

SERVICE MANUAL



BENEFON DELTA TDP-40-TN2

TDP-40-TN2

1.0 GENERAL	1 - 1
1.1 TECHNICAL INFORMATION	1 - 1
1.1.1 Operational System	1 - 1
1.1.2 Dimensions	1 - 1
1.1.3 Power Consumption	1 - 1
1.1.4 Accessories	1 - 1
1.1.5 Ringing Tones	1 - 2
1.1.6 Memory	1 - 2
1.1.7 Clock	1 - 2
1.1.8 Pager	1 - 2
1.1.9 Other Functions	1 - 2
1.1.10 Additional Exchange-Based Features	1 - 3
1.1.11 Manufacturer	1 - 3
1.2 PRODUCT FAMILY CONSISTS OF	1 - 4
2.0 OWNER'S MANUAL	2 - 1
3.0 INSTALLATION INSTRUCTIONS	3 - 1
3.1 Identification Memory Programming	3 - 2
3.1.1 Program the Subscriber Number	3 - 2
3.1.2 Program the Password Code	3 - 2
3.1.3 Program the Serial Number	3 - 2
3.1.4 Program the Date of Sale	3 - 2
3.1.5 Program the Display-Own-Number	3 - 3
3.1.6 Often Used Local Commands	3 - 3
3.2 DELTA CAR KIT	3 - 4
3.2.1 Antenna	3 - 4
3.2.2 Phone Holder HDH-40	3 - 4
3.2.3 Microphone	3 - 4
3.2.4 Cable	3 - 4
3.2.5 External Handset HDS-50	3 - 5
3.2.6 Car Box CIU-40	3 - 5
3.2.7 Hf Speaker	3 - 5

3.3 HF-FUNCTION	3 - 7
3.3.1 CAR KIT TUNING AND OFFICE SET TUNING (theory)	3 - 7
3.3.2 CAR KIT SWING AND OFFICE SET SWING (theory)	3 - 9
3.3.3 Voice Controlled HF Installation	3 - 10
3.4 Light Car Installation Kit	3 - 12
3.5 Questions and Answers	3 - 13
4.0 LOCAL SERVICE-COMMANDS	4 - 1
4.0.1 Keyboard	4 - 1
4.0.2 Commands	4 - 1
4.0.3 Error Messages	4 - 11
5.0 TUNING INSTRUCTIONS	5 - 1
5.0.1 Watchdog Activation	5 - 1
5.0.2 Battery Voltage Calibration	5 - 1
5.0.3 TX-Power Level Adjustment	5 - 1
5.0.4 Frequency Adjustment	5 - 1
5.0.5 Learning the 1 kHz Frequency Shift	5 - 2
5.0.6 Tuning the Receiver	5 - 2
5.0.7 Fsk-Split Level Programming	5 - 2
5.0.8 Rssi-Level Programming	5 - 2
5.0.9 TX Audio Tuning	5 - 3
5.0.10 Microphone Level Adjustment	5 - 3
5.0.11 FFSKT Deviation Adjustment	5 - 3
5.0.12 FII Deviation Adjustment	5 - 3
5.0.13 DTMF Deviation Adjustment	5 - 4
5.0.14 Subscriber Number Programming	5 - 4
5.0.15 Select Battery Type	5 - 4
6.0 PHONE'S CONSTRUCTION	6 - 1
6.1 MECHANICS	6 - 2
6.1.1 Front Cover	6 - 2
6.1.2 Back Cover	6 - 2
6.1.3 Type plate	6 - 2
6.1.4 Antennas	6 - 2
6.2 LOGIC / AUDIO	6 - 3

6.2.1	General	6 - 3
6.2.2	Connectors:	6 - 4
6.2.3	Circuit Diagram	6 - 6
6.2.4	Functions	6 - 6
6.2.5	Function Description	6 - 10
6.2.6	Audio Module Tuning Instructions	6 - 14
6.2.7	Audio Locals	6 - 16
6.2.8	Audio Gate Controls	6 - 18
6.2.9	Parts list	6 - 22
	6.3 RF MODULE	6 - 37
6.3.1	General	6 - 37
6.3.2	Functional Description	6 - 37
6.3.3	Control- and Output-Signals	6 - 37
6.3.4	General	6 - 38
6.3.5	Function Description	6 - 38
6.3.6	Control- and Output-Signals	6 - 39
6.3.7	General	6 - 40
6.3.8	Input- and Output-Signals	6 - 41
6.3.9	RSSI-Level Adjustment	6 - 41
6.3.10	General	6 - 42
6.3.11	Function Description	6 - 42
6.3.12	Control- and Output-Signals	6 - 42
6.3.13	Tuning	6 - 42
6.3.14	Parts list	6 - 46
6.3.15	Parts list of Regulator	6 - 54
6.3.16	Parts list of Antenna Switch Unit	6 - 59
	6.4 BATTERIES	6 - 62
6.4.1	BATTERY PACK	6 - 63
6.4.2	Parts list	6 - 64
	7.0 CHARGING	7 - 1
	7.1 MAINS CHARGER CMA-50-230	7 - 2
	7.2 LIGHTER SOCKET CHARGER CCS-50-12	7 - 3
	7.3 DESKTOP CHARGER	7 - 4
7.3.1	General	7 - 5
7.3.2	Charging the phone	7 - 5

7.3.3	Charging the spare battery	7 - 5
7.3.4	Discharging the reserve battery	7 - 6
7.3.5	Execution	7 - 7
7.3.6	Parts list of Desktop Charger	7 - 10
7.3.7	Parts list of Table Charger Extra Module	7 - 12
8.0	CAR ASSEMBLY KIT	8 - 1
8.1	CARBOX	8 - 1
8.1.1	Including attached functions:	8 - 2
8.1.2	Connector descriptions:	8 - 2
8.1.3	Operation	8 - 4
8.1.4	Parts list OW0314	8 - 5
8.2	PHONE HOLDER	8 - 17
8.3	EXTERNAL HANDSET WITH CRADLE HDS-50	8 - 21
8.3.1	External Handset (not serviceable)	8 - 21
8.3.2	General	8 - 22
8.3.3	Connector XIN Signals	8 - 23
8.3.4	Microphone	8 - 23
8.3.5	Speaker	8 - 23
8.3.6	Hook	8 - 23
8.3.7	Parts list OO0009	8 - 24
8.3.8	Cradle	8 - 28
9.0	OFFICE SET	9 - 1
9.1	OFFICE SET DDS-40	9 - 2
9.1.1	General	9 - 2
9.1.2	Connectors	9 - 3
9.1.3	Operation	9 - 7
9.1.4	Parts list OO0300	9 - 9
9.1.5	Parts list OO301	9 - 18
9.1.6	Parts list OO0302	9 - 20
9.2	EXTERNAL HANDSET HXS-40	9 - 23
9.2.1	External Handset (not serviceable)	9 - 23
9.2.2	General	9 - 24
9.2.3	Connector XIN Signals	9 - 25
9.2.4	Microphone	9 - 25

9.2.5 Speaker	9 - 25
9.2.6 Hook	9 - 25
9.2.7 Parts list OO0009	9 - 26
10.0 OTHER ACCESSORIES	10 - 1
10.1 LINE INTERFACE LIF-40	10 - 2
10.1.1 General	10 - 2
10.1.2 Using the line interface	10 - 2
10.1.3 Technical information	10 - 3
10.1.4 Manufacturers Declaration for BABT/SITS/85/22	10 - 7
10.1.5 Parts list OO0245	10 - 9
10.2 BRANCHING UNIT	10 - 16
10.2.1 General	10 - 17
10.2.2 Connectors	10 - 17
10.2.3 Operation	10 - 18
10.2.4 Parts list OO0241	10 - 19

1.0 GENERAL

General

1.1 TECHNICAL INFORMATION

1.1.1 Operational System

NMT-450i

1.1.2 Dimensions

Size: 58 x 170 x 29 mm

Weight: 350 g

1.1.3 Power Consumption

- Batteries: 5 x 1.2 V NiCd (or NiMH)
- Sleep current: 2 mA
- Standby current: 65 mA
- Conversation mode, high power: app. 0.9 A
- Conversation mode, low power: app. 0.4 A

Service / charger units

- manual selection of battery charging / discharging or
- automatic charging

1.1.4 Accessories

- hands free car kit (carbox, holder, car-radio mute, external antenna, microphone, loudspeaker, external alert)
- light holder
- line interface
- mains charger
- cigarette lighter charger
- desktop charger
- branching unit
- external handset with holder
- office set

1.1.5 Ringing Tones

Adjustable

- frequency
- number of ringing tones / pulse duration
- volume
- progressive or fixed

Silent alarm

- short tone and alarm text in the display

1.1.6 Memory

Alphanumeric

- 99 memory locations, 23 characters / memory location
- memory scroll and recall in alphabetical or numerical order
- writing to memory during a call

Repeat: last dialled number or one of 5 numbers from the quick-memory locations

1.1.7 Clock

- time display
- real time alarm setting
- real time power on setting
- real time power off setting
- elapsed conversation time counter
- received call counter and time display

1.1.8 Pager

- answers incoming calls and receives numeric messages
- 30 memory locations (23 characters / location)
- pre-set number of ring tones before answering (0...6)

1.1.9 Other Functions

DTMF - receiver / transmitter

DTMF - key tones

Display and key illumination

Volume control

- 6 levels
- level indicator

Battery charge level indicator

- battery empty alarm tone and display
- used battery capacity display
- battery specific charge memory

Field strength indicator

Battery-save function

Menu structure for user customisation

Automatic Prefix Management (APM)

Keys lockable against accidental operation

Password code to prevent unauthorised use

SIS protection function

1.1.10 Additional Exchange-Based Features

- R-key (Register recall)
- M-key (DTMF signal transmission)

1.1.11 Manufacturer

Benefon Oyj

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Finland

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1.2 PRODUCT FAMILY CONSISTS OF

- **BENEFON DELTA HANDPORTABLE**

Colours: Black, Grey, Red, Green, Blue

- **MAINS CHARGER**

- **CIGARETTE LIGHTER CHARGER**

- **DESKTOP CHARGER**

Quick charger for Benefon Delta and extra battery.

- **HANDSTRAP**

- **BELT CLIP**

- **OFFICE SET**

- **HANDS FREE CAR KIT**

- **LIGHT CAR KIT**

Contains car antenna and charger.

- **BRANCHING UNIT**

To connect charger and line interface simultaneously or to connect extra handset and line interface simultaneously.

- **LINE INTERFACE**

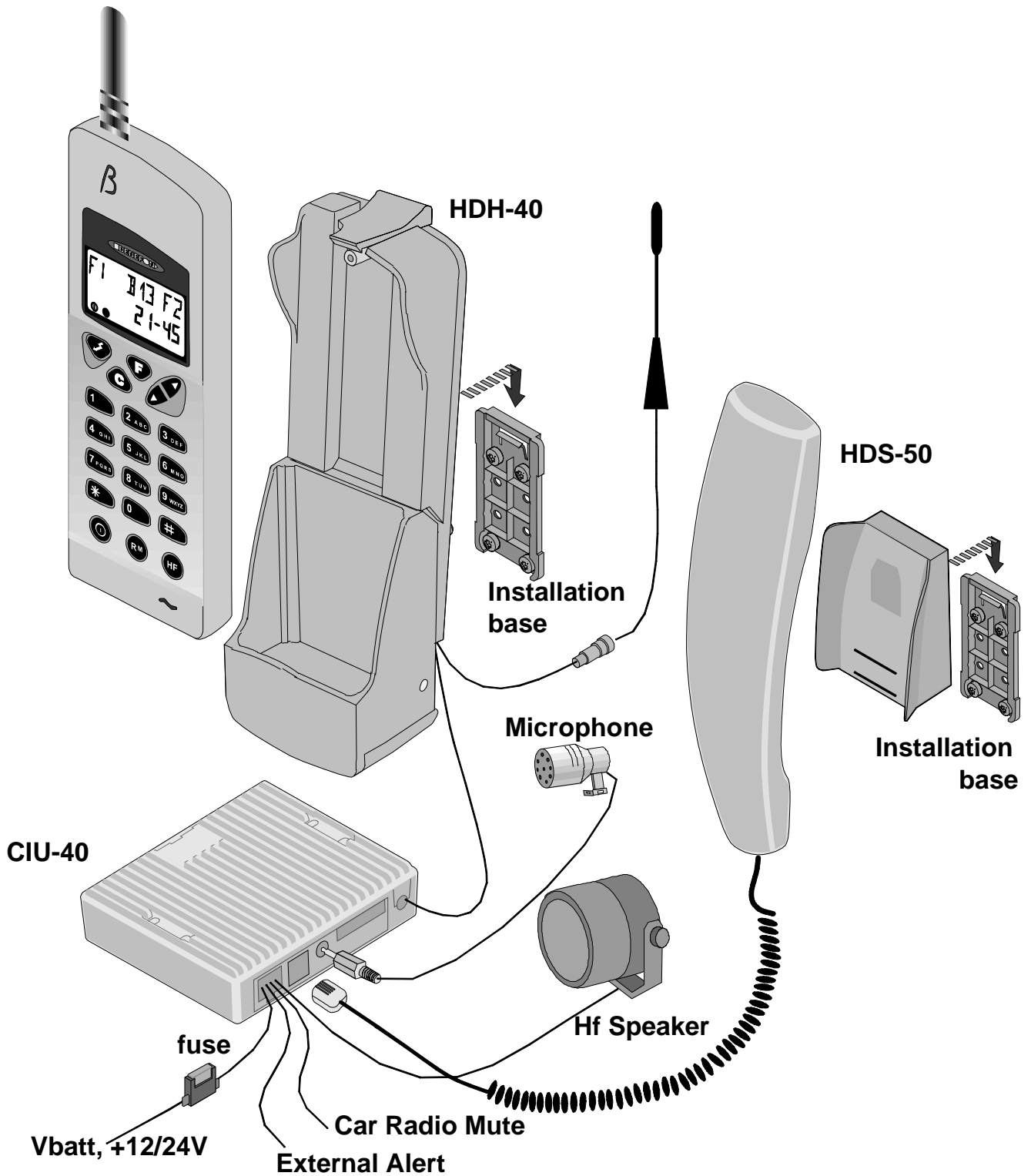
Interface unit for modem's, fax machines, telephones etc.

- **EXTRA HANDSET**

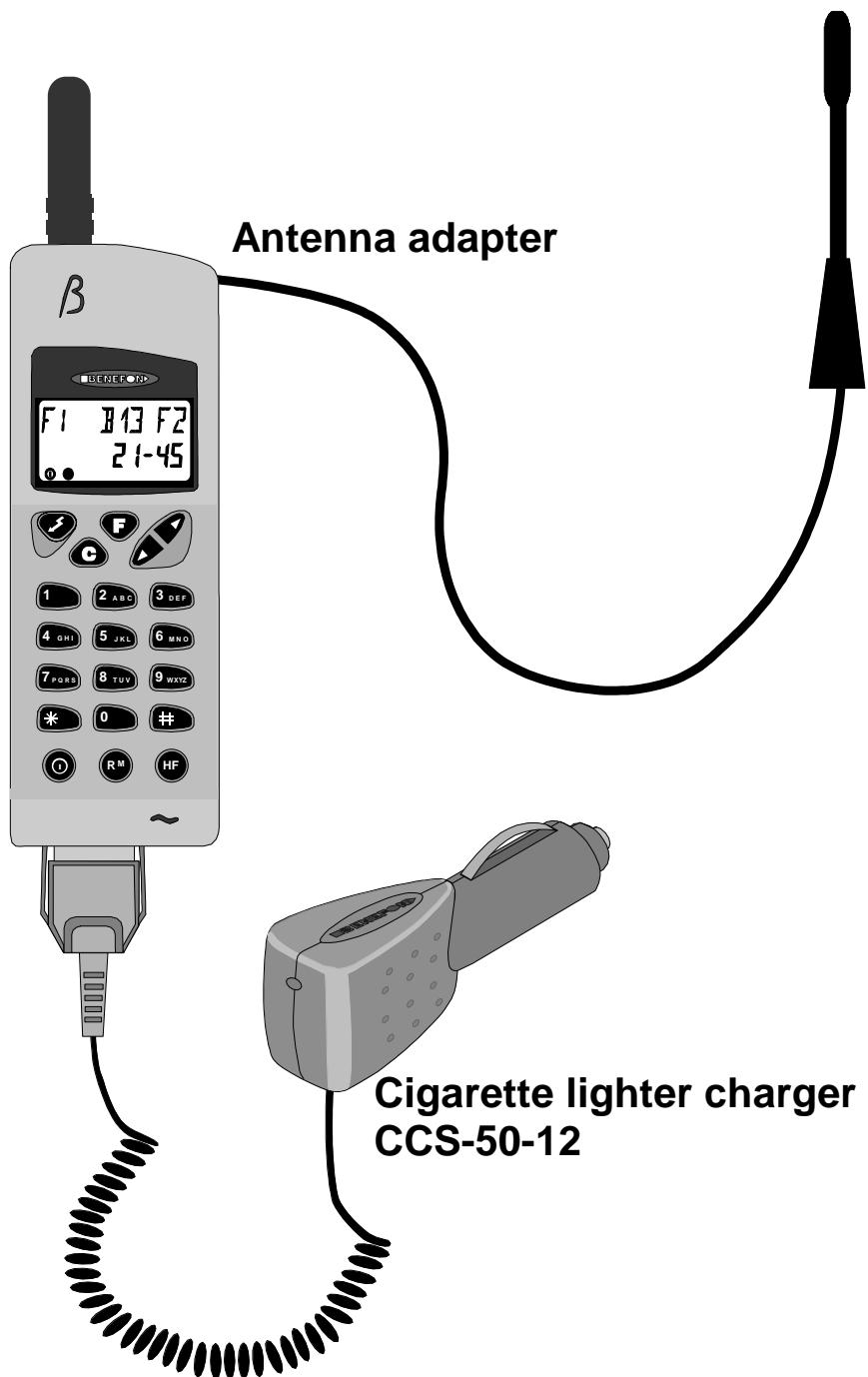
Handset for Hands Free Car Kit.

- **EXTRA ANTENNA FOR BENEFON DELTA**

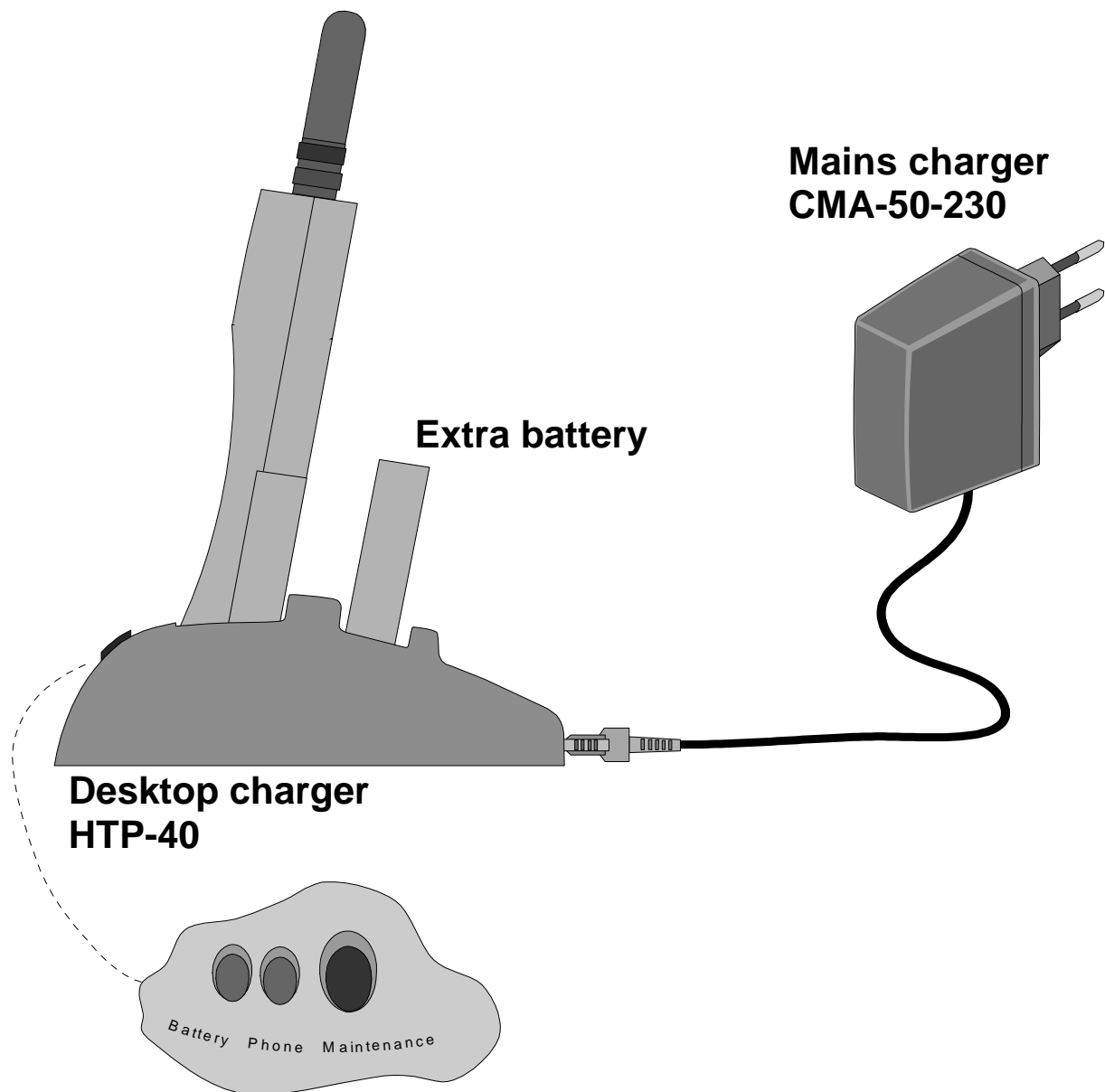
Quarter wave antenna.

HANDS FREE CAR KIT

LIGHT CAR KIT

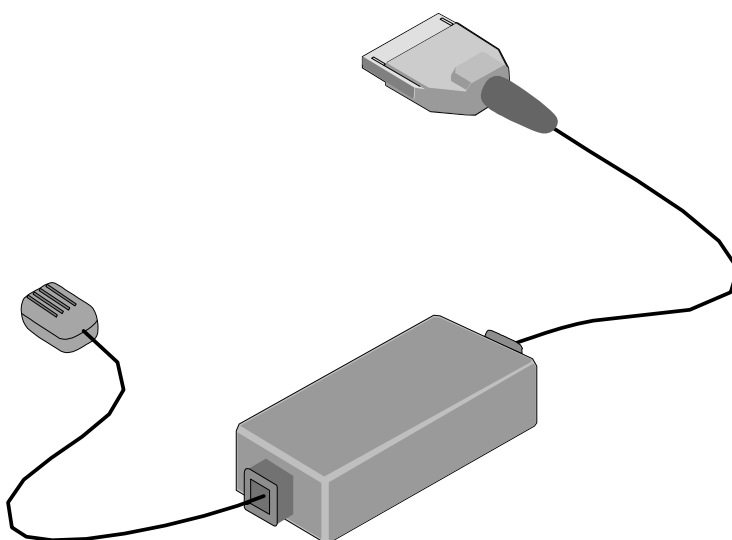


DESKTOP CHARGER

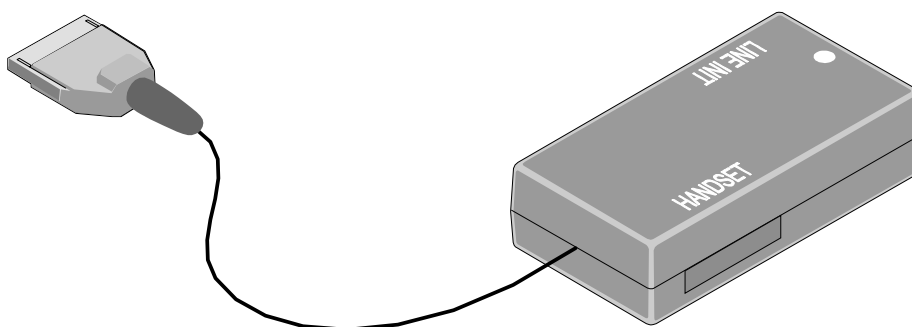


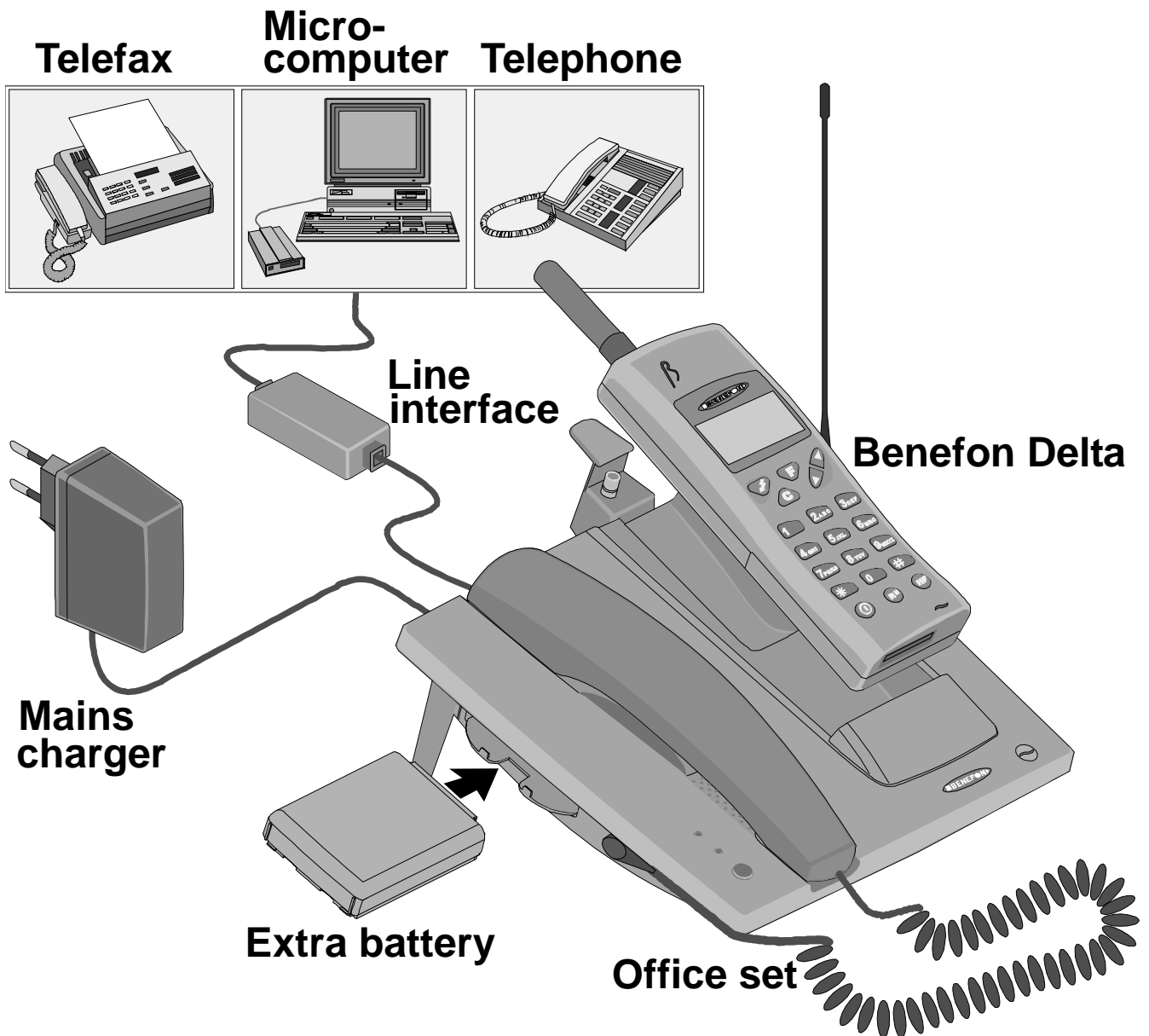
ACCESSORIES

Line interface LIF-40



Branching unit DB-40



OFFICE SET DDS-40



2.0 OWNER'S MANUAL

3.0 INSTALLATION INSTRUCTIONS

Installation Instructions

PROLOGUE

These installation instructions have been prepared to assist fitters in installing the equipment, and are as such only to serve as a guide. Nothing beats common sense and good experience.

Installation is always based on the need of the customer to use the phone in the environment in which it will be installed. Negotiate with the customer where the different parts will be installed. It is important that the customer tells of his own preferences and choices, and that the fitter/salesman tells where it is possible/advisable to locate different items.

It is the salesman's responsibility to see that the installation order is properly filled out.

RECOMMEND

- antenna location on the roof
- handset location does not interfere with road safety
- speaker located in the driver's side leg-room
- microphone as close as possible to the driver's mouth
- car radio mute option

ASK IF THE USER WANTS

- additional alarm
- password code

Benefon Oy

3.1 Identification Memory Programming

Identification memory programming is performed by the dealer before the phone is supplied to the user.

Connect a LOCAL BOX with programming rights to the phone base connector, and turn on the phone. Check that LOCAL is displayed, and enter 0#.

3.1.1 Program the Subscriber Number

For systems with i-specification capabilities:

Enter 2#, Z X1 X2 X3 X4 X5 X6 K1 K2 K3 and finally F.

Z = country code, and X1...X6 = six digit subscriber number, and K1...K3 = phone identification number.

Other systems:

Enter 2#, Z X1 X2 X3 X4 X5 X6 and finally F.

Z = country code, X1...X6 = six digit subscriber number

The subscriber number length may also vary from system to system.

Enter 2* to verify successful programming.

3.1.2 Program the Password Code

Enter 3#, X1 X2 X3 X4 and finally F.

X1...X4 = user defined number series

Enter 3* to verify successful programming

3.1.3 Program the Serial Number

Enter 4#, a six digit serial number, and finally F.

e.g. 1 2 3 4 5 6

Enter 4* to verify successful programming

3.1.4 Program the Date of Sale

Enter 6#, the date of sale, and finally F.

The date of sale is given in the form ddmmyy e.g. 160194

Enter 6* to verify successful programming

3.1.5 Program the Display-Own-Number

The phone's own number will be displayed each time the power is turned on, after the segment test. It is programmed into the phone by storing it in memory location 99. The memory location may also include a name of max. 10 characters, which will be displayed along with the phone's own number.

1. Turn the phone on without the LOCAL BOX.
2. Write the phone's number to the display, including its dialling code.
3. If desired, write also the name to the upper display (see the phone's owner's manual).
4. Enter * 99 (and if necessary, confirm over-write by pressing F).
5. Check the programming by switching the power off, and then on again.

3.1.6 Often Used Local Commands

0#	Local reset
01#	SWING level tuning
1#	HF tuning
2#	Subscriber number programming
2*	Read subscriber number
3#	Password code programming
3*	Read password code
4#	Series number programming
4*	Read series number
6#	Date of sale programming
6*	Read date of sale
9#	Transfer short code memory from the phone to the Local Box
95#	Select battery type (select with +/- keys and F)
95*	Read battery type from battery pack memory
999*	Transfer short code memory from the Local Box to the phone

3.2 DELTA CAR KIT

The Car Kit includes a phone holder (HDH-40), a car box (CIU-40), an antenna, an installation base, a hf speaker, a microphone and a cable. The Car Kit sales package also includes an installation material bag, which contains the necessary installation equipment. On the 6th page you will find a diagram of connections explaining how to install the Car Kit.

Caution:

The Car Kit should be installed by Benefon authorized installer only. An end user should never attempt to install the Car Kit alone without any professional assistance. The professional installers have the required tools and knowledge to install the Car Kit properly and safely. Also the terms of warranty demand that the Car Kit is installed by professional personnel. Cable routing may cause interference with the components of the vehicle's electronic systems (such as ignition and braking systems). It is recommended that cable is not routed next to these electronic components.

3.2.1 Antenna

Choose a suitable place for the antenna. It is recommended that you place the antenna on the roof of the vehicle.

3.2.2 Phone Holder HDH-40

Choose such a place for the phone holder in the vehicle that will be both easy and safe when using the phone. First, fix the installation base to the place you have chosen, and then install the phone holder in the installation base.

3.2.3 Microphone

Install the microphone so that it is aimed directly at the user, and comes as close as possible to the user's mouth. A good place for the microphone is near the rearview mirror where the noise level is lower than, for example, beside a windshield pillar. It is also possible to install the microphone on a sun visor, but then it will be inconvenient to use the sun visor and microphone at the same time. One alternative would be a swan-neck microphone as it can be placed closest to the user's mouth.

3.2.4 Cable

Obtain the necessary +-electricity from a suitable place, preferably directly from the battery of the vehicle. Connect the fuse chamber to the +-wire. You will find the fuse chamber in the installation material bag. Connect the ground lead to the frame of the car with a short wire.

3.2.5 External Handset HDS-50

Install the external handset the same way as you installed the phone holder.

