

SERVICE MANUAL



**Benefon Twin
TGP71EU**

**Benefon Twin DS (Dual SIM)
TGP73EU**

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1.0 PRODUCT FEATURE DESCRIPTION

1.1 Network standard

Benefon Twin is a dual band GSM phone operating seamlessly between the bands. For GSM900 Benefon Twin operates only on primary P-GSM band, i.e. transmitting on 890 - 915 MHz (mobile transmit, base receive) and receiving on 935 - 960 MHz (base transmit, mobile receive) For GSM1800 Benefon Twin transmits on 1 710 - 1 785 MHz (mobile transmit, base receive) and receiving on 1 805 - 1 880 MHz (base transmit, mobile receive). Benefon Twin does not support E-GSM band.

Maximum output power on lower band is 2 W and on upper band 1 W. Thus Benefon Twin belongs to power class 4 on lower band and to power class 1 on higher band.

Benefon Twin standard GSM Full Rate speech coding and Enhanced Full Rate speech coding EFR. Benefon Twin supports full duplex, circuit switched asynchronous data services on data rates 300 bit/s, 1200 bit/s, 4.8 kbit/s, 9.6 kbit/s and 14.4 kbit/s. These data rates can be used for sending PC FAX. Additionally Twin supports V.110 ISDN connection, Radio Link Protocol, RLP., and a set of GSM 07.07 AT commands. No synchronous data services and no alternate speech/data calls are supported.

Benefon Twin supports Short Message Service and Short Message Service Cell Broadcast. Depending on the network configuration Twin also supports concatenated short messages up to length of 640 characters.

1.2 Physical dimensions

Maximum length of the Twin is 112 mm; maximum width 49 mm and maximum thickness is 27 mm.

Weight of the phone is 108 g with 650 mAh Li-On battery pack and 126 g with 800 mAh NiMH and 1050 mAh Li-On battery pack.

1.3 Display

Display is a custom full-graphic display. It will have 48 pixel rows and 100 columns.

1.4 SIM

Benefon Twin is using small plug-in SIM card. SIM interface is guaranteed to work only with 5 V SIM cards.

1.5 Connectors

Benefon Twin has offers several types of connectors, namely

- battery connector with 4 connectors for battery pack
- charging connector with 2 connectors for chargers
- SIM connector with 6 pins for SIM card
- RF -connector (female SMA type) for integral antenna
- system connector with 16 pins for various accessories

There is no auxiliary RF -connector. However it's possible to detach integral antenna and connect an external antenna to its connector.

1.6 Operating voltages

Maximum operating voltage is 5.2 V, minimum voltage 3.3 V. Nominal voltage 4.0 V.

1.7 Battery packs and operating times

Initially three battery packs are available for Benefon Twin, namely

Battery type	Talk time up to	Stand-by time up to
Li-On 650 mAh	320 min	120 h
NiMH 800 mAh	375 min	125 h
Li-On 1050 mAh	540 min	200 h

NiMH battery pack contains three NiMH cells and Li-On battery packs one Li-On cell.

Talk and standby times vary a lot depending on the network conditions.

1.8 Accessories

- belt clip
- portable hands-free kit
- light car cradle
- simple hands-free kit to use in car integrated to cigarette lighter adapter charger
- cigarette lighter adapter charger with hands-free kit
- two different mains chargers, other slightly faster than other
- PC support software for administration of abbreviated dialling entries and sending SMS to several recipients
- PC adapter cable for PC support software and data services

1.9 Main features of Benefon Twin

This section list some of the most important features of Benefon Twin

1.9.1 User changeable mask

Lens mask framing the display can be detached and changed by the user. Many different colour options are available.

1.9.2 Location based services

Benefon Twin has a capability to send information of the base stations it can receive. This information is wrapped into a SMS message including some service requests. Network can calculate the location of the mobile based on this network information. Thereafter network service can handle the service request and reply to the mobile according to its location. This feature is available only in limited number of networks.

1.9.3 T9, text input with nine keys

While writing text into Benefon Twin, user may switch T9 active and make the writing significantly easier and faster. While using T9, user has to press a key only once per letter and the user interface suggests matching words to user.

1.9.4 Abbreviated dialling memory

Up to 255 Abbreviated Dialling entries on SIM card are supported. There's no ADN memory in the phone's memory.

1.9.5 Recent calls memory

Twin separates calls to three different categories and stores the associated telephone numbers if available from the network. Twin stores last 15 dialled calls, last 10 unanswered calls and last 10 answered calls.

1.9.6 Personal organiser (Clock & calendar functions)

Benefon twin has an in-built real time clock and calendar that operates for a significant period even if battery is detached. Several features on the user interface of the phone use this information, namely recent call timestamps, text message handling, alarm clock and calendar with its reminders.

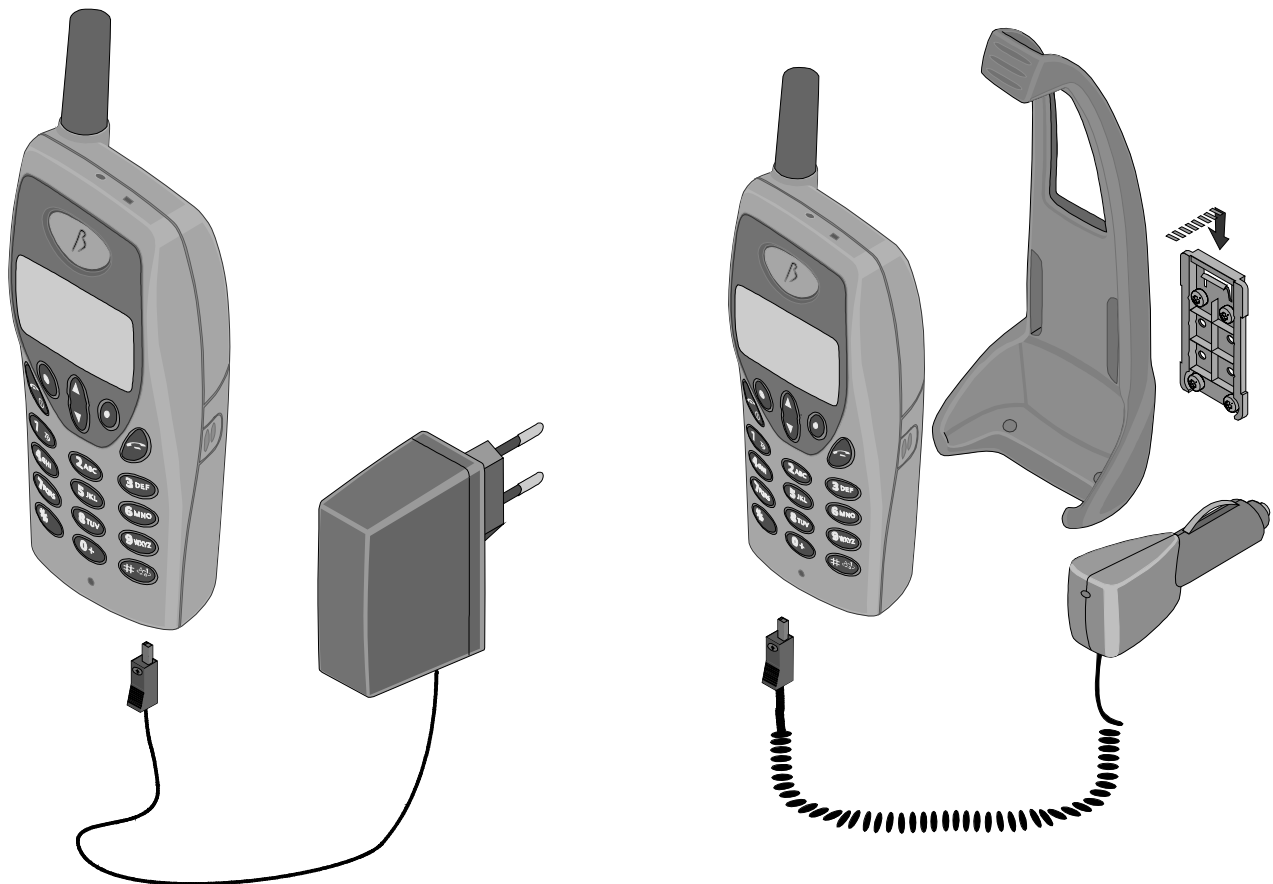
1.10 Manufacturer

BENEFON OYJ
P.O. Box 84
(Meriniitynkatu 11)
FIN 24101 SALO
FINLAND

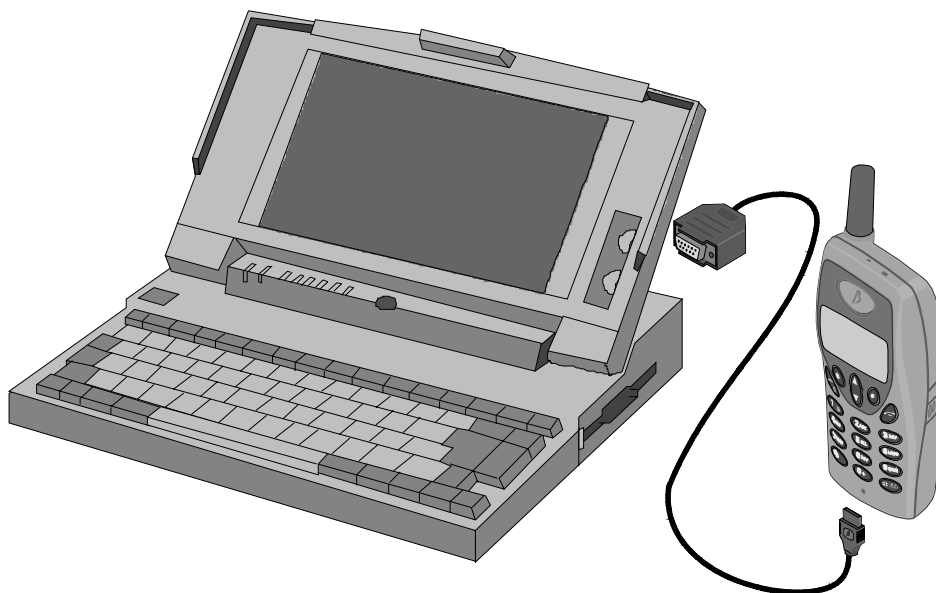
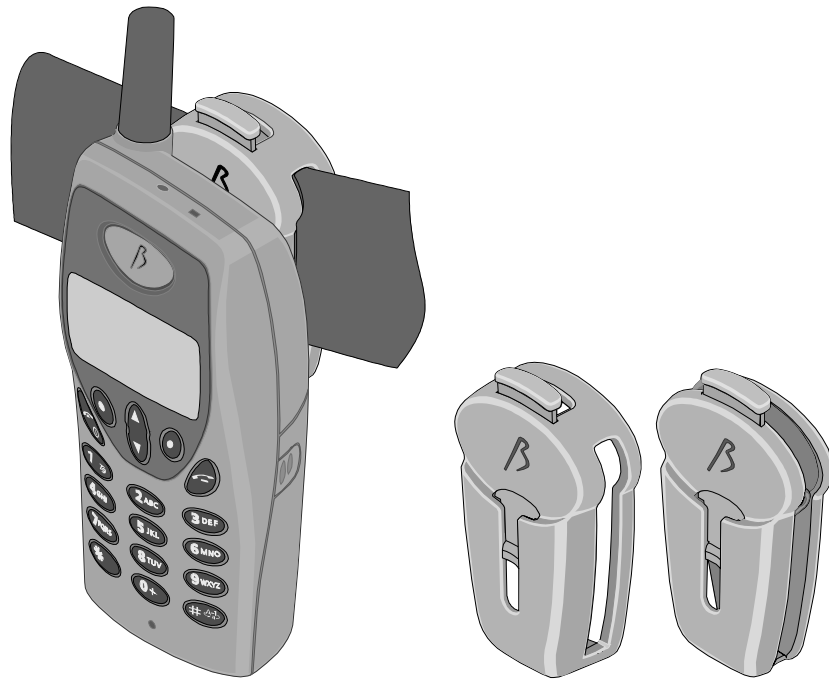
Telephone: + 358 2 77 400
Facsimile: + 358 2 332 633

1.11 PRODUCT FAMILY

- BENEFON TWIN HANDPORTABLE TGP71EU / TGP73EU
- MAINS CHARGER
- CIGARETTE LIGHTER CHARGER
- LIGHT HOLDER
- PORTABLE HANDS FREE
- BENEWIN
- BELT CLIP









2.0 OWNER'S MANUAL

3.0 LIGHT CAR INSTALLATION



4.0 TG Local feature description

Local Service Mode

4.1 General

4.1.1 Scope

This document briefly describes the TG Service software for Benefon products belonging to the Twin Generation, namely Benefon Twin, Benefon Twin DS, Benefon Q, Benefon Esc! and Benefon Track.

4.1.2 Hardware requirements of TG Service software

The use of TG Service software requires a proper service adapter (APD 70). The standard data adapter for TG products does not work with TG Service software.

It's advisable connect the service PC to also a Rohde&Swartz CMD 55 or CTS 55 or a Wavetek 4400M. This is required for automatic tuning.

4.1.3 Revision history

This document is based on TG Service software version 1.8.



4.2 Getting started

First connect the service adapter to the PC and phone. Check that the COM port setting is correctly set in TG Service software in menu item "Device->Options->Phone".

The TG Service software works best on a phone without a SIM. During power-up: reading the contents of a SIM card uses quite a lot of phone's processing power and during this time the Service mode software works slowly. Using TG Service software without a SIM card in the phone overcomes this problem.

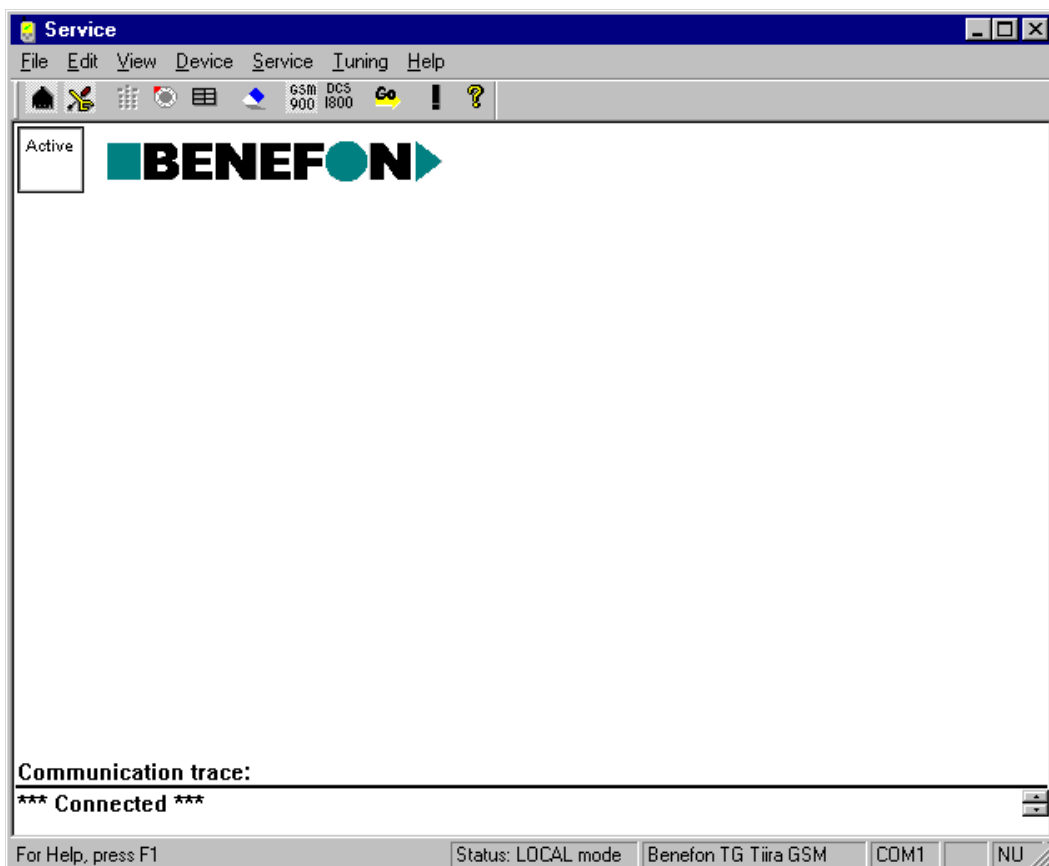
To establish a connection between the TG Service software and the phone do following

1. Connect the phone to the Service adapter and check that phone can be started up. You can use a power supply (recommended) or a properly charged battery.
2. Click the leftmost Toolbar button to establish a connection between TG Service software and the phone. Check the "Communication trace" for this.
3. Click the second Toolbar button from the left to change to phone mode into Service (Local) mode. Now you can use all the functions available in TG Service software. Note that some functions work only in Normal Operation mode and some functions work only in Service (local) mode.

