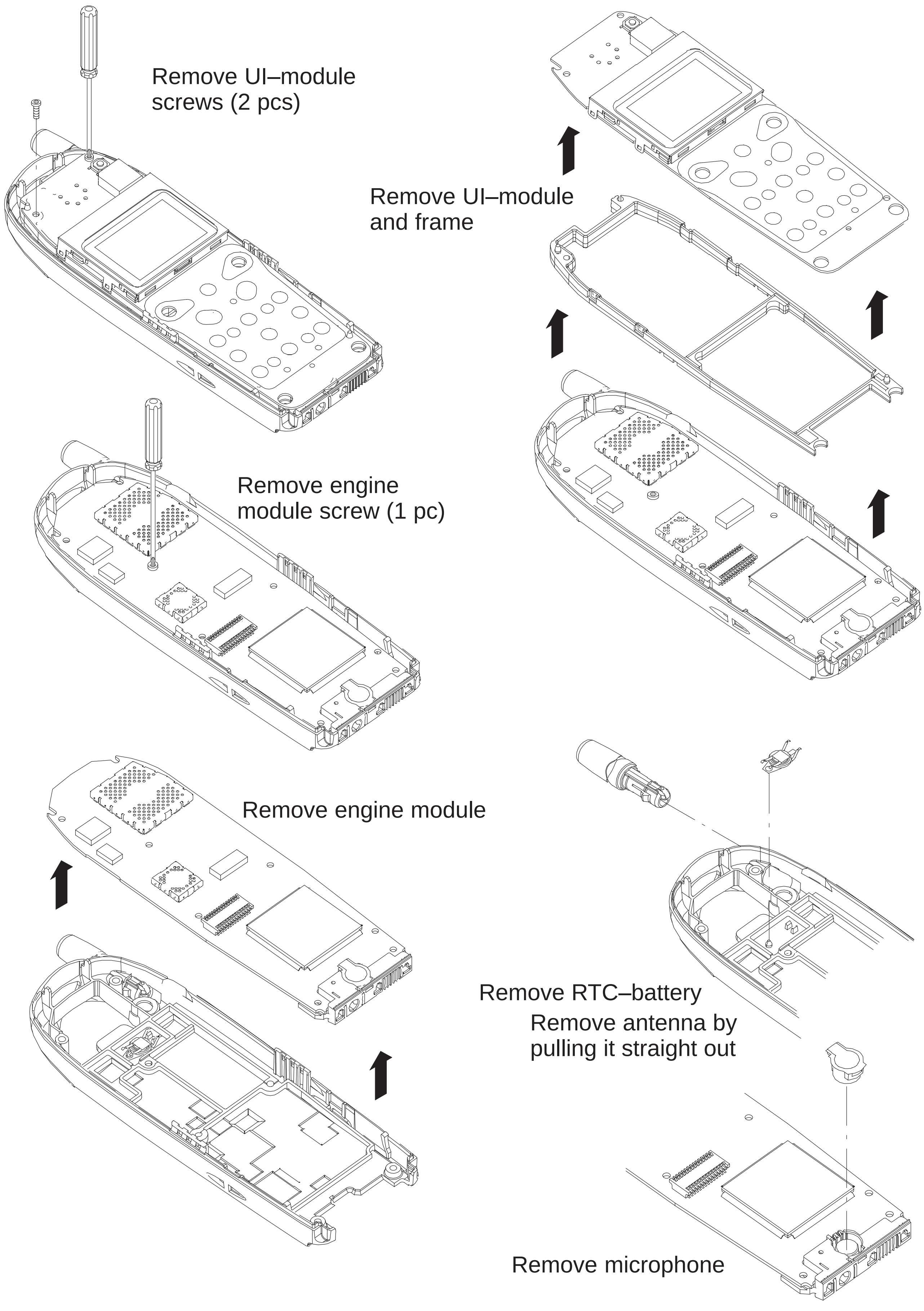
Carefully remove A–cover
Note snap fixings !



Remove back cover screws (4 pcs)



Remove C–cover


Remove UI–module
screws (2 pcs)
Remove UI–module
and frame
Remove engine
module screw (1 pc)
Remove engine module
Remove RTC–battery
Remove antenna by
pulling it straight out
Remove microphone

Trouble Shooting

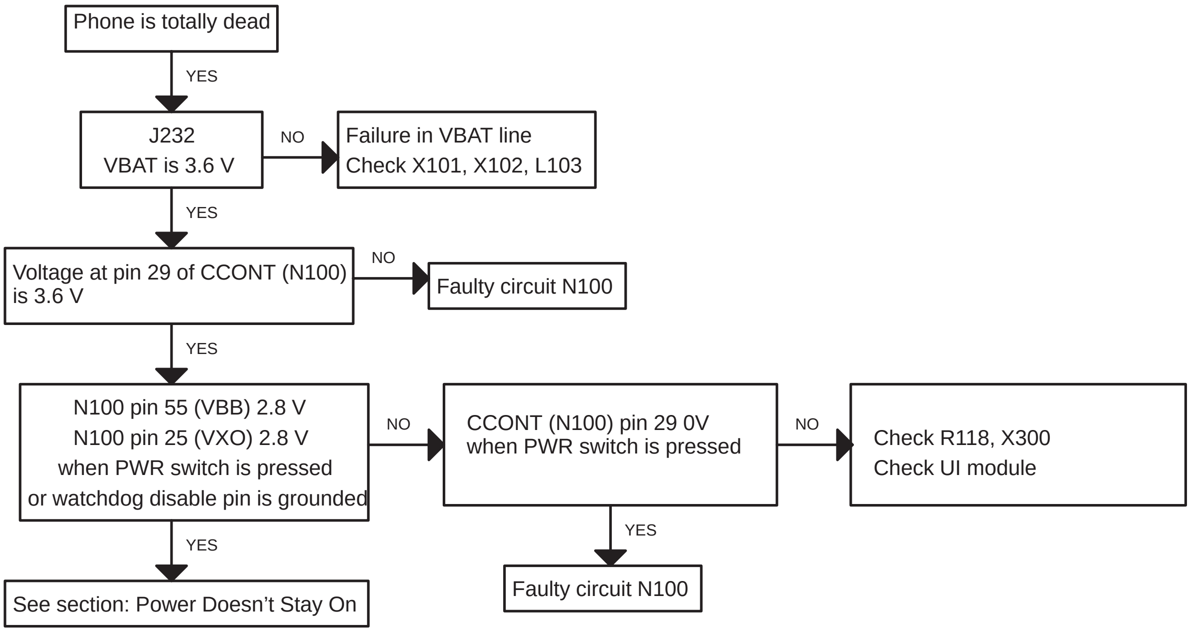
The following hints should facility finding the cause of the problem when the circuitry seems to be faulty. This trouble shooting instruction is divided following section.

1. Phone is totally dead
2. Flash programming doesn‘t work
3. Power doesn‘t stay on or the phone is jammed
4. Display information: Contact Service
5. Phone doesn‘t register to the network or phone doesn‘t make a call.
6. Plug in SIM card is out of order (insert SIM card or card rejected).
7. Audio fault.
8. Charging fault

The first thing to do is carry out a through visual check of the module. Ensure in particular that:
a) there are not any mechanical damages
b) soldered joints are OK

Phone is totally dead

This means that phone doesn't take current at all when the power switch is pressed or when the watchdog disable pin (N100 pin 29) is grounded. Used battery voltage must be higher than 3.0 V. Otherwise the hardware of CCONT (N100) prevents totally to switch power on.



Flash programming doesn't work

In service places flash programming can be done via system connector X100.

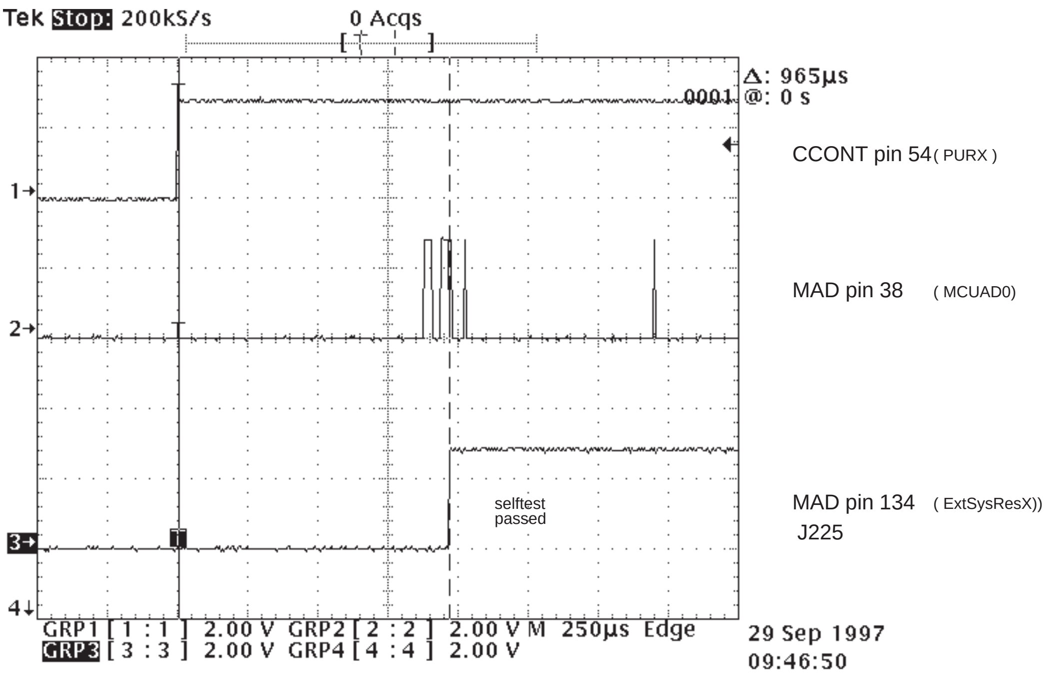
In flash programming error cases the flash prommer can give some information about a fault.
The fault information messages could be:
– MCU doesn't boot
– Serial clock line failure
– Serial data line failure
– External RAM fault
– Algorithm file or alias ID don't find
– MCU flash Vpp error

In cases that the flash programming doesn't succeed there is a possibility to check short circuits between the memories and the MCU (MAD2). This test is useful to do, when the fault information is: MCU doesn't boot, Serial clock line failure or Serial data line failure.

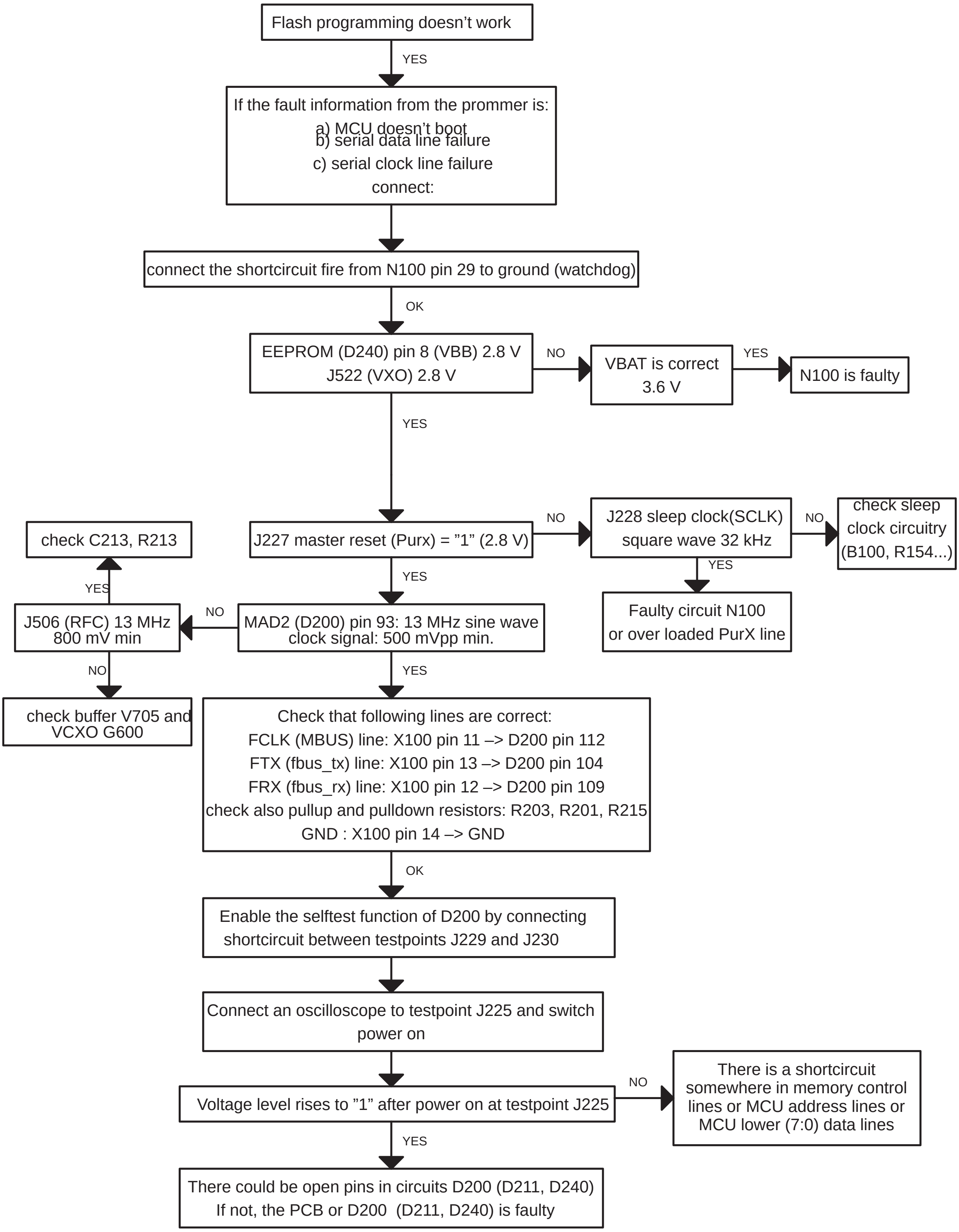
The test procedure is following:

1. Connect the short circuit wire between the test points J229 and J230.
2. Switch power on
3. If the voltage level in testpoint J225 is 2.8 V (”1”), the interface is OK. If there is a short circuit, the voltage level in testpoint J225 stays low and 32kHz square wave signal can be seen in the lines which are already tested.

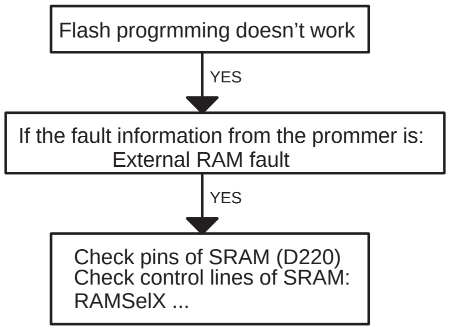
One must be noticed that this test can be found only short circuits, not open pins.
Also upper data lines (15:8) of flash circuit D210 are not included to this test.

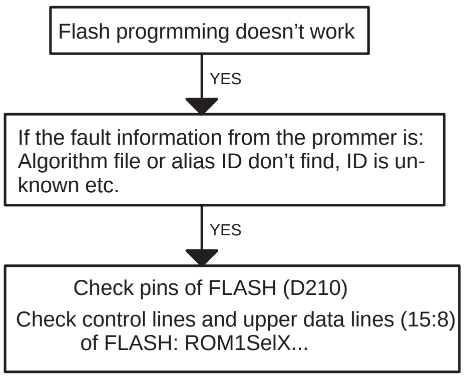


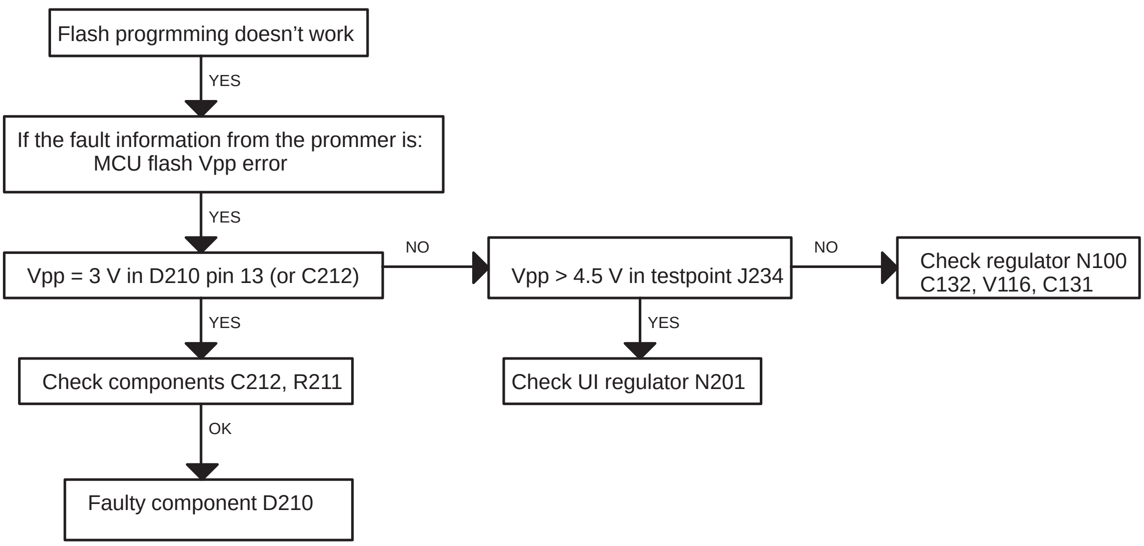
Flash Programming failure (1)



Flash Programming failure (2)





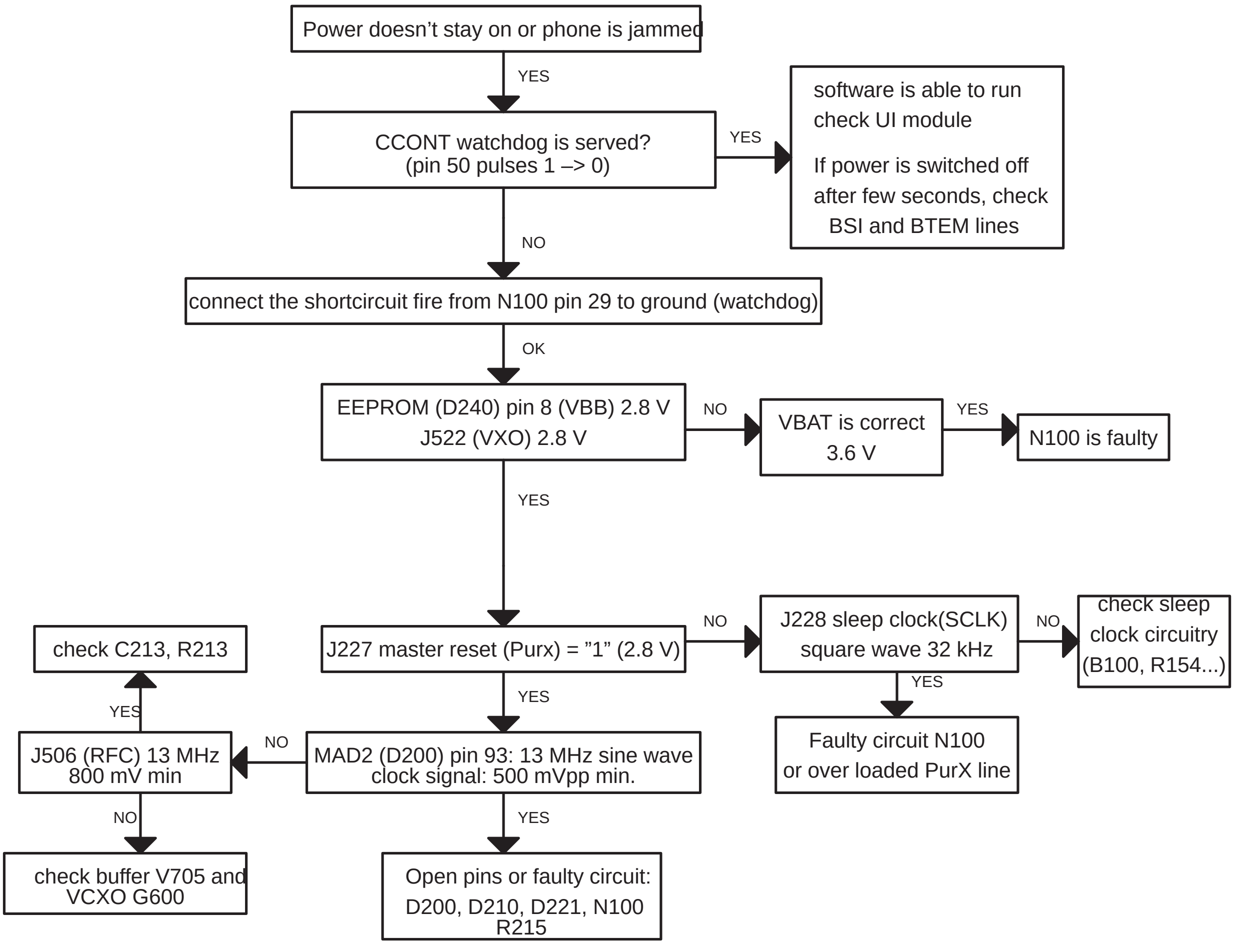


Power doesn’t stay on, or phone is jammed

If this kind of fault has come after flash programming, there are most probably open pins in ICs.
The soldered joints of ICs: D200 (MAD2), D210 (FLASH), N100 (CCONT), D221 (SRAM) are useful to check at first.

Normally the power will be switched of by CCONT (N100) after 30 seconds, if the watchdog of the CCONT can not be served by software.
The watchdog updating can be seen by oscilloscope at pin 50 (DataselX) of CCONT.
In normal case there is a short pulse from ”1” –> 0 every 8 seconds.

The power off function of CCONT can be prevented by connecting a short circuit wire from CCONT pin 29 to ground.



Display Information: Contact Service

This fault means that software is able to run and thus the watchog of CCONT (N100) can be served.
Selftest functions are run when power is switched on and software is started to excute from flash.
If any of selftests is failed, contact service information will be shown on display.

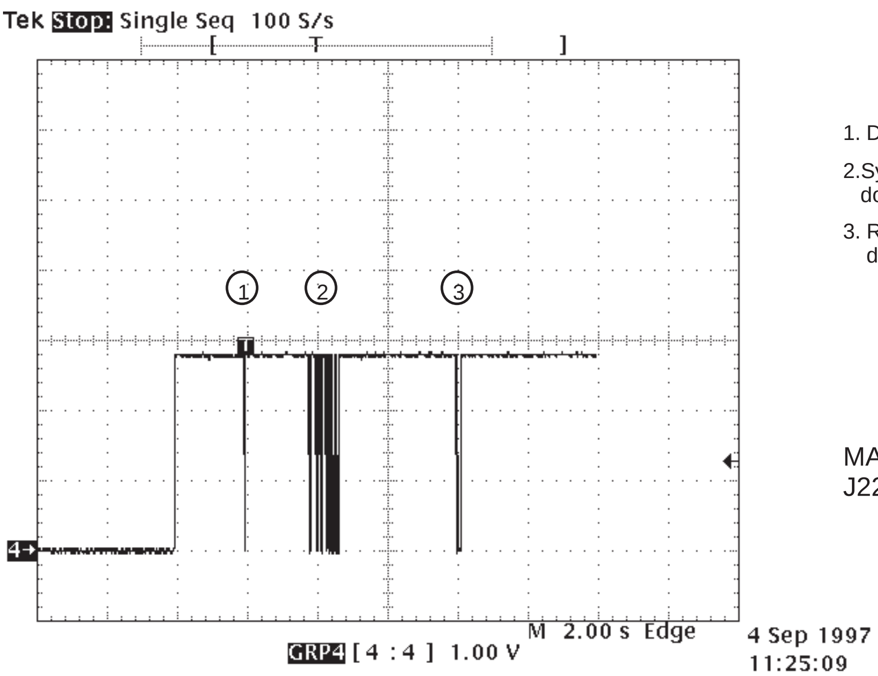
The phone doesn't register to the network or phone doesn't make a call

If the phone doesn't register to the network or the phone doesn't make a call, the reason could be either the baseband or the RF part.
The phone can be set to wanted mode by WinTesla service software and determinate if the fault is in RF or in baseband part (RF interface measurements).

The control lines for RF part are supplied both the System Asic (MAD2;D200) and the RFI (Cobba; N250). MAD2 handles digital control lines (like synthe, TxP etc.) and Cobba handles analog control lines (like AFC, TxC etc.).

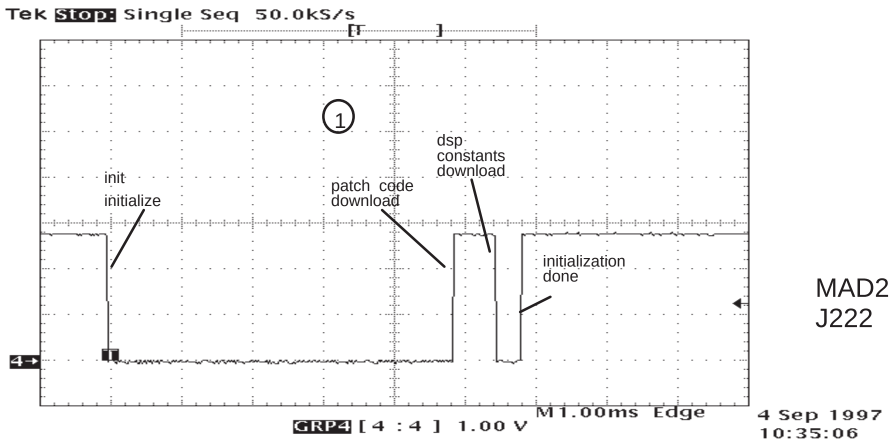
The DSP software is constructed so that operation states of DSP (MAD2) can be seen in external flag (DSPXF) output pin (D200 pin 91).

After power up, DSP signals all completed functions by changing the state of the XF pin (see figures 39 and 40).

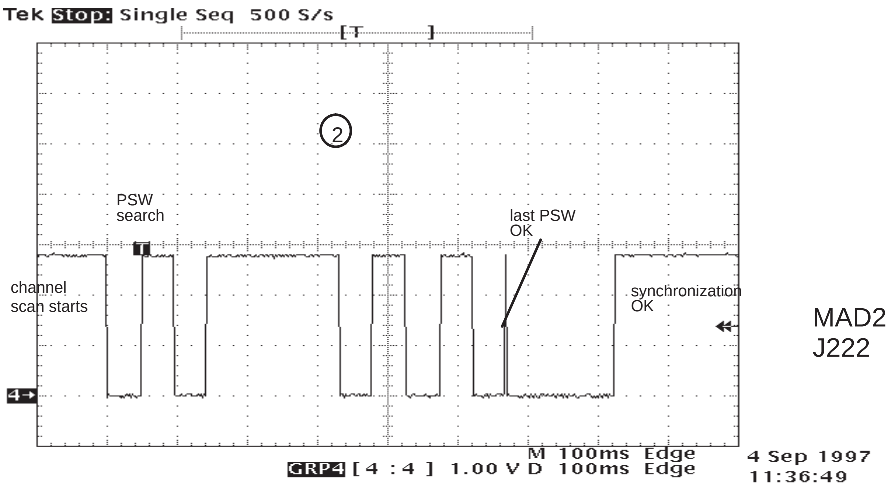


1. DSP initialization done
2. Synchronization to network done
3. Registrarition to network done.

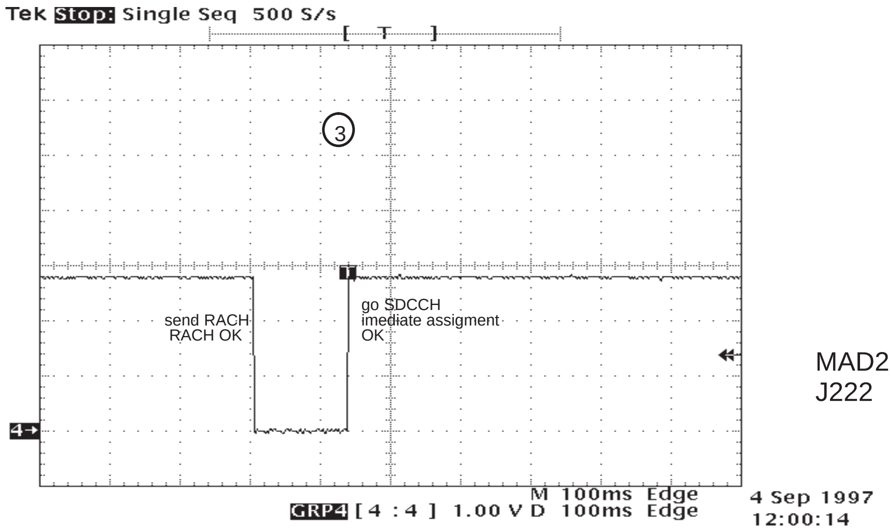
MAD2 pin 91 (DSPXF)
J222



MAD2 pin 91 (DSPXF)
J222

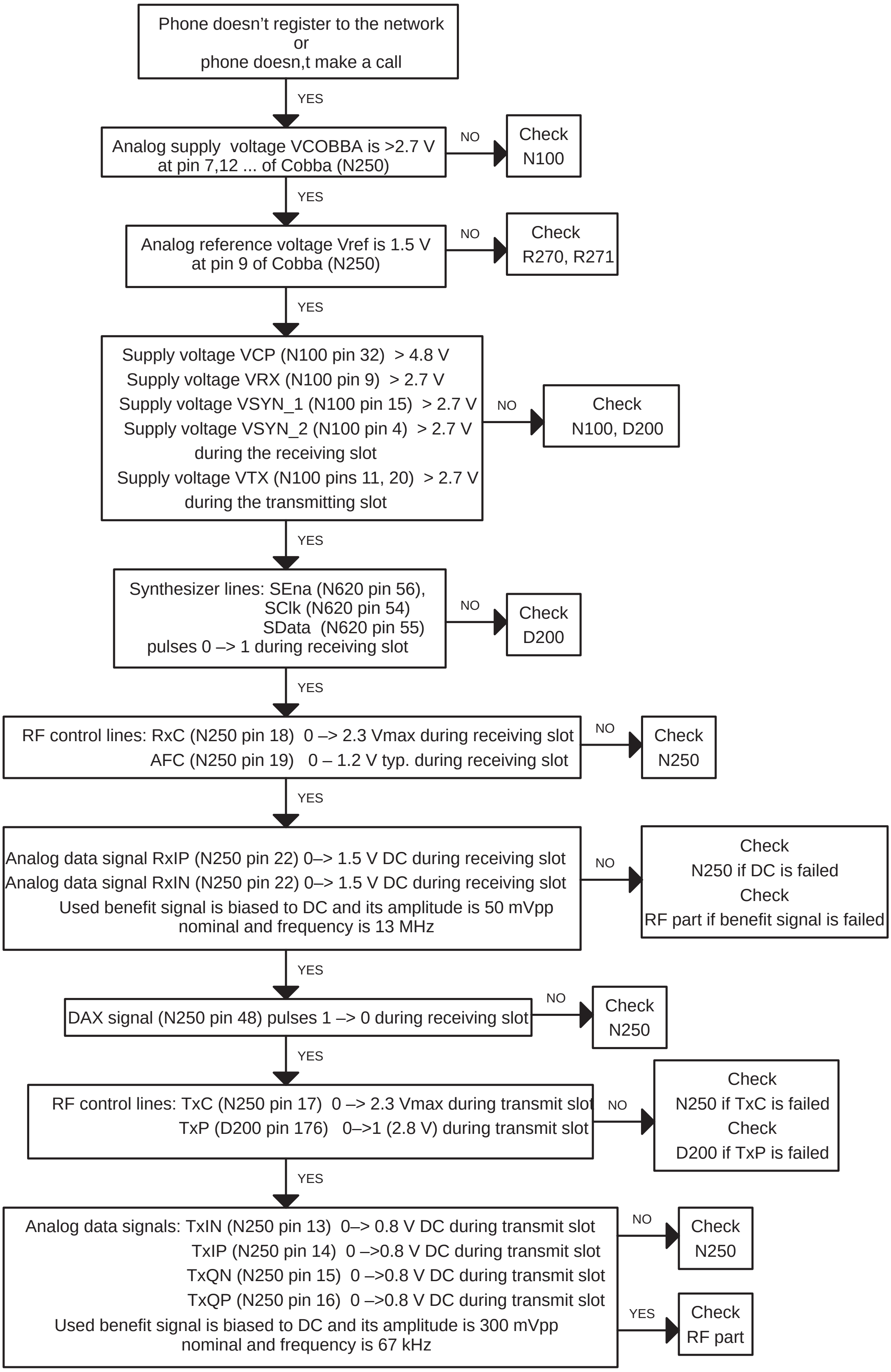


MAD2 pin 91 (DSPXF)
J222



MAD2 pin 91 (DSPXF)
J222

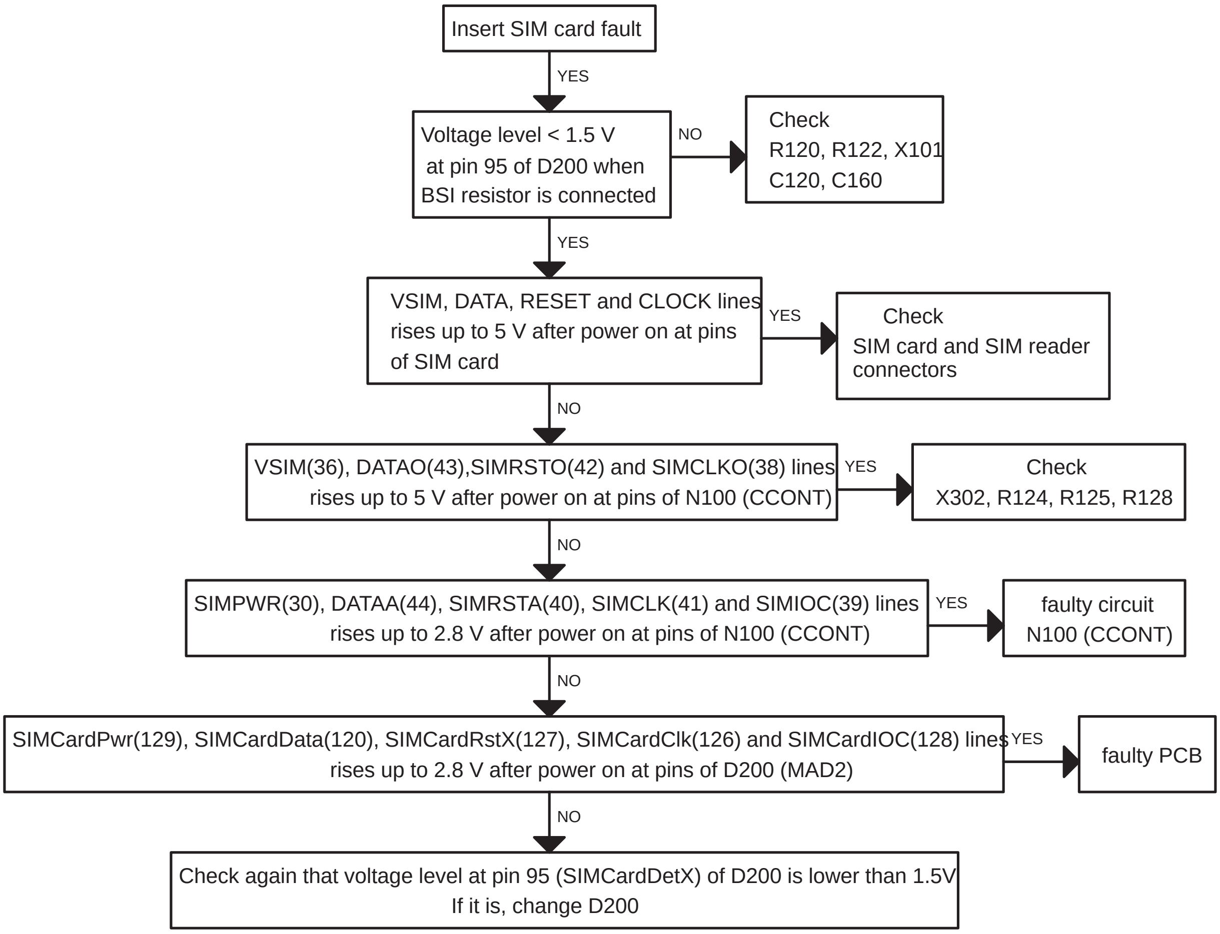
Phone register failure

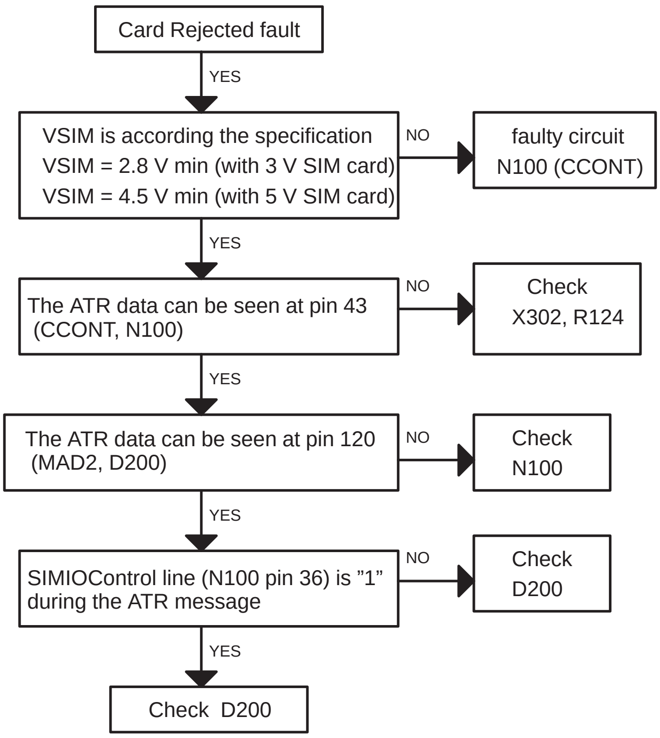


SIM card is out of order

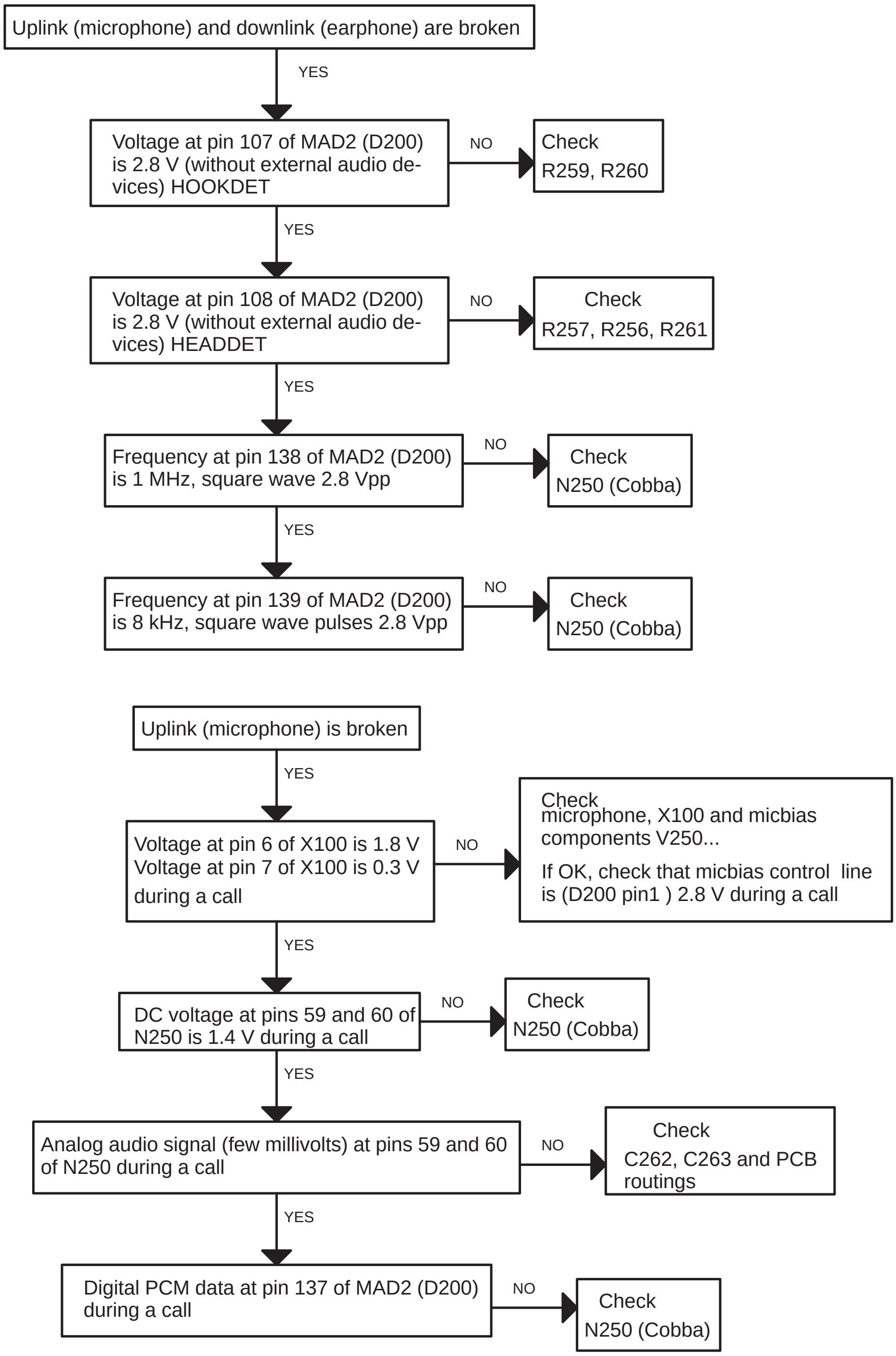
The hardware of the SIM interface from MAD2 (D200) to the SIM connector (X302) can be tested without SIM card.
When the power is switched on and if the BSI line (X101;1) is grounded by resistor, all the used lines (VSIM, RST, CLK, DATA) rises up to 5 V four times. Thus ”Insert SIM card” faults can be found without SIM card.
The fault information ”Card rejected” means that ATR message (the first message is always sent from card to phone) is sent from card to phone but the message is somehow corrupted, data signal levels are wrong etc. or factory set values (stored to the EEPROM) are not correct.

SIM Card failure

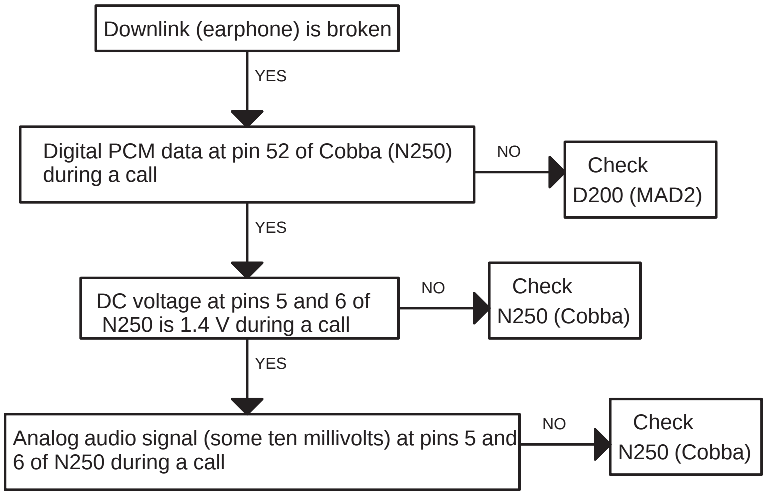




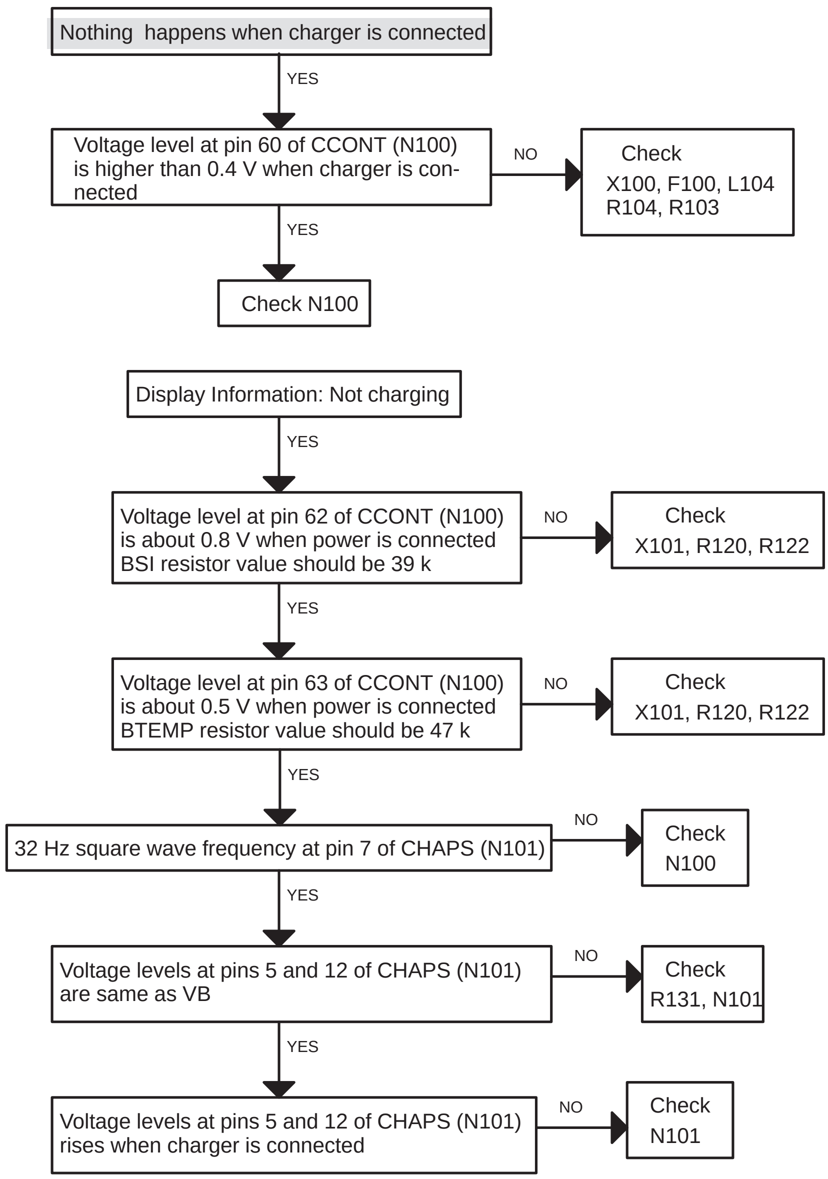
Audio failure (1)



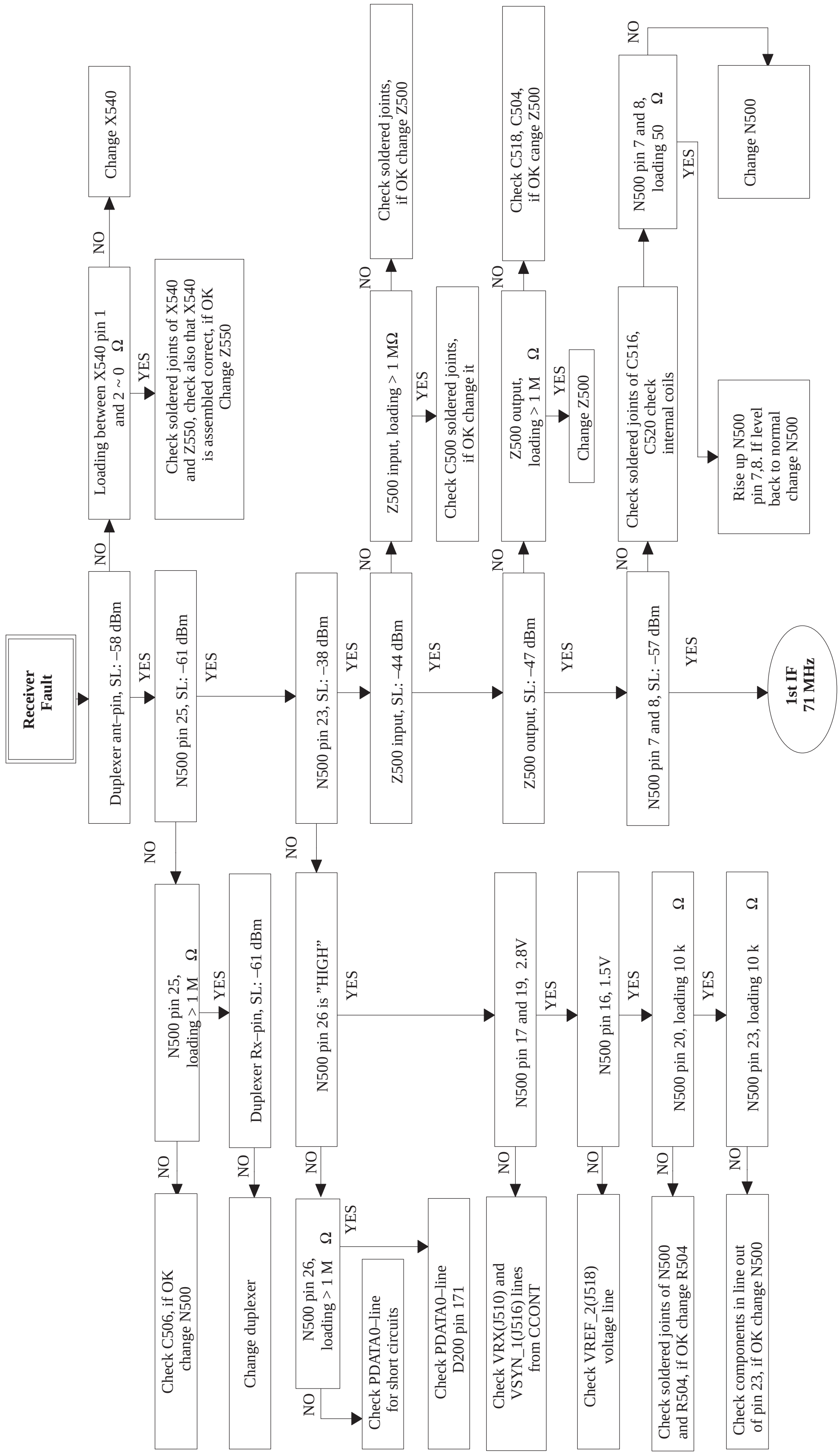
Audio failure (2)



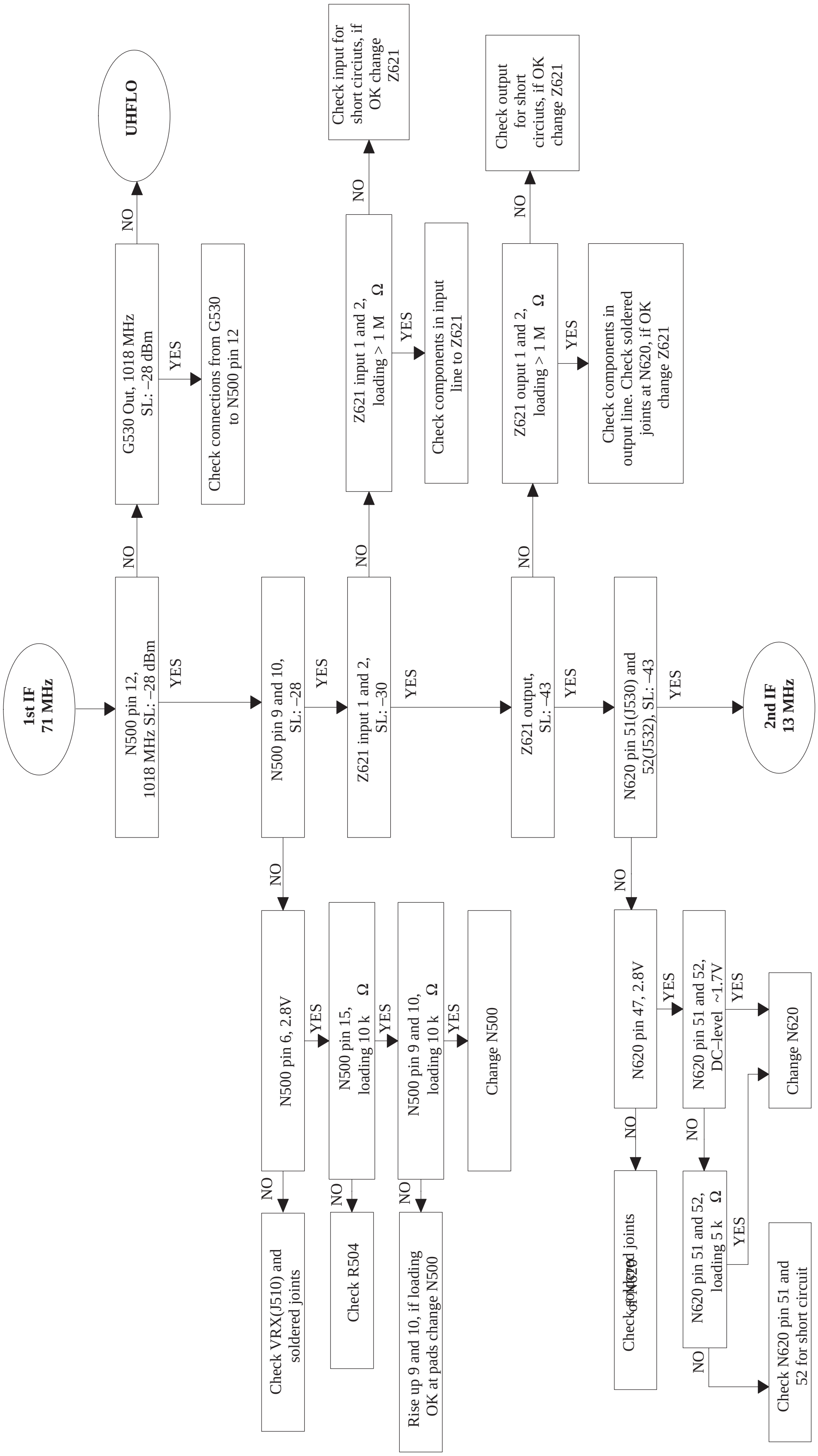
Charger failure



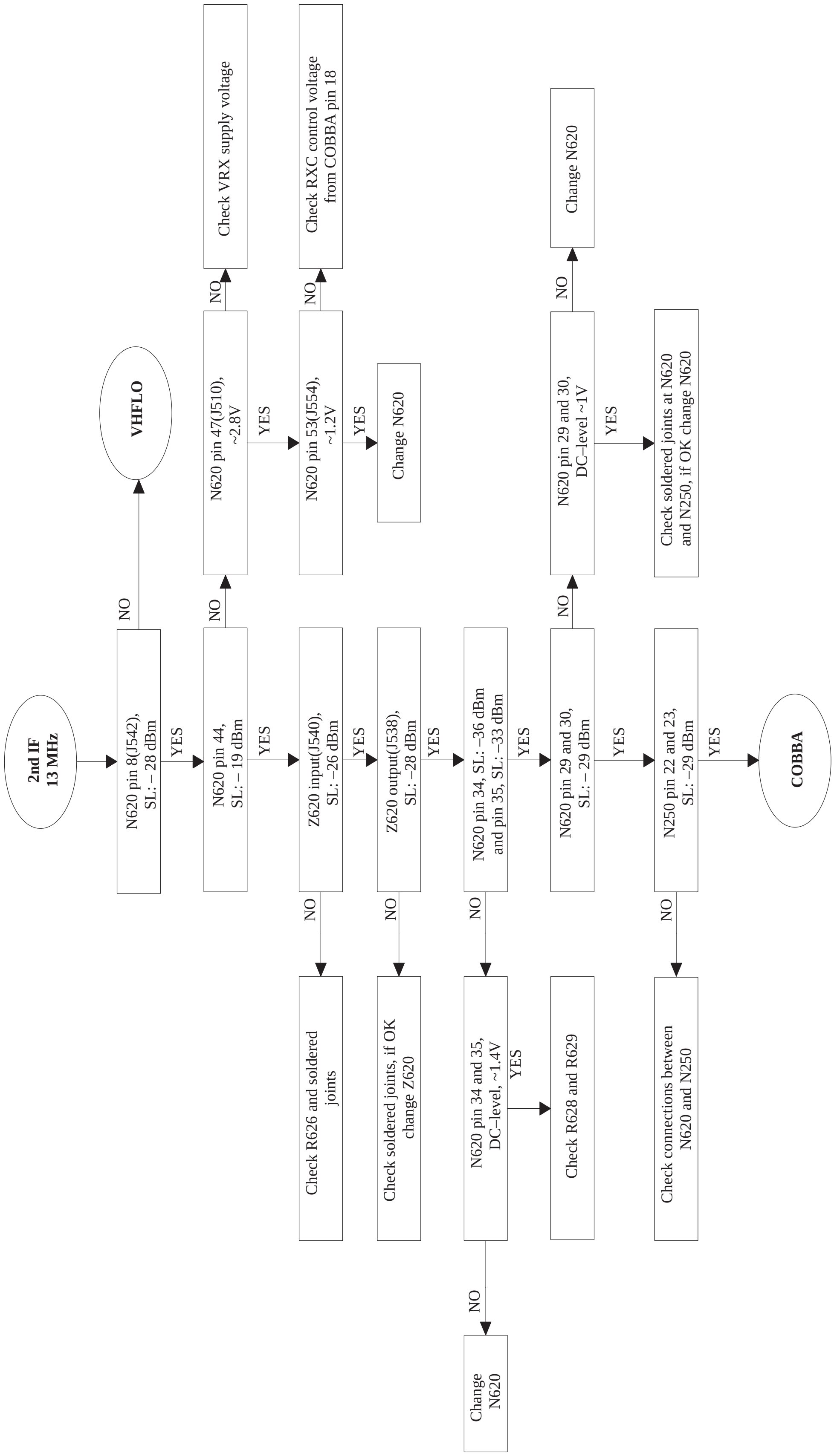
Receiver Fault (1)