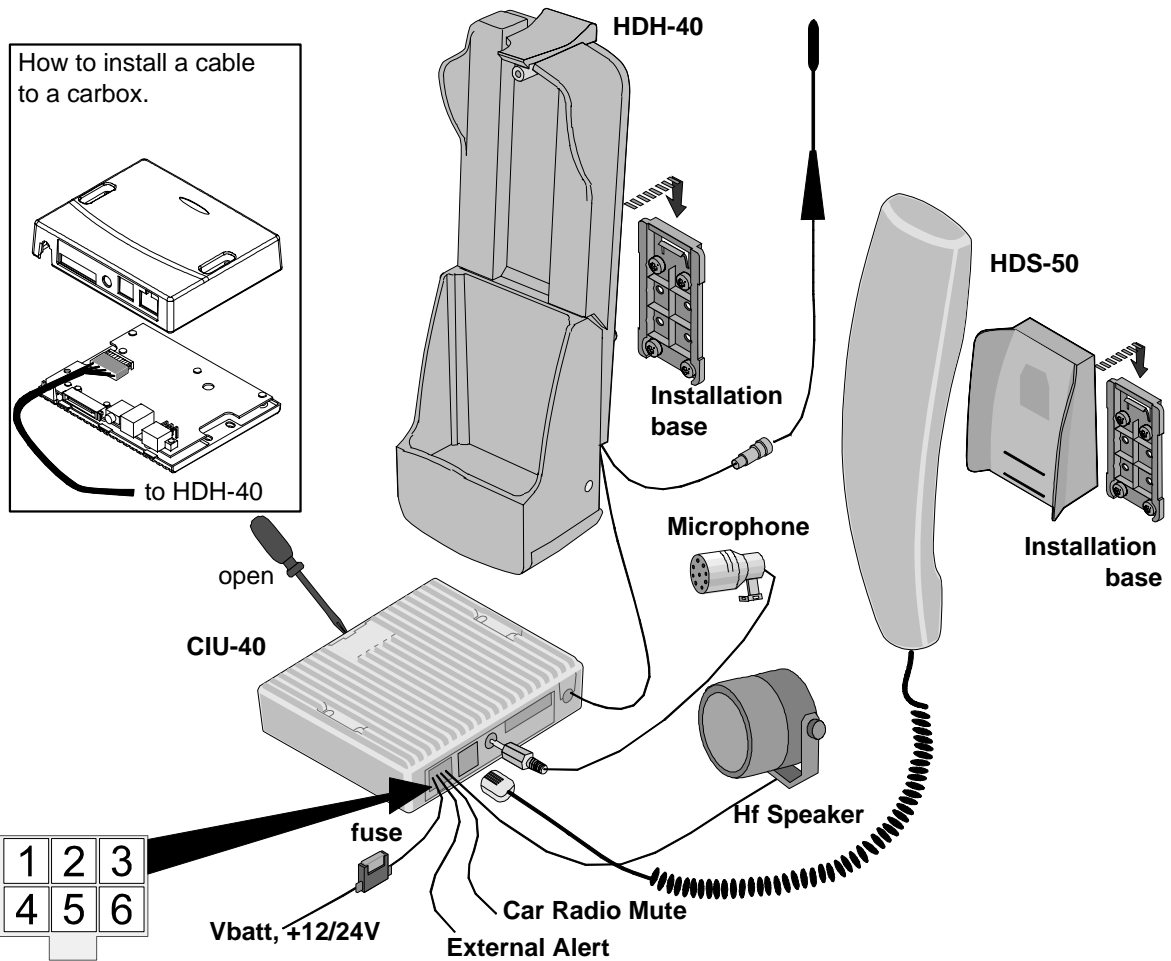
3.2.6 Car Box CIU-40

Place the car box out of sight inside the dashboard of the car or to another suitable place. First, connect the wires to the car box. Install the car box so that the heat sink has some space for cooling. The car box has holes which enable you to fasten the car box with a cable tie. The installation material bag also contains adhesive band fasteners.

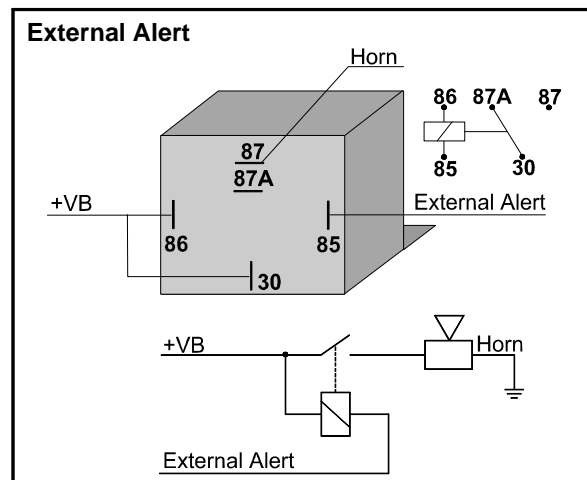
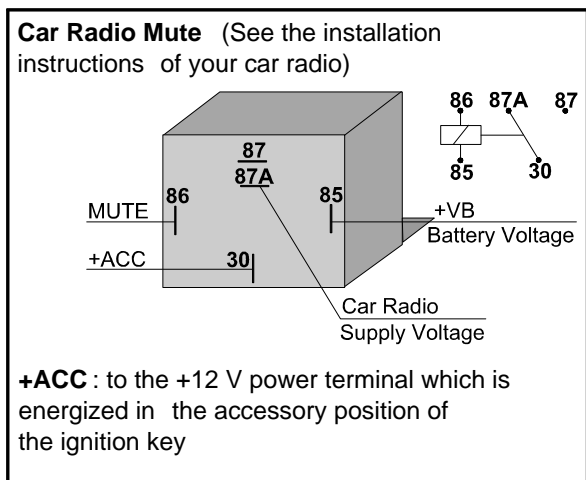
3.2.7 Hf Speaker

Install the speaker in a suitable place near the floor of the car. To avoid echo remember to pay attention to the position of the microphone as well.

A Diagram of Connections:



PIN	Name	Colour
1	Car Radio Mute (active low)	Blue
2	Hf Speaker	Grey
3	Ground	Black
4	External Alert (active low)	Brown
5	Hf Speaker	Grey
6	Vbatt, +12/24 V	Red



3.3 HF-FUNCTION

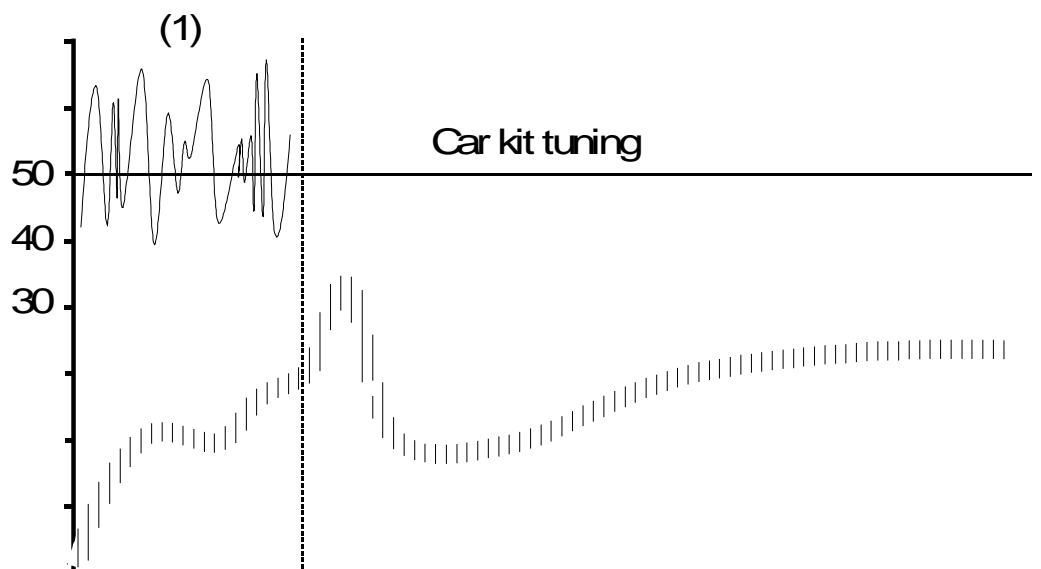
Benefon Delta offers you a hands free -setup for the Car Kit and Office Set: the background noise tuning (CAR KIT AND OFFICE SET TUNING) and MIC-ERP contrast tuning (CAR KIT AND OFFICE SET SWING).

3.3.1 CAR KIT TUNING AND OFFICE SET TUNING (theory)

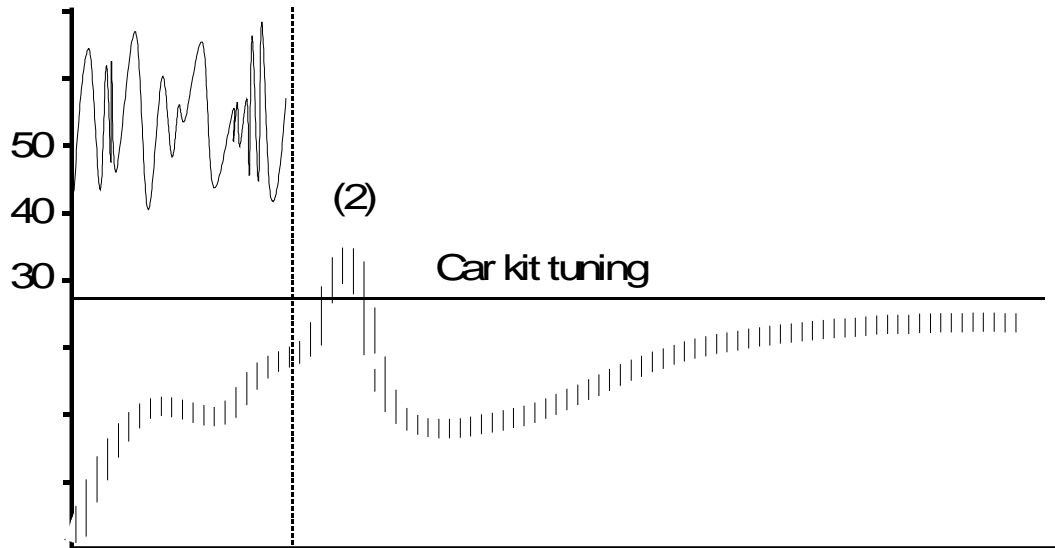
You can set up the activation level of the microphone by using the CAR KIT TUNING option. The level is correct when the microphone path is activated by voice alone, and not, for example, by background noise in your car or office.

The following figure shows you the CAR KIT TUNING AND OFFICE SET TUNING setup process.

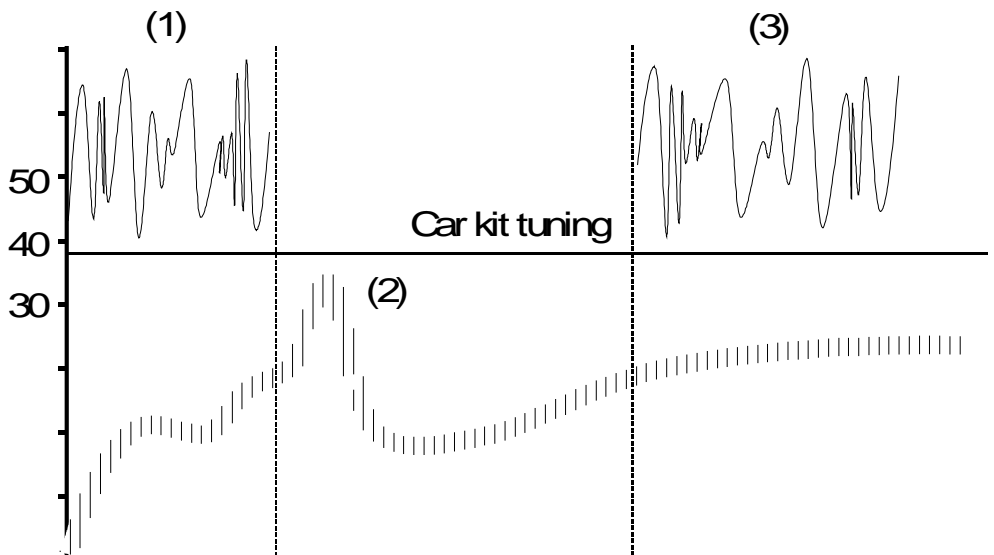
- a. If the CAR KIT TUNING is set too high, your voice (1) will not activate the microphone path properly, and the person at the other end will only hear interrupted transmission of speech.



b. If the CAR KIT TUNING has been set up too low, the background noise in your car (2) will activate the microphone path, and the volume of the HF-speaker will be low.



c. When the CAR KIT TUNING has been set correctly only your voice (1 & 3) will open the microphone path.

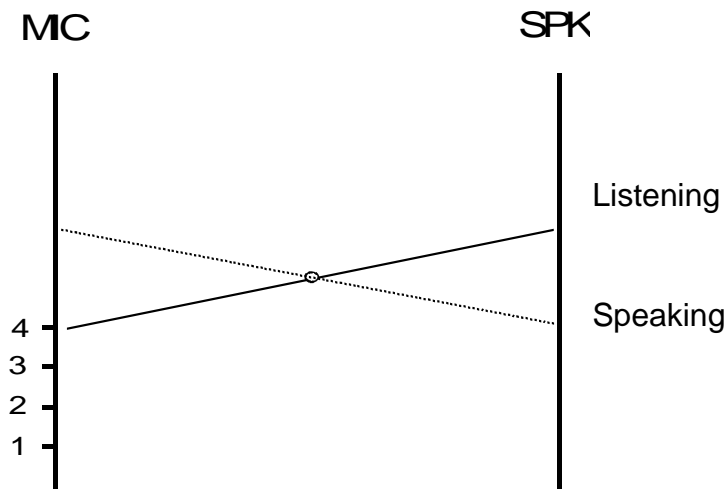


Benefon phones have been set in our factory so that they will function in most cars. The factory setting for the CAR KIT TUNING is 017.

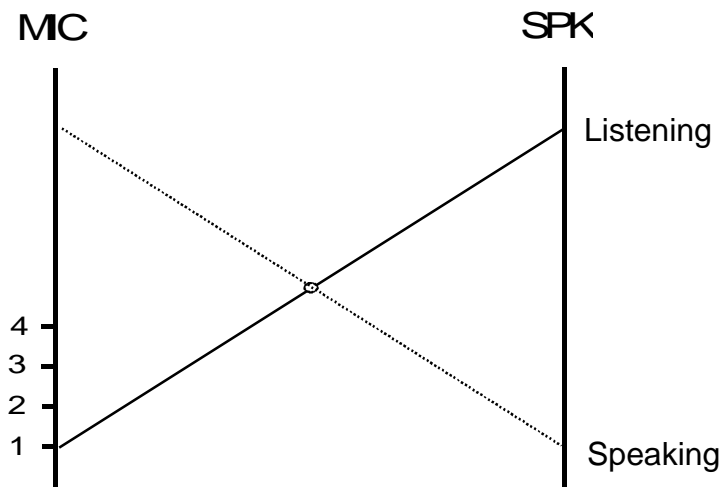
3.3.2 CAR KIT SWING AND OFFICE SET SWING (theory)

The four-step CAR KIT SWING AND OFFICE SET SWING tuning is used to set the contrast of the microphone amplification/speaker attenuation swing. In the following figures the swing position while listening to the Car Kit or Office Set is indicated by a solid line and the position while speaking into Car Kit or Office Set the indicated by a dotted line.

a. With a tuning value of 4 it is possible to obtain the smallest difference between the amplification and attenuation of the microphone and speaker. This means that the connection is almost bidirectional. If the HF-function easily creates feedback, decrease the value of the CAR KIT SWING AND OFFICE SET SWING. By turning down the volume it is possible to reduce the occurrence of feedback.



b. With a tuning value of 1 it is possible to obtain the greatest difference between the amplification and attenuation of the microphone and speaker. This means that the connection is almost unidirectional.



The factory setting for the CAR KIT SWING AND OFFICE SET SWING is 4.

3.3.3 Voice Controlled HF Installation

To ensure trouble-free HF operation, care should be taken in positioning the speaker and microphone, as outlined above.

3.3.3.1 HF Tuning

The purpose of the tuning is to adjust the level at which the microphone is switched on. The trigger level must be a little higher than the normal vehicle background noise, but not more than the user's normal voice level.

3.3.3.2 Automatic HF Tuning

When the speaker and microphone have been installed, connect the LOCAL adapter and set the phone to LOCAL mode.

1. Turn the phone on.
2. Enter 1#

Note that the displayed value changes in response to background noise.

3. Press F when the the display shows the highest value corresponding to background noise.

HF is now set to the level corresponding to the highest background noise. In most cases, the recommended value will be between 16 and 18.

4. Store the value by pressing the F key again.

If the background noise can not for some reason be simulated, the average level must be estimated, and the tuning performed manually (see Manual HF tuning).

3.3.3.3 Manual HF Tuning

It will be necessary to set the HF tuning manually if it is not possible to run a simulation test, or if it is known by experience the desired microphone trigger level.

1. Set the phone to LOCAL mode.
2. Enter 1# and F
3. Enter the desired value and F.

The value must be three digit e.g. 018.

3.3.3.4 Swing-level Tuning

The swing-level controls the HF feedback damping (the larger the value, the smaller the damping). In phones leaving the factory, the default value is 4.

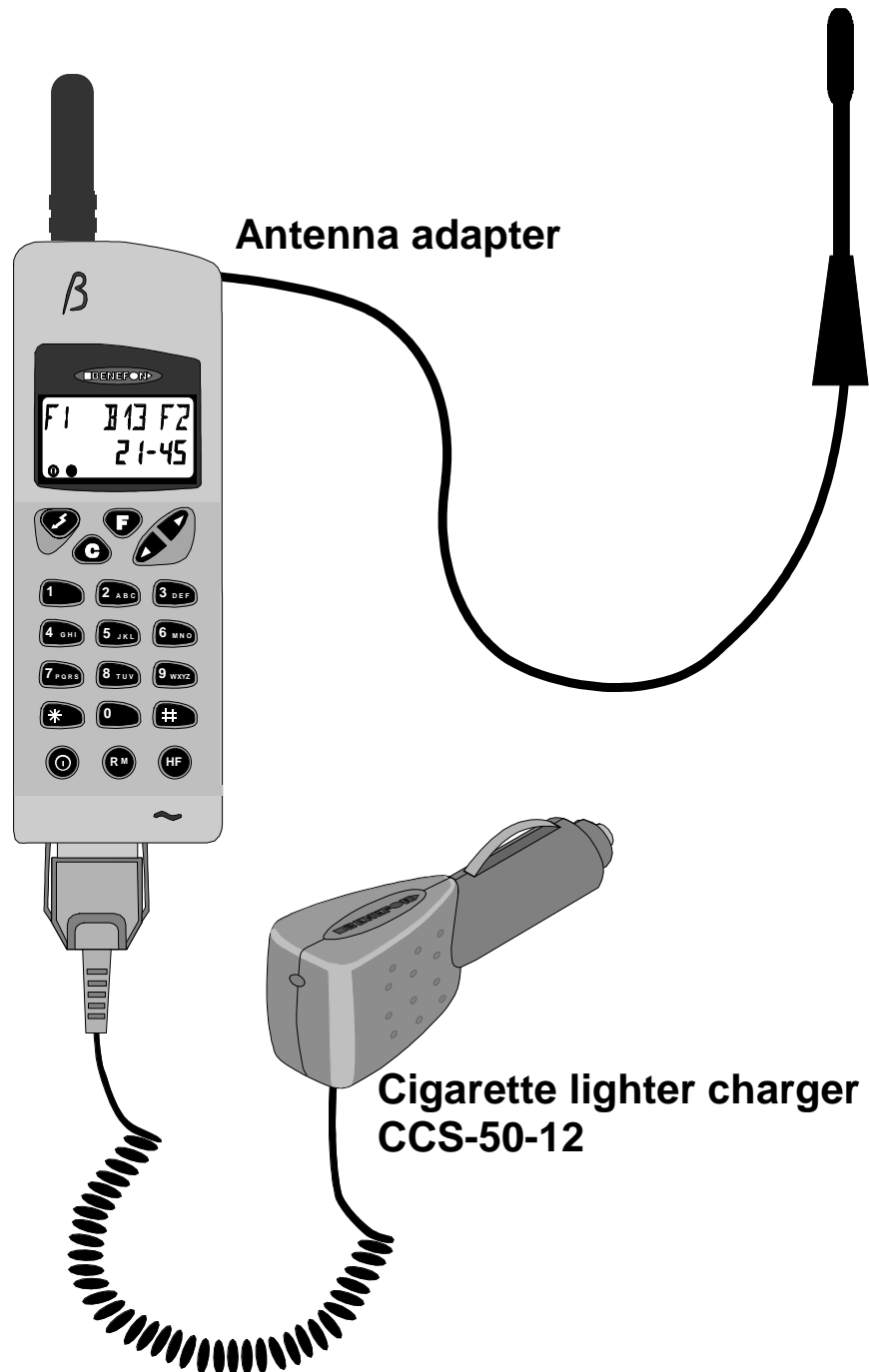
In practice, SWING means the level to which the incoming volume level will be sup-

pressed when speaking and vice versa.

The SWING level must be decreased, if the sound in HF mode starts to feed-back (at high volume levels) in spite of careful positioning of the speaker and microphone.

1. Set the phone to LOCAL mode.
2. Enter 01#, and the current SWING level is displayed.
3. Select a new value 1...4.
4. Store the value by pressing F.

3.4 Light Car Installation Kit



3.5 Questions and Answers

Question: The message BATT MEMO is displayed when turning the phone on or changing the battery. What does it mean?

Answer: There is a memory circuit inside the battery pack which contains information about the battery type, charging currents, battery charge counter, etc. If the phone is not able to read this information when being turned on, it displays the message BATT MEMO.

Question: How can the above fault be repaired?

Answer: Clean the battery contacts, set the phone to LOCAL mode, and read the battery type with command 95*. If the type is incorrect, then programme the correct type with the command 95#. The arrow keys can be used to select the battery type, and pressing F will store the information in the battery pack memory. If BATT MEMO is still displayed when turning the phone on, then the battery pack should be replaced.

If the phone is not able to read the battery pack memory, it will assume that the battery type is 600 mAh NiMH. The phone cannot necessarily charge the battery to its full capacity, charging currents are small, and charging times are long.

Question: The phone displays the message B BATT. What does it mean, and how can the fault be repaired?

Answer: Inside the phone, there is a back-up battery for RAM memory. When the phone is off and the battery pack is removed or completely empty, the back-up battery will supply RAM memory with enough current to ensure that no information is lost. Typical information in RAM memory are quick-memory numbers, short code memory numbers - information provided by the user.

Repair: Replace the back-up battery.

Note ! The B BATT message may be displayed after changing the program PROM. In this case, no action is required.

Question: Can short code memories be transferred from an older Benefon phone to a new one?

Answer: No. In new phones there are more alpha-numeric characters and the memory construction is different from older models. On the other hand, numbers can be transferred between Benefon Beta and Benefon Delta.

4.0 LOCAL SERVICE-COMMANDS

Local

4.0.1 Keyboard

HF/HS	Audio path and microphone switching between ERP, SPK, and EXTHS SPK is indicated by the HF symbol EXTHS is indicated by the flashing HF symbol ERP is indicated when the HF symbol is not visible
SND/END	termination of Local command
R	A, b, C, d, E, F input (Input is concluded by either the F key or the next number) Note: first enter a number.
+/-	Volume etc. control and adjustment (see commands)
FR	To change to NMT mode, if the local box has already been removed

4.0.2 Commands

(XXX)#	executes
(XXX)*	terminates equivalent (XXX)# command
XXXX#	channel command

Note: In local mode * = b and # = c in the lower display

4.0.2.1 Installation and Sales.

0#	Return to the local normal mode e.g. middle radio channel
01#	VOX value selection the chosen VOX value is displayed enter a new value 1...4 press F to enter
1#	VOX tuning press F to stop measurement (fixing value) press F to save tuned value
2#	Subscriber number programming enter 7 digits number (and 3 digits password if needed) and press F to enter
2*	Read subscriber number
3#	Password code programming enter 4 digits and F
3*	Read password code
4#	Serial number programming
4*	Read serial number
5#	Set country of origin country is displayed enter new country 0...9, F to enter
6#	Date of sale programming
6*	Read date of sale
7#	Set time (hours and minutes)
7*	Read time
8#	Set date (day XX, month XX, year XX)
8*	Read date

9#	Short code memory transfer to local box
999*	Short code memory transfer back to the radio
95*	Read battery type and capacity also production week and year
95#	Program battery type and capacity also production week and year

4.0.2.2 Service and Testing 0...

#port command

enter:	0	68HC11A1 PA
	1	IA8000 PA
	2	IA8000 PB
	3	IA8000 PC
	4	IA8000 PD
	5	IA8000 PF
	6	CARBOX
	7	LIF

- The port state is shown in the upper display in hexadecimal form (0...FF)

0 = 0000	1 = 0001	2 = 0010	3 = 0011	4 = 0100
5 = 0101	6 = 0110	7 = 0111	8 = 1000	9 = 1001
A = 1010	B = 1011	C = 1100	D = 1101	E = 1110
F = 1111				

- To change the port state (when the port number z is displayed) enter (z)XY

X	bit number (0...7)
Y	bit state (0 / 1)

- +/- can be used to change the active port number

02# Read the AD channel (real time)

- enter the AD channel number

0 = RSSI	1 = NTC	2 = MICDET	3 = ERPDET
4 = TEMP	5 = BATVOLT	6 = POTIND	

4.0.2.3 Logic Tests 1..

10#	Memory test - EPROM; if error XX1 (no error, XX0) - EEPROM; if error X2X (no error, X0X) - RAM; if error 3XX (no error, 0XX)
11#	COP test - If error, then WDFAIL displayed
12#	"0" frequency transmission - Does not set transmitter etc.
12*	End transmission
13#	"1" frequency transmission Does not set transmitter etc.
13*	End transmission
14#	Open frame transmission - framework specified by entering N1 N2 N3 P(X) Y1 Y2 Z X1 X2 X3 X4 X5 X6 J1 J2 J3 # - default value frame 15 - letters A...F are entered with the R-key
14*	End transmission
15#	Receive frame
16#	FSK-notification test (real time) - XY displayed X = 1, FSK level exceeds the tuned level (X = 0, below) Y = 1, FSK signal detected (Y = 0, not detected)
18#	DTMF loop test
19#	Read machine type
96#	Start charger control test (control voltage -2.5V, I in = - 1.3 A)
96*	Terminate charger control test (control voltage 0V)

4.0.2.4 Audio 2..

20#	AUDIOPOWER ON
20*	AUDIOPOWER OFF
21#	TXAUDIO ON
21*	TXAUDIO OFF
22#	RXAUDIO ON
22*	RXAUDIO OFF
23#	FIILoop ON
23*	FIILoop OFF
24#	FSK ON
24*	FSK OFF
25#	COMPANDER/EXPANDER ON
25*	COMPANDER/EXPANDER OFF
200#	Audio circuit SC11370 settings 1. select register (0...b) +/- keys 2. select the bit to be changed 0...7 3. select the bit logic state 0 or 1
201#	Audio circuit SC11370 tuning 1. select the register to be tuned 1...0 1 NORMDEV GC2 2 HFTXATT GC3 3 MAXDEVLO GC7 4 MAXDEVHI GC10 5 ERPVOL GC8 6 RXAUDLEV GC9 7 MICSENS GC1 8 DTMFLEV GC4 9 FFSKTXLEV GC5 0 FIILEV GC6 +/- keys to select level (0...15)

203#	DTMF tone generator settings
204#	TXAUDIO and RXAUDIO ON
210#	+55 C tuning
211#	+25 C tuning
212#	0 C tuning
213#	-25 C tuning
216#	Deviation correction constant (to reduce distortion)
217#	Deviation correction limits

4.0.2.5 RF 3..., 4...

30#	Transmitter ON Note: Does not set the power level (if the transmitter was OFF, power setting= 0)
30*	Transmitter OFF
31#	Transmitter ON low power
31*	Transmitter OFF
32#	Transmitter ON medium power
32*	Transmitter OFF
35#	Low channel
36#	Middle channel
37#	High channel
38#	RSSI level tuning - level to be tuned shown in the upper display PG -58, PG -68, PG -93, PG -103, PG -115 - enter F to tune the next level - value can be saved if -58dBm> -68dBm> -93dBm> -103dBm >-115dBm
38*	Read the carrier wave level tuning levels from EEPROM
380#	RSSI correction constant
39#	Power level tuning - power level shown in the upper display 150mW 1200mW - power is increased with the + key and decreased with the - key - enter F to save
39*	read the tuned power levels from EEPROM M = 1.2 W, L = 150 mW
43#	CHANNEL SCANNING - starts from the current channel - displays the channel in the upper display, and the TX-frequency in the lower display

- 44# CHANNEL STEPPING
- the +/- keys step through the channels one at a time
- displays the channel in the upper display and the TX frequency in the lower display
- 44* CHANNEL STEPPING
- the +/- keys step through the channels one at a time
- displays the channel in the upper display and the RX frequency in the lower display
- 45# AFC ON
- 45* AFC OFF
- 450# AFC 1kHz correction tuning (value 00000...65535)
- set thousands, press F
- set hundreds, press F
- set tens, press F
- set units, press F
(select with the +/- keys. shown in the upper display)
- 450* Read the AFC 1kHz correction
- 452# TCXO fine tuning
- enter a 5 digit number and store with F
Note: After 0# the radio is on the middle channel. The xxxx# channel command can be used to change the tuning channel.
- 452* Read the TCXO fine tuning value
- 453# 450 kHz intermediate frequency measurement and display

4.0.2.6 Equipment and Accessory Tests 5...

- 50# Display and illumination test
- 50* Display and illumination OFF

4.0.2.7 Other Commands 6..., 7...

- 60# Printing out all power off counters

- | | |
|---|-------|
| 0 | RAM |
| 1 | EPROM |

2	EEROM
3	COP
4	RSSI
5	TXON
6	HANDSET OFF
7	FSK
8	SIM

60*	Reset all power off counters
61*	Read the 4 digit sales codes from EEPROM - the sales code (= local box number) is always stored when programming the subscriber code. - 1 = newest ... 5 = oldest (number given by corresponding number key) - the sales code is XYZW (= 0...9 0...9 0...9 0...9) - If the display contains odd characters, the code is unused
62#	Read program version (ddmmyy)
70#	FSK split level tuning - enter F to save
70*	Read FSK split level value
71#	Program basic band - enter low channel (1...4 digits) and F - enter high channel (1...4 digits) and F - settings can be saved if the lower limit * upper limit (according to their frequencies)
71*	Read the basic band

4.0.2.8 Clearing Memories 8...

80#	Clear RAM
81#	Clear EEPROM (not tuning values nor sales codes)
810#	Clear the whole of EEPROM (not sales codes)
82#	Clear RAM and EEPROM (not tuning values nor sales codes)

4.0.2.9 Sleep Timer

90#	Activate the sleep timer
90*	Deactivate the sleep timer
91#	Sleep timer test - sets phone to sleep mode after 5 seconds for approx. 5 seconds

4.0.2.10 SIS Commands

100#	SIM uses normal SAK number - default value when phone is turned on
100*	SIM uses test SAK number - to test signaling, remove local box and enter F R to switch to NMT mode
101#	SIM sleep mode
101*	SIM wake-up

4.0.2.11 Updating the Local Box

900#	Re-programming of local box rights and user-time
902#	Read the local box number (xxxx) and the phone identification code (yyyyy) - xxxx yyyyy

4.0.3 Error Messages

The upper display usually shows LOCAL, when there is no other information on display. ERROR in the upper display:

1. Incorrect local command or key-entry

2. Fault in EEPROM programming
3. EEPROM input entry error
 - input data string too long
 - incompatible characters in entry
 - carrier wave levels to save are in wrong order of magnitude
 - basic band limits to save are incorrect
 - LOCAL BOX WITHOUT RIGHTS TO PROGRAM e.g. SUBSCRIBER NUMBER
4. Loop test failed to find required response in specified-time

UNKNOWN in the upper display:

Unknown local command

LOCAL in the upper display when turning on power, although there is no local box connected:

Subscriber number not programmed
Date of sale not programmed

BATT MEMO in upper display when turning on power:

battery type not recognised
battery pack connections loose or
battery pack damaged

5.0 TUNING INSTRUCTIONS

Tuning Instructions

Necessary equipment: Local adapter, Local box, radio communication tester, multi-meter.

5.0.1 Watchdog Activation

This operation will reset all settings !! Perform only when changing CPU.

- Connect I201 pin 25 (MODB) to ground and turn power ON. Remove the jumper and turn the power OFF.
- Check: Local 11 # cop test.

If result is WD FAIL or the phone jams, the activation must be repeated.

- Local 0 #

5.0.2 Battery Voltage Calibration

- Adjust the operating voltage to 6.5 V, measuring from the OS-module battery contacts.
- Local 214 #, check that "BT65V" is in the display.
- Local 0 #.