While the phone is controlled by TG Service mode software, the user can read the phone type, HW version and SW version number from the phone's display.

4.3 List of Features

The opening screen of the service software looks like this.



4.3.1 File menu

The file menu allows the user to handle the tuning parameter file. It contains the tuning parameters of an individual phone.



4.3.1.1 Load from mobile

With this option user can read all the tuning parameters from the phone's non-volatile memory.

4.3.1.2 Save to mobile

With this option user can save the tuning parameters from the phone.

4.3.1.3 Load from file

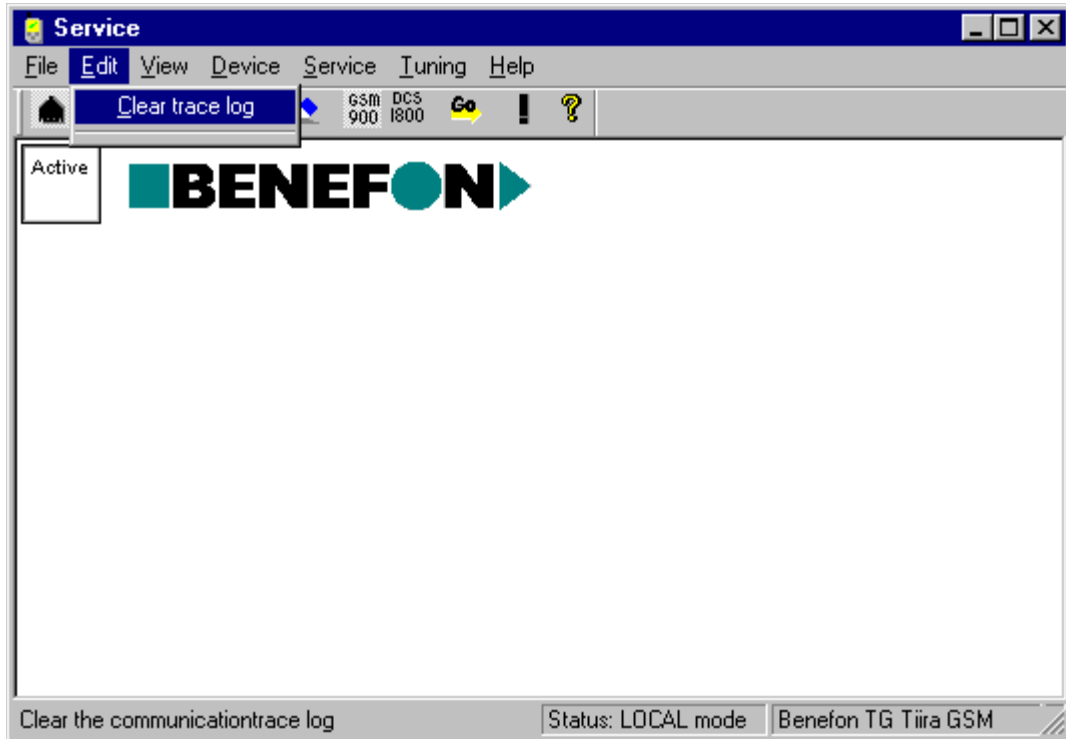
With this option user can read all the tuning parameters from PC.

4.3.1.4 Save to file

With this option user can save the tuning parameters to a file onto PC.

4.3.2 Edit menu

This menu item has only one function to clear the trace box at the bottom of the window.



4.3.2.1 Clear Trace Log

This menu item allows user to clear the trace log at bottom of TG Service software window.

4.3.3 View menu

This menu item allows the user to adjust some TG Service software window settings.



4.3.3.1 Toolbar

With this setting the user can toggle the toolbar on and off. With the visible Toolbar, the user can access the most often needed functions faster than through the menu.

4.3.3.2 Status bar

With this setting, the user can toggle the Status Bar on and off. With the visible Status Bar the user can get some help on different features and follow the signalling traffic between the PC and phone.

4.3.3.3 Keypad window

With this setting, the user can hide and show the Keypad window. With the visible Keypad window, the user can "press" some keys on the phone by clicking the Keypad window on the PC screen. The Keypad window is available only in the Normal operating mode, not in Service mode. Note, the user can toggle the Keypad window on/off with the Toolbar by clicking the third button from the left. Note that not all the TG Phones have separate audio volume keys.

4.3.3.4 Channel window (Radio service window)

In this menu item, the user can open a window to control the radio part. Functions include setting the active TX, RX and MON channels, type of burst transmitted etc. This window can be used only in Service mode.

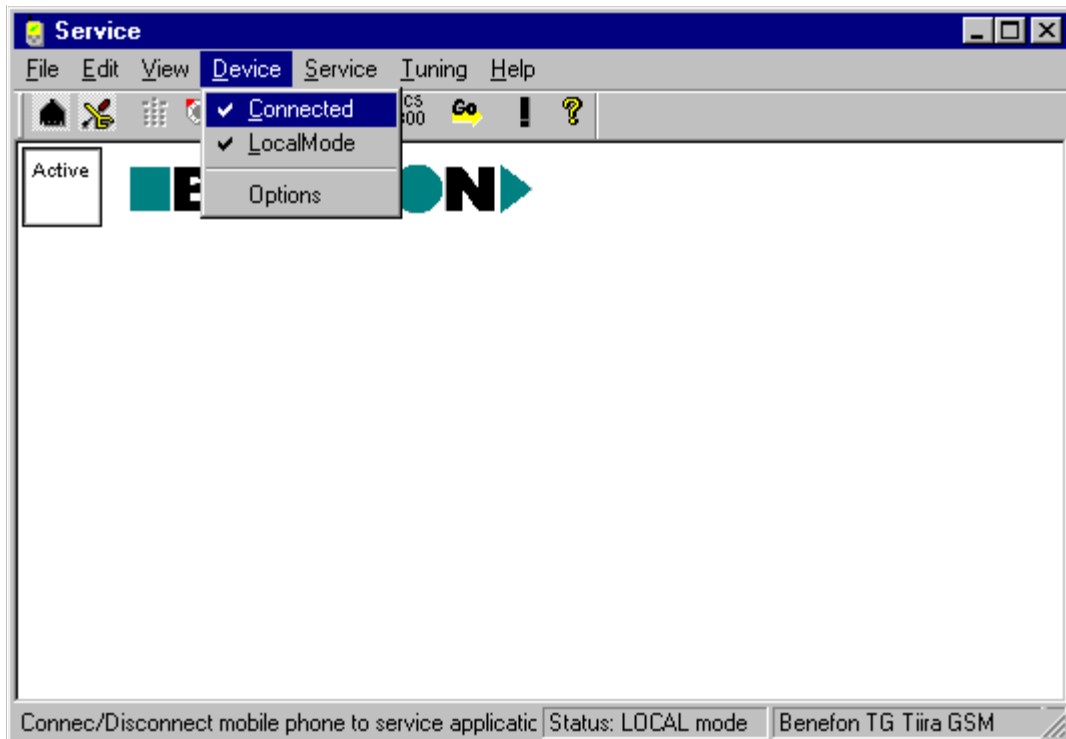
Note the user can toggle the Channel window on/off with the Toolbar by clicking the fourth button from left.

4.3.3.5 Show RFG settings

In this menu item, it shows RF generator settings when RX Gain control is active.

4.3.4 Device menu

This menu item allows the user to initialise a connection between the PC and phone plus toggle the mode of the phone between Service (Local) mode and Normal Operation mode.



4.3.4.1 Connected

By clicking this line the user can establish a connection between the PC and phone and also disconnect. Note, that this menu item can be accessed through the toolbar of clicking the leftmost button.

4.3.4.2 Local mode

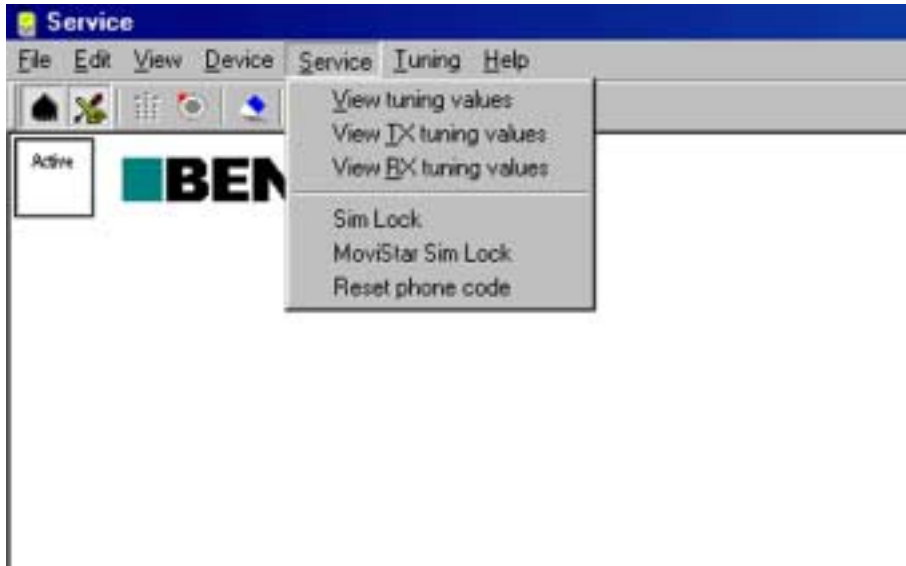
By clicking this line, the user can change the phone mode to Service (Local) mode and back to the normal operating mode. Note that this menu item can be accessed through toolbar by clicking the second button from the left.

4.3.4.3 Options

In this menu item user change various settings of the TG Service software. The use of default settings is recommended.

4.3.5 Service menu

This menu item allows the service personnel to use the service functions needed during unit repair and view related tune-up values.



4.3.5.1 View tuning values

This menu item allows the user to view the LCD contrast setting and battery voltage correction value. A proper and valid battery voltage correction value is very important for the battery charging algorithm. The value is used to stop the charging process at the right point in time.

4.3.5.2 View TX tuning values

This menu item allows the user to view the tuning values related to the transmitter part.

4.3.5.3 View RX tuning values

This menu item allows the user to view the tuning values related to the receiver part.

4.3.5.4 Sim Lock

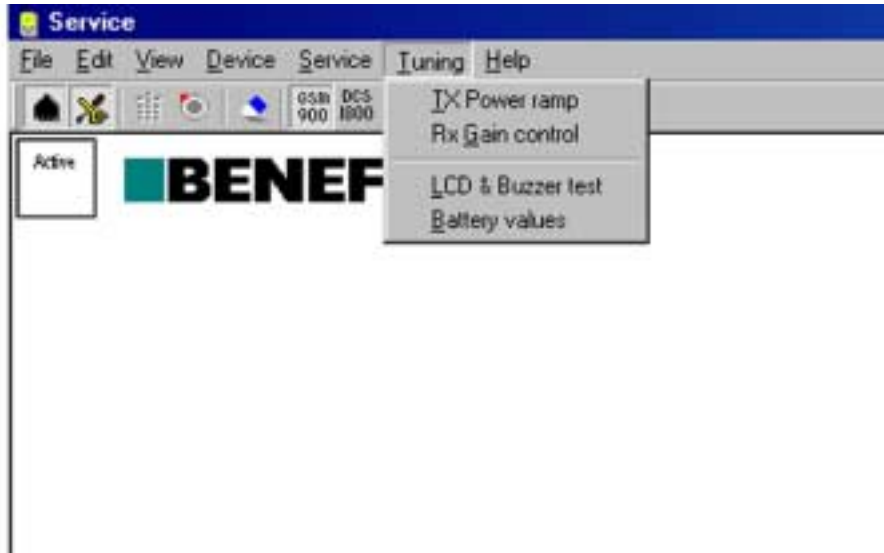
4.3.5.5 MoviStar Sim Lock

4.3.5.6 Reset phone code

This menu item allows the user resets phone code to 1234.

4.3.6 Tuning menu

This menu item allows the user to tune an individual setting related to the phone.



4.3.6.1 TX Power ramp

This menu item allows the user to adjust the TX power levels on both GSM and DCS bands.

4.3.6.2 RX Gain control

This menu item allows the user to adjust the RX gain control values for different signal levels. A routine for automatic adjustment with CMD 55 is available.

4.3.6.3 LCD & Buzzer test

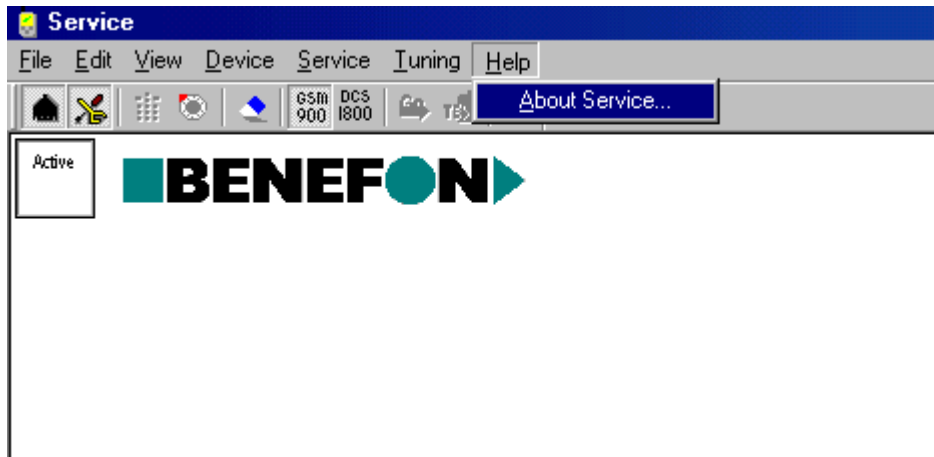
This menu item allows user to change the LCD contrast setting. Note that too dark a setting may cause the display to “flicker” in the light of fluorescent tubes. Buzzer test enables to check the buzzer functioning.

4.3.6.4 Battery values

This menu item allows the user to measure and store the battery voltage correction value. Be sure to apply to the phone's exact operating voltage of 4,32 V with external power adapter.

4.3.7 Help menu

This menu allows the user to check the version of the TG Service software.



5.0 TECHNICAL DESCRIPTION

5.0.1 General

Benefon Twin and Benefon Twin DS has two circuit boards, PCBs. Main PCB has all the GSM specific function on board, both radio and baseband section. Auxiliary PCB provides a platform for LCD display and keypad. Circuit boards are connected to together with a 32 pin connector.

5.0.2 Antenna connector

Antenna connector is SMA compatible and tilted 5 degrees away from the user head. Connector is matched to 50 ohms.

5.0.3 System connector description

This section describes the female system connector in the phone.

5.0.3.1 Pin numbering

With Benefon Twin the system connector pin numbering starts from the right when looking the phone from front, i.e. the display side.

Note that in other TG products the system connector may be assembled upside down. Another way to remember pin numbering is to know that the charging pins are the pins 17-20, i.e. the numbering starts as far as possible from charging connector.

Note that pins NMEA pins are active only in Benefon Esc! and Benefon Locus.