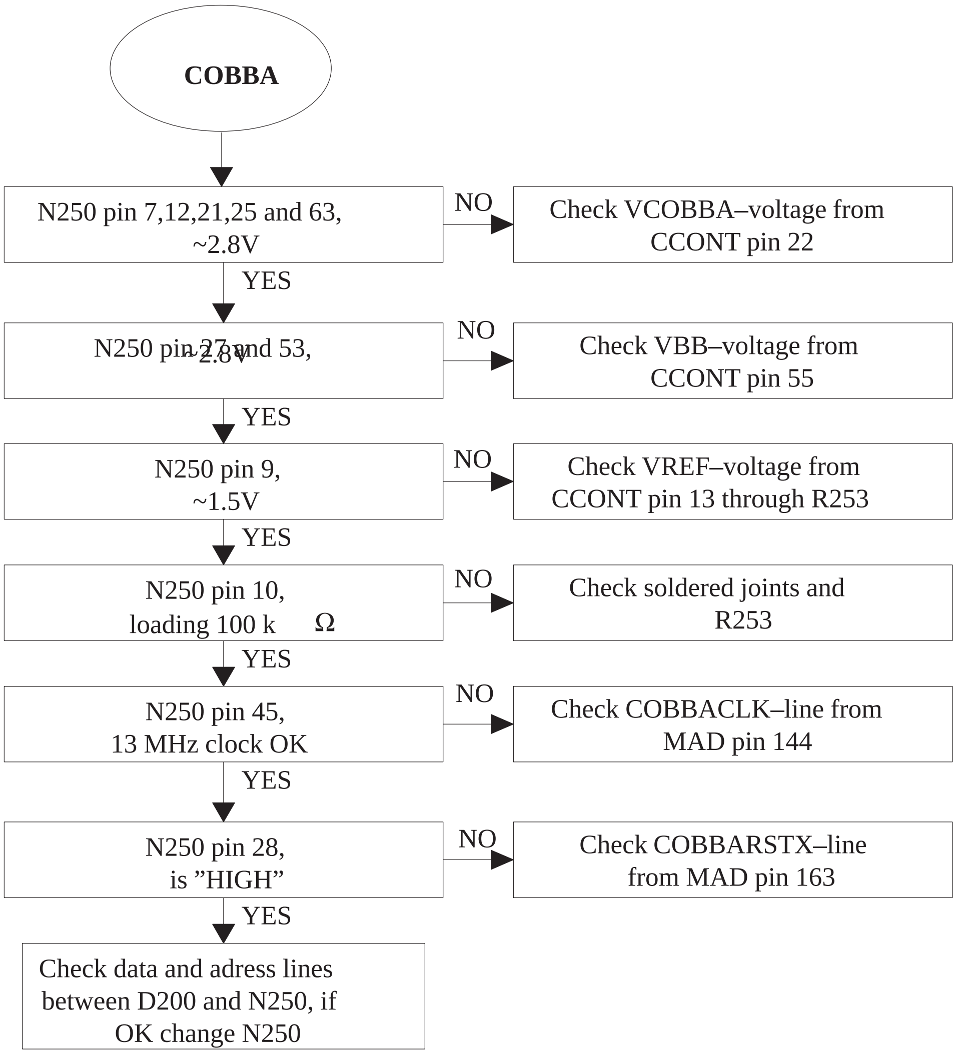
Receiver Fault (2)



Receiver Fault (3)

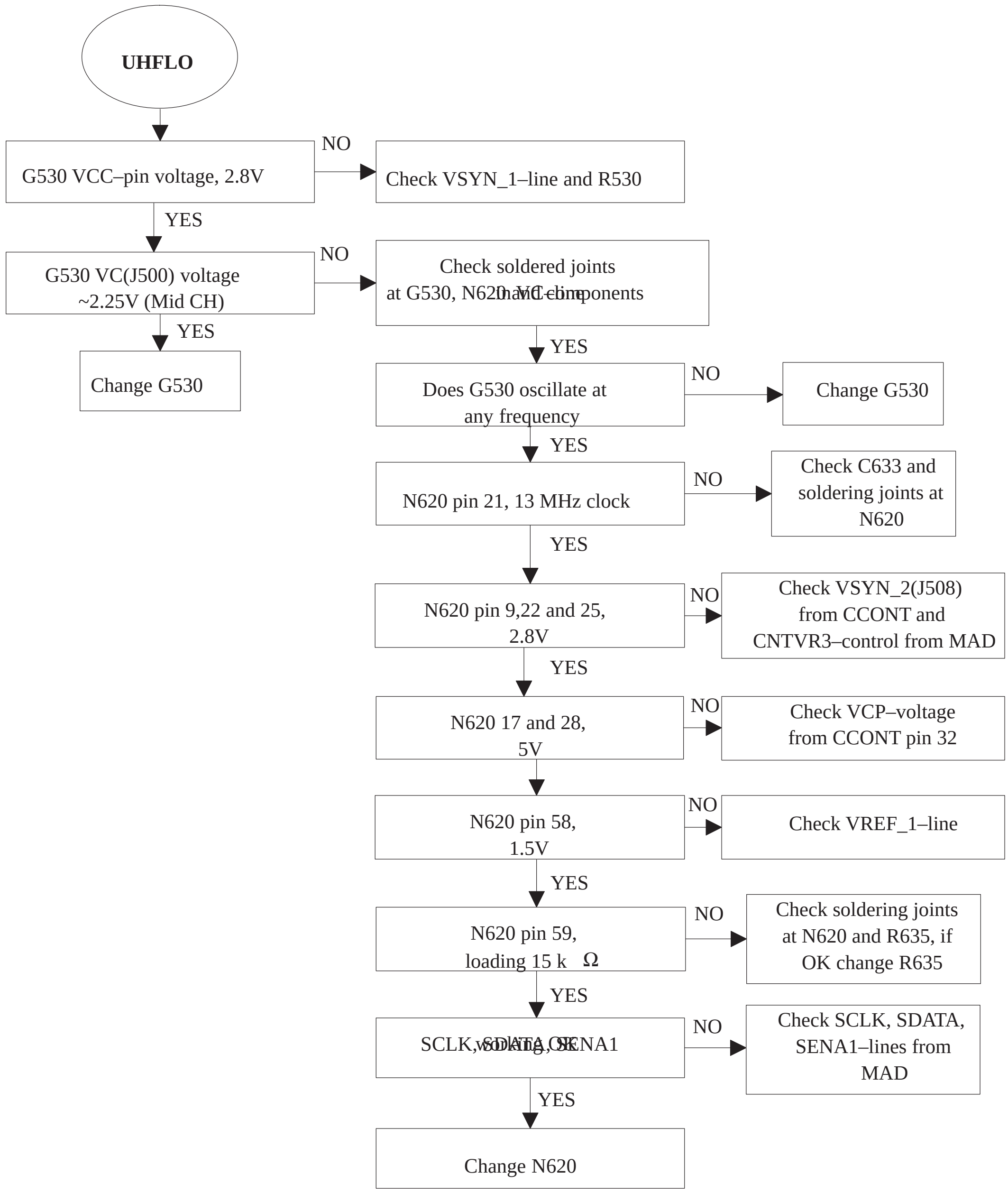


Receiver Fault (4)



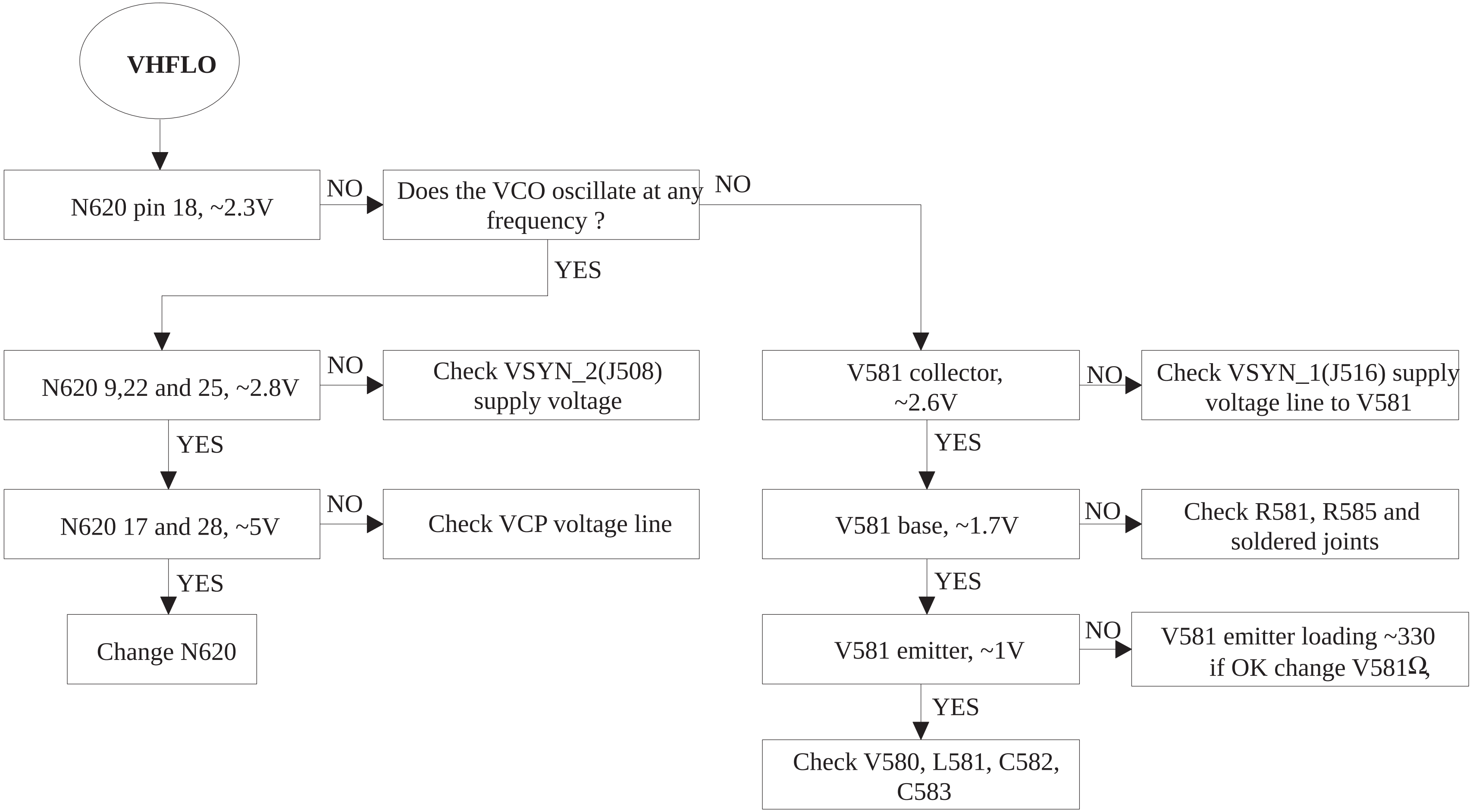
COBBACLK – signal:
Oscilloscope picture in Appendix A

Receiver Fault (5)

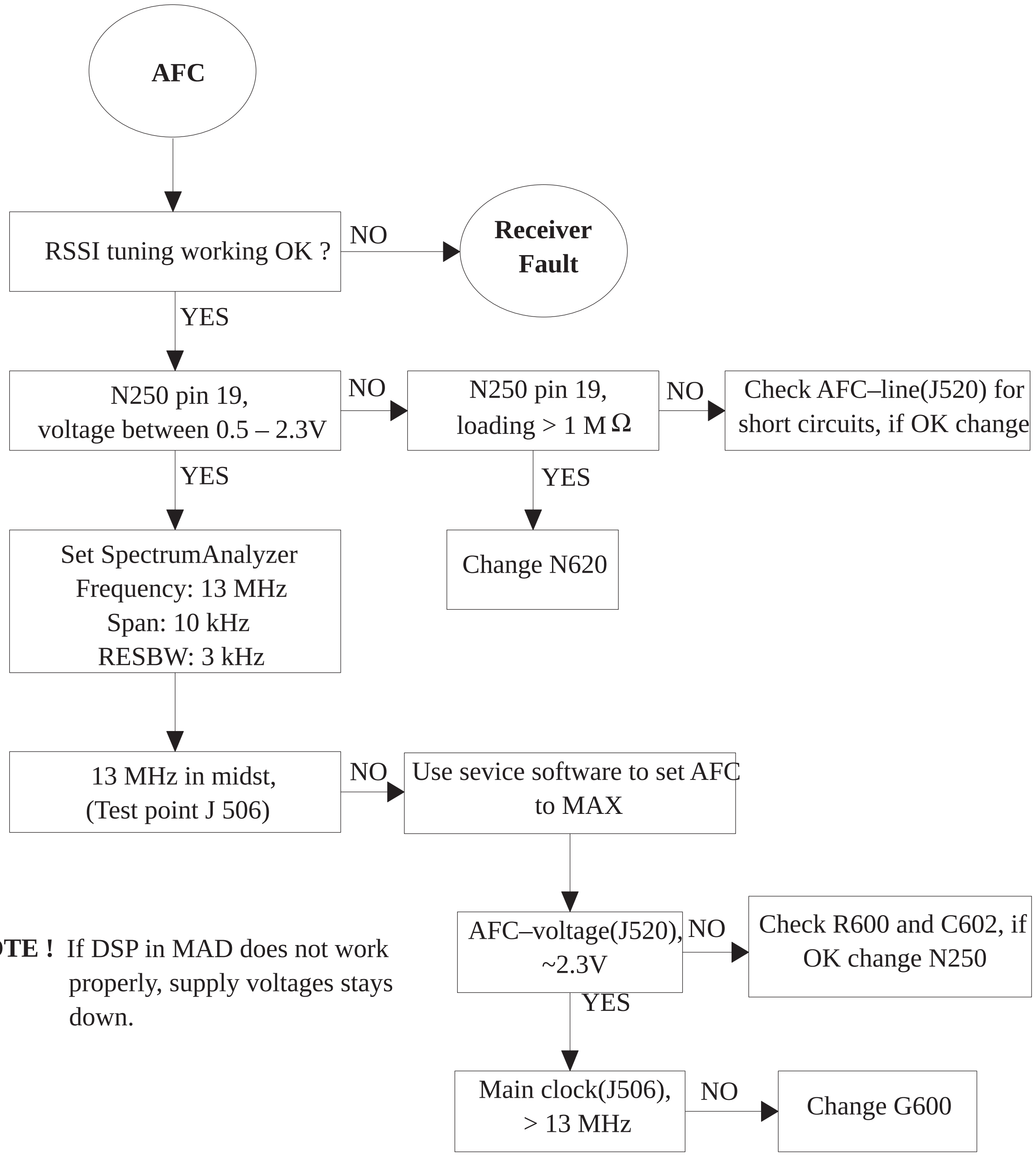


13 MHz clock oscilloscope picture in Appendix A
SCLK, SDATA, SENA1 oscilloscope pictures in Appendix B

Receiver Fault (6)

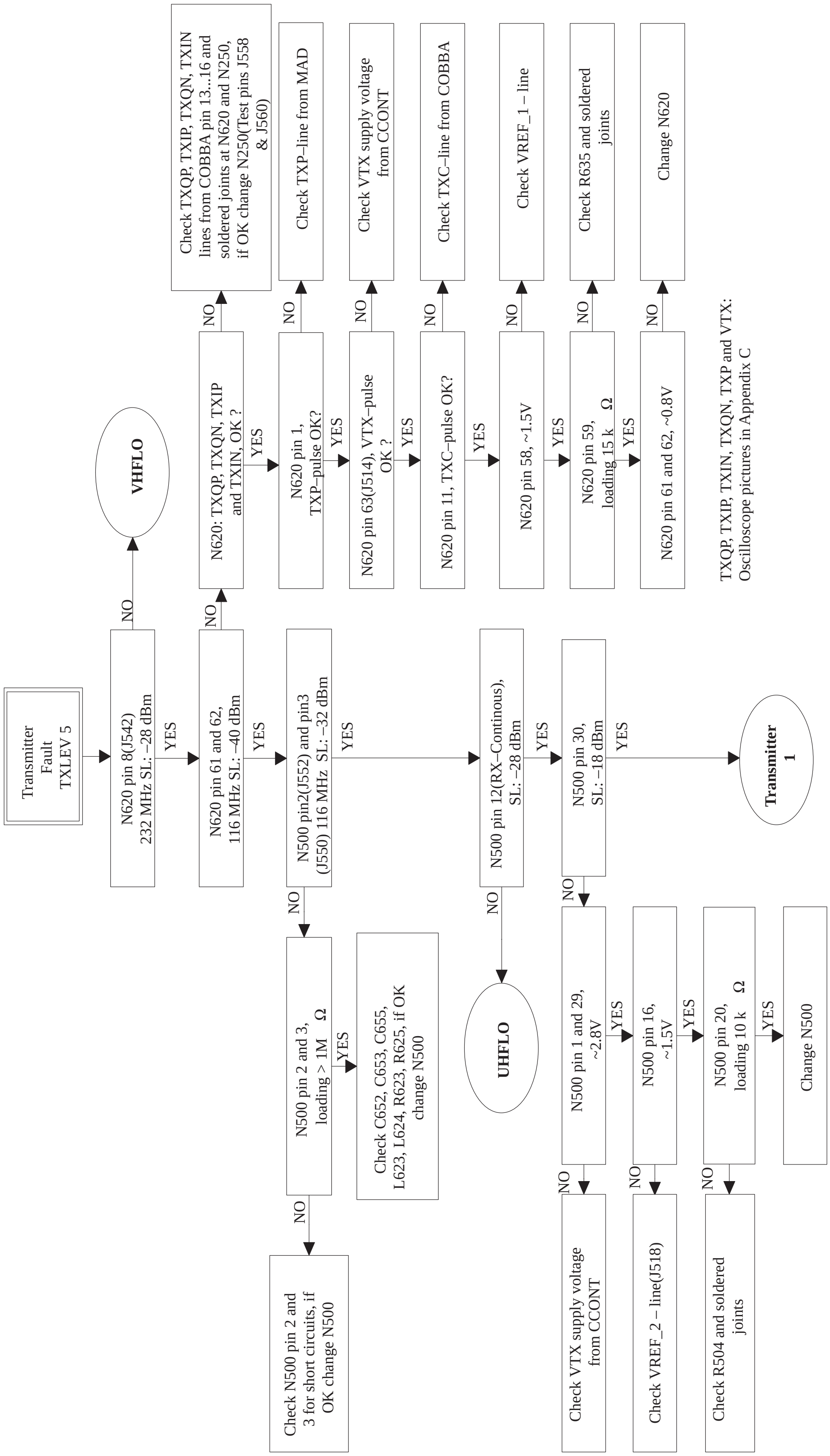


Receiver Fault (7)

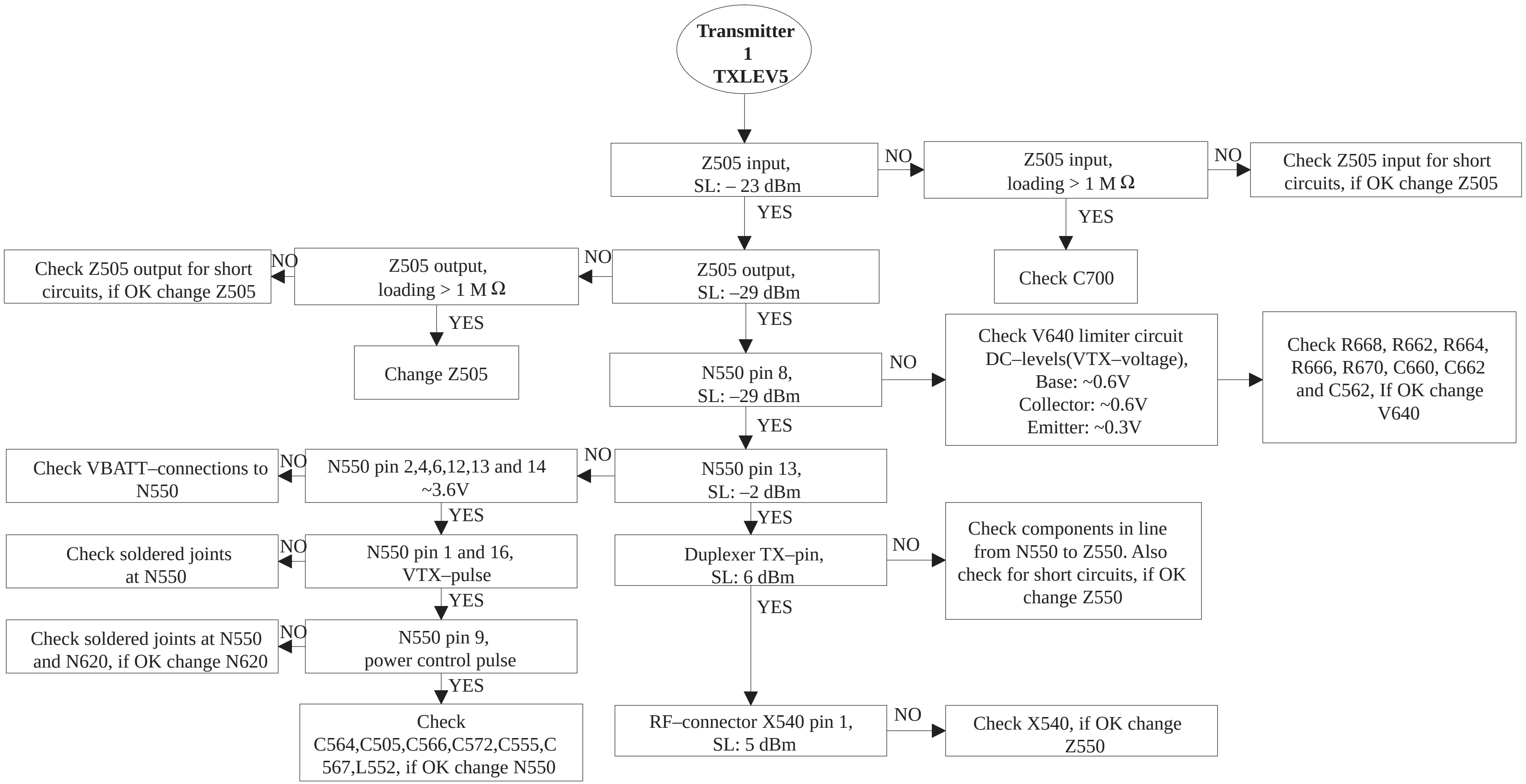


NOTE ! If DSP in MAD does not work properly, supply voltages stays down.

Transmitter Fault (1)

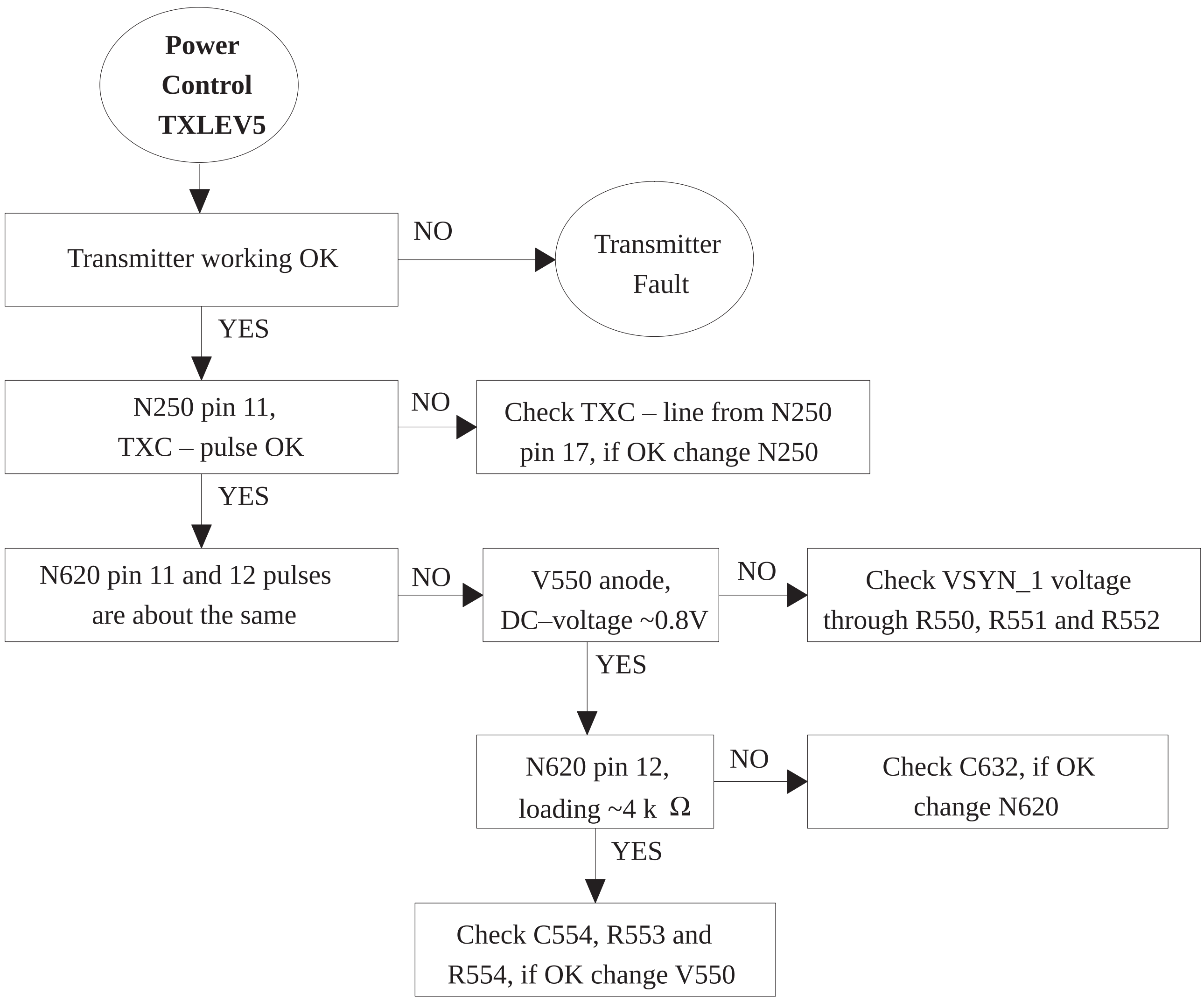


Transmitter Fault (2)



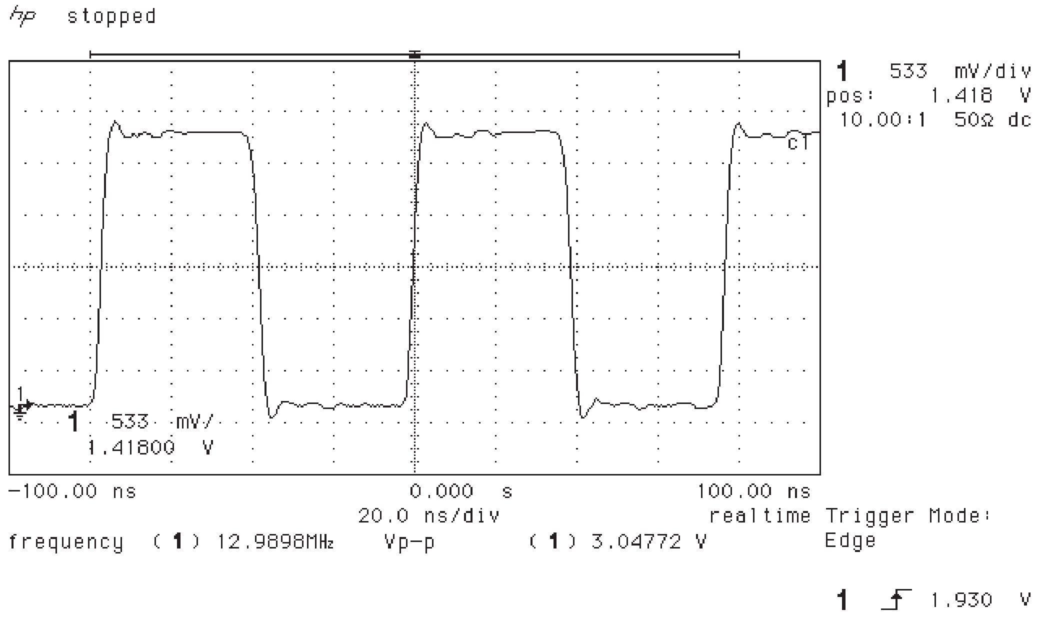
VTX and power contol pulse(TXC):
Oscilloscope pictures in Appendix D

Transmitter Fault (3)

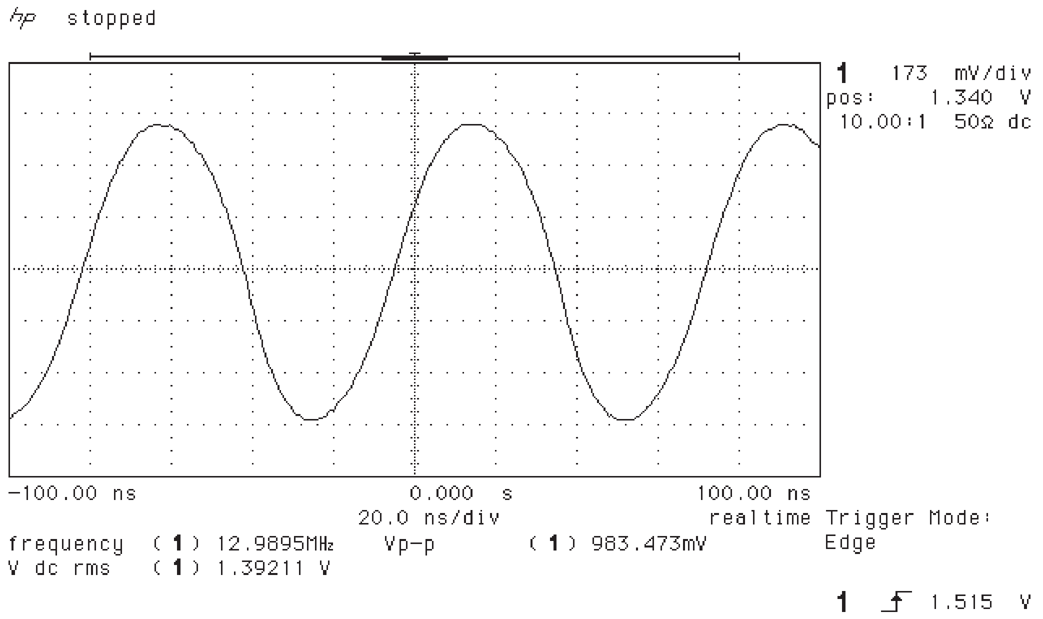


TXC – pulse:
Oscilloscope picture in Appendix D

Appendix A

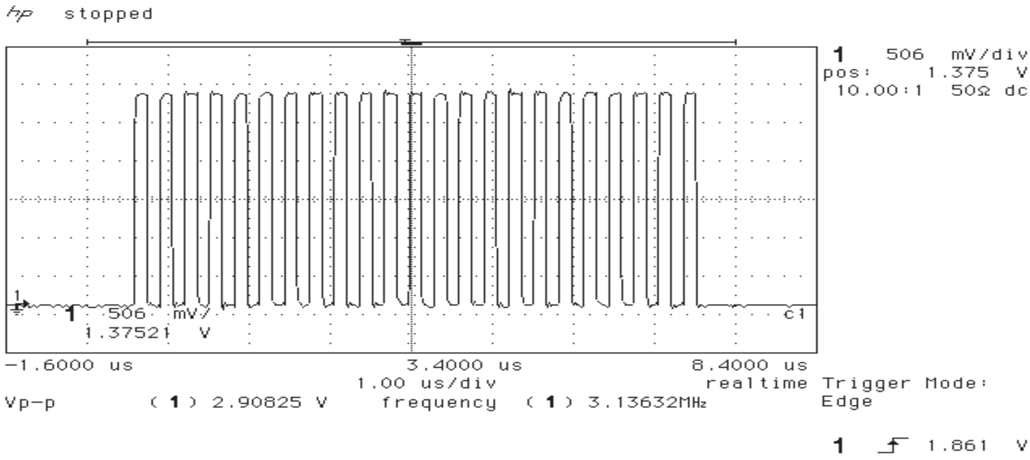


Picture 1. COBBACLK – signal

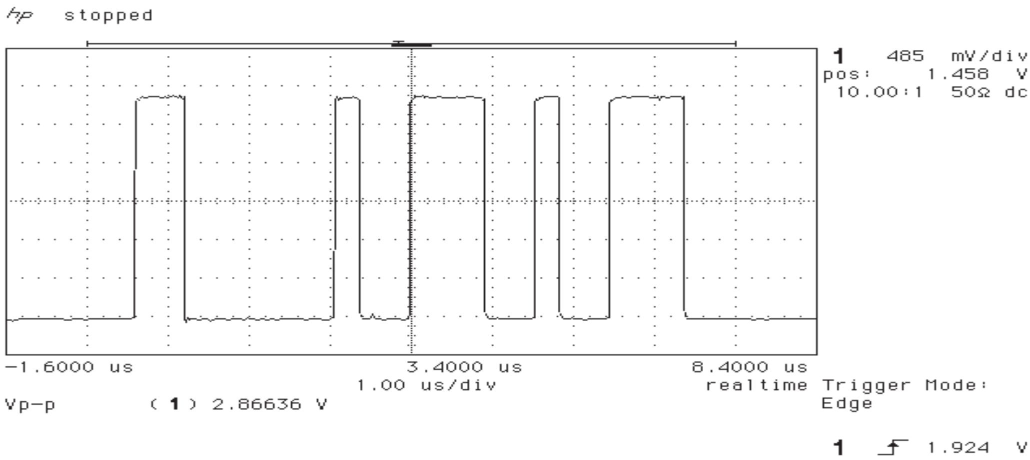


Picture 2. 13 MHz Main clock – signal

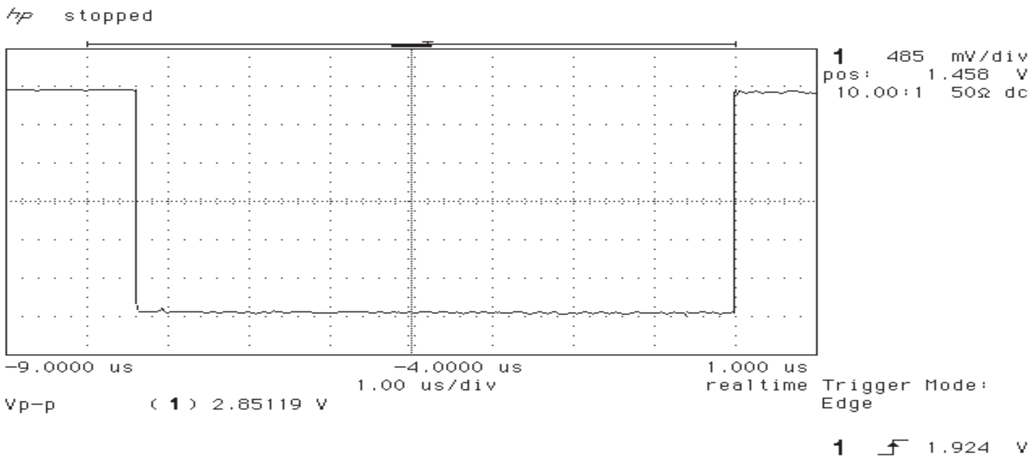
Appendix B



Picture 3. SCLK – signal

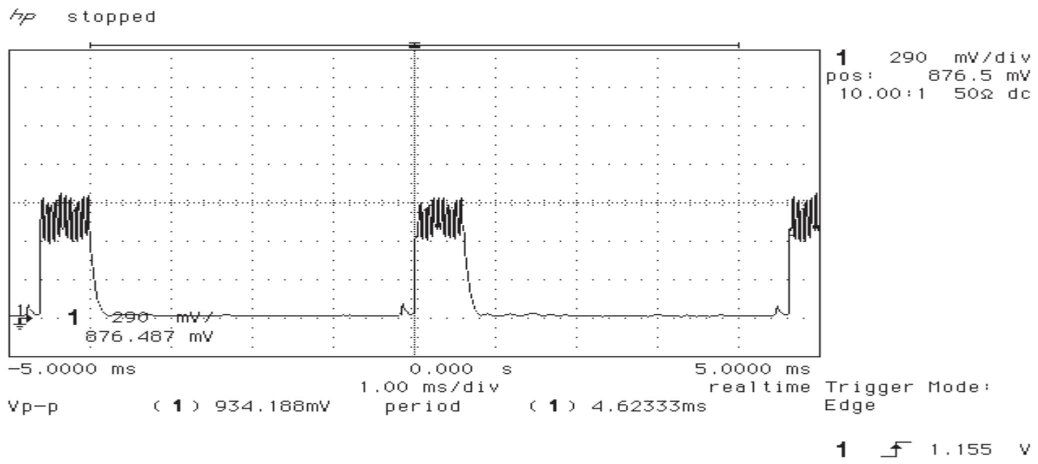


Picture 4. SDATA – signal

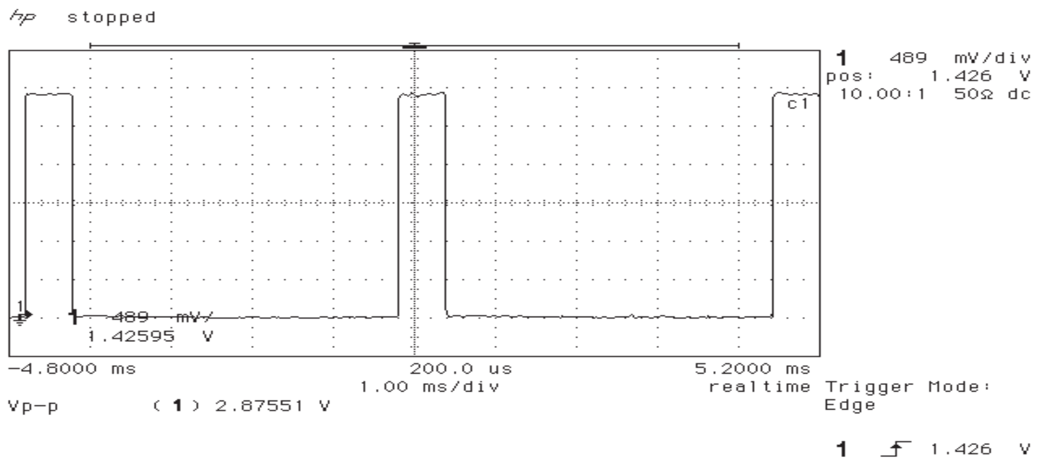


Picture 5. SENA1 – signal

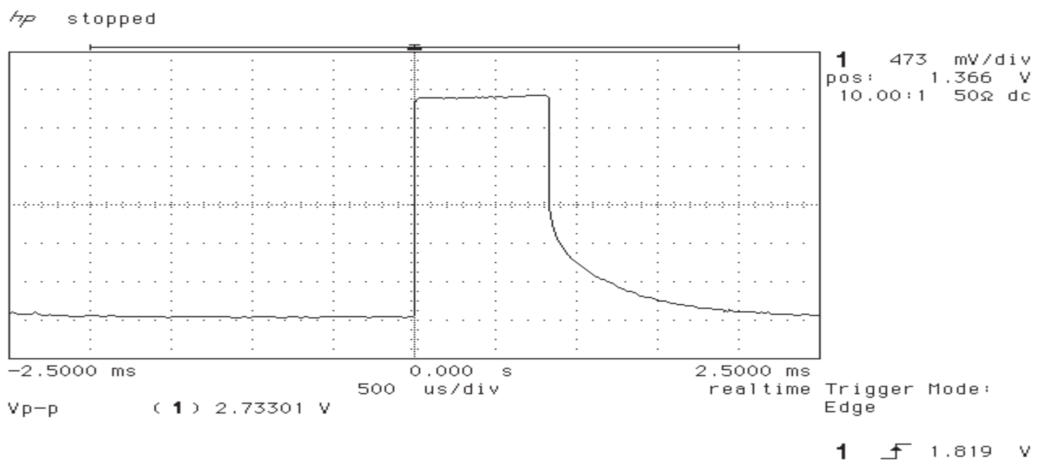
Appendix C



Picture 6. TXQP, TXQN, TXIP and TXIN – signal

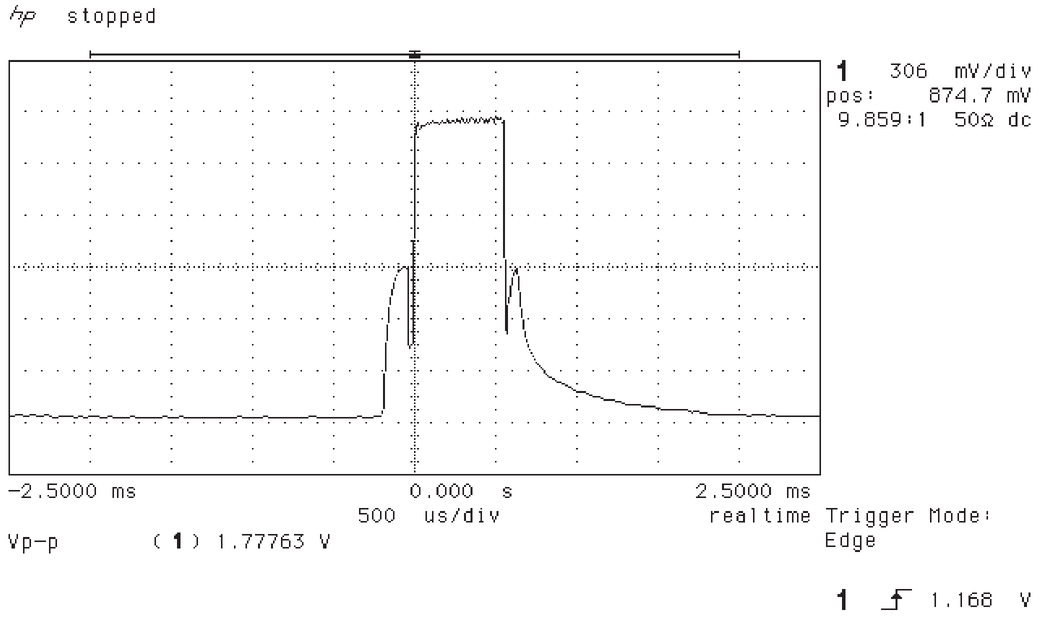


Picture 7. TXP – signal

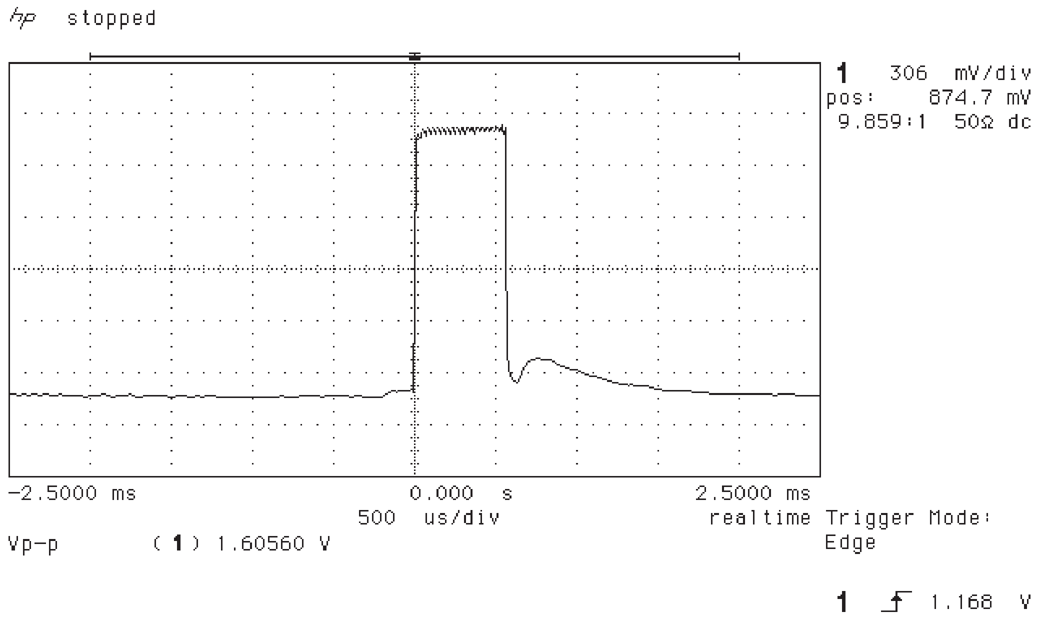


Picture 8. VTX – signal

Appendix D



Picture 9. TXC – signal (TXLEV5)



Picture 10. DET – signal(N620 pin 12) TXLEV5

Programs After Market Services (PAMS)

Technical Documentation

SERVICE MANUAL

[NMP Part No.0275370]

NSE–1 SERIES CELLULAR PHONES

NOKIA

NSE–1 last update: 03/98

AMENDMENT RECORD SHEET

Amendment Number	Date	Inserted By	Comments

NSE–1 SERIES CELLULAR PHONES
SERVICE MANUAL – OVERALL CONTENTS

Service Manual comprising

NSE–1 Series Core Transceiver booklet comprising

Appendices to Transceiver booklet covering a specific variant

Booklets comprising

IMPORTANT

This document is intended for use by qualified service personnel only.

Company Policy

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Warnings and Cautions

Please refer to the phone's user guide for instructions relating to operation, care and maintenance including important safety information. Note also the following:

Warnings:

1. CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI–SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
2. THE HANDPORTABLE TELEPHONE MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES EG PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
3. OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.

Cautions:

1. Servicing and alignment must be undertaken by qualified personnel only.
2. Ensure all work is carried out at an anti–static workstation and that an anti–static wrist strap is worn.
3. Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
4. Use only approved components as specified in the parts list.
5. Ensure all components, modules screws and insulators are correctly re–fitted after servicing and alignment. Ensure all cables and wires are repositioned correctly.

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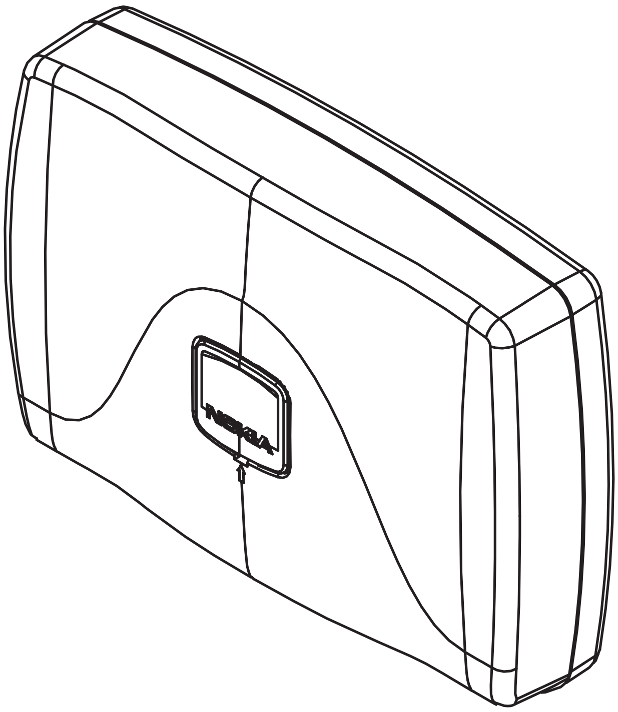
HFU–2

CONTENTS

Introduction

The HFU–2 is a handsfree unit for DCT3 compatible handportable phones. It provides rapid charging for the phone, a possibility to use HF–operation and connections to the data–card and handset unit. The HF box can be connected directly to the Mobile holder MCC–1 via the external cable.



Technical Summary

The HFU–2 has connections to car battery, car ignition sense, car radio muting, antenna motor control, data–card, handset HSU–1, external speaker and microphone. The unit has a System–connector that provides an interface to the Mobile holder MCC–1 via the external cable.

The unit consists of a rapid charger, HF–microphone– and speaker amplifiers, interface to handset, – datacard and –phone, voltage regulators and control circuit (microprocessor).

The HFU–2 is always connected to the car battery. To save the car battery, HFU–2 goes in to the sleep mode if the car is not running and/or the phone is not connected.

List of Modules

Name of module	Type code	Material code	Notes
HF unit	HFU–2	0694049	Advanced handsfree unit
HF module	ED2	0200948	ED2 Advanced hadsfree module
Assembly parts	MHFU–2	0261602	Mechanical Parts

Operation

Phone not connected (sleep mode):

When the phone is not connected the current consumption of the device has been minimized. The switching mode power supply (SMPS) and audio circuits has been turned off. HFU–2 is only waiting a phone to be connected.

Phone connected (active mode):

When the phone is connected to the HFU–2 it goes into the active mode. In the active mode the device provides charging current to the phone. It also can provide hands free call option using the external speaker and the external microphone or micspeaker unit. If more private call wants to be made, the phone itself can be used as a handset without losing the external antenna connection or with handset (option).

The phone controls all functions of HFU–2. In the active mode the HFU–2 sends all state transitions to phone via mbus.

HFU–2 also provides car radio mute function during call.

HFU–2 can control the mobile antenna motor if it is installed to the car.

Supply Voltage and Power Consumption

Conn. / pin	Line Symbol	Minimum	Typical / Nominal	Maximum	Unit / Notes
X300 / 6	GND		0		VDC
X300 / 1	VB	8.0		16	VDC (working)
X300 / 1	VB	10.8	13.5	16	VDC (spec. fulfill)
X300 / 1	VB	0.05	1	2	IDC/A (operating)
X300 / 1	VB	0.2	0.8	1	IDC/mA (sleep mode)

Charging voltage limits within current specifications fulfilled

Conn. / pin	Line Symbol	Minimum	Typical / Nominal	Maximum	Unit / Notes
X200 / 7	GND	0	0	0.1	VDC
X200 / 2	+10VA	9.50	10.0	10.55	VDC
X200 / 2	+10VA		11	200	IDC / mA

Conn. / pin	Line Symbol	Minimum	Typical / Nominal	Maximum	Unit / Notes
X100 / 5,6,11	GND	0	0	0.1	VDC
X100 / 8,9	V_IN	3		8.5	VDC
X100 / 12	VB	8		16	VDC / car battery
X100 / 12	VB			500	IDC / mA

Audio Specifications, electrical

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Max speaker output power at distortion=1%, 1 kHz sine	3.0	3.1		W / Rload = 8 ohm
HF–speaker amplifier gain	27	29	31	dB
PSRR, XEAR line	–60	–68		dB
CMRR, XEAR–SGND to speaker	–50	–55		dB
HF–mic amplifier gain	27	30	33	dB
Mic level at XMIC–SGND, (clipping level)	2000		2800	mVpp
Mic distortion at XMIC–SGND, at Vo = 100 mVrms, 1 kHz		0.15	0.4	%
Noise voltage, HFMIC			5	uVrms psofometric
PSRR, XMIC	–60	–67		dB
Crosstalk XEAR–SGND to XMIC		– 55	– 45	dB / electrical, 1kHz

HFS–12 Audio Specifications, acoustic

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Electroacoustic transfer function (RX) dBPa/1V/0.5m	11	15	19	dBPa / 1V at system connector is theoretical level
Speaker distortion level at XEAR–SGND, d=5%		354		mVrms
HF–speaker: SPL, approximate over 500 ... 3000 Hz	87 –4	89 –2	91 0	dB / 1W / 1m dBPa / 0.5W at 0,5m
Equivalent input noise, XEAR			10	uVrms psofometric
Total noise, HF speaker		200	400	uVrms psofometric

HFM–8 Audio Specifications, acoustic

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Electroacoustic transfer function (TX) dBV/dBPa/0.5m	–28	–24	–20	dBV/–5dBPa/0.5m
Total noise, XMIC–SGND		140	300	uVrms psofometric

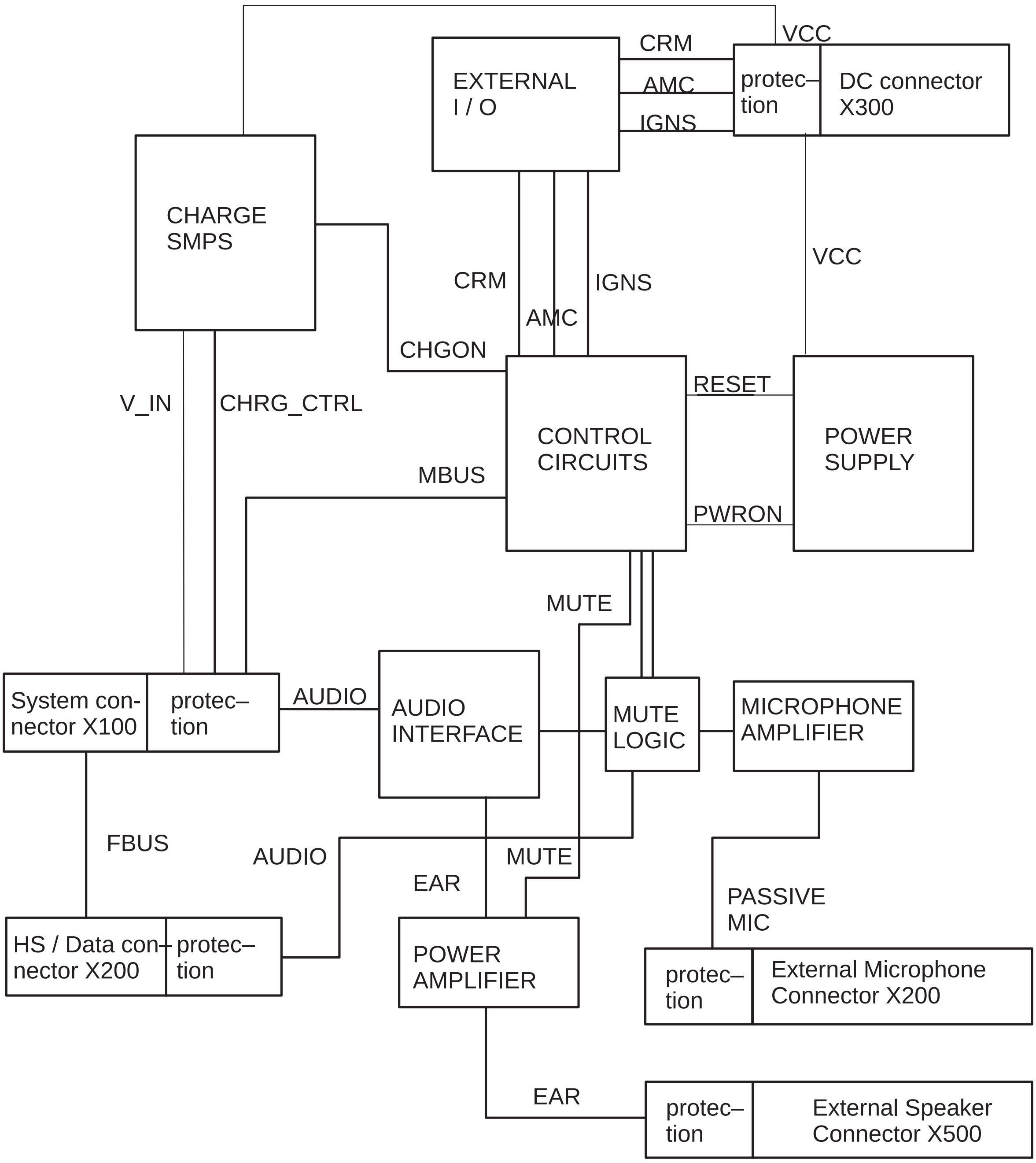
Audio signal levels

Signal name / conn. / pin	Minimum	Typical / Nominal	Maximum	Unit / Notes
XEAR / X100 / 4		80	354	mVrms
SGND / X100 / 3		0		mVrms
XMIC / X100 / 2		60	990	mVrms
HFMIC / X400 / 2		2.0		mVrms
SPEAKER / X500 / 1 & 2		0.75	5	V rms

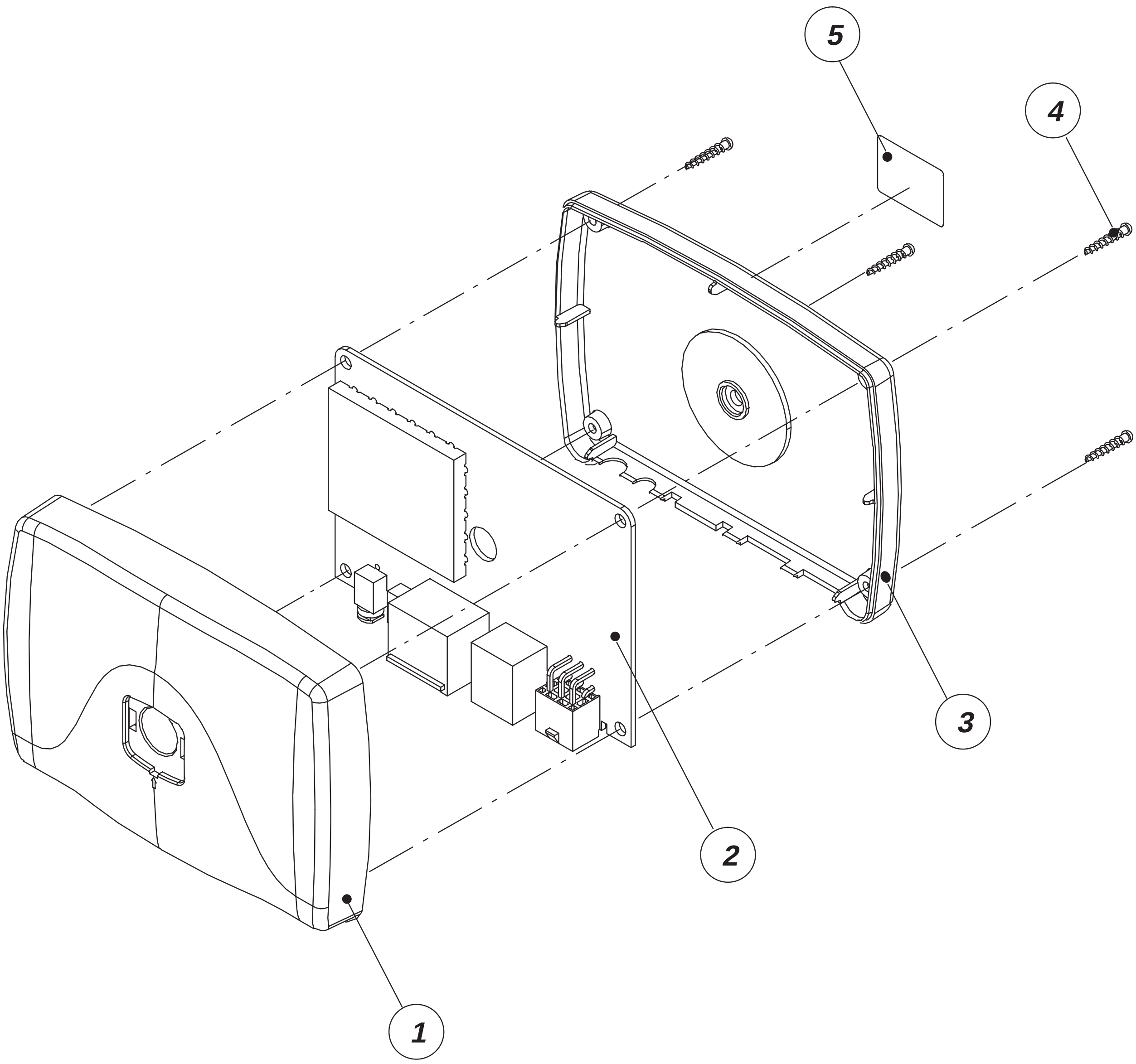
Signals and Connections

Connector Name	Code	Notes	Specifications / Ratings
System connector	X100	Charge, Mbus, Fbus, audio lines, VB	Modular 15 pin.
Handset / Data connector	X200	Mbus, Fbus, Handset audio– lines, Hshook, 10V	Modular 10 pin.
Car connector	X300	+VB, –VB, ign. sense, car radio mute, antenna motor control	2 X 3 Power conn.
HFMIC connector	X400	External microphone	2.5 mm jack
EXT. SPEAKER connector	X500	External speaker	3.2 mm jack