5.0.3 TX-Power Level Adjustment

- Local 0 #, 31 #, 39 #, and use the +/- keys to adjust the power to 180 mW (22.6 dBm), and confirm with the F key; adjust with the +/- keys to 1.2 W (30.8 dBm), and confirm with the F key.
- Check that the current consumption is less than 900 mA.
- Local 0 #.

5.0.4 Frequency Adjustment

- Local 36 #, 31 # LTXON, 45* AFCOFF, 452 #, use the +/- keys to adjust the frequency as close as possible to 455.225 MHz, and confirm with the F key.
- The adjustment can also be done by entering a 5 digit value and saving it with the F key.

If the tuning value needs to be changed more than 2500 units, the TCXO must also be tuned.

- Local 0 #.

5.0.5 Learning the 1 kHz Frequency Shift

- Local 0 #, 36 #, 31 #, 450 #

Adjust the transmitter to 455.226 MHz with the +/-keys and store with the F key.

- Local 0 #.

5.0.6 Tuning the Receiver

- Feed an RF-gen 1 kHz / 3 kHz dev. at -50 dBm on the mid-channel.
- Local 0 #, 36 #, 22 #, RXAON, 201 # 6
- Use the +/- keys to adjust the audio level reading to 220 (+/-10) mVrms or 622 (+/-30) mVpp, store with the F key, press the C key.
- Change the RF level to -113 dBm.
- Check the sensitivity: mid-channel (Local 36#), low channel (Local 35#), and high channel (Local 37#). Minimum sensitivity 20 dB sinad (CCITT).
- Local 0 #

5.0.7 Fsk-Split Level Programming

- Local 0 #, 36 #, 22 #
- Feed an RF-gen. 1 kHz / 350 Hz dev. at -50 dB on the mid-channel.
- Local 70 #, wait until the display stabilises, store with the F key.
- Check 70 *, display shows the stored value.
- Local 0 #

5.0.8 Rssi-Level Programming

- Set the RF-gen on the mid-channel at -58 dBm.
- Local 0 #, 36 #, 38 #, and wait until the displayed value stabilises, and press the F key.
- Change the RF level to -68 dB and wait until the displayed value stabilises, and press the F key.
- Change the RF level to -93 dBm, press the F key.
- Change the RF level to -103 dBm, press the F key.
- Change the RF level to -115 dBm, press the F key.
- Check programming with Local 38 *, the stored values are displayed.
- Local 0 #.

5.0.9 TX Audio Tuning

- Local 0 #, 36 #, 31 #, 21 #
- Feed via the local box GEN connector a 1 kHz sine signal at 4.0 Vrms, and set the local box switch to the SERVICE position.
- Local 215 # (store mic level)
- Change the frequency to 2 kHz at 4 Vrms.
- Local 201 # 4 and use the +/- keys to set the deviation to 4.55 (+/- 0.15) kHz, confirm with the F key.
- Change the signal frequency to 1 kHz at 400 mVrms.
- Press the 1 key and use the +/- keys to set the deviation to 3.00 (+/- 0.05) kHz, confirm with the F key, and press the C key.
- Local 0#

Checking the deviation limiter:

- Local 36#, 31#, 21#
- Local 217#, change the level to 4.0 Vrms, frequency still 1 kHz. Use the +/- keys to set the deviation above 3.7 kHz, and confirm with the F key.
- Local 0 #.

5.0.10 Microphone Level Adjustment

- Feed a 1 kHz sine signal acoustically to the microphone at a normal sound level.
- Enter local 0 #, 21 #, press HF, 31 #, 201 # 7
- Use the +/- keys to set the deviation to 3.00 (+/- 0.05) kHz, confirm with the F key, press the C key.
- Local 0 #

5.0.11 FFSKT Deviation Adjustment

- Local 0 #, 24 #, 31 #, 201 # 9
- Use the +/- keys to set the deviation to 4.20 (+/- 0.05) kHz and press F and C keys.
- Local 0 #

5.0.12 FII Deviation Adjustment

- Set an RF-gen. mod. frequency 4 kHz / 600 Hz deviation, at - 50 dBm.

- Local 0 #, 31 #, 23 #, 201 # 0
- Use the +/- keys to set the deviation to 600 (+/- 20) Hz, press F and C keys.
- Local 0 #.

5.0.13 DTMF Deviation Adjustment

- Local 0 #, 31 #, 21#, 203 #, choose 941 Hz with the +/- keys, and press the F key.
- Local 201 # 8 and set the deviation with +/- keys to 1.80 (+ 0.20) kHz, press F and C keys.
- Local 0 #.

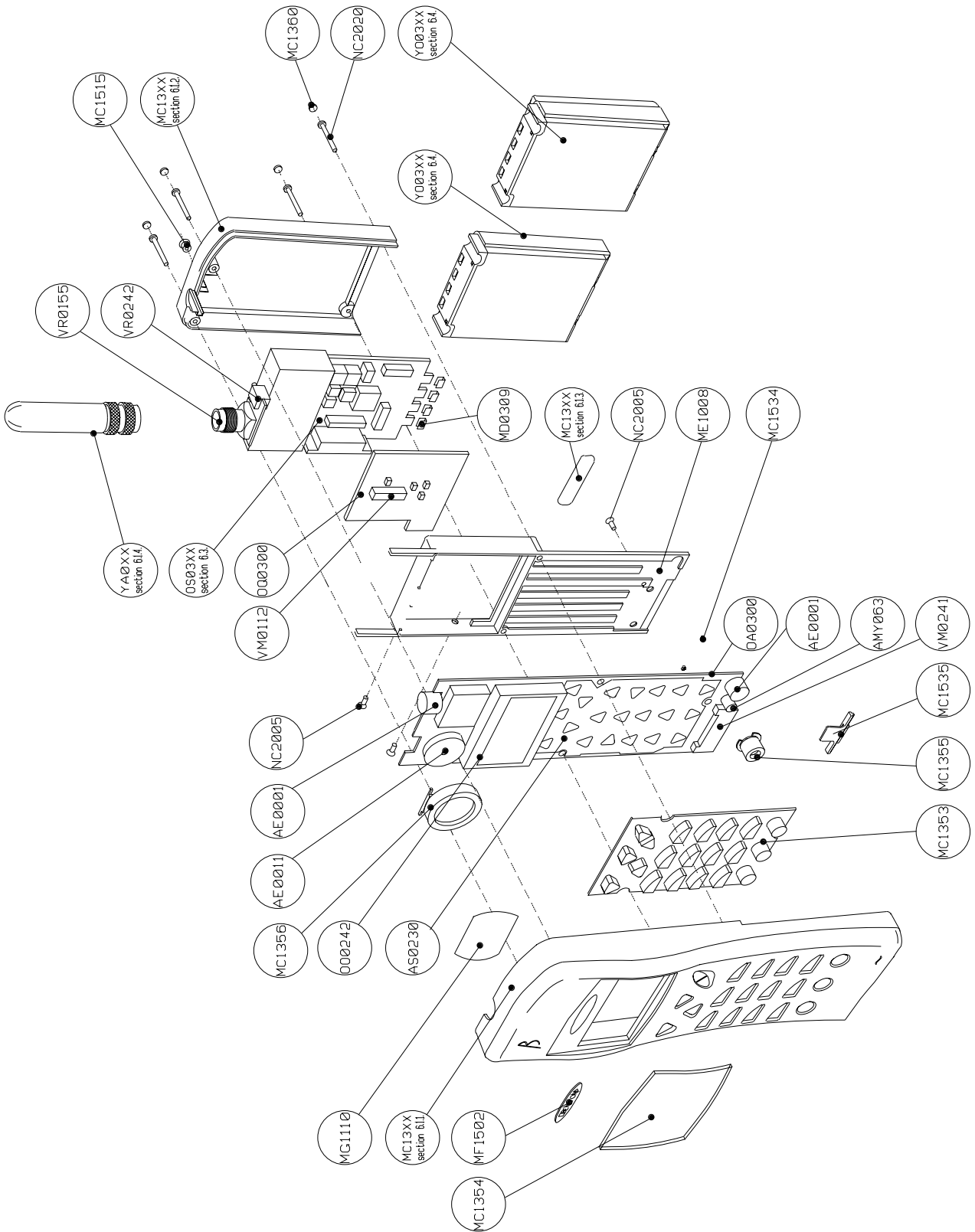
5.0.14 Subscriber Number Programming

- Local 0 #, 2 #, enter 7 digit number (and 3 digit password if needed) and press the f key.
- Check with 2 *.
- Local 0 #

5.0.15 Select Battery Type

- Local 95 #
- Use the +/- keys to select the battery type in use, and press the F key.
- Check with 95*

6.0 PHONE'S CONSTRUCTION



6.1 MECHANICS

6.1.1 Front Cover

MC1383 Grey

MC1384 Green

MC1382 Red

MC1381 Blue

MC1351 Black

6.1.2 Back Cover

MC1393 Grey

MC1394 Green

MC1392 Red

MC1391 Blue

MC1352 Black

6.1.3 Type plate

MC1302

6.1.4 Antennas

6.1.4.1 Helical

YA0055

6.2 LOGIC / AUDIO

OA0300 Processor

Processor

6.2.1 General

The entire radio audio and processor functions are found within a single PA0300 board, through which all other modules are connected. Only the RF signals have a different path.

The processor controls the audio and radio modules, internal devices and external accessories.

The processor includes:

CPU	68HC11A1	8-bit, 8 A/D, 512*8 EEPROM, 256*8 RAM, I/O
PROM	27C010	128*8 EEPROM, program memory
RAM	4465	8K*8 CMOS RAM, number memory
ASIC	IA8001	32 pcs out and 14 pcs inp, 3 series out, 3 analog out, frequency counter, clock
TXLOG		TX power adjustment and control
SIS	68HC11A8	SIS function, 8k ROM, 512*8 EEPROM, 256*8 RAM

6.2.2 Connectors:

6.2.2.1 Radio Base Connector (printed circuit)

1	V-CHARGE	battery charging voltage IN	2A
2	V-CHARGE	battery charging voltage IN	2A
3	VB	6 V output to accessories	0.5A
4	V-PROG	FLASH PROM programming voltage IN	0.5/12 VDC
5	EXT-MIC+PWR	external audio from the microphone	400 mVrms
6	GND		
7	GND		
8	EXTERPX+HOOK	external audio to the speaker amplifier	220 mVrms
9	PTTX	external PTT, radio input 0V active	0/5V
10	I2CINTX	i2c interrupt, radio input	0/5V
11	SCLX	i2c clock	0/5V
12	SDAX	i2c data	0/5V
13	TXDX	rs232 OUT	0/5V
14	RXDX	rs232 IN	0/5V
15	EXTIOX	reserve	0/5V
16	CHGCONTX	charging control voltage	0...5VDG analog

The power switch is connected to the mic-line so that the switch grounds the mic-line.

The Extl-hook switch is connected to the erp-line so that the erp-line dc level drops when the handset is in its holder.

6.2.2.2 RF-Module, 24 pin Connector

1	SLEEP	RF-module sleep control	0/5V
2	TXVCO	tx vco start up	5V
3	VB	power supply from the battery (RF-module battery connector)	6V
4	VB	power supply from the battery	
5	VB	power supply from the battery	
6	GND		
7	GND		
8	GND		
9	SDATA	RX and TX data to the splitter	0/5V
10	SCLK	RX and TX data clock	0/5V
11	STE	TX divider enable pulse	5V
12	SRE	RX divider enable pulse	5V
13	RSSI	RX signal strength indicator, analog 0-5V	
14	RXAUDIO	RX audio signal	100mVrms
15	450KHZ	450kHz for AFC measurement	approx.1Vpp
16	AFC	frequency compensation control voltage	approx 2.5V
17	TXAUDIO	TX audio modulation	550mVrms
18	TXPWR	TX power control, analog	0-5V
19	TXSENSE	not connected	
20	TXBIAS	TX initiate, 0V = TX OFF	0/5V
21	BNTC	battery temperature data, analog	
22	BSENSEX	input memory data-line	
23	SPRIO	no function	
24	DTUNE	not connected	

6.2.2.3 Keyboard (internal)

1	KEY-INP4	key matrix input	0/5V
2	KEY-INP0		
3	KEY-INP3		
4	KEY-INP2		
5	KEY-INP1		
7	PWS	power switch	
6	GND		
8	KEY-OUT0	key matrix output	0/5V
9	KEY-OUT1		
10	KEY-OUT2		
11	KEY-OUT3		

6.2.2.4 Display Module

1	VCC		
2	LIGHTKEY	light control, 6V = ON	0/6V
3	SDAL		
4	SCLL		
	GND		

6.2.3 Circuit Diagram

The processor circuit diagram is split into three parts. The first diagram shows the module connector pins and power supply. The second diagram shows all the processor functions. The whole audio is in a single diagram. Signals in the circuit diagrams have been given names, and signals with the same name are connected between diagrams.

6.2.3.1 Circuit Diagram Contents

OA0300A0	power supply and connectors
OA0300B0	cpu, ASIC, RAM, EPROM, SIS-function
OA0300C0	audio parts (filters, modem, DTMF, compander)

6.2.3.2 Numbering of Components

The different modules making up the radio unit have all their components unambiguously numbered. An individual component number is used only once:

OA0300A0 has numbers 001...199

OA0300B0 has numbers 200...299

OA0300C0 has numbers 300...399

6.2.4 Functions

6.2.4.1 CPU

I201 is itself a processor circuit. It comprises CPU, 512*8bit EEPROM, timers, A/D converters, and both series- and parallel I/O lines. The clock oscillator is located in the audio circuit and provides the CPU with a 5.5296 MHz clock signal. The CPU divides this by 4 to get timing signal E.

When the processor is operating, RESET = 5V, VCC = 5V, E = 1.3824 Mhz, AS, R/W and A0...A15 pulses should be 0/5V (no intermediate values, only 0 or 5V).

6.2.4.2 Memories

Memory- and external I/O-circuit address coding is done with the ASIC circuit 203. The circuit options CSR, CSP, and CSIO are 0-active.

The program memory is in 128k*8 EPROM. The program uses the addresses 2100H...FFFFH. Page selection makes available another similar memory block.

RAM-memory is 8k*8 CMOS RAM at the addresses 0000H...1FFFFH. RAM receives its power supply from its own regulator which is always operating, even when the radio is in OFF state.

6.2.4.3 The Modem

The FFSK modem is located in the audio circuit. The modem is connected to the CPU by a series line, input to synchronised port, and transmission is controlled by an ASIC series output. The modem gives a 1200 Hz signal RXCLK to the processor and TXCLK to ASIC. There is a data detector within the modem, the speed of which is controlled by C395. D376 serves as the data detector, and the CPU A/D converter measures the level of acceptance. The same detector also serves to control the HF function.

6.2.4.4 AFC

The AFC function is performed by an internal ASIC frequency counter. A 450 kHz intermediate frequency is amplified to a square-wave form by Q109. The frequency is adjusted by ASIC pulse frequency modulated signal D/A 0, which is integrated by C284. This approx. 2.5V DC voltage is fed to the synthesiser AFC pin.

6.2.4.5 Sleep Timer

The phone puts the central functions to sleep for a time. Although everything seems normal to the user, most of the functions are closed down. The radio- and audio-units are closed down completely. The processor still has a power supply, but the processor is halted and has minimal power consumption. Only the ASIC circuit sleep timer and its 32 kHz crystal oscillator remain in active mode. The phone is "woken up" by interrupting the sleep timer or by changing the keyboard state. The sleep timer 32 kHz clock frequency is produced by the oscillator made by crystal X203.

6.2.4.6 Warm Start

C221 and R221 measure the length of a voltage break. The voltage drops during a break, after which it is measured by the A/D converter. The time constant is approx. 10 s . Thus a "warm start" is detected.

6.2.4.7 RESET

The processor voltage regulator ERROR output resets (stops) the processor and zeroes the controls when the battery voltage drops below 5V. As the voltage rises again, the processor restarts.

6.2.4.8 Power Switch

The power switch (PWS) is grounded, and directs the regulator I101 to conduct when pressed. The program commences and checks the PWRSW line to ensure

that the switch is being pressed, and sets hold on the regulator for the PWRON line. When the switch is depressed for a longer time, the program directs power to the PWROFF line. During a short voltage break, C124 and R123 remember the previous control, i.e. fet Q101 conducts again when the voltage is restored within 10 seconds. The switch-fet also serves as a watch-dog should the voltage drop or processor error-state continue; after 10 seconds, the radio will shut down completely.

Note! The RAM and ASIC circuits have their own regulator connected to the battery to ensure an uninterrupted power supply. RAM power supply is ensured during a battery-pack change by the battery A100.

6.2.4.9 Battery Voltage Measurement

The battery voltage is measured by an A/D converter. The converter 256 step conversion scale is not sufficient as it stands, so the measured range is restricted to 5...8V by the operational amplifier I206. The reference voltage for the measurement is provided by the processor regulator 5V supply. Calibration is done by the program against a precisely known battery voltage.

6.2.4.10 I/O ports

The ASIC I/O ports PA...PF are 8-bit hold circuits. DATA is fed to the addressed output. When the RESET line is down (0V) all the ASIC ports are zeroed (0V). As RESET rises again, all of the two-way I/O ports are inputs until the program sets them to the desired state. With the radio in OFF state, RESET is down so all of the controls are also down although ASIC is still provided with operational voltage (VRAM).

6.2.4.11 Tone Generator

Tones for the internal buzzer are provided by the ASIC tone generator. The frequency can be programmed between 400...4000 Hz. The wave form is square.

6.2.4.12 SIS

SIS functions are provided by a mask-programmed single chip processor I202 (68HC11A8). It communicates with the host processor via ASIC with an RS232 bus (5V levels). The circuit operation is not externally visible as it is a single-chip solution. User specific information is stored in EEPROM which CANNOT be read from outside the chip. All external attempts to read the information clear both EEPROM and RAM (fill with FF).

6.2.4.13 Power Adjustment

The transmitter control logic switches TX power and also adjusts it to the correct level. The TXVCO signal sets the transmitter to ready-mode. Power is controlled by the ASIC analog output D/A 1. It is a pulse frequency modulated output which is converted to a DC voltage by integrating it with C287. 0V corresponds to "no power" state, and 5V to maximum transmitter power. The power levels are calibrated by the program at the source of measurement.

6.2.4.14 Charging Control

The charger is controlled by the program. The charger is detected by a voltage at the VCHARGE pin. The charging current (0...2A) is controlled by an analog (0...5V) CHGCONT signal which comes from the ASIC D/A 2 pulse frequency output. Charging is governed by the battery and radio temperatures, battery voltage, and time measurement. D104 prevents the battery voltage reaching the charger.

6.2.4.15 Temperature Measurement

The radio has two separate temperature sensors, one within the battery pack, and the other within the radio module. Inside the radio the NTC resistor R209 voltage is measured by the processor A/D converter. This value is converted by a programmed table to a temperature reading. The battery pack temperature is calculated in the same way.

6.2.4.16 Real-time Clock

A real-time clock is provided within ASIC to give the time and date. The alarm function can also be programmed to the ALARM pin. This will initiate the processor regulator and thus also the radio although it was in OFF state.

The ASIC circuit has a continuous power supply and the 32 kHz clock crystal runs constantly. Not even the RESET line stops the clock. If the power supply has dropped too low, the clock will need to be reset with the radio buttons (from the menu).

Audio

6.2.5 Function Description

OA0300 Audio

The audio module comprises the following functions:

1. TX-audio signal handling
2. RX-audio signal handling
3. Fii signal handling
4. FFSK modem
5. DTMF generator/receiver
6. Signal level detectors
7. Compander
8. Alarm tone buzzers

The audio functions are for the main part located in a single circuit SC11370. This chip from Sierra Semiconductor is controlled by a n i2c bus. It is possible to shut down parts of the circuit, one block at a time to minimise power consumption. The circuit provides six separate clock frequencies for the processor, or alternatively the clock frequency can be switched off entirely.

In addition to the audio circuit, the audio module uses a Phillips Semiconductor low-current compander SA578, and for alarm tones the ASIC tone generator and Citizen buzzers.

6.2.5.1 TX-Audio

The input from the microphone is fed to the audio circuit I300 pin 36, which is an operational amplifier inverting input. The operational amplifier gain is set by resistors R304 and R306. The amplifier is connected as a low pass filter. After the filter, the signal is fed to the programmable amplifier GC1 (gain 0...+6dB), which sets the microphone signal to the correct level. After GC1 comes switch t1, which selects either the internal microphone or an audio signal via the base connector X-EXT pin 5 from an external device (HF-microphone, user equipment). The external audio signal is fed to the amplifier I310, in which the large signal peaks are limited (pre-limiter). The power supply for I310 can be switched off with the COMPWRON control (COMPWRON = 0). The resistors R313 and R316 are used to adjust the signal to a suitable level for the audio circuit, and the signal is fed to the audio circuit pin 35. The switch is controlled by the EXTON control so that the internal microphone is connected when EXTON = 0, and the external signal when EXTON = 1. From the switch, the signal is fed through a high pass filter F1, and then to compressor I330 C, which can be by-passed using the audio circuit internal switch t3, which in turn is

directed by the COMPOFF control. The compressor is by-passed when COMPOFF = 1. From the compressor, the signal is fed through a -6 dB pre-amplifier F2 to the programmable amplifier GC2 (gain 0...6dB) which regulates normal deviation. After the normal deviation regulation, the signal is fed to an amplitude limiter, and then on to the 4 kHz band-block filter F3A. After the filter comes switch m6, which mutes the TX audio signal using the TXMUTE control. From the switch, the signal is fed to the programmable amplifier GC3 (gain -17...+4 dB), which is used in conjunction with the HF function. After GC3, the signal is filtered with a 3 kHz low pass filter F3B, and then the signal level, maximum deviation, can be regulated with the programmable amplifier GC10 (gain 0...+6 dB). The adjustable amplifier GC7 (gain 0...+4 B) is used to automatically regulate the signal level. The TX signal is then fed to the X-RF connector pin 17.

6.2.5.2 RX-Audio

The RX signal coming from the receiver through the X-RF pin 14 is fed to the audio circuit I300 pin 21. Inside the circuit, the signal is fed to the programmable amplifier GC9 (gain 0...+6 dB), which regulates the incoming signal from the receiver to the correct level. The signal is next passed through a -6 dB muting filter F5 to the filter chain formed by the high-pass filter F7A, the band-rejection filter F6, ja low-pass filter F7B. The signal passes from the filters through the switch m19, which is operated by the RXMUTE control, from circuit I300 pin 23 to the expander I330B. The expander can be by-passed using the switch t23 within the audio circuit, which is operated by the EXPOFF control. When EXPOFF = 1, the expander is by-passed. From the expander, the signal is fed back to circuit I300 pin 22.

Inside the circuit, the signal passes through switch t23 to the programmable amplifier GC8 (gain -8...+20 dB), which adjusts the volume. After the volume control, the signal is fed to t20 and t21. The signal is directed to the earphone by the EARON = 1 control through switch t20 to the earphone amplifier and on to the earphone. The signal can be directed to an external device, by the EXTLSON = 1 control through switch t21 and the amplifier, and out of the circuit I300 from pin 24 to the base connector X-EXT pin 8.

6.2.5.3 FII Signal

The NMT system uses the FII signal to check the radio path quality. This approx. 4 kHz signal is split from the RX-audio signal after the adjustable amplifier GC9 and is filtered through the band-pass filter F8. The signal level is regulated by the programmable amplifier GC6 (gain +2...+8 dB) and is passed through switch t11, which can be operated by the FIION control, to be summed with the TX-audio signal before the programmable amplifier GC10.

6.2.5.4 FFSK Modem

The FFSK data signal to be transmitted is passed through a +6 dB pre-amplifier F10 to the programmable amplifier GC5 (gain 0...+6 dB), which adjusts its level. The data signal is switched using m10, which is operated by the FFSKDTMFSEL control. The data signal is summed with the TX-audio signal by the summer between GC3 and the low pass filter F3B.

The received data signal is split from the RX-audio signal after the -6 dB muting filter F5 and is fed to the FFSK receiver and data detector. The data detector speed is determined by the external condenser C395.

The modem is connected to the CPU by series lines, the receiver to a synchronised gate, and transmission is directed to an ASIC series output. The modem provides a 1200 Hz clock signal RXCLK to the processor and TXCLK to ASIC.

6.2.5.5 The DTMF Generator/Receiver

The DTMF generator provides all sixteen standard DTMF tones, and each individual frequency separately. The generator is used to produce both key- and alarm-tones in a car installation, and enable numeric message transmission during a call.

Key- and alarm-tones are taken from the generator to switch t14, which is operated by the DTMFRXON control, and is the summed with the RX-audio signal before the volume control GC8. After the volume control the signal is routed through the switch t21 to the amplifier, and then out from the circuit pin 24 to the connector X-EXT pin 8. Switching is directed by the EXTLSON control.

When transmitting a numeric message, the DTMF tones produced by the generator are fed through the programmable amplifier GC4 (gain 0...+6 dB) to the switch t2, which is operated by the DTMFTXON control, and is summed with the TX-audio signal after the filter F1.

The DTMF receiver takes in numeric messages sent to the phone. When the receiver has captured a received number, the STD line rises to 5V, and the number can be read through the I2C bus.

The route to the DTMF receiver splits from the RX-audio signal after the filter F5, through switch t16 and on through switch t12.

In addition, the DTMF receiver is used to receive DTMF tones from a fax connected to the line converter or from a conventional fixed-line telephone. In this case the DTMF tones from the EXTMIC connector passes along the TX-audio signal path and splits from it before the compressor to switch t15, which is operated by the ANSLOOPON control. From the switch, the DTMF tones are passed to switch t12 and on to the DTMF receiver.

6.2.5.6 Signal Level Detectors

Signal level detectors are required with the HF-function to measure the transmitted and received audio signal level, and to study the data signal level. Measurement is done by rectifying the signal, and the resultant DC voltage is read by a phones processor A/D converter. Rectifying is done by two operational amplifiers from the audio circuit and external diodes.

The transmission side audio signal is taken from the I300 pin 33 to pin 31, which is an operation amplifier inverting input. The signal comes out of pin 30, and is rectified by the diode D326 and filtered by the capacitor C326. The DC voltage (MICDET) is taken to a processor A/D converter, which measures the level.

The receiver side audio signal and data signal are taken from I300 pin 23 to pin 27, which is an operational amplifier inverting input. The signal comes out of pin 28 and is rectified by diode D376 and filtered by the capacitor C374. The DC voltage (ERP-DET) is taken to a processor A/D converter, which measures the level.

6.2.5.7 Compander

The audio signal signal-to-noise ratio is improved by using the compander. The transmission side signal is compressed by a 2:1 ratio, and the signal is expanded in the receiver by the inverse 1:2 ratio. The compander specifications are outlined in the CCITT recommendation Rec. G.162.

The compander circuit is a Phillips Signetics SA578D. The circuit has low power consumption in operation, and additionally, can be powered down by the external COMPWRON control (CPMPWRON = 0).

6.2.5.8 Alarm Buzzer

Tones for the internal alarm tones are provided by the ASIC tone generator, from which the square wave is brought by the TONE signal to the base of the transistor Q395. The alarm tone volume is adjusted by the BUZVOL0 signal fed to the transistor Q396, and the BUZVOL1 signal fed to the transistor Q394. EX-BUZZ is included only in the loudest (HIGH) levels.

LEVEL	BUZVOL0	BUZVOL1	TONE
HIGH	0	1	ON
MEDIUM	1	0	ON
LOW	0	0	ON
SILENT	0	0	OFF

6.2.6 Audio Module Tuning Instructions

6.2.6.1 TX-Audio

- feed a 1 kHz sine signal of 4.0Vrms to connector pin 5 (via local box, GEN-connector)
- enter 0 # and 21 # and 215 # (read phone level)
- change the signal frequency to 2 kHz at 4.0Vrms
- if the RF module is present, enter also 31 #
- if the RF module is not present, connect an oscilloscope to the X-RF connector pin 17.
- enter 201 # 4 and use the +/- keys to adjust the oscilloscope to show 2075...2125mVpp and press the F key. If the RF module is present, set the deviation to 4,5...4,7 kHz and press the F key.

- change the input sine signal to 1 kHz at 400mVrms.
- press 1 and use the +/- keys to adjust the oscilloscope to show 1510...1530mVpp and press the F key. If the RF module is present, set the deviation to 2,95...3,05 kHz and press the F key.
- press the C key.

Check the deviation limiter as follows and tune if necessary:

- change the signal level to 4.0Vrms keeping the frequency at 1kHz. If the deviation does not exceed 3.7 kHz, enter 217 # and raise the tuning value with the + key one step at a time until the deviation rises above the limit, and press the F key. If the deviation is already above 3.7 kHz, press the F key.
- change the frequency to 650 Hz. If the deviation exceeds 4.7 kHz, use the + key to increase the tuning value one step at a time until the deviation drops below the limit, and press the F key. If the deviation is already below 4.7 kHz, press the F key.

- feed 1 kHz sine wave acoustically at a normal noise level into the microphone.
- enter 0 #, 21 # and press the HF key. If the RF module is present, enter also 31 #.
- enter 201 # 7 and use the +/- keys to adjust the oscilloscope to show 1510...1530mVpp, and press the F key. If the RF module is present, set the deviation to 2,95...3,05 kHz and press the F key.
- press the C key.

6.2.6.2 FFSKT

- if there is no RF module, connect the oscilloscope to the connector X-RF pin 17.
- enter 0 # and 24 #. If the RF module is present, enter also 31 #.
- enter 201 # 9 and adjust the oscilloscope to show 2120...2140mVpp and press the F key. If the RF module is present, set the deviation to 4,15...4,25 kHz and press the F key.
- press the C key.

6.2.6.3 DTMFTX

- if there is no RF module, connect the oscilloscope to the connector X-RF pin 17.
- enter 0 # and 203 # and use the +/- keys to select 941 Hz and press the F key. If the RF module is present, enter also 31 #.
- enter 201 # 8 and adjust the oscilloscope to show 600...620mVpp and press the F key. If the RF module is present, set the deviation with +/- keys to 1,40 kHz (+ 0.20 kHz), and press the F key.
- press the C key.

6.2.6.4 RX-Audio

- feed a 1 kHz sine signal of 100mVrms to the connector X-RF pin 14. If the RF module is present, feed a 1 kHz modulated signal with 3 kHz deviation, RF level -53 dB, to the antenna connector.
- connect a voltmeter or oscilloscope to the connector X-EXT pin 8 (local box, METER connector).
- enter 0 # and 22 #.
- enter 201 # 6 and use the +/- keys to adjust the voltmeter to show 210...230mVrms (555...615 mVpp) and press the F key.
- press the C key.

6.2.6.5 FII

- feed a 4 kHz sine signal of 20mVrms to the X-RF connector pin 14. If the RF module is present, feed a 4 kHz modulated signal with 600 Hz deviation, RF level -53 dB, to the antenna connector.
- if the RF module is not present, connect an oscilloscope to the connector X-RF pin 17.
- enter 0 # and 23 #. If the RF module is present, enter also 31 #.
- enter 201 # 0 and use the +/- keys to adjust the oscilloscope to show 300mVpp and press the F key. If the RF module is present, set the deviation to 580...620 Hz and press the F key.
- press the C key.

6.2.7 Audio Locals

0 #	AUDIO RESET (SET AUDIO CHIP TO DEFAULT VALUES)
18 #	DTMF LOOP TEST
20 #	AUDIOPOWER SWITCHED ON
20 *	AUDIOPOWER SWITCHED OFF
21 #	TX AUDIO PATH ON (EXTMIC INPUT)
21 *	TX AUDIO PATH OFF
22 #	RX AUDIO PATH ON (EXTERP OUTPUT)
22 *	RX AUDIO PATH OFF
23 #	FII (SAT) LOOP ON
23 *	FII (SAT) LOOP OFF
24 #	TX FFSK ON
24 *	TX FFSK OFF
25 #	COMP ON
25 *	COMP OFF
200 #	AUDIO GATE CONTROLS

- 1.select gate (0..b) by +/- button
 - 2.select bit by buttons 0..7
 - 3.select state of the bit by 0 or 1
- See the list of gate controls (file: port 2).

201 # AUDIO TUNING COMMANDS

1. NORMAL DEVIATION ADJUST (GC2)
2. HANDSFREE TX ATTENUATOR (GC3)
3. DEVIATION CORRECTION (GC7)
4. MAXIMUM DEVIATION ADJUST (GC10)
5. ERP VOLUME CONTROL (GC8)
6. RX AUDIO LEVEL ADJUST (GC9)
7. MIC SENSITIVITY ADJUST (GC1)
8. TX DTMF LEVEL ADJUST (GC4)
9. TX FFSK LEVEL ADJUST (GC5)
0. FII (SAT) LEVEL ADJUST (GC6)

Tune by +/- button (steps 0..15).

203 # DTMF GENERATOR CONTROL (SINGLE TONE)

DTMF OFF

697 Hz 1209 Hz
770 Hz 1336 Hz
852 Hz 1477 Hz
941 Hz 1633 Hz

Select by +/- button and push F button.