Pin Nbr	NAME	FUNCTION	STATE	IN/OUT
1	AGND	Analog Ground	0V	
2	RS1CTS / !2CINT	RS1 Clear to Send / I2C Interrupt (NMT)	0V 2.7V	in
3	EXTMIC	External MIC line	0V -1.5V pp DC	in out
4	RS1RTS / ACCPWR	RS1 Ready to Send / Accessory pwr control	0V 2.7V	out
5	EXTERP	External ERP line + BOOT pin	0V -1.5V pp 0V/12V DC	out in

6	CHARGE	Charging Current + Power On		in
7	HEADSETDET	Headset Detector / Accessory pwr control	0V 2.7V	in/out
8	RS1RX	RS1 Receive Data	0V 2.7V	in
9	VBAT	Battery Voltage	2.7V -6.0V	out
10	RS1TX	RS1 Transmit Data	0V 2.7V	out
11	NMEAIN / I2CDATA	NMEA input (GPS) / I2C data (NMT)	0V 2.7V	in/out
12	NMEAOUT / I2CCLK	NMEA output (GPS) / I2C clock (NMT)	0V 2.7V	out
13	AUXDET	Headset Hook / Accessory Detector	0V 2.7V	in
14	RS2RX	RS2 Receive Data	0V 2.7V	in
15	RS2TX	RS2 Transmit Data	0V 2.7V	out
16	DGND	Digital Ground	0V	
17	NC	Not connected		in
18	DGND	Digital Ground	0V	
19	NC	Not connected		in
20	CHARGE	Charging Current + Power On		in

5.0.3.2 Pin descriptions

- PIN 1: Analog Ground should be connected to digital ground at only one point inside the mobile phone. This point is the analog ground pin of the first microphone amplifier stage.
- PIN 2: CTS signal for asynchronous serial line number 1 (RS232). Used for data communication between the GSM mobile phones and PC. With NMT phones this pin is used to detect I2C interrupt. The pin is normally in logical '1' state and I2C interrupt pulls the pin to logical '0'.

- PIN 3: External MIC line is used as an audio input for the mobile phone. There is a DC level in this pin for headset. The DC level has been made by connecting the pin to 2.2V voltage via 2.2 kohm resistor.
- PIN 4: RTS signal for asynchronous serial line number 1 (RS232). Used for data communication between the GSM mobile phones and PC. When there is other accessory than data cable connected to the mobile phone this pin can be used to control the accessory power. Logical '1' turns the accessory power on and logical '0' turns the accessory power off. With MiniHF this same feature can be used to mute the audio lines.
- PIN 5: If boot signal is 12V when resetting the phone, the phone will start performing software from the BOOT ROM memory. This is used for FLASH downloading. Otherwise this pin is used as an EXTERP pin to get the analog audio out from the mobile phone. The analog audio is connected to this pin via 10 uF capacitor and there is not any DC level in audio out signal.
- PIN 6: Charging current input, max. 1.0A. Connecting a charger to this pin will also power on the mobile phone. Powering off the mobile happens with EMMI command (see pins 14 & 15).
- PIN 7: The headset detector signal is normally at logic '1' state (2.7V). When pulling this signal to ground outside the mobile the mobile knows that either the headset or the MiniHF car kit is connected to the phone. When the mobile phone pulls this signal to ground it disables the accessory regulator preventing the accessory to take power. With MiniHF this same feature can be used to mute the audio lines. This can be done with next circuit:
- With this circuit the 100k resistor can be omitted if the in/out pin has an internal pull-up when in input mode. The maximum voltage of VCC connected to 100 kohm resistor in the accessory side is 2.7V. The in/out pin is in output mode only when there is a need to power off an accessory or to mute the audio lines of MiniHF car kit.
- PIN 8 & 10: Asynchronous serial line number 1 (RS232).
- PIN 9: The maximum current from the VBAT line is 300 mA.
- PIN 11 & 12: NMEA 0183 signals for GPS and I2C lines for NMT phones.
- PIN 13: Hook line for active headset and MiniHF detection line. This line is normally at logic '1' state (2.7V). When pulling this signal to ground after the headset accessory has been detected the mobile phone assumes that the hook of the headset has been pressed.

If pins 13 and 7 have been pulled to ground and the charger has been

connected to pin 6 (CHARGE) within 100ms, the mobile phone assumes that the connected accessory is MiniHF car kit.

If this signal has been pulled to ground and the headset detector (pin 7) is in logic '1' state the mobile assumes that there is an accessory using serial port connected to the system connector.

PIN 14 & 15: Asynchronous serial line number 2 (RS232) for accessories and for debugging mobile's software. This line does not have CTS or RTS signals. The data is transferred according EMMI protocol defined in GSM phase2 specification 11.10-1 section 36.3.5.; 9600 bit/s, 1 start bit (S), 8 bits (D1 to D8), no parity, 1 stopbit (E). The flow control is not used.

PIN 16: The maximum current of DGND pin is 1,0A.

PIN 17: Not connected. If connected, Charger Switch 0 (CHGSW0) is normally in logic '1' state (2.7V) and grounded when the charger is connected to DC jack.

PIN 18: Same as pin 16. The maximum current of DGND pin is 1.0A.

PIN 19: Not connected. If connected, Charger Switch 1 (CHGSW1) is normally grounded and goes to logic '1' state when the charger is connected to DC jack.

PIN 20: Same as pin 6. The maximum current of CHARGE pin is 1.0A.

The maximum current of all pins except pins 6, 9 and 16 - 20 is 10 mA.

5.0.4 Charging & battery

During charging the charger provides a constant current that can be cut off by the phone. After main charging phase phone uses short current pulses to keep up the fully charged. Charging connector uses only two leads and therefore the charging cable and connector can be simple.

The estimate of remaining battery capacity is based on both battery voltage and used current integration. Current integration means that phone makes "notes" on the current used and the period this current was used.

TG charging concept has charger options. Slow "overnight" charger and fast charger.

TG battery concept uses two pins to read battery type. The pins can only have fixed setting, low (ground) and high. This limits the number of battery categories to four. Note that within a category the battery capacity can vary up to 10-15%, but the cell type remains the same.

5.0.5 HW and SW version numbering

Both HW and SW version are displayed in Service (local) mode.

From idle mode SW version can be read from the phone by keying in `*#0000#`. Additionally this display shows also the SW compilation date.

5.0.5.1 Hardware version

HW version number consists of 8 digits like SBBRRDDZ. HW version numbers are issued in alphabetical order (numbers preceding letters). i.e. later HW versions come later in alphabetical order. HW version can be read with the same key sequence as SW version.

5.0.5.2 Software version

Software version code has format X.XXXXXA, for example 1.290162F. SW version numbers are issued in alphabetical order (numbers preceding letters), i.e. later SW versions come later in alphabetical order.

5.1 Logic/audio

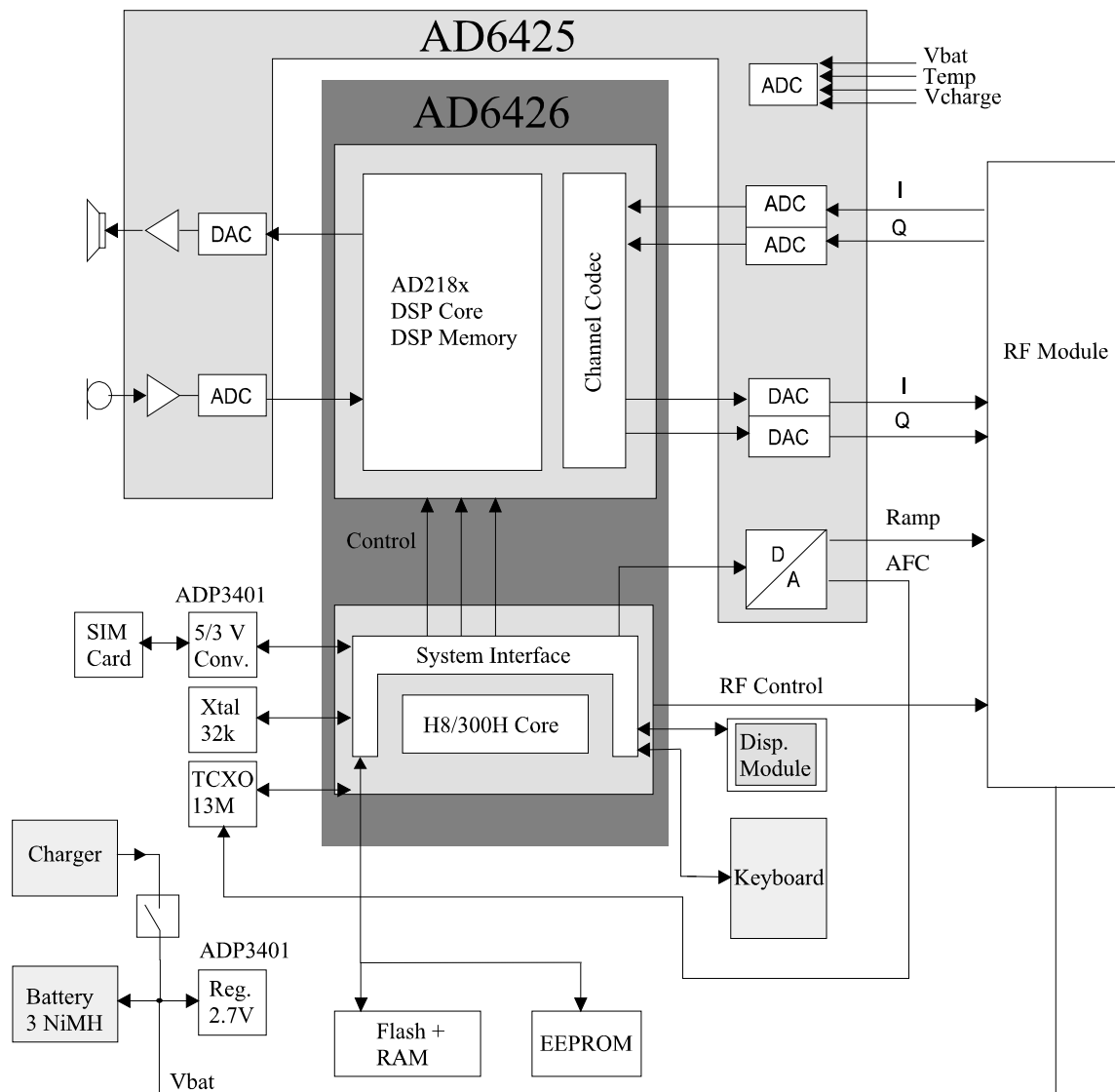
OC2300

5.1.1 General description for the baseband

The baseband is built with Analog Devices components.

The baseband can be divided into six major parts:

1. Enhanced GSM Processor
2. Voice Band Codec
3. Memory
4. Display
5. Power

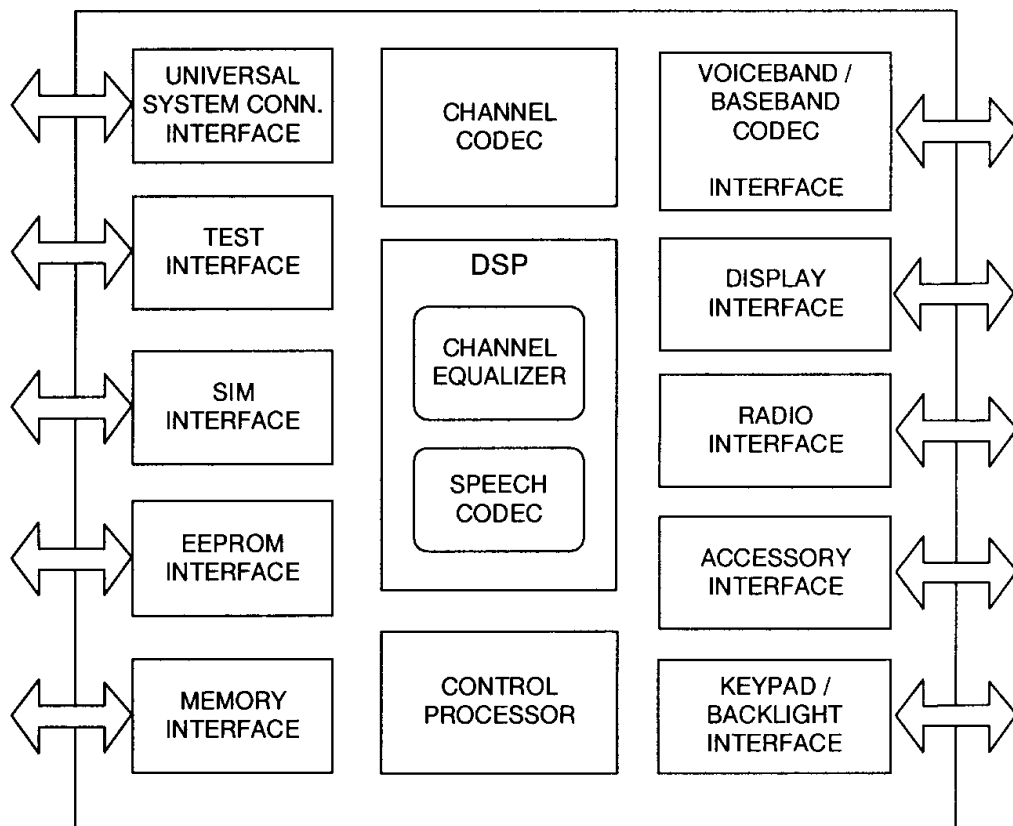


5.1.1.1 Enhanced GSM Processor

The EGSMP (ADI chip AD6426) performs all the baseband functions of the layer 1 processing of the GSM interface. This includes all data encoding and decoding processes as well as timing radio sub-system control functions.

In the EGSMP there is a DSP (speech codec and channel equalizer), main processor (Hitachi H8/300H processor) and also the interfaces (all the sub-system of the terminal, including the keypad, memories, display driver, SIM, DTE and DTA data services interface and radio).

Functional block diagram



5.1.1.2 Voice Band Codec

The VBC (ADI chip AD6425) contains complete codecs for the conversion of voiceband and baseband signals as well as D/A- converters to control the radio subsystem and auxiliary A/D-converter for signal monitoring purposes.

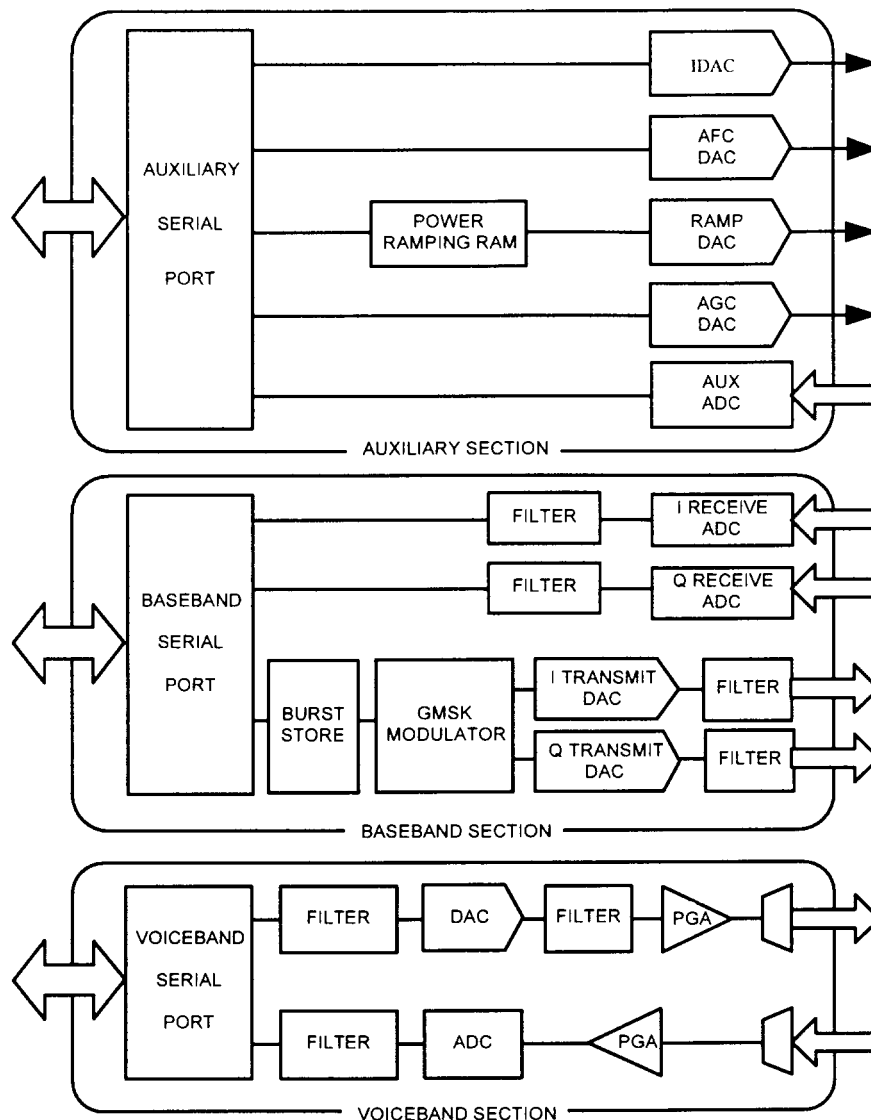
The voiceband codec is a complete analog front-end, which can interface directly with a microphone and a speaker.