Block Diagram



Exploded View of HFU–2



Parts list of ED2 (EDMS Issue 5.1) Code: 0200948

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R200	1415960	Melf resistor	33.2 k	1 % 0.2 W 0204
R201	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R202	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R203	1413829	Chip resistor	10	5 % 0.1 W 0805
R204	1413829	Chip resistor	10	5 % 0.1 W 0805
R205	1419007	Chip resistor	0.22	2 % 1210
R206	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R207	1416393	Melf resistor	221 k	1 % 0.2 W 0204
R209	1430001	Chip resistor	100	5 % 0.063 W 0603
R210	1415791	Melf resistor	100	1 % 0.2 W 0204
R211	1413716	Chip resistor	220 k	5 % 0.1 W 0805
R212	1416273	Melf resistor	150 k	1 % 0.2 W 0204
R213	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R214	1430089	Chip resistor	120 k	5 % 0.063 W 0603
R215	1430105	Chip resistor	560 k	5 % 0.063 W 0603
R216	1415664	Melf resistor	27.4 k	1 % 0.2 W 0204
R218	1412328	Chip resistor	820	5 % 0.1 W 0805
R219	1416798	Melf resistor	681	1 % 0.2 W 0204
R222	1410003	Chip resistor	33 k	1 % 0.1 W 0805
R223	1410001	Chip resistor	22 k	1 % 0.1 W 0805
R224	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R225	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R226	1413716	Chip resistor	220 k	5 % 0.1 W 0805
R227	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R228	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R233	1430015	Chip resistor	470	5 % 0.063 W 0603
R240	1430001	Chip resistor	100	5 % 0.063 W 0603
R245	1415960	Melf resistor	33.2 k	1 % 0.2 W 0204
R246	1414406	Chip resistor	5.6 k	5 % 0.1 W 0805
R270	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R300	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R301	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R302	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R303	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R304	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R306	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R307	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R310	1412261	Chip resistor	100	5 % 0.1 W 0805
R311	1430073	Chip resistor	27 k	5 % 0.063 W 0603
R312	1430073	Chip resistor	27 k	5 % 0.063 W 0603
R313	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R315	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R316	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603

R317	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R319	1430079	Chip resistor	47 k	5 % 0.063 W 0603
R321	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R323	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R324	1410003	Chip resistor	33 k	1 % 0.1 W 0805
R325	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R327	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R328	1410003	Chip resistor	33 k	1 % 0.1 W 0805
R331	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R332	1430055	Chip resistor	6.8 k	5 % 0.063 W 0603
R333	1430055	Chip resistor	6.8 k	5 % 0.063 W 0603
R334	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R335	1410003	Chip resistor	33 k	1 % 0.1 W 0805
R336	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R337	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R350	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R351	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R352	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R353	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R380	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R400	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R402	1430073	Chip resistor	27 k	5 % 0.063 W 0603
R403	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R404	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R405	1430167	Chip resistor	47	5 % 0.063 W 0603
R406	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R407	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R408	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R409	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R410	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R411	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R412	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R415	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R416	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R417	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R421	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R422	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R423	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R425	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R426	1430142	Chip resistor	4.7	5 % 0.063 W 0603
R427	1430142	Chip resistor	4.7	5 % 0.063 W 0603
R429	1430167	Chip resistor	47	5 % 0.063 W 0603
R430	1430167	Chip resistor	47	5 % 0.063 W 0603
R431	1414533	Chip resistor	56 k	1 % 0.1 W 0805
R432	1415230	Melf resistor	11.0 k	1 % 0.2 W 0204
R433	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R434	1414276	Chip resistor	47 k	1 % 0.1 W 0805

R435	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R436	1430159	Chip resistor	22	5 % 0.063 W 0603
R437	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R438	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R439	1415230	Melf resistor	11.0 k	1 % 0.2 W 0204
R440	1416266	Melf resistor	140 k	1 % 0.2 W 0204
R441	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R442	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R443	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R444	1430167	Chip resistor	47	5 % 0.063 W 0603
R446	1430039	Chip resistor	1.5 k	5 % 0.063 W 0603
R447	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R449	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R465	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R466	1430055	Chip resistor	6.8 k	5 % 0.063 W 0603
R467	1430001	Chip resistor	100	5 % 0.063 W 0603
R468	1430001	Chip resistor	100	5 % 0.063 W 0603
R469	1430001	Chip resistor	100	5 % 0.063 W 0603
R471	1430053	Chip resistor	5.6 k	5 % 0.063 W 0603
R472	1430053	Chip resistor	5.6 k	5 % 0.063 W 0603
R473	1430053	Chip resistor	5.6 k	5 % 0.063 W 0603
C201	2503072	Electrol. cap.	470 u	20 % 16 V 10x16
C202	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C203	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C205	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C206	2505261	Electrol. cap.	220 u	20 % 25 V 8.5x11.5
C207	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C208	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C209	2503072	Electrol. cap.	470 u	20 % 16 V 10x16
C210	2503072	Electrol. cap.	470 u	20 % 16 V 10x16
C211	2604093	Tantalum cap.	2.2 u	20 % 35 V 6.0x3.2x2.5
C212	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C213	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C214	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C218	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C219	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C220	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C221	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C301	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C304	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C306	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C308	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C309	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C316	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C318	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C321	2320059	Ceramic cap.	100 p	5 % 50 V 0603
C322	2320059	Ceramic cap.	100 p	5 % 50 V 0603

C323	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C326	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C329	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C334	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C335	2505261	Electrol. cap.	220 u	20 % 25 V 8.5x11.5
C338	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C339	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C340	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C400	2320069	Ceramic cap.	270 p	5 % 50 V 0603
C402	2320079	Ceramic cap.	680 p	5 % 50 V 0603
C403	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C404	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C405	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C406	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C407	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C408	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C409	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C410	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C412	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C413	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C414	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C415	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C416	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C417	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C418	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C419	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C420	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C421	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C422	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C423	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C425	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C427	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C428	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C429	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C430	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C431	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C432	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C433	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C434	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C435	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C436	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C437	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C438	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C439	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C440	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C441	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C442	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603

C443	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C444	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C445	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C446	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C447	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C449	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C450	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C453	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C454	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C455	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C456	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C457	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C458	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C460	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C465	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C466	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C467	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C470	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C490	2320043	Ceramic cap.	22 p	5 % 50 V 0603
L200	3609001	Coil	100 u	10 % Q=20/796 kHz Q20/796 kHz 8X11
L201	3609001	Coil	100 u	10 % Q=20/796 kHz Q20/796 kHz 8X11
L301	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L302	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L303	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L304	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L400	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L401	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
Z300	4507733	Cer.reson 1.0mhz+–0.5% 8.0x5.0smd		8.0x5.0smd
Z400	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
Z401	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
Z402	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
V200	4110195	Zener diode	BZX84	5 % 18 V 0.3 W SOT23
V201	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V202	4211423	MosFet	MTB30	D2PAK
V203	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V204	4200909	Transistor	BC858B/BCW30	pnp 30 V 100 mA SOT23
V205	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V207	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V208	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V300	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V301	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V302	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V304	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V306	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V307	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23

V309	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V310	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V311	4210096	Transistor	BCP54	npn 45 V 1.5 A SOT223
V312	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V313	4210020	Transistor	BCP69–25	pnp 20 V 1 A SOT223
V314	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V315	4100218	Trans. supr.	LDP24A	100 V 30A/40 ms AG
V318	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
D300	4370315	IC, MCU		QFP44
D400	4309431	IC, 4 x bi.switch	4066	SO14S
N200	4340127	Mic29152 reg ld adj 1.5a to263–5		TO263–5
N201	4305733	IC, 4 x comp	LM2901	SO14S
N202	4340067	IC, regulator	LP2951	3.3 V 100 mA
N204	4340067	IC, regulator	LP2951	3.3 V 100 mA
N400	4301182	IC, 2 x op.amp.	LM2902	SO14S
N401	4340125	L2726 2xop.amp pw5w1a 4–28v so20w		SO20W
N402	4301199	IC, 2 x op.amp.	LM2904	SO8S
S001	9510365	RF shield dmd02481 hfu–1		
X100	5400087	Modular jack 15pol f p2.04 90deg		90DEG
X200	540Y031	Use code 5400103		
X300	540Y021	Use code 5400093		
X400	5409057	Jack 2.5mm+sw+lock f 4pol str. s		SM
X500	5409059	Jack 3.5mm+sw+lock f 3pol str. s		SM
	9854195	PCB ED2 110.0X75.01.6 D 4/PA		
	9854195	PC board	ED2	110.0x75.01.6 d 4/pa

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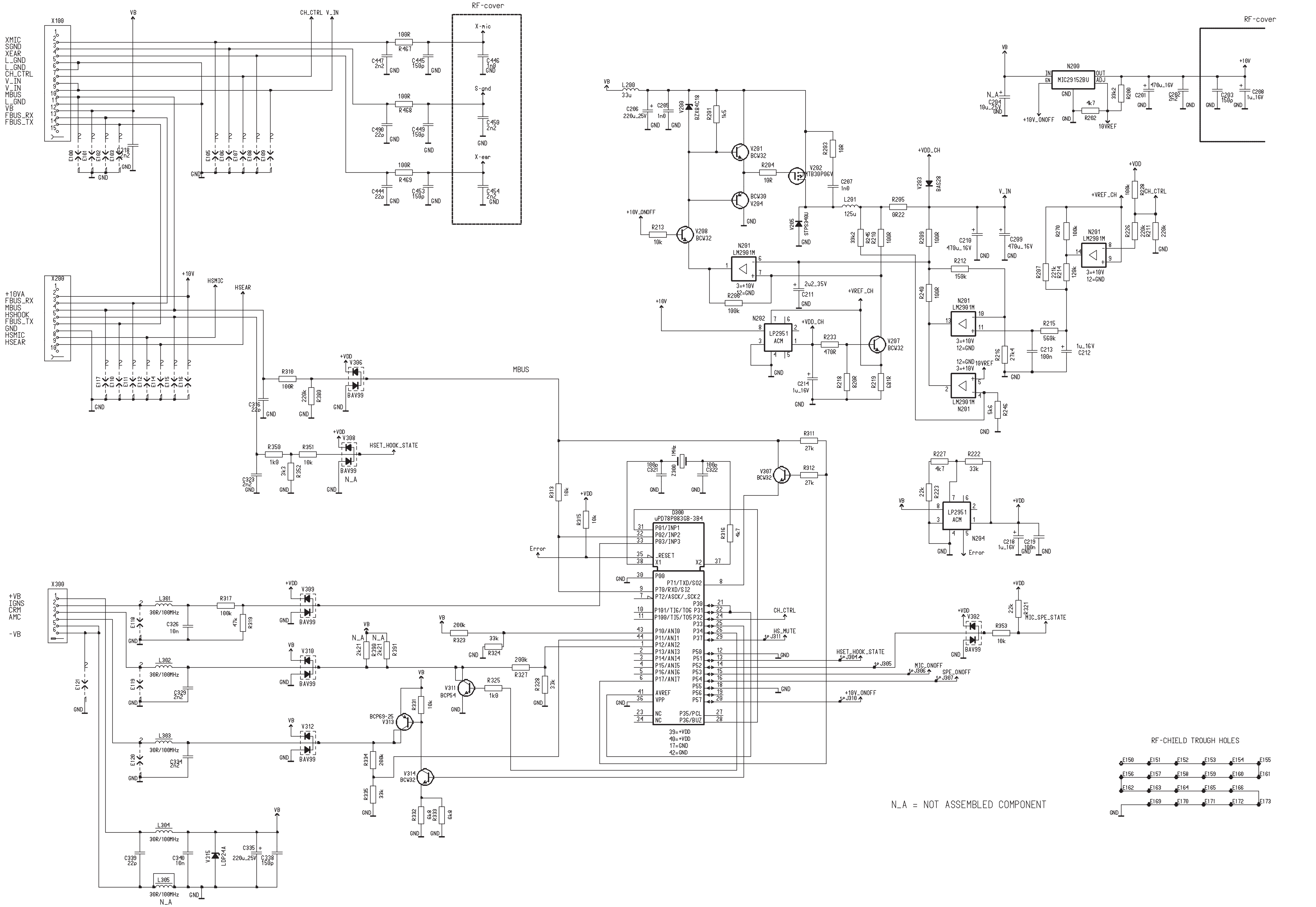
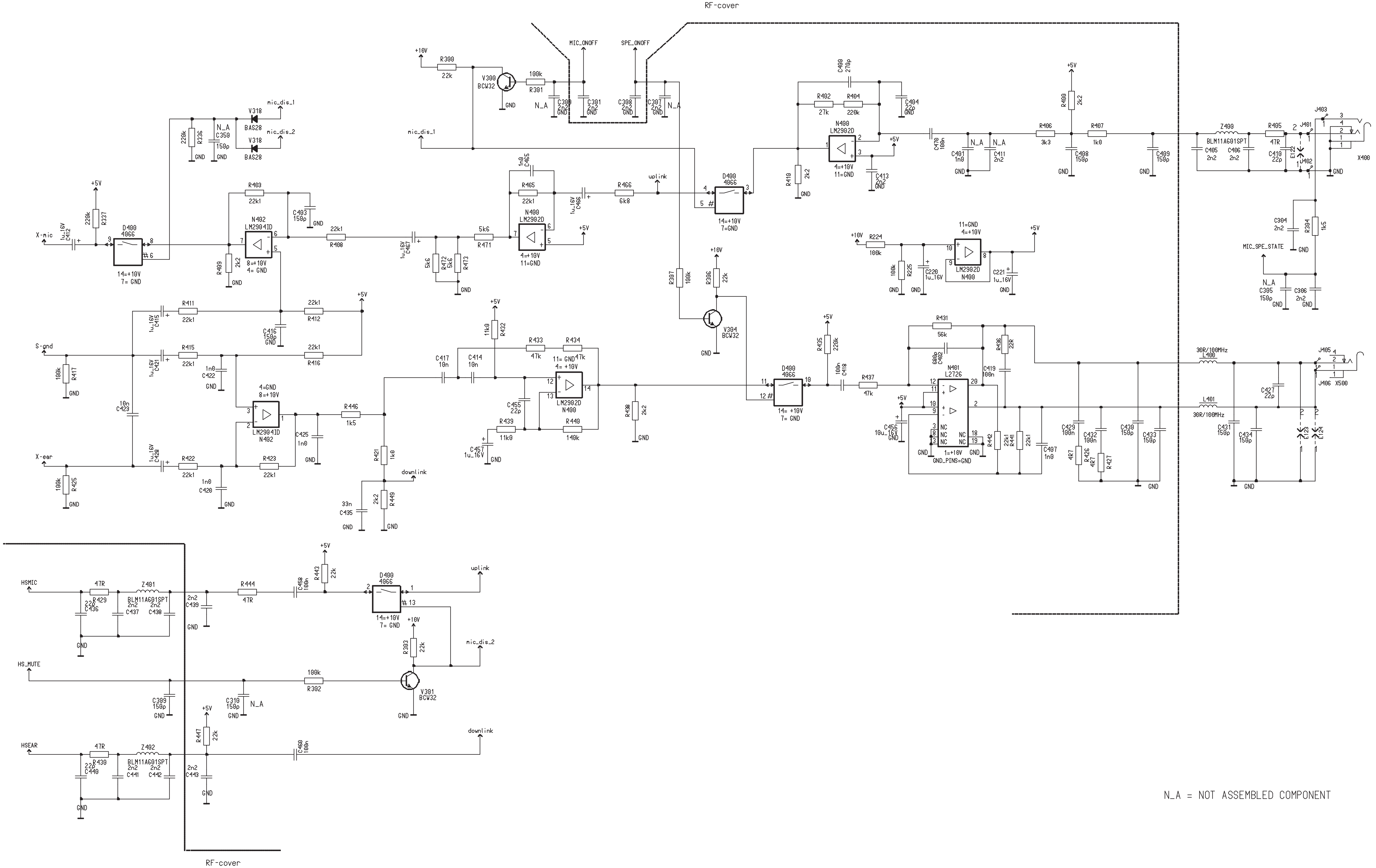
Block Diagram of Power & Charging (Version 5 Edit 94) for layout version 05

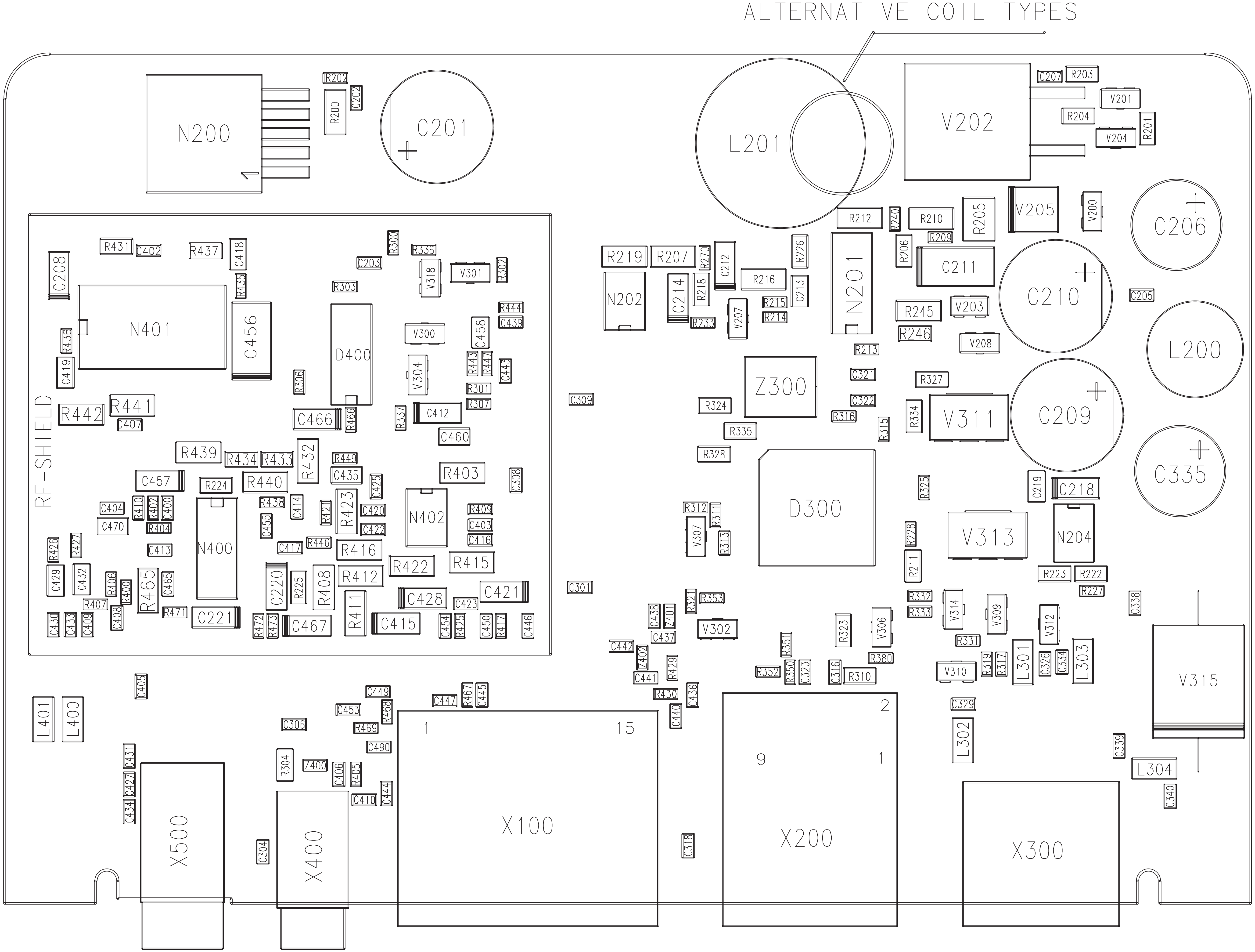


Circuit Diagram of Audio (Version 5 Edit 87) for layout version 05



N_A = NOT ASSEMBLED COMPONENT

Layout Diagram of ED2 (Version 05)



CARK–64
Installation Guide

Introduction

This installation guide has been prepared to provide the basic information

necessary to install this car kit. This guide is not intended to be definitive, because different types and models of vehicles will require different installation work. The information given is for general guidance only.

The terms of warranty demand that this car kit be installed by an experienced installer and only genuine Nokia parts are used. An end user should never attempt to install this car kit without professional assistance as the installation requires special tools and knowledge.

Please refer to the telephone's User's Guide for instructions on the telephone's operation, care and maintenance, including important safety information.

Note: Read the warnings below before beginning the installation procedure.

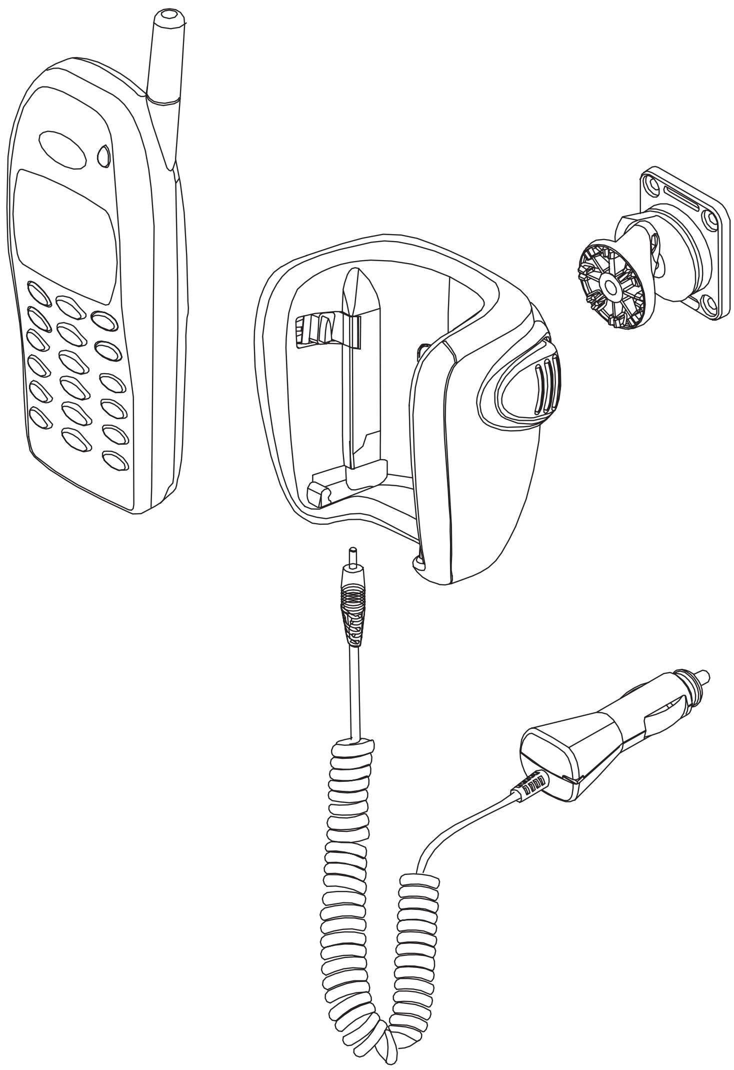
WARNINGS

1. **ENSURE THAT THE VEHICLE'S BATTERY IS DISCONNECTED BEFORE YOU START THE INSTALLATION PROCEDURE, AND THAT IT REMAINS DISCONNECTED DURING THE PROCEDURE.**
2. **DO NOT SMOKE OR USE OPEN FLAMES WHEN WORKING NEAR THE VEHICLE'S FUEL SYSTEM.**
3. **ENSURE THAT THE VEHICLE'S ELECTRICAL CABLES, HYDRAULIC LINES, FUEL LINES, AND SAFETY EQUIPMENT ARE NOT DAMAGED DURING INSTALLATION.**
4. **ENSURE THAT NORMAL CONTROL AND OPERATION OF THE VEHICLE IS NOT IMPAIRED BY THE INSTALLATION, PARTICULARLY THE BRAKES AND STEERING. ENSURE THAT AIRBAG OPERATION IS NOT OBSTRUCTED.**
5. **ELECTRONIC AND OTHER SOPHISTICATED SYSTEMS (e.g. SPEED CONTROL, ABS ANTI–LOCK BRAKE, FUEL INJECTION–, NAVIGATION–, AND AIR–BAG SYSTEMS) ARE RELATIVELY IMMUNE TO MALFUNCTION CAUSED BY NEARBY RADIO TRANSMISSIONS. HOWEVER, SHOULD YOU EXPERIENCE FALSE OPERATION OF THESE SYSTEMS OR ARE IN ANY DOUBT WHATSOEVER AS TO THEIR FUNCTIONALITY, PLEASE CONSULT THE VEHICLE'S DEALER.**
6. **THE CAR KIT IS SUITABLE FOR USE ONLY IN VEHICLES WITH A 11..32 V NEGATIVE GROUNDING. USE ON OTHER SUPPLY VOLTAGES OR ALTERNATIVE POLARITY WILL DAMAGE THE EQUIPMENT.**
7. **THE PHONE SHOULD NOT BE LEFT SWITCHED ON FOR EXTENDED PERIODS WITHOUT RUNNING THE VEHICLE'S ENGINE. FAILURE TO COMPLY COULD DRAIN THE VEHICLE'S BATTERY.**

Unpacking

Carefully unpack the equipment and ensure that the following items are present.

Phone Holder	MBC–1
Swivel Mount	HHS–9
Mobile Charger	LCH–9



Component Parts

Phone Holder MBC–1

The holder allows the phone to be firmly located in a convenient position. The holder is attached to the vehicle's interior using the swivel mount HHS–9, or the mounting plate MKU–1. The mounting must be secured with a screw (included with HHS–9). The screw recess can then be covered with the NOKIA logo plate.

Mounting Plate MKU–1 and Swivel Mount HHS–9

MKU–1 is a fixed position mounting plate; HHS–9 is a swivel mount which allows for adjustable fixing. The two mounting plates are interchangeable.

Mobile Charger LCH–9

The mobile charger enables the phone to be charged via the vehicle's cigarette lighter socket. The charger connects to the phone via a d.c. jack socket located on the base of phone. The supply voltage may vary between 11 and 32 V.

Installation and Testing

There are some important aspects that require special attention when positioning the phone holder.

The positioning of the phone holder is the most important factor when trying to achieve the most comfortable position for the user. The location of the holder should be selected so that the visibility of the phone's display is good under all lighting conditions, but not so that the driver's attention is easily distracted. The phone holder can be installed so that only one of the release buttons is visible, as only one of the buttons needs to be pressed to release the phone. The holder should be located so that the driver can easily reach the keypad. Under no circumstances should the holder prevent the driver from controlling or operating the vehicle in any way or observing traffic.

Once installed, the equipment should be tested to ensure that it is operating satisfactorily and that the position of the unit does not impair the driver's ability to control and operate the vehicle in any way.

Use the phone to make a call when the vehicle is parked with the engine running. During the call, switch off the engine. Ensure that the phone is operational both with the engine running, and with the engine switched off.

For operating information refer to the User's Guide supplied with the phone.

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CARK–91
Installation Guide

Introduction

This installation guide has been prepared to provide the basic information

necessary to install this car kit. This guide is not intended to be definitive, because different types and models of vehicles will require different installation work. The information given is for general guidance only.

The terms of warranty demand that this car kit be installed by an experienced installer and only genuine Nokia parts are used. An end user should never attempt to install this car kit without professional assistance as the installation requires special tools and knowledge.

Please refer to the telephone's User's Guide for instructions on the telephone's operation, care and maintenance, including important safety information.

Note: Read the warnings below before beginning the installation procedure.

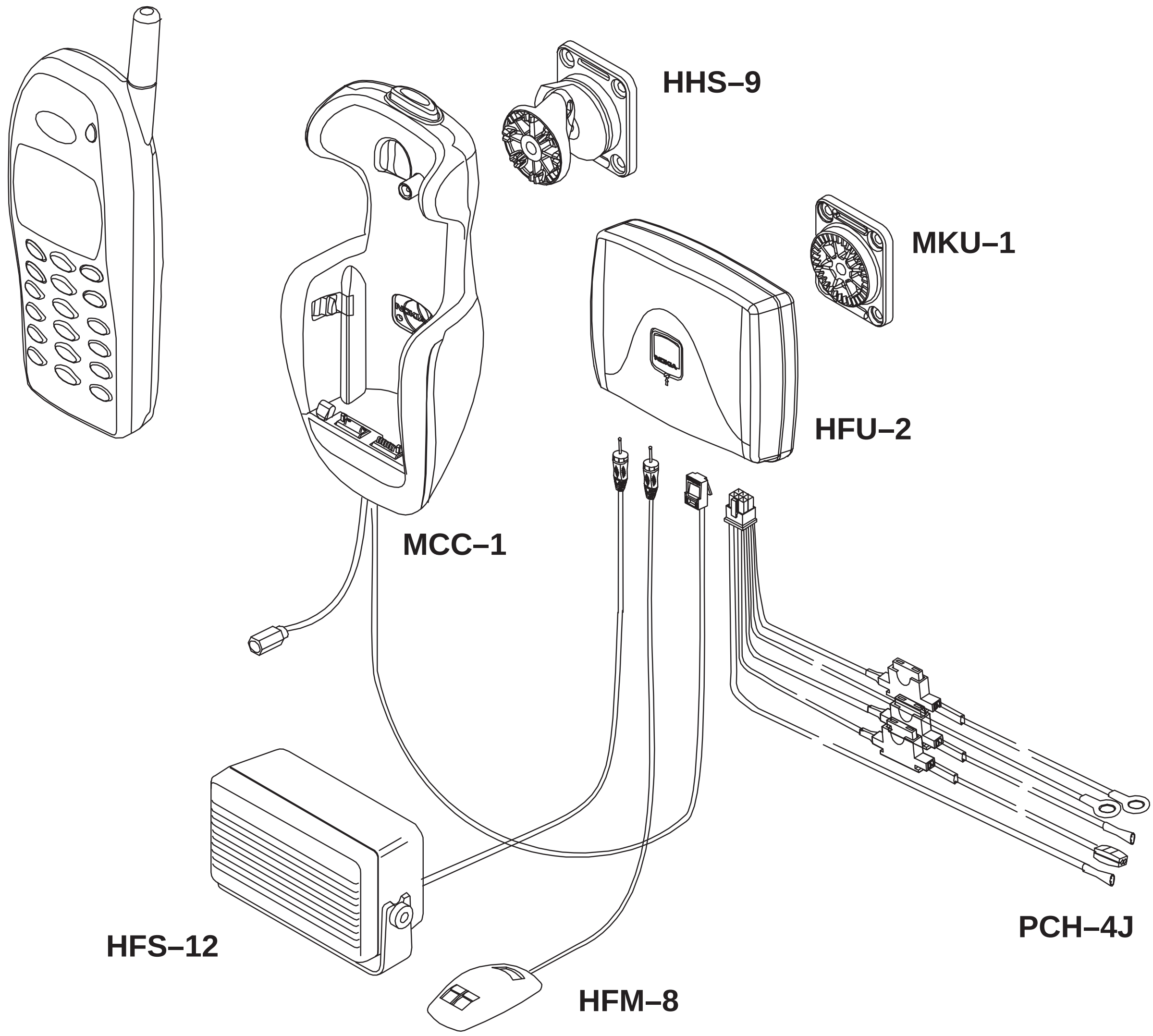
WARNINGS

1. **ENSURE THAT THE VEHICLE'S BATTERY IS DISCONNECTED BEFORE YOU START THE INSTALLATION PROCEDURE, AND THAT IT REMAINS DISCONNECTED DURING THE PROCEDURE.**
2. **DO NOT SMOKE OR USE OPEN FLAMES WHEN WORKING NEAR THE VEHICLE'S FUEL SYSTEM.**
3. **ENSURE THAT THE VEHICLE'S ELECTRICAL CABLES, HYDRAULIC LINES, FUEL LINES, AND SAFETY EQUIPMENT ARE NOT DAMAGED DURING INSTALLATION.**
4. **ENSURE THAT NORMAL CONTROL AND OPERATION OF THE VEHICLE IS NOT IMPAIRED BY THE INSTALLATION, PARTICULARLY THE BRAKES AND STEERING. ENSURE THAT AIRBAG OPERATION IS NOT OBSTRUCTED.**
5. **ELECTRONIC AND OTHER SOPHISTICATED SYSTEMS (e.g. SPEED CONTROL, ABS ANTI–LOCK BRAKE, FUEL INJECTION–, NAVIGATION–, AND AIR–BAG SYSTEMS) ARE RELATIVELY IMMUNE TO MALFUNCTION CAUSED BY NEARBY RADIO TRANSMISSIONS. HOWEVER, SHOULD YOU EXPERIENCE FALSE OPERATION OF THESE SYSTEMS OR ARE IN ANY DOUBT WHATSOEVER AS TO THEIR FUNCTIONALITY, PLEASE CONSULT THE VEHICLE'S DEALER.**
6. **THE CAR KIT IS SUITABLE FOR USE ONLY IN VEHICLES WITH A 11..32 V NEGATIVE GROUNDING. USE ON OTHER SUPPLY VOLTAGES OR ALTERNATIVE POLARITY WILL DAMAGE THE EQUIPMENT.**
7. **THE PHONE SHOULD NOT BE LEFT SWITCHED ON FOR EXTENDED PERIODS WITHOUT RUNNING THE VEHICLE'S ENGINE. FAILURE TO COMPLY COULD DRAIN THE VEHICLE'S BATTERY.**

Unpacking

Carefully unpack the equipment and ensure that the following items are present.

Advanced Active Car Holder	MCC–1
Advanced HF Unit	HFU–2
Power Cable	PCH–4J
Mounting Plate	MKU–1
Swivel Mount	HHS–9
HF Microphone	HFM–8
HF Speaker	HFS–12



Component Parts

Advanced Active Holder MCC–1

The holder allows the phone to be firmly located in a convenient position. The holder is attached to the vehicle's interior using the swivel mount HHS–9. The mounting must be secured with a screw (included with HHS–9). The screw recess can then be covered with the NOKIA logo plate.

Advanced HF Unit HFU–2

The handsfree unit enables the phone to operate in handsfree mode. The unit is attached to the vehicle interior using the mounting plate MKU–1. The mounting must be secured with a screw (included with MKU–1). A temporary installation can be achieved using installation belts (not supplied).

Power is supplied from the vehicle's battery via the power cable PCH–4J. The handsfree unit provides the power supply to the phone via the system connector.

The HF microphone HFM–8, connects to the MIC socket. And the HF speaker HFS–12, connects to the 🕨 socket.

Mounting Plate MKU–1 and Swivel Mount HHS–9

MKU–1 is a fixed position mounting plate; HHS–9 is a swivel mount which allows for adjustable fixing. The two mounting plates are interchangeable.

HF Microphone HFM–8

The HF microphone connects directly to the handsfree unit (MIC socket). Insert the plug into the MIC socket and twist 90° to lock firmly in place.

HF Speaker HFS–12

The HF speaker connects directly to the handsfree unit (🕨 socket). Insert the plug into the 🕨 socket and twist 90° to lock firmly in place.

Power Cable PCH–4J

The power cable connects the standard handsfree unit HFU–2 to the vehicle’s power supply. The red wire must be connected to the + voltage on the vehicle’s power supply via the supplied fused connector. The black wire must be attached to a good negative GND connection.

The blue ignition sense (IGNS) wire is connected to +12 V voltage controlled by the vehicle’s ignition key via the supplied fused connector. See section ”Ignition Sense”.

The yellow wire is used for car radio muting (XCRM). The line goes down to 0 volts during a call. See section ”Car Radio Muting”.

The green wire is used for motor antenna (AMC). The voltage in this output is +12 V whenever the phone is on. See section ”Antenna Motor Control”.

External Mobile Antenna (not supplied)

The cellular phone is designed to operate with a high quality external antenna. However, due to many different types of antennas being available, an antenna is NOT included as part of this kit. Please, consult the dealer to find out which is the most suitable antena type for your installation.

Installation

There are some important aspects that require special attention in positioning car kit accessories.

The positioning of the phone holder is the most important factor when trying to achieve the most comfortable position for the user. The location of the holder should be selected so that the visibility of the phone's display is good under all lighting conditions, but not so that the driver's attention is easily distracted. The holder should be located so that the driver can easily reach the keypad. Under no circumstances should the holder prevent the driver from controlling or operating the vehicle in any way or observing traffic.

The HF microphone should be installed according to the directions in the separate microphone installation guide. Ensure the microphone is as close to the driver's mouth as possible, and attached to a surface that is mechanically quiet. The microphone should be mounted at least 3 ft/1 m away from the handsfree unit speaker to avoid acoustic feedback.

Ensure cables are routed as far away as possible from the vehicle's electronic systems (refer to WARNINGS)*. Also, ensure that cables are not subjected to undue mechanical stress e.g. under seats or against sharp edges.

* To prevent disturbance, cables should be routed as far away from the interference source as possible

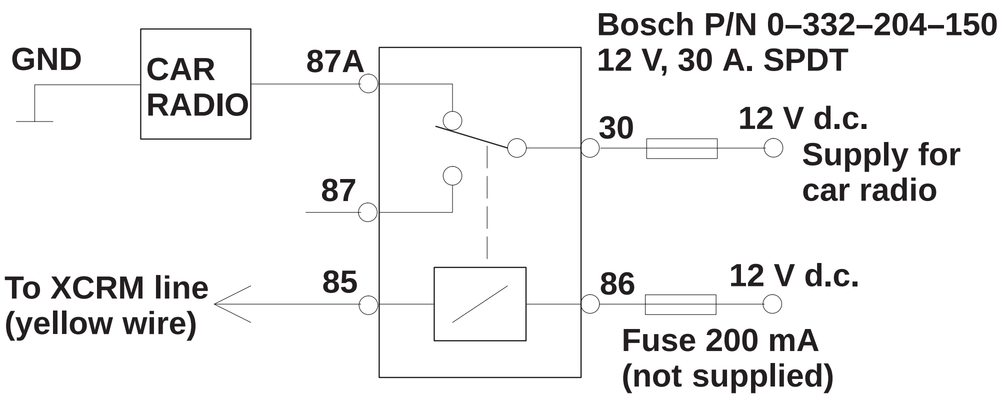
Ignition Sense IGNS

The ignition sense feature prevents your car kit from draining the car battery by executing an auto power off in 20 seconds after the ignition key has been turned off. The blue wire of the power cable is used for the ignition sense feature. The use of ignition sense is recommended to prevent accidental draining of the car's battery. The wire is connected via a 1 A fuse to a 12/24 volt potential that is controlled by the ignition key. Do not connect it directly to the high voltage sections of the ignition circuit.

Car Radio Muting CRM

The car kit offers a feature that can mute the car radio automatically during a conversation. This feature is convenient and provides for safer handsfree operation. The car radio muting feature is based on a grounded line, so it means that in standby, the yellow wire (XCRM) is not grounded and car radio works normally, but during a call, line is grounded and car radio is muted. Note that an auxiliary relay or muting unit must be used when the car radio doesn't have a mute feature available.

When a relay is used, connect of series with the car radio main supply. A 200 mA fuse should be used to protect the XCRM output in event of a short circuit. Some radios have separate supplies for amplifiers and motors, and another for memory backup purposes. Very often these radios also have a secret code system, which activates itself if a break in the memory supply is detected. Be careful when installing the relay not to break the memory supply (usually marked ACC or +MEM), but to install the relay in the main supply feed.

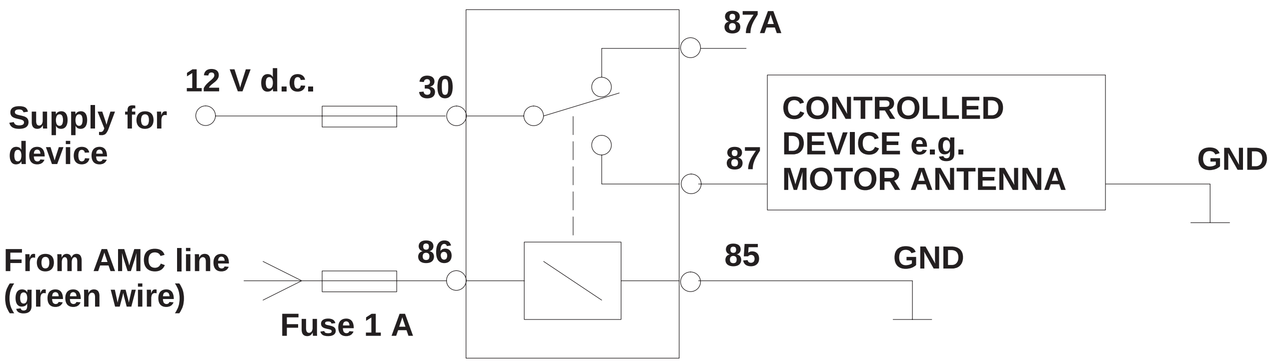


Another possibility is to use a special muting unit, which mutes the radio by connecting load resistors to the speaker lines of the car radio.

Antenna Motor Control AMC

The antenna motor control offers a feature, green wire of the system cable (AMC), that may be used to control different devices on and off. The voltage in this output is +12 V whenever the phone is on. If the phone is turned off, the voltage disappeares. The maximum output current is 200 mA, therefore for example motorized antenna must be controlled via a relay, see picture below.

Bosch P/N 0–332–204–150
12 V, 30 A. SPDT



All installations should take into account any special requirements of the customer. However, should the customer require an installation that is illegal or unsafe these facts must be pointed out to the customer and a policy of non–compliance adopted.

Testing

Once installed, the equipment should be tested to ensure that it is operating satisfactorily and that the position of the units does not impair on the driver's ability to control and operate the vehicle in any way.

Use the phone to make a call when the vehicle is parked with the engine running. During the call, switch off the engine. Ensure that the phone is operational with the engine running and with the engine switched off. For operating information refer to the User's Guide supplied with the phone.

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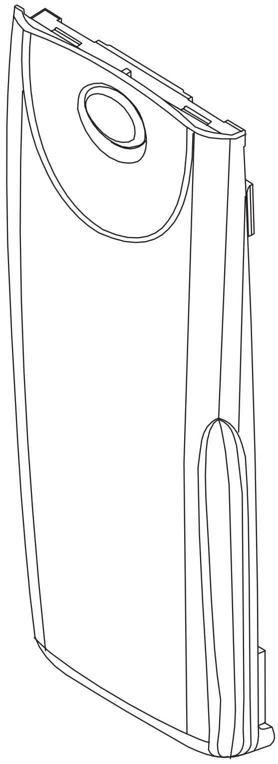
Non Serviceable Accessories

CONTENTS

Slim Battery BLS–2

The BLS–2 is a Li–ion light battery with 900 mAh capacity.

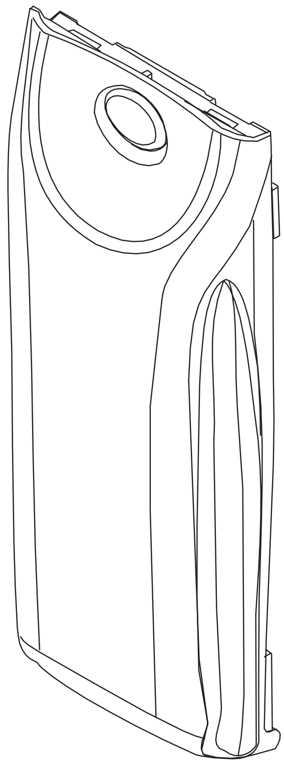


Product Code

Battery pack BLS–2: *0670206*

Standard Battery BMS–2

The BMS–2 is a NiMH battery with 900 mAh capacity.

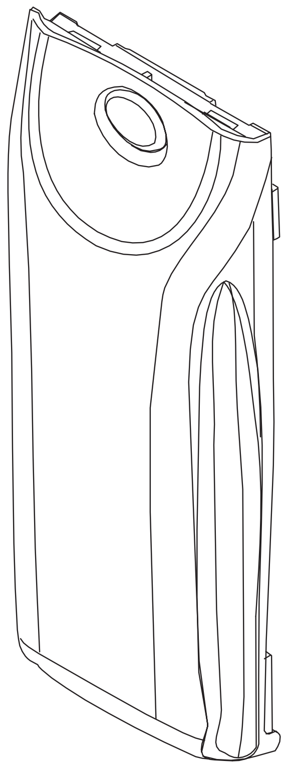


Product Code

Battery pack BMS–2: *0670203*

Battery BMS–2S

The BMS–2S is a NiMH battery with 900 mAh capacity. Slimmer than BMS–2.

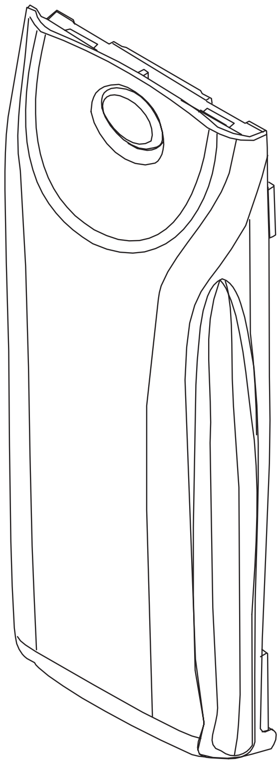


Product Code

Battery pack BMS–2S: *0670225*

Vibrator Battery BMS–2V

The BMS–2V is a NiMH battery with 900 mAh capacity and vibrator.

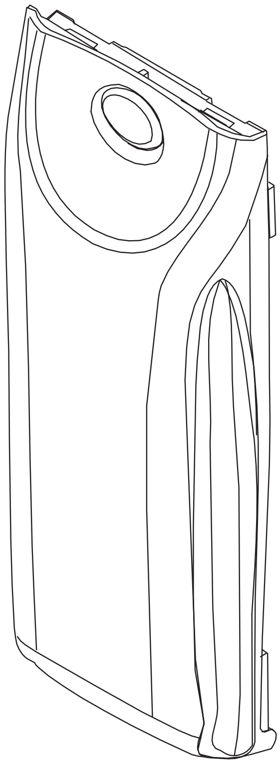


Product Code

Battery pack BMS–2V: *0670204*

Extended Battery BLS–4

The BLS–4 is a Li–ion battery with 1500 mAh capacity.

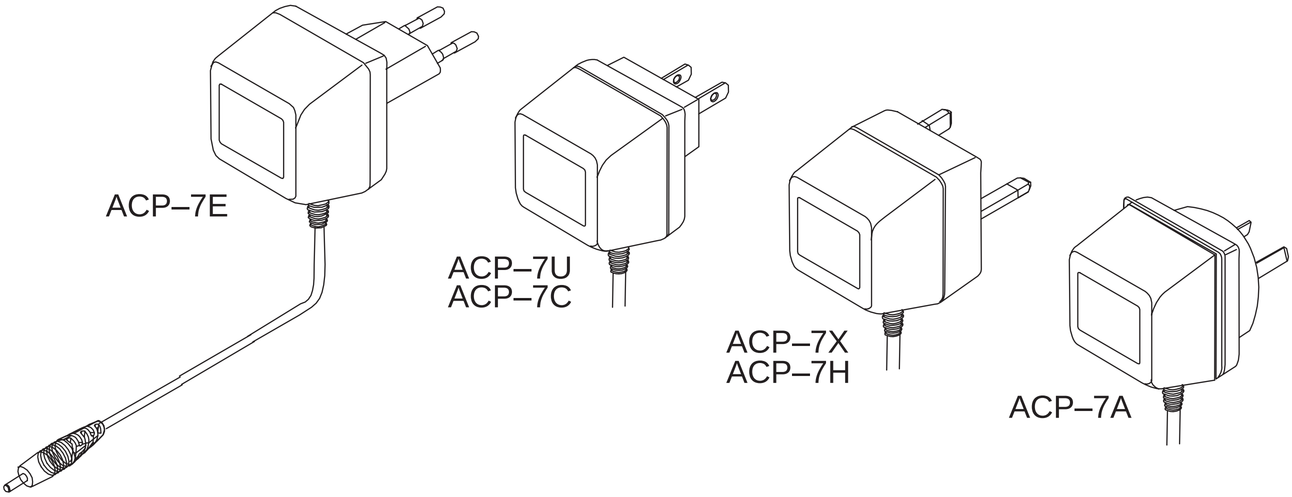


Product Code

Battery pack BLS–4: *0670207*

AC Travel Charger ACP–7

The standard charger is available for different voltage levels and comes with different wall plugs. The standard charger can also be used as a power supply for the desktop stand.



S0001160

Product Codes

AC Travel Charger (Euro plug) 207–253 Vac	ACP–7E	0675144
AC Travel Charger (US plug) 108–132 Vac	ACP–7U	0675143
AC Travel Charger (US plug) 198–242 Vac	ACP–7C	0675158
AC Travel Charger (UK plug) 207–253 Vac	ACP–7X	0675145
AC Travel Charger (UK plug) 180–220 Vac	ACP–7H	0675146
AC Travel Charger (Australia) 216–264 Vac	ACP–7A	0675148

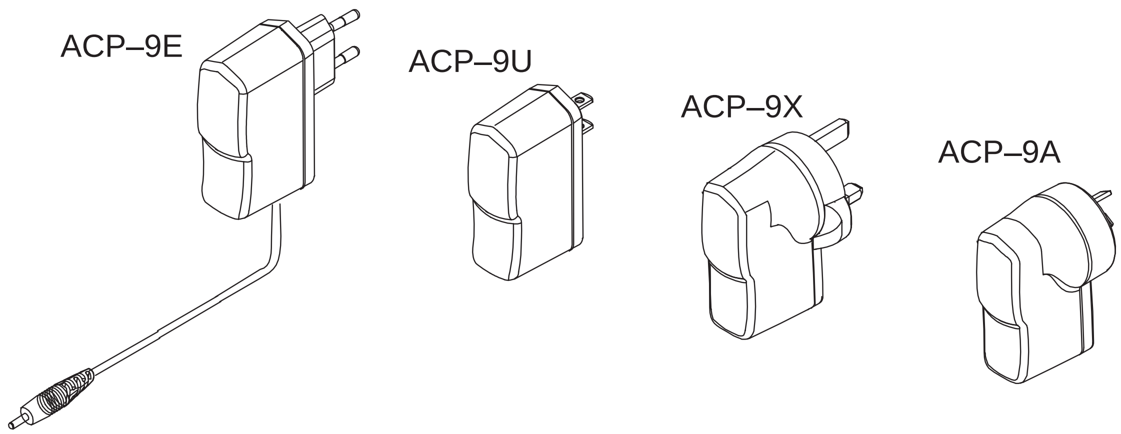
Specification

Output connectors:	*3.5 mm DC plug, 2–pole*
Protection:	PTC protection
Output Voltage /Current (typ)	7.6 V / 370 mA

Fast Travel Charger ACP–9

Operating within the voltage range 90 V...264 V AC (50 Hz...60 Hz), the Fast Travel Charger is practically current independent in normal office and household use. Like the standard charger, it is compatible with all battery options and is available for different wall sockets.

The Fast Travel Charger can also be used with desktop stand.



Product Codes

Fast Travel Charger (Euro plug) 90–264 Vac	ACP–9E	0675149
Fast Travel Charger (US plug) 90–264 Vac	ACP–9U	0675151
Fast Travel Charger (UK plug) 90–264 Vac	ACP–9X	0675150
Fast Travel Charger (Australia) 90–264 Vac	ACP–9A	0675152
Output cable PCC–1 (supplied with ACP–9):		*0730076*

Specification

Output connectors: *3.5 mm DC plug, 3–pole (+, –, control)*

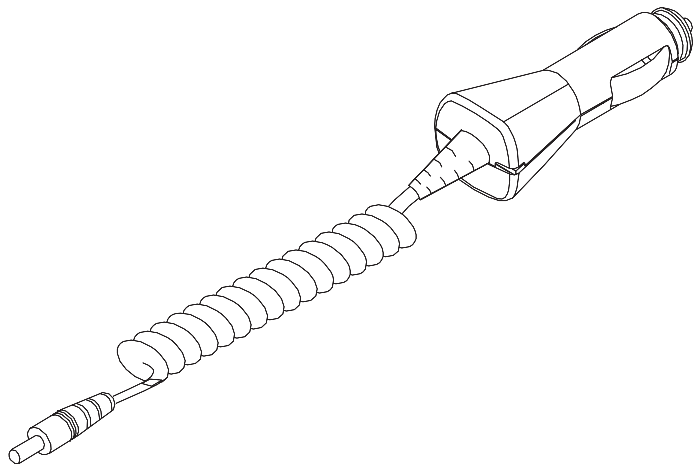
Protection: *output current limiting, max. 850 mA*
output voltage limiting, max. 9.3 V (unloaded)

Output voltage/current (typ): *8.4 V / 800 mA*

Cigarette Lighter Charger LCH–9

A green light indicates that the cigarette lighter charger is ready for charging. Check the charging status on the phone display. The input voltage can be from 11 or 32 V d.c., negative grounding.

Universal mobile charger can be used with all car accessories provided for your phone except MCC–1.



Product Code

Universal mobile charger LCH–9:	*0675120*

Specification

Connectors
- input: *D 21/23 mm*
- output: *3.5 mm DC plug*

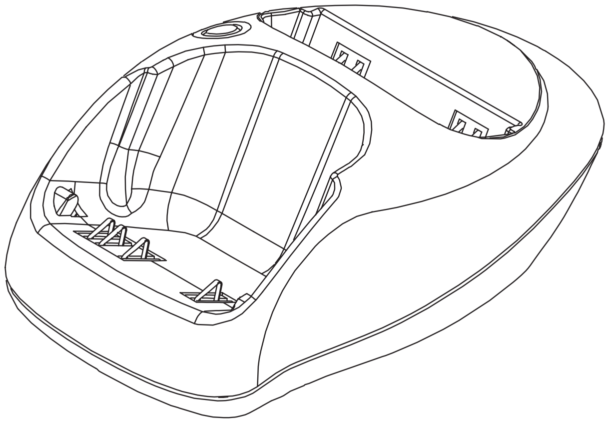
Protection: *input fused, output current limit 850 mA*

Voltage
- input: *11...32 V*
- output (nominal): *8.4 V*

Nominal output current: *800 mA*

Desktop Stand DCH–9

The desktop stand provides mounting place for both the phone and a spare battery.



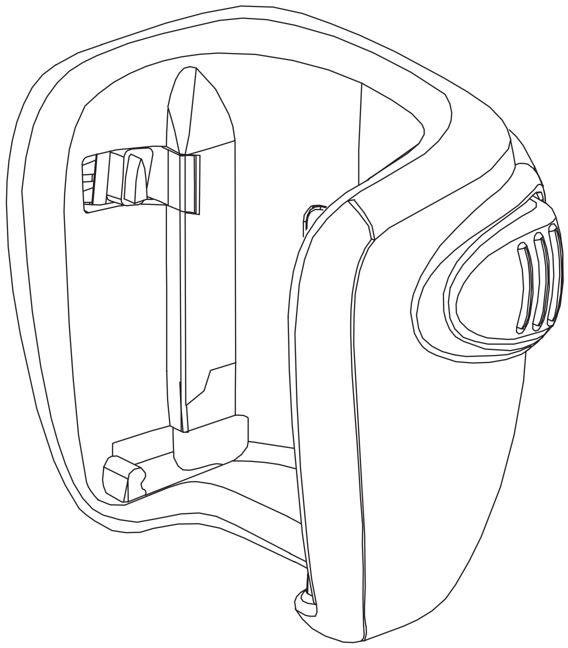
Product Code

Desktop stand DCH–9:	*0675174* *0700049*

Specification

Connections:	*3.5 mm DC jack*
Charge control:	MCU control for spare battery charging
Operation input voltage:	*9...16 V*

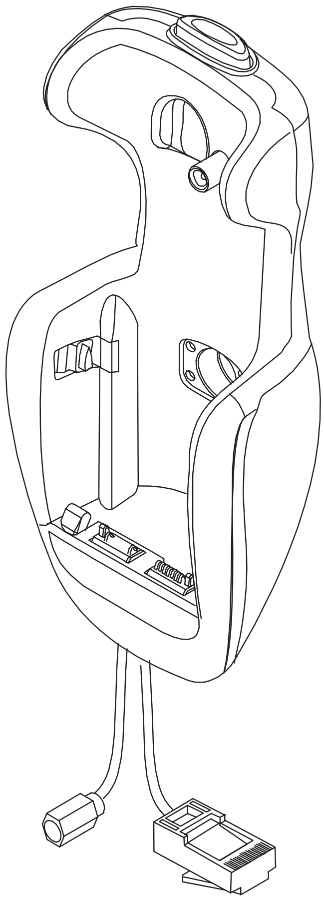
Mobile Holder MBC–1



Product Code

Mobile holder MBC–1: *0700060*

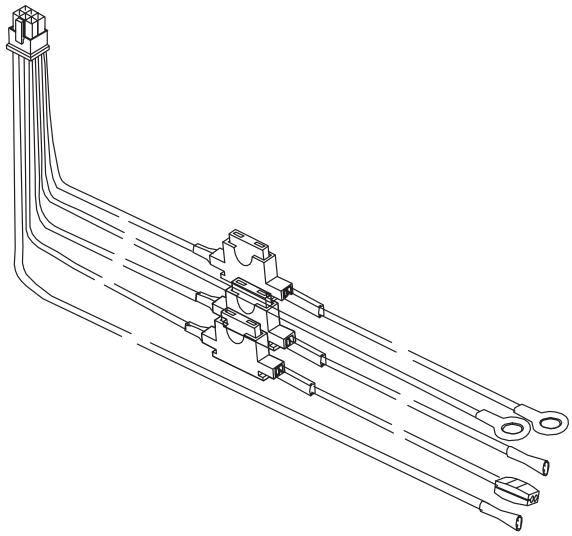
Mobile Holder MCC–1



Product Code

Mobile holder MCC–1: *0620043*

Power Cable PCH–4J

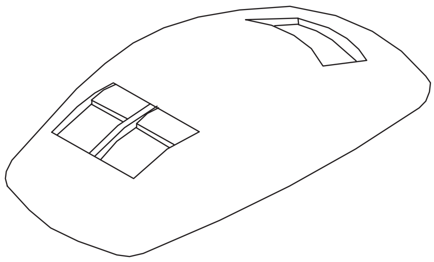


Product Code

Power cable PCH–4J:	*0730055*

Handsfree Microphone HFM–8

The HFM–8 microphone forms part of advanced handsfree unit.