204 #	RX AND TX AUDIO PATHS ON
210 #	+ 55 C° TUNING
211 #	+ 25 C° TUNING
212 #	0 C° TUNING
213 #	- 25 C° TUNING
214 #	STORING THE VALUE OF BATTERY VOLTAGE A/D CONVERTER
215 #	STORING THE VALUE OF MICROPHONE LEVEL A/D CONVERTER
215 *	CHECKING THE VALUE OF MICROPHONE LEVEL A/D CONVERTER
216 #	SET THE FIRST DEVIATION CORRECTION LEVEL (REDUCE DISTORTION GC2)
217 #	SET DEVIATION CORRECTION LIMITS (GC7)
# 4	0 0 COMPWROFF
# 4	0 1 COMPWRON

6.2.8 Audio Gate Controls

addr	bitnr.	name	0	1	fixed
00H	0	t1	EXTOFF	EXTON	
	1	t2	DTMFTXOFF	DTMFTXON	
	2	m60	TXMUTE ON	TXMUTE OFF	
	3	m61			0
	4	t7			0
	5	m100	FFSKTXOFF	FFSKTXO	
	6	m101			0
	7	t11	FIIOFF	FIION	

01H	0	t13	FFSKBPOFF	FFSKBPON		
	1	t14	DTMFRXOFF	DTMFRXON		
	2	t15	ANSLOOPOFF	ANSLOOPON		
	3	m190	0 LPF BY-	1 RX	0 LPF	1 LPF
	4	m191	0 PASSED	0 MUTED	1 ACTIVE	1 ACTIVE
	5	t20	EAROFF	EARON		
	6	t21	EXTLSOFF	EXTLSON		
7	t22	OPAINP GND	OPAINP REF			
02H	0-3	GC2[0-3]	NORMDEVPGA06			
	4-7	GC3[0-3]	HFTXATTPGA1704			
03H	0-3	GC7[0-3]	MAXDEVLOPGA04			
	4-7	GC10[0-3]	MAXDEVHIPGA06			
04H	0-3	GC8[0-3]	ERPVOLPGA2010			
	4-7	GC9[0-3]	RXAUDLEVPGA06			
05H	0	Pref12	AUDREFOFF	AUDREFON		
	1	Pref3	MODREFOFF	MODREFON		
	2	Prespwr	FDETPWROFF	FDETPWRON		
	3	Frxpwr	FRXPWROFF	FRXPWRON		
	4	Ftxpwr	FTXPWROFF	FTXPWRON		
	5	Drxpwr	DRXPWROFF	DRXPWRON		
	6	Dtxpwr	DTXPWROFF	DTXPWRON		
7	Aupwr	AUDPWROFF	AUDPWRON			
06H	0	Tx[0]	DTXCONT0	DTXCONT0		
	1	Tx[1]	DTXCONT1	DTXCONT1		
	2	Tx[2]	DTXCONT2	DTXCONT2		
	3	Tx[3]	DTXCONT3	DTXCONT3		
	4	ATTPB	PREDTMFOFF	PREDTMFON		
	5	Rtone	DLOWDISABLED	DLOWENABLE		
	6	Ctone	DHIGHDISABLED	DHIGHENABLE		
7						

07H	0	Xsel[0]	CLOCKSEL	Xsel[2:0]	010 = DIV 8	101 = DIV 2
	1	Xsel[1]	CLOCKSEL	000 = OFF	011 = DIV 4	110 = DIV 1.5
	2	Xsel[2]	CLOCKSEL	001 = DIV 2	100 = DIV 3	111 = DIV 1
	3	t23	EXPON		EXPOFF	
	4	Uopwr	OPAPWROFF		OPAPWRON	
	5	Fivep	FIVEPWROFF		FIVEPWRON	
	6	Lp255	LBLOW = 3 KHZ		LBLOW = 2.5 KHZ	
	7	t8	TXDATASEL = FFSK		TXDATASEL = TXDATA	
08H	0	t3	COMPON		COMPOFF	
	1	t4	PRETXON		PRETXOFF	
	2	t5	LIMON		LIMOFF	
	3	t9	PREFFSKON		PREFFSKOFF	
	4	t12	RXDTMFSEL = DTMF		RXDTMFSEL = LINECONV	
	5	t16	DEFFSKON		DEFFSKOFF	
	6	t17	DERXON		DERXOFF	
	7	t18	RXNOTCHON		RXNOTCHOFF	
09H	0-3	GC1[0-3]	MICSENS	PGA06		
	4-7	GC4[0-3]	DTMFLEV	PGA06		
0AH	0-3	GC5[0-3]	FFSKTXLEV	PGA06		
	4-7	GC6[0-3]	FIILEV	PGA06		
0FH	0	Proff			discharge capasitor (time const.)	0
	1	Sdet			bypass FFSK band-pass filter	0
	2	Sw_dis				0
GC*[3:0]	GC1,2,4,5,9,10	GC3	GC7	GC8	GC6	
	PGA06	PGA1704	PGA04	PGA2025	PGA28	
0000	0.0	-17.0	0.0	15.0	2.0	
0001	0.4	-15.6	0.3	20.0	2.4	
0010	0.8	-14.2	0.5	25.0	2.8	
0011	1.2	-12.8	0.8	-20.0	3.2	

0100	1.6	-11.4	1.1	-15.0	3.6
0101	2.0	-10.0	1.3	-10.0	4.0
0110	2.4	-8.6	1.6	-8.0	4.4
0111	2.8	-7.2	1.9	-6.0	4.8
1000	3.2	-5.8	2.2	-4.0	5.2
1001	3.6	-4.4	2.4	-2.0	5.6
1010	4.0	-3.0	2.7	0.0	6.0
1011	4.4	-1.6	3.0	2.0	6.4
1100	4.8	-0.2	3.2	4.0	6.8
1101	5.2	1.2	3.5	6.0	7.2
1110	5.6	2.6	3.8	8.0	7.6
1111	6.0	4	4.0	10.0	8.0

6.2.9 Parts list

OA0300

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
AB0001	A100	Lithium battery	3V 35mAh	Matsushita	BR-1225-1HC
AE0001	BUZ	Buzzer 9x5,5mm	5V 25ohm 90dB	Citizen	CB-09GP
CF0471	C101	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0471	C102	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0471	C103	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0471	C104	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0223	C105	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0471	C106	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0471	C107	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0471	C108	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0471	C109	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0471	C110	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0471	C111	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0471	C112	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CF0223	C113	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C114	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU1106	C122	SMD tantal	10uF/16V	AVX	TAJB106M016R
CU1106	C124	SMD tantal	10uF/16V	AVX	TAJB106M016R
CF0223	C125	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0103	C126	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CU1226	C127	SMD tantal	22uF/6.3V 20% 6x3.2mm	Matsushita	ECSTOJC 226R
CF0223	C128	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C165	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU1106	C166	SMD tantal	10uF/16V	AVX	TAJB106M016R
CF0103	C191	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CF0102	C202	SMD capasitor	1 nF 5 % NP0	Philips	
CF0223	C203	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C204	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C205	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C206	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C208	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU1106	C221	SMD tantal	10uF/16V	AVX	TAJB106M016R
CF0223	C222	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C224	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C242	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C250	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C251	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C256	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0220	C281	SMD capasitor	22 pF 5% 50 V NP0	Philips	
CF0220	C282	SMD capasitor	22 pF 5% 50 V NP0	Philips	
CU1105	C284	SMD tantal	1uF/16V	AVX	TAJR105M016R
CH0105	C287	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C288	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CU3475	C300	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CF0101	C302	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0223	C304	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0222	C306	SMD capasitor	2.2 nF 5% 50 V NP0	Philips	
CF0680	C308	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CU1105	C309	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0223	C310	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0101	C311	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0223	C312	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C313	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C314	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C320	SMD capasitor	22 nF 10% 50 V X7R	Philips	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CU1105	C326	SMD tantal	1uF/16V	AVX	TAJR105M016R
CH0104	C327	SMD capasitor	100nF/25V X7R	TaiyoYuden	TMK212BJ104K00T
CH0105	C330	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CU1105	C332	SMD tantal	1uF/16V	AVX	TAJR105M016R
CU1105	C334	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0221	C335	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CH0105	C336	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CF0223	C338	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C340	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU1105	C350	SMD tantal	1uF/16V	AVX	TAJR105M016R
CH0104	C351	SMD capasitor	100nF/25V X7R	TaiyoYuden	TMK212BJ104K00T
CH0104	C352	SMD capasitor	100nF/25V X7R	TaiyoYuden	TMK212BJ104K00T
CH0104	C353	SMD capasitor	100nF/25V X7R	TaiyoYuden	TMK212BJ104K00T
CF0103	C355	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CH0105	C360	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CF0101	C364	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0101	C365	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CU1105	C366	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0223	C368	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C370	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU1105	C374	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0223	C379	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CH0105	C380	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CU1225	C382	SMD tantal	2.2uF/10V	AVX	TAJS225M010R
CF0222	C385	SMD capasitor	2.2 nF 5% 50 V NP0	Philips	
CF0223	C386	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU1106	C388	SMD tantal	10uF/16V	AVX	TAJB106M016R
CF0223	C390	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C395	SMD capasitor	22 nF 10% 50 V X7R	Philips	
DS1070	D101	SMD diode pair	70V/100mA common cathode	Philips	BAV 70W
DS1070	D102	SMD diode pair	70V/100mA common cathode	Philips	BAV 70W
DS1070	D103	SMD diode pair	70V/100mA common cathode	Philips	BAV 70W
DY0034	D104	Schottky diode	40V/2,6A VF=0.45V	Shindengen	D3FS4A
DY0054	D105	Shottky diode		Philips	BAT 54
DS1070	D106	SMD diode pair	70V/100mA common cathode	Philips	BAV 70W
DLG170	D111	SMD led	Green	Citizen	CL 170G-CD
DLG170	D112	SMD led	Green	Citizen	CL 170G-CD
DLG170	D113	SMD led	Green	Citizen	CL 170G-CD
DLG170	D114	SMD led	Green	Citizen	CL 170G-CD
DLG170	D115	SMD led	Green	Citizen	CL 170G-CD
DLG170	D116	SMD led	Green	Citizen	CL 170G-CD
DLG170	D117	SMD led	Green	Citizen	CL 170G-CD
DLG170	D118	SMD led	Green	Citizen	CL 170G-CD
DLG170	D119	SMD led	Green	Citizen	CL 170G-CD
DLG170	D120	SMD led	Green	Citizen	CL 170G-CD
DLG170	D121	SMD led	Green	Citizen	CL 170G-CD
DLG170	D122	SMD led	Green	Citizen	CL 170G-CD
DLG170	D123	SMD led	Green	Citizen	CL 170G-CD
DLG170	D124	SMD led	Green	Citizen	CL 170G-CD
DLG170	D125	SMD led	Green	Citizen	CL 170G-CD
DLG170	D126	SMD led	Green	Citizen	CL 170G-CD
DLG170	D127	SMD led	Green	Citizen	CL 170G-CD
DLG170	D128	SMD led	Green	Citizen	CL 170G-CD
DLG170	D129	SMD led	Green	Citizen	CL 170G-CD
DLG170	D130	SMD led	Green	Citizen	CL 170G-CD
DS1056	D201	SMD diode pair	70V/100mA common anode	Philips	BAW 56W
DS1070	D326	SMD diode pair	70V/100mA common cathode	Philips	BAV 70W
DS1070	D376	SMD diode pair	70V/100mA common cathode	Philips	BAV 70W
AE0011	ERP	Earphone	Ceramic receiver	Panasonic	WM-71
MC1356	ERUB	Earphone rubber		Masamuovi	931580 40

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
AE0001	EX-BU	Buzzer 9x5,5mm	5V 25ohm 90dB	Citizen	CB-09GP
AF1005	F100	SMD PTC Fuse	0.5A	Raychem	miniSMD050-2
IR8850	I101	SMD regulator	5V/30mA	SeikoInstr	S-8850AF-TF
IR8850	I102	SMD regulator	5V/30mA	SeikoInstr	S-8850AF-TF
IP6810	I201	Processor (Peippo)	512 EEPROM, 8A/D, no ROM	Motorola	MC68HC11A1FU
IP6832	I202	Processor (SIS)	8k maskPROM,512EEPROM	Motorola	MC68HC11A8 FU
IG8001	I203	ASIC		SeikoEpson	SLA919SF1V
IM1010	I204	Flash PROM	128kx8 150ns	Texas	TMS28F010-15C4FM
IM3664	I205	8K*8 CMOS RAM	F28GA-P 11.8mm width	Toshiba	TC5565AFL-15L
IA7550	I206\	Single op.amp.		Toshiba	TA 75S01F-TE85L
IX1370	I300	Analog prosessor	Asic	SierraSemi	SC11370ACQ
IA7550	I310\	Single op.amp.		Toshiba	TA 75S01F-TE85L
IX0578	I330\	Low power compander		Signetics	SA578D
LF0061	L101	SMD EMI suppression filt	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472
AMY063	MIC	Microphone Omnidirectio	-42-+3dB	Matsushita	WM-060AY
MC1355	MRUB	Microphone rubber		Masamuovi	931579 30
NF0200	NUTL	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
NF0200	NUTR	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
PA0300	PCB	PCB-audio/pros	52x157 Fr4 6-layer	Metalex	
QF7002	Q101	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QS0848	Q102	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0858	Q103	SMD transistor	PNP 0.1A/30V hFE 125-800	Philips	BC858BW
QS0858	Q104	SMD transistor	PNP 0.1A/30V hFE 125-800	Philips	BC858BW
QS0848	Q105	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0858	Q107	SMD transistor	PNP 0.1A/30V hFE 125-800	Philips	BC858BW
QS0848	Q108	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0848	Q109	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0848	Q228	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0848	Q229	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0858	Q331	SMD transistor	PNP 0.1A/30V hFE 125-800	Philips	BC858BW
QS0848	Q332	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0848	Q360	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0848	Q361	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0848	Q394	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0848	Q395	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0848	Q396	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
RF0101	R090	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R091	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R092	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R093	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0470	R094	SMD resistor	47 R 5% 0.125 W	Kamaya	
RF0470	R095	SMD resistor	47 R 5% 0.125 W	Kamaya	
RF0101	R096	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R097	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R098	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R099	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R100	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R101	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R102	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0103	R103	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R104	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0470	R105	SMD resistor	47 R 5% 0.125 W	Kamaya	
RF0470	R106	SMD resistor	47 R 5% 0.125 W	Kamaya	
RF0103	R107	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0101	R108	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0104	R109	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R110	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0103	R111	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0104	R112	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0103	R113	SMD resistor	10 k 5% 0.125 W	Kamaya	

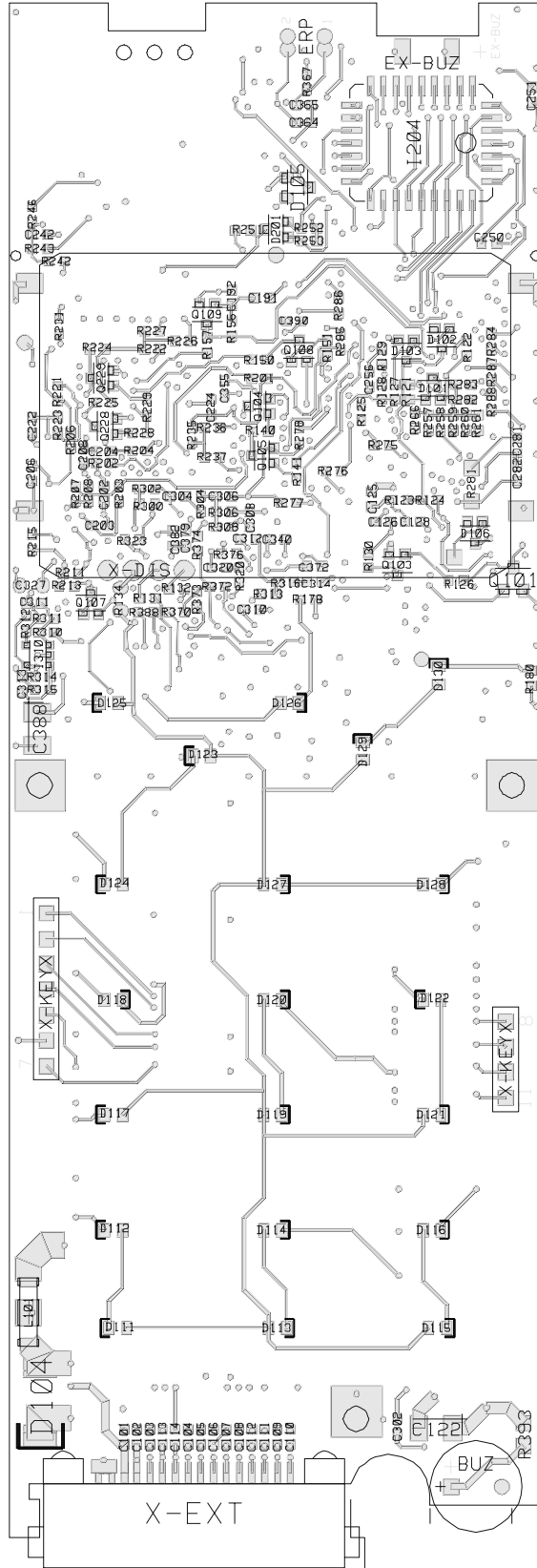
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RF0105	R114	SMD resistor	1 M 5% 0.125 W	Kamaya	
RD0102	R120	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0224	R121	SMD resistor	220 k 5% 0.125 W	Kamaya	
RF0224	R122	SMD resistor	220 k 5% 0.125 W	Kamaya	
RF0105	R123	SMD resistor	1 M 5% 0.125 W	Kamaya	
RF0223	R124	SMD resistor	22 k 5% 0.125 W	Kamaya	
RF0104	R125	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0223	R126	SMD resistor	22 k 5% 0.125 W	Kamaya	
RF0103	R127	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0473	R128	SMD resistor	47 k 5% 0.125 W	Kamaya	
RF0104	R129	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0224	R130	SMD resistor	220 k 5% 0.125 W	Kamaya	
RF0102	R131	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R132	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0101	R133	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0101	R134	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0103	R140	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R141	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R150	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R151	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0104	R156	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0392	R157	SMD resistor	3.9 k 5% 0.125 W	Kamaya	
RF0101	R164	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0472	R171	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0472	R172	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0472	R173	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0472	R174	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0472	R175	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0472	R176	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0472	R177	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0332	R178	SMD resistor	3.3 k 5% 0.125 W	Kamaya	
RF0472	R179	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0472	R180	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0104	R201	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R202	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R203	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R204	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R205	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0105	R206	SMD resistor	1 M 5% 0.125 W	Kamaya	
RF0104	R207	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0224	R208	SMD resistor	220 k 5% 0.125 W	Kamaya	
RTN154	R209	SMD NTC-resistor	150k 5% B=4100	Hokuriku	157-154-45001TP
RF1104	R211	SMD resistor	100 k 1% 0.125 W	Kamaya	
RF1224	R212	SMD resistor	220k 1% 0.125W		
RF1104	R213	SMD resistor	100 k 1% 0.125 W	Kamaya	
RF1104	R214	SMD resistor	100 k 1% 0.125 W	Kamaya	
RF1104	R215	SMD resistor	100 k 1% 0.125 W	Kamaya	
RF0105	R221	SMD resistor	1 M 5% 0.125 W	Kamaya	
RF0103	R222	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0104	R223	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0103	R224	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R225	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R226	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R227	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0104	R228	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R229	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF1712	R231	SMD resistor	7.15 k 1%	Kamaya	
RF0472	R235	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0102	R236	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0101	R237	SMD resistor	100 R 5% 0.125 W	Kamaya	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RF0104	R241	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0103	R242	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R243	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R244	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R245	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R246	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R251	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R252	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R253	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R255	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R256	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0104	R257	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R258	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R259	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R260	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R261	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R266	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R275	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R276	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R277	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R278	SMD resistor	100 k 5% 0.125 W	Kamaya	
RC0106	R281	SMD resistor	10 M 5% 0.125 W	Kamaya	
RF0103	R282	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R283	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R284	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0472	R285	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0472	R286	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0103	R287	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R288	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R300	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0222	R302	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RF0473	R304	SMD resistor	47 k 5% 0.125 W	Kamaya	
RF1105	R306	SMD resistor	1 M 1% 0.125 W	KOA	
RF1153	R308	SMD resistor	15 k 1% 0.125 W	KOA	
RF0104	R310	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF1823	R311	SMD resistor	82 k 1% 0.125 W	Kamaya	
RF0103	R312	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0683	R313	SMD resistor	68 k 5% 0.125 W	Kamaya	
RF0104	R314	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R315	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF1154	R316	SMD resistor	150 k 1% 0.125 W	KOA	
RF1333	R320	SMD resistor	33 k 1% 0.125 W	KOA	
RF1104	R322	SMD resistor	100 k 1% 0.125 W	Kamaya	
RF1105	R324	SMD resistor	1 M 1% 0.125 W	KOA	
RF0222	R326	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RF1712	R336	SMD resistor	7.15 k 1%	Kamaya	
RF0102	R358	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0104	R359	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0100	R360	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0102	R361	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R367	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF1333	R370	SMD resistor	33 k 1% 0.125 W	KOA	
RF1153	R372	SMD resistor	15 k 1% 0.125 W	KOA	
RF1105	R374	SMD resistor	1 M 1% 0.125 W	KOA	
RF0222	R376	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RF0102	R377	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R378	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0822	R380	SMD resistor	8.2 k 5% 0.125 W	Kamaya	
RF0103	R386	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R387	SMD resistor	10 k 5% 0.125 W	Kamaya	

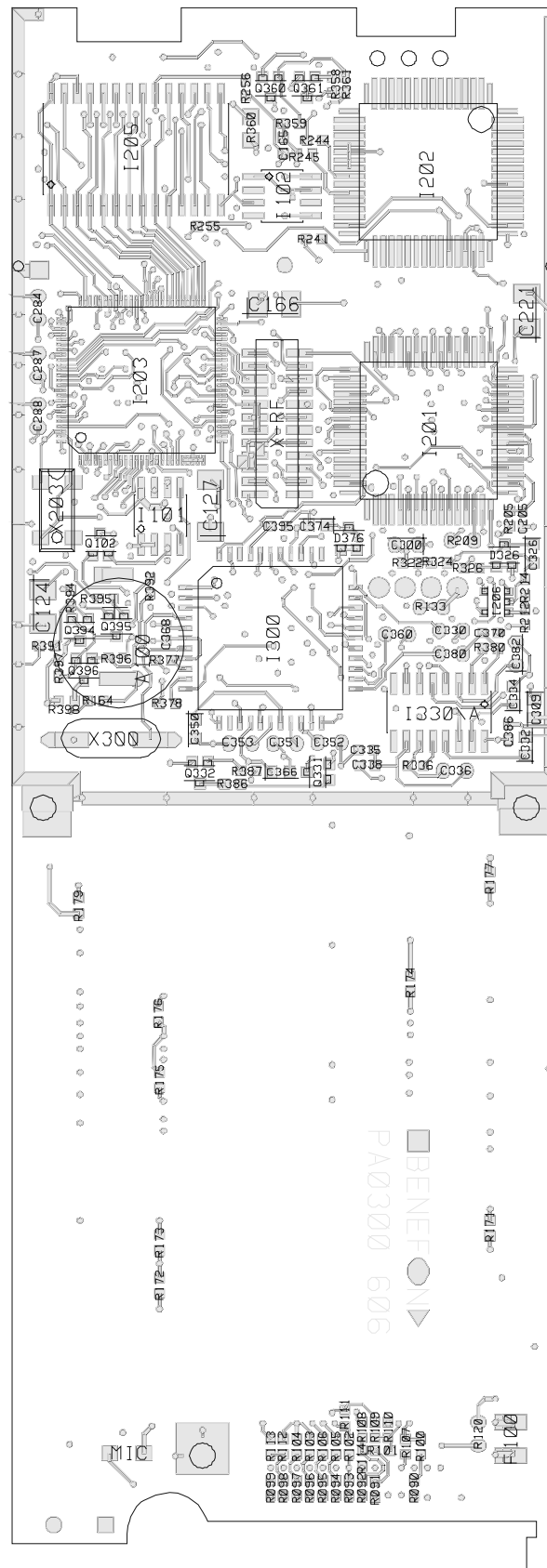
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RF1104	R388	SMD resistor	100 k 1% 0.125 W	Kamaya	
RF0104	R391	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R392	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0100	R393	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0102	R394	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R395	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R396	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0681	R397	SMD resistor	680 R 5% 0.125 W	Kamaya	
RF0101	R398	SMD resistor	100 R 5% 0.125 W	Kamaya	
NC2004	SCRL	Cross recessed screw	M2x4 SFS2976 FeZn8C2	Ruuvitalo	Pozidriv
NC2004	SCRR	Cross recessed screw	M2x4 SFS2976 FeZn8C2	Ruuvitalo	Pozidriv
OO0242	X-DIS	LCD module	LCD+PCF8578	Elcoteg	
VM0242	X-EXT	SMD system connector	1x16 pin	AMP	188227-1
AS0230	X-KEY	Keyboard	Membrane switch	ScreenTec	931578 40
VN0112	X-RF	SMD connector	2x12 pitch 1.25mm	AMP	5-176313-4
X32765	X203	SMD Crystal	32.768kHz +/-20ppm	Citizen	CM200
X11059	X300	SMD crystal	11.0592MHz	ShowaCryst	SMX-3F

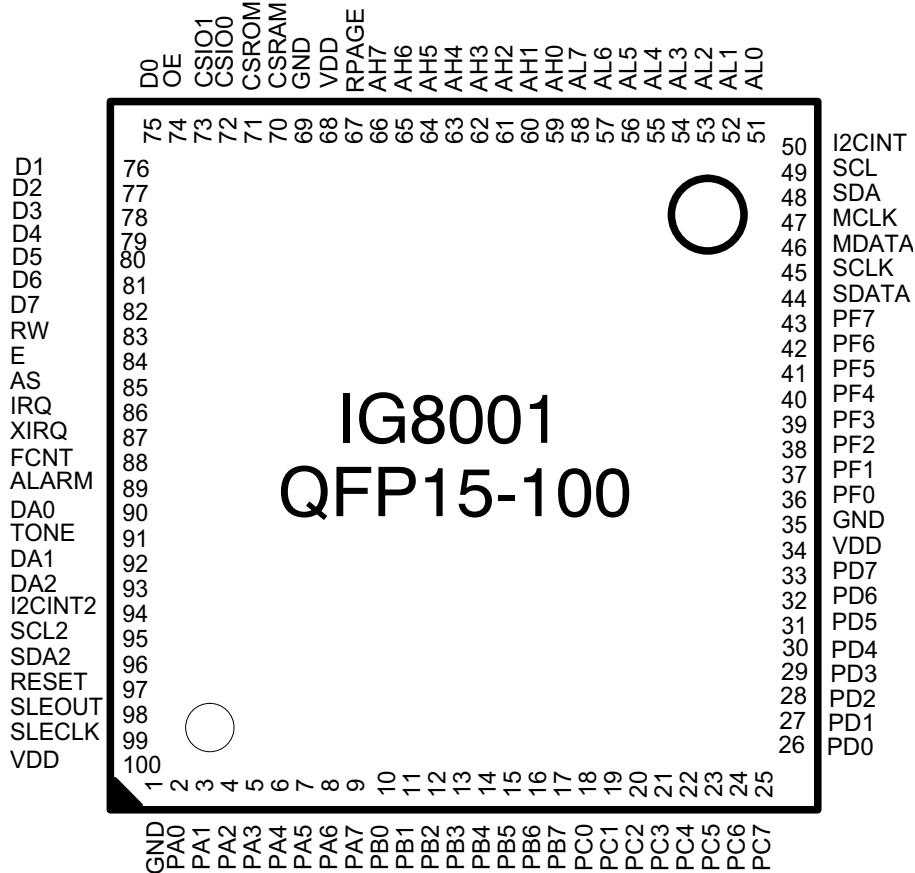
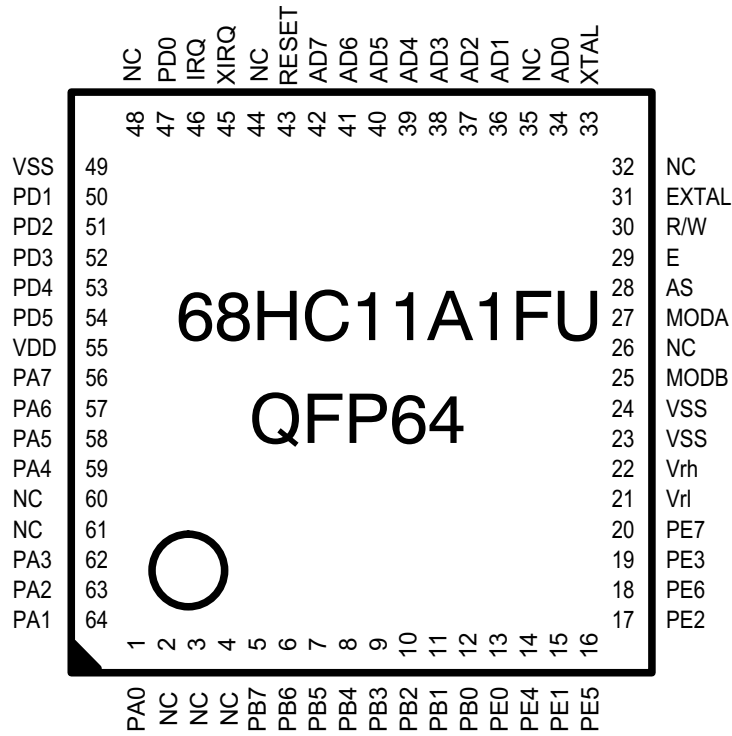
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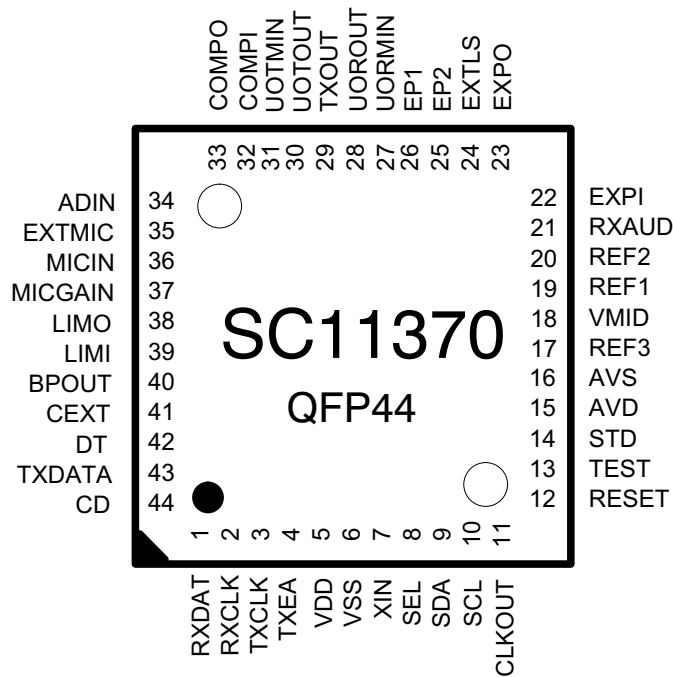
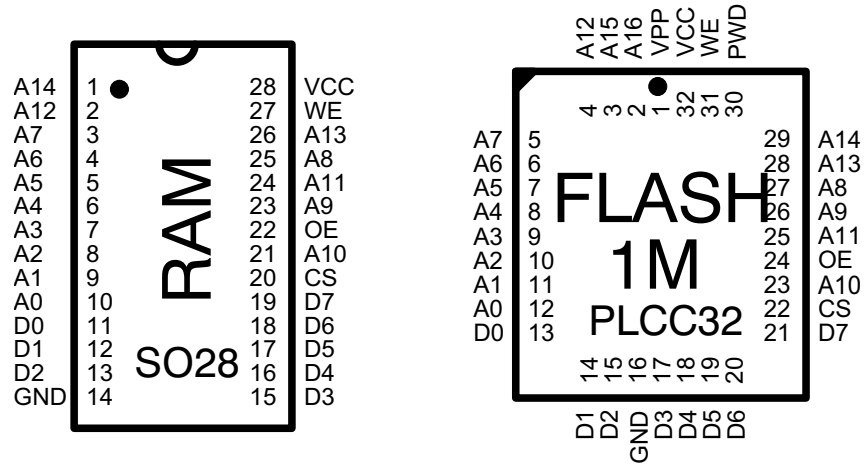
Component Side Layout PA0300A4 (Schematic OO0300A-C3)