The baseband codec is a complete low power, two channel, input/output port with signal conditioning. The transmit path consists of an on-chip burst store, a GMSK modulator and two high speed DACs with output reconstruction filters.

The receive path consists of two 15 bit Sigma Delta A/D converters, which include high performance digital filters for RF-channel selection.

The auxiliary section of the VBC consists of D/A converters for AFC, AGC and for control of the transmit-burst envelope.

The auxiliary section also includes A/D converters that measures different voltages and temperatures.



5.1.1.3 Memory

The memories consists of Flash SRAM and EEPROM. The Flash and RAM are 16 bits wide with total size of 32Mbit (Flash) and 4Mbit (RAM). The EEPROM is a 2-Wire Serial memory with the size of 128kbit.

5.1.1.4 Display

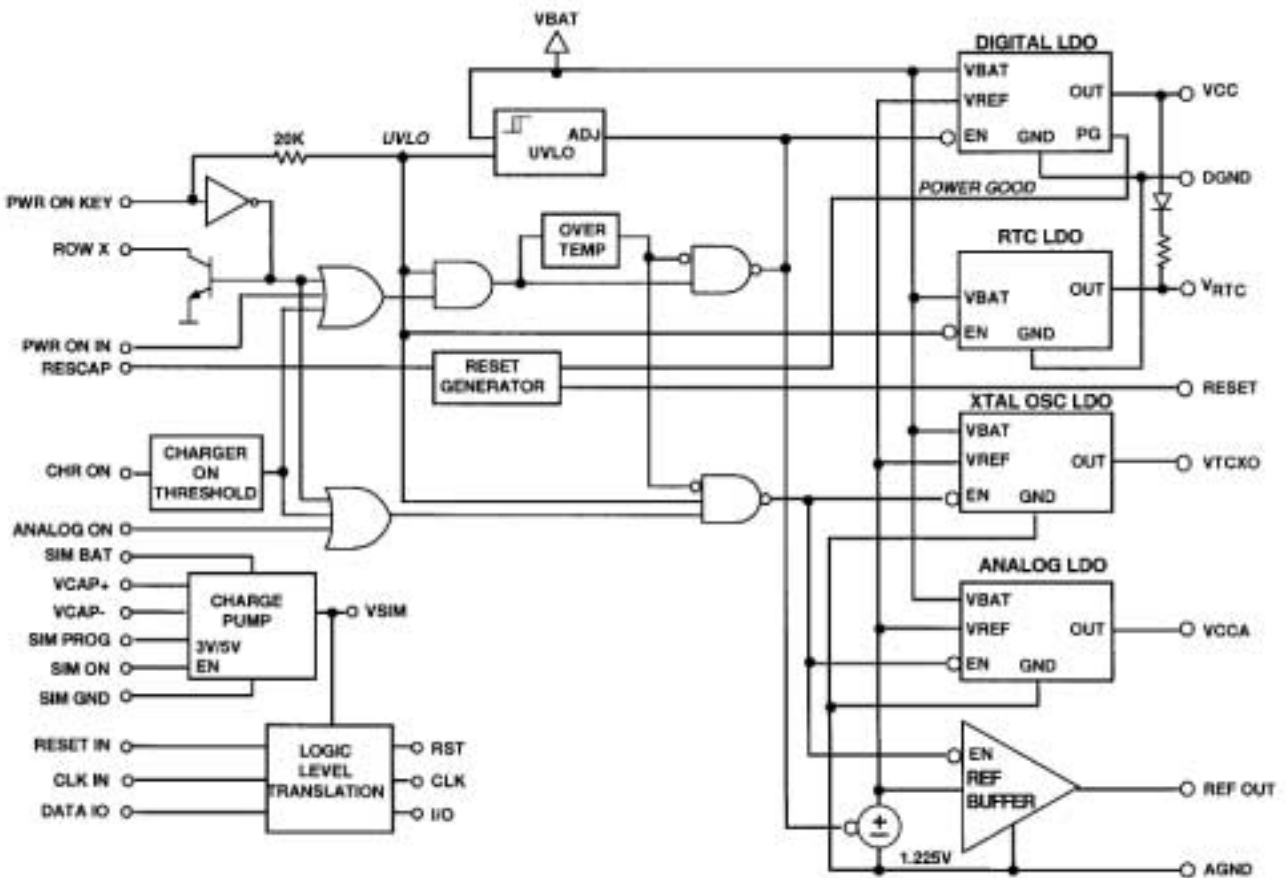
The Display is a Seiko Epson FSTN LCD module (100*48 dots 2.7V) The module have a possibility to be driven either in parallel or serial mode.

5.1.1.5 Power management

The power management is mainly handled by the Analog Device Regulator (ADP3401) wich consists of four LDOs, charge pump (5V) for SIM card and logic level translations for SIM card (3 to 5V). The chip also handles the charging of the litium battery for the real time clock.

The charging of main battery is made so that the charger gives a constant current and its switched in the phone to the right level for the battery. The battery is Lithium, Lithium Polymer or Nickel Metal Hydride, NiMH.

FUNCTIONAL BLOCK DIAGRAM



5.2 RF

5.2.1 General

The RF-part is based on Hitachi dualband GSM RF-chip HD155121F, which includes receiver circuit, offset loop modulation TX architecture and IF-VCO. The final power amplifier is Hitachi PF08103B dualband TX module. RF parts are powered by three 2.8V linear regulators, which provide separate power supply for PLL synthesizer and VCO, modulator and TX-parts, and other RF-parts such as AGC-amplifier and LNA etc.

5.2.2 Receiver

The incoming RX signal from antenna front-end switch X403 is fed via front end filter X301 to the LNA-block, which consists of two amplifiers, one for each band. After LNA-block RX signal is filtered again in filter X302 and applied to the input of first mixer in the RF-chip where the signal is converted to first IF of 225MHz. The channel filtering is accomplished with first IF filter X303. After filtering the signal is fed back to the RF-chip for second frequency conversion. Second IF-frequency is 45 MHz. The second local oscillator signal and 45MHz signal required for IQ demodulation is generated in RF-chip. Automatic Gain Control (AGC) is made by changing the gain of both mixer stages and by adjusting the gain of 45 MHz second IF-amplifier.

5.2.3 Transmitter

The TX signal is generated by dividing the 540 MHz IF-VCO frequency by 2 or by 4. This 270 MHz signal (135 MHz in DCS-1800 band) is then modulated with I and Q signals. The IQ modulated signal is fed to the phase comparator where it is compared to the mixed signal of RF-VCO X304 and TX-VCO X401. The phase comparator output is then filtered and applied to TX-VCO. This architecture makes it possible to use oscillators running at final frequency. Modulated RF-signal from TX-VCO is then amplified in dualband TX module I405 and routed via antenna front-end switch X403 to the antenna connector. The power control loop consists of directional coupler X402, detector diodes D401 and comparator I404.

5.2.4 Synthesizer

RF-synthesizer, which controls RF-channel frequency, is made of serial controlled dual synthesizer chip I304 and dualband VCO-module X304. IF-synthesizer includes the same synthesizer chip I304 and IF-VCO, which is integrated in Hitachi RF-chip, resonator circuits is excluded. Loopfilters of both synthesizers are passive type. 13 MHz reference signal is generated in VCTCXO module X1. The frequency of IF-synthesizer is switched 4 MHz depending on TX / RX cycle and used RF channel.

5.2.5 Power supply and power switching

The battery voltage is regulated in switchable regulators I302, I303 and I401. The used supply voltage for RF-components is 2.8 V, except dual-band TX-module. The power on/off switching is controlled from baseband-processor using output-enable pin of each regulator.

5.2.6 Antenna and antenna connector

The RF-signal from antenna front-end switch X403 is applied to the antenna connector V2. The antenna connector is SMA-type and the nominal impedance is 50 ohm. Antenna itself is a helical type dualband antenna.

5.2.7 Parts list OC2300

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CG0101	C100	SMD capasitor X7R	100pF ñ5%	Murata	
CG0330	C101	SMD capasitor NPO	33pF ñ5%	Murata	
CG0103	C102	SMD capasitor X7R	10nF ñ10%	Murata	'
CG0103	C150	SMD capasitor X7R	10nF ñ10%	Murata	'
CG0103	C151	SMD capasitor X7R	10nF ñ10%	Murata	'
CG0103	C152	SMD capasitor X7R	10nF ñ10%	Murata	'
CG0104	C160	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C161	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0101	C162	SMD capasitor X7R	100pF ñ5%	Murata	
CG0101	C163	SMD capasitor X7R	100pF ñ5%	Murata	
CG0101	C164	SMD capasitor X7R	100pF ñ5%	Murata	
CG0101	C165	SMD capasitor X7R	100pF ñ5%	Murata	
CG0332	C180	SMD capasitor X7R	3.3nF ñ10%	Murata	
CG0471	C181	SMD capasitor X7R	470pF ñ10%	Murata	
CH0105	C182	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CG0332	C183	SMD capasitor X7R	3.3nF ñ10%	Murata	
CG0682	C184	*** EI KOODATTU VARAS- TOON ***			
CG0104	C185	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C186	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C187	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C188	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0330	C190	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C191	SMD capasitor NPO	33pF ñ5%	Murata	
CG0104	C200	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C201	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0223	C202	SMD capasitor X7R	22nF 20%	Murata	
CF0105	C210	SMD capasitor	1uF 10% 6,3V X5R	AVX	CM105X5R105K06AT
CG0471	C211	SMD capasitor X7R	470pF ñ10%	Murata	
CU1106	C212	SMD tantal	10uF/16V	AVX	TAJB106M016R
CC2103	C213	SMD capasitor	10nF 10% 100V X7R	AVX	12061C103KAT2A
CH0105	C215	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C216	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CG0104	C217	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C218	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C219	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C220	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C221	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C222	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C225	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C226	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C227	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C228	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C229	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0104	C230	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0223	C232	SMD capasitor X7R	22nF 20%	Murata	
CU3106	C233	SMD tantal	10uF / 6V +-20%	AVX	TAJA106M006R
CH0105	C234	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CU3106	C235	SMD tantal	10uF / 6V +-20%	AVX	TAJA106M006R
CU3106	C236	SMD tantal	10uF / 6V +-20%	AVX	TAJA106M006R
CG0104	C237	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0103	C241	SMD capasitor X7R	10nF ñ10%	Murata	'
CH0105	C242	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CG0101	C243	SMD capasitor X7R	100pF ñ5%	Murata	
CG0680	C244	SMD capasitor NPO	68pF ñ5%	Murata	
CG0104	C245	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0102	C248	SMD capasitor X7R	1nF ñ10%	Murata	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CG0104	C249	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CH0105	C250	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CG0101	C251	SMD capasitor X7R	100pF ñ5%	Murata	
CG0102	C252	SMD capasitor X7R	1nF ñ10%	Murata	
CG0101	C253	SMD capasitor X7R	100pF ñ5%	Murata	
CG0101	C254	SMD capasitor X7R	100pF ñ5%	Murata	
CG0101	C255	SMD capasitor X7R	100pF ñ5%	Murata	
CU3106	C260	SMD tantal	10uF / 6V +20%	AVX	TAJA106M006R
CG0104	C261	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0223	C263	SMD capasitor X7R	22nF 20%	Murata	
CG0223	C264	SMD capasitor X7R	22nF 20%	Murata	
CG0680	C270	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C271	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C272	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C273	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C274	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C275	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C276	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C277	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C278	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C279	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C280	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C281	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C282	SMD capasitor NPO	68pF ñ5%	Murata	
CG0104	C290	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0680	C291	SMD capasitor NPO	68pF ñ5%	Murata	
CF0105	C294	SMD capasitor	1uF 10% 6,3V X5R	AVX	CM105X5R105K06AT
CG0680	C295	SMD capasitor NPO	68pF ñ5%	Murata	
CG0471	C3	SMD capasitor X7R	470pF ñ10%	Murata	
CG0330	C301	SMD capasitor NPO	33pF ñ5%	Murata	
CG0279	C302	SMD capasitor NPO	2.7pF ñ0,25pF	Murata	
CG0129	C303	SMD capasitor NPO	1.2pF ñ0,25pF	Murata	
CG0109	C304	SMD capasitor NPO	1.0pF ñ0,25pF	Murata	
CG0103	C305	SMD capasitor X7R	10nF ñ10%	Murata	
CG0221	C306	SMD capasitor X7R	220pF ñ10%	Murata	
CG0109	C307	SMD capasitor NPO	1.0pF ñ0,25pF	Murata	
CG0100	C308	SMD capasitor NPO	10pF+0.25pF	Murata	
CG0279	C311	SMD capasitor NPO	2.7pF ñ0,25pF	Murata	
CG0229	C313	SMD capasitor NPO	2.2pF ñ0,25pF	Murata	
CG0680	C321	SMD capasitor NPO	68pF ñ5%	Murata	
CG0270	C322	SMD capasitor NPO	27pF ñ5%	Murata	
CG0229	C323	SMD capasitor NPO	2.2pF ñ0,25pF	Murata	
CG0109	C324	SMD capasitor NPO	1.0pF ñ0,25pF	Murata	
CG0103	C325	SMD capasitor X7R	10nF ñ10%	Murata	
CG0221	C326	SMD capasitor X7R	220pF ñ10%	Murata	
CG0399	C327	SMD capasitor NPO	3.9pF ñ0,25pF	Murata	
CG0479	C328	SMD capasitor NPO	4.7pF ñ0,25pF	Murata	
CG0129	C331	SMD capasitor NPO	1.2pF ñ0,25pF	Murata	
CG0189	C332	SMD capasitor NPO	1.8pF ñ0,25pF	Murata	
CG0220	C333	SMD capasitor NPO	22pF ñ5%	Murata	
CG0101	C334	SMD capasitor X7R	100pF ñ5%	Murata	
CG0101	C335	SMD capasitor X7R	100pF ñ5%	Murata	
CG0103	C336	SMD capasitor X7R	10nF ñ10%	Murata	
CG0102	C337	SMD capasitor X7R	1nF ñ10%	Murata	
CG0103	C338	SMD capasitor X7R	10nF ñ10%	Murata	
CH0105	C339	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CG0103	C341	SMD capasitor X7R	10nF ñ10%	Murata	
CG0121	C343	SMD capasitor X7R	120pF ñ5%	Murata	
CG0121	C344	SMD capasitor X7R	120pF ñ5%	Murata	
CG0339	C345	SMD capasitor NPO	3.3pF ñ0,25pF	Murata	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CG0339	C346	SMD capasitor NPO	3.3pF ñ0,25pF	Murata	
CG0339	C347	SMD capasitor NPO	3.3pF ñ0,25pF	Murata	
CG0151	C348	SMD capasitor X7R	150pF ñ5%	Murata	
CG0103	C351	SMD capasitor X7R	10nF ñ10%	Murata	
CG0103	C352	SMD capasitor X7R	10nF ñ10%	Murata	
CG0102	C353	SMD capasitor X7R	1nF ñ10%	Murata	
CU3475	C354	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CU3475	C355	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CG0102	C356	SMD capasitor X7R	1nF ñ10%	Murata	
CU3475	C357	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CG0680	C360	SMD capasitor NPO	68pF ñ5%	Murata	
CG0101	C361	SMD capasitor X7R	100pF ñ5%	Murata	
CG0331	C362	SMD capasitor X7R	330pF ñ10%	Murata	
CH0105	C363	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CG0103	C364	SMD capasitor X7R	10nF ñ10%	Murata	
CG0270	C365	SMD capasitor NPO	27pF ñ5%	Murata	
CG0100	C366	SMD capasitor NPO	10pF-+0.25pF	Murata	
CH0105	C367	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CG0101	C368	SMD capasitor X7R	100pF ñ5%	Murata	
CP2223	C371	SMD film capasitor	22nF/16V +5%	Panasonic	ECHU1C223JB5
CG0152	C372	SMD capasitor X7R	1.5nF ñ10%	Murata	
CH0105	C373	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CG0102	C374	SMD capasitor X7R	1nF ñ10%	Murata	
CG0152	C375	SMD capasitor X7R	1.5nF ñ10%	Murata	
CP2223	C376	SMD film capasitor	22nF/16V +5%	Panasonic	ECHU1C223JB5
CG0102	C378	SMD capasitor X7R	1nF ñ10%	Murata	
CG0100	C380	SMD capasitor NPO	10pF-+0.25pF	Murata	
CG0100	C381	SMD capasitor NPO	10pF-+0.25pF	Murata	
CG0569	C382	SMD capasitor NPO	5.6pF ñ0,25pF	Murata	
CG0103	C383	SMD capasitor X7R	10nF ñ10%	Murata	
CG0220	C384	SMD capasitor NPO	22pF ñ5%	Murata	
CG0689	C385	SMD capasitor NPO	6.8pF ñ0,25pF	Murata	
CG0689	C388	SMD capasitor NPO	6.8pF ñ0,25pF	Murata	
CG0331	C389	SMD capasitor X7R	330pF ñ10%	Murata	
CG0100	C390	SMD capasitor NPO	10pF-+0.25pF	Murata	
CG0220	C401	SMD capasitor NPO	22pF ñ5%	Murata	
CG0220	C402	SMD capasitor NPO	22pF ñ5%	Murata	
CG0101	C403	SMD capasitor X7R	100pF ñ5%	Murata	
CG0103	C404	SMD capasitor X7R	10nF ñ10%	Murata	
CG0103	C405	SMD capasitor X7R	10nF ñ10%	Murata	
CG0103	C406	SMD capasitor X7R	10nF ñ10%	Murata	
CG0100	C407	SMD capasitor NPO	10pF-+0.25pF	Murata	
CG0100	C408	SMD capasitor NPO	10pF-+0.25pF	Murata	
CG0101	C409	SMD capasitor X7R	100pF ñ5%	Murata	
CP2682	C411	SMD film capasitor	6,8nF/16V +-5%	Panasonic	ECHU1C682JB5
CG0471	C412	SMD capasitor X7R	470pF ñ10%	Murata	
CD0103	C413	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CG0680	C414	SMD capasitor NPO	68pF ñ5%	Murata	
CG0121	C416	SMD capasitor X7R	120pF ñ5%	Murata	
CG0120	C420	SMD capasitor NPO	12pF ñ5%	Murata	
CG0102	C421	SMD capasitor X7R	1nF ñ10%	Murata	
CU3475	C422	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CG0104	C423	SMD capasitor	100nF/10% 6,3V X5R	AVX	CM05X5R104K06AH
CG0339	C424	SMD capasitor NPO	3.3pF ñ0,25pF	Murata	
CG0100	C425	SMD capasitor NPO	10pF-+0.25pF	Murata	
CG0471	C426	SMD capasitor X7R	470pF ñ10%	Murata	
CG0220	C427	SMD capasitor NPO	22pF ñ5%	Murata	
CG0680	C428	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C429	SMD capasitor NPO	68pF ñ5%	Murata	
CU1107	C430	SMD tantal	100uF/10V -+20%	AVX	TAJD107M010R