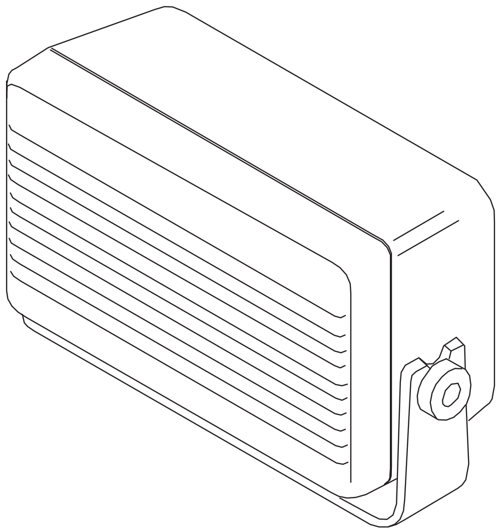


Product Code

Handsfree microphone HFM–8: *0690016*

Handsfree Speaker HFS–12

The HFS–12 speaker forms part of advanced handsfree unit.

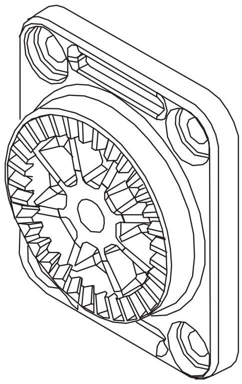


Product Code

Handsfree Speaker HFS–12: *0692008*

Mounting Plate MKU–1

The MKU–1 mounting plate provides a method of fixing the phone holder, the basic handsfree unit or the handset to the vehicle interior.

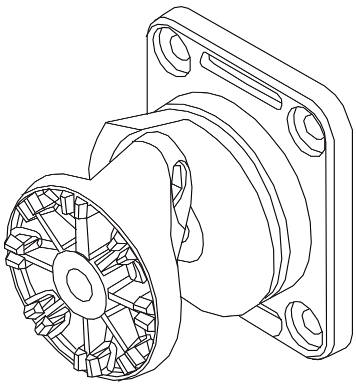


Product Code

Mounting plate MKU–1: *0620036*

Swivel Mount HHS–9

The HHS–9 swivel mounting plate provides an alternative (to MKU–1) method of locating the phone holder, the handsfree unit ,or the handset.

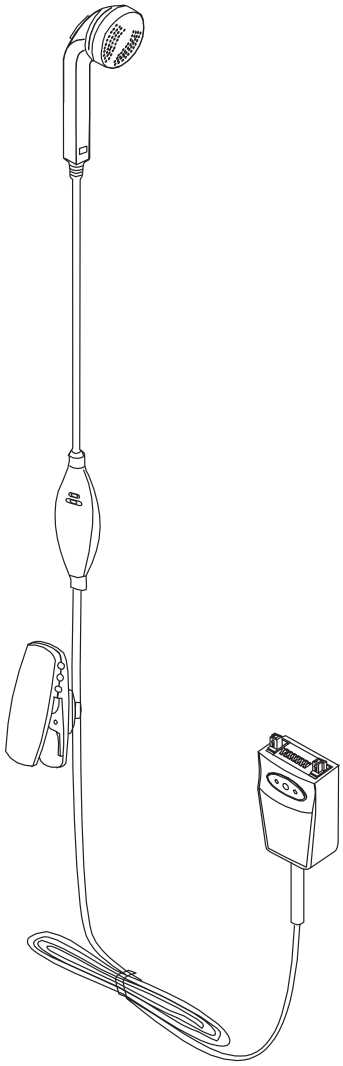


Product Code

Swivel mounting plate HHS–9: *0620037*

Headset HDC–9

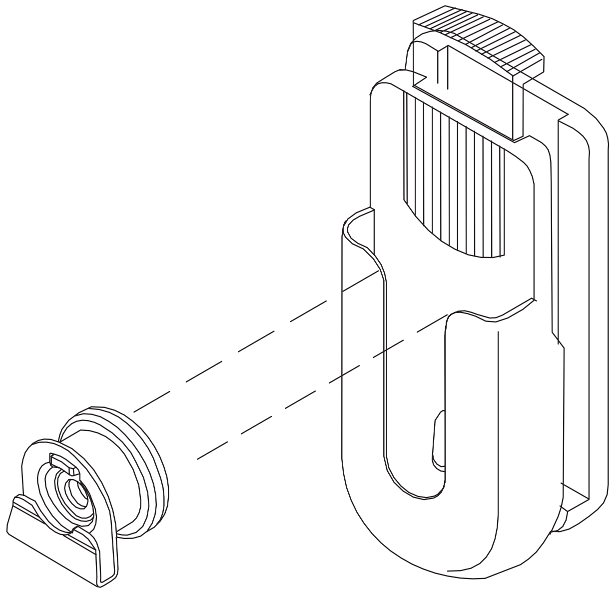
The HDC–9 headset provides a also hook switch for the phone/microphone.



Product Code

Headset HDC–9: *0694053*

Belt Clip BCH–12

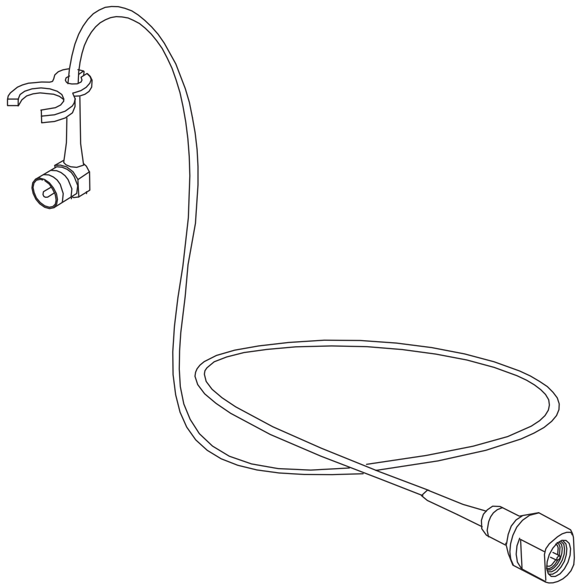


Product Code

Belt Clip BCH–12: *0720098*

External Antenna Cable XRC–1

The External Antenna Cable is used to connect the phone to an external antenna.

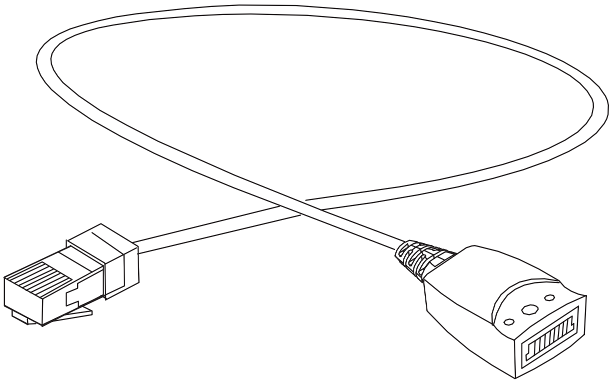


Product Code

External Antennacable XRC–1: *0730103*

Data Adapter Cable DAC–2

The Data Adapter Cable is used with the Advanced Car kit.



Product Code

Data Adapter Cable DAC–2: *0720100*

Service Tools

CONTENTS

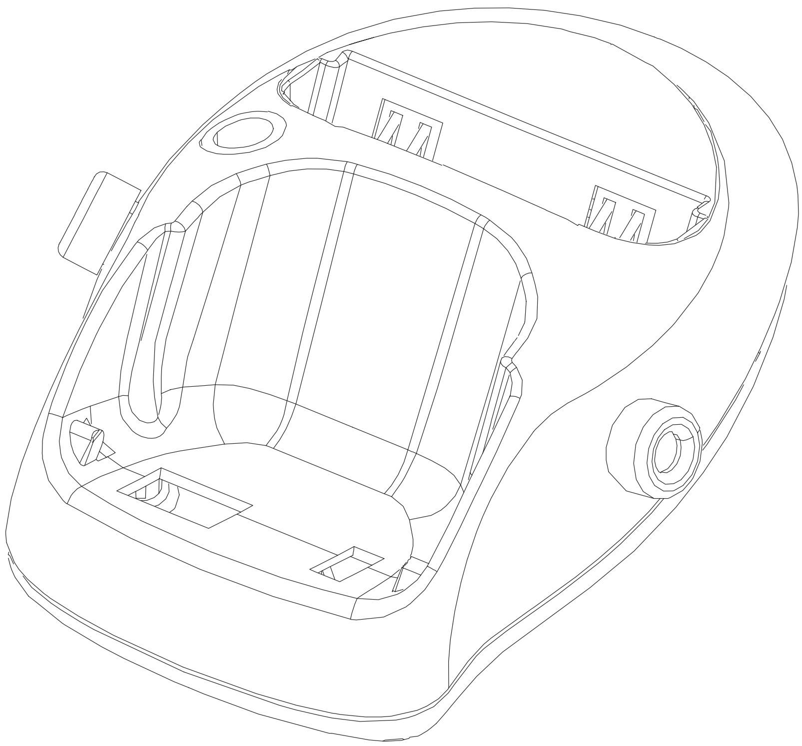
Battery Adapter BDC–3

The Battery Adapter BDC–3 is used along with an external battery capacity meter to check battery capacity.
Note that Li–ion batteries have an internal protection circuit to prevent deep discharge.

Product Code

Battery Adapter BDC–3: 0770083

View of BDC–3



Service Battery BBD–3

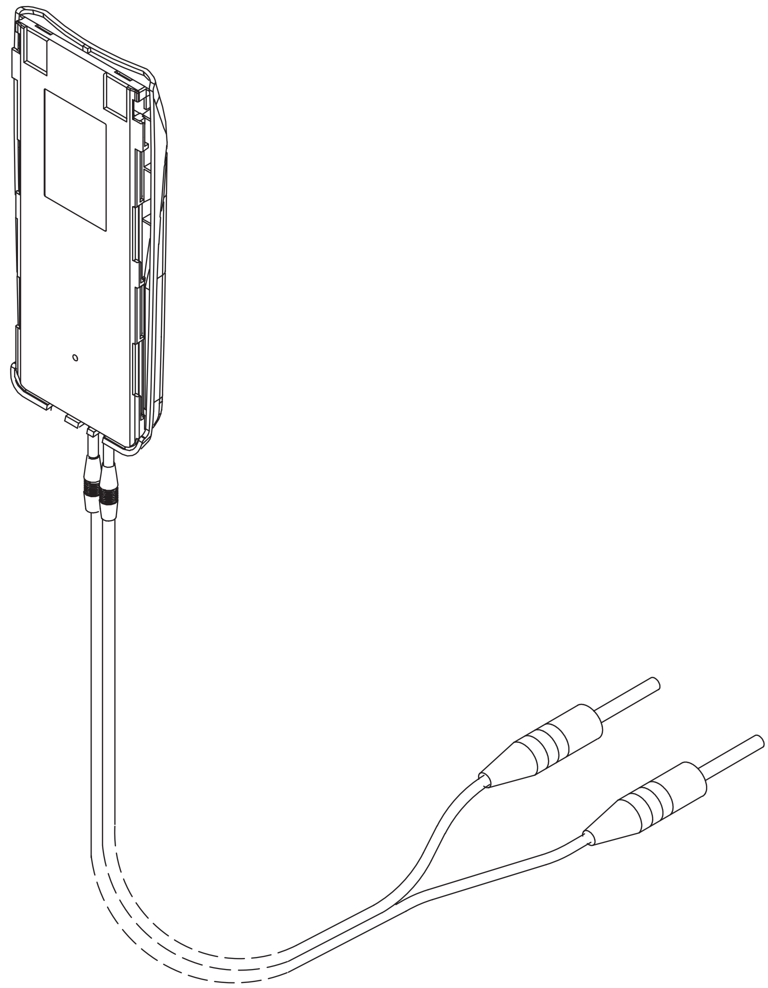
The Service Battery BBD–3 is used in place of the phone’s normal battery during service, to supply a controlled operating voltage to the phone for current and charger calibration, and is also required when flashing the phone.

Note that the cable SCB–3 (0730114) is also required for charger calibration.

Product Code

Service Battery BBD–3: 0775071

View of BBD–3



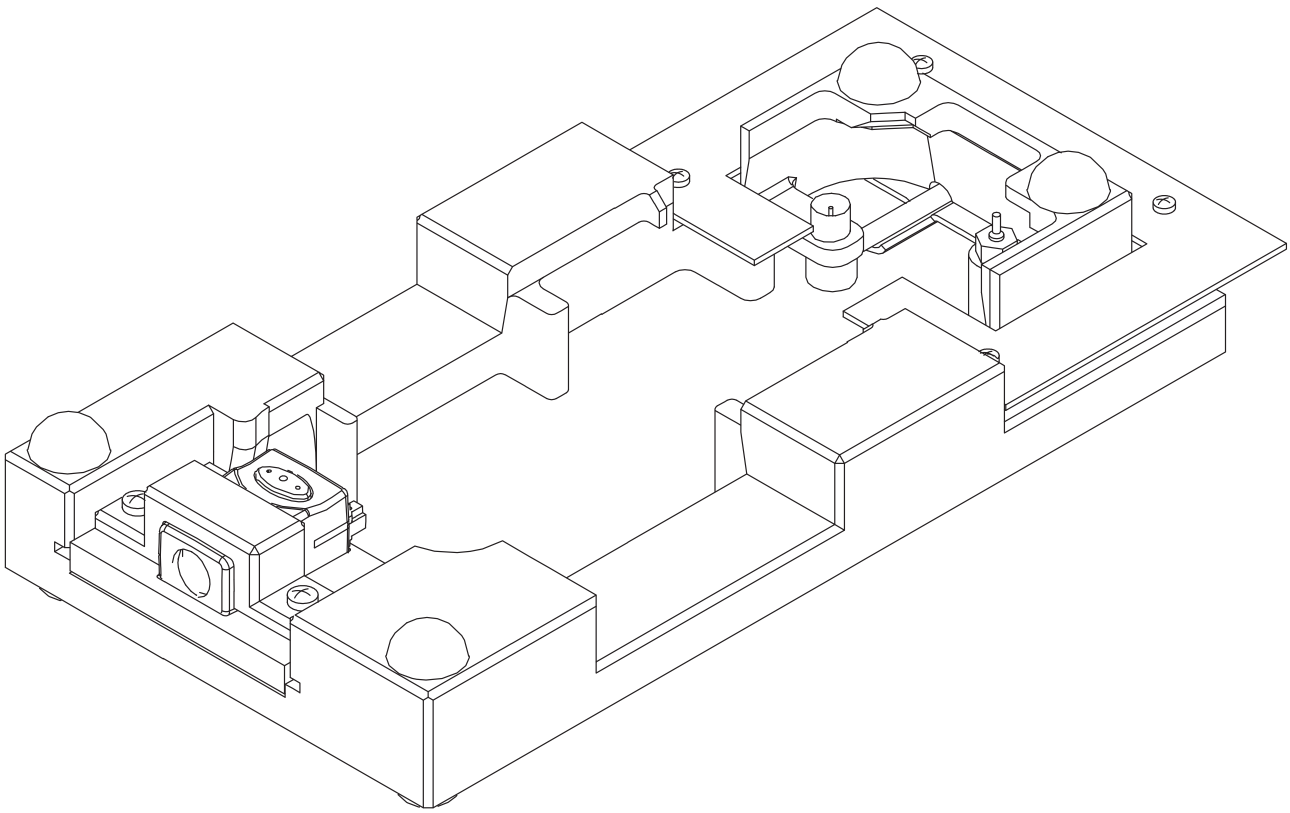
Light Module Jig JBT–1

The Light Module Jig JBT–1 is used for component level repair of the system/RF module. *

Product Code

Light Module Jig JBT–1: 0770109

View of JBT–1



*) Connect the External antenna cable XRC–1B, service Cable SCH–5, and the DC Cable PCS–1 to the JBT–1 jig.
The service cable SCH–5 can be replaced by the DAU–9P cable.

Note: The nominal supply voltage for JBT–1 is +3.6 V.
The supply voltage must not exceed +4.0 V.

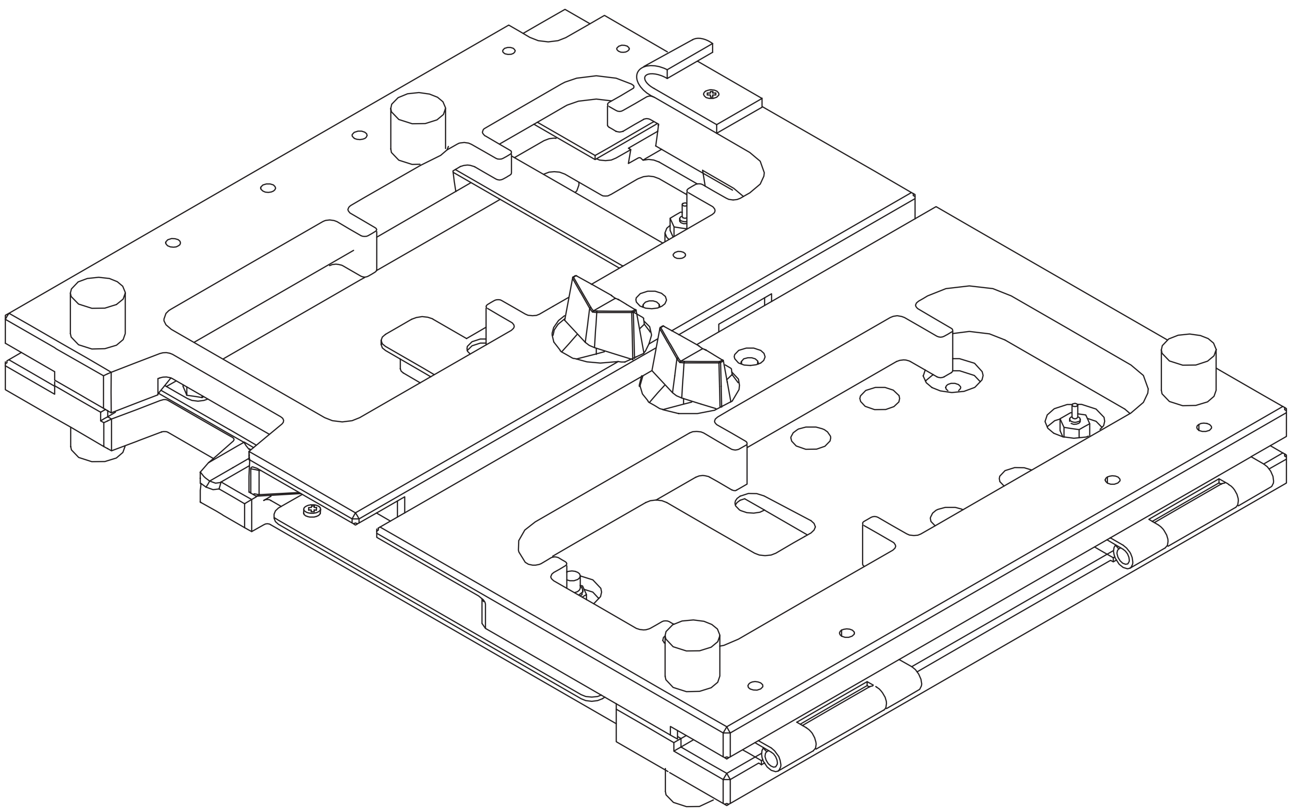
Module Jig JBS–19

The Module Jig JBS–19 is used for repair of both system/RF and UIF modules. *****

Product Code

Light Module Jig JBS–19: 0770098

View of JBS–19



*****) Connect the External antenna cable XRC–1B, service Cable SCH–5, and the DC Cable PCS–1 to the JBS–19 jig.
The service cable SCH–5 can be replaced by the DAU–9P cable.

Note: The nominal supply voltage for JBS–19 is +3.6 V.
The supply voltage must not exceed +4.0 V.

Flash Loading Adapter FLA–5 (Sales Pack)

The Flash Loading Adapter FLA–5 is used with the Service Battery BBD–3 and Service Cable SCH–5. Power is supplied to FLA–5 from the Flash Security Box TDF–4 via the DC cable PCC–1, (The PCC–1 cable can be replaced with a Travel Charger ACH–6), and is connected to the Flash Prommer FPS–4S with the cable AXS–5.

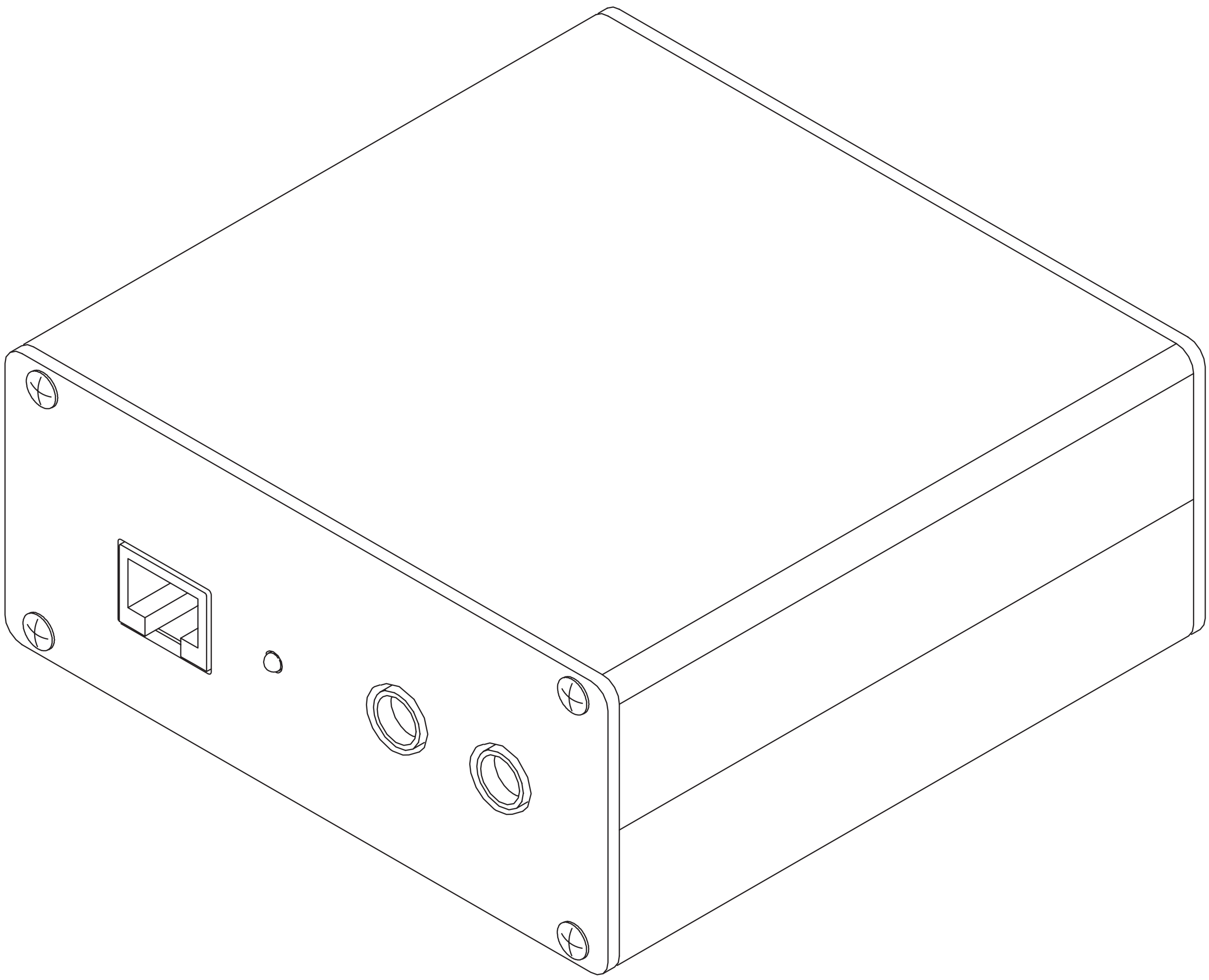
The sales pack includes:

– Flash Loader Adapter FLA–5	0770085
– Service cable SCH–5	0730098
– D15 – D15 Cable AXS–5	0730091
– Installation software for FPS–4	8400041

Sales package code

Flash Loading Adapter FLA–5: 0080178

View of FLA–5



Flash Prommer FPS–4S (Sales Pack)

The Flash Prommer FPS–4S is used to update the main software of the phone. Updating is done by first loading the new MCU software from the PC to the flash prommer, and then loading the new SW from the prommer to the phone. When updating more than one phone in succession, the MCU software only needs to be loaded to the prommer once.

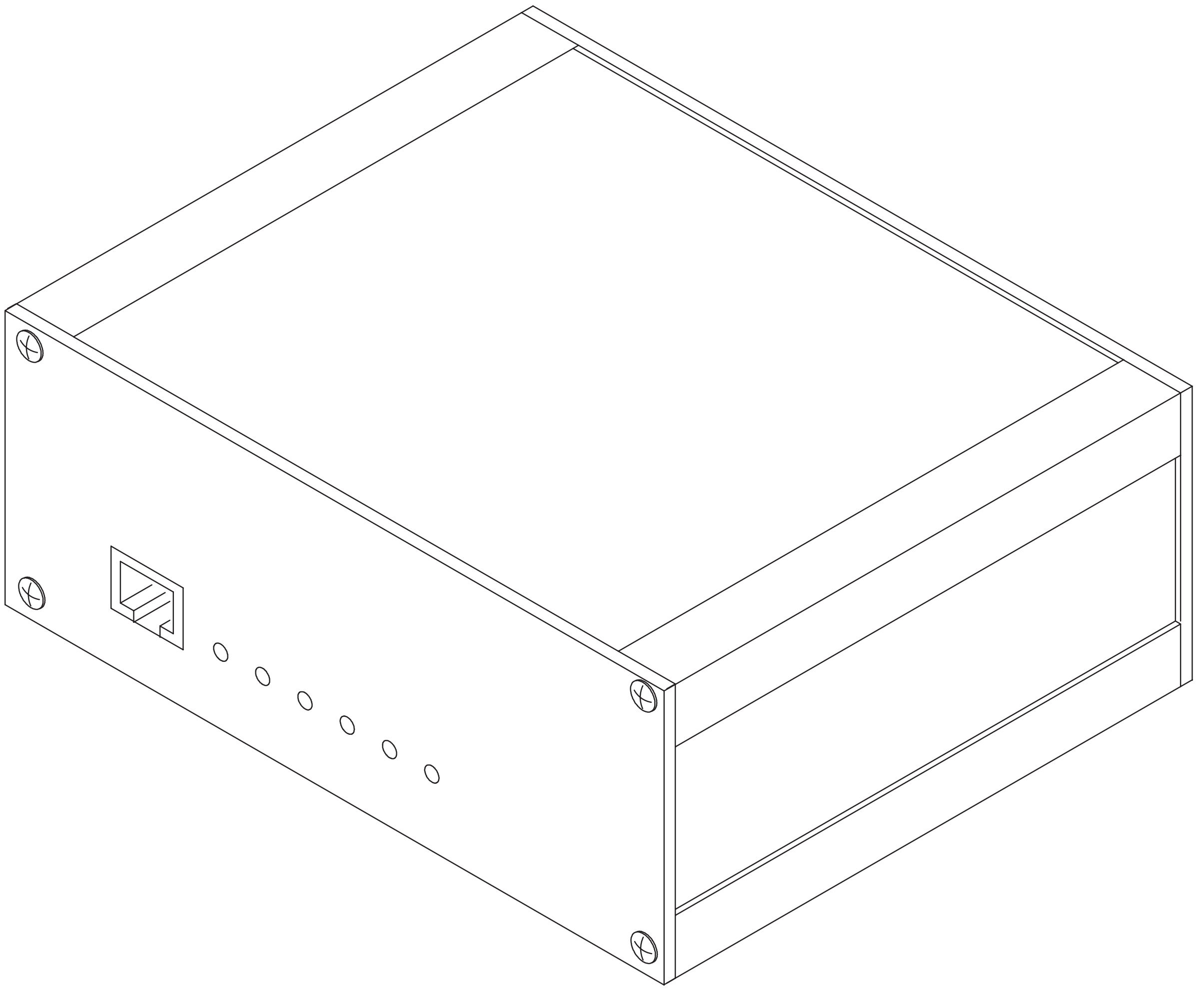
The sales pack includes:

– Flash Prommer FPS–4	0750090
– Charger ACL–3E	0680015
– Printer cable	0730029
– D9 – D9 Cable AXS–4	0730090
– Installation software for FPS–4	8400041

Sales package code

Flash Prommer FPS–4: 0085095

View of FPS–4



Security Box TDF–4

The Security Box TDF–4 is required for updating MCU software, and infra red testing.

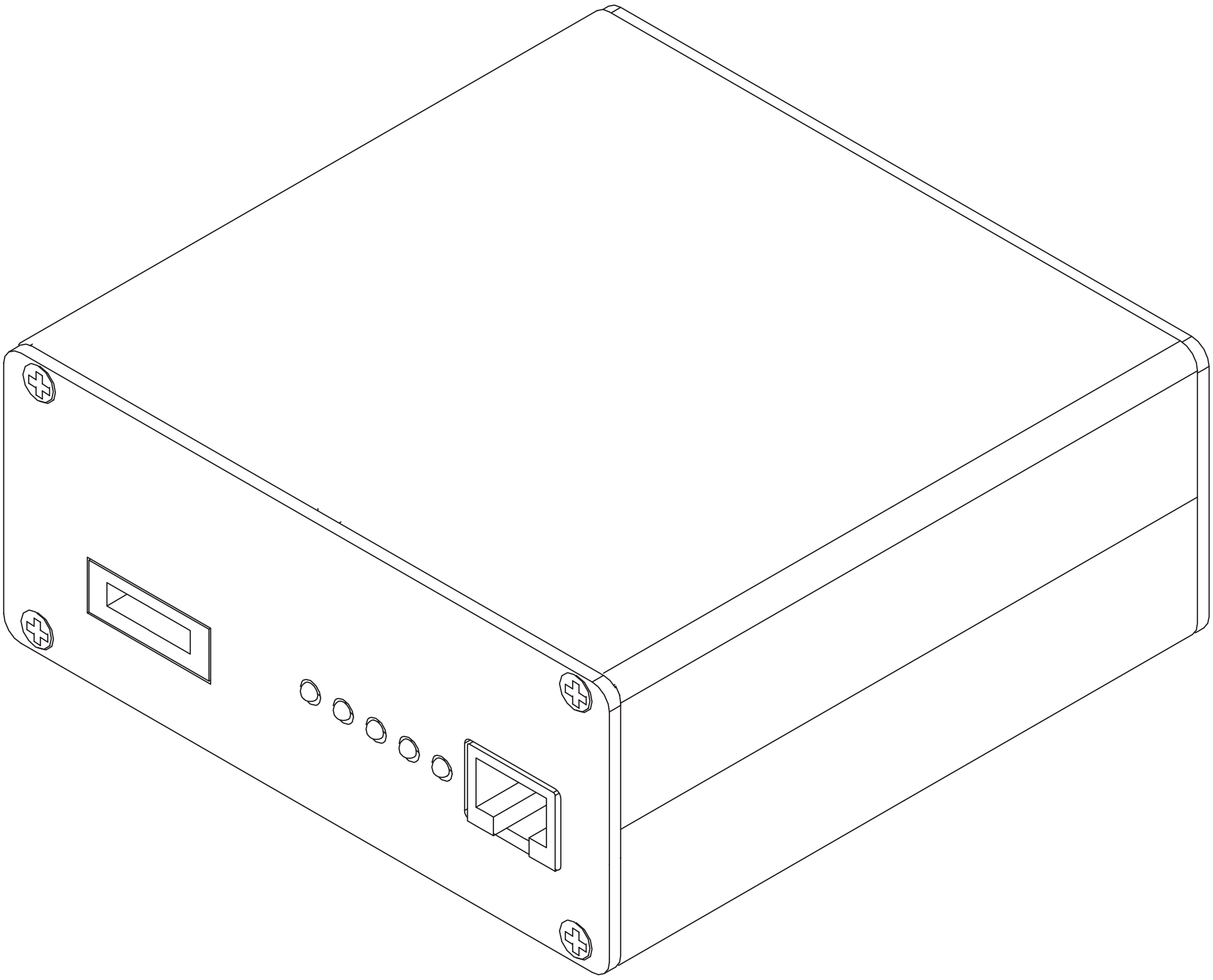
Note 1: TDF–4 is delivered in de–activated mode. Fill in the enclosed Activation Request Form, and fax to NMP Salo to get the activation code

Note 2: The infra red module JLP–1 is not included in the TDF–4 sales package

Product Code

Security Box TDF–4: 0770106

View of TDF–4



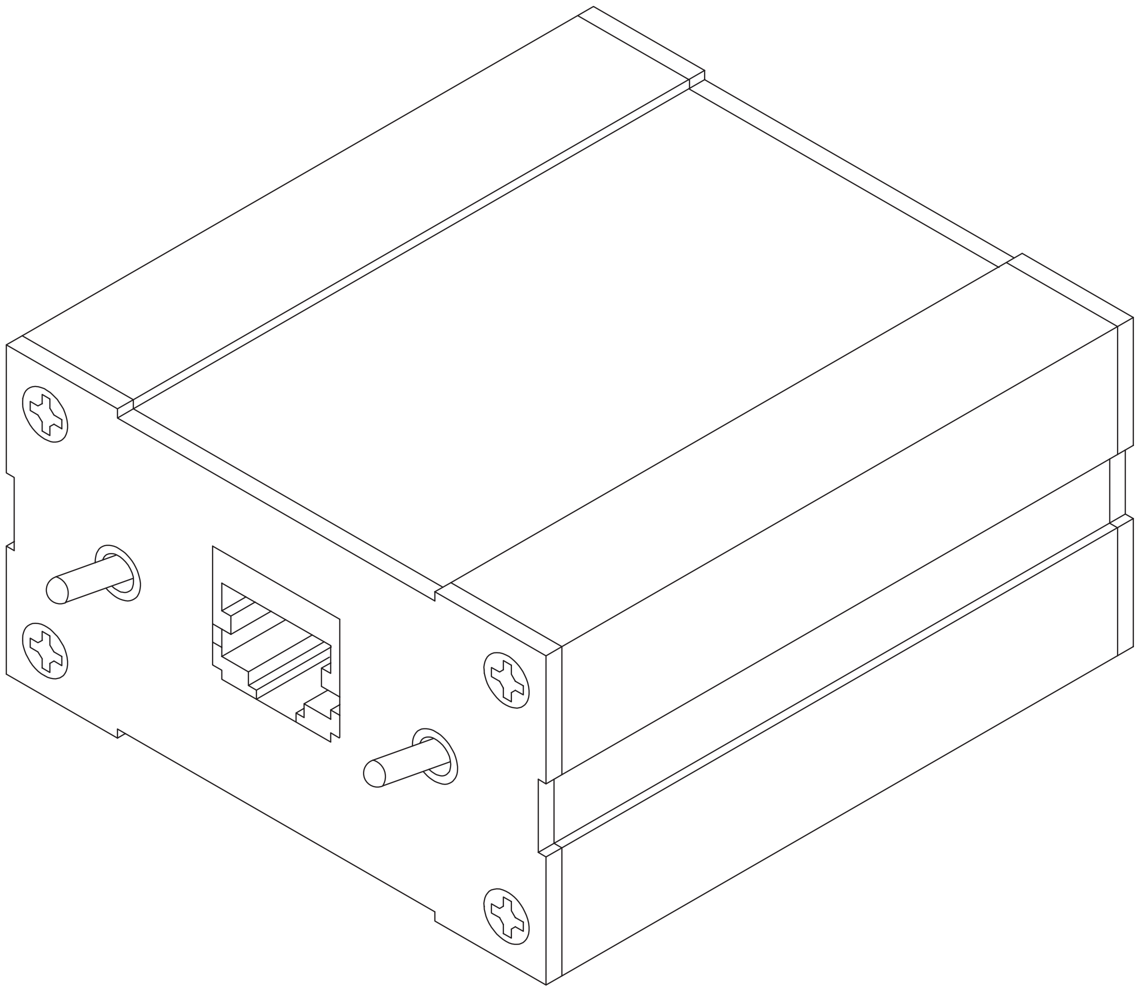
Service Audio Box JBA–4

The Service Audio Box JBA–4 is used between the Service Cable SCH–5, MBUS Cable DAU–9S, and Audio Cable ADS–1.

Product Code

Service Audio Box JBA–4: 0770094

View of JBA–4



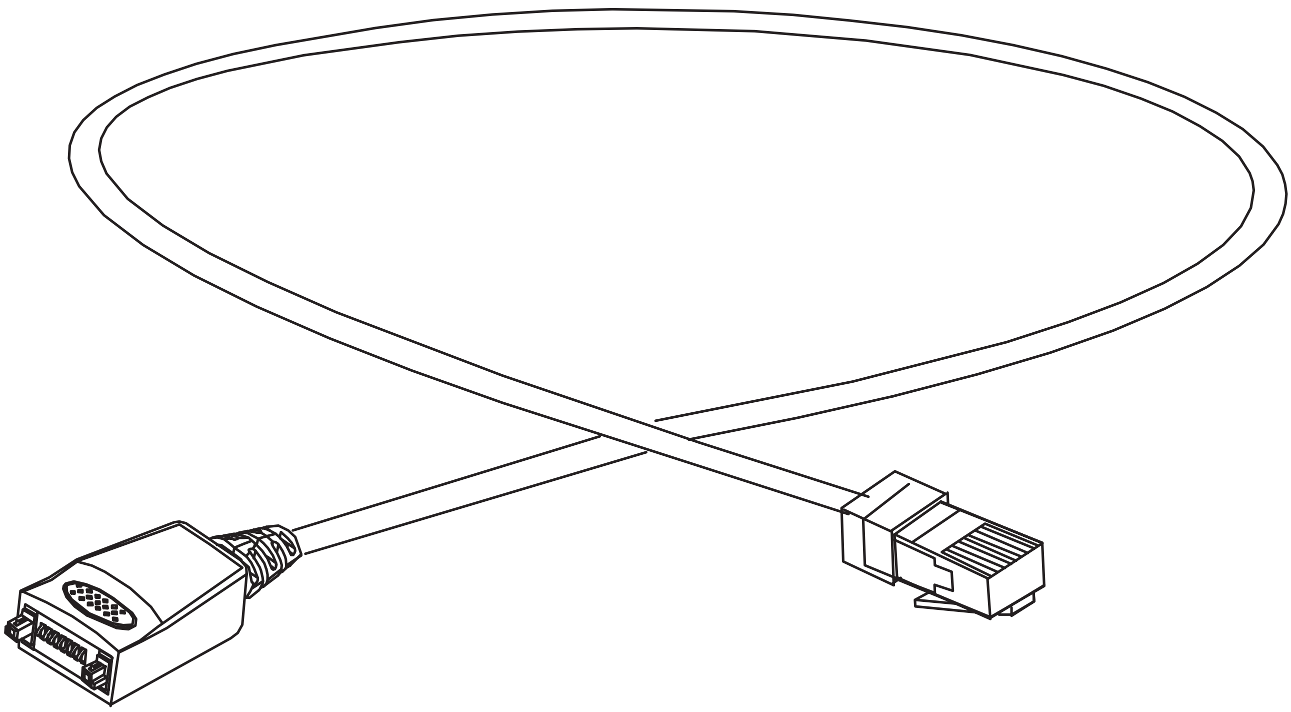
Service Cable SCH–5

The Service Cable SCH–5 is used between the phone and Service Audio Box JBA–4 (or modular T–adapter. It is also used between the phone and the Flash Loading Adapter FLA–5.

Product Code

Service Cable SCH–5: 0730098

View of SCH–5



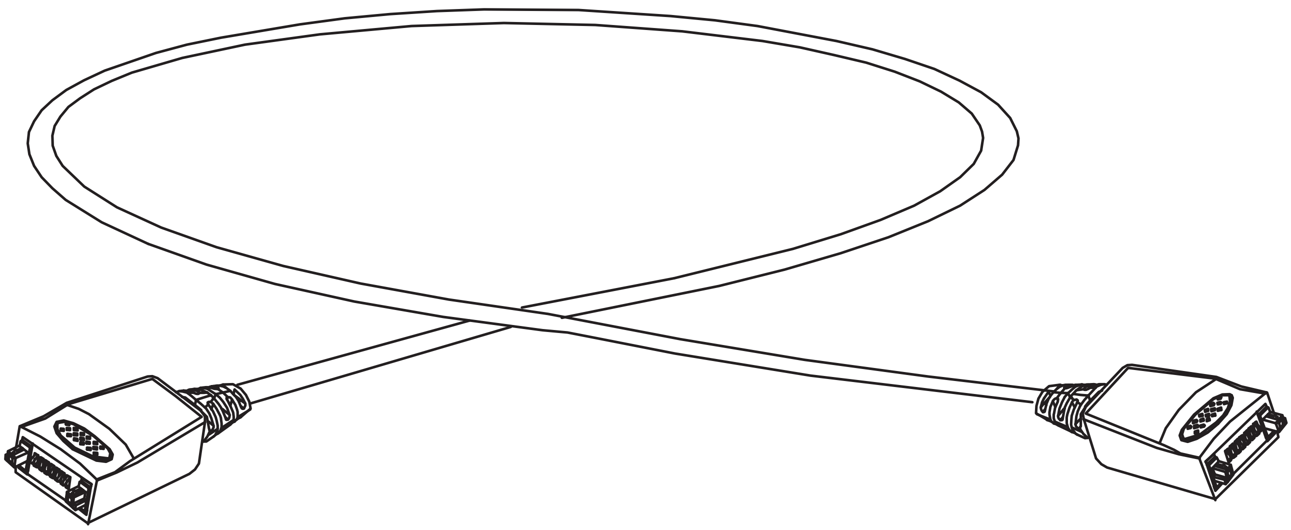
Warranty Cable SCH–6

The Warranty cable SCH–6 is used to connect two phones, and enables transfer of data (stored numbers etc.) from one phone to another.

Product Code

Warranty Cable SCH–6: 0730099

View of SCH–6



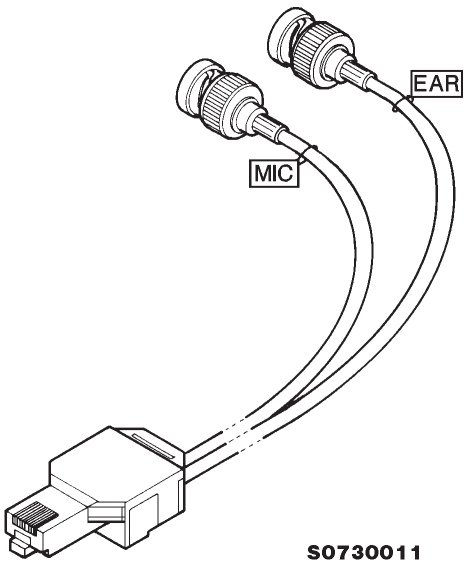
Audio Cable ADS–1

Audio cable is an adapter routing AF signals (MIC/EAR) from 8 pin modular connector to two BNC connectors. It is used to connect JBA–4, SCH–5, and DAU–9S.

Product code

Audio Cable ADS–1: 0730011

View of ADS–1



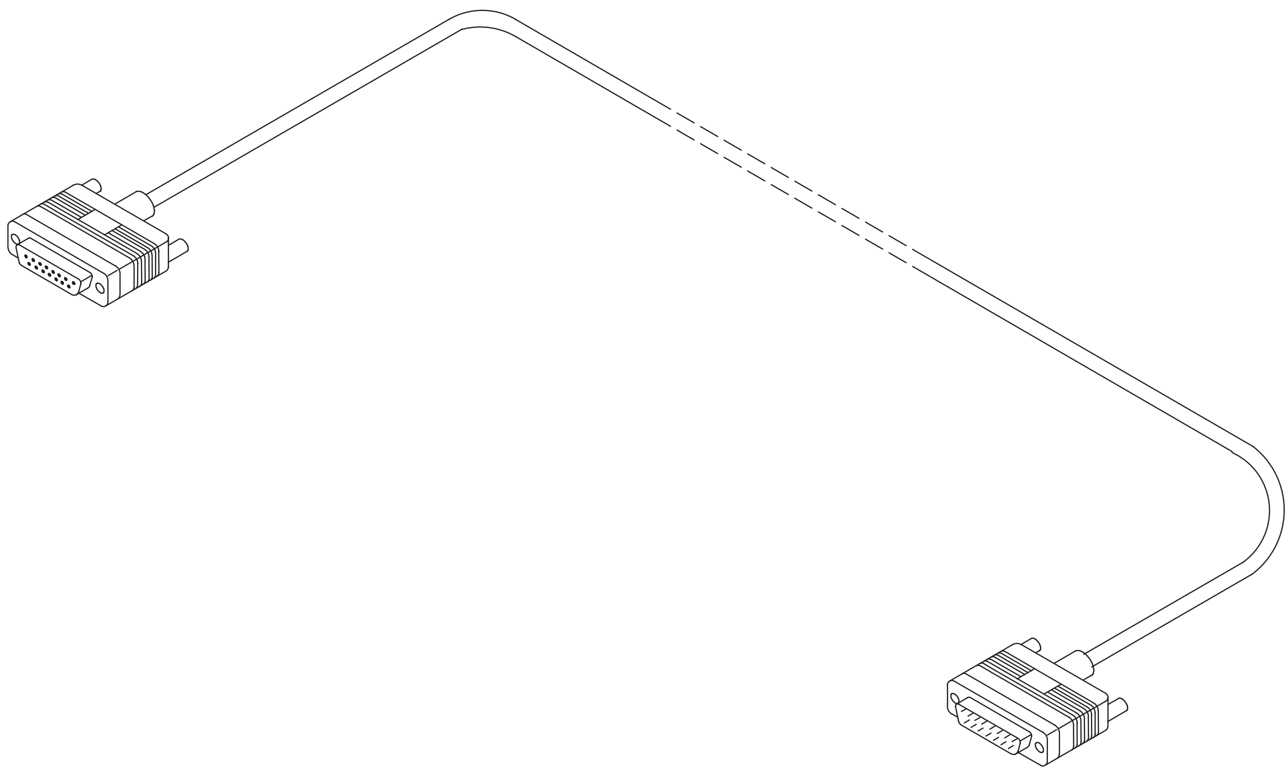
D15–D15 Cable AXS–5

The D15–D15 Cable AXS–5 is used to connect two 15 pin D connectors. e.g. between FLA–5 and FPS–4S.

Product Code

D15–D15 Cable AXS–5: 0730091

View of AXS–5



DC Charging Cable PCC–1

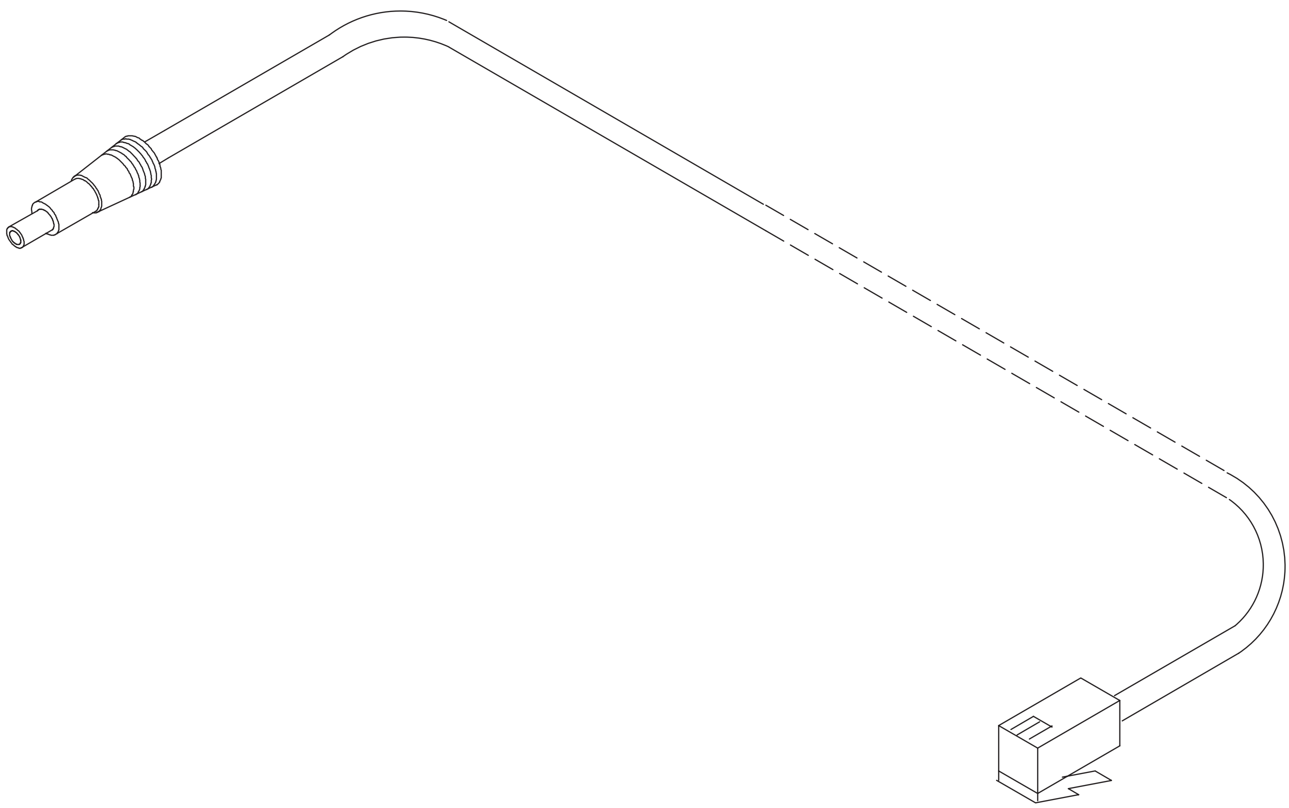
The DC Cable PCC–1 is used e.g. to connect FLA–5 and TDF–4.

Product Code

DC Cable PCC–1 (with modular RJ connector): 0730053

DC Cable PCC–1B (with banana connectors): 0770050

View of PCC–1



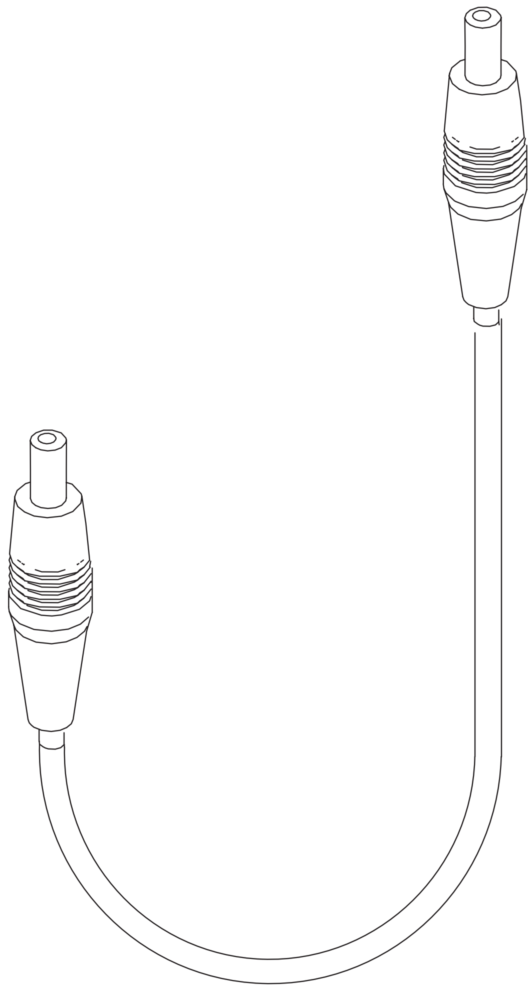
DC Cable SCB–3

The DC Cable SCB–3 is used to connect the Service Battery to the charger connection Vin of the phone when doing the charger calibration service procedure.

Product Code

DC Cable SCB–3: 0730114

View of SCB–3



External Antenna Cable XRC–1B

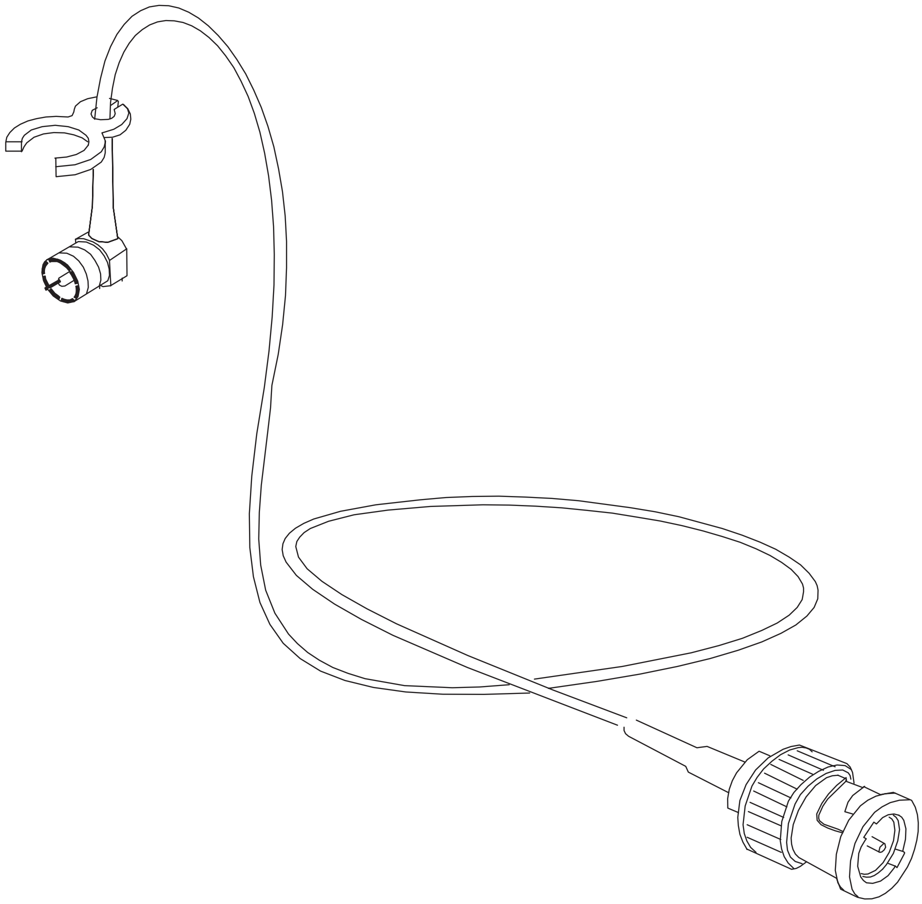
The External Antenna Cable is used to connect the transceiver to measuring equipment during servicing.

Note: Typical attenuation at 900 MHz is 0.7 dB.
Typical attenuation at 1800 MHz is 0.9 dB.