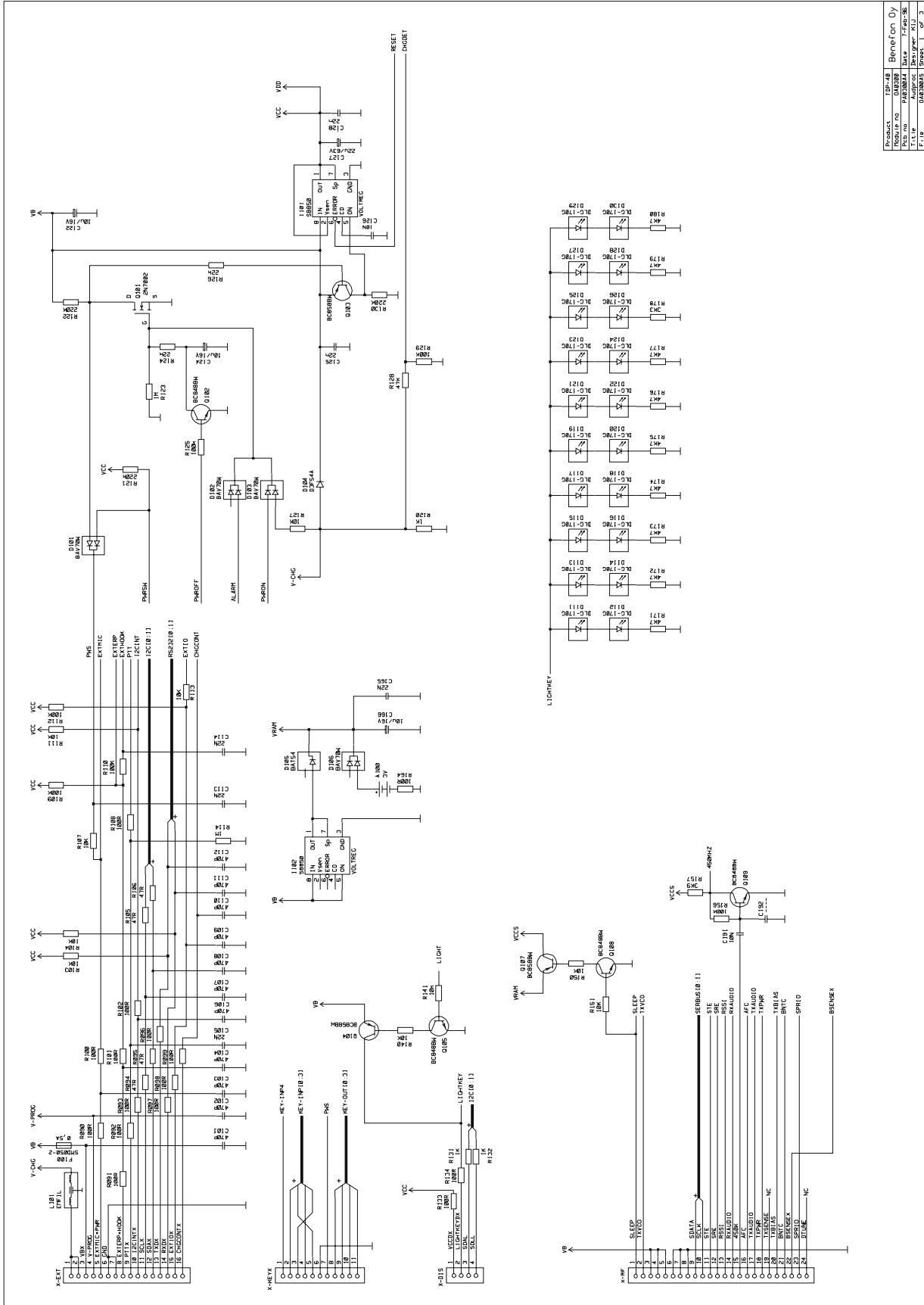


Solder Side Layout PA0300A4 (Schematic OA0300A-C3)

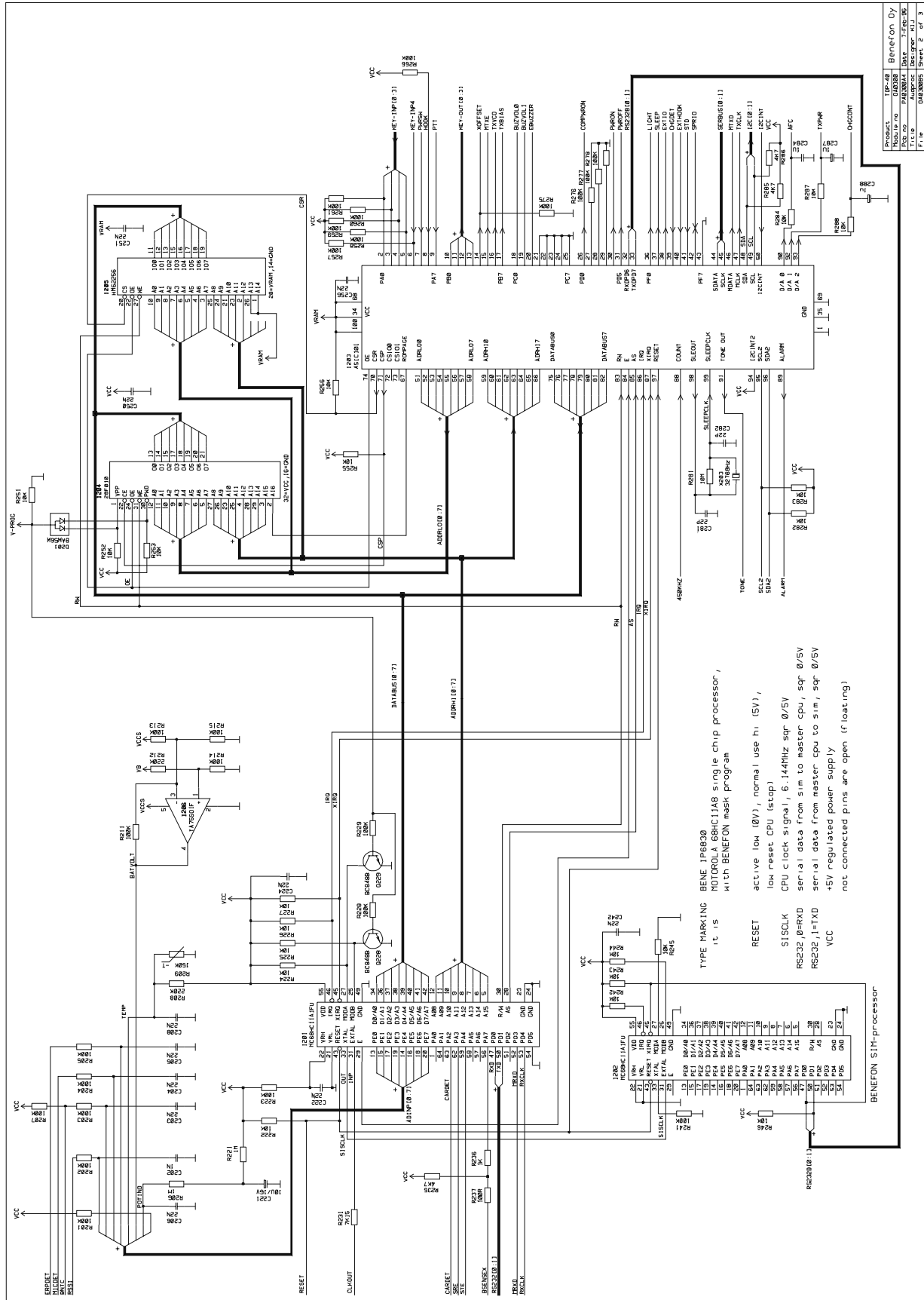




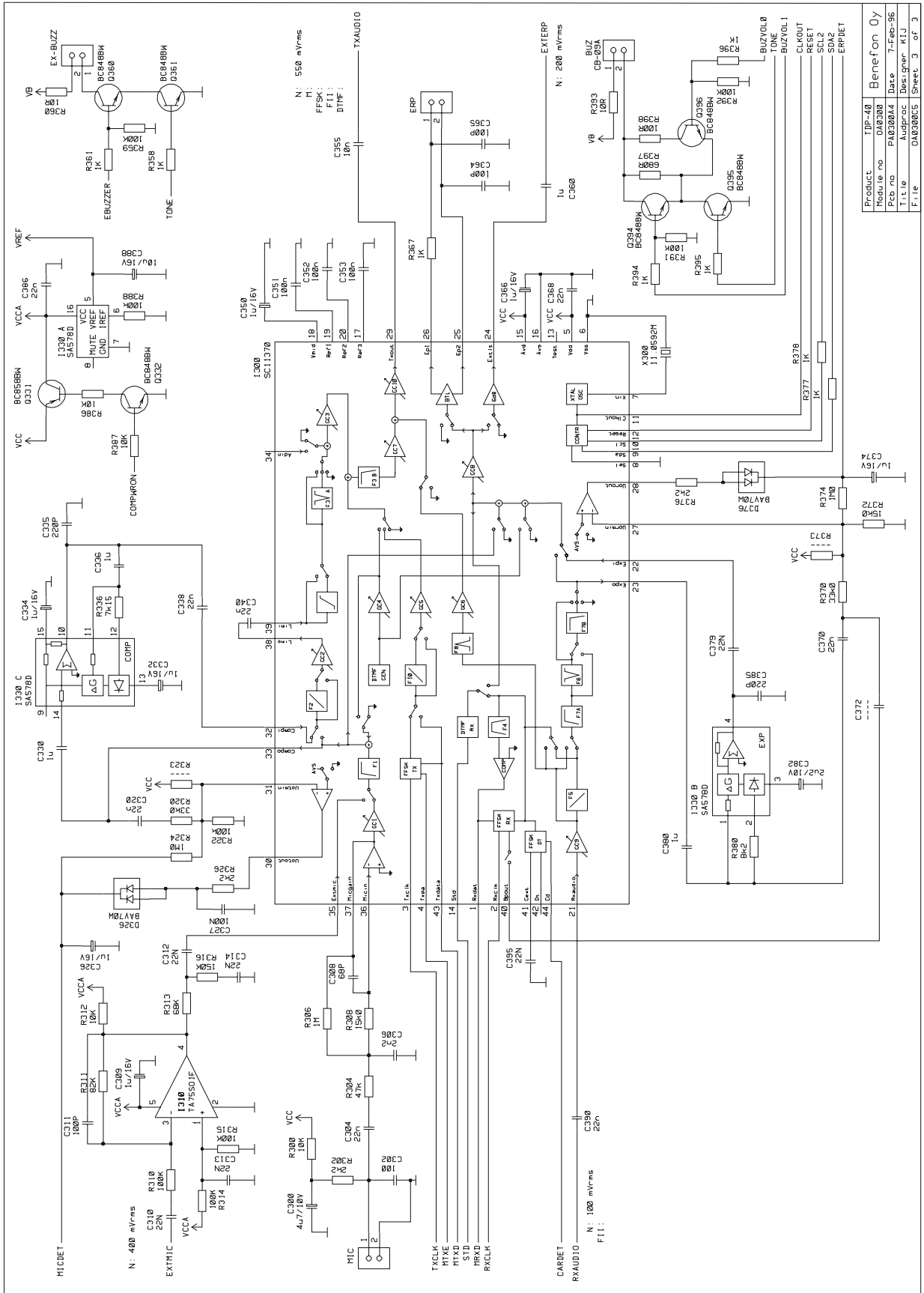




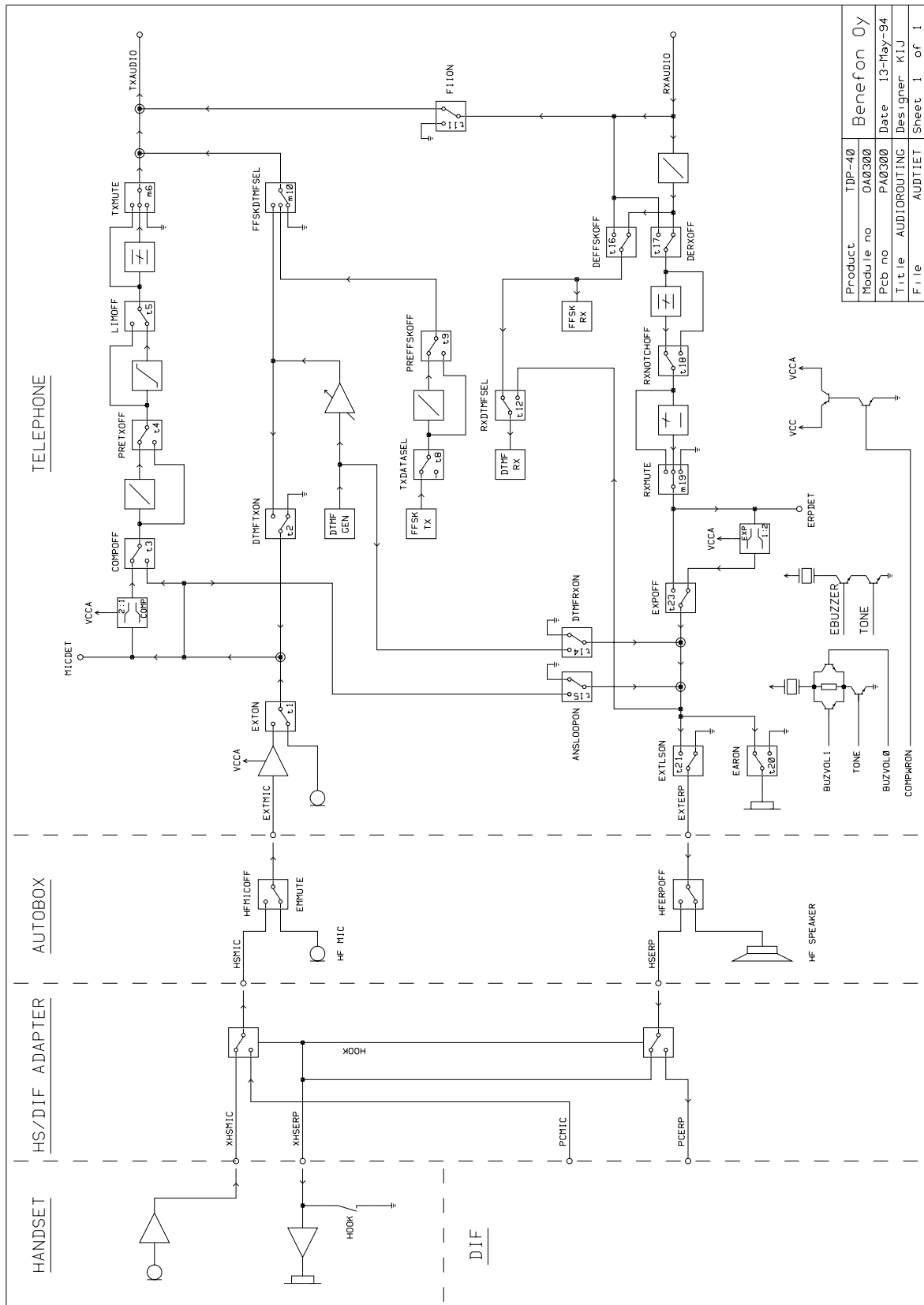
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Revision	000000	
Proj. no.	000000	
Doc. no.	000000	
File	000000	
Sheet	1	3



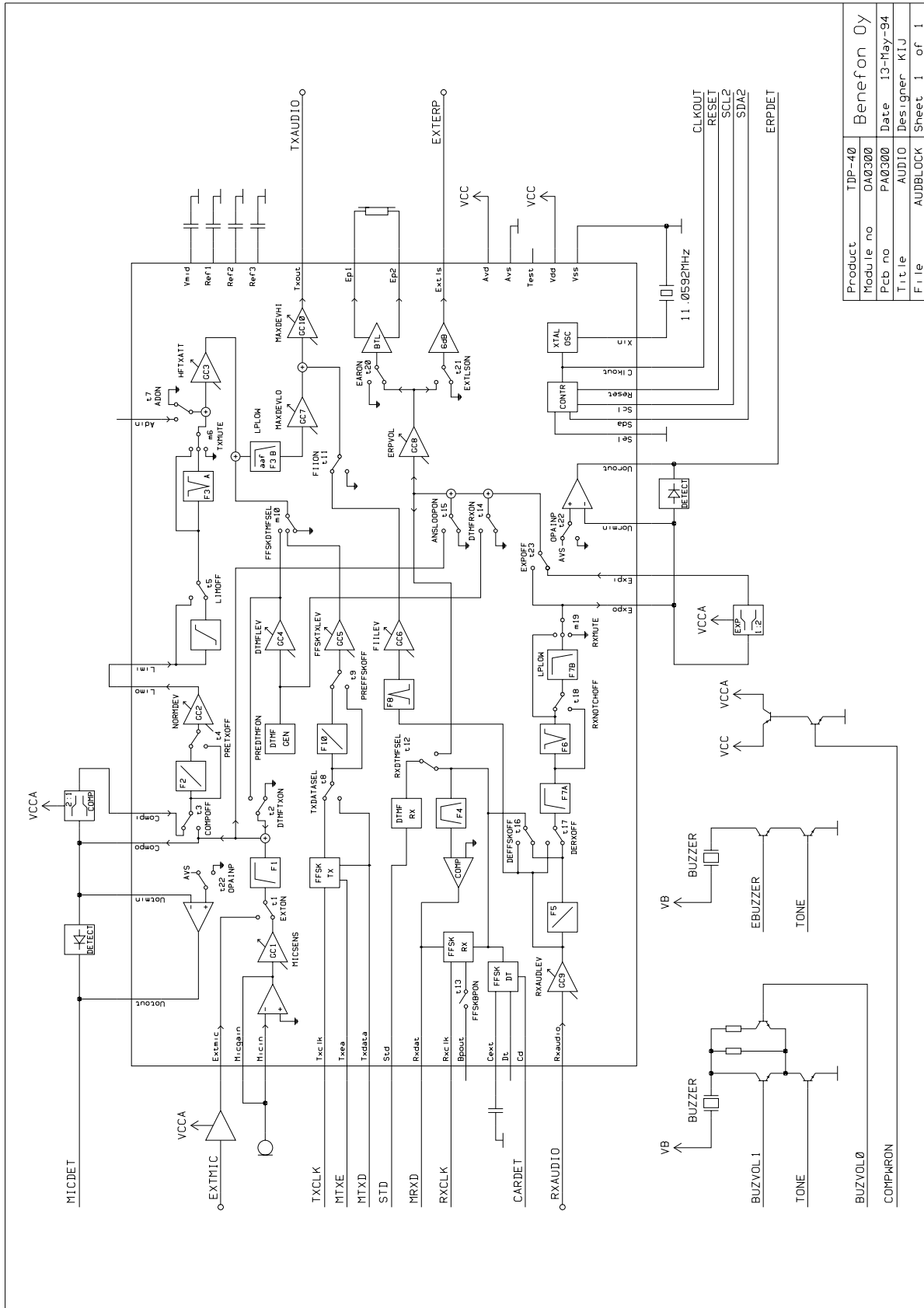
PRODUCT	TDP-40	BENEFON Oy
REV. NO.	PA0300A	DATE
FILE NO.	PA0300A	7-92-98
FILE	A0300	DATE
FILE	00A0005	SHEET 2 of 3



Product	TDP-40	Benefon Oy
Module no	OA0300	
PCB no	PA0300M4	Date
Title	Designer	WJU
File	OA0300CS	Sheet
		3



Product	TDP-40	Benefon Oy
Module no	OA0300	
Pcb no	PA0300	Date 13-May-94
Title	AUDIOROUTING	Designer KIJ
File	AUDTIET	Sheet 1 of 1



Product	TDP-40	Benefon Oy
Module no	OA0300	
Pcb no	PA0300	Date 13-May-94
Title	AUDIO	Designer K1J
File	AUDBLOCK	Sheet 1 of 1

6.3 RF MODULE

RX Synthesizer

OS0320 Synthesizer

6.3.1 General

The RX synthesizer generates an upper side injection frequency for the receiver. The injection frequency is fed to the receiver's first mixer.

Operating voltage	4.75VDC
Current consumption	15 mA
Output level to the receiver	+1 dBm
Frequency range	540,25...544,725 MHz

6.3.2 Functional Description

The RX injection frequency is generated with a phase locked loop. The VCO produces the injection frequency determined by the control voltage. After the VCO stage comes the amplifier stage Q350. After the amplifier stage, part of the signal is fed to the synthesizer circuits I302 divider. The synthesizer circuit contains a pre-divider, programmable divider, reference frequency divider, and a phase comparator.

The synthesizer circuit produces pulses at two outputs as a result of the phase-shift comparison, which are converted to current pulses by the charge pumps Q301 and Q302. The current pulses either charge or discharge the loop filter. The VCO control voltage is derived from the loop filter output.

The synthesizer 25 kHz reference frequency is made by dividing the 12.8 MHz signal from the temperature compensated oscillator (TCXO). The series-form signal which controls the channel frequency comes from the audio/processor-modules via the X-RF connector. SDATA and SCLK signals are common to both TX- and RX-synthesizers. A positive pulse in the SRE line loads the division ratio (corresponding to the channel frequency of the channel) fed to the SDATA line, to the synthesizer circuit I302.

6.3.3 Control- and Output-Signals

VRX	RX synthesizer operating voltage	4.75V
SCLK	Clock signal for the synthesizer control data	
SDATA	Synthesizer control data	
SRE	ENABLE pulse to the synthesizer	
RX-INJ	RX synthesizer output to the receiver	+1 dBm

TX-Synthesizer

6.3.4 General

The TX synthesizer generates the final modulated transmission frequency, which is fed to the transmitter.

Operating voltage	4.75VDC
Current consumption	<30 mA
Output level to the transmitter	+6 dBm
Frequency range	453.000...457.475 MHz

6.3.5 Function Description

The TX frequency is generated with a phase locked loop (PLL). The VCO produces the injection frequency determined by the control voltage, and the VCO also has a modulation input. After the VCO stage comes two amplifier stages Q450 and Q470. These ensure separation between the VCO and transmitter, and also boost the injection level sufficient. Part of the signal is fed from between the amplifier stages to the synthesizer circuit I402 pre-divider input. The synthesizer circuit contains a pre-divider, programmable divider, reference frequency divider, and a phase comparator.

The synthesizer circuit produces pulses at two outputs as a result of the phase-shift comparison, which are converted to current pulses by the charge pumps Q401 and Q402. The current pumps either charge or discharge the loop filter condensers. The VCO control voltage is derived from the loop filter output.

The synthesizer 25 kHz reference frequency is made by dividing the 12,8 MHz signal from the temperature compensated oscillator (TCXO). The series-form signal which controls the channel frequency comes from the audio/processor-modules via the X-RF connector. SDATA and SCLK signals are common to both TX- and RX-synthesizers. A positive pulse in the STE-line loads the division ratio (corresponding to the channel frequency of the channel) fed to the SDATA line, to the synthesizer circuit I401.

Modulation is fed to the TX synthesizer TX-AUDIO line. The frequency response is corrected by the components R490, R491 and C491. Modulation sensitivity is set by the resistor R492.

6.3.6 Control- and Output-Signals

VTX	TX synthesizer operating voltage (4.75V)
TXAUDIO	Transmitter audio signal
TCXO	12.8 MHz signal to the synthesizer circuit.
SCLK	Clock signal for the synthesizer control data
SDATA	Synthesizer control data
STE	ENABLE pulse to the synthesizer
TX-INJ	TX synthesizer output to the transmitter (+6 dBm)

Receiver

OS0320 Receiver

6.3.7 General

The module contains all FM-receiver functional blocks.

RF-amplifier	CF 739
1. mixer	double-balanced mixer
1. IF-amplifier	CF 739
FM IF system	SA 607 includes the following blocks: 2. mixer IF limiter quadrature detector RSSI (received signal strength indicator)

The RF signal being received is brought through the duplex filter to the amplifier stage Q101. The amplified signal is passed through the band pass filter F111 to the double-balanced mixer X 101.

The upper side injection frequency is brought from the synthesizer through a small resistive attenuator to the mixer LO pin 1 (LO = local oscillator). The 77.25 MHz intermediate frequency from the mixer output is fed through the IF-SAW filter F102 to the FM VT-circuit I101.

RX injection frequency 540,250...544,725 MHz

RF-level/impedance +1 dBm / 50 ohm

The second intermediate-frequency local-oscillator-frequency required by the FM IF-circuit is generated by multiplying the 12.8 MHz reference-oscillator frequency by six. The multiplier circuit is made with transistor Q201.

The other intermediate frequency is 450 kHz. The phase-shift required by the quadrature detector is made with the parallel-circuit L204. The detected AF-signal temperature correction is done in the buffer amplifier stage. The RX module is gets the supply voltage from the regulatorboard OQ0300.

6.3.8 Input- and Output-Signals

RF input from the duplex filter	463,000...467,475 MHz
2.LOCAL	12.8 MHz signal to the multiplier for the 2.mixer
VRX	RX module 4.75 V operating voltage from the regulator module
450 kHz	Output from 2. IF to the AFC detector
RXAUDIO	Receiver audio output 100mVrms
RSSI	Received signal strength indicator output 0,5...2V

SENSITIVITY CHECK

channel	RF input	SINAD psf.
001	-113 dBm	20 dB
180	-113 dBm	20 dB

6.3.9 RSSI-Level Adjustment

Feed a 465.225 MHz RF-signal of -58dBm to the receiver. Set the AFC ON (LOCAL 45#) and commence RSSI programming (LOCAL 38#). Wait until the display stabilises, and press the F key. Change the level to -68 dBm and press F; -93 dBm and press F; -103 dBm and press F; -115 dBm and press F; LOCAL 0#.

Transmitter

OS0320 Transmitter

6.3.10 General

Operating voltage	5,7...8,0 VDC
Current consumption	mid power max. 1.0 A low power max. 0.45 A
Input level from the synthesizer	+6 dBm
Output level to the duplex filter	mid power 33 dBm (2.0W) low power 24.7 dBm (0.3W)
Frequency range	453,000...457,475 MHz

6.3.11 Function Description

The transmitter unit comprises three amplifier stages and two attenuator stages. The pre-amplifier Q601 and power module I601 form the transmitter amplifier chain. The attenuators surrounding the pre-amplifier are included to enhance the electric separation between the TX synthesizer and the transmitter. C604 enhances power module efficiency.

The operational amplifier I620 and transistors Q620 and Q621 serve as a power regulator circuit, which adjusts the power level so that the voltage from the transmitter power detector (D640), and the control voltage TXPWR from the audio/processor unit are equal. The power-module power-control voltage must not exceed 4V.

When the phone is connected to an external voltage supply, the audio/processor unit raises the transmitter power by approx 1.0 dB using the TXPWR control.

6.3.12 Control- and Output-Signals

VBat	Transmitter operating voltage from the battery-pack (fused)	
VBTX	Power control and amplifier supply	
TXPWR	Power level control signal from the D/A converter	0...5V
TXINJ	RF signal from the TX synthesizer	+6dBm
TXDUPLEX	Transmitter output to the duplex filter	

6.3.13 Tuning

The transmitter power is set on mid-channel with a fully charged battery pack or external power supply. (U = 6.2V)

Connect a power meter to the antenna connector.

Select low power (LOCAL 31#)

Power adjustment (LOCAL 39#)

With "150" in the display, use the +/- keys to adjust power to
150 mW (21.8 dBm)

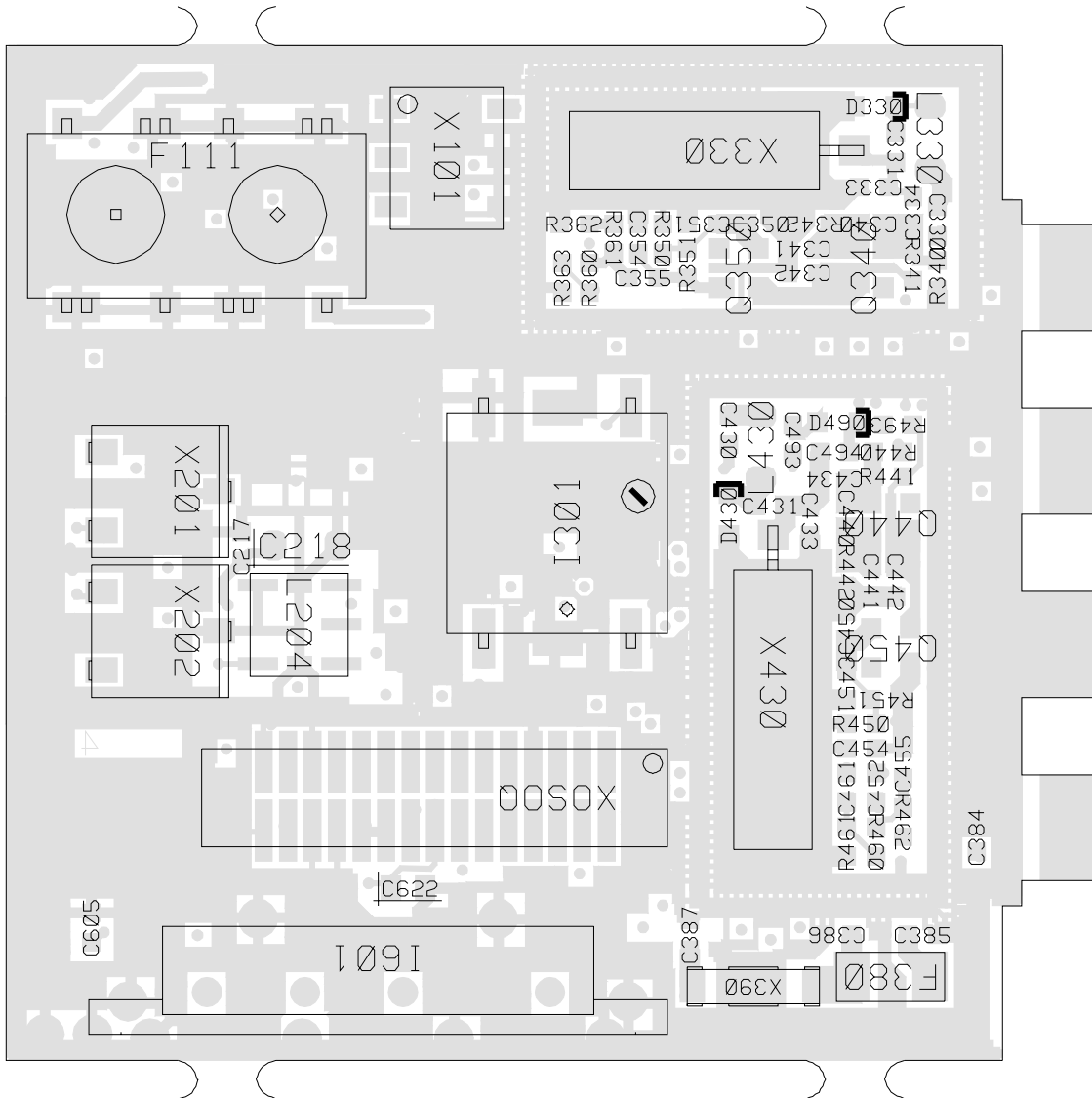
With "1.2" in the display, use the +/- keys to adjust power to
1.2 W (30.8 dBm)

Component Side Layout PS0300A1

OS0320



Solder Side Layout PS0300A1



6.3.14 Parts list

OS0320-RF

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CF0330	C101	SMD capasitor	33 pF 5% 50 V NP0	Philips	
CF0479	C102	SMD capasitor	4.7 pF/0.25pF 50 V NP0	Philips	
CF0101	C103	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0569	C104	SMD capasitor	5.6 pF/0.25pF 50 V NP0	Philips	
CF0101	C105	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0101	C106	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0229	C107	SMD capasitor	2.2pF +-0.25pF 50V NP0	Philips	
CF0101	C108	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0150	C109	SMD capasitor	15 pF 5% 50 V NP0	Philips	
CF0103	C110	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CF0101	C112	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0829	C113	SMD capasitor	8p2/0.25pF 50V NP0	Philips	
CF0101	C114	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0180	C115	SMD capasitor	18 pF 5% 50 V NP0	Philips	
CF0821	C116	SMD capasitor	820 pF 5% 50 V X7R	Philips	
CF0821	C117	SMD capasitor	820 pF 5% 50 V X7R	Philips	
CF0101	C118	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0180	C119	SMD capasitor	18 pF 5% 50 V NP0	Philips	
CF0223	C202	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0689	C203	SMD capasitor	6.8 pF/0.25pF 50 V NP0	Philips	
CF0223	C204	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C205	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C206	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C207	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0100	C208	SMD capasitor	10 pF/0.25pF 50 V NP0	Philips	
CF0223	C209	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0101	C211	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0150	C212	SMD capasitor	15 pF 5% 50 V NP0	Philips	
CF0103	C213	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CF0102	C214	SMD capasitor	1 nF 5 % NP0	Philips	
CF0150	C215	SMD capasitor	15 pF 5% 50 V NP0	Philips	
CF0479	C216	SMD capasitor	4.7 pF/0.25pF 50 V NP0	Philips	
CF0102	C217	SMD capasitor	1 nF 5 % NP0	Philips	
CU3475	C218	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CU1105	C219	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0223	C220	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0331	C231	SMD capasitor	330 pF 5% 50 V NP0	Philips	
CF0103	C232	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CF0103	C233	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CF0103	C240	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CF0103	C241	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CU1105	C300	SMD tantal	1uF/16V	AVX	TAJR105M016R
CU1105	C301	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0103	C302	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CF0101	C303	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CU1105	C305	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0102	C306	SMD capasitor	1 nF 5 % NP0	Philips	
CF0101	C307	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0101	C308	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0101	C309	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0102	C310	SMD capasitor	1 nF 5 % NP0	Philips	
CD0104	C320	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CU1105	C321	SMD tantal	1uF/16V	AVX	TAJR105M016R
CC0103	C322	SMD capasitor	10 nF 10% 50V X7R	Philips	
CC0223	C323	SMD capasitor	22 nF 10% 50 V X7R	Philips	