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CU1107	C431	SMD tantal	100uF/10V +-20%	AVX	TAJD107M010R
CG0680	C432	SMD capasitor NPO	68pF ñ5%	Murata	
CG0103	C433	SMD capasitor X7R	10nF ñ10%	Murata	
CG0680	C434	SMD capasitor NPO	68pF ñ5%	Murata	
CG0103	C435	SMD capasitor X7R	10nF ñ10%	Murata	
CG0680	C436	SMD capasitor NPO	68pF ñ5%	Murata	
CG0330	C437	SMD capasitor NPO	33pF ñ5%	Murata	
CG0101	C438	SMD capasitor X7R	100pF ñ5%	Murata	
CG0229	C439	SMD capasitor NPO	2.2pF ñ0,25pF	Murata	
CG0680	C440	SMD capasitor NPO	68pF ñ5%	Murata	
CG0101	C441	SMD capasitor X7R	100pF ñ5%	Murata	
CG0101	C442	SMD capasitor X7R	100pF ñ5%	Murata	
CF0689	C443	SMD capasitor	6.8 pF/0.25pF 50 V NPO	Philips	
CG0680	C445	SMD capasitor NPO	68pF ñ5%	Murata	
CG0330	C446	SMD capasitor NPO	33pF ñ5%	Murata	
CG0680	C447	SMD capasitor NPO	68pF ñ5%	Murata	
CG0330	C448	SMD capasitor NPO	33pF ñ5%	Murata	
CG0680	C450	SMD capasitor NPO	68pF ñ5%	Murata	
CG0680	C451	SMD capasitor NPO	68pF ñ5%	Murata	
CG0102	C452	SMD capasitor X7R	1nF ñ10%	Murata	
CG0330	C456	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C457	SMD capasitor NPO	33pF ñ5%	Murata	
CG0101	C458	SMD capasitor X7R	100pF ñ5%	Murata	
DY0016	D200	SMD shottky diode	40V/1,33A VF=0.55V	Shindengen	M1FS4
DS0019	D201	SMD diode	100v / 200mA	Philips	BAS19
DC0229	D301	SMD silicon tuning diode	1V/19pF...4V/11pF	Toshiba	1SV229
DY0062	D401	SMD shcottky diode	40V 20mA	Siemens	BAT 62
AF1035	F251	PolySwitch		Raychem	miniSMDC035-2
IX6426	I100	Enhanced GSM processor		AnalogDevi	AD6426AB
IX6425	I101	Analog/Digital IC GSM		AnalogDevi	AD6425AST
IM8421	I110	Flash+SRAM memory	16MB + 2MB	Fujitsu	MB84VD21091-85PB
IM0128	I115	EEPROM	128K(16.384x8)	Atmel	AT24C128N-10SI2,
IR3401	I120	Regulator		AnalogDevi	ADP3401ARU-REEL
IX0826	I122	EL-lamp driver	4,5V / 120V	Supertex	HV826MG
IF1551	I301	RF-circuit Bright II	GSM Tx/Rx	Hitachi	HD155121FEB
IR2982	I302	Regulator	2,8V 50mA	NationalSe	LP2982IMS-2,8
IR2982	I303	Regulator	2,8V 50mA	NationalSe	LP2982IMS-2,8
IS1503	I304	PLL frequency synthesize		Fujitsu	MB15F03SLPV-ER
IR2982	I401	Regulator	2,8V 50mA	NationalSe	LP2982IMS-2,8
IH0126	I403	Quad tri state buffer		Fairchild	MM74HC126MTC
IA4165	I404	Op Amps	2,7V--6,5V/80mA	Maxim	MAX4165
IW0810	I405	RF-power amplifier	900/1800MHz	Hitachi	PF08103B
LC0567	L200	SMD inductors	560uH 10% 3,2x2,5mm	Murata	LQH3C561K34
LG0332	L301	SMD inductor	3n3 +-0,3nH	TaiyoYuden	HK1005 3N3J-T
LG0103	L302	SMD inductor	10n +-5%	TaiyoYuden	HK1005 10NJ-T
LG0392	L303	SMD inductor	3n9 +-0,3nH	TaiyoYuden	HK1005 3N9J-T
LG0332	L304	SMD inductor	3n3 +-0,3nH	TaiyoYuden	HK1005 3N3J-T
LG0822	L305	SMD inductor	8n2 +-5%	TaiyoYuden	HK1005 8N2J-T
LG0682	L306	SMD inductor	6n8 +-5%	TaiyoYuden	HK1005 6N8J-T
LG0682	L307	SMD inductor	6n8 +-5%	TaiyoYuden	HK1005 6N8J-T
LC4104	L311	SMD inductor	100n +-5%	TaiyoYuden	HK1608 R10J-T
LC4104	L312	SMD inductor	100n +-5%	TaiyoYuden	HK1608 R10J-T
LC4154	L313	SMD inductor	150n +-5%	TaiyoYuden	HK1608 R15J-T
LC3823	L314	SMD inductor	82n +-5%	TaiyoYuden	HK1608 82NJ-T
LC3823	L315	SMD inductor	82n +-5%	TaiyoYuden	HK1608 82NJ-T
LG0103	L317	SMD inductor	10n +-5%	TaiyoYuden	HK1005 10NJ-T
LC4822	L318	SMD inductor	8n2 +-0,2n	Murata	LQP21A8N2C14M00
LG0103	L402	SMD inductor	10n +-5%	TaiyoYuden	HK1005 10NJ-T
QS0060	Q150	SMD transistor arrey	NPN/PNP 100mA/50V	Siemens	BCR 10PN
QF6702	Q200	P-channel MOSFET	Vdss 20V rds 0,2 ohm	I&R	IRLMS6702

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
QS1847	Q201	piensignaali yleistransi	NPN 100mA/45V hfe=200...450	Philips	BC847BW
QS1847	Q210	piensignaali yleistransi	NPN 100mA/45V hfe=200...450	Philips	BC847BW
QS0060	Q220	SMD transistor arrey	NPN/PNP 100mA/50V	Siemens	BCR 10PN
QS1847	Q241	piensignaali yleistransi	NPN 100mA/45V hfe=200...450	Philips	BC847BW
QS1847	Q250	piensignaali yleistransi	NPN 100mA/45V hfe=200...450	Philips	BC847BW
QA0420	Q301	RF transistor	NPN silicon 1.8GHz	Siemens	BFP420
QA0420	Q302	RF transistor	NPN silicon 1.8GHz	Siemens	BFP420
QS1857	Q401	piensignaali yleistransi	PNP 100mA/45V hfe=220...470	Philips	BC857BW
QS0060	Q402	SMD transistor arrey	NPN/PNP 100mA/50V	Siemens	BCR 10PN
QS1857	Q403	piensignaali yleistransi	PNP 100mA/45V hfe=220...470	Philips	BC857BW
QS1847	Q404	piensignaali yleistransi	NPN 100mA/45V hfe=200...450	Philips	BC847BW
RG0151	R100	SMD resistor	150R 5% 0.063W	Kamaya	RMC1/16S
RG0103	R102	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0103	R103	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RF0106	R104	SMD resistor	10 M 5% 0.125 W	Kamaya	
RG0103	R105	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R113	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R114	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R117	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0000	R121	SMD resistor	0 ohm		
RG0564	R150	SMD resistor	560k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R151	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0684	R152	SMD resistor	680k 5% 0.063W	Kamaya	RMC1/16S
RT2500	R153	NTC resistor	150k+-5% B=4750	TaiyoYuden	TBPS1R154J475H5Q
RG0105	R154	SMD resistor	1M0 5% 0.063W	Kamaya	RMC1/16S
RG0104	R155	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R160	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R161	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0103	R162	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0472	R163	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R164	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R165	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R166	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R170	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R171	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R172	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R173	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0104	R174	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0272	R180	SMD resistor	2k7 5% 0.063W	Kamaya	RMC1/16S
RG0101	R181	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0272	R183	SMD resistor	2k7 5% 0.063W	Kamaya	RMC1/16S
RG0103	R190	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0103	R191	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0272	R192	SMD resistor	2k7 5% 0.063W	Kamaya	RMC1/16S
RG0102	R202	SMD resistor	1k0 5% 0.063W	Kamaya	RMC1/16S
RG0103	R203	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0105	R204	SMD resistor	1M0 5% 0.063W	Kamaya	RMC1/16S
RG0103	R205	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0103	R206	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0103	R207	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R208	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0102	R210	SMD resistor	1k0 5% 0.063W	Kamaya	RMC1/16S
RG0220	R211	SMD resistor	22R 5% 0.063W	Kamaya	RMC1/16S
RG0564	R212	SMD resistor	560k 5% 0.063W	Kamaya	RMC1/16S
RG0105	R213	SMD resistor	1M0 5% 0.063W	Kamaya	RMC1/16S
RG0472	R215	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R216	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0103	R220	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0101	R221	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0103	R241	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RG0220	R242	SMD resistor	22R 5% 0.063W	Kamaya	RMC1/16S
RG0222	R243	SMD resistor	2k2 5% 0.063W	Kamaya	RMC1/16S
RG0104	R244	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0222	R245	SMD resistor	2k2 5% 0.063W	Kamaya	RMC1/16S
RG0220	R246	SMD resistor	22R 5% 0.063W	Kamaya	RMC1/16S
RG0151	R247	SMD resistor	150R 5% 0.063W	Kamaya	RMC1/16S
RG0105	R250	SMD resistor	1M0 5% 0.063W	Kamaya	RMC1/16S
RG0105	R251	SMD resistor	1M0 5% 0.063W	Kamaya	RMC1/16S
RG0103	R255	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R260	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R261	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0101	R262	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0102	R263	SMD resistor	1k0 5% 0.063W	Kamaya	RMC1/16S
RG0101	R264	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R265	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R266	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R267	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R268	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R269	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R270	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R271	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R272	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R273	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0104	R274	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R275	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R276	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R277	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R278	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0103	R281	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0102	R282	SMD resistor	1k0 5% 0.063W	Kamaya	RMC1/16S
RG0104	R283	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0223	R290	SMD resistor	22k 5% 0.063W	Kamaya	RMC1/16S
RG0223	R291	SMD resistor	22k 5% 0.063W	Kamaya	RMC1/16S
RG0000	R292	SMD resistor	0 ohm		
RG0104	R293	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0102	R294	SMD resistor	1k0 5% 0.063W	Kamaya	RMC1/16S
RG0151	R301	SMD resistor	150R 5% 0.063W	Kamaya	RMC1/16S
RG0472	R302	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R303	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0101	R304	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0471	R305	SMD resistor	470R 5% 0.063W	Kamaya	RMC1/16S
RG0100	R306	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0222	R307	SMD resistor	2k2 5% 0.063W	Kamaya	RMC1/16S
RG0100	R311	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0100	R312	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R313	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R314	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R315	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R316	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R317	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0102	R319	SMD resistor	1k0 5% 0.063W	Kamaya	RMC1/16S
RG0100	R321	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0100	R322	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0180	R324	SMD resistor	18R 5% 0.063W	Kamaya	RMC1/16S
RG0472	R326	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0182	R327	SMD resistor	1k8 5% 0.063W	Kamaya	RMC1/16S
RG0101	R328	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0100	R331	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0103	R332	SMD resistor	10k 5% 0.063W	Kamaya	RMC1/16S
RG0100	R333	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S