Product Code

External Antenna Cable XRC–1B: 0730128

View of XRC–1B



Light Flash FLC–5 (Sales Pack)

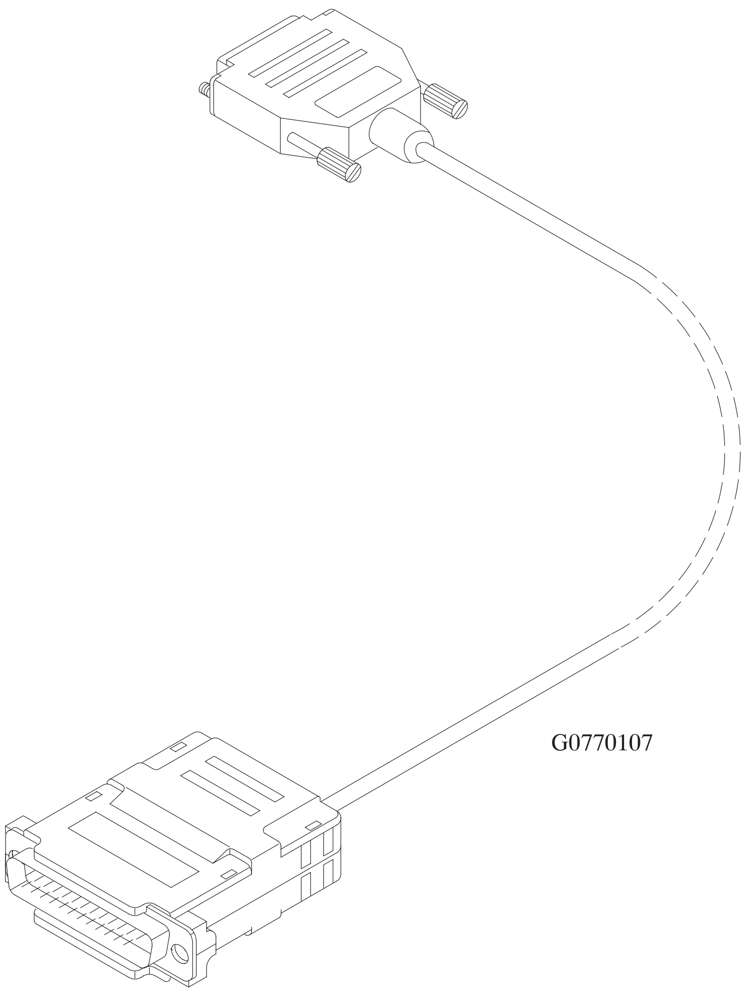
The sales pack includes:

– Light Flash Cable FLC–5	0770107
– Modular Cable XCM–1	4626131
– Light Flash PC SW	0774094

Sale package code

Light Flash FLC–5: 0081263

View of FLC–5



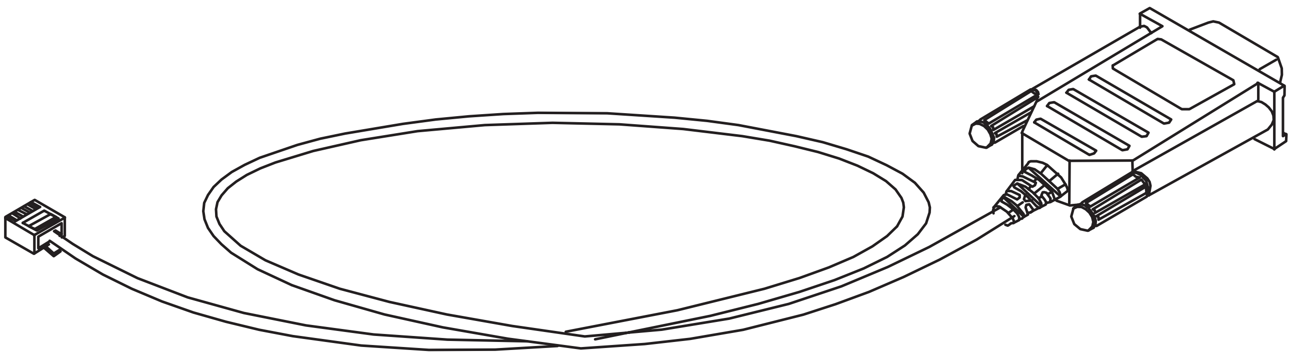
MBUS Cable DAU–9S

The MBUS Cable DAU–9S has a modular connector, and is used with the service Audio Box JBA–4, or a modular T–adapter.

Product Code

MBUS Cable DAU–9S: 0730108

View of DAU–9S



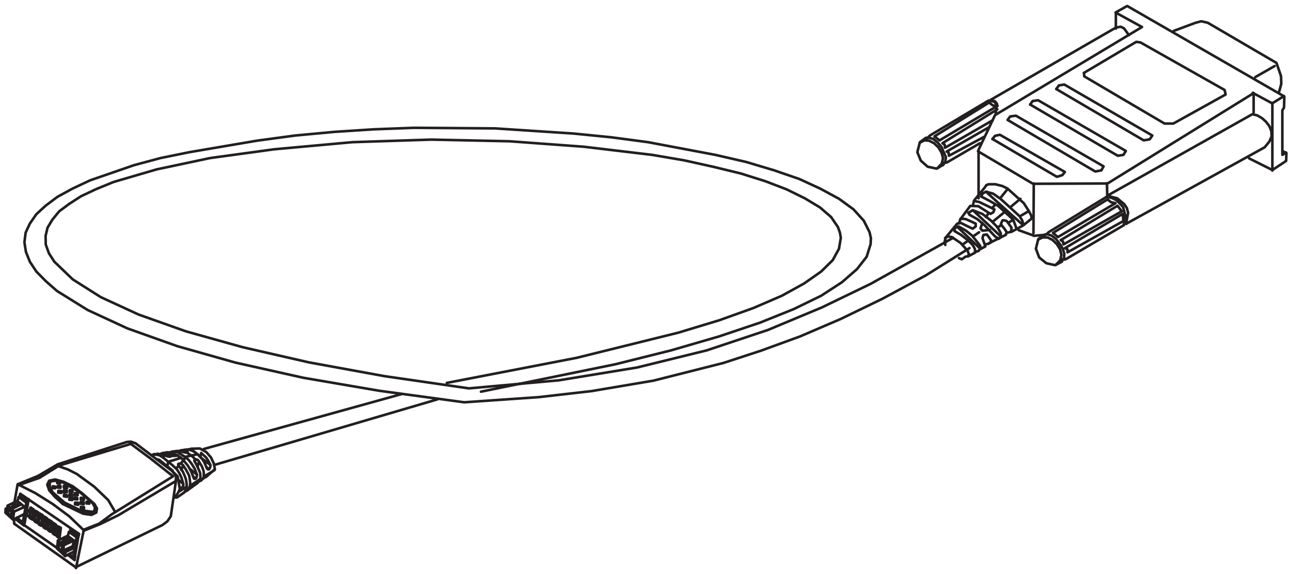
MBUS Cable DAU–9P

The MBUS Cable DAU–9P has a phone system connector, and is used between the phone and external devices.

Product Code

MBUS Cable DAU–9P: 0730109

View of DAU–9P



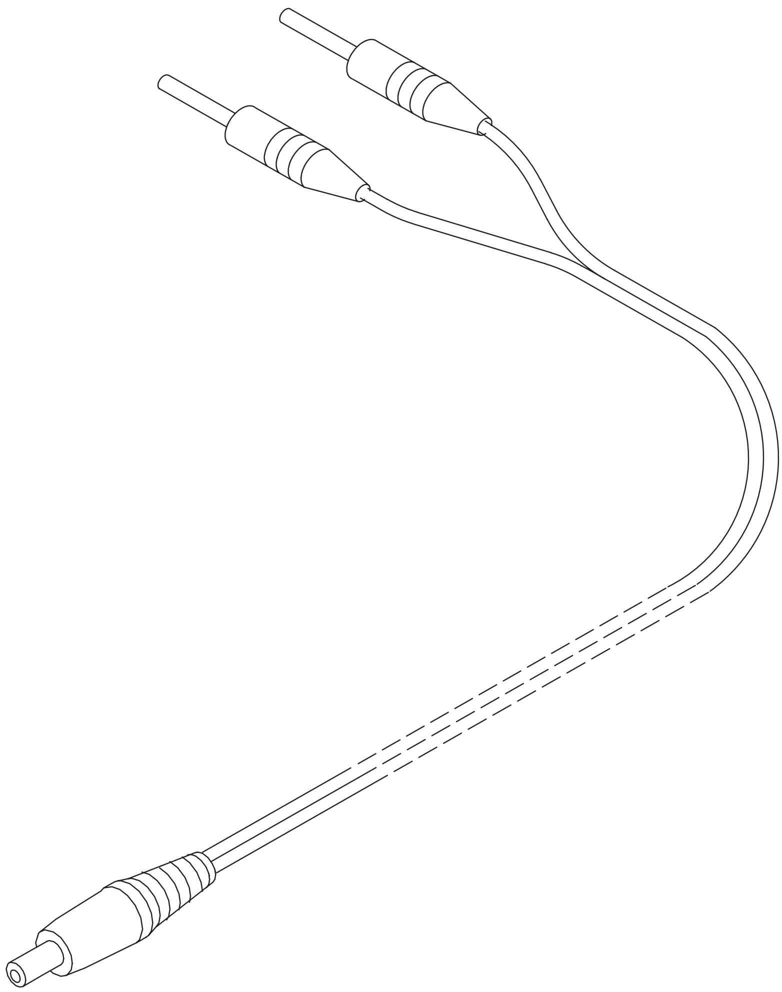
Power Cable PCS–1

The Power Cable PCS–1 is used to connect the module jigs JBT–1 and JBS–19 to an external power supply. Can be used with FPS–4 also.

Product Code

Power Cable PCS–1: 0730012

View of PCS–1



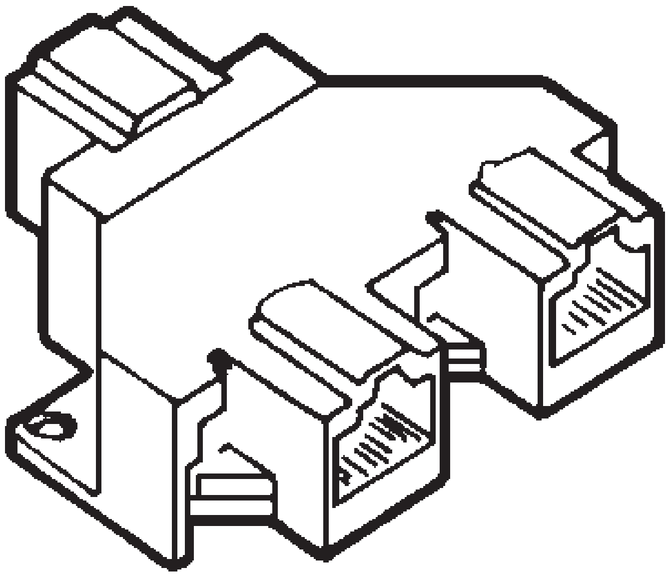
Modular T–adapter

The modular T–adapter is a suitable branching unit to provide the needed parallel modular connections.

Product Code

Modular T–adapter: 4626134

View of Modular T–adapter



SW Security Device PKD–1

SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC. Whitout the dongle present it is not possible to use the service software. Printer or any such device can be connected to the PC through the dongle if needed.

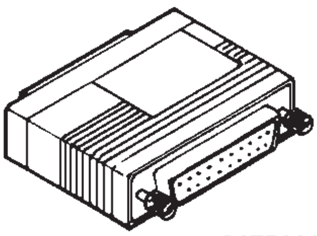
Caution: Make sure thet you have switched off the PC and the printer before making connections!

Caution: Do not connected the PKD–1 to the serial port. You may damage your PKD–1!

Product Code

SW Security Device PKD–1:   0750018

View of SW Security Device



G0750018

Service Software Instructions

CONTENTS

Service Software

General

To run the After Sales SW, a parallel port software protection device (PKD–1) has to be connected. TDF–4 box must connected to PC for flashing purposes. The user can use WinTesla functions in modules for testing NSE–1/3 mobile stations (MS). The test functions send test messages from PC to MS and receive results and show them in the PC display. The messages can be sent via M2BUS or FBUS.

Note: if this software is to be run on laptops, the power saving feature MUST be switched off.

Hardware requirements for Windows 3.1x

The recommended minimum hardware standard to run Service Software is any computer which is 386 33 MHz or greater with at least 4 MB of memory and VGA type display (640 x 480). This assumes that only the WinTesla with After Sales Support Modules is active, i.e. other Windows packages are not running in the background.

Hardware requirements for Windows 95

The recommended minimum hardware standard to run Service Software is any computer which has Pentium processor, memory 8 MB and meets HW requirements recommended by Microsoft.

Software Environment of the Support Modules

The Service Software user interface is intended for the following environments: Microsoft Windows 3.1x (enhanced mode) and Windows 95environment running in enhanced mode. Support for Microsoft NT may be added, if required. Detailed information about Windows and application usage can be found from the Microsoft Windows Version 3.1 Users Guide chapter one (Windows Basics) and chapter two (Application Basics).

As an ordinary Windows application, the main idea in the user interface is that selections are made with menus, push buttons and shortcut keys. Selections can be done by using keyboard and/or mouse. There is always a status bar displayed at the bottom of the main window which contains information about current actions.

Required Servicing Equipment

– Computer: At least IBM 80386 or compatible with one unused serial port (COM1 or COM2) *), one parallel port (LPT1), hard disk recommended
– Operating System: DOS Version 3.2 or later
– If PCLStart in use: DOS 6.22 and IBM 80486 or compatible
– Display: Any 80–character text display
– Service software version for 3.5” disk (product code: 0774080)
– Software protection key PKD–1 (product code: 0750018)
– Service MBUS Cable DAU–9P (product code: 0730109)
– Audio cable ADS–1 (product code: 0730011)
– External Antenna Cable XRC–1B (product code 0730128)
– Modular T–adapter (product code: 4626134)

*) Note: A number of PC’s of an older generation use the Intel, National Semiconductor, or United Microelectronics IC 8250 as the serial port UART. This is a comparatively inefficient circuit for current purposes and does not necessarily support the M2BUS adapter at 9600 baud. The newer UART’s NS16450 and NS16550AF of National Semiconductor offer solutions for these problems.

Installation

Mechanical Connections

Caution: Make sure that you have switched off the PC and the printer before making connections.

Caution: Do not connect the PKD–1 key to the serial port. You may damage your PKD–1 !

The software controls the phone via a separate adapter connected to the serial port of the PC, and to the telephone's M2BUS (DAU–9P).

Attach the dongle PKD–1 to the parallel port 1 (25–pin female D–connector) of the PC. When connecting PKD–1 to the parallel port, be sure that you insert the computer side of the PKD–1 to the PC (male side). If you use a printer on parallel port 1, install the PKD–1 between the PC and your printer cable.

The PKD–1 should not affect devices working with it. If some errors occur (errors in printing are possible) please try printing without the PKD–1. If printing is OK without the PKD–1 please contact your dealer. We will offer you a new PKD–1 in exchange for your old one.

Installing the Software on PC Hard Disk

The program is delivered on a diskette and is copy protected with a dongle PKD–1. It must be present in parallel port when using Service software.

The program can also be installed on the hard disk, which is recommendable to obtain a maximum data access rate.

Keep the original diskette safe to enable upgrading of the program !

If you plan to use PCL Start service software, you must install it before installing Service software, see PCL Start installation instructions.

To install the new Service software program, follow the steps below:

1.	insert the new Service software diskette	
	into drive A: of your computer	
2.	start Windows, and open File Manager	
	log into drive a:	*type* **A:** *and press <Enter>*
3.	start INSTALL.EXE and	*type* ***C:*** *and press <Enter>*
	install Service software to drive C:	

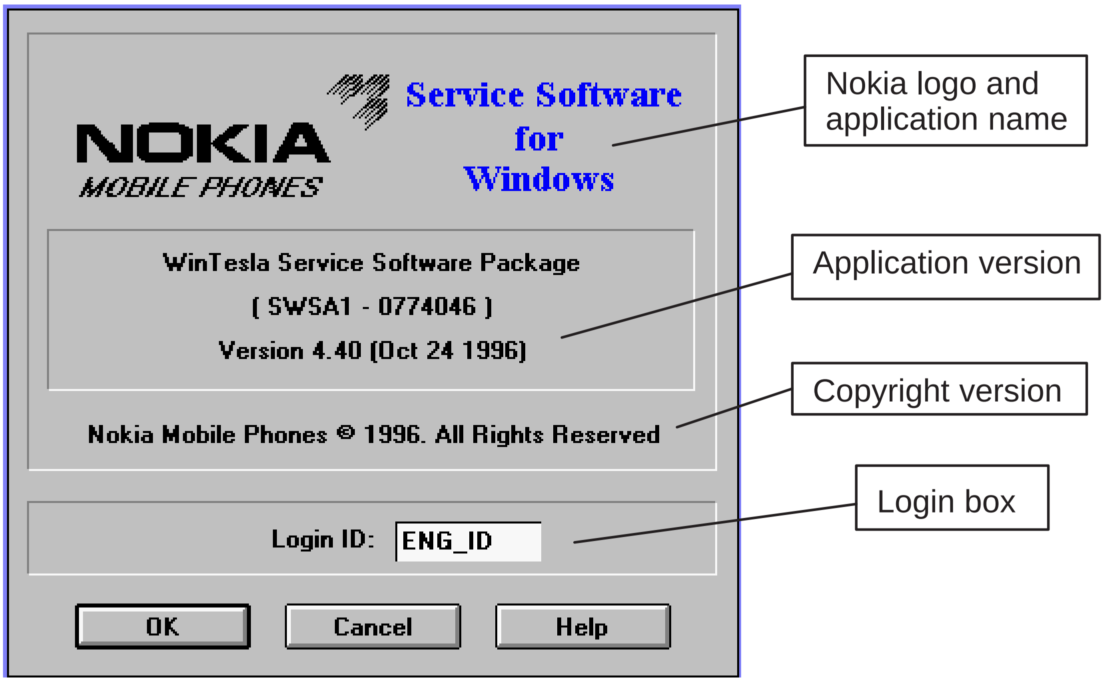
Common Properties of the User Interface

This chapter describes how the User Interface CLF must appear to the user.

The User Interface MUST be capable of being driven without the use of a mouse, as the service engineer rarely has space on the bench to use a mouse.

Login Dialog

When the Service Software application is invoked, by checking on the Service Software icon, the **Login** dialog box will be displayed on the screen.



Nokia logo and application name bitmap (–)

Displays Nokia logo and name of the application.

Application version static text (–)

Contains the name and version of the application.

Copyright notice static text (–)

Copyright is informed as: "**Nokia Mobile Phones (c) 1996. All Rights Reserved**".

Login Box edit box (–)

The user Login ID edit box, where the user enters his faultlog user name. (See Faultlog User Guide)

OK button (default key)

The user name is stored in memory and the dialog box is closed. When the dialog box is closed, the application starts.

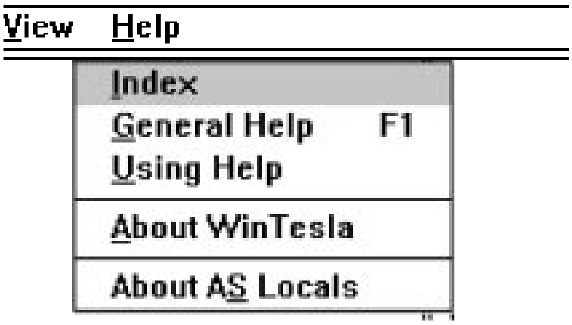
Cancel button (ESC)

The Dialog box is closed and application is started, but the Faultlog feature is disabled.

Help button (F1)

Activates the Windows Help application and displays context sensitive Help.

Main Window



Title bar

The *title bar* is located at the top of the window.

A title bar contains the following elements:

- Application Control–menu button
- Maximise button
- Minimise button
- Name of the application
- Restore button

The properties of these elements and their usage is described in Ref 3– Microsoft Windows Version 3.1 Users Guide chapter one (Windows Basics) and chapter two (Application Basics).

Menu bar

The *menu bar* is below the title bar and contains all available menu selections. The menu bar is a dynamic element and is dependent on the dongle type fitted, and whether a phone is connected.

Underlined characters in menu names and options indicates that the menu selection can be done by pressing *Alt*+ *underlined character*. Options can also be selected by activating menu bar with *Alt*– key (or *F10* key) and using arrow–keys to highlight the desired menu. In that case, selection is done by pressing *Enter*.

Menus can also be selected by using the mouse as described in Ref 3–Microsoft Windows Version 3.1 Users Guide

Status bar

The *status bar* is displayed at the bottom of the Service Software main window. The status bar contains information about the menu selections and events.

The left area of the status bar describes the actions of menu items as the user uses the arrow keys to navigate through menus.

The status bar texts are explained in detailed in each of command's description.

The right areas of the status bar indicate which of the following keys are latched down:

Indicator	Description
USER	Entered Login ID.
CAP	The Caps Lock key is latched down.
NUM	The Num Lock key is latched down.
SCRL	The Scroll Lock key is latched down.

Tool bar

The *tool bar* is NOT defined and will not be implemented until specified by this document.

Menu Bar

The Service Software package will have two menu bar configurations. The first, is an abbreviated version that contains the minimum number of menus that allows package configurations when a phone is NOT connected. The second is described below:

The menu bar MUST only contain the follow menus for the Service Software package when a phone is connected:

- Product*
- Configure*
- Tuning
- Testing
- Software
- Dealer
- View
- Help*

* – always displayed, even if no phone is connected.

A menu is broken down into sections that are indicated with menu separators. Each sections identifies a logical difference from itself and other sections, i.e. between transmitter and receiver. Any items that are required to be added to a menu lists will be added on the bottom of the appropriate menu section list. If a new item is to be added which is common to two or more phone types, then that menu item will become a common menu item.

The menu lists will use the Microsoft [...] symbol after an item name to indicate that selecting that item will NOT initiate an operation immediately, i.e. a dialog box will be displayed for the user to select options or type in data and press the OK button before the operation is performed.

Product

The Product menu contains the following menu items:

- New Ctrl+R
- Open...
- Close
- Initialize
  - Normal Mode F5
  - Local Mode Shift+F5
- Faultlog
  - Activate Faultlog... F9
  - Edit Faultlog...
- Exit Alt+F4

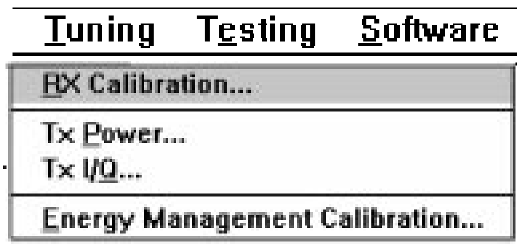
Configure

The Configure menu contains the following items:

- Options...
- Directories...
- Faultlog...
- Phone Type Specific configuration items (where applicable)

Tuning

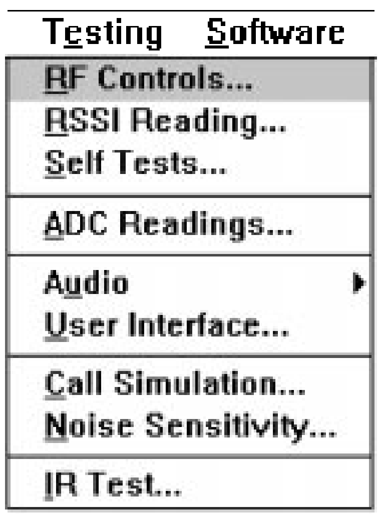
The Tuning menu contains the following menu sections:



- RX Calibration...
- Tx Power...
- Tx I/Q...
- Energy Management Calibration...

Testing

The Testing menu contains the following sections:



- RF Controls...
- RSSI Reading ...
- Self Tests
- ADC Readings
- Audio
- User Interface
- Call Simulation
- Noise Sensitivity...
- IR Test

Software

The Software menu contains the following menu sections:

- Product Profile...
- Start Up Self–tests...
- Set Factory Values
- Phone Identity...
- Production Data Edit...
- Flash Phone...

Dealer

The Dealer menu contains the following menu sections:

- User Settings...
- Short Code Memory...
- SCM & User settings ...
- Set UI/DEV Default Values ...
- Post–programming memory...

View

The View menu contains the following sections:

- Quick/RF Info...
- Phone Identity...

Phone Identity Window

The Phone Identity window should contain, as a minimum, the following data:

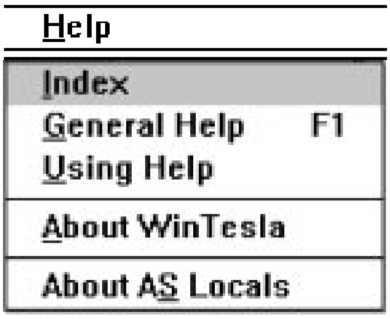
- Software Version(s)
- Hardware Version(s)
- Serial Number(s)
- Product Code

This window will only be used as a display window and therefore will not allow editing of the displayed data. This window will not contain any controls other than a scroll bar.

Help

The Help menu contains the following menu items:

- Index
- General Help
- Using Help
- About WinTesla
- About AS Locals



Mouse Cursors

The standards Windows pointer will be used as the mouse cursor.

During time consuming tasks e.g. communication to phone, an hour glass will be shown informing the user that a task is in progress. The application uses the hour glass cursor to inform user that the application has taken the control and any actions from user will be ignored.

When a function is initiated, the hour glass will be displayed and when the function has finished the mouse pointer will return to normal.

Reserved Keys

The following Hot keys and Short Cut keys are reserved either as Microsoft standard keys or as part of the Common Look and Feel specified by this document.

Short Cut Function Keys

Key	Description	Defined by
F1	Context Sensitive Help	Microsoft
F5	Normal Mode	NMP
Shift+F5	Local Mode	NMP
F9	Activate Faultlog	NMP
F10	Goto Menu Bar	Microsoft
Ctrl+F4	Close Active Window	Microsoft

Alt Hot Keys

Key	Description	Defined by
Alt+F4	Exit Active Application	Microsoft
Alt+H	Help	Microsoft

Ctrl Hot Keys

Key	Description	Defined by
Ctrl+N	File – New	Microsoft
Ctrl+O	File – Open	Microsoft
Ctrl+P	File – Print	Microsoft

Ctrl+R	Product – New	NMP

Shift Hot Keys

Key	Description	Defined by
Shift+F5	Local Mode	NMP

Key Strokes

Key	Description	Defined by
Alt+P	Product Menu	NMP
Alt+P,N	New	NMP
Alt+P,O	Open	NMP
Alt+P,C	Close	NMP
Alt+P,I	Initialize Pop–up	NMP
Alt+P,I,N	Normal Mode	NMP
Alt+P,I,L	Local Mode	NMP
Alt+P,F	Faultlog Pop–up	NMP
Alt+P,F,A	Activate Faultlog	NMP
Alt+P,F,E	Edit Faultlog	NMP
Alt+P,X	Exit Application	NMP
Alt+C	Configure	NMP
Alt+C,O	Option	NMP
Alt+C,D	Directories	NMP
Alt+C,F	Faultlog	NMP
Alt+C,G	GPIB instruments (disabled)	NMP
Alt+T	Tuning Menu	NMP
Alt+T,R	RX Calibration	NMP
Alt+T,X	Tx Power	NMP
Alt+T,Q	Tx I/Q	NMP
Alt+T,E	Eanergy Management calibration	NMP
Alt+E	Testing Menu	NMP
Alt+E,F	RF Controls	NMP
Alt+E,R	RSSI Reading	NMP

Alt+E,S	Self Tests	NMP
Alt+E,A	ADC Readings	NMP
Alt+E,U	Audio	NMP
Alt+E,U,I	Audio Internal	NMP
Alt+E,U,E	Audio External	NMP
Alt+E,U	User Interface	NMP
Alt+E,C	Call Simulation	NMP
Alt+E,N	Noise Sensitivity	NMP
Alt+E,I	IR Test	NMP
Alt+S	Software Menu	NMP
Alt+S,P	Product Profile	NMP
Alt+S,S	Start–up Self Tests	NMP
Alt+S,V	Set Default Values	NMP
Alt+S,I	Phone Identity	NMP
Alt+S,P	Production Data Edit	NMP
Alt+S,F	Flash Phone	NMP
Alt+D	Dealer Menu	NMP
Alt+D,U	User Settings	NMP
Alt+D,S	Short Code Memory	NMP
Alt+D,M	SCM & User Settings	NMP
Alt+D,V	Set UI/DEV Default Values	NMP
Alt+V	View Menu	NMP
Alt+V,Q	Quick/RF Info	NMP
Alt+V,P	Phone Identity	NMP
Alt+H	Help Menu	Microsoft
Alt+H,I	Index	Microsoft
Alt+H,G	General Help	Microsoft
Alt+H,U	Using Help	Microsoft
Alt+H,A	About WinTesla	NMP
Alt+H,S	About AS Locals	NMP

Help Functions

The Help User Interface will be the standard Windows help tool called WinHelp.

The context sensitive help is activated with **F1**–key. Help contains also Using Help which describes how to use help facility. Refer to the Windows manual for detailed description on the Windows Help.

Dialog boxes

The Service Software application uses many different dialog boxes. Dialog boxes are used to display data and prompt the user for input.

Dialog boxes are opened from menus or with shortcut keys. Dialog boxes have different properties but some features are common.

All service dialog boxes must be modal, that is, the user will not be able to start another operation without first closing the present dialog box.

All dialog boxes will contain the following entities:

– Help button

– Title bar

– At least one button other than Help

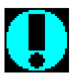
– Application Control–menu Button

Common Dialog boxes

This sections describes the common dialog boxes used in the Service Software package, and the context in which they will be used.

Note Message Box

When the user has made an illegal selection, a *note message box* dialog will be opened and message text is displayed. The message box is also opened when the program has some information for the user. The size of the dialog box may vary. An information dialog box is recognized by the **!**–icon.



The dialog box will also contain an OK button and a Help button.

OK button (default key):

Acknowledge displayed information and continue. The dialog box is closed after selection.

Help button (Alt+H):

Opens context sensitive help as F1–key does.

Query Message Box

Confirmations and questions are asked in *a query message box*. A query dialog box is recognized by the **?**–icon.

The dialog box will also contain a Yes button, a No button, and a Help button.

Yes button (Alt+Y or Y) (default key):

Accepts confirmation or question.

No button (Alt+N or N):

Denies confirmation or question.

Help button (Alt+H):

Opens context sensitive help as F1–key does.

The buttons may also be OK and Cancel. The operation of these buttons are the same as in the Note dialog box.

Error Message Box

Error message dialog boxes use the Stop–icon. When a “Stop”–dialog box is shown, the current operation is terminated.

The dialog box has a description about the failed operation and reason. Pressing F1 (Help) application opens the appropriate help topic that gives information about recommended actions.

The dialog box will also contain an OK button and a Help button.

OK button (default key):

Acknowledges displayed information and terminate current operation. The dialog box is closed after selection.

Help button (Alt+H):

Open context sensitive help as F1–key does.

Custom Dialog boxes

All custom dialog boxes will contain the predefined buttons as defined below in the section – *Buttons.* However, it is recognised that features may require additional button types, but the addition of these non–standard buttons should be carefully considered to minimise any inconsistencies between implementations.

The buttons will be positioned down the right–hand side of the dialog boxes. The default action will be **OK**, except where that default action could result in an irretrievable failure.

All tuning dialogs that contain tuning results, will display the old tuned data read from the phone before the tuning was performed, as well as the newly tuned data.

List boxes will be used to display lists of data, such as tuning data, test results etc.

The use of Radio buttons should be limited and carefully considered. The use of radio buttons defines the number of possible choices available to the user, which may be acceptable for one project, but not for another.

Buttons

All buttons must be the Microsoft style of buttons.

In general, the default button will be the action button, the Close button or the Yes button, but this will depend on the context of the dialog box that the button is associated with.

(action) button:

Accepts and validates entered settings and values and closes the dialog. If the values have not been changed, then no action will be taken. The status bar will reflect the status. The user should only be queried, if the settings or values accepted will over–write data that CAN NOT be reproduced.

A greyed **OK** button indicates that settings selected by the user are not acceptable.

Close button:

Closes the current dialog box. Does not send or store anything and closes the dialog. The Close button is only used for dialogs that do not set or change any data.

Cancel button (Esc):

Cancel operation. Does not send or store anything and closes the dialog box.

A greyed **Cancel** button indicates that it is not possible to quit from this dialog box.

Yes button (ALT+Y or Y):

Replies Yes to a question asked of the user.

No button (ALT+N or N):

Replies No to a question asked of the user.

Help button (ALT+H):

Opens context sensitive help as F1–key does.

Reporting Status

The status bar will be used to report the present status to the user. When a feature is initiated, the status bar will be updated with a brief description of the function. The status bar will also be updated at key points in a time consuming function.

If an error is to be reported to the user, it will be displayed in the status bar as well as displayed in a common error dialog box. This will mean the user is not delayed from progressing on to the next operation unless an error occurs, in which case, the user will have to acknowledge the error by pressing the OK button.

NSE–1/3 FEATURES

Menu bar

After Sales SW's menus follows the menu structure specified in WinTesla User Interface Specification /9/. This specification will describe functionality that differs from WinTesla specification.

Product

New command

Activation	Status Bar Text
Alt, P, N	Rescan a new phone
Ctrl+R	

If phone is changed (with same phone type only serial number is changed) phone will be initialised to local mode. If phone is changed to different phone type the current DLLs are unloaded and new ones are loaded for that phone.

If the Quick/RF Info view is open, window will be automatically updated.

If Phone Information view is open, it will be automatically updated.

Open... command

Activation	Status Bar Text
Alt, P, O	Force load phone specific functionality

Phone is set to local mode.

Initialise... command

Activation	Status Bar Text
Alt, P, I	

Opens a submenu

Normal Mode

Activation	Status Bar Text
Alt, P, N	Initialises phone to normal mode
F5	

When normal mode has been activated or program has been started, self–test results will be asked from MCU. If any fault was found in the tests, an error message is shown. If normal mode has been set successfully (no self test error has been found), and paging listening has been started, the used AFC value is requested from MS.

Initialisation routine checks phone's cellular type and if unsupported phone is detected, application unloads the DLLs.

The After Sales SW sets automatically the MS state to normal mode when needed.

If phone identification view is open, window will be automatically updated. Also if RF Information Window is open it will be updated to quick info view.

Local Mode

Activation	Status Bar Text
Alt, P, L	Initialises phone to local mode
Shift+F5	

Selection will change the MS state to *local*. When user selects item from Testing or Tuning menus, the After Sales SW software will change automatically the MS state to local.

The After Sales SW sets automatically the MS state to normal mode when needed.

Also if quick info view is open it will be updated to RF Information view.

Tuning

The tuning menu offers functions for ME adjustments.

RX Calibration... command

Activation	Status Bar Text
Alt, T,R	Open RX Calibration dialog box

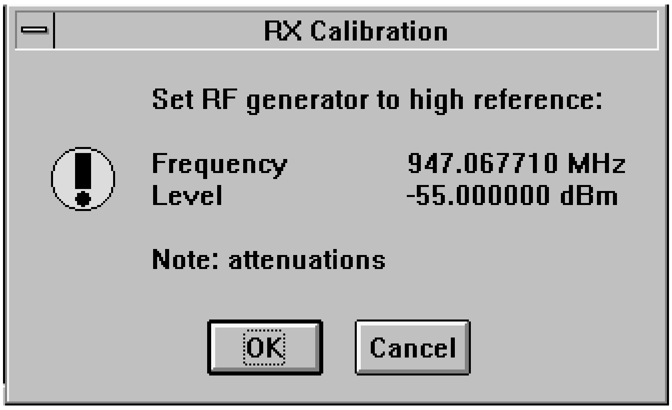
Starts RX calibration.

The next automatic selections are made when this tuning function is activated:

- Phone is set to local mode
- Update RF information window

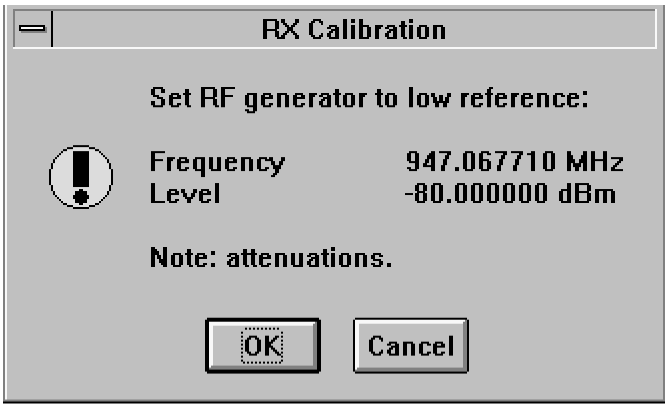
The measurement is started automatically when RX calibration is entered. The measurement is done in five steps:

1. User is requested to put signal generator to high input level (read from .INI file).



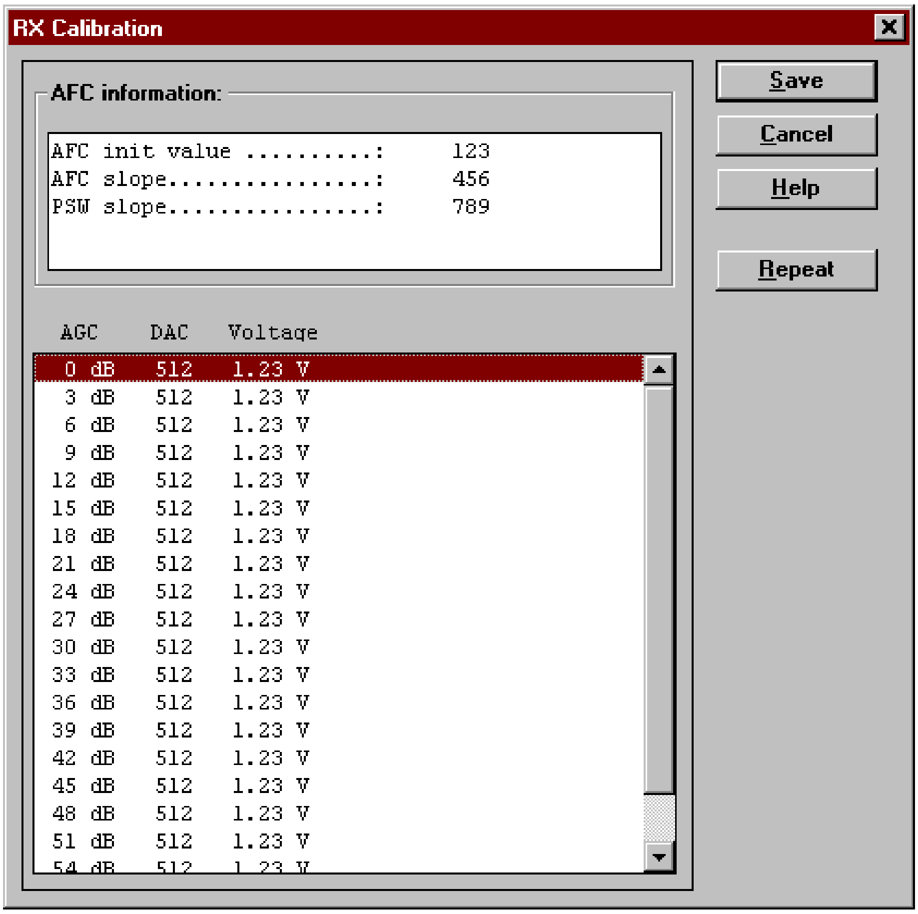
2. Measurement with high input level is executed

3. User is requested to put signal generator to low input level (read from .INI file).



4. Measurement with low input level is executed

5. The **RX Calibration** dialog will be updated when previous steps are done.



Dialog mode: **modal**

RX Calibration dialog has the following items:

AFC information box:

Shows AFC init value, AFC slope and PSW slope values.

AGC List box (ALT+A):

AGC, DAC, Voltage and Difference. The difference column shows the difference between tuned DAC values and mean straight line calculated from part slopes in dBs (see /1/). This can be calculated when all measurement results have been received from phone.

Repeat button (ALT+R):

The measurement can be started again by pressing this button.

Save button (ALT+S):

Dialog is closed and tuning *is saved* to phone.

Cancel button (ESC):

Dialog is closed and tuning *is not saved* to phone.

When calibration is ended, the DAC value checking is made and if it is not succeeded, error message is shown.

When exit is made, the next selections are set to the values which were selected before this adjustment.

Operation Mode

Update RF Information window

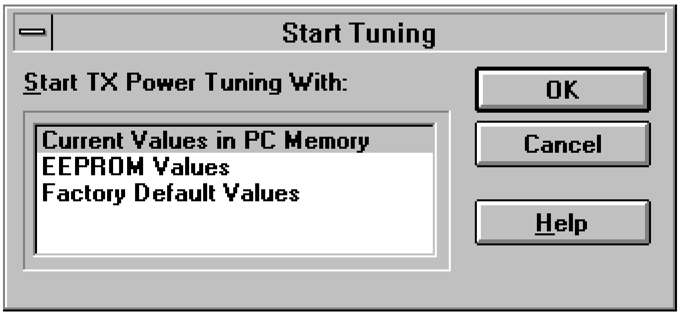
The exit and the use of AGC–control values is done same way as exit from power level tuning and power coefficient use:

Tx Power... command

Activation	Status Bar Text
Alt, T,X	Open TX Power Tuning dialog box

Starts TX power tuning.

User is first requested to select with which values tuning is started in **Start Tuning** dialog.



Start Tuning dialog has following items:

Start Tuning With list box (ALT+S):

Current Values in PC memory

Tuning values are load from program's internal memory.

EEPROM Values

Tuning values are load from ME's EEPROM.

Factory Default Values

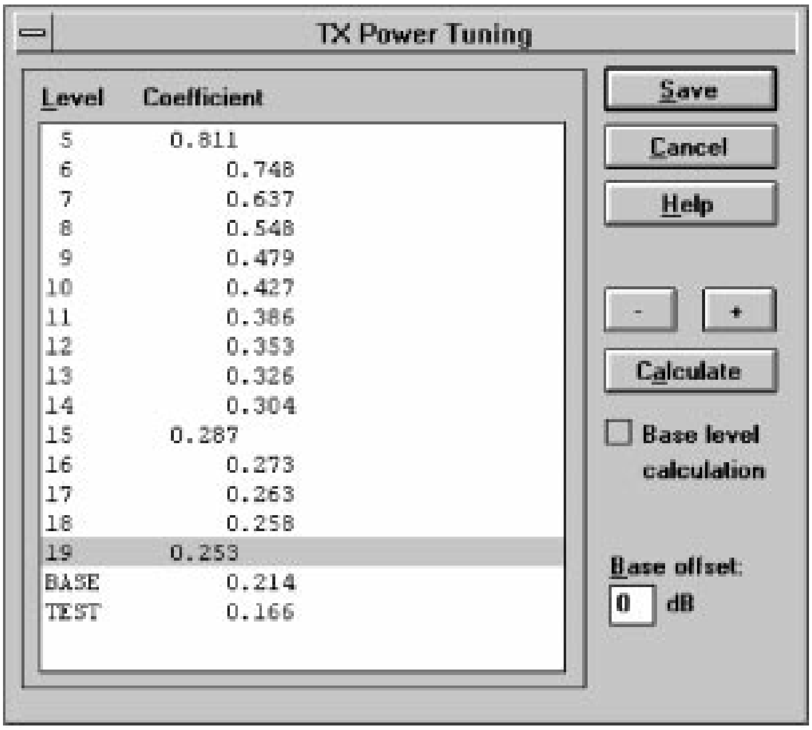
Tuning values are load from ME's flash.

The next automatic selections are made when this tuning function is activated:

the lowest (19) power level is selected

Operation mode = TX pulsed

The **TX Power Tuning** dialog will be activated automatically after value selection.



Dialog mode: **modal**

TX Power Tuning dialog has following items:

Power Level & Coefficients list box (ALT+L):

The power is presented in GSM or PCN values. The base power is selected automatically when the dialog is opened. The test value is not saved to the EEPROM. The test value can be changed during tuning as other power coefficients and the program remembers its value when tuning function is activated later again.

If there is more power levels in the phone that can fit into window the window is scrollable. When phone is initialised the program asks the number of power levels used in the phone.

Only three power coefficients (highest, third smallest and lowest) are needed to tune (left justified Coefficients) and the rest of them are calculated.

The tuning position is highlighted and can be tuned with +/– keys or left/right cursor keys.

Calculate button (ALT+C):

The calculation is activated with this button. The power coefficients which are calculated from the tuned coefficients are displayed on the different columns than the others. All values can be tuned if needed.

Base level calculation check box:

If this box is checked the base level is calculated.

+/– buttons (+/– and left/right cursor keys):

+ and – buttons will cause power changing by 0.25dB steps. When these keys are used the coefficient value is updated on the tuning window.

Save button (ENTER):

Dialog is closed and tuned values are *saved* to phone.

Cancel button (ESC):

Dialog is closed and tuning *is not saved* to phone.

When selections are used, the power value checking is made and if it is not succeeded, error message is shown. The test checks that all power coefficients are in descending order (same order than power levels).

If the power tuning function is ended and EEPROM values are not received or EEPROM fault is noticed, an error message is shown.

When all power coefficients have such values that they don’t cause any error messages, save can be made. The last used tuning power is in use after exit.

The next automatic selection is made when this tuning function is ended:

Operation Mode = RX pulsed

Tx I/Q... command

Activation	Status Bar Text
Alt, T,Q	Open TX I/Q Tuning dialog box

This function is used for tuning TX I and Q branch DC offset, amplitude difference and phase difference.

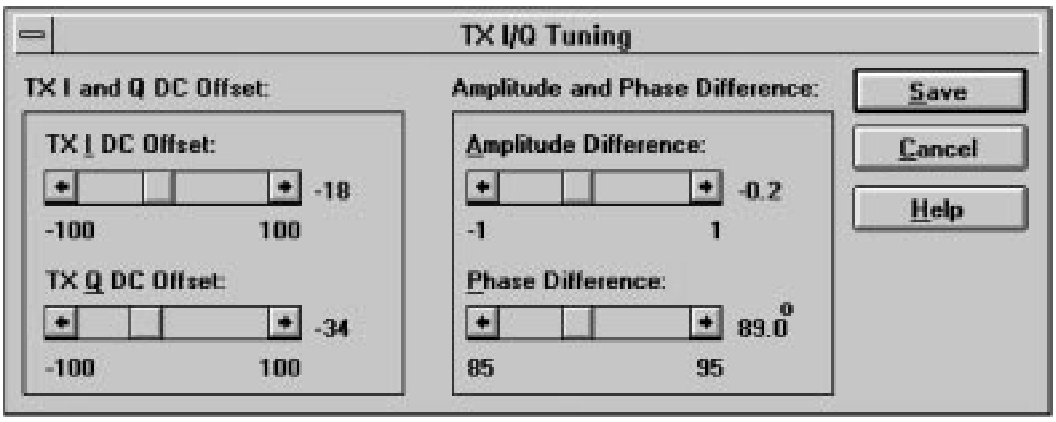
The function opens same **Start Tuning** dialog as with TX Power Tuning.

The next automatic selections are made when this function is activated:

Operation Mode = TX pulsed

Update RF Information window

The **TX I/Q Tuning** dialog is opened.



Dialog mode: **modal**

TX I/Q Tuning has following items:

Tune TX I DC Offset scroll bar (ALT+I):

The DC Offset is shown as percents (%) from the ± maximum value. 0% means that there is no DC. The value range is –100%...100%. The value is rounded to the nearest integer value.

Tune TX Q DC Offset scroll bar (ALT+Q):

The operation of this function is the same as one above, except with this selection the Q branch DC Offset is tuned. The value range is –100%...100%. The value is rounded to the nearest integer value.

Tune Amplitude Difference scroll bar (ALT+A):

When this selection is made user can increase or decrease the amplitude difference within 0.1 dB steps. The value range is –1...1.

Tune Phase Difference scroll bar (ALT+P):

When this selection is made user can increase or decrease the phase difference within 0.5° steps. The current phase difference is shown on the tuning window with numbers and bar figure. The value range is –85...90.

Save button (ENTER):

Dialog is closed and tuning *is saved* to phone.

Cancel button (ESC):

Dialog is closed and tuning *is not saved* to phone.

After each value change the new value is sent to the phone.

The next automatic selection is made when TX I / Q tuning function is ended:

Operation Mode = RX pulsed

Update RF Information window

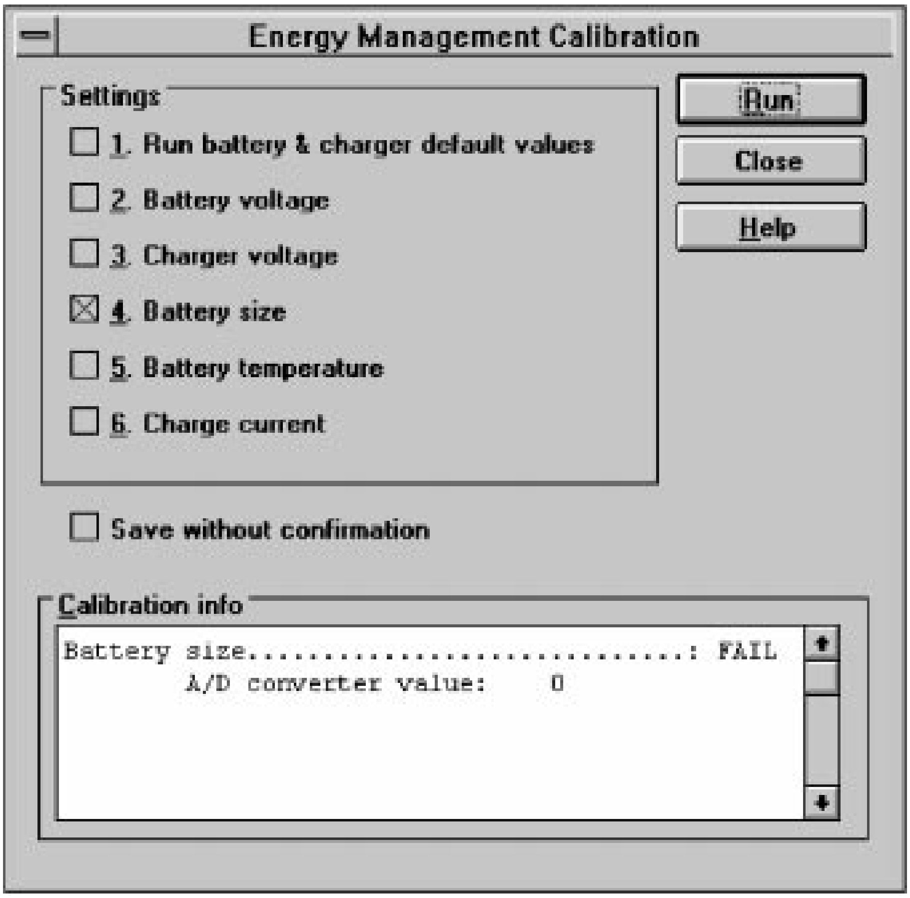
Energy Management Calibration... command

Activation	Status Bar Text
Alt, T,E	Calibrate Battery Voltage

This function is for battery a/d and charge current tunings.

Before battery a/d tuning is started a voltage setting request is shown to user (Set supply voltage to 10,5 V).

When external power is connected and user selects Yes to continue, the application displays the **Energy Management Calibration** dialog box:



Dialog mode: **modal**

Energy Management Calibration dialog has following items:

Settings group box:

Contains EM calibration setting checkboxes:

1. Run battery & charger default values checkbox (ALT+1):

Runs battery & charger default values to phone when selected

2. Battery voltage checkbox (ALT+2):

Calibrates battery voltage A/D value.

3. Charger voltage checkbox (ALT+3):

Calibrates charge voltage A/D value.

4. Battery size checkbox (ALT+4):

Calibrates battery size A/D value.

5. Battery temperature checkbox (ALT+5):

Calibrates battery temperature A/D value.

6. Charge current checkbox (ALT+6):

Calibrates charging current.

Save without confirmation checkbox (ALT+S):

When selected, all selected calibrations are saved to phone without confirmation, otherwise user must confirm every A/D value saving to phone.

Calibration info listbox (ALT+S)

Shows information about current calibrations.

Run button (ENTER):

All selected settings are executed.

Close button (ESC):

Dialog is closed.

Help button (ALT+H):

Context sensitive help.

After battery a/d tunings a voltage setting request is shown to user (Set supply voltage to 8.0 V).

Testing

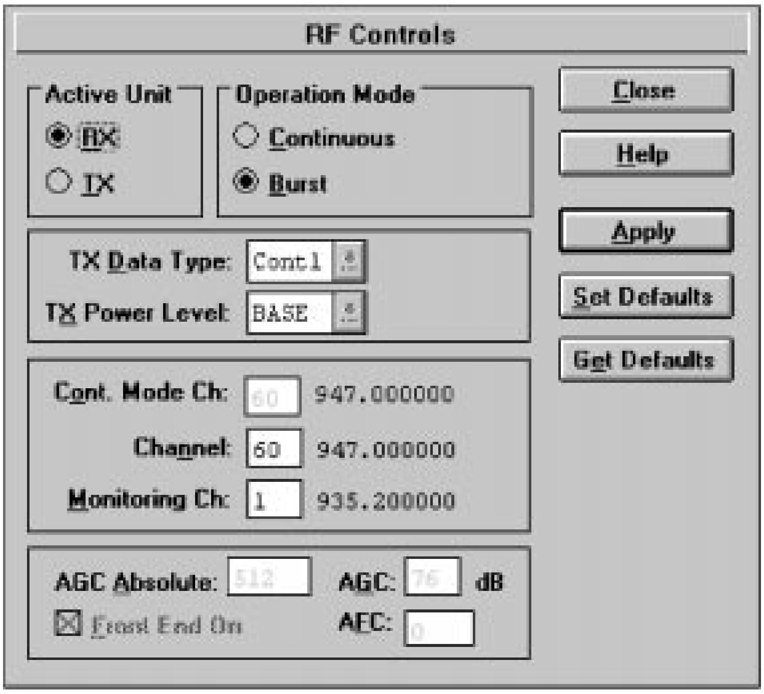
The Testing sub menu offers functions for ME testing.

RF Controls... command

Activation	Status Bar Text
Alt, E,R	Open RF Controls dialog box

This function is used for RF testing.

Command opens **RF Controls** dialog, which contains data for testing and adjustments.



Dialog mode: **modal**

RF Controls dialog has following items:

Active Unit group:

RX radio button (ALT+R):

When *RX* is selected, the next functions are made:

Data transmission is deactivated

TX power is deactivated

If operation mode is continuous,

– AGC is controlled

– RX continuous mode channel is activated

RF Information window is updated

The RX value is always given as default.

Note! Function is activated immediately, Apply is not needed.

TX radio button (ALT+T):

When *TX* is selected, the next functions are made:

Data transmission is activated

If operation mode is continuous,

– Operation mode is set to burst

RF Information window is updated

Continuous mode radio button is disabled.

Note! Function is activated immediately, Apply is not needed.

Operation Mode group:

Continuous radio button (ALT+C):

When *continuous* selection is used,

synthesiser is set to constant frequency

synthesiser channel number is as given with Continuous Mode Channel selection

transmitter power is not connected

if Active Unit is RX, AGC is controlled

Note! Function is activated immediately, Apply is not needed.

Burst radio button (ALT+B):

When *burst* selection is used,

synthesiser is controlled by using receiving/transmission/measuring synthesiser control sequence

synthesiser channel numbers are as given with Channel/Monitoring Channel selections

if Active Unit is TX, data (selected with TX Data Type) is sent and the TX power is connected

Note! Function is activated immediately, Apply is not needed.

TX Data Type drop list (ALT+D):

TX Power Level edit box (ALT+T):

With this value is possible to change the transmission power. The user can give the needed power value or select the test value, which is tuned with TX power tuning function. The test value is found at the end of the list.

TX Power have value *OFF* and is disabled (*greyed*) when active unit is RX. When the TX power is tuned with test value (smallest value) the TX Power has value *TEST*.

Channel edit box (ALT+H):

User can enter here channel number that is used for both transmission and receiving. The frequency of the selected channel is shown after selection.

Monitoring Channel edit box (ALT+M):

This field selects neighbour monitoring channel. The frequency of the selected channel is shown after selection.

Continuous Mode Channel edit box (ALT+C):

To this edit box user can type continuous mode channel which may have all channel numbers.

The used frequency depends on the Active Unit. If Active Unit is RX, then RX frequency is used, else TX frequency. The frequency of the selected channel is shown after selection.

AGC Absolute edit box (ALT+A):

This selection allows user to edit AGC absolute value (value from A/D converter).

When AGC Absolute value is changed the AGC dB value will be calculated depending on the AGC Absolute value.

Front End On check box:

This selection allows user to change whether the Front End amplifier is On or Off.

AGC edit box (ALT+G):

This selection allows user to edit AGC absolute value (value from A/D converter).

AGC value is shown only when its value is controlled by PC. When Active Unit has value RX and Operation Mode is continuous, AGC is controlled by PC except when next adjustment functions are activated:

RSSI Calibration

AFC Diagram

Apply button (ALT+A):

Accepts entered values and validates them. After validation application sends corresponding messages to ME. Closes dialog and updates Info Window.

Note! Active Unit and Operation mode are not send with because they are activated immediately.

Set Defaults button (ALT+S):

Sets current values as default Rf Controls values.

Get Defaults button (ALT+G):

Gets default Rf Controls values as current values.

The next automatic selection is made when Quick testing function is ended:

Active Unit = RX

Update RF Information window

The next table shows the dialog’s properties on different situations:

ACTIVE UNIT = TX:

TX Data Type: Updated

AGC values: Greyed

Monitoring Channel: Greyed

OPERATION MODE = BURST:

TX Power Level: Updated

Continuous Mode Channel: Greyed

Channel: Updated

ACTIVE UNIT = RX:

TX Data Type: Greyed

TX Power Level: OFF, Greyed

OPERATION MODE = BURST:

AGC values: Greyed

Continuous Mode Channel: Greyed

Channel: Updated

Monitoring Channel: Updated

OPERATION MODE = CONT:

AGC values: Updated

Continuous Mode Channel: Updated

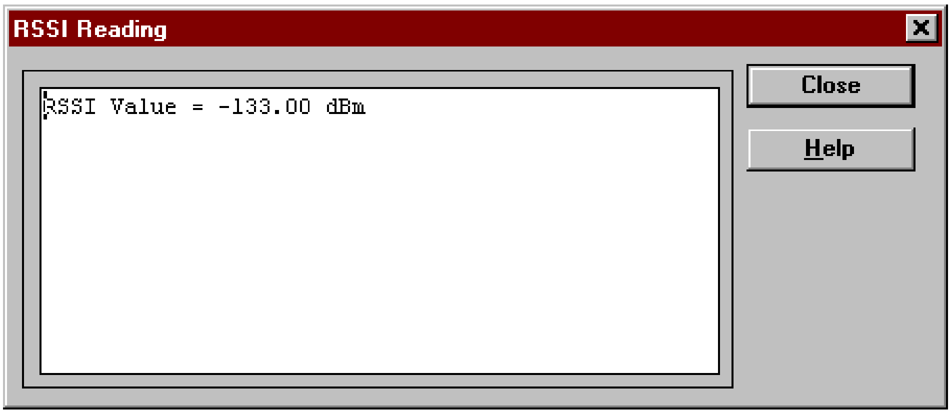
Channel: Greyed

Monitoring Channel: Greyed

RSSI Reading... command

Activation	Status Bar Text
Alt, E,R	read continuously RSSI value

Command opens RSSI Reading dialog:



Dialog mode: **modal**

RSSI value is read continuously until user presses ESC–key or Close button to cancel reading.

RSSI Reading dialog has following items:

Close (ENTER) button:

Closes the RSSI Reading dialog. Does not send anything to phone.