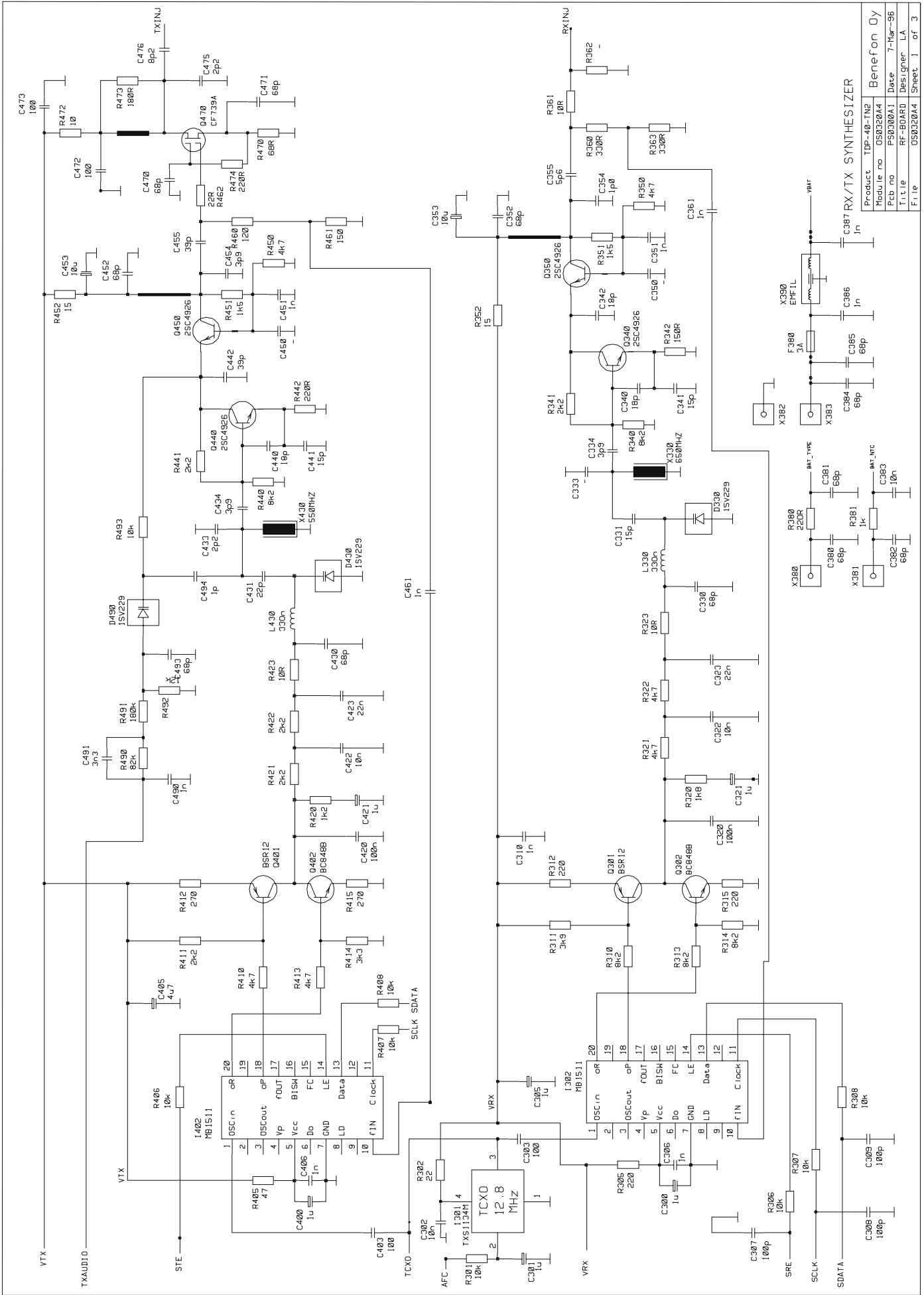
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CD0473	C326	SMD capasitor	47 nF 10% 50 V X7R	Philips	
CF0680	C330	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0150	C331	SMD capasitor	15 pF 5% 50 V NP0	Philips	
CF0399	C334	SMD capasitor	3.9pF 0.25 50V NP0	Philips	
CF0180	C340	SMD capasitor	18 pF 5% 50 V NPO	Philips	
CF0150	C341	SMD capasitor	15 pF 5% 50 V NP0	Philips	
CF0180	C342	SMD capasitor	18 pF 5% 50 V NPO	Philips	
CF0102	C351	SMD capasitor	1 nF 5 % NP0	Philips	
CF0680	C352	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CU1106	C353	SMD tantal	10uF/16V	AVX	TAJB106M016R
CF0109	C354	SMD capasitor	1 pF/0.25pF 50 V NP0	Philips	
CF0569	C355	SMD capasitor	5.6 pF/0.25pF 50 V NP0	Philips	
CF0102	C361	SMD capasitor	1 nF 5 % NP0	Philips	
CF0680	C380	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0680	C381	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0680	C382	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0103	C383	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CF0680	C384	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0680	C385	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0102	C386	SMD capasitor	1 nF 5 % NP0	Philips	
CF0102	C387	SMD capasitor	1 nF 5 % NP0	Philips	
CU1105	C400	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0101	C403	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CU3475	C405	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CF0102	C406	SMD capasitor	1 nF 5 % NP0	Philips	
CD0104	C420	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CU1105	C421	SMD tantal	1uF/16V	AVX	TAJR105M016R
CC0103	C422	SMD capasitor	10 nF 10% 50V X7R	Philips	
CC0223	C423	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0680	C430	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0220	C431	SMD capasitor	22 pF 5% 50 V NP0	Philips	
CF0229	C433	SMD capasitor	2.2pF +-0.25pF 50V NPO	Philips	
CF0399	C434	SMD capasitor	3.9pF 0.25 50V NP0	Philips	
CF0180	C440	SMD capasitor	18 pF 5% 50 V NPO	Philips	
CF0150	C441	SMD capasitor	15 pF 5% 50 V NP0	Philips	
CF0390	C442	SMD capasitor	39pF 5% 50V NP0	Philips	
CF0102	C451	SMD capasitor	1 nF 5 % NP0	Philips	
CF0680	C452	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CU1106	C453	SMD tantal	10uF/16V	AVX	TAJB106M016R
CF0399	C454	SMD capasitor	3.9pF 0.25 50V NP0	Philips	
CF0390	C455	SMD capasitor	39pF 5% 50V NP0	Philips	
CF0102	C461	SMD capasitor	1 nF 5 % NP0	Philips	
CF0680	C470	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0680	C471	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0101	C472	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0101	C473	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0229	C475	SMD capasitor	2.2pF +-0.25pF 50V NPO	Philips	
CF0829	C476	SMD capasitor	8p2/0.25pF 50V NP0	Philips	
CF0102	C490	SMD capasitor	1 nF 5 % NP0	Philips	
CF0332	C491	SMD capasitor	3.3 nF 5% 50 V NP0	Philips	
CF0680	C493	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF2109	C494	SMD capasitor	1pF +-0.1pF 50V NPO	AVX/Kyocer	06031J1R0BAW
CF0101	C601	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0101	C602	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0569	C603	SMD capasitor	5.6 pF/0.25pF 50 V NP0	Philips	
CF0229	C604	SMD capasitor	2.2pF +-0.25pF 50V NPO	Philips	
CF0103	C620	SMD capasitor	10 nF 10% 50 V X7R	Philips	
CF0332	C621	SMD capasitor	3.3 nF 5% 50 V NP0	Philips	
CU1105	C622	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0102	C624	SMD capasitor	1 nF 5 % NP0	Philips	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CF0102	C635	SMD capasitor	1 nF 5 % NP0	Philips	
CU3475	C636	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CF0101	C640	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0101	C641	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CF0101	C642	SMD capasitor	100 pF 5% 50 V NP0	Philips	
DC0229	D330	SMD silicon tuning diode	1V/19pF...4V/11pF	Toshiba	1SV229
DC0229	D430	SMD silicon tuning diode	1V/19pF...4V/11pF	Toshiba	1SV229
DC0229	D490	SMD silicon tuning diode	1V/19pF...4V/11pF	Toshiba	1SV229
DP3880	D601	SMD pin diode		HP	HSMP-3880-L31
DY0071	D640	SMD shottky diode	70V 15mA	SGS-Thomso	BAS 70-04
DY0071	D641	SMD shottky diode	70V 15mA	SGS-Thomso	BAS 70-04
XW7725	F102	SAW IF-filter	77.25MHZ, I/O 1.6K//2.3pF	Murata	SAFC77.250MA53X
LH1465	F111	SMD H-filt.MY,HU,SK,CZ,	NORD.MOSK. 465MHz	Neosid	SM-H80056 1522
AF1103	F380	SMD fuse	3.5A nanofuce	Littelfuse	R271 03.5
IV6070	I101	FM IF-system		Philips	SA607DK
XO3128	I301	SMD VCTCXO	12.8 MHZ	TEW	TXS 1144M
IS1511	I302	PLL freg.synthesiz		Fujitsu	MB1511
IS1511	I402	PLL freg.synthesiz		Fujitsu	MB1511
IW8710	I601	RF-power amplifier	430-460 MHz	Mitsubishi	M68710H
IA7550	I620\	Single op.amp.		Toshiba	TA 75S01F-TE85L
LC2334	L111	SMD inductor	330 nH/+10%	TDK	MLF2012DR33KT
LC2334	L201	SMD inductor	330 nH/+10%	TDK	MLF2012DR33KT
LC2224	L202	SMD inductor	220 nH/+10%	TDK	MLF2012DR22KT
LC2104	L203	SMD inductor	100 nH/+10%	TDK	MLF2012DR10KT
LI1687	L204	SMD Quad. coil	680uH/180pF 455kHz	Toko	303LC-1150
LC2334	L211	SMD inductor	330 nH/+10%	TDK	MLF2012DR33KT
LC0334	L330	SMD inductor	330 nH	Siemens	B82412A3331M
LC0334	L430	SMD inductor	330 nH	Siemens	B82412A3331M
MD0311	P101	Shield plate for IF		Telemetall	931605 40
MD0301	P102	IF-shield plate 2		Telemetall	931606 40
MD0303	P330	Shield case for Rx/VCO		Telemetall	931585 41
MD0304	P430	Shield case for Tx/VCO		Telemetall	931586 41
ME1008	P601	Casting body		Jysk,,nmeta	931534 10
MD0306	P602	Tx-fastening plate		Telemetall	931584 41
NC2005	P603	Cross recessed screw	M2x5 SFS2977 DIN9652	Ruuvitalo	Pozidriv
NC2005	P604	Cross recessed screw	M2x5 SFS2977 DIN9652	Ruuvitalo	Pozidriv
MD0305	P605	Shield plate for Tx		Telemetall	931583 41
QFB739	Q101	GaAs MES FET	2 GHz 240mW N1.8dB/1.75GHz	Siemens	CF 739 B
QFB739	Q102	GaAs MES FET	2 GHz 240mW N1.8dB/1.75GHz	Siemens	CF 739 B
QAA193	Q201	SMD RF-transistor	6GHz/300mW F=1.9dB	Philips	BF93AW
QS0012	Q301	SMD-low-power switc.tra.	PNP 15V/250mW	Philips	BSR12-215
QS0848	Q302	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QA4926	Q340	SMD NPN RF-transistor	G=16.5dB/900MHz NF=1.1	Hitachi	2SC4926YD-TL
QA4926	Q350	SMD NPN RF-transistor	G=16.5dB/900MHz NF=1.1	Hitachi	2SC4926YD-TL
QS0012	Q401	SMD-low-power switc.tra.	PNP 15V/250mW	Philips	BSR12-215
QS0848	Q402	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QA4926	Q440	SMD NPN RF-transistor	G=16.5dB/900MHz NF=1.1	Hitachi	2SC4926YD-TL
QA4926	Q450	SMD NPN RF-transistor	G=16.5dB/900MHz NF=1.1	Hitachi	2SC4926YD-TL
QFA739	Q470	GaAs MES FET	2 GHz 240mW N1.8dB/1.75GHz	Siemens	CF 739 A
QA3606	Q601	SMD RF-transistor	NPN 7GHz NF=1.1dB	Toshiba	2SC3606
QS0848	Q620	SMD transistor	NPN 0.1A/30V hFE 110-800	Philips	BC848BW, 115
QS0858	Q621	SMD transistor	PNP 0.1A/30V hFE 125-800	Philips	BC858BW
RF0100	R103	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0471	R104	SMD resistor	470 R 5% 0.125 W	Kamaya	
RF0102	R106	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0101	R107	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0471	R109	SMD resistor	470 R 5% 0.125 W	Kamaya	
RF0471	R111	SMD resistor	470 R 5% 0.125 W	Kamaya	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RF0100	R112	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0472	R115	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0220	R116	SMD resistor	22 R 5% 0.125 W	Kamaya	
RF0271	R117	SMD resistor	270 R 5% 0.125 W	Kamaya	
RF0102	R119	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0100	R120	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0100	R121	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0102	R122	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0472	R201	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0102	R202	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0242	R203	SMD resistor	2.4 k 5% 0.125 W	Kamaya	
RF0333	R205	SMD resistor	33 k 5% 0.125 W	Kamaya	
RF0103	R206	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0393	R207	SMD resistor	39 k 5% 0.125 W	Kamaya	
RF0102	R208	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0683	R211	SMD resistor	68 k 5% 0.125 W	Kamaya	
RF0102	R212	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0683	R213	SMD resistor	68 k 5% 0.125 W	Kamaya	
RTN223	R214	SMD-NTC resistor	22k 10% B=3924	Hokuriku	157-223-45001TP
RF0332	R215	SMD resistor	3.3 k 5% 0.125 W	Kamaya	
RF0473	R221	SMD resistor	47 k 5% 0.125 W	Kamaya	
RF0822	R222	SMD resistor	8.2 k 5% 0.125 W	Kamaya	
RF0100	R223	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0220	R224	SMD resistor	22 R 5% 0.125 W	Kamaya	
RF0103	R301	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0220	R302	SMD resistor	22 R 5% 0.125 W	Kamaya	
RF0221	R305	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0103	R306	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R307	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R308	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0822	R310	SMD resistor	8.2 k 5% 0.125 W	Kamaya	
RF0392	R311	SMD resistor	3.9 k 5% 0.125 W	Kamaya	
RF0221	R312	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0822	R313	SMD resistor	8.2 k 5% 0.125 W	Kamaya	
RF0822	R314	SMD resistor	8.2 k 5% 0.125 W	Kamaya	
RF0221	R315	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0182	R320	SMD resistor	1.8 k 5% 0.125 W	Kamaya	
RF0472	R321	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0472	R322	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0100	R323	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0822	R340	SMD resistor	8.2 k 5% 0.125 W	Kamaya	
RF0222	R341	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RF0151	R342	SMD resistor	150 R 5% 0.125 W	Kamaya	
RF0472	R350	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0152	R351	SMD resistor	1.5 k 5% 0.125 W	Kamaya	
RF0150	R352	SMD resistor	15 R 5% 0.125 W	Kamaya	
RF0331	R360	SMD resistor	330 R 5% 0.125 W	Kamaya	
RF0100	R361	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0331	R363	SMD resistor	330 R 5% 0.125 W	Kamaya	
RF0221	R380	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0102	R381	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0470	R405	SMD resistor	47 R 5% 0.125 W	Kamaya	
RF0103	R406	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R407	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R408	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0472	R410	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0222	R411	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RF0271	R412	SMD resistor	270 R 5% 0.125 W	Kamaya	
RF0472	R413	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0332	R414	SMD resistor	3.3 k 5% 0.125 W	Kamaya	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RF0271	R415	SMD resistor	270 R 5% 0.125 W	Kamaya	
RF0122	R420	SMD resistor	1.2 k 5% 0.125 W	Kamaya	
RF0222	R421	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RF0222	R422	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RF0100	R423	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0822	R440	SMD resistor	8.2 k 5% 0.125 W	Kamaya	
RF0222	R441	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RF0221	R442	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0472	R450	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0152	R451	SMD resistor	1.5 k 5% 0.125 W	Kamaya	
RF0150	R452	SMD resistor	15 R 5% 0.125 W	Kamaya	
RF0121	R460	SMD resistor	120 R 5% 0.125 W	Kamaya	
RF0151	R461	SMD resistor	150 R 5% 0.125 W	Kamaya	
RF0220	R462	SMD resistor	22 R 5% 0.125 W	Kamaya	
RF0680	R470	SMD resistor	68 R 5% 0.125 W	Kamaya	
RF0100	R472	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0181	R473	SMD resistor	180 R 5% 0.125 W	Kamaya	
RF0221	R474	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0823	R490	SMD resistor	82 k 5% 0.125 W	Kamaya	
RF0184	R491	SMD resistor	180 k 5% 0.125 W	Kamaya	
RF0123	R492	SMD resistor	12 k 5% 0.125 W	Kamaya	
RF0103	R493	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0100	R601	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0470	R603	SMD resistor	47 R 5% 0.125 W	Kamaya	
RF0102	R604	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0392	R605	SMD resistor	3.9 k 5% 0.125 W	Kamaya	
RF0391	R606	SMD resistor	390 R 5% 0.125 W	Kamaya	
RF0100	R607	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0391	R608	SMD resistor	390 R 5% 0.125 W	Kamaya	
RF0104	R620	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0102	R621	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0152	R622	SMD resistor	1.5 k 5% 0.125 W	Kamaya	
RF0471	R623	SMD resistor	470 R 5% 0.125 W	Kamaya	
RF0184	R640	SMD resistor	180 k 5% 0.125 W	Kamaya	
RF0103	R641	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R642	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0104	R643	SMD resistor	100 k 5% 0.125 W	Kamaya	
XM0006	X101	Dual balanced mixer	450 MHz	MiniCircui	RMS-1LL
XC3450	X201	Ceramic IF-filter	450Khz	Murata	CFUCG450E
XC4450	X202	Ceramic IF-filter	450kHz	Murata	CFUCG450F
XR1650	X330	Ceramic coaxial resonato	650MHz 4x4x13mm Q>250	Siemens	B69610-G6506-A41
MD0309	X380	Contactplate		Telemetall	941770 40
MD0309	X381	Contactplate		Telemetall	941770 40
MD0309	X382	Contactplate		Telemetall	941770 40
MD0309	X383	Contactplate		Telemetall	941770 40
LF0061	X390	SMD EMI suppression filt	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472
XR1550	X430	Ceramic coaxial resonato	550MHz 4x4x14,5mm Q>250	Siemens	B69610-G5506-A41
OD0320	X600	Duplexer Nord.	Rx465,Tx455MHz	Solitra	NBS4401
XI0005	X601	Directional coupler	NMT450	MKT Taisei	DCS3120-09
VN0008	XOSOQ	Katso VN0115	Katso VN0115		Katso VN0115

Last
update
29.08.96

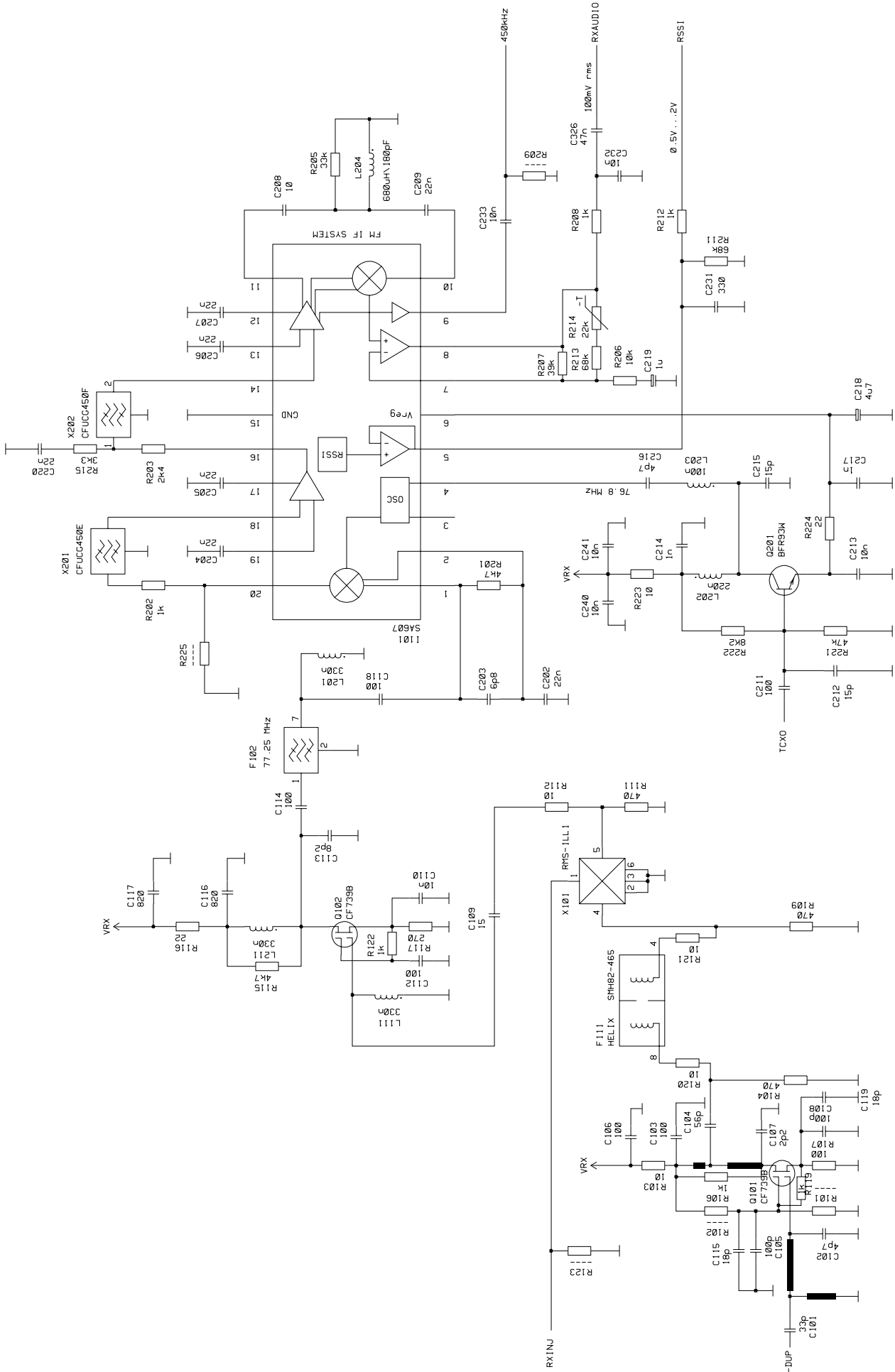


Product	TDP-40-TN2
Module no	050320A4
Pcb no	P50300A1
Title	RF-BOARD
Designer	LA
File	050320A4
Sheet	1 of 3

Benefon Oy

7-Mar-96

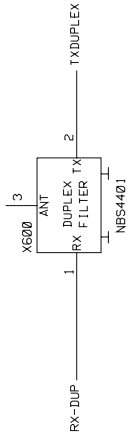
RF-RX/TX SYNTHESIZER



Product	TDP-40-TN2	Benefon Oy
Module no	050320B5	
Pcb no	PS0300A1	Date 29-Aug-96
Title	RF-BOARD	Designer JFS
File	050320B5	Sheet 2 of 3

X0500

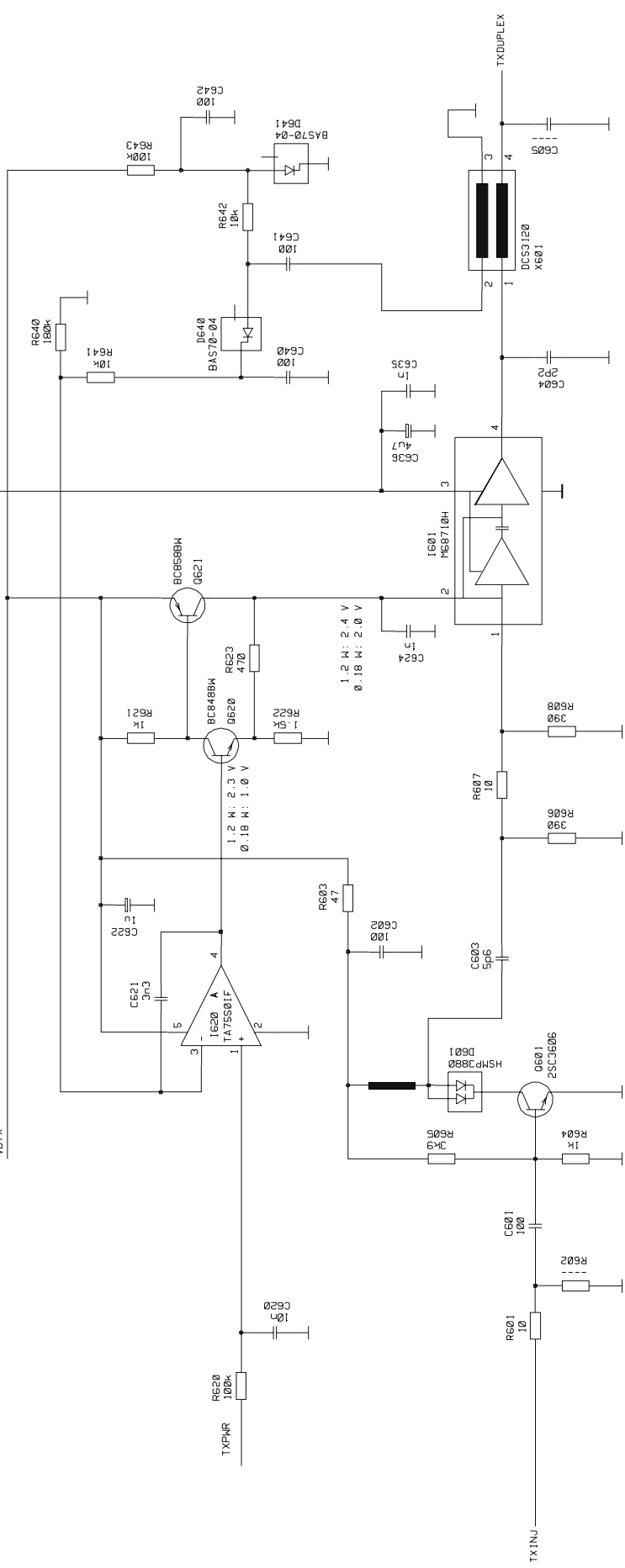
- 1 TXAUDIO
- 2 BAT-NIC
- 3 BAT-TYPE
- 4 GND
- 5 STE
- 6 SDATA
- 7 SCL_A
- 8 SCL_K
- 9 YFX
- 10 AFC
- 11 RSST1
- 12 RXAUDIO
- 13 GND
- 14 4500KHZ
- 15 GND
- 16 GND
- 17 GND
- 18 GND
- 19 GND
- 20 GND
- 21 GND
- 22 TXPMR
- 23 YBTX
- 24 GND
- 25 YBAT
- 26 YBAT
- 27 YBAT
- 28 YTX
- 29 GND
- 30 GND



VBAT

VBTX

4.7 V



Product	TDP-40-TN2	Benefon Oy
Module no	050320C4	
Pcb no	P50300A1	Date
Title	RF-BOARD	Designer
File	050320C4_1	Sheet
		3
		of
		3

Regulator

6.3.15 Parts list of Regulator

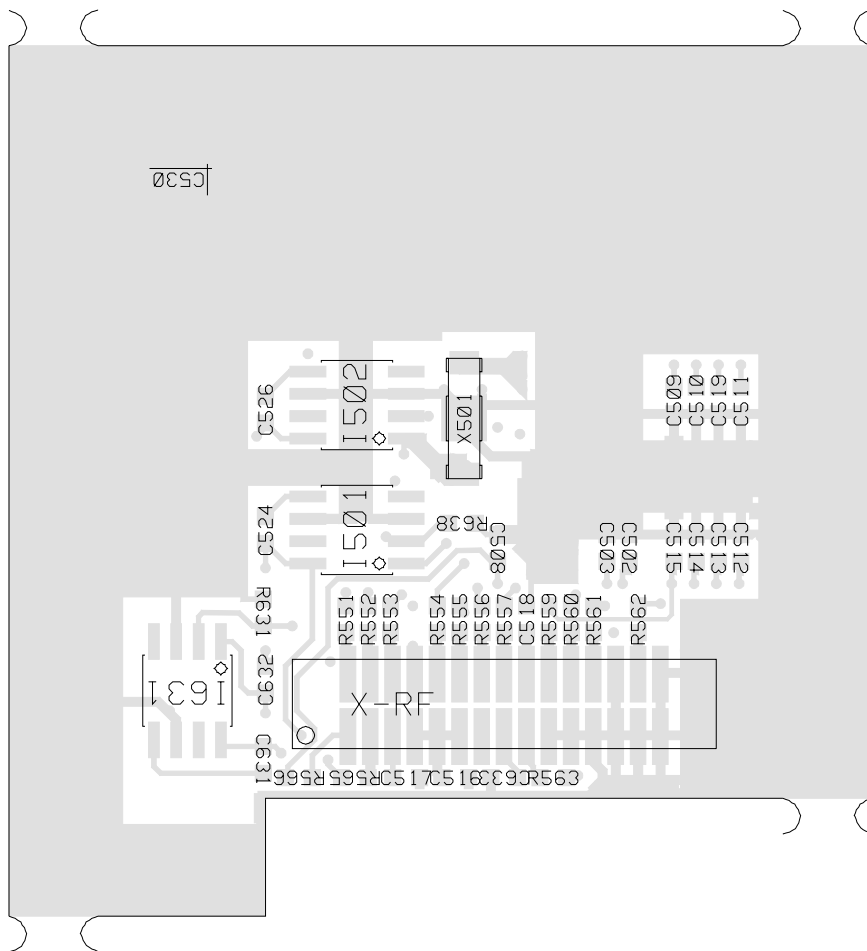
OQ0300 Regulator

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CF0102	C501	SMD capasitor	1 nF 5 % NP0	Philips	
CF0102	C502	SMD capasitor	1 nF 5 % NP0	Philips	
CF0102	C503	SMD capasitor	1 nF 5 % NP0	Philips	
CD0104	C504	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CF0102	C505	SMD capasitor	1 nF 5 % NP0	Philips	
CF0680	C506	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0102	C507	SMD capasitor	1 nF 5 % NP0	Philips	
CF0102	C508	SMD capasitor	1 nF 5 % NP0	Philips	
CF0221	C509	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CF0221	C510	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CF0221	C511	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CF0221	C512	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CF0221	C513	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CF0102	C515	SMD capasitor	1 nF 5 % NP0	Philips	
CF0102	C516	SMD capasitor	1 nF 5 % NP0	Philips	
CF0102	C517	SMD capasitor	1 nF 5 % NP0	Philips	
CF0102	C518	SMD capasitor	1 nF 5 % NP0	Philips	
CF0221	C519	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CU3475	C523	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CF0102	C524	SMD capasitor	1 nF 5 % NP0	Philips	
CU3475	C525	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CF0102	C526	SMD capasitor	1 nF 5 % NP0	Philips	
CU3475	C527	SMD tantal	4.7uF/10V 20%	AVX	TAJA475M010R
CU1105	C530	SMD tantal	1uF/16V	AVX	TAJR105M016R
CF0102	C631	SMD capasitor	1 nF 5 % NP0	Philips	
CF0102	C632	SMD capasitor	1 nF 5 % NP0	Philips	
CF0102	C633	SMD capasitor	1 nF 5 % NP0	Philips	
MG1104	CASE5	RF-contact strip	2.0x4.1x610mm	Instr.Spec	0097-T551-02
IR1547	I501	Voltage regulator	4.75V/ 180mA	Toko	TK 11547 MTL
IR1547	I502	Voltage regulator	4.75V/ 180mA	Toko	TK 11547 MTL
IR1547	I631	Voltage regulator	4.75V/ 180mA	Toko	TK 11547 MTL
MC1399	INSUL	Insulator foil		Sreenhouse	941785 40
LC0105	L501	SMD inductor	1.0 uH	Siemens	B82412-A1102-M
PQ0300	PCB	Tavi PCB-reg./conn.	??		
RF0102	R501	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R502	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0221	R503	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0102	R504	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R505	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R506	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R507	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R508	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R509	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0100	R510	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0102	R511	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R512	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R513	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R514	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R515	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R516	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R551	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R552	SMD resistor	1 k 5% 0.125 W	Kamaya	