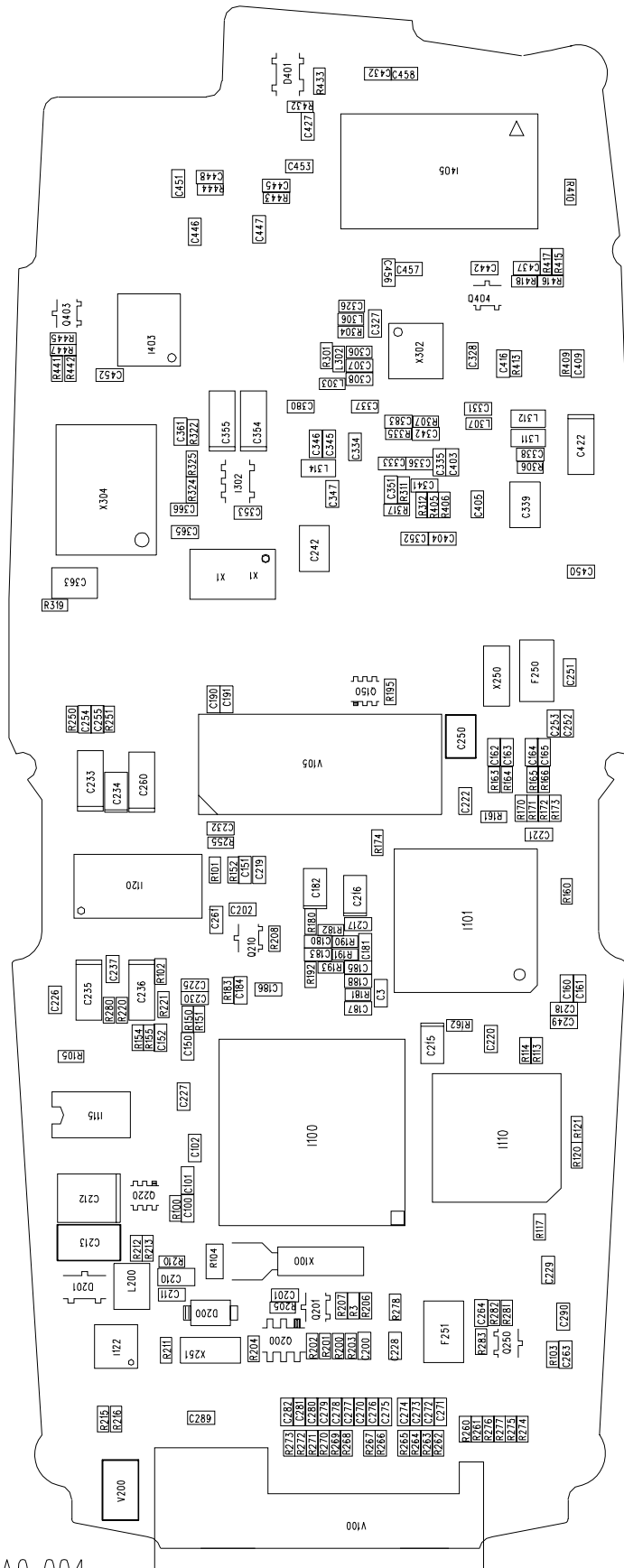
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RG0100	R334	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0100	R335	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0270	R336	SMD resistor	27R 5% 0.063W	Kamaya	RMC1/16S
RG0222	R337	SMD resistor	2k2 5% 0.063W	Kamaya	RMC1/16S
RG0562	R338	SMD resistor	5k6 5% 0.063W	Kamaya	RMC1/16S
RG0472	R339	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0101	R341	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R342	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R343	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0102	R400	SMD resistor	1k0 5% 0.063W	Kamaya	RMC1/16S
RG0101	R401	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R402	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R403	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R404	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0100	R405	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0100	R406	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0223	R408	SMD resistor	22k 5% 0.063W	Kamaya	RMC1/16S
RG0100	R409	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0473	R410	SMD resistor	47k 5% 0.063W	Kamaya	RMC1/16S
RG0100	R411	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0560	R412	SMD resistor	56R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R413	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0121	R415	SMD resistor	120R 5% 0.063W	Kamaya	RMC1/16S
RG0270	R416	SMD resistor	27R 5% 0.063W	Kamaya	RMC1/16S
RG0390	R417	SMD resistor	39R 5% 0.063W	Kamaya	RMC1/16S
RG0151	R418	SMD resistor	150R 5% 0.063W	Kamaya	RMC1/16S
RG0101	R422	SMD resistor	100R 5% 0.063W	Kamaya	RMC1/16S
RG0472	R423	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0473	R424	SMD resistor	47k 5% 0.063W	Kamaya	RMC1/16S
RG0105	R426	SMD resistor	1M0 5% 0.063W	Kamaya	RMC1/16S
RG0563	R427	SMD resistor	56k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R428	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0472	R429	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0470	R430	SMD resistor	47R 5% 0.063W	Kamaya	RMC1/16S
RG0104	R431	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R432	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0104	R433	SMD resistor	100k 5% 0.063W	Kamaya	RMC1/16S
RG0100	R435	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0100	R436	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0470	R437	SMD resistor	47R 5% 0.063W	Kamaya	RMC1/16S
RG0472	R440	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R441	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R442	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R443	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0472	R444	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
RG0473	R445	SMD resistor	47k 5% 0.063W	Kamaya	RMC1/16S
RG0100	R446	SMD resistor	10 R 5% 0.063W	Kamaya	RMC1/16S
RG0472	R447	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
VN2302	V100	In phone connector		L&K	HO1433GB
VM0002	V101	Modulat cntact	2pin 2A/pin	Bours	70AAJ002M0
VM0002	V102	Modulat cntact	2pin 2A/pin	Bours	70AAJ002M0
VW0109	V105	Connector	32-pin 1mm pitch	Elco	589158032000011
VI2302	V120	SIM-reader		Siemens	V23533-A9222-A20
VR0248	V2	SMA connector		?????????	982589
XO0174	X1	VCTCXO 3,5*6,0mm	13.0 MHz 2,5ppm 3V+-5%	Raltron	RTVY-174EF230S13
X32766	X100	SMD crystal	32.768kHz +-30ppm	MicroCryst	MS1V-TK
LF0062	X250	SMD EMI filter	10nF/2A	Panasonic	ELKE103FA
LF0062	X251	SMD EMI filter	10nF/2A	Panasonic	ELKE103FA
XW8425	X301	Rx Dual SAW-filter	for GSM	Panasonic	FARG6CH1G8425L22
XW9418	X302	SAW-filter	Rx dual	Panasonic	EFCH9418MTYB

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
XW0225	X303	SAW filter, GSM	225MHz	Murata	MKFC225.000MBA
XO0490	X304	Dual Rx-VCO	for GSM	Panasonic	ENFVZ4G90
XO0473	X401	Dual Tx-VCO	for GSM	Panasonic	ENFVZ4G73
XI1519	X402	Direktional coupler	Dual coupler	Murata	LDC15D190A0007AH
ID2300	X403	Dual switch diplexer	900/1800MHz	Murata	LMC36-07A0501PTA
PC2300	Y240	*** EI KOODATTU VARAS- TOON ***			

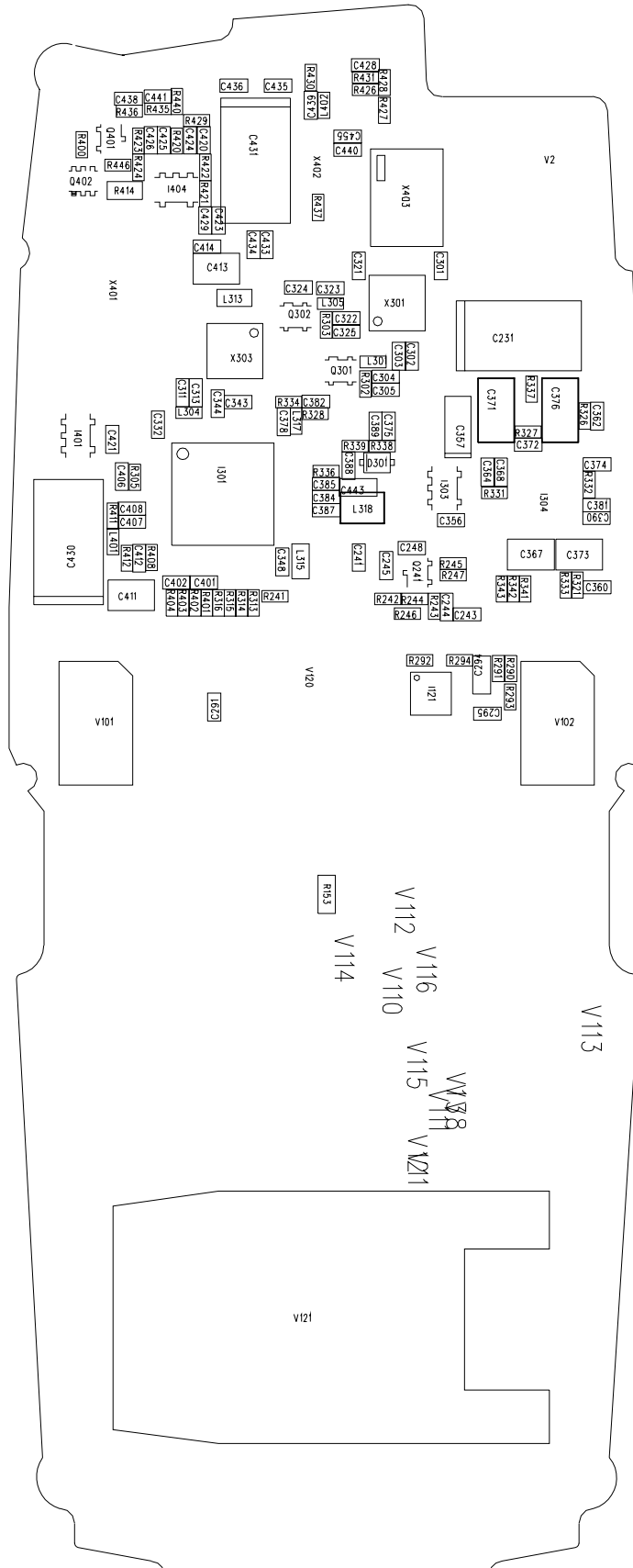
Last
update
08.05.00

There are some differences between the single (TGP71EU) and dual SIM (TGP73EU) in the OC2300 module

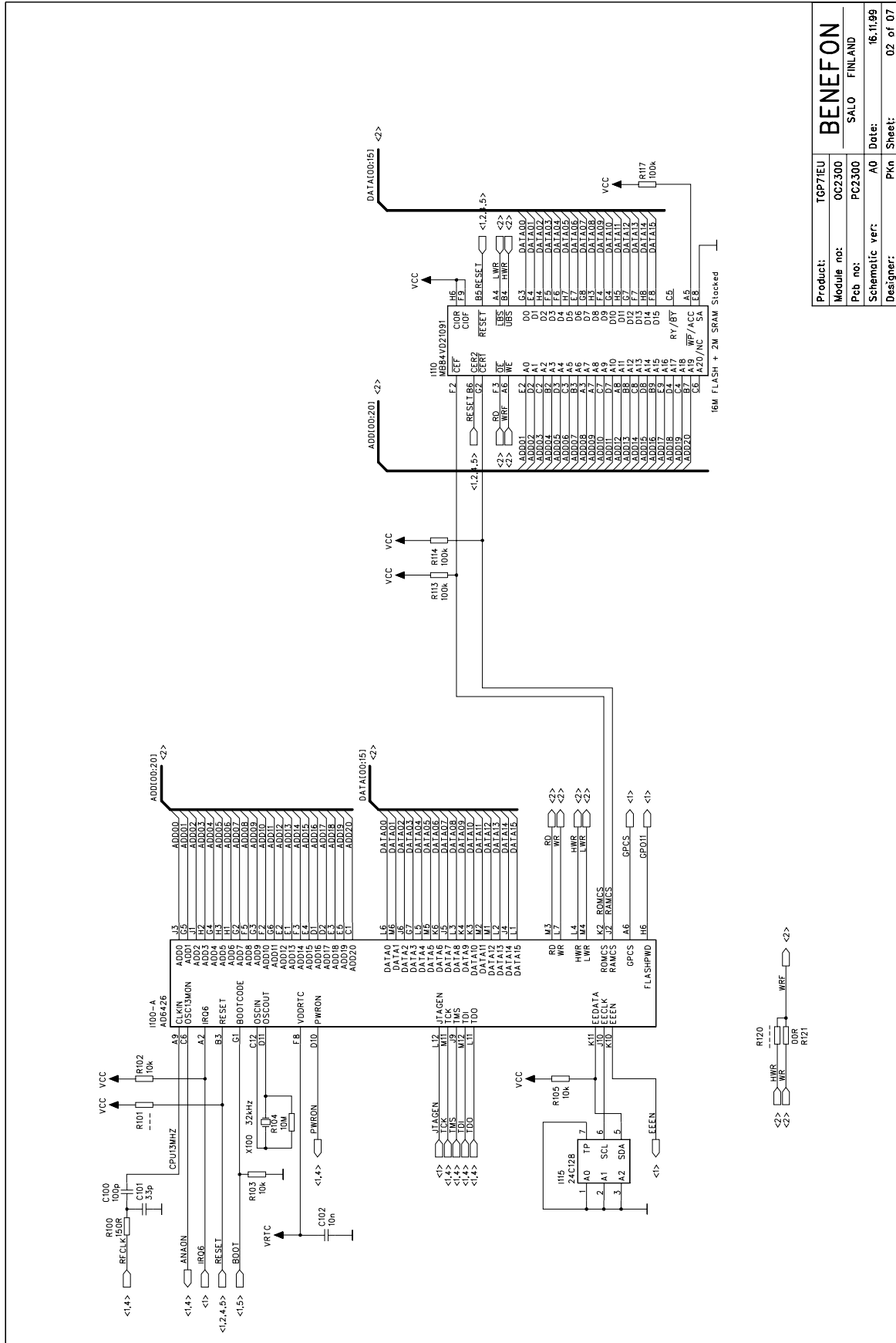
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VI1707	V121	SIM-reader	-	X
IC0454	I121	ana switch	-	X
RG0000	R292	0R	X	-