Help button:

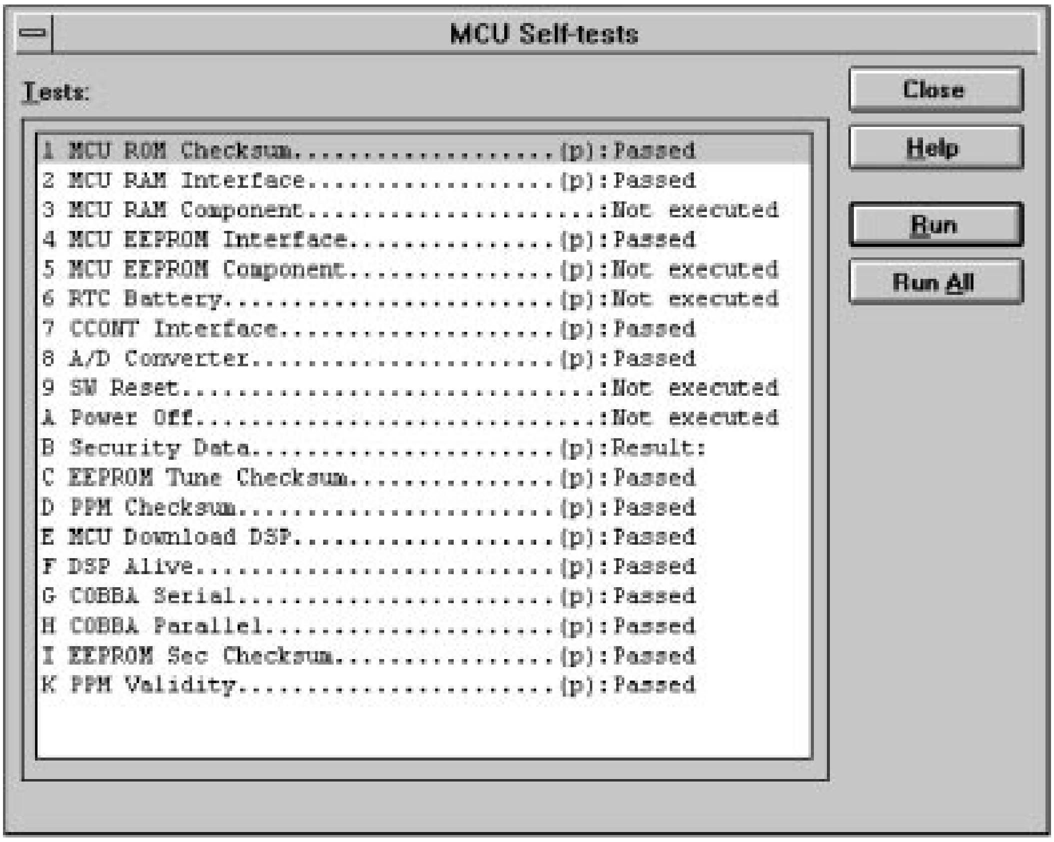
Context sensitive help.

Self Tests... command

Activation	Status Bar Text
Alt, E,S	Open MCU Self–tests dialog box

Command is used for reading self test results and running self tests.

When the selection is made, the test result is read from ME. The test result will be shown to the user within **MCU Self–test** dialog.



Dialog mode: **modal**

MCU Self–test dialog has following items:

Tests list box (ALT+T):

The field ”(p)” in the screen example means that the test is also run in power up. The field “/s)” means that this test is selectable one.

Test states are updated according to results received from the phone. Possible test states will be one of the next:

Passed

Failed

No response

Not executed

Not valid

RUNNING....

Note that power–off test have no values, because if test has been passed, power has been turned off. If power–off test fails a special error message window is shown. If no response is received to power off test message in a few seconds, the user is informed by special info window, where user is asked to turn the power on and then press the return key.

Note also that power–off test (if passed) turns power off and power should be reconnected by using the phones keypad after the successful test. After the power has been connected to phone, the normal start–up routines are made and the self–test results are shown in the MCU self–tests menu (i.e. all other than power–up self–tests are in *Not executed* state after the power–up routines).

Run button (ALT+R):

User can select desired test from list and hit **Run** button. When user selects test to be run the text *RUNNING...* is shown in test state field and test is run. When results are received the test state field is updated according to the result.

If no response was received in the defined time, a *error message box* will be shown and the test state is changed to *No response*. Phone is set to local mode if it is not already there.

Run All button (ALT+A):

User can run all listed tests. The text *RUNNING...* is shown in test state field and test is run. When results are received the test state field is updated according to the result. When state field is updated application moves to next test and repeats previous cycle. Phone is set to local mode if it is not already there.

Supported Self Tests

1 MCU ROM Checksum................

2 MCU RAM Interface..............

3 MCU RAM Component..............

4 MCU EEPROM Interface...........

5 MCU EEPROM Component...........

6 RTC Battery.....................

7 CCONT Interface.................

8 A/D Converter..................

9 SW Reset.......................

A Power Off......................

B Security Data..................

C EEPROM Tune Checksum...........

D PPM Checksum...................

E MCU Download DSP...............

F DSP Alive......................

G COBBA Serial........................

H COBBA Parallel......................

I EEPROM Sec Checksum.................

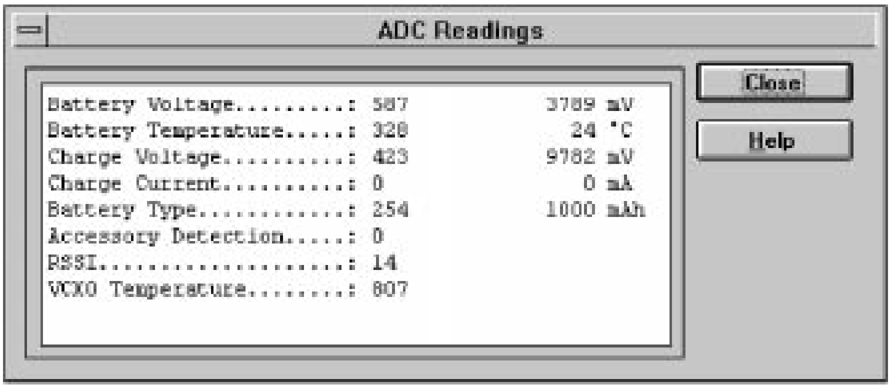
K PPM Validity...................

ADC Readings... command

Activation	Status Bar Text
Alt, E,A	Open ADC Readings dialog box.

Command is used to read and show A/D values from phone.

Command opens **ADC Readings** dialog.



Dialog mode: **modal**

ADC Readings dialog has static text field where measurements are updated to window every one second.

ADC Readings dialog has following items:

Close (ENTER) button:

Closes the ADC Readings dialog. Does not send anything to phone.

Help button:

Context sensitive help.

3.1.4.4.1 A/D Readings

Following a/d readings are measured:

Battery Voltage.........:

Battery Temperature.....:

Charge Voltage..........:

Charge Current..........:

Battery Type............:

Acessory Detection......:

Hook....................:

RSSI....................:

VCXO Temperature........:

Audio... command

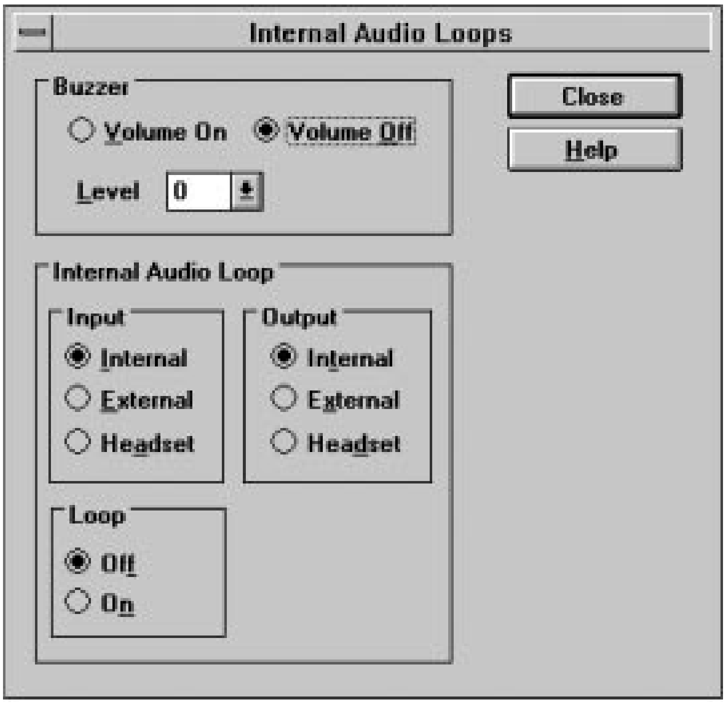
Activation	Status Bar Text
Alt, E,U	

Opens a submenu which contains following options:

Internal Audio Loops

Activation	Status Bar Text
Alt, E,U,I	Open Internal Audio loops dialog box.

Command is used for making internal audio loop tests in **Internal Audio Loops** dialog.



Dialog mode: **modal**

Internal Audio Loops dialog has following items:

Buzzer Volume group:

Next three different values can be selected for Buzzer volume:

Volume On radio button (ALT+V):

Turns buzzer on.

Volume Off radio button (ALT+O):

Turns buzzer off.

Level drop down list (ALT+L):

Sets level of a buzzer. Allowed range 0...127

Internal Audio Loop group:

Input group:

Next two different values can be selected for input:

Internal radio button (ALT+I):

Turns internal input.

External radio button (ALT+I):

Turns external input.

Headset radio button (ALT+A):

Turns headset input.

Output group:

Next two different values can be selected for output:

Internal radio button (ALT+T):

Turns internal output.

External radio button (ALT+X):

Turns external output.

Headset radio button (ALT+D):

Turns headset output.

Loop group:

Next two different values can be selected for loop:

Off radio button (ALT+F):

Turns audio loop off.

On radio button (ALT+N):

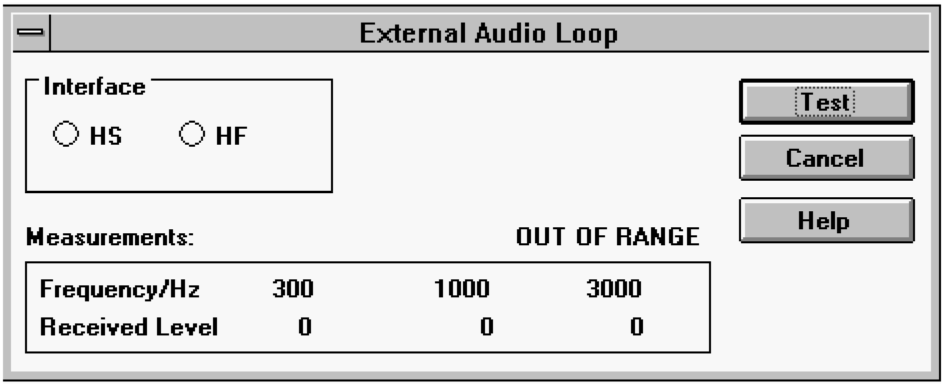
Turns audio loop on.

When dialog is closed with the Buzzer Volume is switched always off. Also internal audio loop is turned off.

External Audio Loops

Activation	Status Bar Text
Alt, E,U,E	Open External Loops dialog box

Command is used for making external audio loop tests in **External Audio Loops** dialog.



Dialog mode: **modal**

External Audio Loop dialog has following items:

Interface group:

Next two different values can be selected:

HS radio button:

Turns interface to HS (handset)

HF radio button:

Turns interface to HF (handsfree)..

Test button:

Starts the external audio loop test.

Cancel button:

Closes the External Audio Loop dialog. Sends nothing to phone.

Help button:

Context sensitive help.

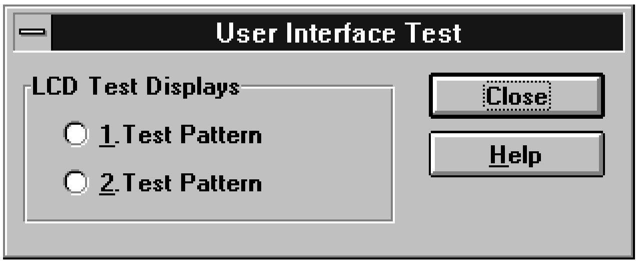
Measurements group:

Contains received levels for used frequencies. If received level is out of range that is displayed top of measurements group box.

User Interface... command

Activation	Status Bar Text
Alt, E,U	Open User Interface Tests dialog box

Command is used for making display tests in **Display Tests** dialog.



Dialog mode: **modal**

Display Tests dialog has following items:

1. Test Pattern radio button (ALT+1):

In test display 1 all indicators are displayed and the display is filled with chessboard letters.

2. Test Pattern radio button (ALT+2):

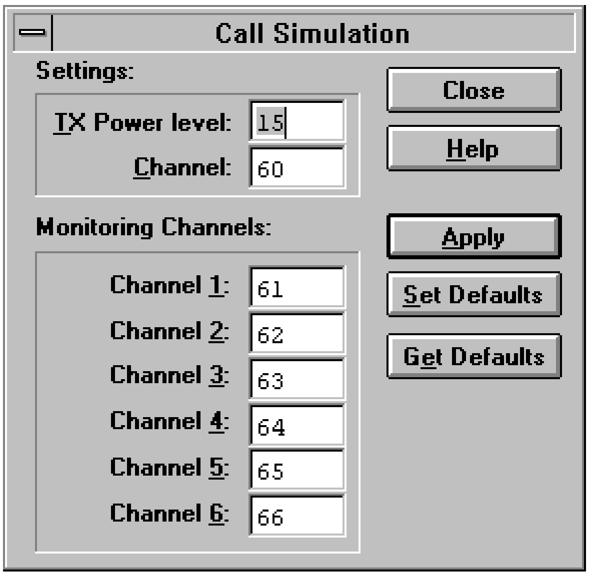
In test display 2 none of the indicators are displayed and the display is filled with inverse chessboard letters.

When dialog is closed the phone LCD display is cleared.

Call Simulation... command

Activation	Status Bar Text
Alt, E,C	Open Call Simulation dialog box

Command is used for making call simulation. Function opens **Call Simulation** dialog.



Dialog mode: **modal**

Call Simulation dialog has following items:

TX Power Level edit box (ALT+T):

All power levels can be selected. This updates same parameter as **TX Power Level** in the **RF Controls** dialog. Note that TEST value cannot be selected. If TEST value was in use when Call simulation menu selected, power level is changed to smallest value.

Channel edit box (ALT+C):

This tells the normal operating RF channel number. Normal GSM/PCN channel numbers can be selected. Same channel is used both for transmission and receiving. This updates same parameter as **Channel** in the **RF–Controls** dialog.

Channel 1,2,3,4,5,6 edit box (ALT+1,2,...):

Channels for monitoring are specified with these six selections. All GSM/PCN channel numbers can be used. If more than one selection has same number, the monitoring channel list (neighbour list) will have less than 6 selected channels. The minimum number of monitoring channels is one (all channels have same value). The monitoring channel can also have same value as normal operating channel.

The first monitoring channel updates same parameter as **Monitoring Channel** in the **RF–Controls** dialog.

Apply button (ALT+A):

Validates and sends entered data to ME.

Set Defaults button (ALT+S):

Sets current values as default Call Simulation values.

Get Defaults button (ALT+G):

Gets default Call Simulation values as current values.

Noise Sensitivity... command

Activation	Status Bar Text
Alt, E,N	Opens Noise sensitivity dialog box

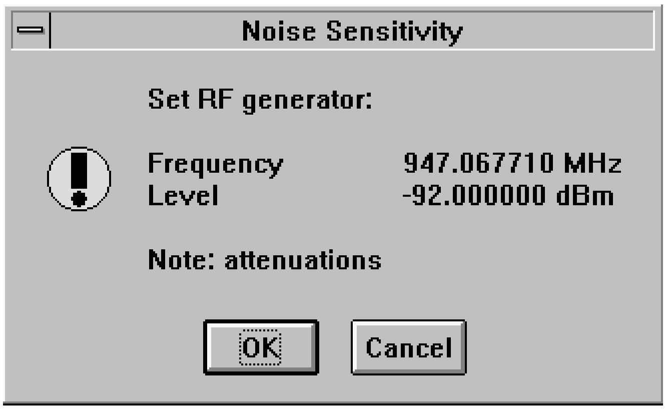
Command is used for noise sensitivity measurement.

The next automatic selections are made when this tuning function is activated:

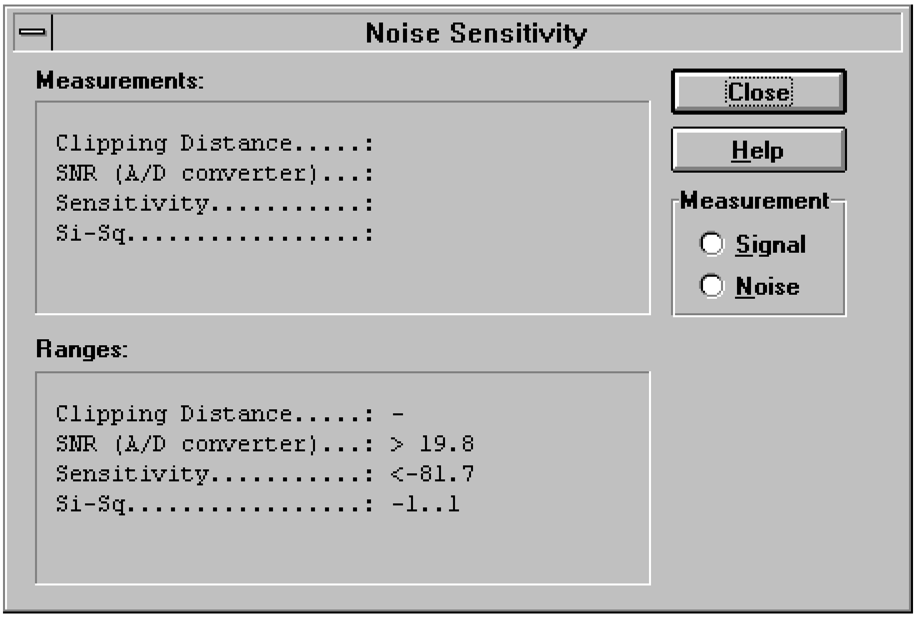
– Operation mode = RX cont

– AGC = 81 dB

Before function opens **Noise Sensitivity** dialog application prompts:



Then application opens **Noise Sensitivity** dialog:



Dialog mode: **modal**

Noise Sensitivity dialog has following items:

Measurements group:

Clipping distance is the difference to the signal clipping value. SNR is measured in AD converter.

The last value on the display is signal power difference between I and Q branch. The numbers are shown in 0.1dB accuracy. The error messages, ”OUT OF RANGE”, are shown only if the SNR and/or amplitude difference values are not acceptable.

Signal/Noise radiobutton (ALT+S/ALT+N):

When buttons are pressed, the RX I and Q burst data is asked, text ”SIGNAL MEASURING...” or ”NOISE MEASURING...” will come to the measurement group window. The power level value should be –92 dBm during signal measurement.

When signal data is received, distance to clipping signal level is shown as dBs on the display. When either signal or noise measurement results are received ”MEASURING” text is removed and measurements are updated to screen. When both measurements (signal and noise) are done at least once, the signal to noise relation and difference are also shown on the display.

When exit is made, the next selections are set to the values which were selected before this adjustment.

– Operation mode

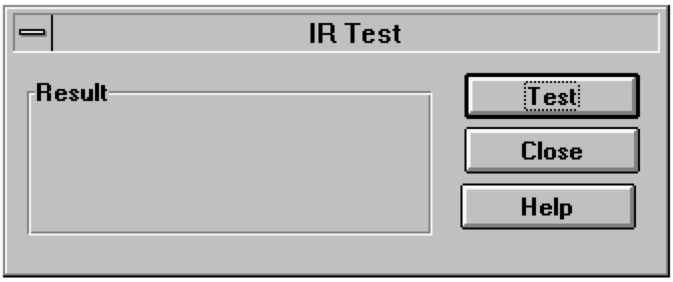
– AGC value

IR Test... command

NOTE! *Applies only to phones equipped with Infrared ports.*

Activation	Status Bar Text
Alt, E,I	IR module test

Command is used for making IR module test. Function opens **IR Test** dialog:



Dialog mode: **modal**

IR Test dialog has following items:

Result box:

Result can be OK/FAILED

Test (ENTER) button:

Starts IR Test.

Close button:

Closes the IR Test dialog.

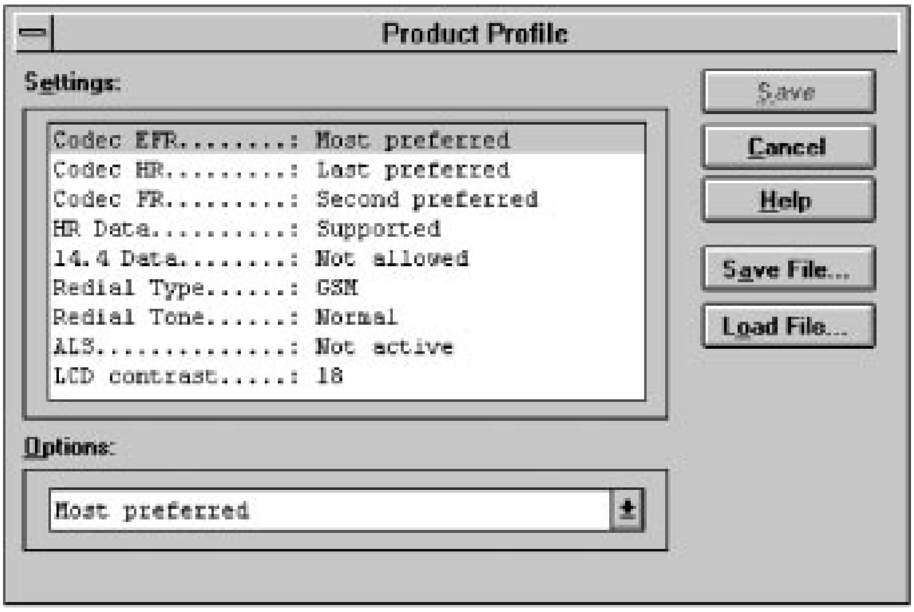
Software

Product Profile... command

Activation	Status Bar Text
Alt, S,P	Open Product Profile settings dialog box.

Function is used for making product profile settings.

When command is activated the product profile information is read from EEPROM and **Product Profile** dialog is opened.



Dialog mode: **modal**

Product Profile dialog has following items:

Settings list box (ALT+E):

A list where user can select desired setting.

User can toggle setting with following **Options** drop list or by double clicking desired setting in list box.

Options drop list (ALT+O):

List allows user to set options to each settings which are listed in **Settings** list box.

Save(OK) button (ENTER)

Selections are accepted and saved to EEPROM.

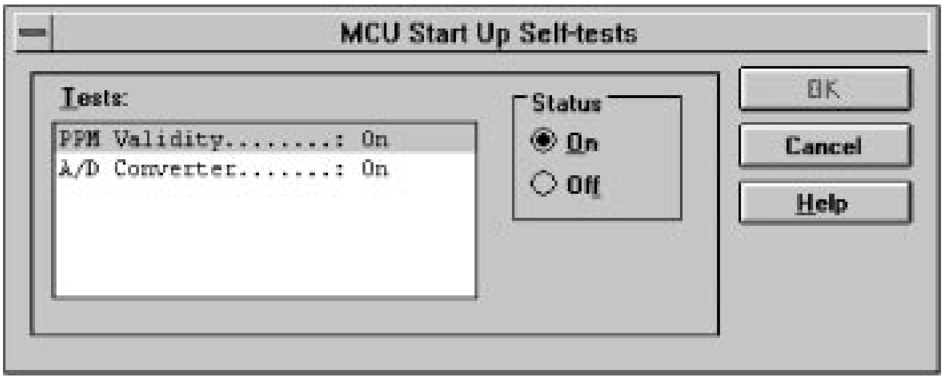
Cancel button (ESC)

Selections are ignored and control is returned back to main menu.

Start Up Self–tests... command

Activation	Status Bar Text
Alt, S,S	Open MCU start Up self–tests dialog box.

Function is used for changing the state of the EEPROM selectable tests in **MCU Start Up Self–tests** dialog.



Dialog mode: **modal**

MCU Start Up Self–tests dialog has following items:

Tests list box (ALT+T):

When dialog is opened, the previous values will be read from the MCU EEPROM and shown on the list box.

Status group:

When radio button **On** is selected, the test will be run every time when automatic start up self–tests are activated (e.g. in power up).

Save button (ENTER)

Selections are accepted and saved to EEPROM. A power up routine is made to phone.

Cancel button (ESC)

Selections are ignored and control is returned back to main menu.

Selectable Start–Up self tests:

1. PPM Validity

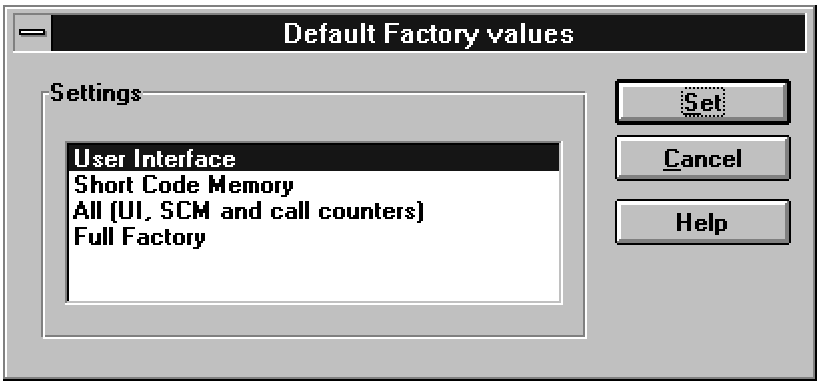
3. A/D Converter

Set Factory Values... command

Activation	Status Bar Text
Alt, S,V	Set factory values

Application does not ask confirmation. Next kind of text will be shown to user:

“Setting UI and SCM Factory values...”



Dialog mode: **modal**

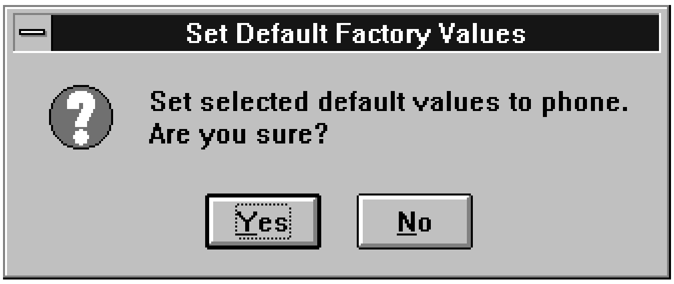
Default Factory Values dialog has following items:

Settings list box:

Contains the selectable factory values.

Set button:

Sets the selected factory value to phone. Before setting software asks confirmation:



Cancel button:

Closes the Default Factory Values dialog.

Phone Identity... command

Activation	Status Bar Text
Alt, S,I	Open Phone Identity dialog box for editing

Function is used to edit phone identity. With this dialog IMEI or SIM locks may be changed in following manner:

– current phone information is read from phone

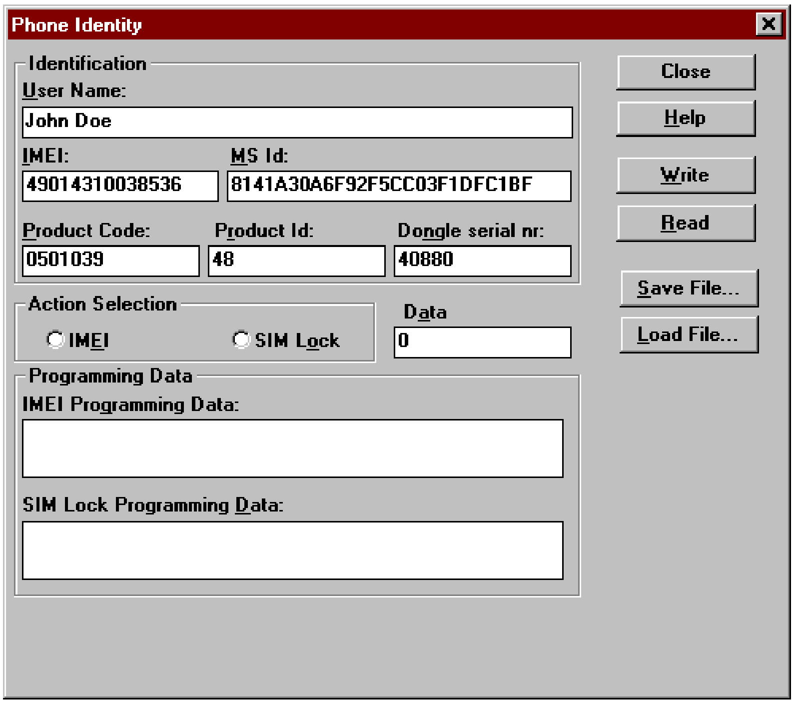
– user edits User Name (and IMEI and Product Code, if they were not read correctly from phone)

– dialog information is saved to file, which is sent to secure place where actual programming information may be constructed

– programming information is got from secure place in an other file, which is loaded to dialog

– program checks input values and if they are correct programming information is written to phone

Function opens **Phone Identity** dialog.



Dialog mode: **modal**

Phone Identity dialog has following items:

User Name edit box (ALT+U):

Field where user can enter user identification.

IMEI edit box (ALT+I):

Field where user can enter IMEI value. Field can contain up to 40 digits.This field is automatically filled, if ME is connected to the PC when dialog is loaded.

Product Code edit box (ALT+P):

Field where user can enter Product Code value. This field is automatically filled, if ME is connected to the PC when dialog is loaded.

MS Id edit box (ALT+M):

Field where user can enter MS Id corresponding programming data. This field is automatically filled, if ME is connected to the PC when dialog is loaded.

Product Id edit box (ALT+R):

Field where user can enter Product Id. This field is automatically filled, if ME is connected to the PC when dialog is loaded.

Dongle Serial nr. edit box (ALT+N):

Field where user can enter Product Id. This field is automatically filled, if ME is connected to the PC when dialog is loaded.

Data edit box (ALT+A):

Field where user can enter Data entry. This field is automatically filled, when file is loaded or data is saved.

IMEI radio button:

File and ME operations contains only IMEI data.

SIM Lock radio button:

File and ME operations contains only SIM Lock data.

IMEI Programming Data edit box (ALT+I):

IMEI programming data is read from file or entered by user to this field.

SIM Lock Programming Data edit box (ALT+D):

SIM Lock programming data is read from file or entered by user to this field.

Close button (ESC):

Cancels all edits and does not save values to phone.

Help button

Opens a help text.

Write button (ALT+W):

Writes programming data to phone. Actions are selected with Action Selection radio button.

Read button (ALT+R):

Reads identification data from phone and shows it in dialog controls. Needed data is selected by Action Selection radio button.

Save File... button (ALT+S):

Writes a file containing data needed by security place application to create needed programming data. File is selected with File Save As dialog.

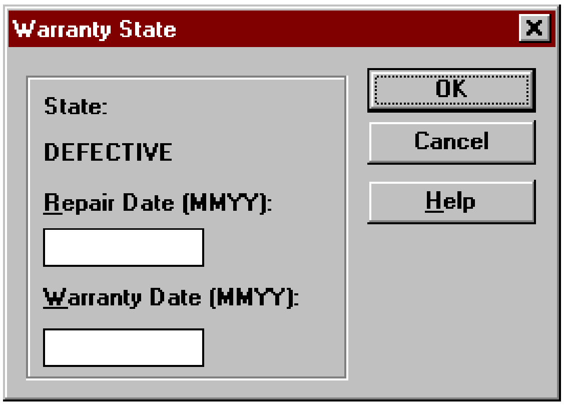
Load File... button (ALT+L):

Reads a file containing data needed to program selected data. File is selected with File Open dialog.

Warranty State... command

Activation	Status Bar Text
Alt, S,W	Open Warranty State dialog box

This command is used to set the warranty state of a phone. When selected application opens **Warranty State** dialog box.



Dialog mode: **modal**

Warranty State dialog has the following items:

State static text:

USE

For nomal phones.

DEFECTIVE

For phones which are being swapped. A warranty and other information is transferred to the working phone.

EXCHANGE

For phones which are already repaired from **DEFECTIVE** one.

Repair Date edit box:

When Warranty State is **USE** and PKD–1CS or PKD–1NS dongle is connected user can edit repair date. Otherwise field is read only. Format is MMYY, where MM stands for month digits and YY stands for year digits.

Warranty Date edit box:

When state is **DEFECTIVE** and PKD–1CS or PKD–1NS dongle is connected user can edit warranty date. When warranty date is saved warranty state will be **EXCHANGE**. Format is MMYY, where MM stands for month digits and YY stands for year digits.

OK button (ENTER):

Closes the dialog box and saves the edited date to the phone. This button is enabled only when phone is Repair Date or Warranty Date is changed.

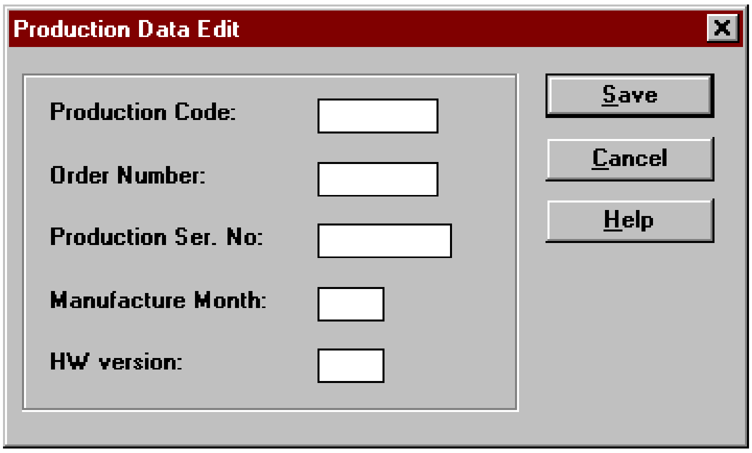
Cancel button (ESC):

Closes the dialog box and *does not* save the warranty state to the phone.

Production Data Edit... command

Activation	Status Bar Text
Alt, S,P	Open Production Data Edit dialog box

This command is used for programming HW version to phone. Function opens the following **Production Data Edit** dialog box.



Dialog mode: **modal**

Production Data dialog has the following items:

Production Code edit box (read only):

Displays production code.

Order Number edit box (read only):

Displays order number.

Production Ser. No edit box (read only):

Displays production serial number.

Manufacture Month edit box (read only):

Displays manufacturing month.

HW Version edit box:

User can edit HW version.

OK button (ENTER):

Closes the dialog box and writes HW version to ME.

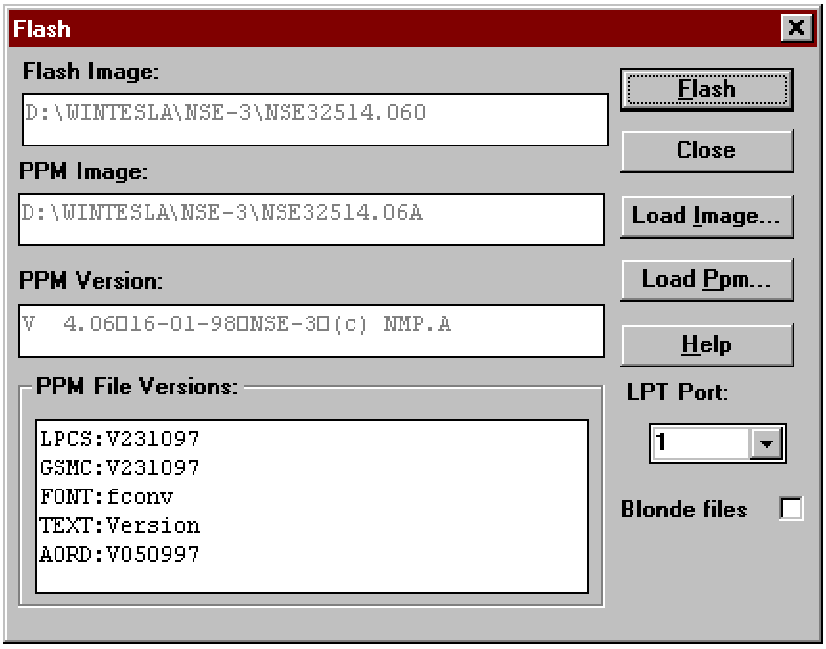
Cancel button (ESC):

Closes the dialog box and *does not* write HW version to ME.

Flash Phone... command

Activation	Status Bar Text
Alt, S,F	Open service Numbers dialog box

This command is used for flashing new software into the phone. Function opens the following **Flash** dialog box. When flashing is started, waiting windows is showed which tells the user approximated flashing time.



Dialog mode: **modal**

Flash dialog box has following items:

Flash Image edit field (read only):

Displays path of image file to be flashed.

PPM Image edit field (read only):

Displays path of PPM package file to be flashed.

PPM Version edit field (read only):

MCU SW version string of the PPM package.

PPM File Versions edit field (read only):

Lists the file versions of PPM package.

Flash button (ALT+L):

Starts flashing of selected file to phone. Before flashing asks, does user want to save all user settings to file (and load them after flashing). If reading user settings to ME or writing them to ME failed, Restore Default User Settings dialog is opened and user can restore default settngs to phone. See **Error! Reference source not found. Error! Reference source not found.**.

Load Image button (ALT+I):

Opens Open File dialog, with which user can select a image file to be flashed to ME. If user selects OK button, the name of selected file is copied to Flash Image edit field.

Load Ppm button (ALT+P):

Opens Open File dialog, with which user can select a PPM package file to be flashed to ME. If user selects OK button, the name of selected file is copied to PPM Image edit field.

LPT Port list box:

User can select parallel port to be used when flashed.

Blonde check box:

When control is checked, application searches from file **blonde.ini** for section corresponding product and HW version (e.g *[NSE–3_2304]*). If section is found and contains entries Ppm and Image, those files are loaded for flashing.

[NSE–3_2502]

Ppm=*ppm_file_path*

Image=*image_file_path*

Blonde settings are checked when dialog is opened and check box status tells, is there blonde settings for current phone.

Notice: if user wants to load other files than succested in blonde.ini file, then Blonde files check box must be unchecked.

Close button (ESC):

Closes the dialog box and *does not* start flashing.

During flashing status dialog is showed. After phone is flashed current time in PC is set to phone and user is asked to check that the time is correct.

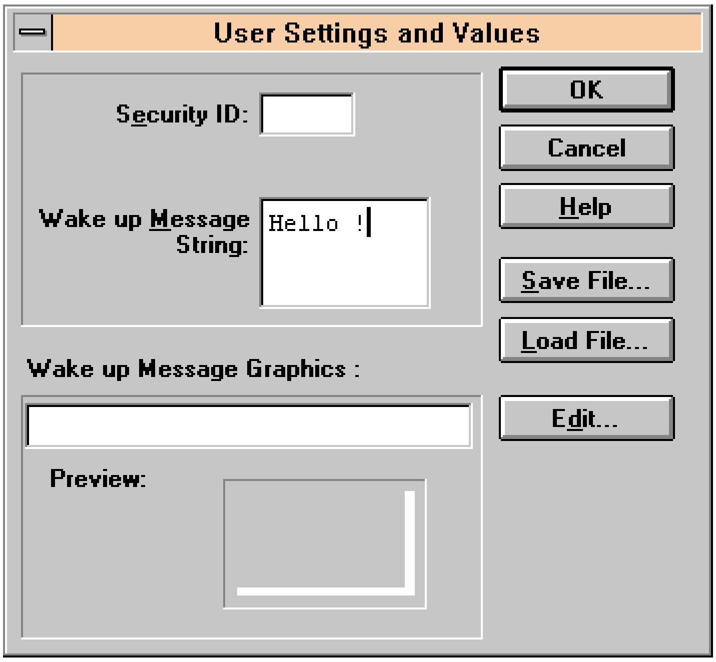
Dealer

The dealer sub menu offers functions for ME settings for dealers.

User Settings... command

Activation	Status Bar Text
Alt, D,U	Open User Setting dialog box

This command is used to edit user settings.



Dialog mode: **modal**

User Settings dialog box has following items:

Save File... button (ALT+S):

User can save user settings to file.

Load File button (ALT+L):

User can load user settings from file.

Edit... button (ALT+D):

Start Windows Paintbrush to edit loaded or saved graphical Wake up message.

Preview picture:

Shows graphical Wake up message.

Ok button (ENTER):

Writes user settings to phone.

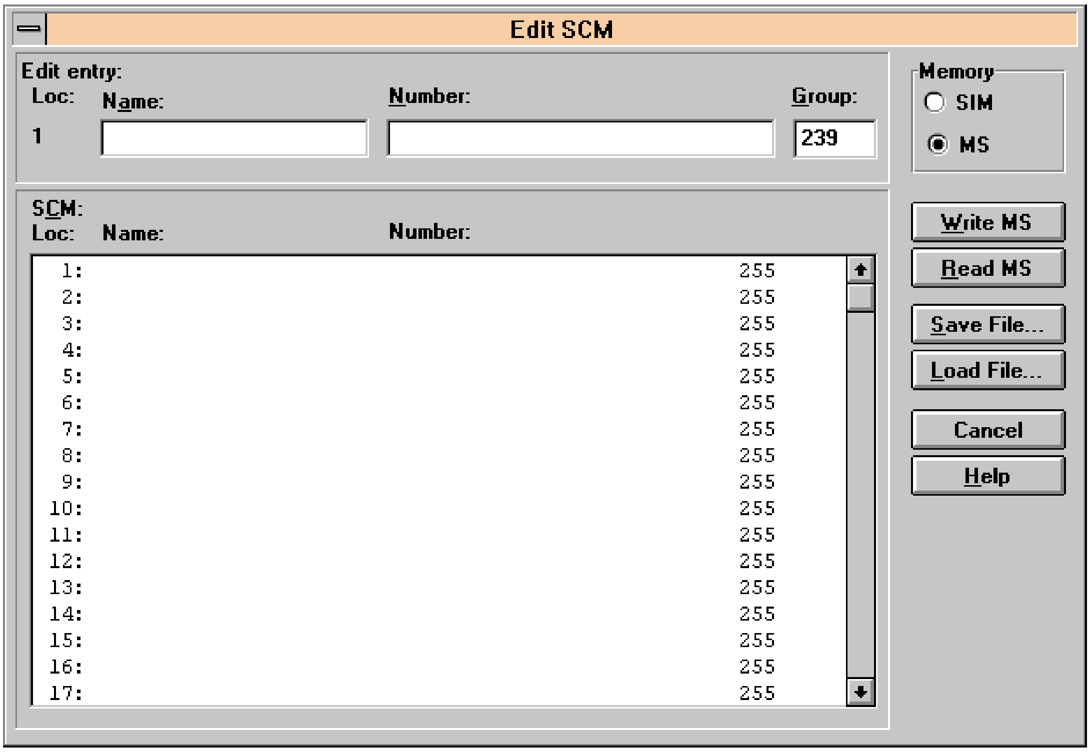
Cancel button (ESC):

Closes the dialog box

Short Code Memory... command

Activation	Status Bar Text
Alt, S,C	Open Edit SCM dialog box.

This command is used for reading, storing and modifying the SIM/ME SCM values. Function opens the following Edit SCM dialog:



Dialog mode: **modal**

Edit SCM dialog has the following items:

Loc static text:

Display current location.

Name edit box (ALT+A):

Edit the Name.

Number edit box (ALT+N):

Edit the Number.

Group edit box:

Edit the Group number.

SCM list box (ALT+C):

List for available names and numbers.

Write button (ALT+W):

Write SCM values to phone and checks the validity of names and numbers.

Read button (ALT+R):

Read SCM values from phone.

Save File... button (ALT+S):

Opens a default Windows **File Save As** dialog and asks filename where to save SCM values.

Load File... button (ALT+L):

Opens a default Windows **File Open** dialog and asks filename where from load SCM values. Checks the validity of names and numbers.

Memory group box selection:

SCM memory can be defined to ME or SIM.

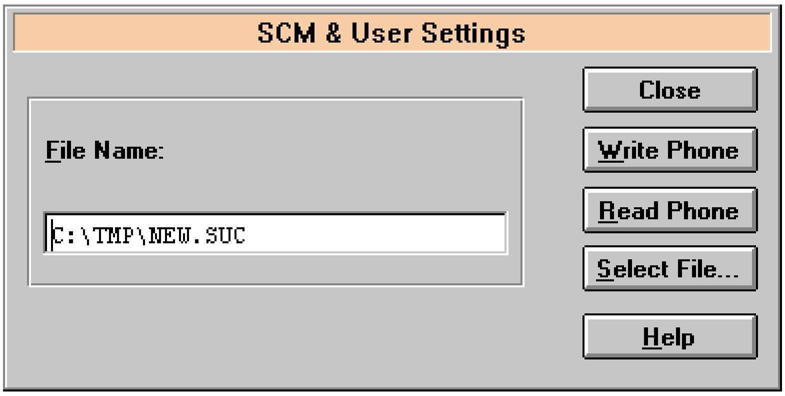
When all values are sent and responses received, waiting window is removed and **Edit SCM** is back in control. The waiting state can be broken with **Cancel** (ESC) button. If writing to the ME is broken, only part of the SCM entries in the ME may be changed.

SCM & User Settings... command

Activation	Status Bar Text
Alt, D,M	Open SCM & User settings dialog box.

This command is used to get SCM and user settings from phone to file and vice versa. Following information is loaded/saved with this dialog: all user settings, graphical/text wake up message, SCM, alarms, calendar items and CLI logos and groups

When data is written or read phone waiting dialog is showed to user.



Dialog mode: **modal**

SCM & User Settings dialog box has following items:

File Name edit field (ALT+F):

User can edit file name or select file with Open File dialog. When dialog is opened, it contains name of the previously saved or loaded file.

Write Phone button (ALT+W):

Loads settings from file and writes them to phone.

Read Phone button (ALT+R):

Reads settings from phone and writes them to file.

Select File button (ALT+S):

Opens Open File dialog, with which user can select the file, that contains the data to be loaded to ME or file to which data is saved from ME. If user selects OK button, the name of selected file is copied to File Name edit field.

Close button (ESC):

Closes the dialog box.

Set UI/DEV Default Values... command

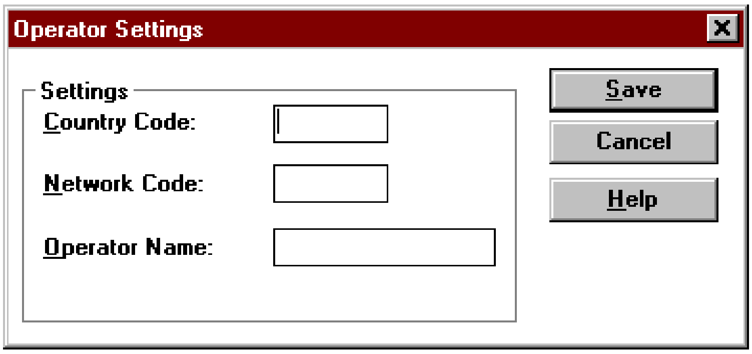
Activation	Status Bar Text
Alt, D,V	Reset phone to UI and SCM factory settings

After selection application asks confirmation: “Are you sure you want to set UI/DEV to factory settings?”. If Yes is answered, default settings are resetted to phone.

Operators Settings... command

Activation	Status Bar Text
Alt, D,O	Open Operator Settings dialog.

This command is used to set operator settings This selection opens following **Operator Settinngs** dialog.



Dialog mode: **modal**

Operator Settings dialog box has following items:

Settings group:

Country Code edit box (ALT+C):

User can edit country code.

Nerwork Code edit box (ALT+N):

User can edit network code.

Operator Name edit box (ALT+O):

User can edit operator name.

Save button (ALT+S):

Saves settings to phone and closes dialog..

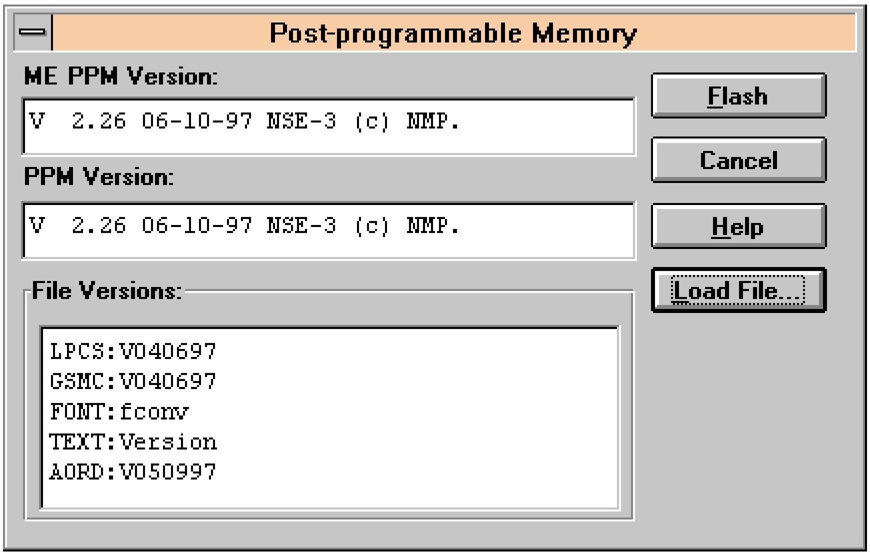
Cancel button (ESC):

Closes the dialog box and do not save settings to phone.

Post–programmable Memory... command

Activation	Status Bar Text
Alt, D,P	Open Post–programmable Memory dialog box.

This command is used to load PPM from file to phone. Application checks version numbers of PPM package and ME, when file is loaded.



Dialog mode: **modal**

Post–programmable Memory dialog box has following items:

ME Version edit box (read only):

Shows MCU SW version string of connected phone.

PPM Version edit box (read only):

Shows MCU SW version string of PPM package.

File Versions static text:

Lists following file versions from the PPM package: Text fonts, ringing tones, display texts and operator data.

Flash button (ALT+S):

Flashes PPM–package to phone. Button is disabled, if MCU SW versions of ME and PPM package differ.

Cancel button (ESC):

Closes dialog..

Load File... button (ALT+L):

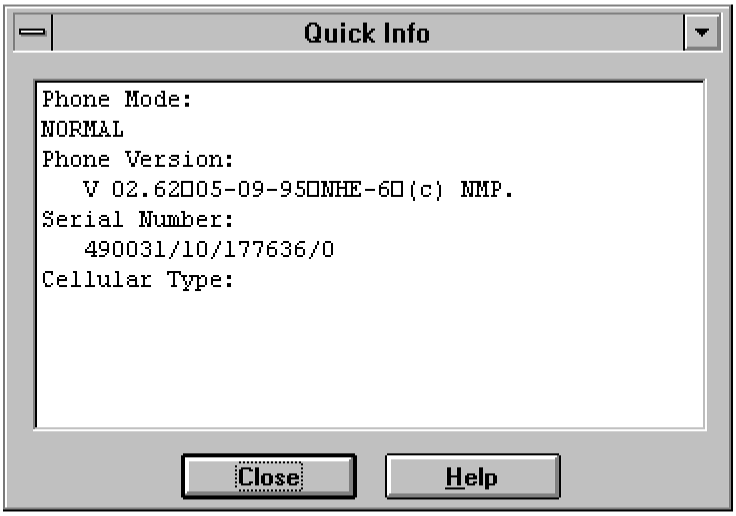
Opens Open File dialog, with which user can select the file, that contains the PPM package.

View

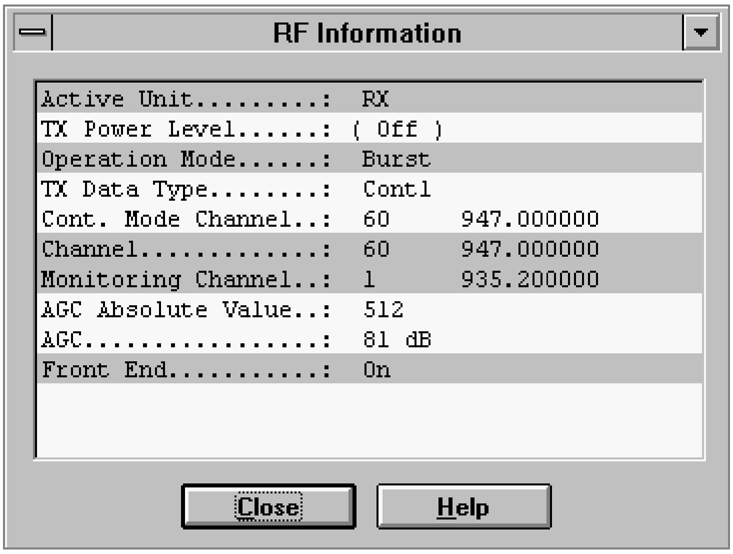
Quick/RF Info... command

Activation	Status Bar Text
Alt, V,Q	View Quick/RF information.

If phone is in *normal* mode following **Quick Info** is shown:



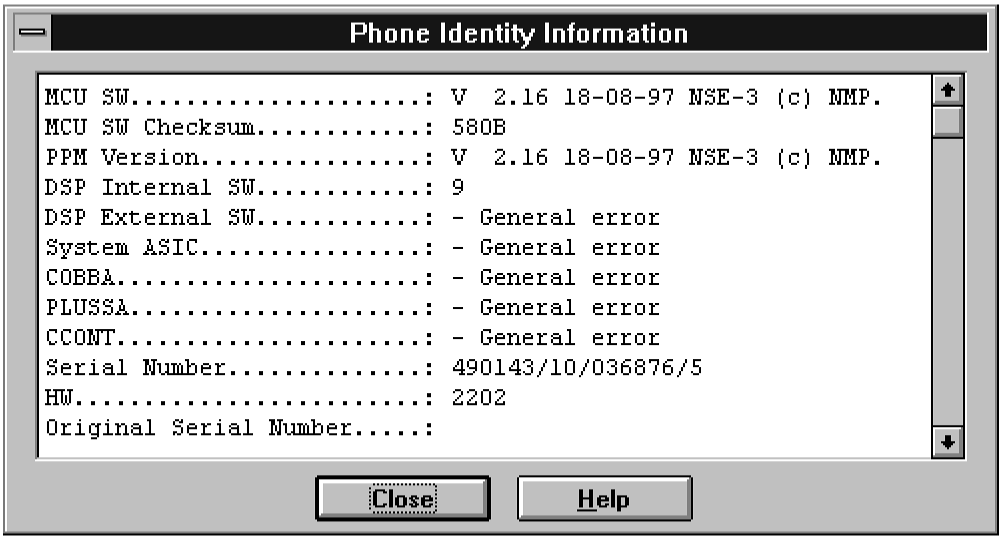
If phone is in local mode following **RF Information** is shown. Information is shown in a modeless dialog which may be left open during other operations. It is also updated when ever needed.



Phone Identity... command

Activation	Status Bar Text
Alt, V,P	View Phone Identity.

Command opens **Phone Identity Information** dialog, which shows identification information. Information is shown in a modeless dialog which may be left open during other operations. It is also updated when ever needed.



The After Sales Software has an initialisation file which has extension .INI. Initialisation file is TESLA.INI which includes all next selections (on mentioned menus or dialogs) and parameters:

RF Controls dialog ([NSB/E/K–3RF])

Active Unit (Active Unit=)

TX Power Level (TX Power Level=)

Operation Mode (Operation Mode=)

TX Data Type (TX Data Type=)

Continuous Mode Channel (Cont Mode Channel=)

Channel (Channel=)

Monitoring Channel 1 (MonitoringChannel=)

AGC dB value (AGC=)

- AGC Absolute Value (AGCAbsolute=)
- Front End (FrontEnd=)

Call Simulation dialog ([NSB/E/K–3CALLSIM])

Monitoring Channel 2 (Monitoring Channel 2 =)

Monitoring Channel 3 (Monitoring Channel 3 =)

Monitoring Channel 4 (Monitoring Channel 4 =)

Monitoring Channel 5 (Monitoring Channel 5 =)

Monitoring Channel 6 (Monitoring Channel 6 =)

All selections and parameters which are not same as in the RF Controls menu.

TX Power Tuning dialog ([TX Power Tuning])

TX power coefficients

TX I/Q Tuning dialog ([TX I/Q Tuning])

TX I/Q

Appendix 1, Vocabulary

Abreviation	Description
ASIC	Custom circuit which for instance controls communication between MCU and DSP
BBD–3	Service battery
CLF	Common Look and Feel
CLI	Calling Line Identification
COBBA	Common Base Band Analog
DATA	DATA interface module
DAU–9S/P	MBUS/FBUS cable
DLL	Dynamic Link Library
DSP	Digital Signal Processor which controls radio interface and speech coding/decoding
EEPROM	Memory for adjustment parameters (Electrically Erasable and Programmable Read Only Memory)
FBUS	Fast serial bus
IMEI	International Mobile Equipment Identification code
IR	Infra Red transmitter
M2BUS	Serial communication bus which can be connected to accessory devices and test PC
MCU	Master Control Unit processor
MDI	MCU DSP Interface; message interface via ASIC registers
ME	Mobile Equipment
MODAL (dialog box)	A modal dialog box requires the user to complete interaction within a dialog box, and close it before continuing with any further interaction outside the window.
MODELESS (dialog Box)	A modeless dialog box allows the user to interact with other windows and applications.
MS	Mobile Station

PC	IBM PS/AT or compatible personal computer
PCI	Phone Controlling Interface SW for PC
PKD–1/1NS/1CS	Hardware protection key (DESKEY DK2) for protecting service software from illegal copying. The software will not work without this key !
RF	Radio Frequency parts
RTC	Real Time Clock
SW	Software
TDF–4	Flash security box
UI	User Interface

Tuning Instructions

CONTENTS

Tuning Instructions

General

All tuning operations of the NSE–1 are carried out using the service software. The service software turns the phone into the locals mode, in which the phone can be outwardly controlled via the MBUS interface.

Tuning is based on the software communicating with the D/A and A/D converters of the phone. In some instances the phone processor will also calculate the required correction parameter.

The tuning values of the phone reside on the EEPROM. The contents of the EEPROM can be read by the service software and saved as a file. This is advisable when there is need to retain that information, e.g. in view of replacement of the circuit. The program also enables writing the default parameters on the EEPROM, in which case all tuning steps should be carried out.