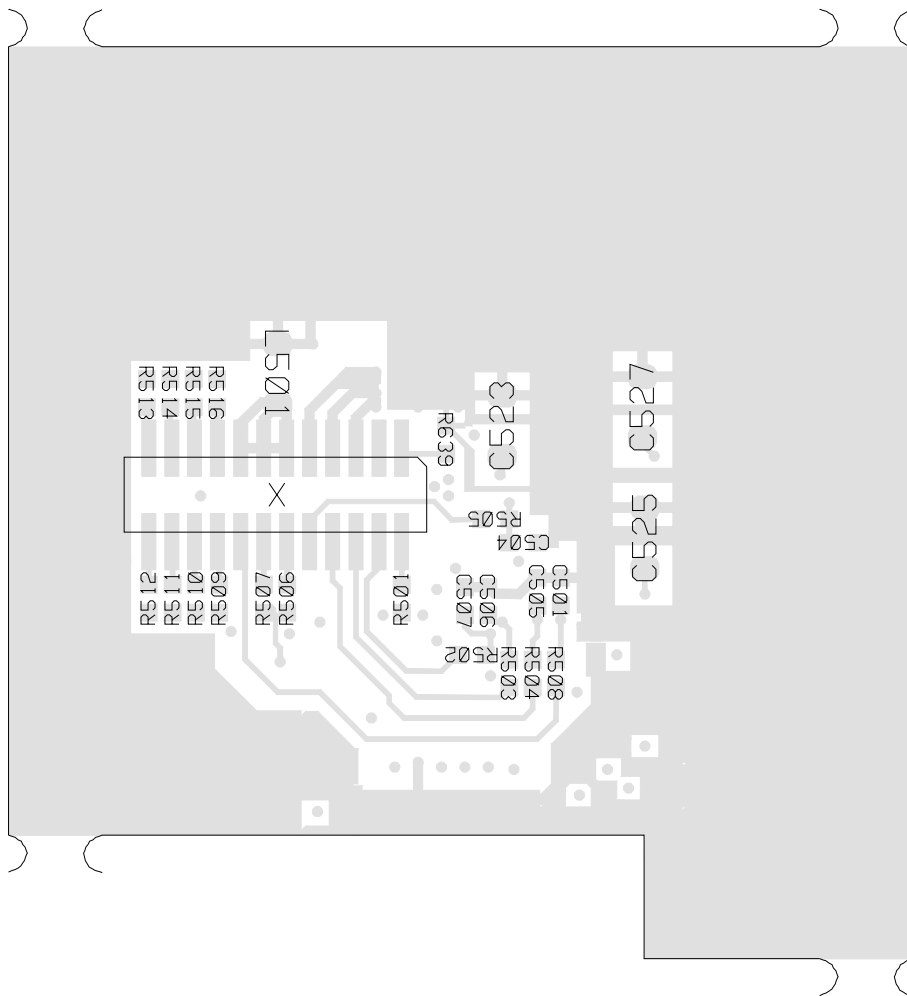
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RF0221	R553	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0102	R554	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R555	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R556	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R557	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R559	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R560	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R561	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0100	R562	SMD resistor	10 R 5% 0.125 W	Kamaya	
RF0102	R563	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R565	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0102	R566	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0104	R631	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R638	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R639	SMD resistor	100 k 5% 0.125 W	Kamaya	
VM0112	X	SMD connector	2x12 male	AMP	5-175643-4
VM0018	X-RF	SMD B/B-connector	2x15 vertical male	SuyinConne	12753A-30G
LF0061	X501	SMD EMI suppression filt	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472

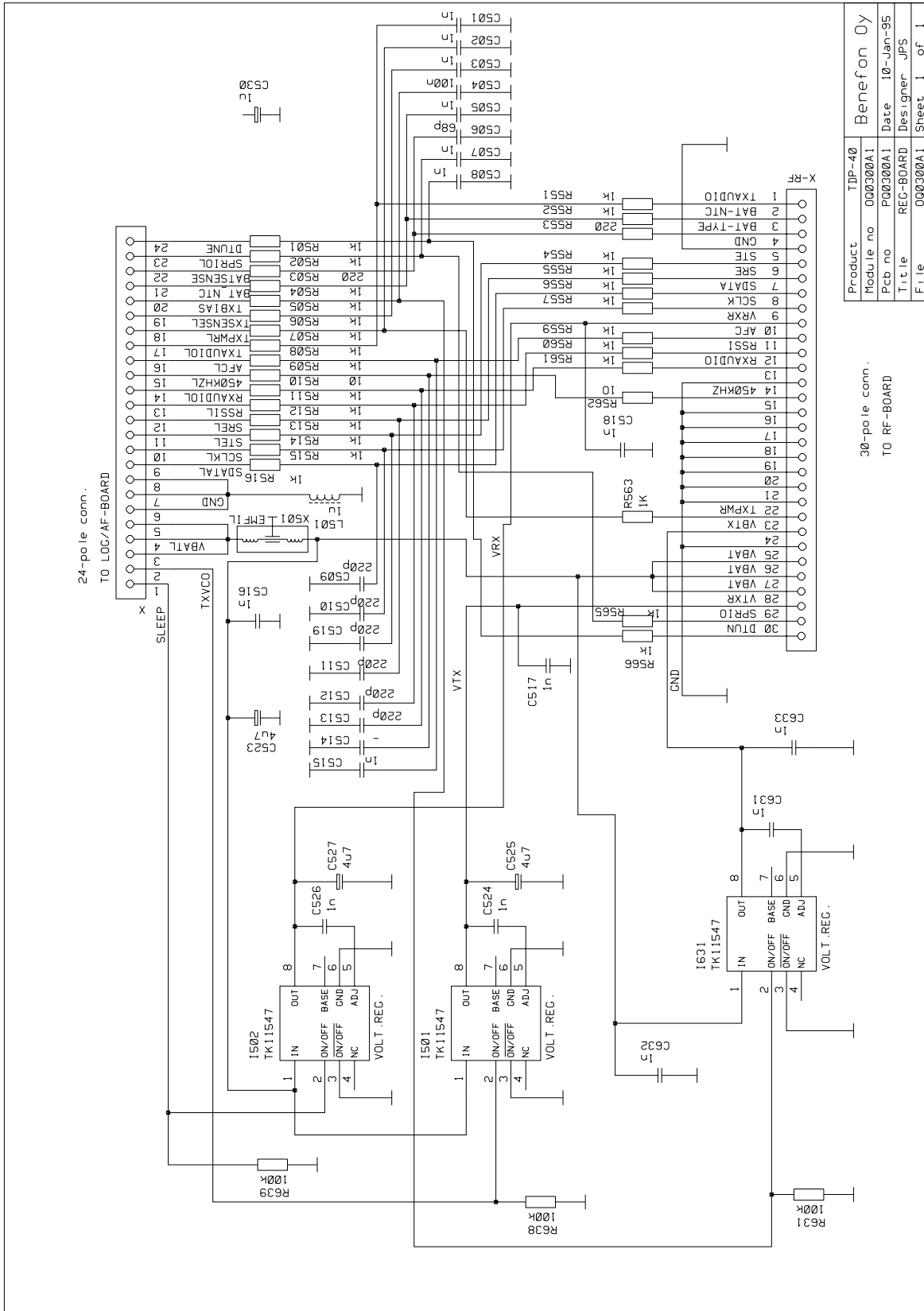
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09.05.96

Component Side Layout PQ0300A1 (Schematic OQ0300A1)



Solder Side Layout PQ0300A1 (Schematic OQ0300A1)





Product	TDP-40	Benefon Oy
Module no	QQ0300A1	
Pcb no	PQ0300A1	Date 10-Jan-95
Title	REG-BOARD	Designer JPS
File	QQ0300A1	Sheet 1 of 1

30-pole conn.
TO RF-BOARD

Antenna Switch Unit

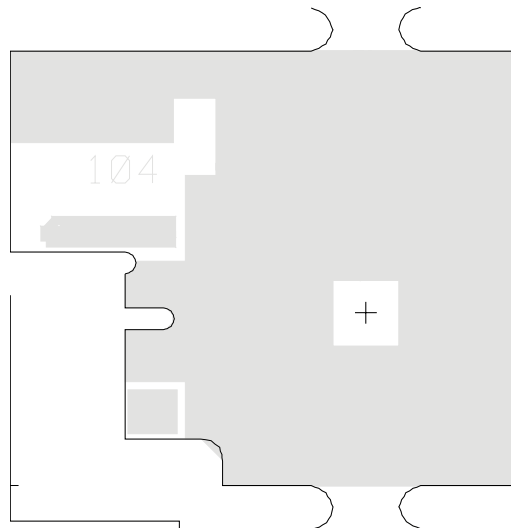
OT0300 Antenna Switch

6.3.16 Parts list of Antenna Switch Unit

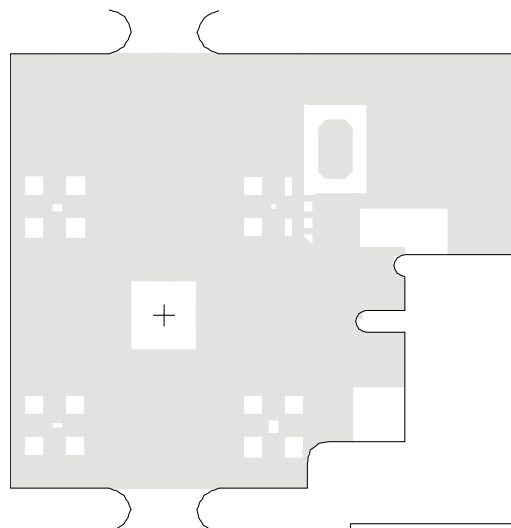
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
PT0300	PCB	PCB-antenna switch			
VR0242	X701	Antenna switch		IMS	939.99.2520.009
VR0155	X702	TNC-connector		Rosenberge	56K101-400 A4

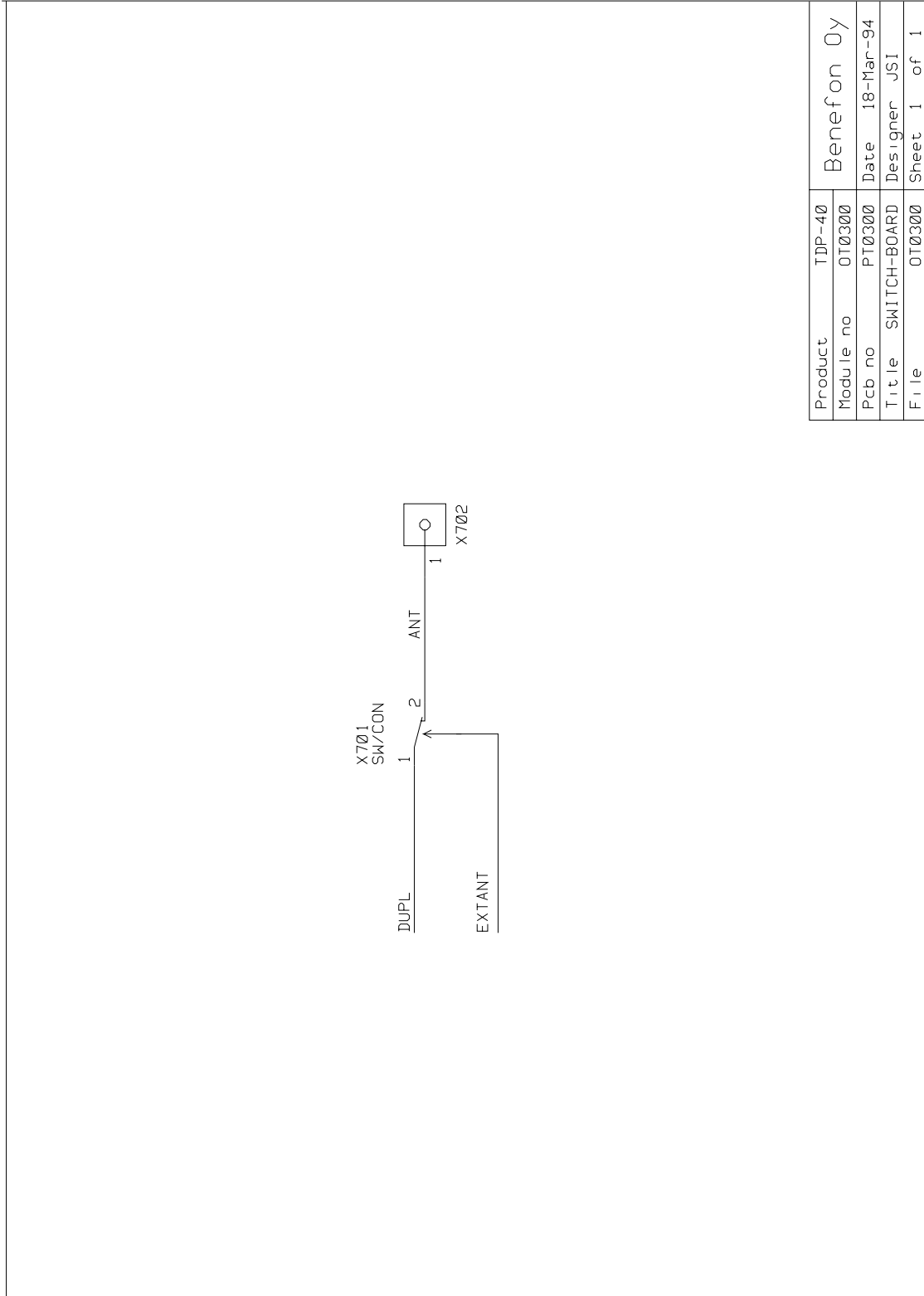
Last
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18.03.94

Component Side Layout PT0300A0 (Schematic OT0300A0)



Solder Side Layout PT0300A0 (Schematic OT0300A0)

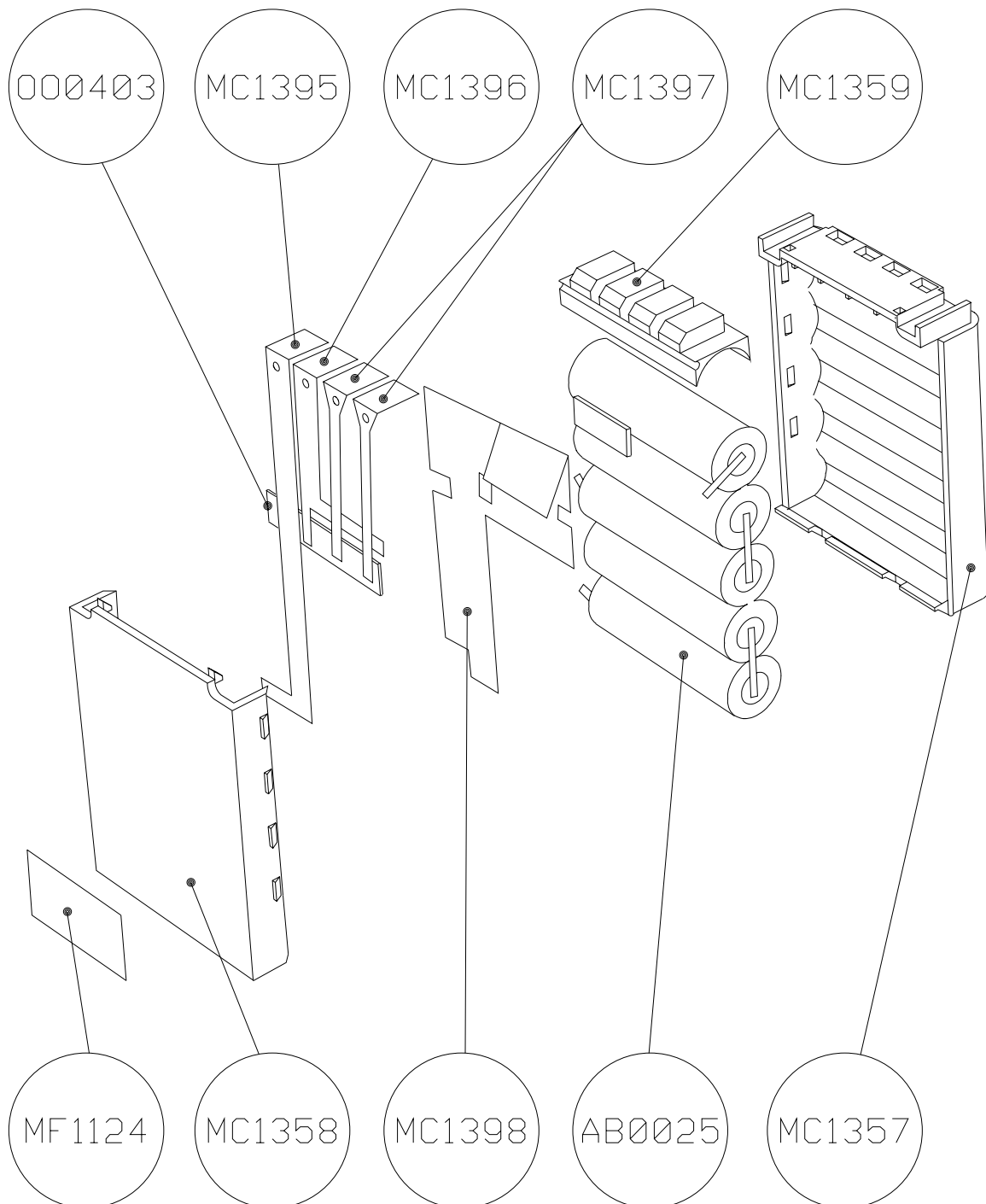




Product	TDP-40	Benefon Oy
Module no	OT0300	
Pcb no	PT0300	Date 18-Mar-94
Title	SWITCH-BOARD	Designer JSI
File	OT0300	Sheet 1 of 1

6.4 BATTERIES

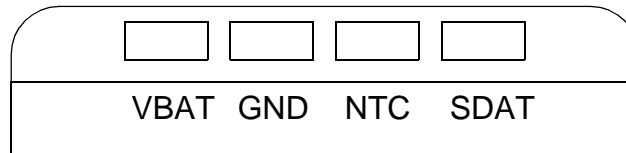
YO0300 Batteries



6.4.1 BATTERY PACK

The battery pack module contains five NiCd or NiMH cells, short protection circuit, NTC termistor and a Memory chip. NTC termistor, Memory chip and its components are located on a PC-Board inside the battery pack.

6.4.1.1 Connectors



VBAT	Battery voltage 6.4 - 7.2 V
GND	Ground
NTC	NTC termistor output
SDAT	Serial data-bus for Memory chip

6.4.1.2 Battery pack Memory board

Memory chip contains an id for the battery pack, battery type, used capacity and some other information about the batteries. The Memory chip is protected against static voltages by two zener diodes. A capacitor is used to stabilize supply voltage.

The memory chip communicates with main CPU through single wire asynchronous serial bus. The CPU controls charging by using the parameter's in Battery pack Memory.

Memory chip can be reprogrammed in LOCAL-state. Local command 95# sets the battery type.

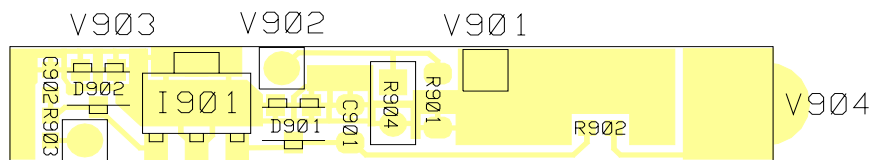
6.4.2 Parts list

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CD0473	C901	SMD capacitor	47 nF 10% 50 V X7R	Philips	
DZ0569	D901	SMD zener	5V6 5% 300mW	Philips	BZX84C5V6
DZ0569	D902	SMD zener	5V6 5% 300mW	Philips	BZX84C5V6
IM2224	I901	EconoRAM	32B ROM, 224B RAM	Dallas	DS2224Z
PO0403	MEC1	PCB for battery pack	7x43x0.6mm FR4	Ascomp	
RF0101	R902	SMD resistor	100 R 5% 0.125 W	Kamaya	
RF0101	R903	SMD resistor	100 R 5% 0.125 W	Kamaya	
RT0223	R904	NTC-resistor	22k	Philips	2322 640 63223

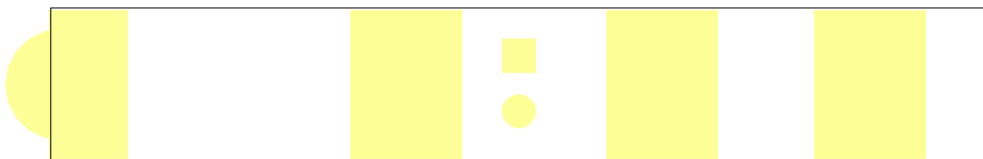
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update
20.05.94

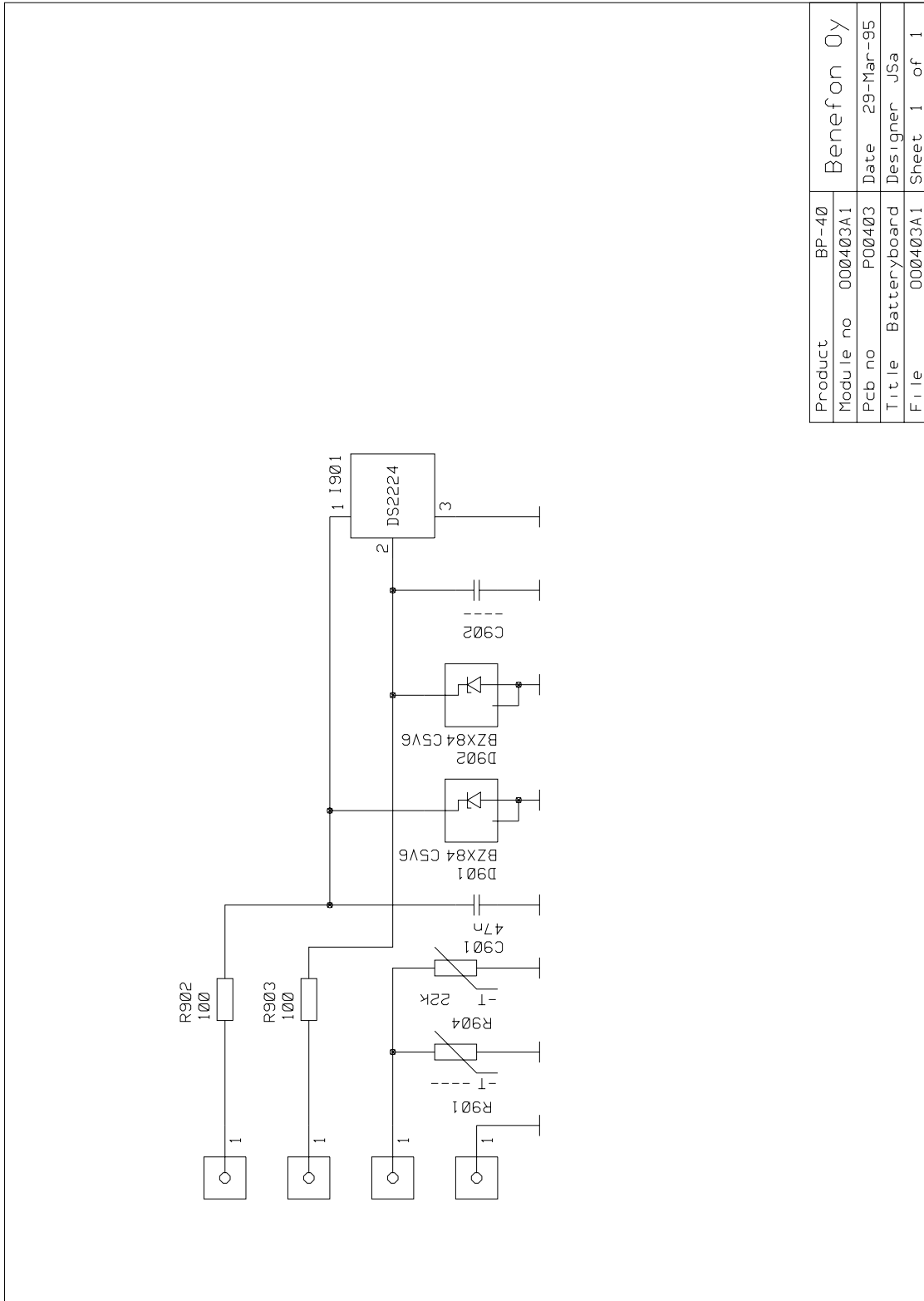
PO0403

Component Side Layout



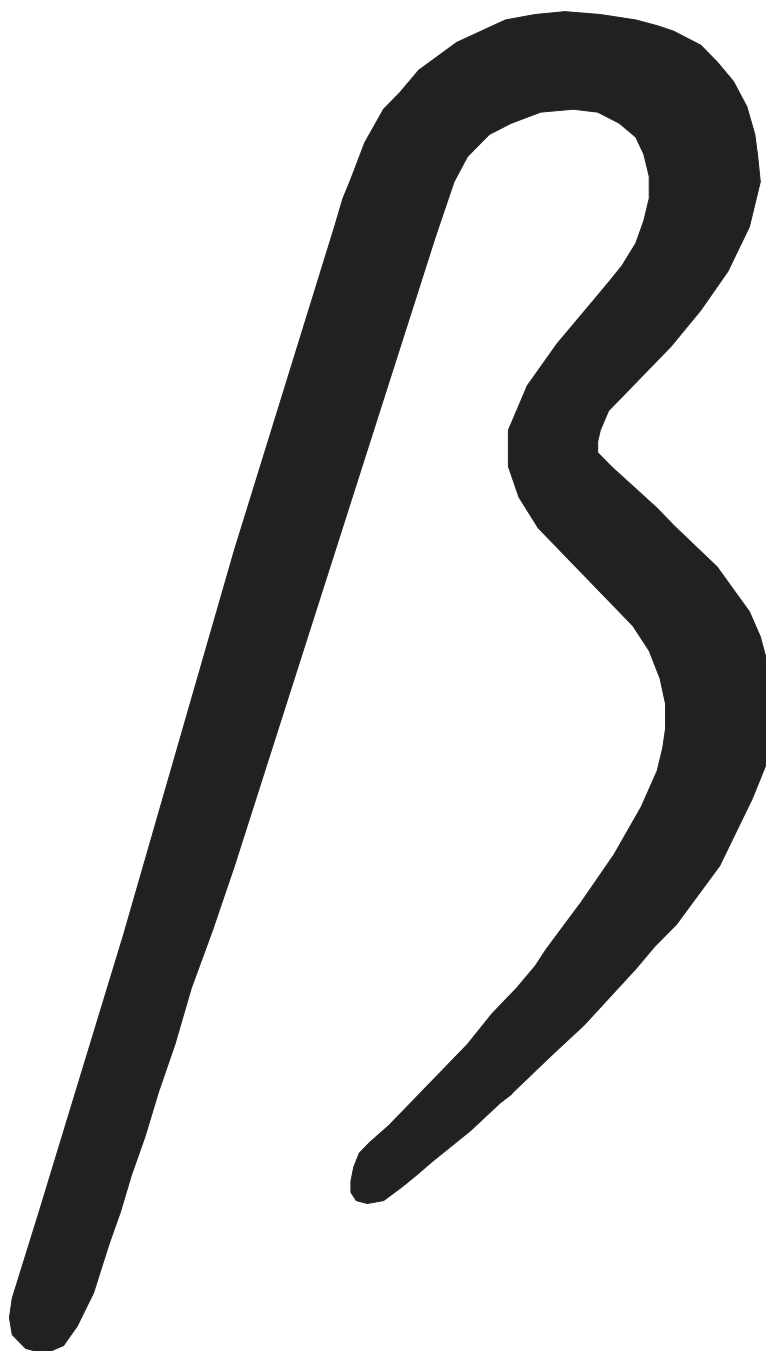
Solder Side Layout





Product	BP-40	Benefon Oy
Module no	000403A1	
Pcb no	P00403	Date 29-Mar-95
Title	Batteryboard	Designer JSa
File	000403A1	Sheet 1 of 1

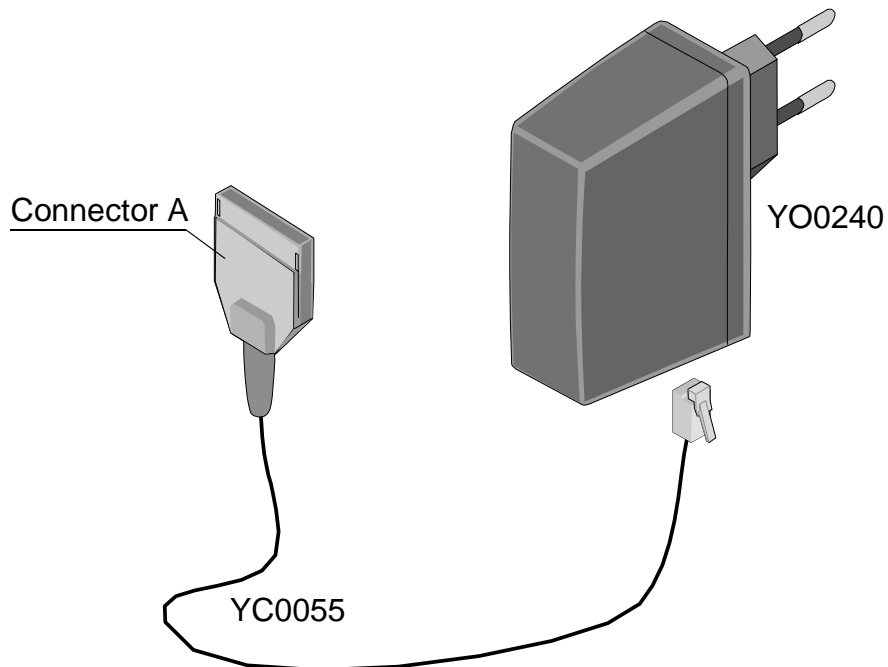
7.0 CHARGING



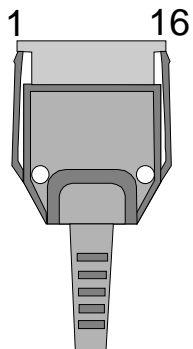
CHARGING

7.1 MAINS CHARGER CMA-50-230

The charger provides functions for charging Benefon brand mobile phones from a mains supply.



CONNECTOR A

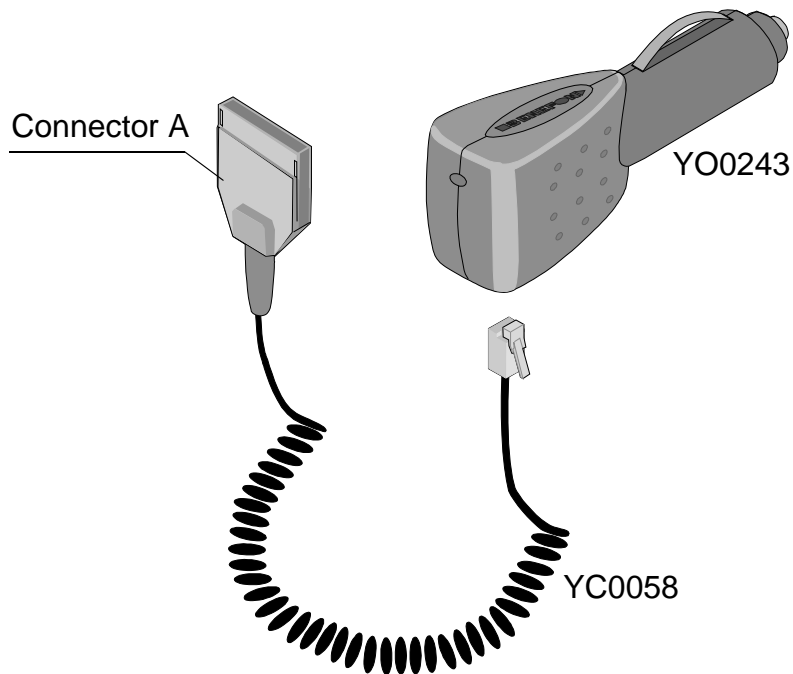


PIN CONFIGURATION:

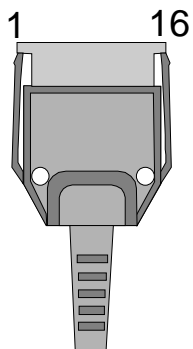
1,2	charge current	max. 10V, 1,5A
3 - 5	nc	
6,7	ground	
8 - 15	nc	
16	control voltage	0-5 VDC

7.2 LIGHTER SOCKET CHARGER CCS-50-12

The charger includes functions for using the handportable and for charging its batteries from the car battery.