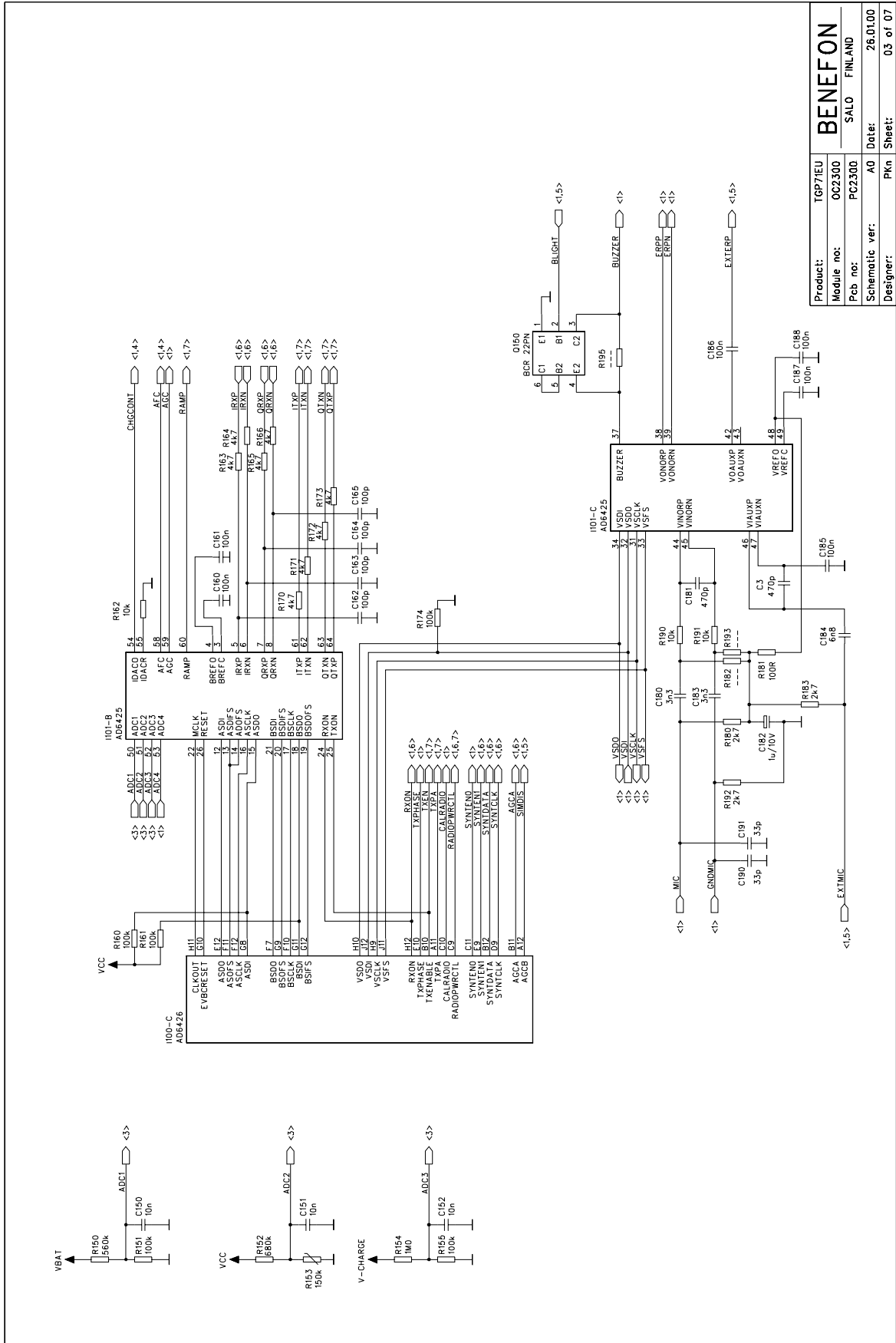
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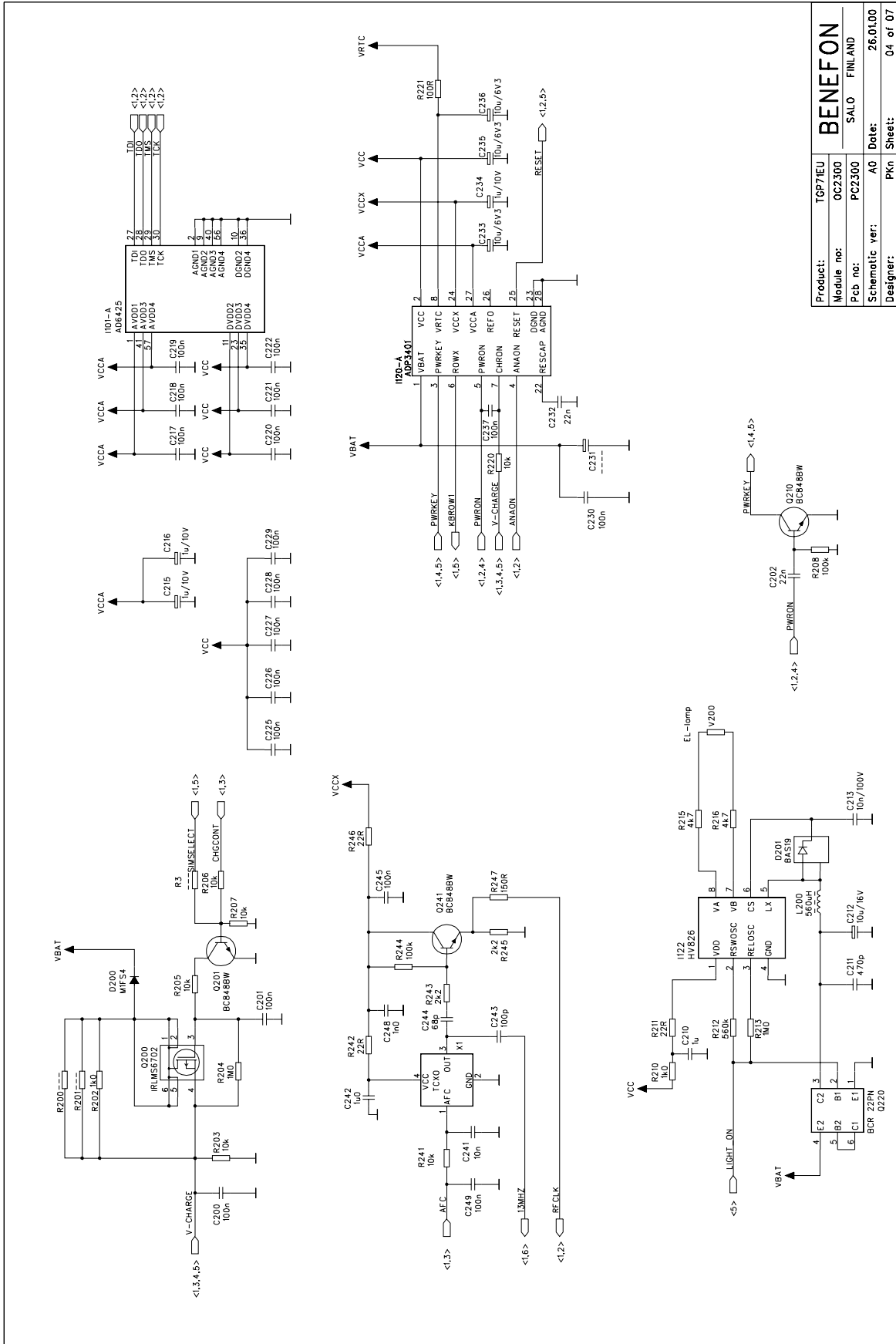
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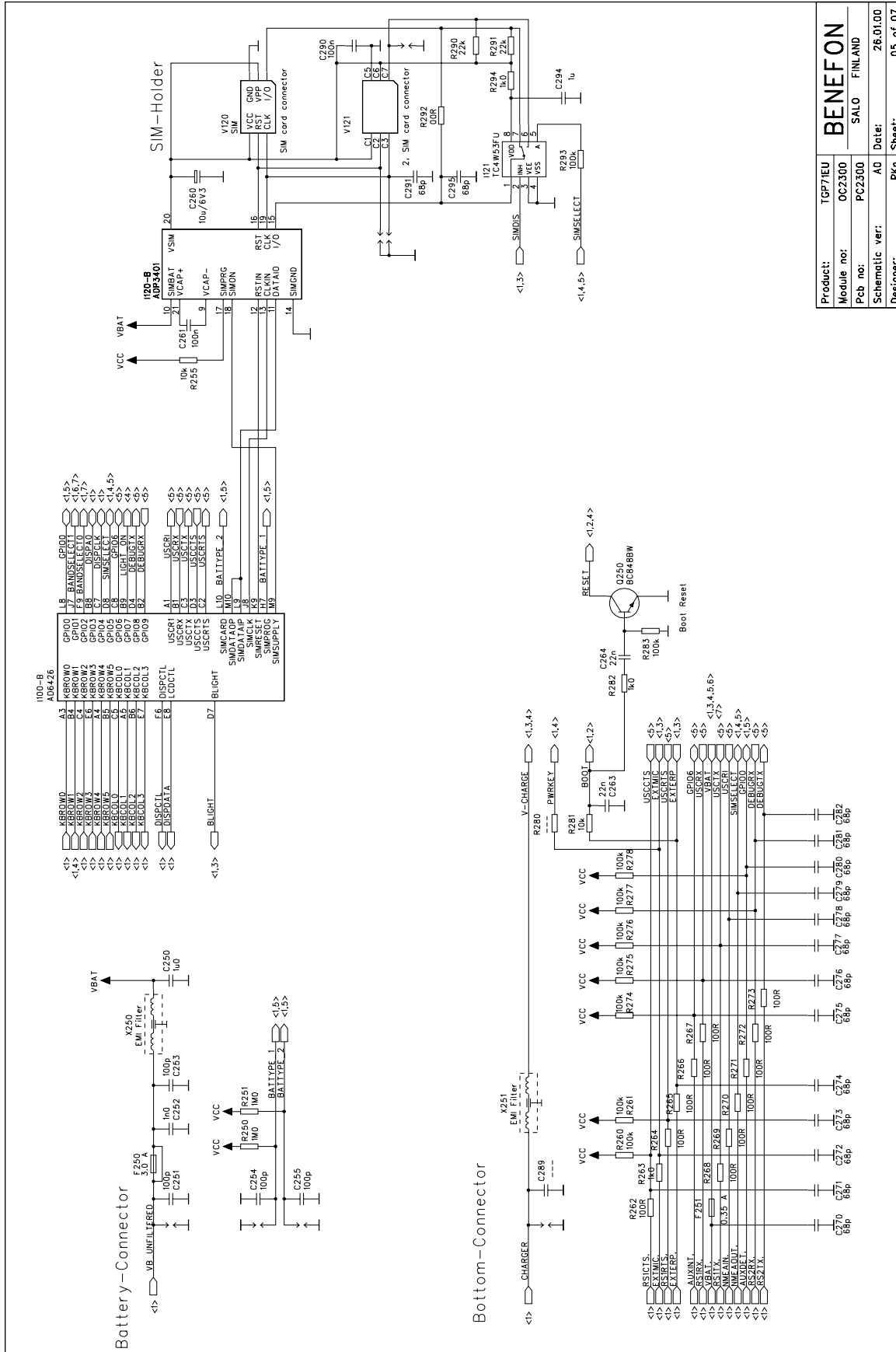
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Module no:	OC2300	SALO FINLAND
Pcb no:	PC2300	
Schematic ver:	A0	Date: 16.11.99
Designer:	Pkn	Sheet: 02 of 07

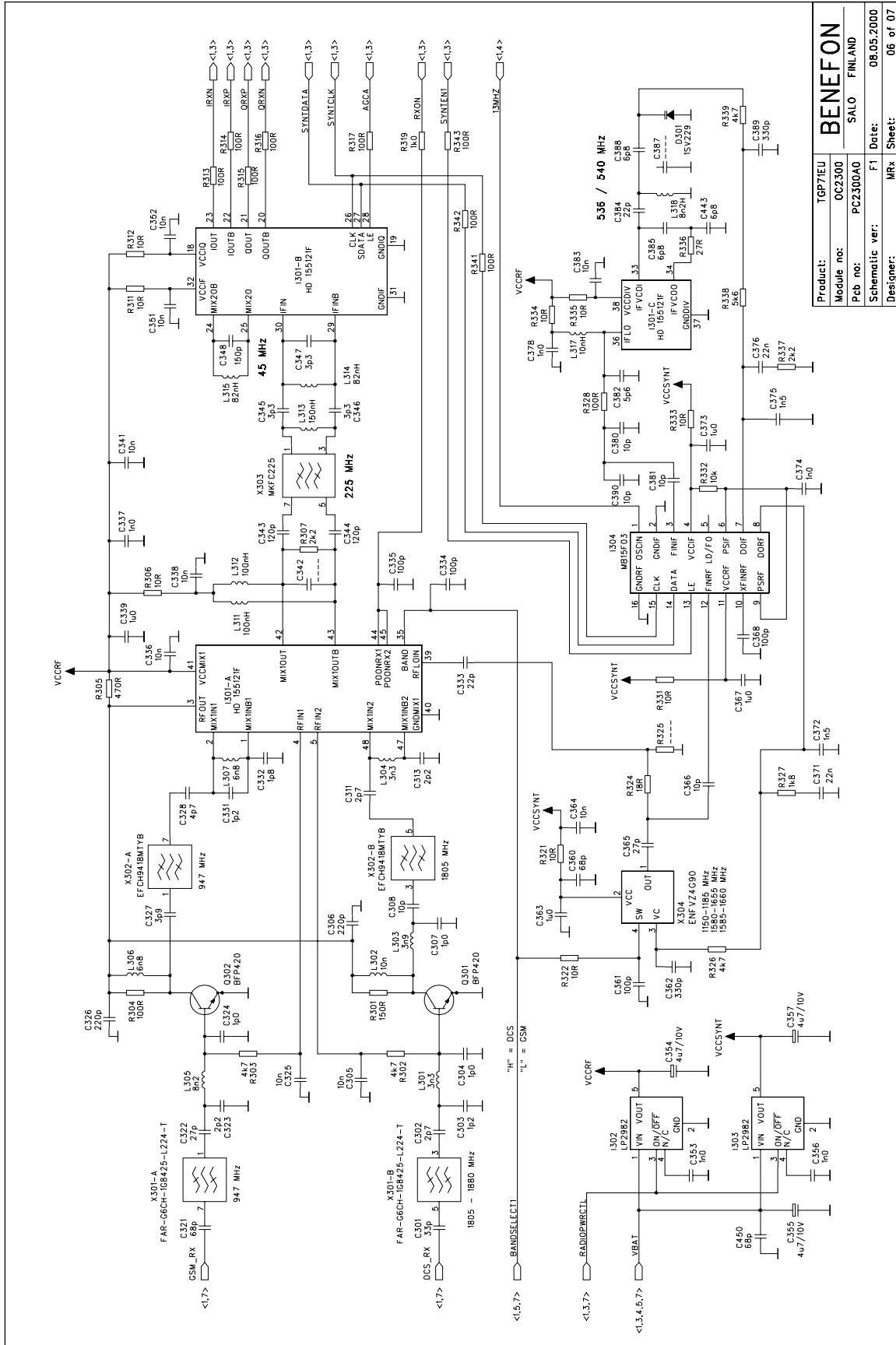


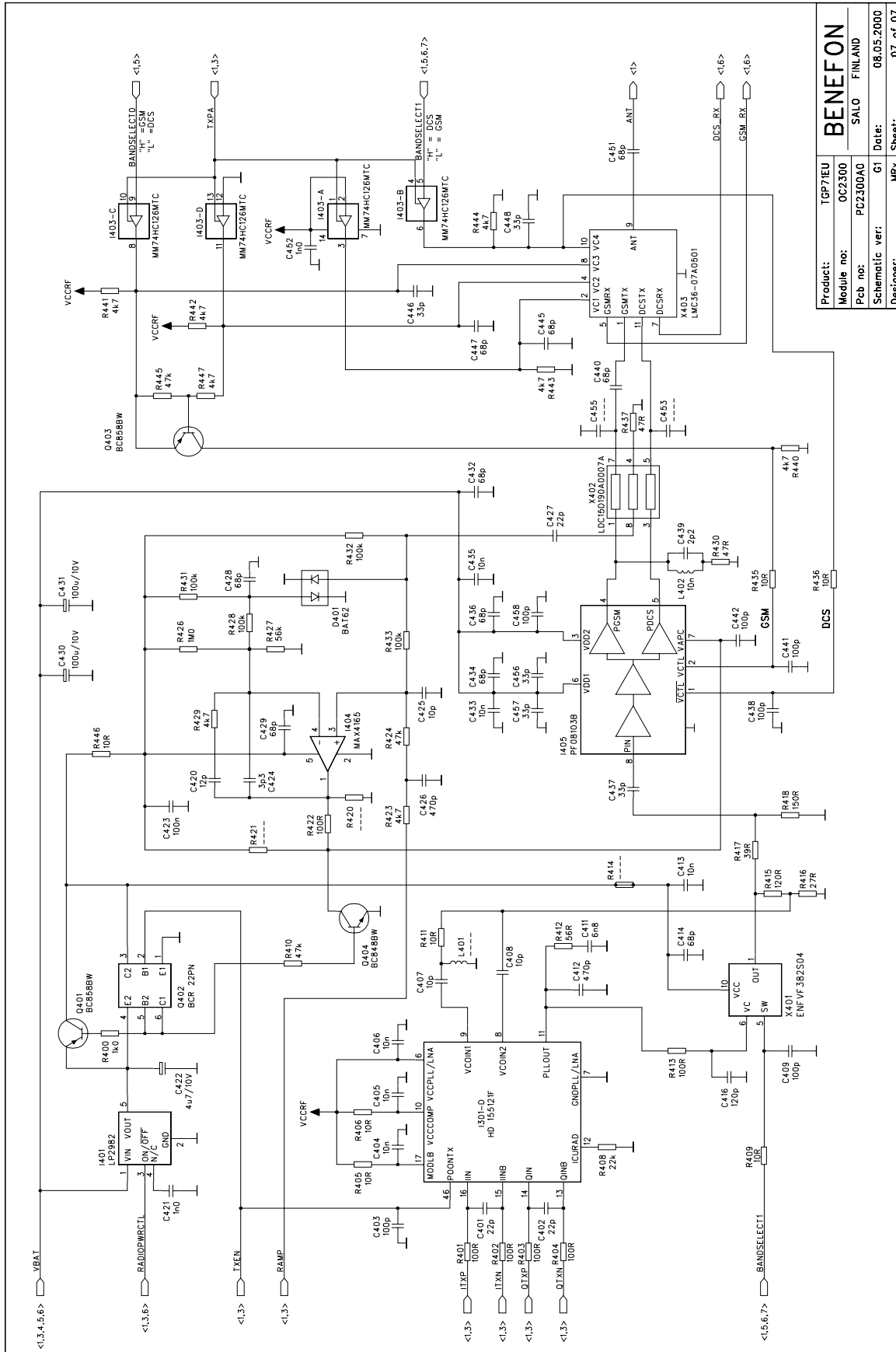
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Module no:	OC2300	SALO FINLAND
Pcb no:	PC2300	
Schematic ver:	AD	Date: 26.01.00
Designer:	Pko	Sheet: 03 of 07



Product:	TGP71EU	BENEFON
Module no:	OC2300	
Pub no:	PC2300	SALO FINLAND
Schematic ver:	A0	Date: 26.01.00
Designer:	Pkn	Sheet: 04 of 07