During tuning, proceed as follows:

- Take care not to damage sensitive measuring instruments with excessive RF power.
- Carry out all tuning steps in the shortest possible time to avoid excessive heating of RF units.
- Perform all tuning steps in the order presented.
- Never try to mask a fault by tuning it out!

Required Equipment

- PC/AT computer with service software; see separate section for instructions on installation and use.
- Service accessories; see equipment setup pictures.
- Multimeter or DVM.
- GSM radio telephone test station or separate measuring equipment as follows:
  - RF generator
  - pulse power meter
  - spectrum analyzer
  - attenuator and branching unit

Equipment Setup

Caution: Make sure that you have switched off the PC and the printer before making connections !

Caution: Do not connect the PKD–1 key to the serial port. You may damage your PKD–1 !

Attach the protection key PKD–1 to parallel port one (25–pin female D–connector) of the PC. When connecting the PKD–1 to the parallel port be sure that you insert the PC end of the PKD–1 to the PC (male side). If you use a printer on parallel port one, place the PKD–1 between the PC and your printer cable.

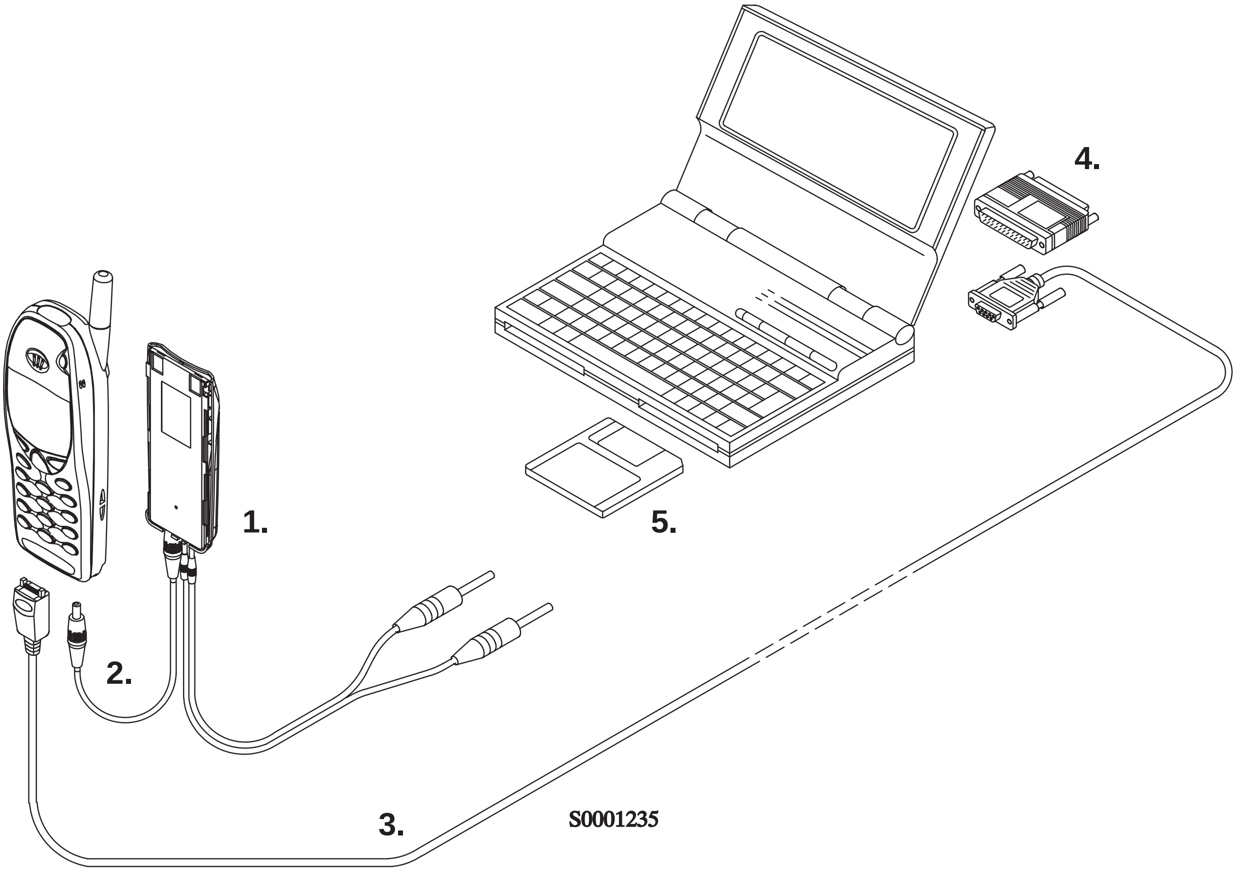
Next connect the M2BUS service cable, DAU–9P, to the serial port (RS–232) of the computer. Attach one end of the service cable to the PC serial port and the other end to the service box, JBA–4. For servicing the phone with the covers in place the service box should always be used.

When the phone covers are removed the jigs should be used.

For audio measurements connect the audio cable, ADS–1, as follows:

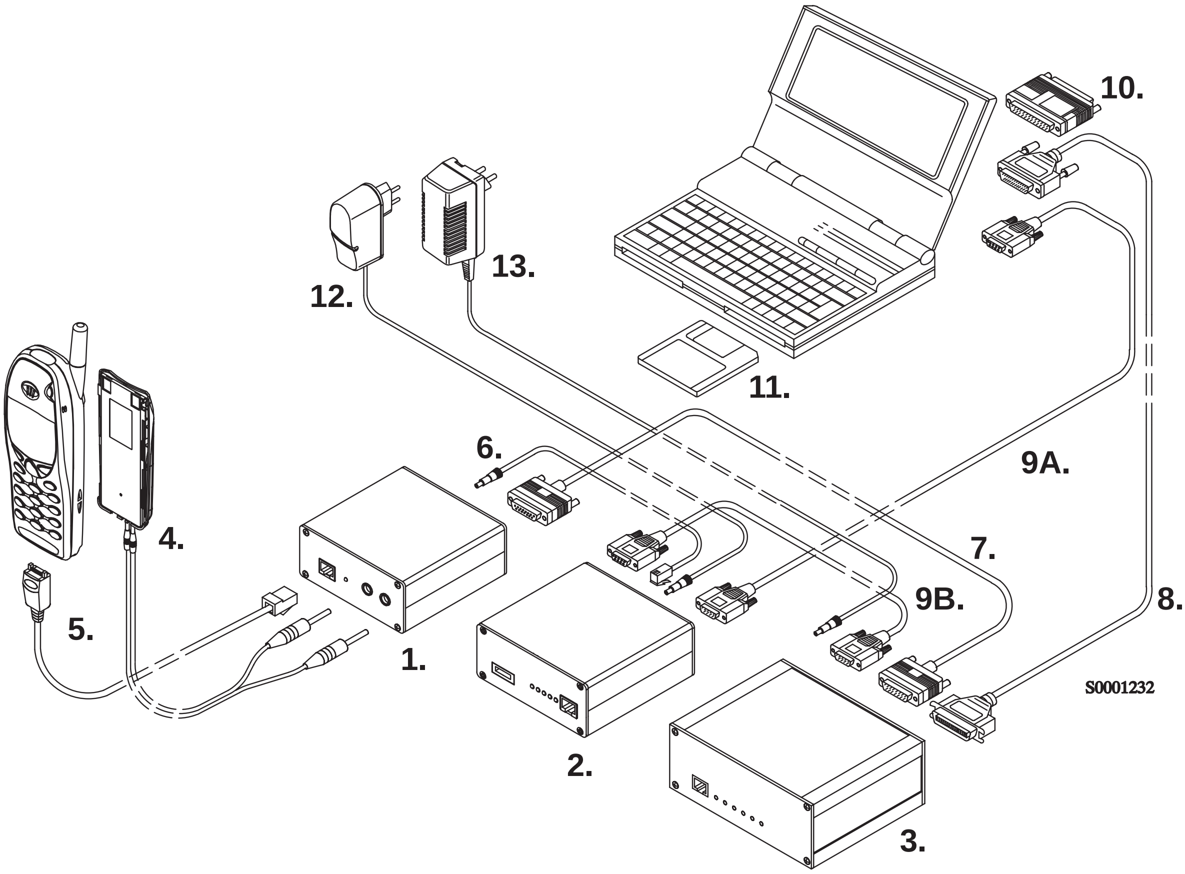
– EAR line to AF INPUT of test equipment
– MIC line to MOD GEN OUTPUT of test equipment

Equipment Setup for Tuning a Phone without Removing Covers



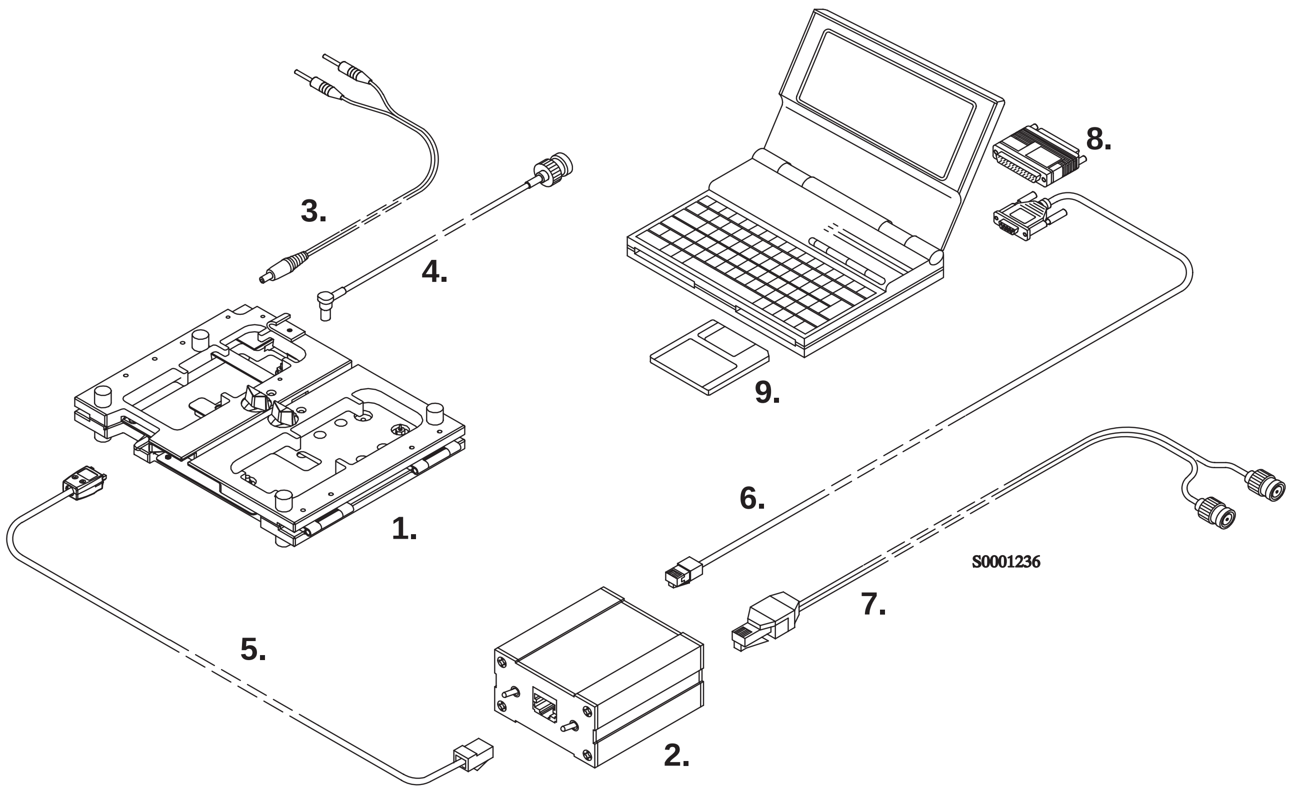
Item:	Service accessory:	Product code:
1	Service Battery BBD–3	0775071
2	DC Cable SCB–3	0730114
3	Service MBUS Cable DAU–9P	0730109
4	Software protection key PKD–1	0750018
5	Service SW diskette 3.5”	0774080

Flash Concept for NSE–1



Item:	Service accessory:	Product code:
1	Flash Loading Adapter FLA–5	0080178
2	Flash Security Box TDF–4	0770106
3	Prommer FPS–4S	0085095
4	Service Battery BBD–3	0775071
5	Service Cable SCH–5	0730098
6	DC Cable PCC–1B	0730053
7	D15 – D15 Cable AXS–5 (Included in FLA–5 sales pack)	0730091
8	Printer Cable (Included in FPS–4 sales pack)	0730029
9A	D9 – D9 Cable AXS–4 (Included in FPS–4 sales pack)	0730090
9B	D9 – D9 Cable AXS–4	0730090
10	Software protection key PKD–1	0750018
11	Service SW diskette 3.5”	0774080
12	Travel Charger ACH–6E (Euro)	0270381
	Travel Charger ACH–6U (USA/Japan)	0270382
	Travel Charger ACH–6X (UK)	0270380
13	AC Charger ACL–3E (Included in FPS–4 sales pack)	0680015

Tuning With Covers Off – Using Test–frame JBS–19

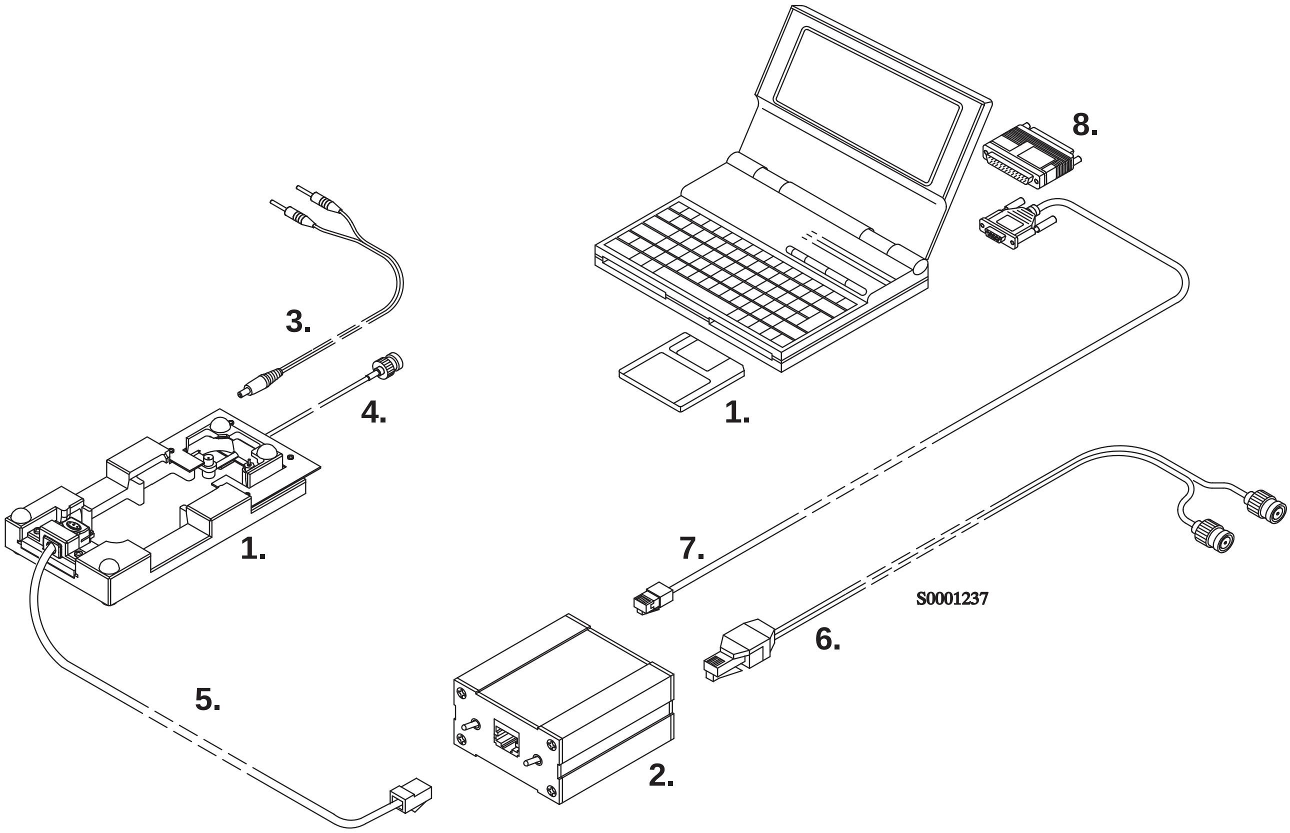


Item:	Service accessory:	Product code:
1	Module Jig JBS–19 *	0770098
2	Service Audio Box JBA–4 **	0770094
3	DC Cable PCS–1	0730012
4	External Antenna Cable XRC–1B	0730128
5	Service Cable SCH–5 **	0730098
6	Service MBUS Cable DAU–9S **	0730108
7	Audio Cable ADS–1	0730011
8	Software Protection Key PKD–1	0750018
9	Service SW diskette 3.5”	0774080

*) The nominal operating voltage for JBS–19 is 3.6 V.
The supply voltage for JBS–19 must never exceed 5.0 V

**) SCH–5, JBA–4, and DAU–9S can be replaced with DAU–9P

Tuning With Covers Off – using Light Jig JBT–1

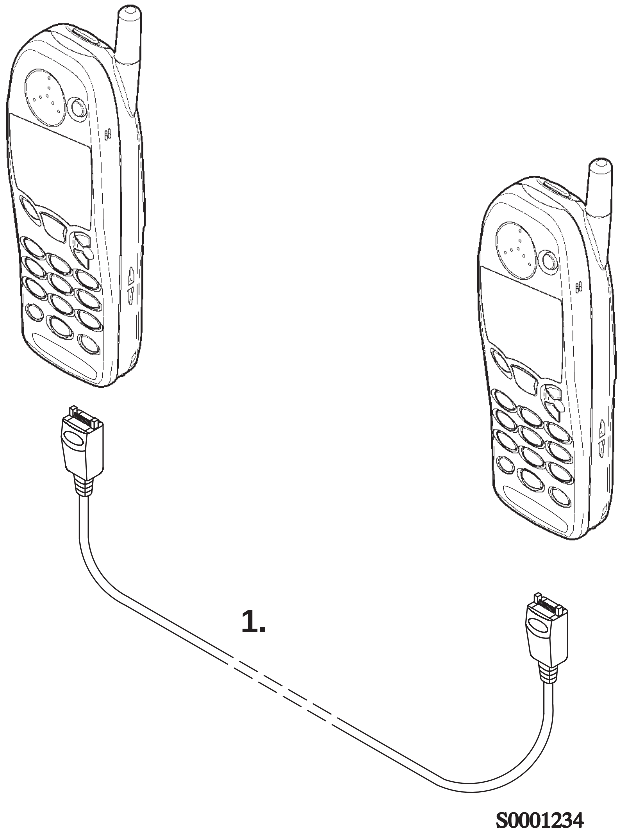


Item:	Service accessory:	Product code:
1	Light Module Jig JBT–1 *	0770109
2	Service Audio Box JBA–4 **	0770094
3	DC Cable PCS–1	0730012
4	External Antenna Cable XRC–1B	0730128
5	Service Cable SCH–5 **	0730098
6	Audio Cable ADS–1	0730011
7	Service MBUS Cable DAU–9S **	0730108
8	Software Protection Key PKD–1	0750018
9	Service SW diskette 3.5”	0774080

*) The nominal operating voltage for JBT–1 is 3.6 V.
The supply voltage for JBT–1 must never exceed 5.0 V

**) SCH–5, JBA–4, and DAU–9S can be replaced with DAU–9P

Warranty Transfer



Item:	Service accessory:	Product code:
1	Warranty Cable SCH–6	0730099

Tuning Steps

1. RX Calibration (AGC + AFC)

Reference values for the received signal strength meter are program tuned.

RSSI reference signal level programming:

- Select *Tuning –> RX Calibration*
- Connect RF generator to antenna connector at 947.067710 MHz.
- Adjust signal generator level to –55 dBm + cable attenuation.
- Press *OK* button
- Adjust signal generator level to –80 dBm + cable attenuation.
- Press *OK* button.

Service software reports:

A Table of AFC Parameters:

AFC INIT Value
AFC Slope
PSW Slope

A Table for AGC Calibration:

AGC in 3 db steps 0...57 dB
DAC and voltage reading for each gain value

- Press *SAVE* button

2. I/Q Modulator Amplitude Balance and Phase Shift Tuning

The purpose of this tuning operation is to adjust the I/Q modulator d.c. offsets and the I/Q modulator amplitude balance and phase shift.

I/Q modulator d.c. offsets, amplitude balance and phase shift tuning:

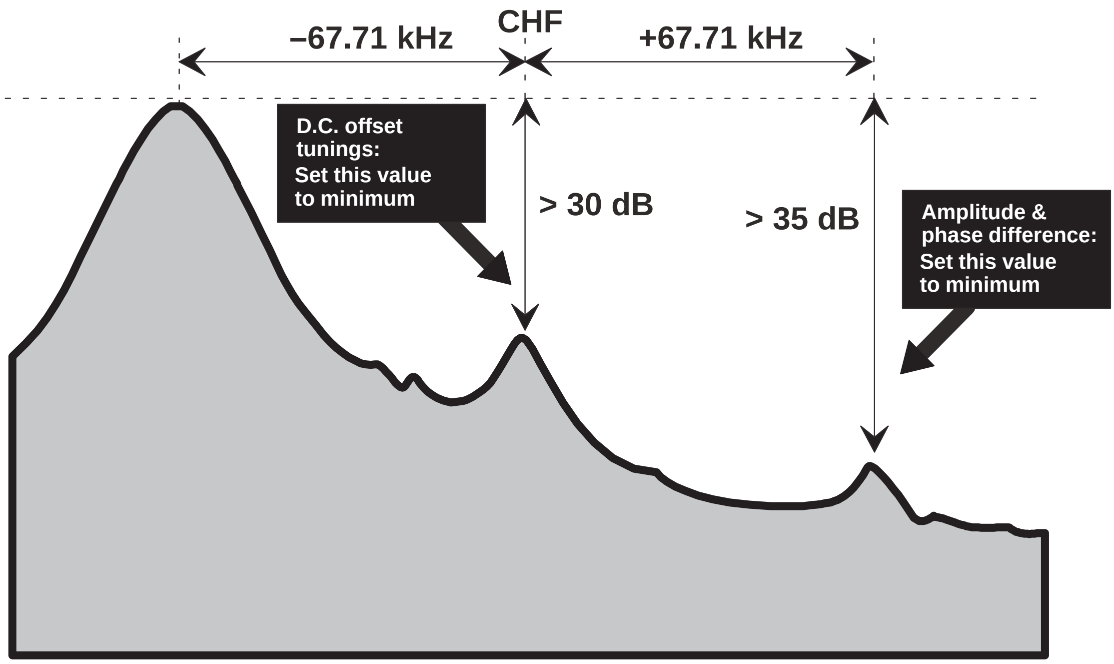
– Select *Tuning –> TX I/Q...*

– Select I/Q tuning values from PC's memory, phone's EEPROM or factory default values.

– Connect spectrum analyzer (with attenuator if needed) to phone antenna connector.

– Check that TX power level is level 10, channel is 60 and TX data type is 1.

– Adjust spectrum analyzer centre frequency to 902 MHz, Span 200 kHz, Res BW 10 kHz, Video BW 1 kHz and Sweep time 0.5 s.



– Select the ”TX I d.c. offset” option.

– Adjust the level of centre frequency (CHF signal) to minimum by varying D/A converter value with <– and –> buttons.

– The amplitude difference between CHF–67.7 kHz and CHF should be >30 dB.

– Select option ”TX Q d.c. offset”.

– Adjust the level of signal CHF to minimum by varying D/A converter value with <– and –> keys.

– Use the ”Amplitude Difference” option.
– Adjust the level of signal CHF+67.7 kHz (902.06777 MHz) to minimum by varying D/A converter value with <– and –> keys.
– The amplitude difference between CHF+67.7 kHz and CHF–67 kHz should be >35 dB.
– Select the ”Phase Difference” option.
– Adjust the level of signal CHF+67.7 kHz to minimum by varying D/A converter value with <– and –> keys.
– When values are correct press *SAVE* button.

3. Tuning of Transmitter Power Levels

This adjustment loads the power levels of the phone transmitter into the EEPROM. When doing this, a pulse power meter or spectrum analyzer must be used.

Power levels programming:

- Select *Tuning –> TX Power...*
- Select I/Q tuning values from PC's memory, phone's EEPROM or factory default values.
- Set power supply voltage 8.4 V to service battery (or 3.6 V to jig).
- Connect pulse power meter or spectrum analyzer to antenna connector.
- Check that channel is 60.
- Adjust the power level (levels 5, 15 and 19) by clicking the + and – buttons, and change levels with ↑ and ↓ keys.

Power level	**Tuning P_{OUT}/dBm (CH 60)**	**Tuning P_{OUT}/dBm (CH 60)**
	RFMA PA/UPS8R	Philips PA/UPS8S
5	32.5	32.5
15	13.0	13.0
19	7.0	5.5
Base	–20.0	–20.0

Note: If the base calculation feature is enabled, then the base level is calculated automatically.

- Press *Calculate* button to calculate all other levels.
- Once all TX levels are correct, press *SAVE* button.

4. Energy Management Calibration

– Select Tuning –> Energy Management Calibration
– Connect service battery to phone and dc cable between phone and service battery
– Set supply voltage to 10.5 V
– Run calibrations separately or all at once
– Select calibrations:

Battery & charger default values

– Select 1.Run Battery & charger default values checkbox

Battery voltage

– Select 2.Battery voltage checkbox

Charger voltage

– Select 3.Charger voltage checkbox

Battery size

– Select 4.Battery size checkbox

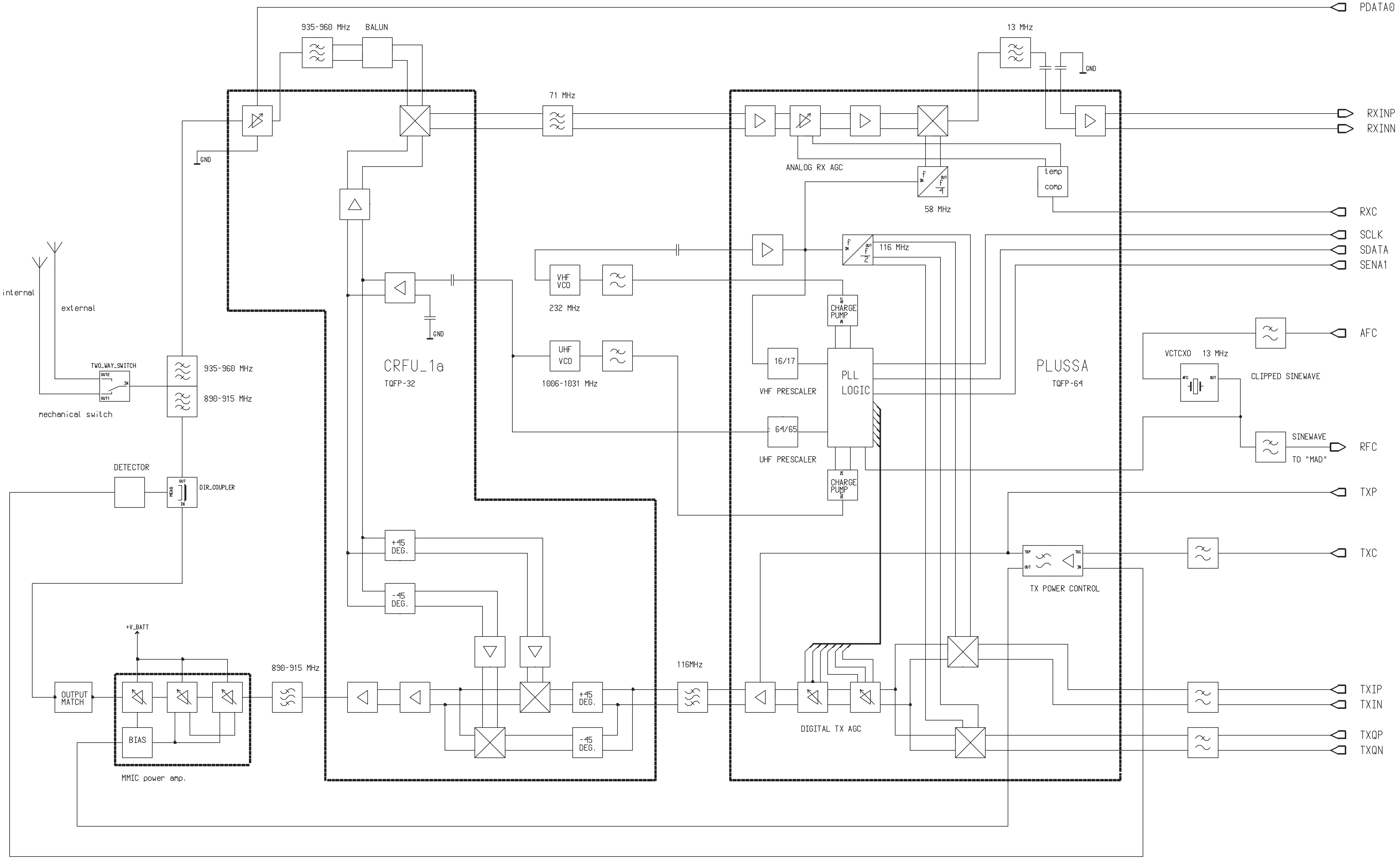
Battery temperature

– Select 5.Battery temperature checkbox

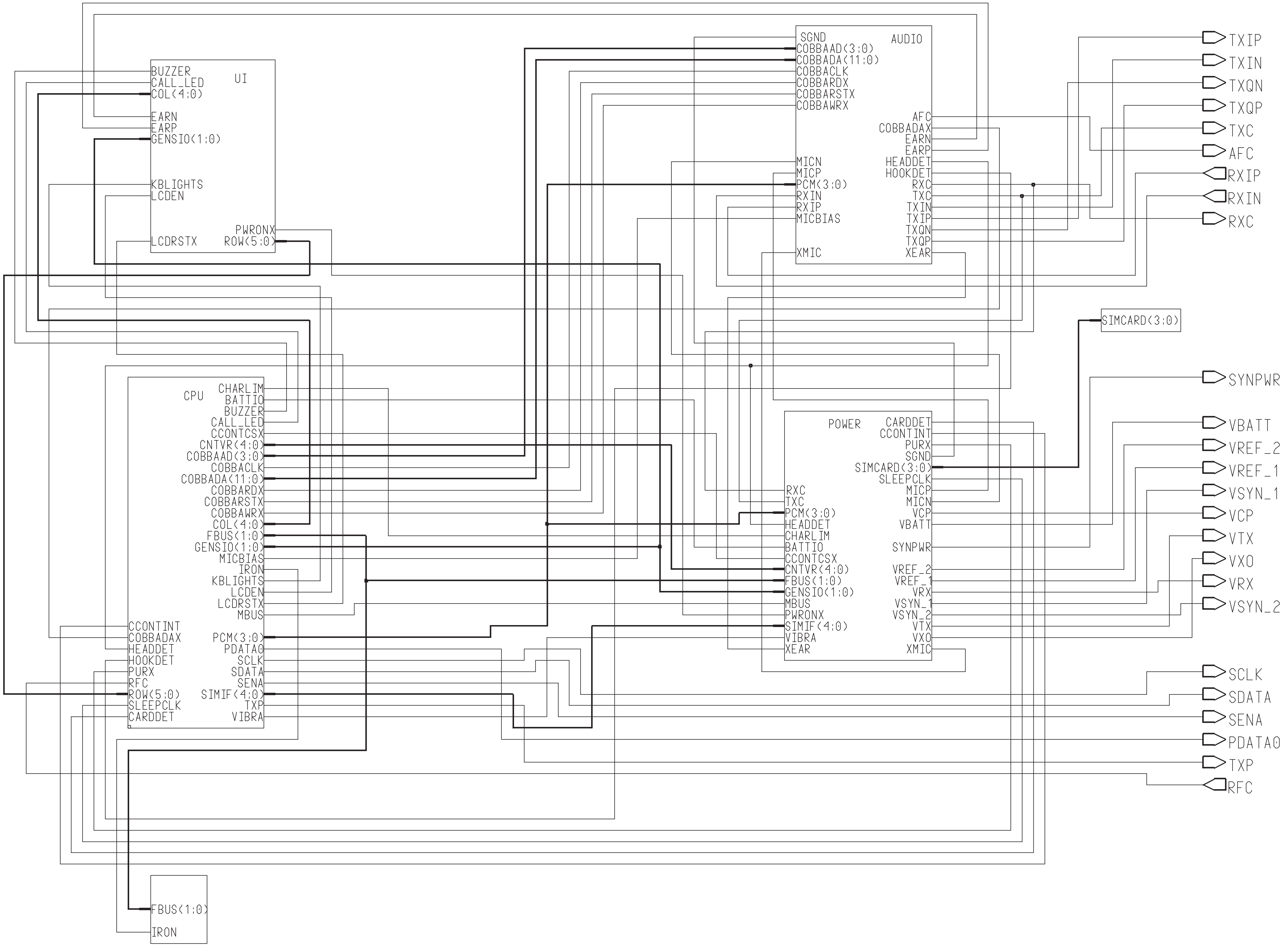
Charge current

– Select 6.Charge current
– Select Save without confirmation, if you don’t want confirm all the selected calibration values before saving
– Run calibrations by pressing Run button
– Set supply voltage back to 8.4 V

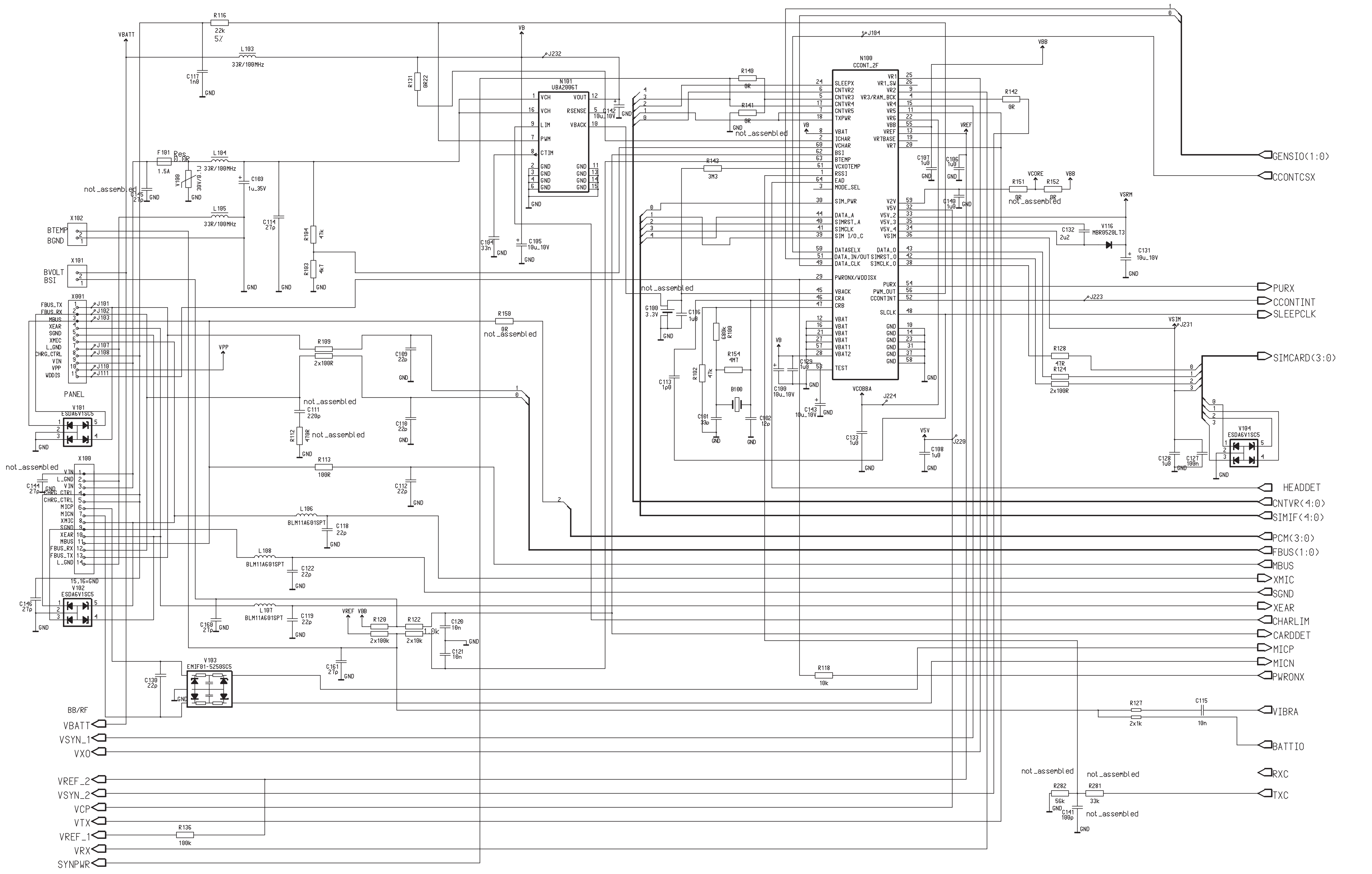
Block Diagram of System/RF Blocks



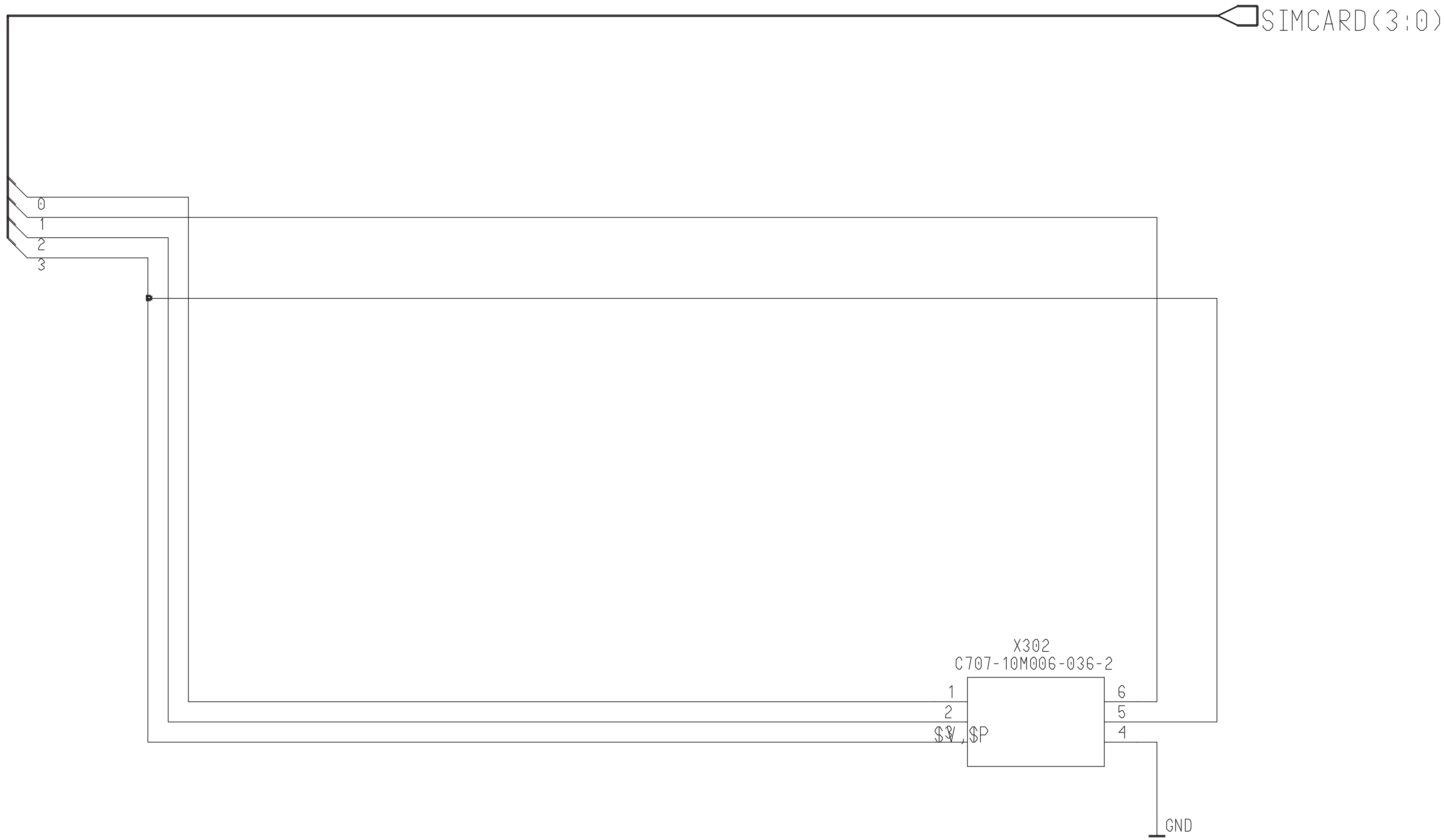
Circuit Diagram of Baseband (Version 15.1 Edit 4) for layout version 15



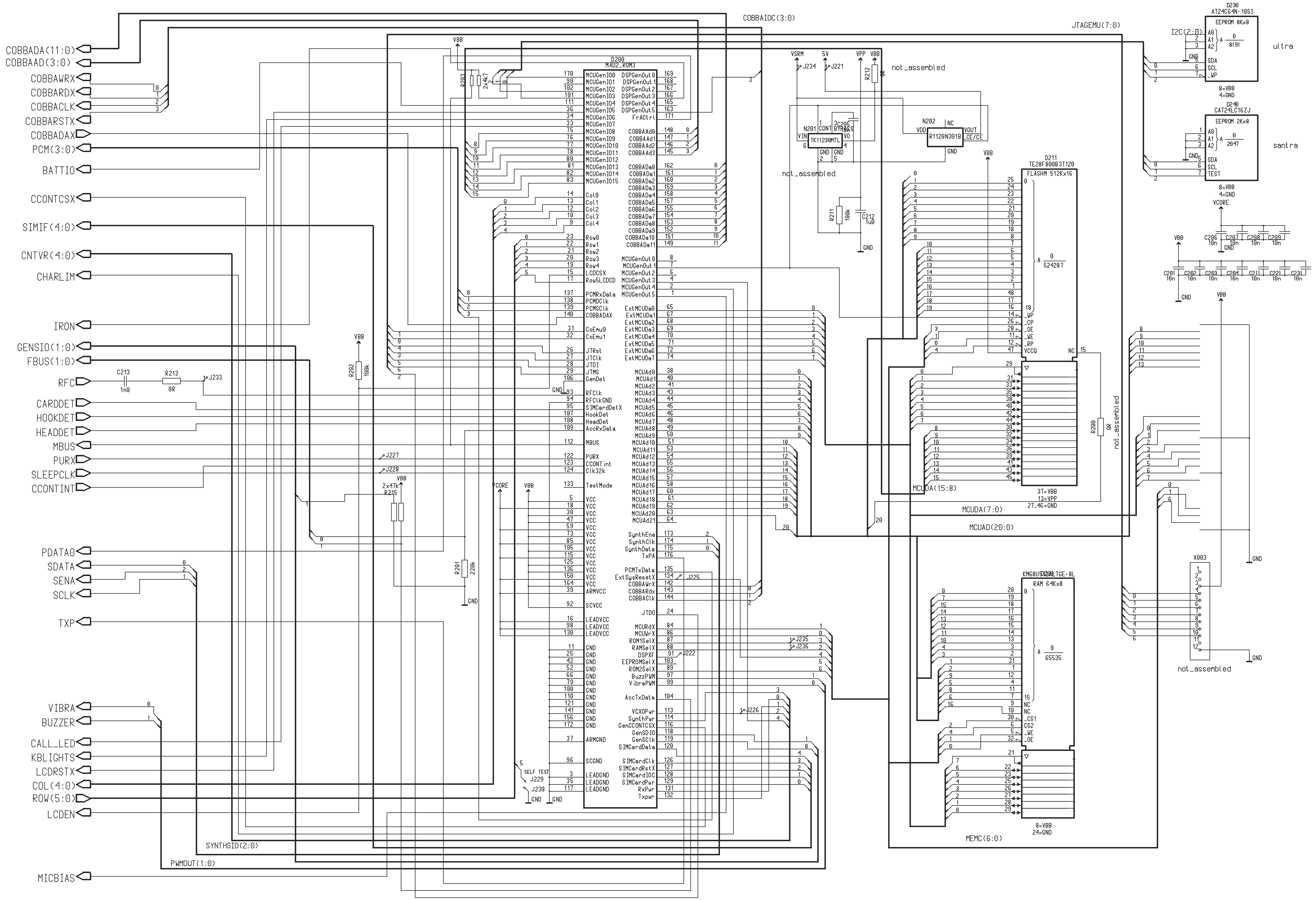
Circuit Diagram of Power Supply (Version 15.1 Edit 8) for layout version 15



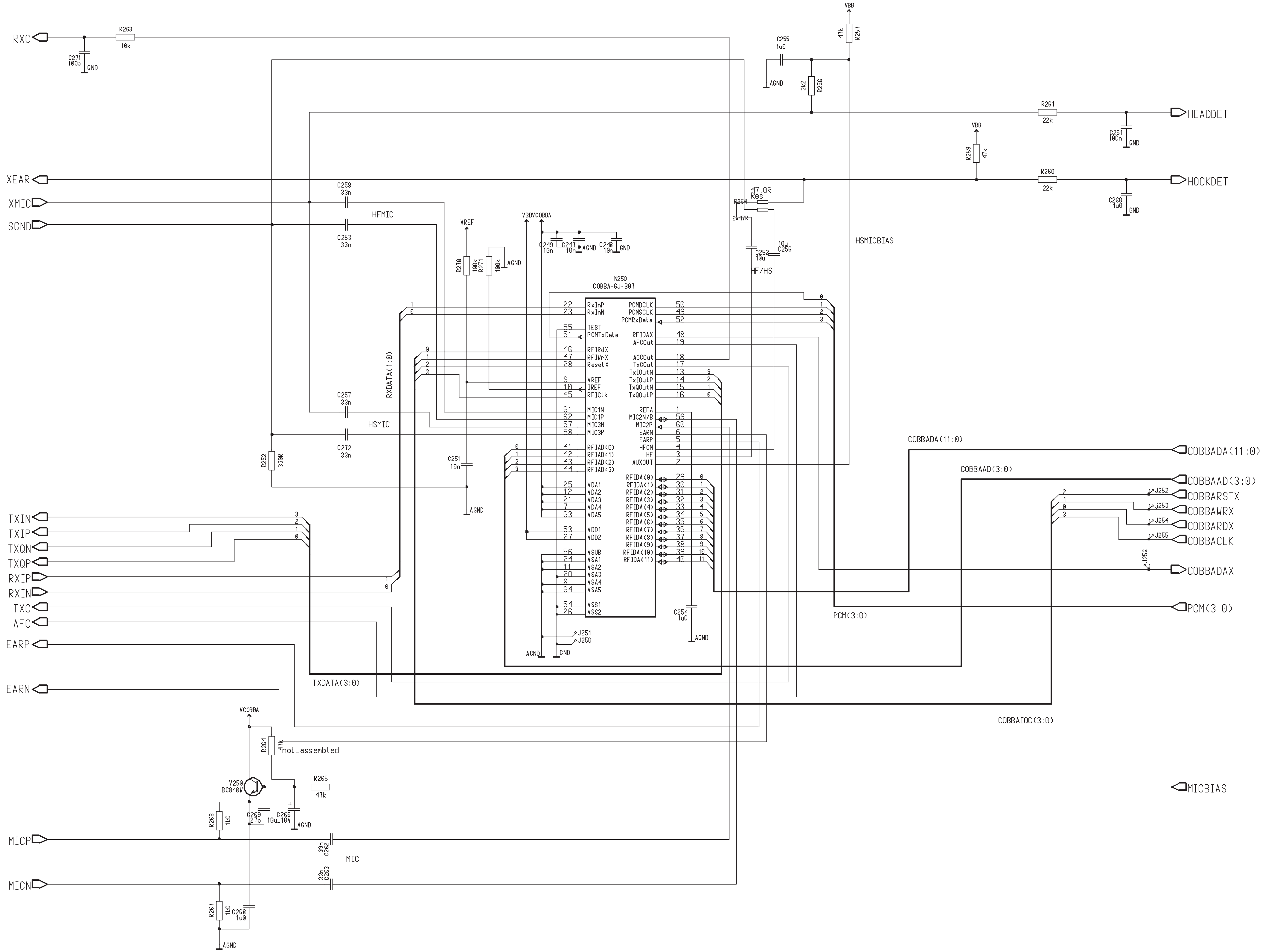
Circuit Diagram of SIM Connectors (Version 15.1 Edit 5) for layout version 15



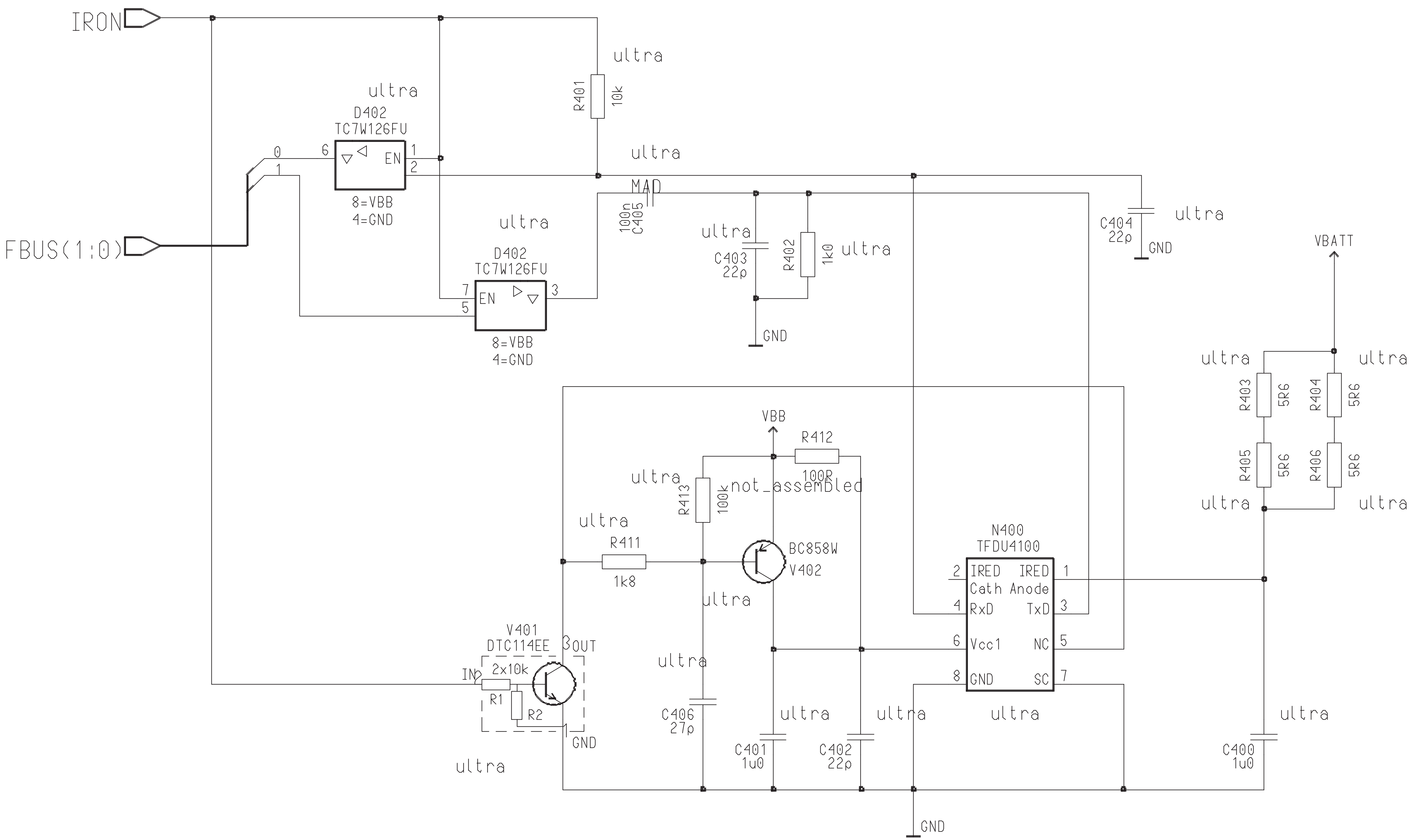
Circuit Diagram of CPU Block (Version 15.1 Edit 7) for layout version 15



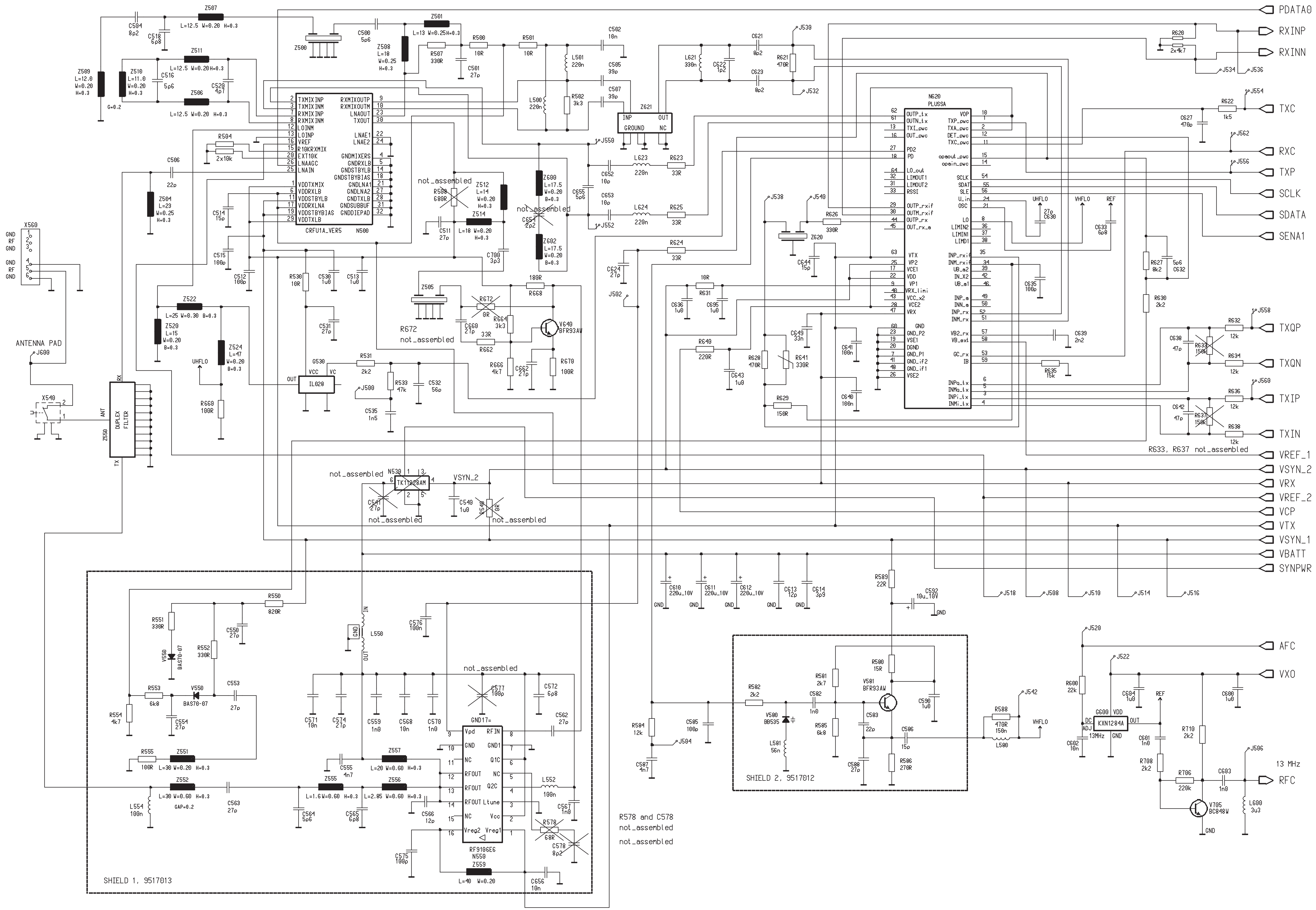
Circuit Diagram of Audio (Version 15 Edit 5) for layout version 15



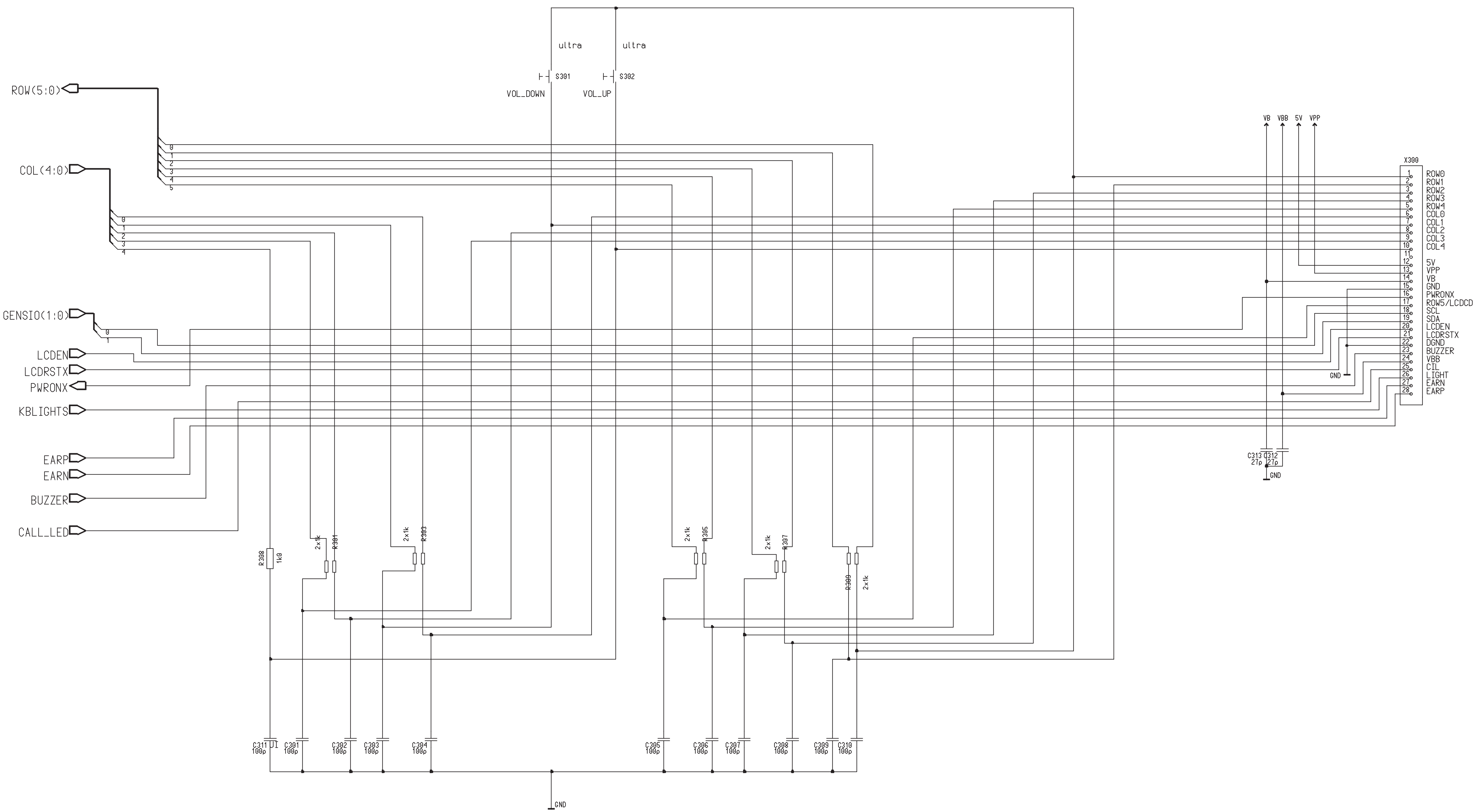
Circuit Diagram of IR Module (Version 15.1 Edit 10) for layout version 15