Product:	TGP71EU
Module no:	OC2300
Pcb no:	PC2300A0
Schematic ver:	G1
Designer:	MRx
BENEFON	
SALO FINLAND	
Date:	08.05.2000
Sheet:	07 of 07

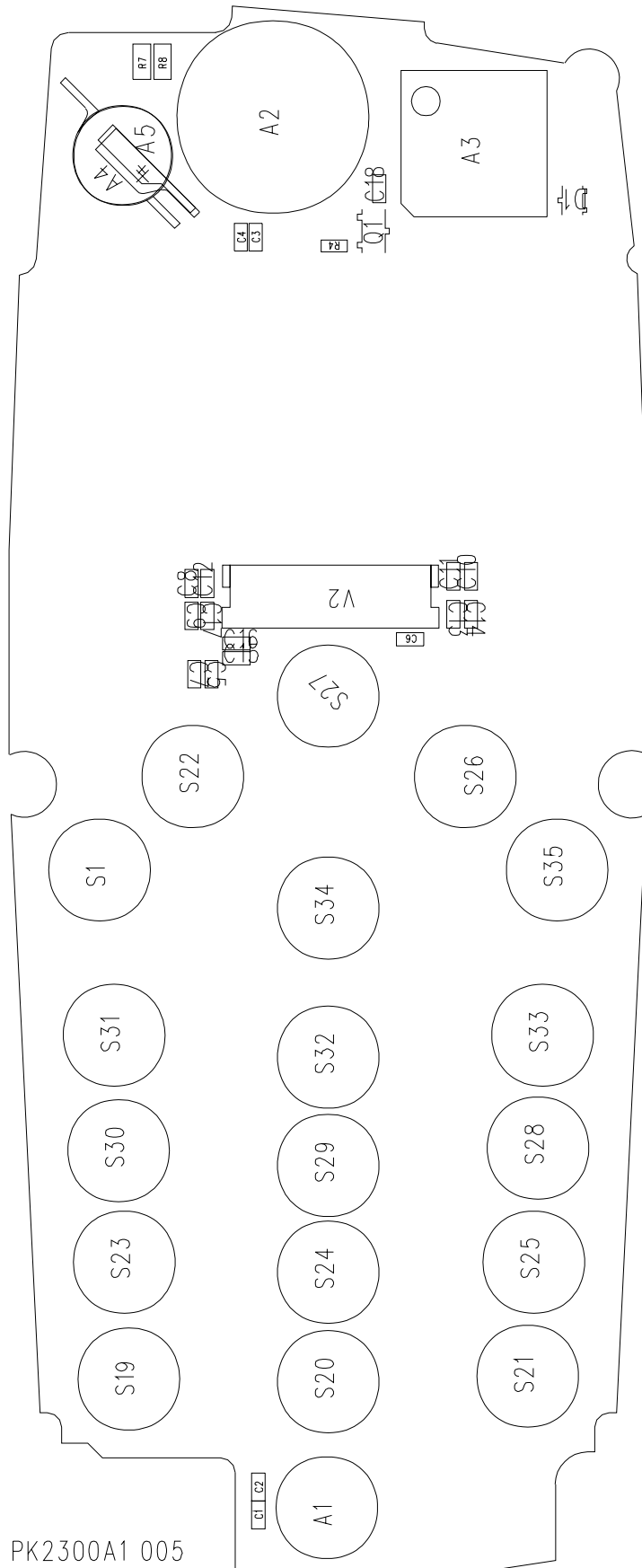
5.3 Keyboard

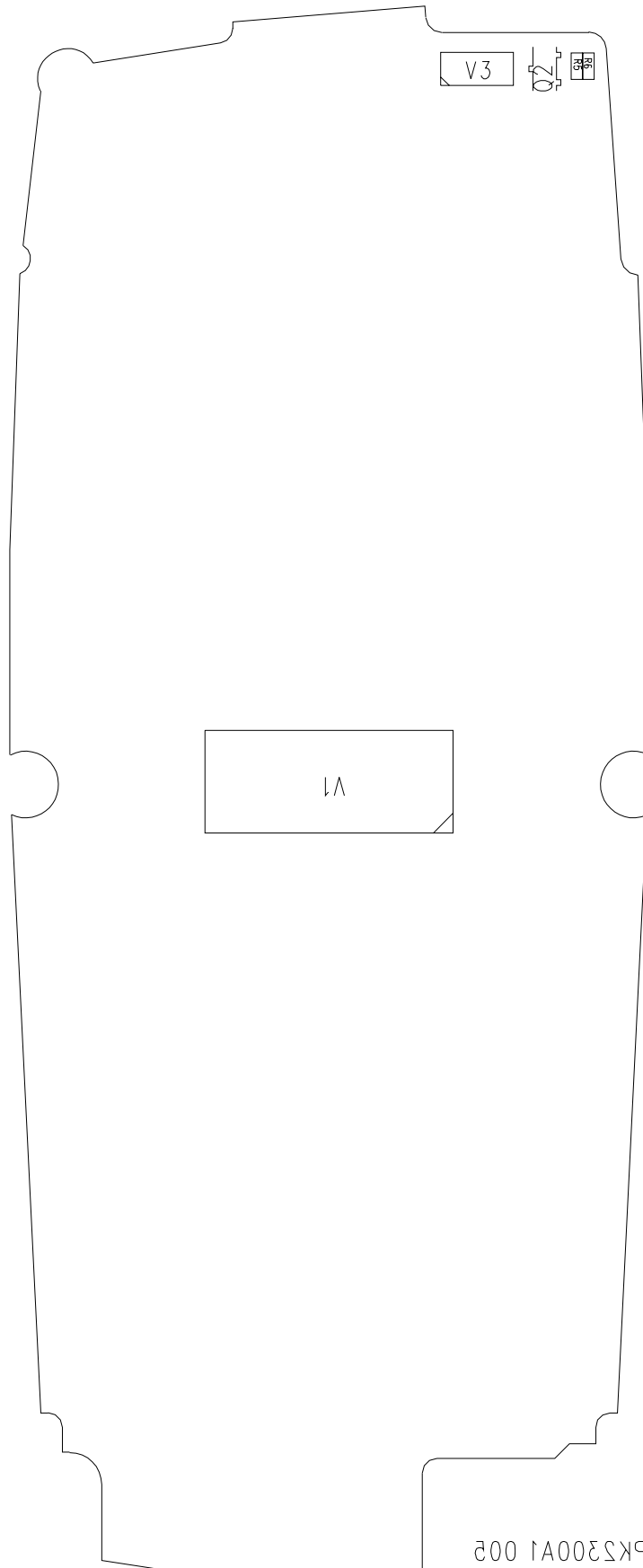
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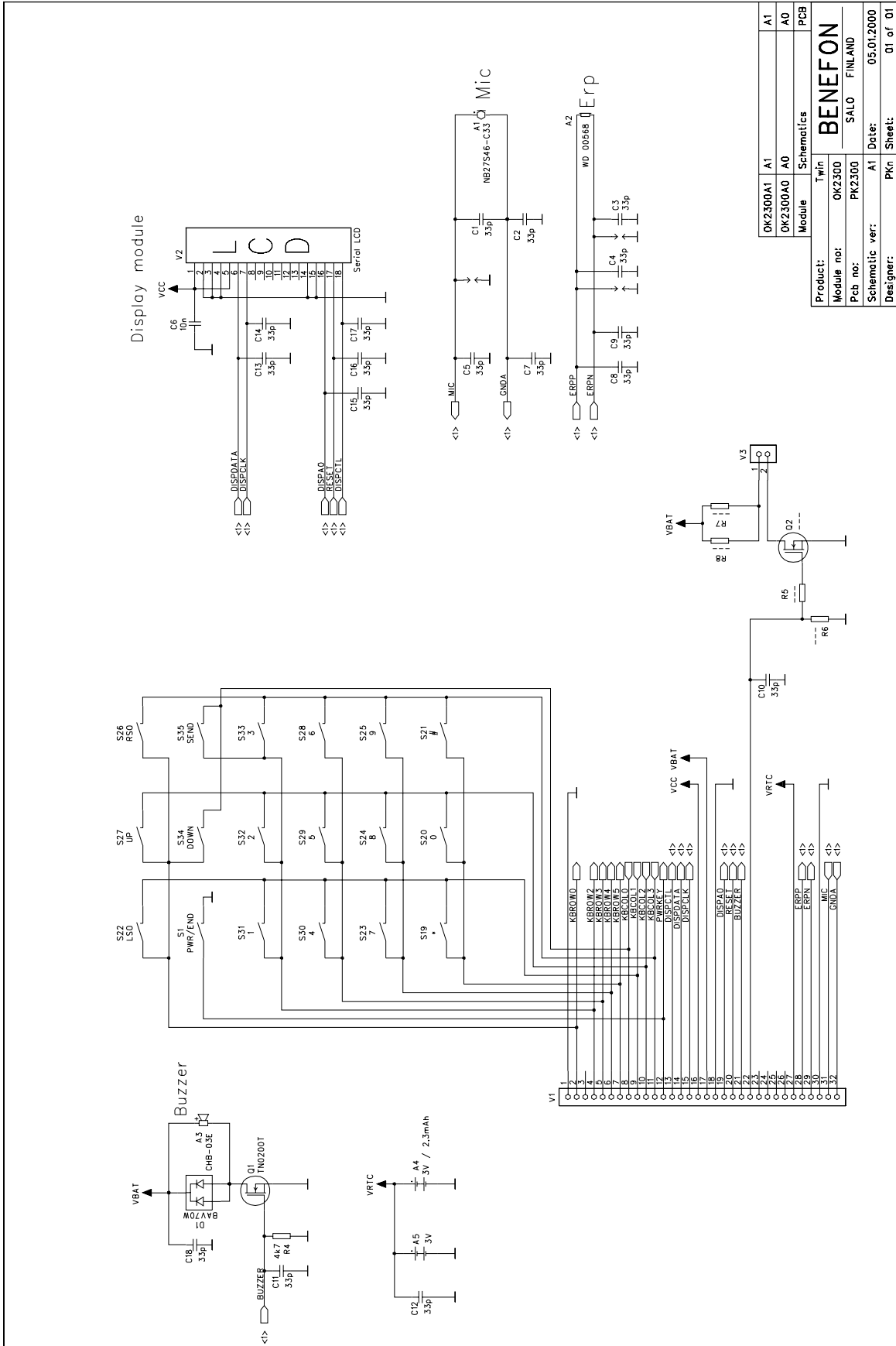
5.3.1 Parts list OK2300

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
AM1846	A1	Electret condenser moco	phone with rubber holder+zeb	BSE	OBG18S46-C33
AE0023	A2	Dynamic transducer	13,3x2,6 low Z	Philips	WD00518/32U
AE0024	A3	Buzzer	10x10x3mm 1,5V/70mA	Citizen	CHB-03E
AB0621	A5	Backup-akku 3,4V	Lithium-ion/Manganese Oxide	Varta	MC621
CG0330	C1	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C10	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C11	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C12	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C13	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C14	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C15	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C16	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C17	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C18	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C2	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C3	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C4	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C5	SMD capasitor NPO	33pF ñ5%	Murata	
CG0103	C6	SMD capasitor X7R	10nF ñ10%	Murata	
CG0330	C7	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C8	SMD capasitor NPO	33pF ñ5%	Murata	
CG0330	C9	SMD capasitor NPO	33pF ñ5%	Murata	
DS1070	D1	SMD diode pair	70V/100mA common cathode	Philips	BAV 70W
QF0200	Q1	N-channel MOSFET	20V/0,73A	TEMIC	TN0200T
RG0472	R4	SMD resistor	4k7 5% 0.063W	Kamaya	RMC1/16S
VN2303	V2	SMD connector	18 pin 0,5mm pitch	Elco	046239018001800
PK2300	Y41	*** EI KOODATTU VARAS- TOON ***			

Last
update
24.01.00

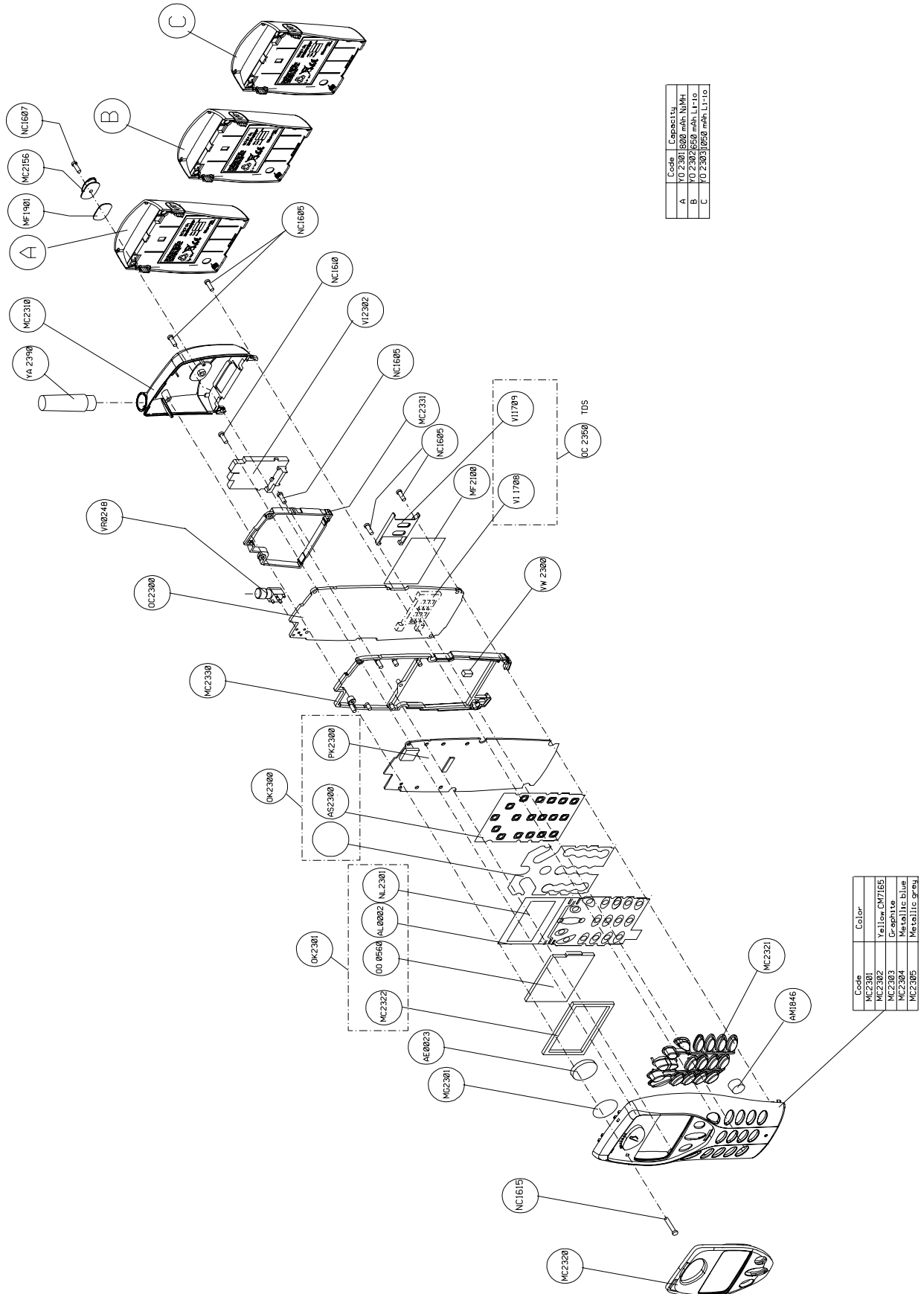






Product:	OK2300	Module	OK2300A1	A1	A1
Module no:	OK2300	Module	OK2300A0	A0	A0
Pcb no:	PK2300	Schematics			PCB
Schematic ver:	A1	Date:	05.01.2000		
Designer:	PKn	Sheet:	01 of 01		

5.4 MECHANICS



Code	Capacity
A	10 2301 500 mAh NiMH
B	10 2302 650 mAh NiMH
C	10 2303 1050 mAh Li-Io

Code	Color
MC2301	Yellow CM7165
MC2302	Graphite
MC2303	Marshall blue
MC2305	Metallic grey