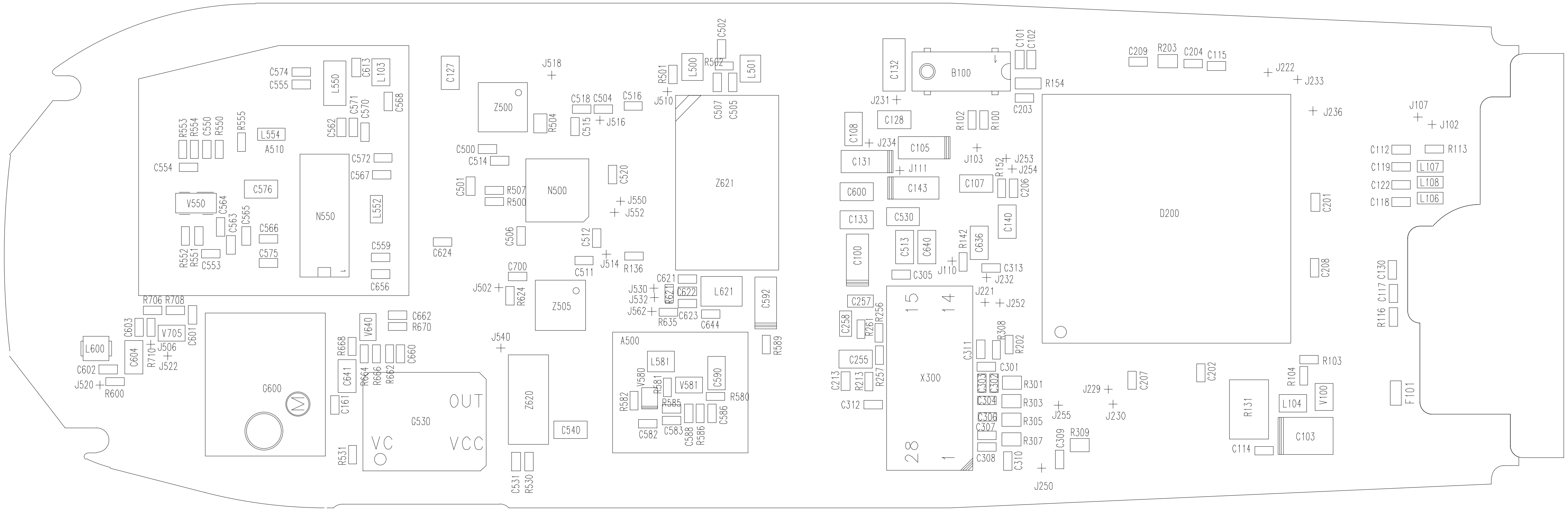
Circuit Diagram of RF Block (Version 15 Edit 8) for layout version 15



User Interface Connector (Version 15.1 Edit 5) for layout version 15



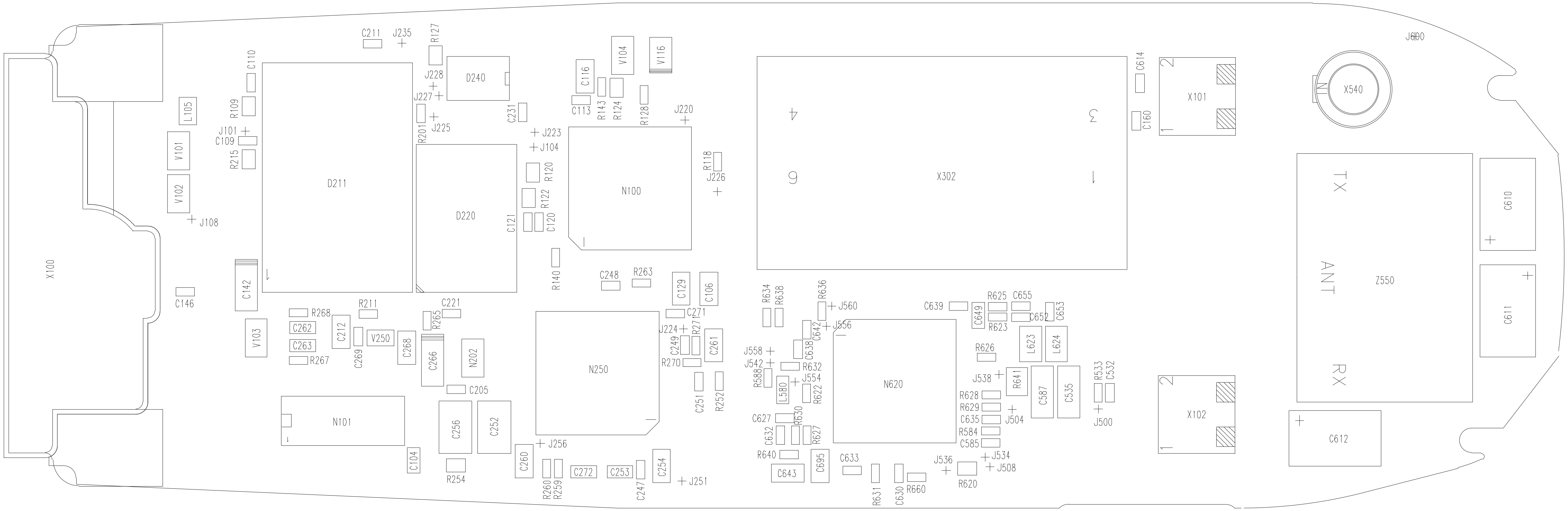
Layout Diagram of UP8R – Top (Version 15)



testpoint	name	condition	dc–level	ac–level
J102	FBUS_RX	power on	pulsed DC (0V/2.8V)	
J103	MBUS	power on	pulsed DC (0V/2.8V)	
J107	LGND		0V	
J110	VPP	flash programming	nominal 5V (5V flash) or 3.0V (3V flash)	
J111	WDDISX	power on	reset state 0V, normal state 2.8V	
J221	5V	flash programming	nominal 5.0V (5V flash) or 3.0V (3V flash)	
J222	DSPXF	power on	pulse active 0V, non–active 2.8V	
J229	MAD selftest	test mode set externally		
J230	MAD selftest	test mode set externally		
J231	VSIM	SIM power on	nominal 2.8V (3V SIM card) or 5.0V (5V SIM card)	
J232	VB (battery voltage in baseband)	battery connected	nominal 3.6V (min 3.0, max 4.2)	
J233	RFCLK	active state		typ. 1.0Vpp (min 0.5Vpp, max 2.0Vpp)
J234	VSRM	power on	nominal 5.5V (min 5V, max 6V)	CCONT switch mode regulator ripple voltage
J236	RAMSELX	active state	pulse active 0V, non–active 2.8V	
J250	GND		0V	
J252	COBBARSTX	power on	reset state 0V, normal state 2.8V	
J253	COBBAWRX	active state	pulse active 0V, non–active 2.8V	
J254	COBBARDX	active state	pulse active 0V, non–active 2.8V	
J255	COBBACLK	active state	pulsed DC (0V/2.8V)	

testpoint	name	condition	dc–level	ac–level
J502	Power control op.amp output voltage to N550 (Vpd, pin)	power level depended	pulsed DC	
J506	RFC (13 MHz sine-wave)		0 V	typ. 1.0 Vpp min 0.5/max 2.0 Vpp
J510	VRX (regulated supply for RX)		2.8 V min 2.7 / max 2.85 V, pulsed	
J514	VTX (regulated supply for TX)		2.8 V min 2.7 / max 2.85 V, pulsed	
J516	VSYN_1 (regulated supply for VCOs)		2.8 V min 2.7 / max 2.85 V	
J518	VREF_2 (ref. voltage for N500)		1.5 V +/– 1.5%	
J520	AFC (autom. freq. cntrl)		0 – 2.3 V, typ. 1.15 V (room temp.)	
J522	VXO (regulated supply for VCTCXO)		2.8 V min 2.7 / max 2.85 V	
J530 & J532	71 MHz IF input to N620	–95 dBm @ X540 (ext. RF connector)	typ. ca. 1.2 V pulsed	typ 100 – 140 uVpp balanced voltage at 71 MHz
J540	13 MHz output from N620 to Z620	–95 dBm @ X540 (ext. RF connector) RXC at level of full calibrated gain	typ. ca. 1.5 V pulsed	typ. ca. 700 uVrms
J550 & J552	116 MHz TX IF to N500		typ. ca. 1.1 – 1.2 V pulsed	typ. ca. 100 mVrms each
J562	RXC (receive gain control voltage)	RX gain setting depended	control range is 0.5 – 1.45 V, ,pulsed. typ. 1.3–1.4 V for calibrated maximum gain	

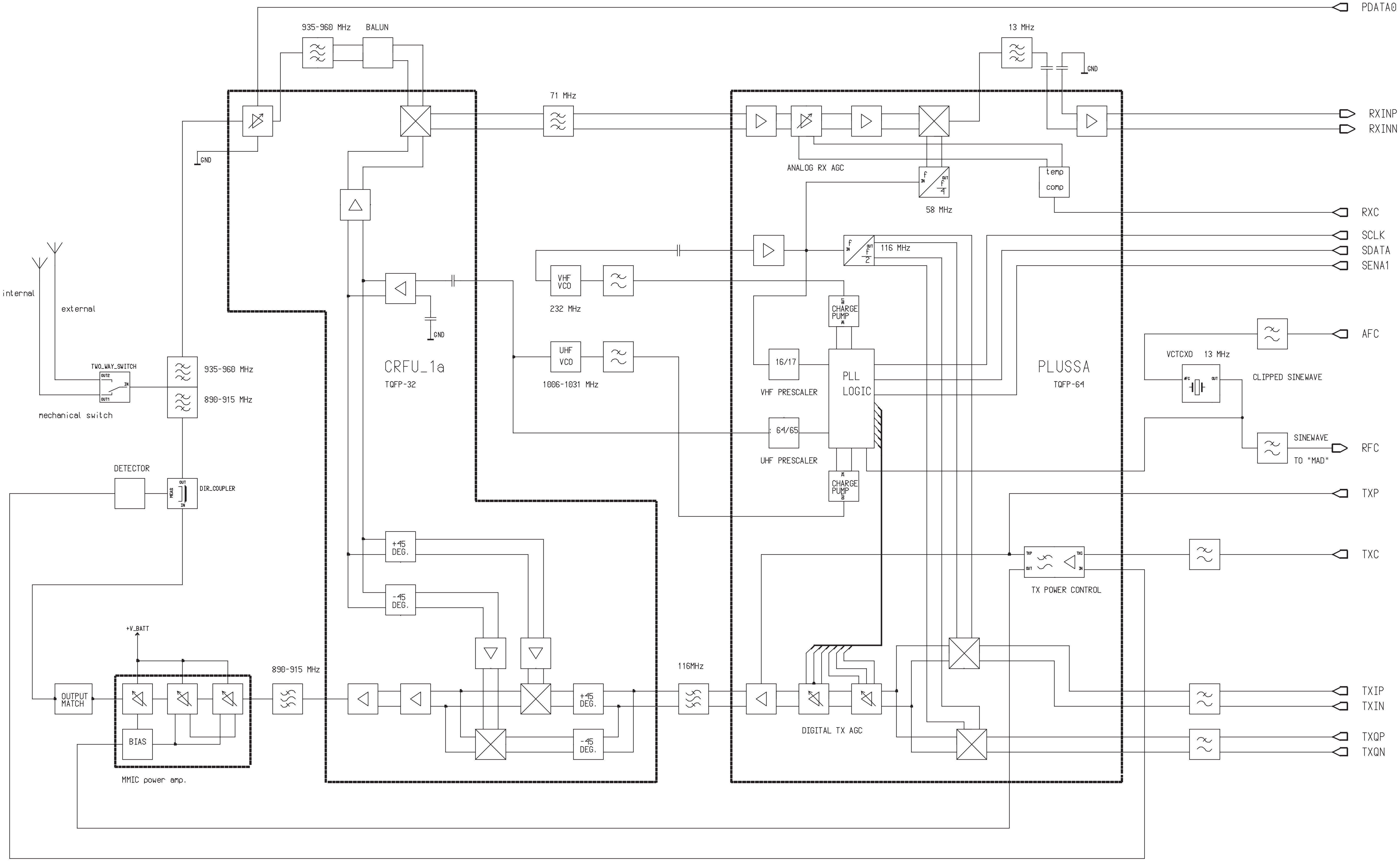
Layout Diagram of UP8R – Bottom (Version 15)



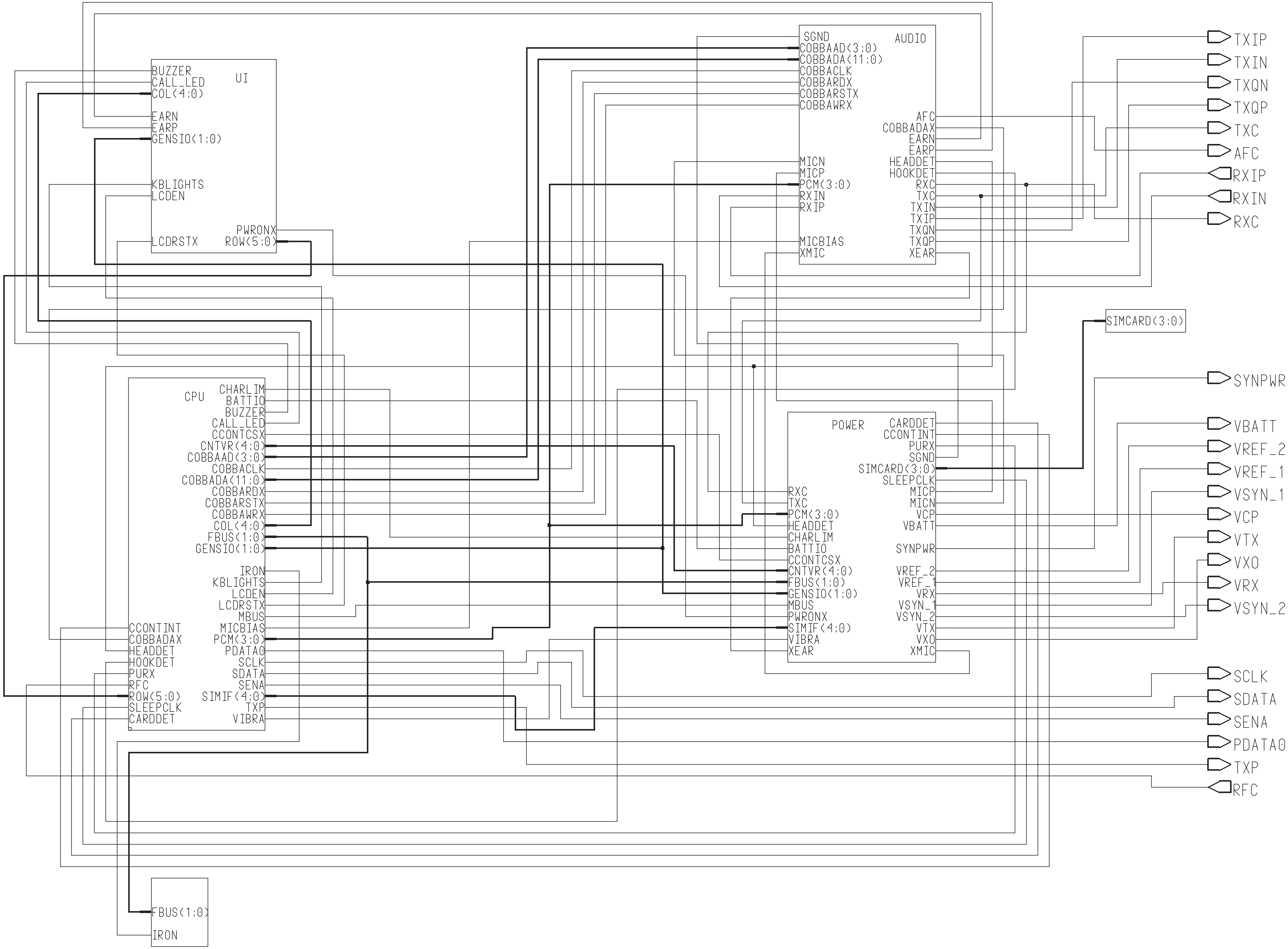
testpoint	name	condition	dc–level	ac–level
J101	FBUS_TX	active state	pulsed DC (0V72.8V)	
J104	CCONTCSX (CCONT chip select)	active state	pulse active 0V, non–active 2.8V	
J108	CHRG_CTRL	charger connected	pulsed DC (0V/2.8V)	
J220	V5V	active state	nominal 5.0V (min 4.8V, max 5.2V)	
J223	CCONTINT (charger, RTC interrupt)	interrupt	pulse active 2.8V, non–active 0V	
J224	VCOBBA	active state	nominal 2.8V (min 2.7V, max 2.85V)	
J225	EXTSYSRESETX	power on	reset state 0V, normal state 2.8V	
J226	VCXOPWR	power on	active state 2.8V, non–active 0V	
J227	PURX (power on reset)	power up/down	reset state 0V, normal state 2.8V	
J228	SLEEPCLK (32kHz clock)	power on	pulsed DC (0V/2.8V)	
J235	ROM1SELX	active state	pulse active 0V, non–active 2.8V	
J251	AGND	pcb ground	0V	
J256	COBBADAX	active state	pulse active 0V, non–active 2.8V	

testpoint	name	condition	dc–level	ac–level
J500	Control voltage for UHF VCO module G600	channel 60 channel 1 channel 124	2.25 +/– 0.25 V > 0.8 V < 3.7 V	
J504	Control voltage for VHF VCO circuit		typ. 2.0 –2.2 V min 0.5 / max 4.0 V	
J508	VSYN_2 (regulated supply for PLLS)		2.8 V min 2.7 / max 2.85 V	
J534&J536	13 MHz IF output to N250	–95 dBm @ X540 (ext. RF connector) RXC at level of full calibrated gain	typ ca. 1.0 – 1.1 V pulsed min. 0.7 / max. 1.4 V	typ. 50 mVpp balanced voltage at 13 MHz
J538	13 MHz output from Z620 to N620	–95 dBm @ X540 (ext. RF connector) RXC at level of full calibrated gain	typ. ca. 1.5 V pulsed	typ. ca 600 uVrms
J542	VHF VCO output (232 MHz)		–	typ. 400 mVpp. > 100 mVpp required
J554	TXC (TX power control voltage)		@level 19 typ. ca. 0.6 V pulse @level 5 typ ca. 1.8 V pulse	
J556	TXP (TX enable)		2.8 V logic level pulse, (max. 0.8 V ”0” / min 2.0 V ”1”)	
J558	TXQP (other half of balanced Q–signal)		0.8 V pulsed	400 mVpp
J560	TXIP (other half of balanced I–signal)		0.8 V pulsed	400 mVpp

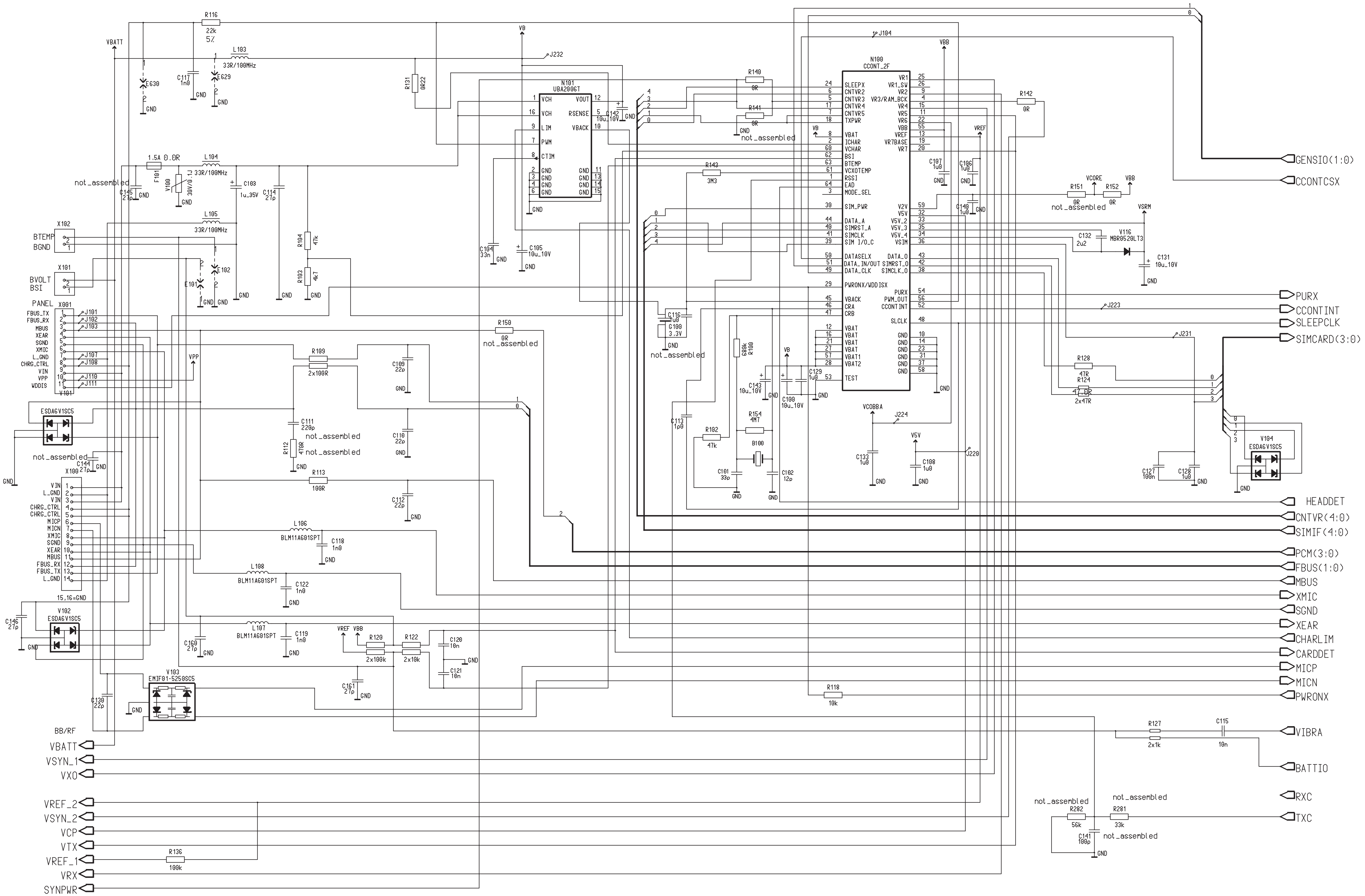
Block Diagram of System/RF Blocks



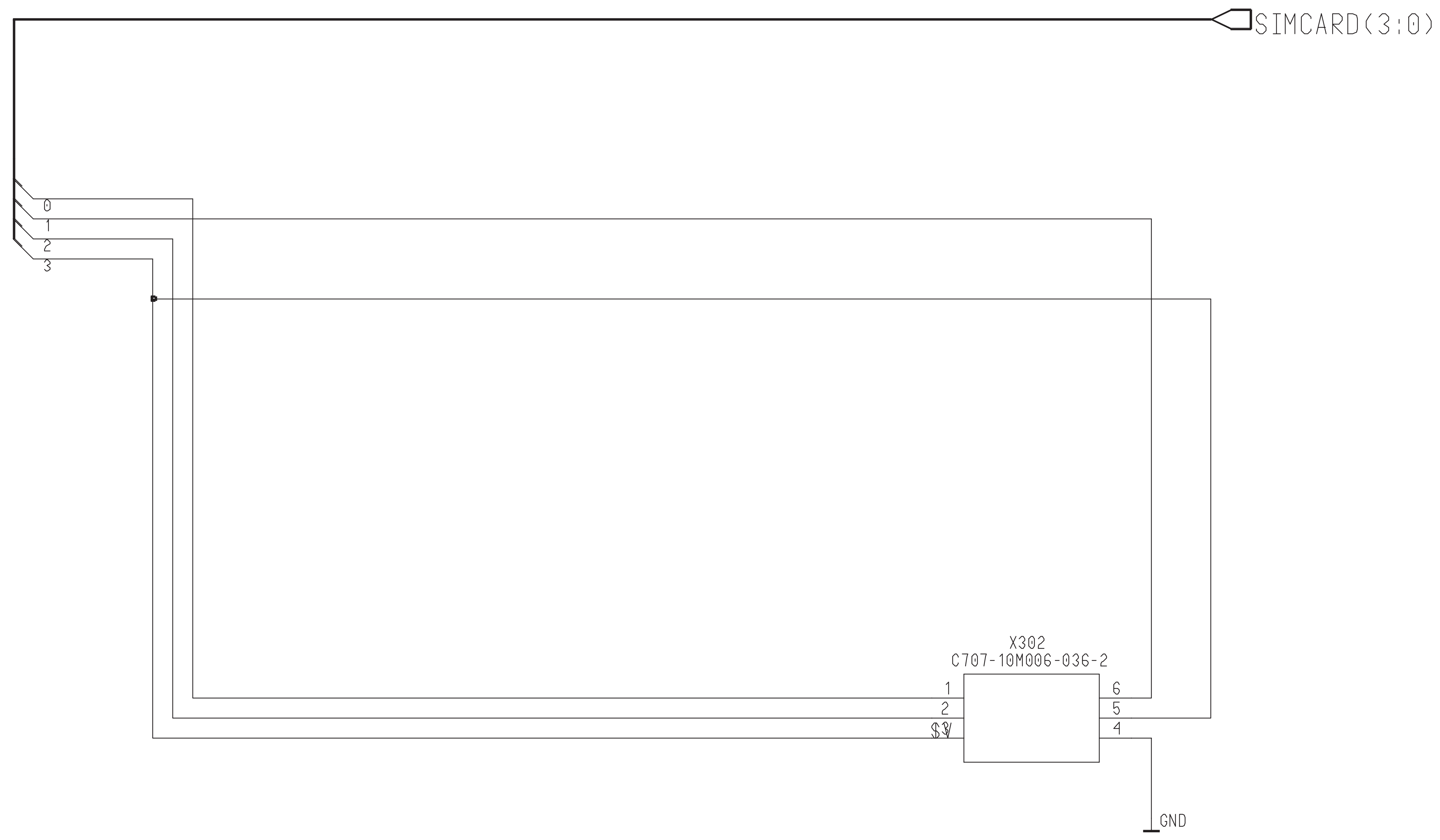
Circuit Diagram of Baseband (Version 9 Edit 64) for layout version 09



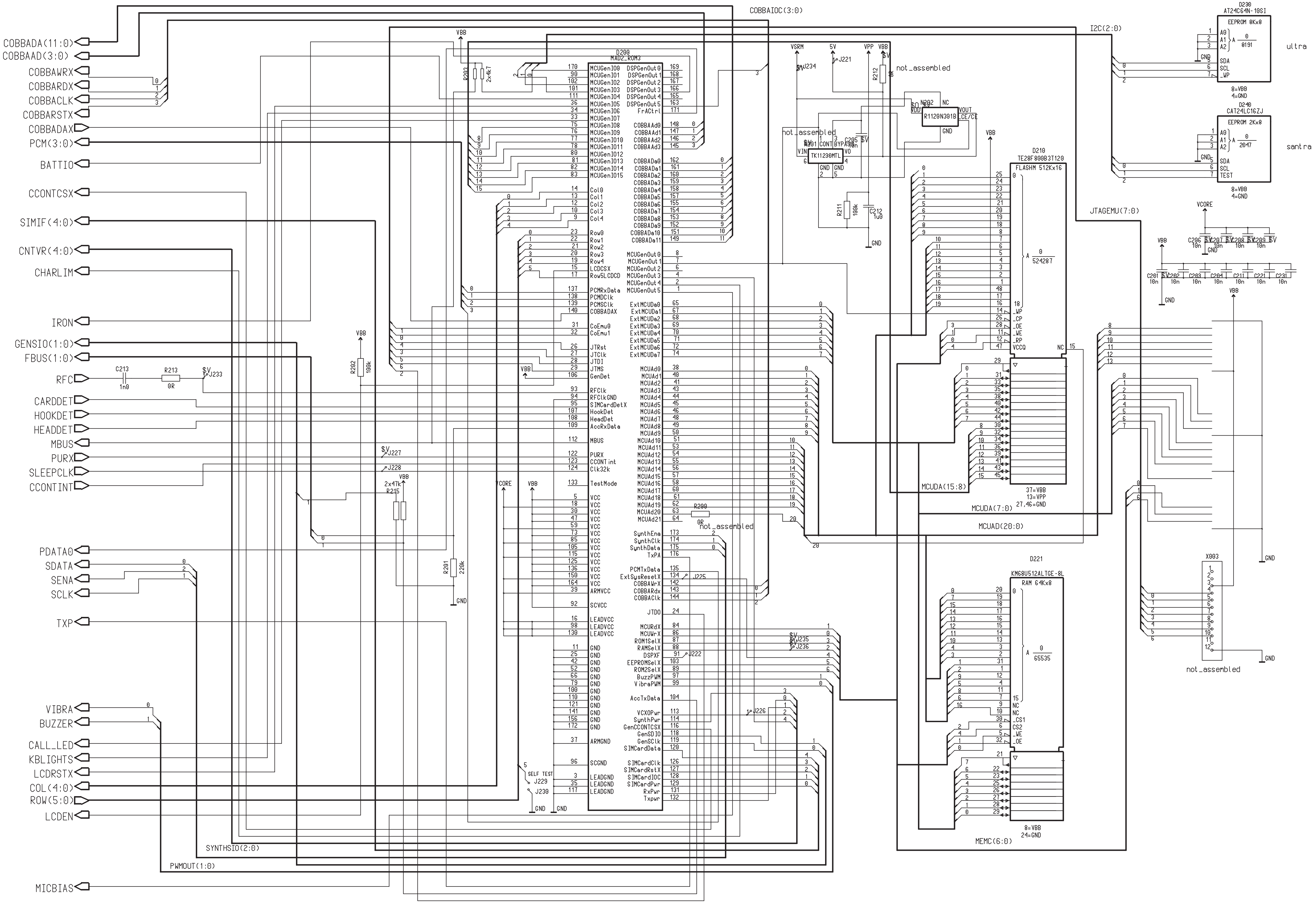
Circuit Diagram of Power Supply (Version 9 Edit 216) for layout version 09



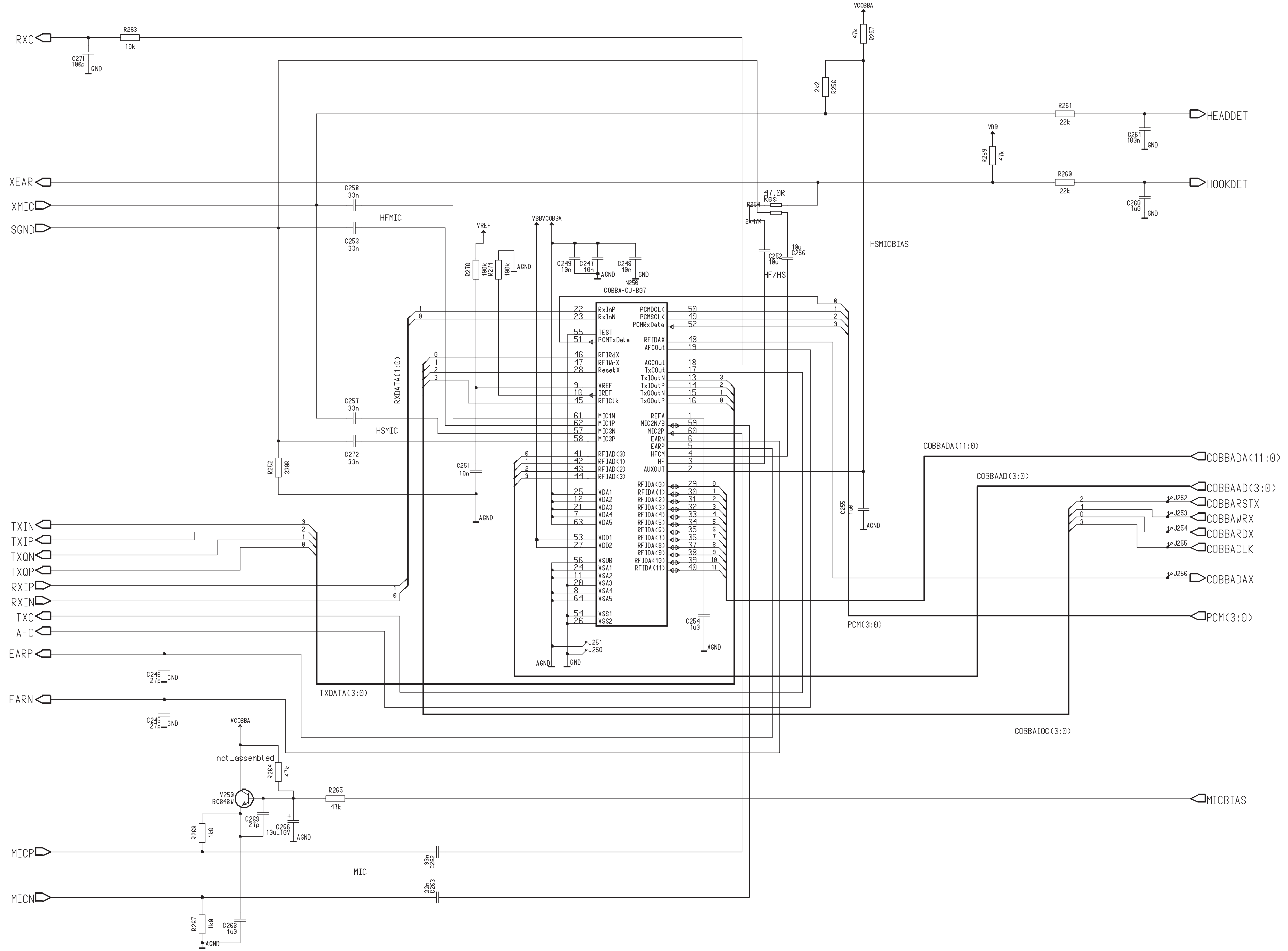
Circuit Diagram of SIM Connectors (Version 9 Edit 54) for layout version 09



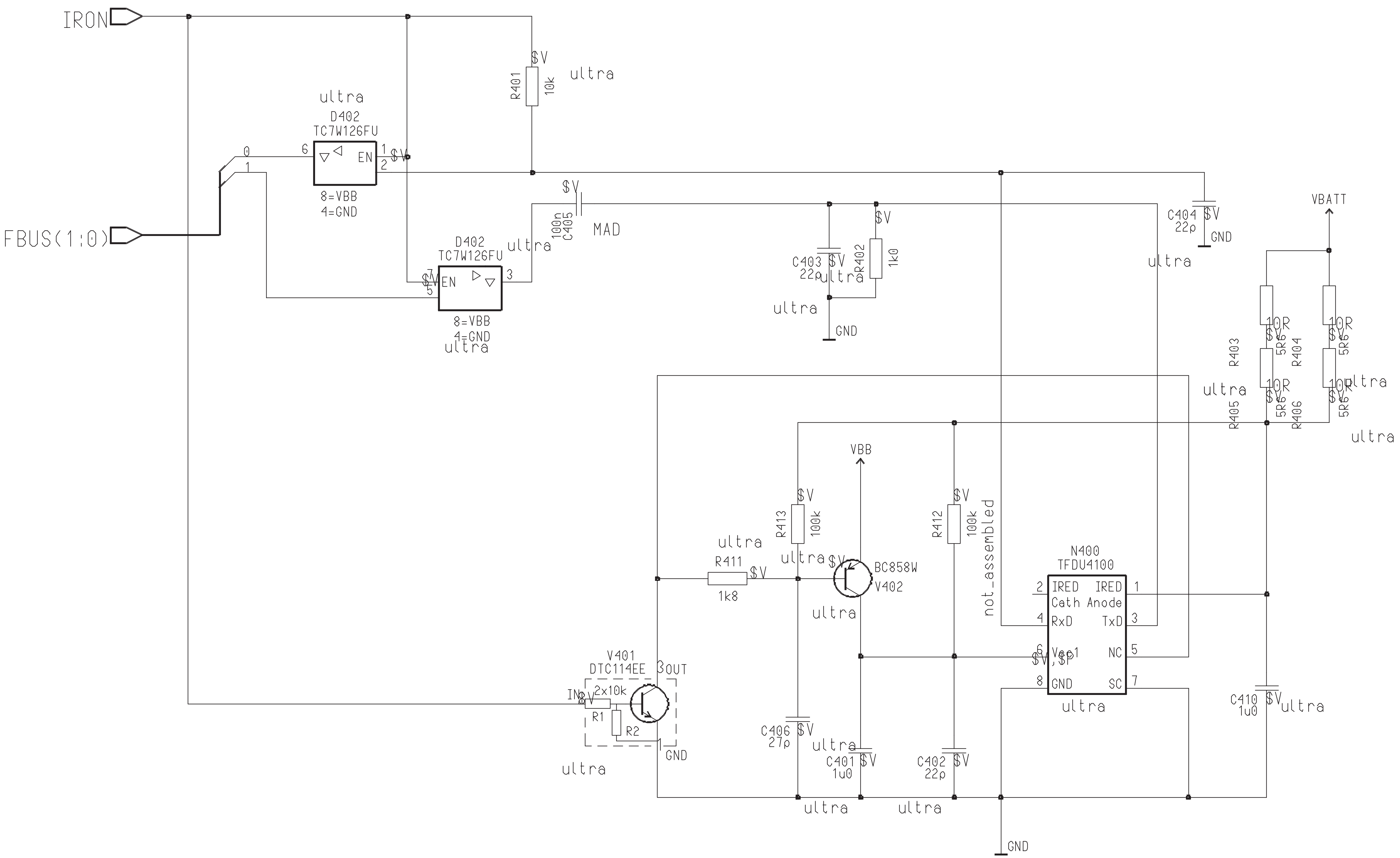
Circuit Diagram of CPU Block (Version 9 Edit 155) for layout version 09



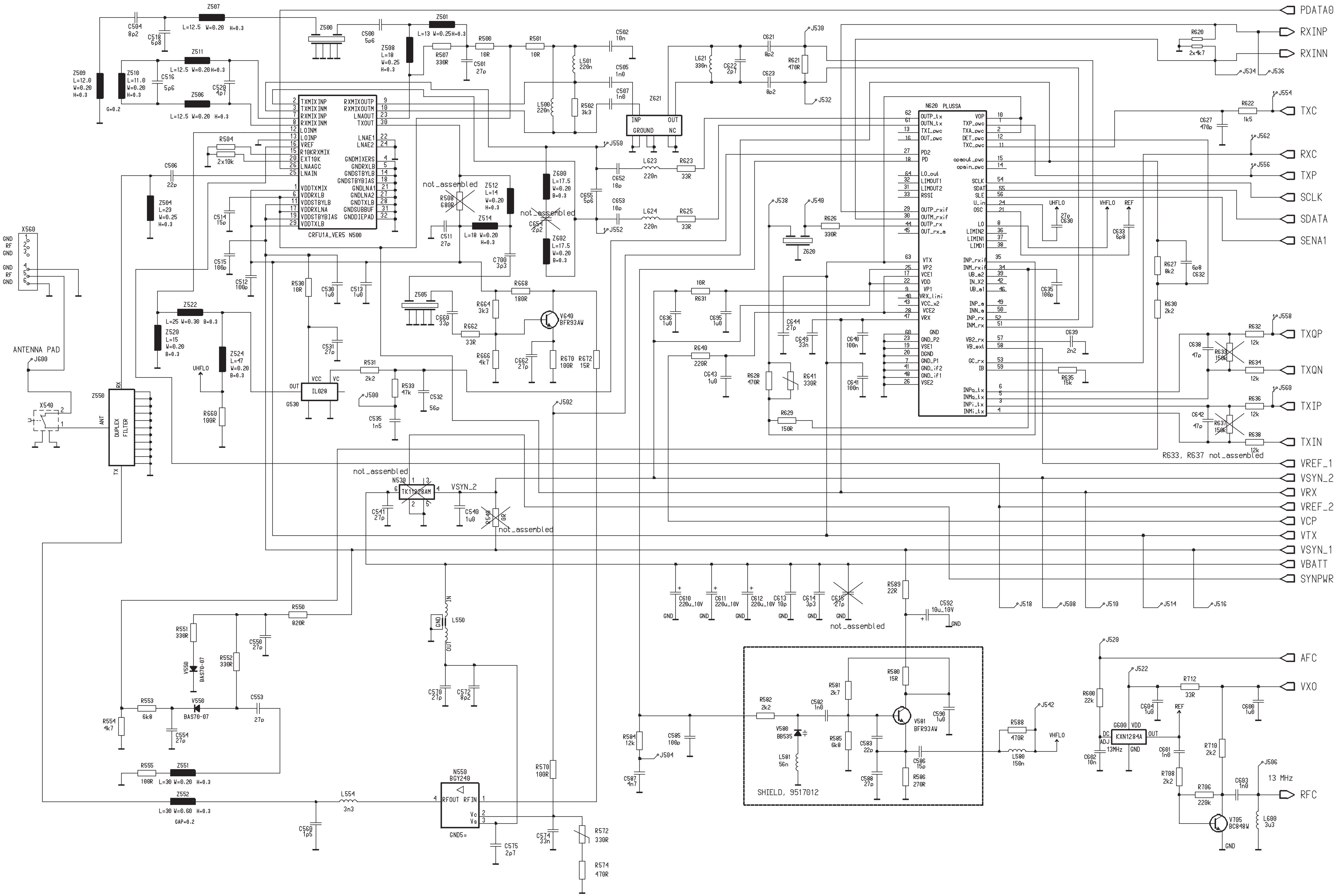
Circuit Diagram of Audio (Version 9 Edit 115) for layout version 09



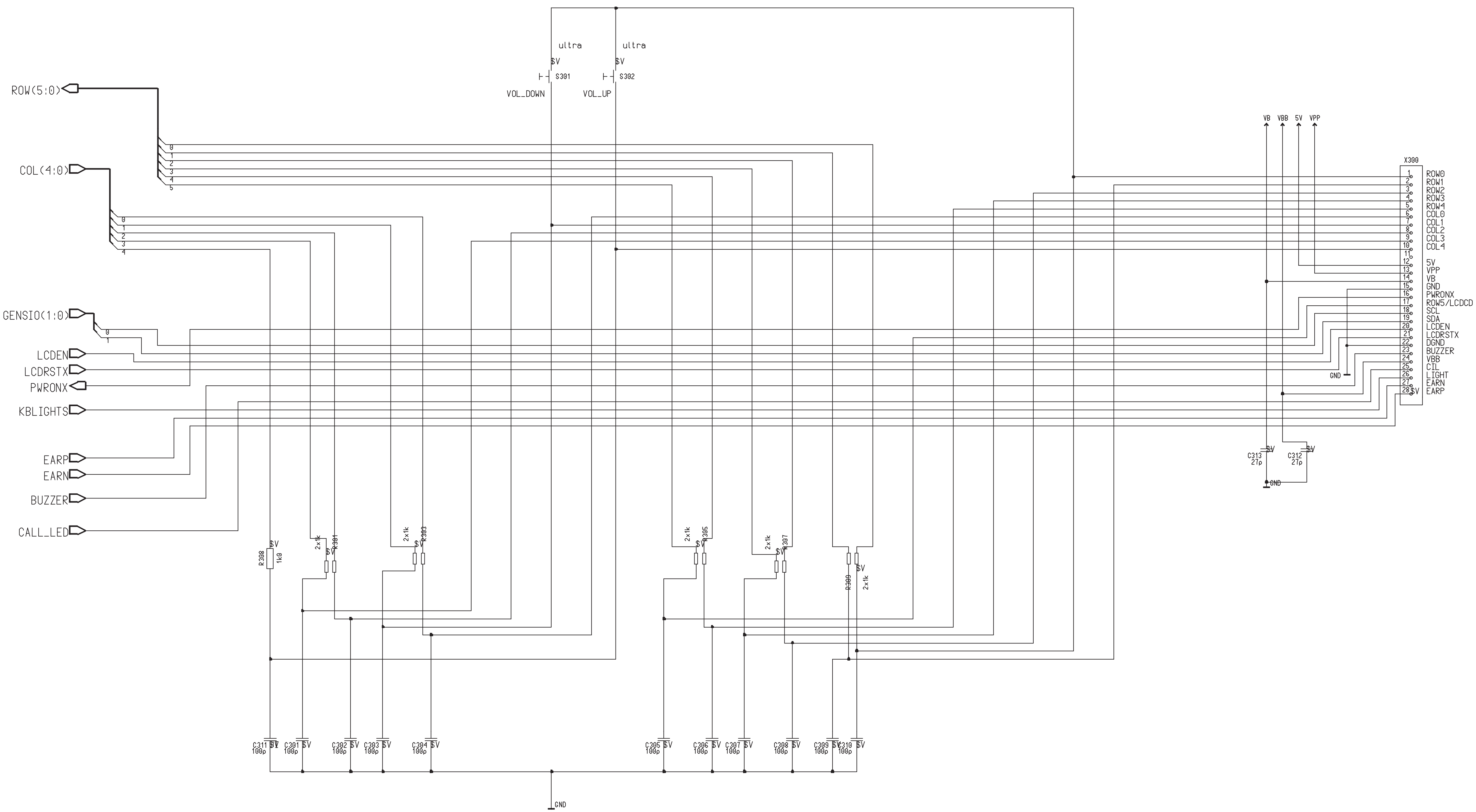
Circuit Diagram of IR Module (Version 9 Edit 93) for layout version 9



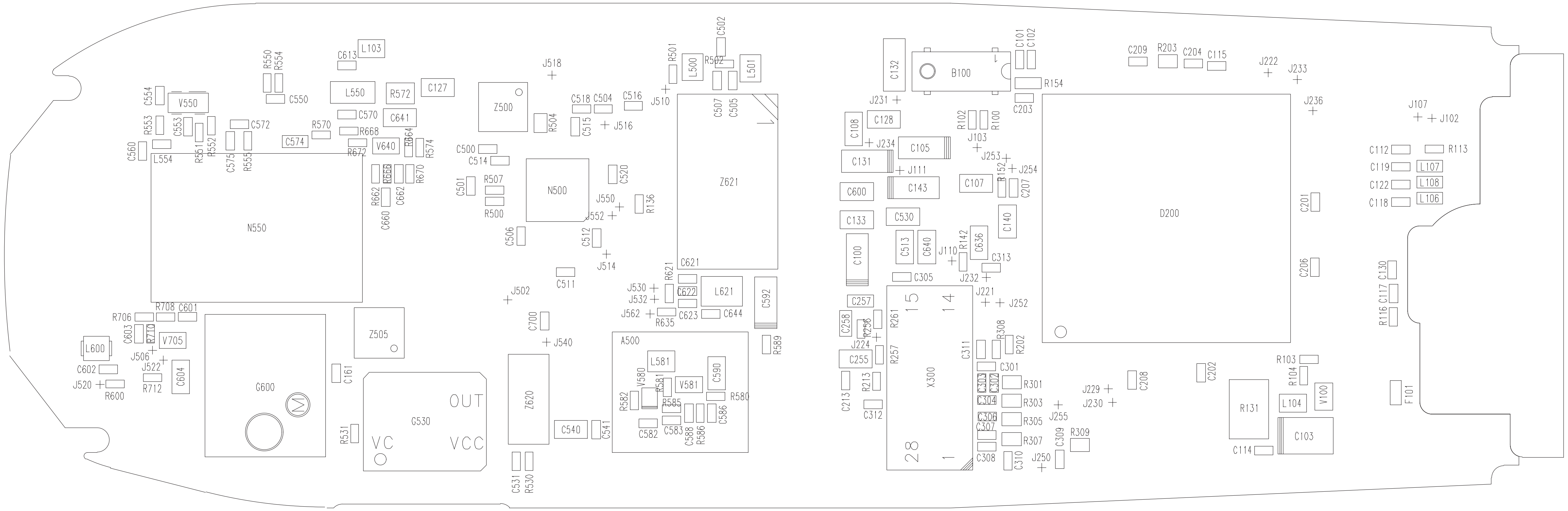
Circuit Diagram of RF Block (Version 9 Edit 187) for layout version 09



User Interface Connector (Version 9 Edit 75) for layout version 9



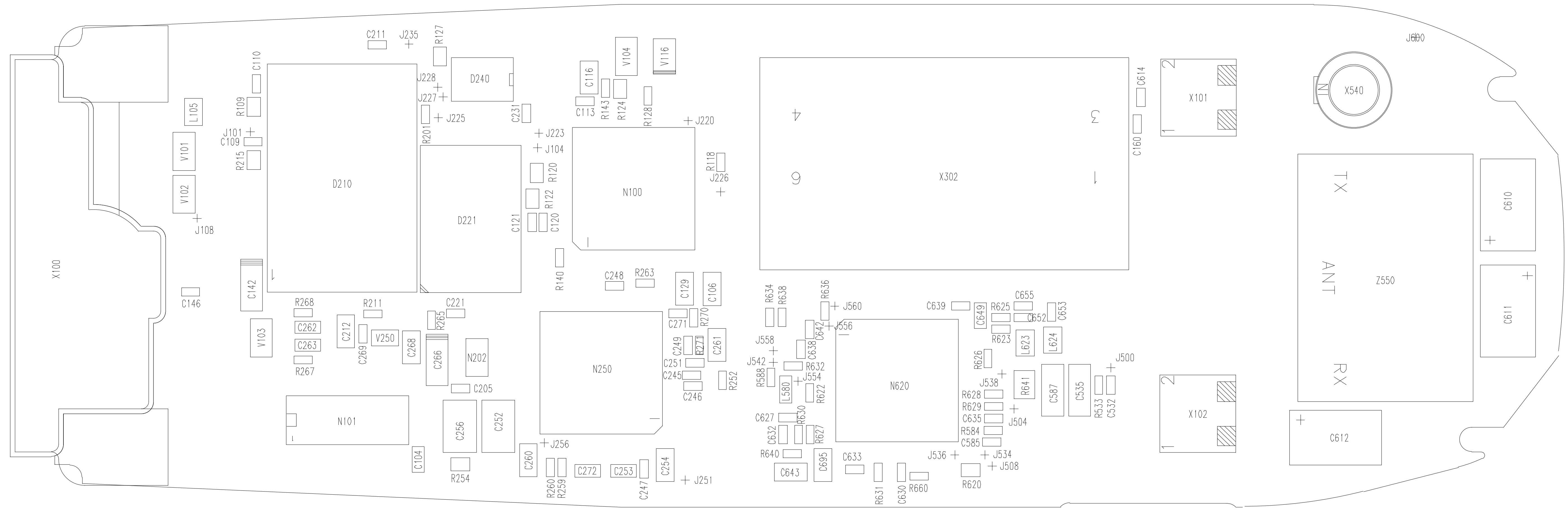
Layout Diagram of UP8S – Top (Version 09)



testpoint ref	name	condition	dc–level	ac–level
J102	FBUS_RX	power on	pulsed DC (0V/2.8V)	
J103	MBUS	power on	pulsed DC (0V/2.8V)	
J107	LGND		0V	
J110	VPP	flash programming	nominal 5V (5V flash) or 3.0V (3V flash)	
J111	WDDISX	power on	reset state 0V, normal state 2.8V	
J221	5V	flash programming	nominal 5.0V (5V flash) or 3.0V (3V flash)	
J222	DSPXF	power on	pulse active 0V, non–active 2.8V	
J224	VCOBBA	active state	nominal 2.8V (min 2.7V, max 2.85V)	
J229	MAD selftest	test mode set externally		
J230	MAD selftest	test mode set externally		
J231	VSIM	SIM power on	nominal 2.8V (3V SIM card) or 5.0V (5V SIM card)	
J232	VB (battery voltage in baseband)	battery connected	nominal 3.6V (min 3.0, max 4.2)	
J233	RFCLK	active state		typ. 1.0Vpp (min 0.5Vpp, max 2.0Vpp)
J234	VSRM	power on	nominal 5.5V (min 5V, max 6V)	CCONT switch mode regulator ripple voltage
J236	RAMSELX	active state	pulse active 0V, non–active 2.8V	
J250	GND		0V	
J252	COBBARSTX	power on	reset state 0V, normal state 2.8V	
J253	COBBAWRX	active state	pulse active 0V, non–active 2.8V	
J254	COBBARDX	active state	pulse active 0V, non–active 2.8V	
J255	COBBACLK	active state	pulsed DC (0V/2.8V)	
J502	Power control op.amp output voltage to N550 (Vpd, pin)	power level depended	pulsed DC	
J506	RFC (13 MHz sinewave)		0 V	typ. 1.0 Vpp min 0.5/max 2.0 Vpp
J510	VRX (regulated supply for RX)		2.8 V min 2.7 / max 2.85 V, pulsed	
J514	VTX (regulated supply for TX)		2.8 V min 2.7 / max 2.85 V, pulsed	

testpoint ref	name	condition	dc–level	ac–level
J516	VSYN_1 (regulated supply for VCOs)		2.8 V min 2.7 / max 2.85 V	
J518	VREF_2 (ref. voltage for N500)		1.5 V +/– 1.5%	
J520	AFC (autom. freq. cntrl)		0 – 2.3 V, typ. 1.15 V (room temp.)	
J522	VXO (regulated supply for VCTCXO)		2.8 V min 2.7 / max 2.85 V	
J530&J532	71 MHz IF input to N620	–95 dBm @ X540 (ext. RF connector)	typ. ca. 1.2 V pulsed	typ 100 – 140 uVpp balanced voltage at 71 MHz
J540	13 MHz output from N620 to Z620	–95 dBm @ X540 (ext. RF connector) RXC at level of full calibrated gain	typ. ca. 1.5 V pulsed	typ. ca. 700 uVrms
J550 & J552	116 MHz TX IF to N500		typ. ca. 1.1 – 1.2 V pulsed	typ. ca. 100 mVrms each
J562	RXC (receive gain control voltage)	RX gain setting depended	control range is 0.5 – 1.45 V, ,pulsed. typ. 1.3–1.4 V for calibrated maximum gain	

Layout Diagram of UP8S – Bottom (Version 9)



testpoint ref	name	condition	dc–level	ac–level
J101	FBUS_TX	active state	pulsed DC (0V72.8V)	
J104	CCONTCSX (CCONT chip select)	active state	pulse active 0V, non–active 2.8V	
J108	CHRG_CTRL	charger connected	pulsed DC (0V/2.8V)	
J220	V5V	active state	nominal 5.0V (min 4.8V, max 5.2V)	
J223	CCONTINT (charger, RTC interrupt)	interrupt	pulse active 2.8V, non–active 0V	
J225	EXTSYSRESETX	power on	reset state 0V, normal state 2.8V	
J226	VCXOPWR	power on	active state 2.8V, non–active 0V	
J227	PURX (power on reset)	power up/down	reset state 0V, normal state 2.8V	
J228	SLEEPCLK (32kHz clock)	power on	pulsed DC (0V/2.8V)	
J235	ROM1SELX	active state	pulse active 0V, non–active 2.8V	

testpoint ref	name	condition	dc–level	ac–level
J251	AGND	pcb ground	0V	
J256	COBBADAX	active state	pulse active 0V, non–active 2.8V	
J500	Control voltage for UHF VCO module G600	channel 60 channel 1 channel 124	2.25 +/– 0.25 V > 0.8 V < 3.7 V	
J504	Control voltage for VHF VCO circuit		typ. 2.0 –2.2 V min 0.5 / max 4.0 V	
J508	VSYN_2 (regulated supply for PLLS)		2.8 V min 2.7 / max 2.85 V	
J534&J536	13 MHz IF output to N250	–95 dBm @ X540 (ext. RF connector) RXC at level of full calibrated gain	typ ca. 1.0 – 1.1 V pulsed min. 0.7 / max. 1.4 V	typ. 50 mVpp balanced voltage at 13 MHz
J538	13 MHz output from Z620 to N620	–95 dBm @ X540 (ext. RF connector) RXC at level of full calibrated gain	typ. ca. 1.5 V pulsed	typ. ca 600 uVrms
J542	VHF VCO output (232 MHz)		–	typ. 400 mVpp. > 100 mVpp required
J554	TXC (TX power control voltage)		@level 19 typ. ca. 0.6 V pulse @level 5 typ ca. 1.8 V pulse	
J556	TXP (TX enable)		2.8 V logic level pulse, (max. 0.8 V ”0” / min 2.0 V ”1”)	
J558	TXQP (other half of balanced Q–signal)		0.8 V pulsed	400 mVpp
J560	TXIP (other half of balanced I–signal)		0.8 V pulsed	400 mVpp