CONNECTOR A

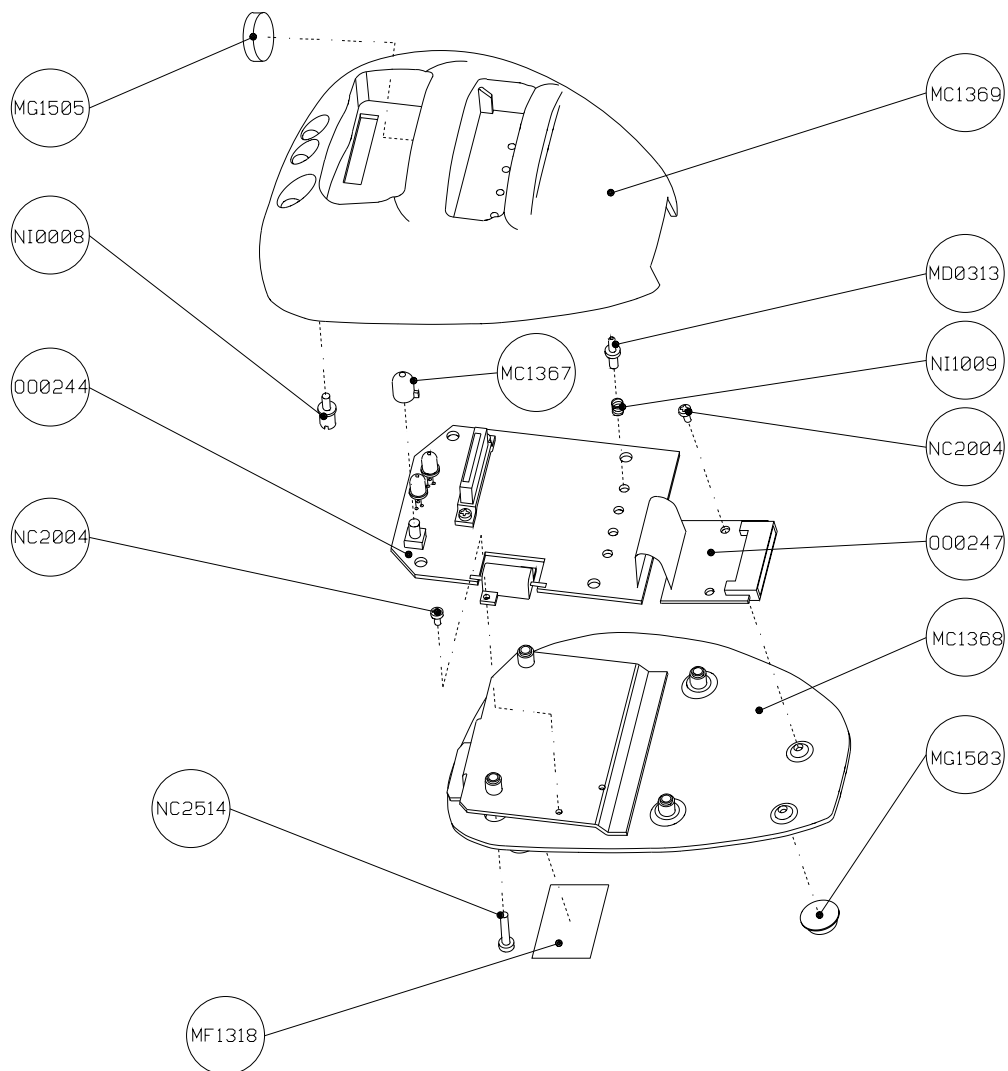


PIN CONFIGURATION:

1,2	charge current	max. 10V, 1,5A
3 - 5	nc	
6,7	ground	
8 - 15	nc	
16	control voltage	0-5 VDC

7.3 DESKTOP CHARGER

YO0244



7.3.1 General

The desktop charger is designed for charging NiCd or NiMH batteries when connected to either a lighter socket charger or a 220 V mains charger. The desktop charger has two units. The first unit is for the phone, and the second is for a reserve battery pack. The additional battery pack can also be discharged to improve its performance. The battery capacity and type are read from the memory within the battery pack before charging commences. If the battery memory is missing, empty, or faulty, the charger will use the default values stored in the processor EEPROM.

7.3.2 Charging the phone

The desktop charger detects the phone by measuring a voltage in the VBAT line voltage split. The charging process for the phone is such that the phone controls the desktop charger processor, which in turn controls the charger connected to the holder (lighter socket or mains). If the reserve battery pack is also being charged, then the desktop charger splits the charging current between the phone and the battery. The phone is always assured of its required current (max. 1500 mA).

7.3.2.1 Discharging the phone battery

The phone indicates discharge state to the desktop charger by a control voltage below 4.0 V. The charger will not then supply any current to the phone, and a red led is illuminated in the phone charging indicator. The charger takes no other part in the discharging process.

7.3.3 Charging the spare battery

The spare battery charging process has three phases: quick charge, continuous charge, and stand-by charge. The charging sequence starts with quick-charge, and ends with stand-by charging. The sequence is re-started only if there is a break in the power supply or the battery is removed from its holder. Accidental shorting of the charger contacts is prevented by the charging current being supplied to the contacts after the battery has been in the holder for approx. 1s. Battery recognition is done with the NTC line. During charging, the desktop charger updates the charge-indicator counter in the battery-pack memory.

7.3.3.1 Quick-charge

The battery is detected in its holder when the A/D converter value is below 162 ($U = 3.32$ V). This corresponds to an NTC resistance value of 181 kohm, i.e. -20 C temperature.

Quick charge only functions if the temperature is +10...+40 (A/D 75...28; $U = 1,46...0,55$ and NTC resistance 41,8...12,2 kohm). Charging is accomplished by directing the charger to give a 1500 mA current. The current is split by the switches Q101 and Q102 in turn, according to the relative requirements of the phone and

reserve battery. The phone is provided with its full requirement, so that the remaining current is available to charge the reserve battery (1500 mA - current called for by phone). When charging only the reserve battery, current equivalent to its capacity is supplied.

The charging indicator (green led) flashes during the whole of the quick-charge phase. After quick-charge the battery capacity has been charged 70...80%. The change is made from quick-charge to continuous charge when one of the following terms is fulfilled:

- a) The battery voltage exceeds its instantaneous corresponding temperature limit, according to the following formula: $V = 7.5 - 11.25 \text{ mV} \times (T - 20)$, where T is the battery temperature (+10...+40 C)
- b) The battery has been charged to its nominal capacity.

7.3.3.2 Continuous charging

When changing to continuous charging, there is approx. 20...30% of battery capacity left to charge. The continuous charge duration depends on the total capacity of the battery under charge. The battery is charged with a current corresponding to 1/4 of its capacity. If the temperature rises above +55 C, then a NiMH battery is charged with a current 1/30 of its capacity, and a NiCd battery with a current 1/10 of its capacity, until the battery temperature returns to +40 C.

The change to stand-by charging takes place when the last of the battery capacity has been charged. The charging indicator (green led) flashes throughout the continuous charging phase. The battery capacity after continuous charging is 100%.

7.3.3.3 Stand-by charging

The charging current during stand-by charging depends on the type of battery under charge (1/10 NiCd capacity; 1/30 NiMH capacity). Stand-by charging is the last phase in the charging sequence, and continues as long as the battery remains in its holder. The charging indicator (green led) is now lit continuously.

7.3.4 Discharging the reserve battery

The discharge sequence is initiated by pressing the discharge button on the holder for approx. 1 s. with the battery in its holder. The battery is discharged until its voltage drops to approx. 4.5 V (or the battery is removed from the holder). This is followed by the charging sequence 1..3. During the discharge sequence, the discharge indicator (red led) is lit. The battery voltage is measured under load. During discharge, the desktop charger up-dates the battery charge counter in the memory within the battery pack.

7.3.5 Execution

7.3.5.1 Processor

The processor I103 is Motorola 68HC11, 512b EEPROM, 512b RAM, crystal frequency 3.57 MHz. The A/D convertor inputs are used as follows:

0. charging current required by the phone
1. reserve battery temperature
2. phone battery voltage
3. reserve battery voltage
4. control voltage to the charger

B-port I/Os are used as follows:

0. Q103 control (switches charging current to the phone)
1. Q104 control (switches charging current to the reserve battery)
2. Q105 control (switches the reserve battery discharge ON)
3. n.a.
4. Q107 control (green led to indicate phone charging)
5. Q110 control (red led to indicate phone discharge)
6. Q109 control (green led to indicate reserve battery charging)
7. Q108 control (red led to indicate reserve battery discharge)

A-port I/Os are used as follows:

0. discharge button
1. tuning state control
2. n.a.
3. n.a.
4. n.a.
- 5 n.a.
- 6 n.a.
- 7 data line for the memory in the reserve battery.

Interrupt pins are drawn at the resistor R111 (100 kohm). The analog converter reference voltage is 5.0 V and it is brought through the small filter R110 and C1209 from normal 5 V operating voltage.

7.3.5.2 RESET and +5V

The processor and measurement amplifier operating voltage 5V is regulated from the mains charger output voltage from the I102 connector V101 pins 1 and 2. The I101 error output serves as a RESET for the processor. The error pin draws the RESET line via R101 when the 5V voltage has dropped to approx. 4.75V.

7.3.5.3 Reserve battery analog measurements

The reserve battery pack temperature is measured by the NTC-resistance as a voltage by the A/D converter on PE1 channel. The line has a pull-up resistor R117 and RC-filter R133 and C113.

For the voltage measurement, the 4,5...9V battery voltage is converted to 0...5V A/D input voltage by the non inverting amplifier connection of I102A.

7.3.5.4 Charger outputs

The pair of p-channel FETs Q101 and Q102 (SI9953DY) serve as the charger switch, and are controlled from the processor B-port by N-channel FETs Q103 and Q104 (2N7002). The control works by switching the transistors in turn at about a 100 Hz frequency. The desired charging current is achieved by a suitable pulse ratio.

7.3.5.5 Reserve battery discharge function

The reserve battery discharge is initiated when the push button S101 is pressed for approx. 1 s. while the battery is in its holder. The processor pin PB2 rises and Q105 causes the battery voltage to be discharged through Q106 (IRFR9024) to resistor R145. The resistor is attached to the metal base plate so that the resulting heat can be dissipated.

7.3.5.6 Charging/discharging indicators

Operating functions are indicated by two two-color leds D102 and D103. The leds are controlled by processor ports PB7, PB6, PB5 and PB4 via the transistors Q107, Q108, Q109, and Q110. Both quick-charge and continuous charge are indicated by a flashing green light, and stand-by charge by a steady green light. Discharging is indicated by a steady red light. If the phone is discharging its battery (control voltage to the charger above 4V) then the led is red.

7.3.5.7 Setting the quick-charge trigger voltage.

The Vb voltage brought to the charger is the quick-charge trigger voltage (7.2V) and the processor port PA1 is drawn up. The processor lights both red leds, and switches Q102 to conduct. The processor measures the voltage coming to the reserve battery contacts and stores it in EEPROM. When the measured value is stored, the leds change to green. NOTE! THE RESERVE BATTERY MUST NOT BE CONNECTED.

7.3.5.8 Reserve battery default values

If the attempt to read the reserve battery type and capacity are unsuccessful, the charging parameters are taken from the default values programmed in EEPROM. EEPROM data:

e.g.

\$b600	quick-charging trigger voltage	\$a8
\$b601	reserve battery upper capacity	\$02
\$b602	reserve battery lower capacity	\$58
\$b603	reserve battery type	\$00

The processor itself programmes the quick-charge trigger voltage (memory location \$b600) while in tuning mode. Other reserve battery default values must be programmed. The capacity is measured in milli-ampere-hours and coded hexadecimally in memory locations \$b601 and \$b602. The reserve battery type is in the address \$b603, coded as follows: NiMH = \$00 and NiCd = \$01.

7.3.5.9 Error situations

The charger will not commence charging if the trigger voltage has not been set or the reserve battery default values have not been programmed (Red leds flash in turn).

If the charger does not recognise the reserve battery, it will not update the memory within the battery pack.

7.3.6 Parts list of Desktop Charger

OO0244

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CD0473	C101	SMD capasitor	47 nF 10% 50 V X7R	Philips	
CD0223	C102	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU0226	C103	SMD tantal	22uF/16V 10% 7.3x4.3mm	Kyocera	TAJD226K016R
CD0223	C104	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0221	C110	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CD0223	C111	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0223	C112	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0220	C140	SMD capasitor	22 pF 5% 50 V NP0	Philips	
CD0220	C141	SMD capasitor	22 pF 5% 50 V NP0	Philips	
CD0473	C142	SMD capasitor	47 nF 10% 50 V X7R	Philips	
CD0473	C143	SMD capasitor	47 nF 10% 50 V X7R	Philips	
CD0223	C144	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0223	C150	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0223	C151	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0121	C160	SMD capasitor	120pF 5% 50V NP0	Philips	
CD0680	C161	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CD0121	C170	SMD capasitor	120pF 5% 50V NP0	Philips	
CD0121	C171	SMD capasitor	120pF 5% 50V NP0	Philips	
CD0121	C172	SMD capasitor	120pF 5% 50V NP0	Philips	
CD0121	C173	SMD capasitor	120pF 5% 50V NP0	Philips	
CD0121	C174	SMD capasitor	120pF 5% 50V NP0	Philips	
CD0121	C175	SMD capasitor	120pF 5% 50V NP0	Philips	
CD0121	C180	SMD capasitor	120pF 5% 50V NP0	Philips	
CD0223	C181	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CH0105	C182	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CD0223	C183	SMD capasitor	22 nF 10% 50 V X7R	Philips	
DY0006	D101	Shottky diode	60V/3.3A	I&R	30WQ06F
DL5300	D102	Bicolor led	Green/Orange-red D=5mm	Telefunken	TLUV 5300
DL5300	D103	Bicolor led	Green/Orange-red D=5mm	Telefunken	TLUV 5300
IR2952	I101	Regulator	100mA 5V adj. 0.5%	Micrel	MIC2951-02BM
IA0272	I102\	2 x op.amp.	LinCMOS Low noise,power	Texas	TLC27M2ID
IP6871	I103	OTP processor		Motorola	MC68HC711E9CFN2
LF0061	L101	SMD EMI suppression filit	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472
LF0061	L102	SMD EMI suppression filit	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472
LF0061	L103	SMD EMI suppression filit	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472
PO0244	MEK1	PCB for OO0244	87x65 FR4	Metalex	
VI1052	MEK2	SMD IC-socket PLCC-52	25.22x25,22x5mm	Yamaichi	IC 160-0524-201
VI0040	MEK3	Component base	1 base = 40 holes	Perlos	
NC2006	MEK4	Cross recessed screw	M2x6 SFS2976 FeZn8CZ	Ruuvitalo	
NC2006	MEK5	Cross recessed screw	M2x6 SFS2976 FeZn8CZ	Ruuvitalo	
NF0200	MEK6	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
NF0200	MEK7	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
QF9953	Q101	SMD Dual p-channel fets	20V/2.3A Rds=0.25	Siliconix	Si9953DY
QF9953	Q102	SMD Dual p-channel fets	20V/2.3A Rds=0.25	Siliconix	Si9953DY
QF7002	Q103	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QF7002	Q104	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QF7002	Q105	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QF9024	Q106	SMD p-channel FET	60V 9A Rds=0.28	I&R	IRFR9024TR
QSB848	Q107	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q108	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q109	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q110	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
RD0103	R101	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0104	R110	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0102	R111	SMD resistor	1 k 5% 0.125 W	Kamaya	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RD0104	R112	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R113	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0823	R114	SMD resistor	82 k 5% 0.125 W	Kamaya	
RM4752	R115	Mini-Melf resistor	47k5 1% 0.25W	Beyschlag	MMA 0204-50
RD0103	R120	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0471	R121	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0471	R122	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0103	R123	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0471	R130	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0471	R131	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0103	R132	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R133	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0105	R140	SMD resistor	1 M 5% 0.125 W	Kamaya	
RD0102	R141	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0104	R142	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0103	R143	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0104	R144	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0103	R145	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R150	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R151	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R160	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0104	R161	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R162	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0562	R163	SMD resistor	5.6 k 5% 0.125 W	Kamaya	
RD0221	R164	SMD resistor	220 R 5% 0.125 W	Kamaya	
RD0104	R165	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R166	SMD resistor	100 k 5% 0.125 W	Kamaya	
RL0479	R167	Wirewound resistor	4R7/10W/5% alumin.housed	Vitrohm	
RD0104	R170	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R171	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R172	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R173	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0100	R180	SMD resistor	10 R 5% 0.125 W	Kamaya	
RD0104	R181	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R182	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0103	R183	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0472	R184	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
AS0105	S101	Tact switch	h=9,5mm	Alps	SKHHAP
VN0242	V102	SMD system conn.	(holder)	AMP	
X35796	X101	DTMF-quartz crystal	3.579545 MHZ +-30PPM	Meiden	

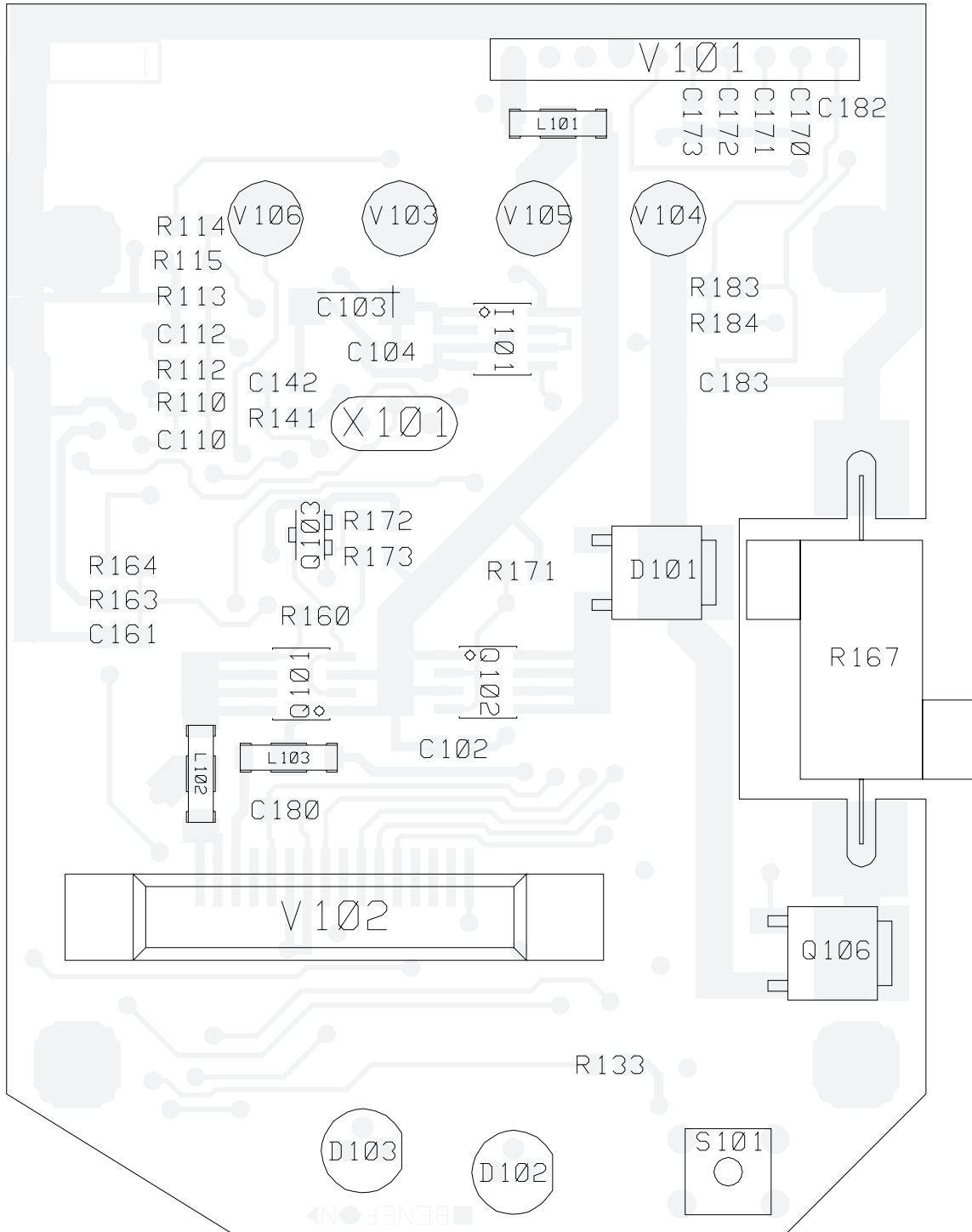
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7.3.7 Parts list of Table Charger Extra Module

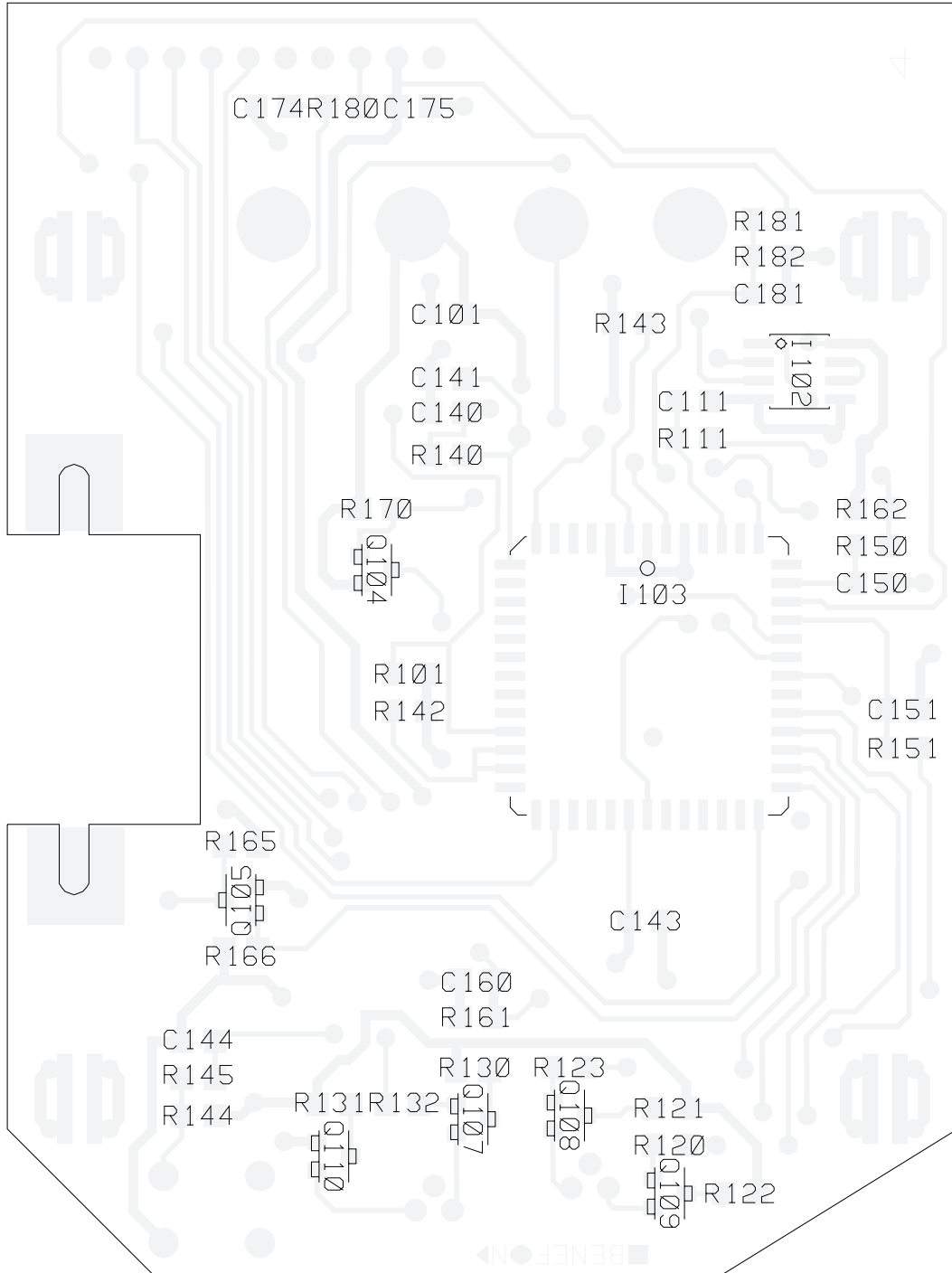
CODE	PART	DESCRIPT.	VALUE	MANUF	TYPE
NC2015	M201	Cross recessed screw	M2x5 DIN7985A pozidrive	Ruuvitalo	
NC2015	M202	Cross recessed screw	M2x5 DIN7985A pozidrive	Ruuvitalo	
NF0200	M203	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
NF0200	M204	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
PO0242	MEK1	PCB for table charger	connector (Tavi)	Metalex	
VM0242	X\IN	SMD system connector	1x16 pin	AMP	188227-1
AC0046	X\OUT	Flat cable jumper	10x 0.5mm, pitch 2,54mm		

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17.05.95

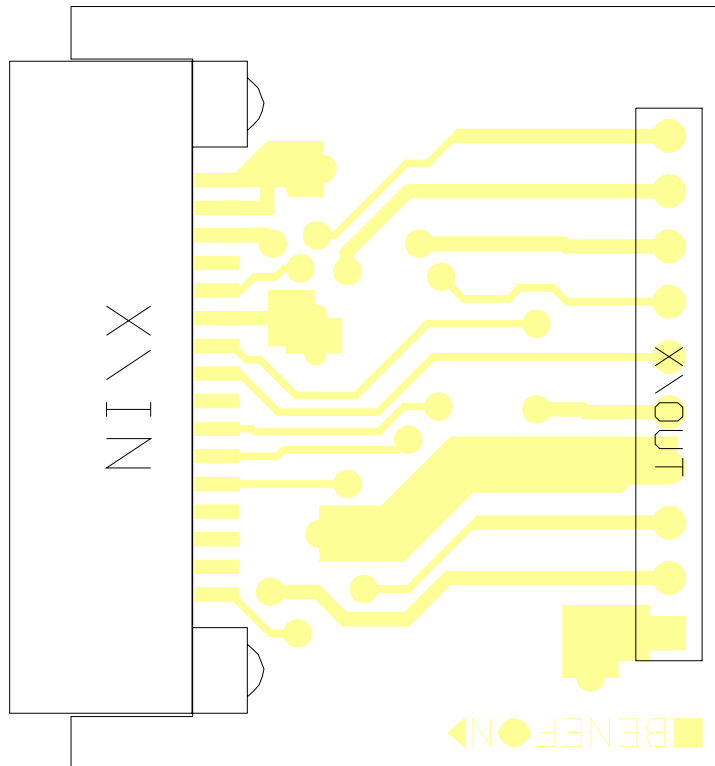
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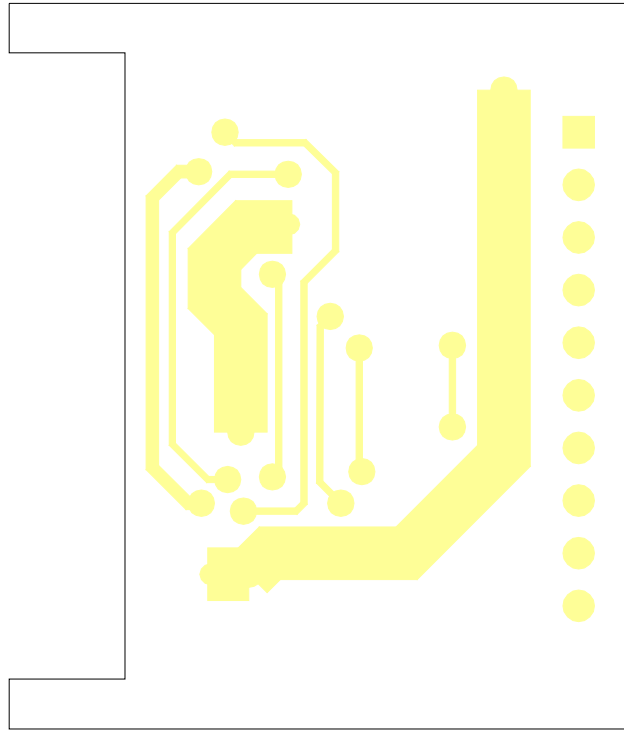
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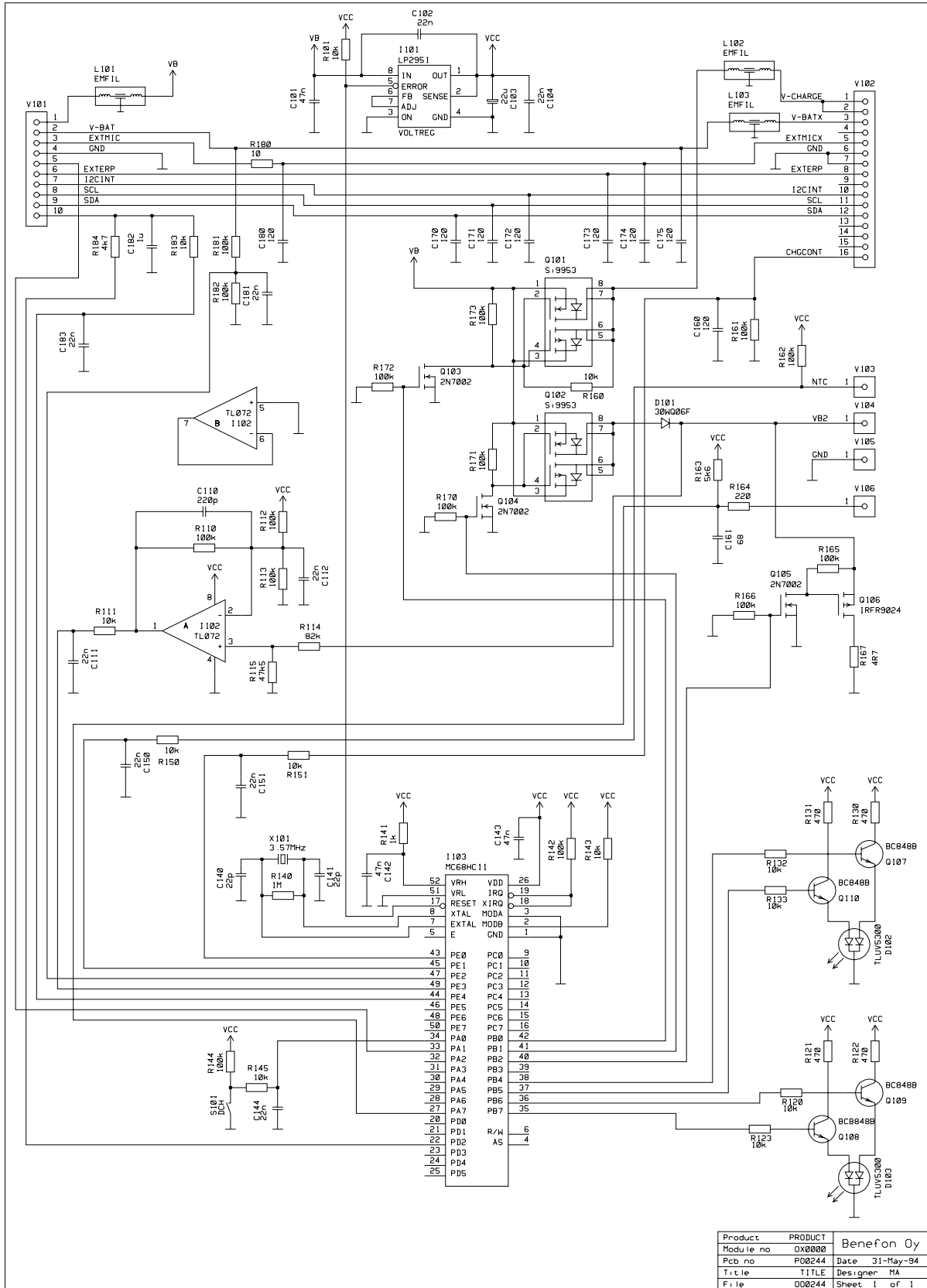


Component Side layout PO0247A0 (Schematic OO0247A0)

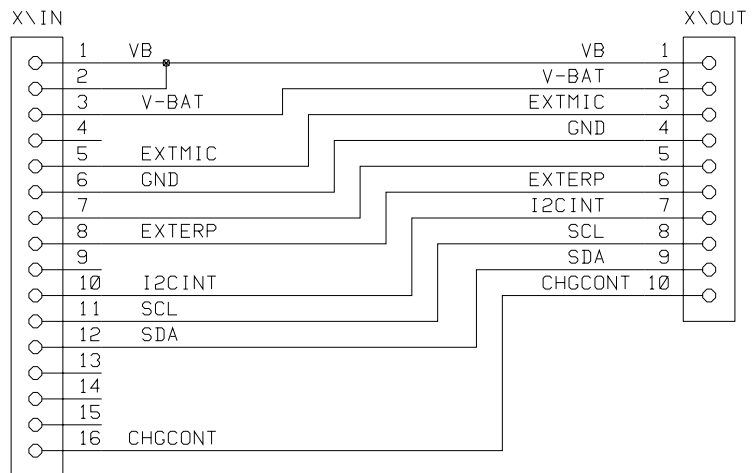


Solder Side Layout PO0247A0 (Schematic OO0247A0)





Product	PRODUCT	Benefon Oy
Module no	OX0000	
Pcb no	PO0244	Date 31-May-94
Title	TITLE	Designer MA
File	000244	Sheet 1 of 1

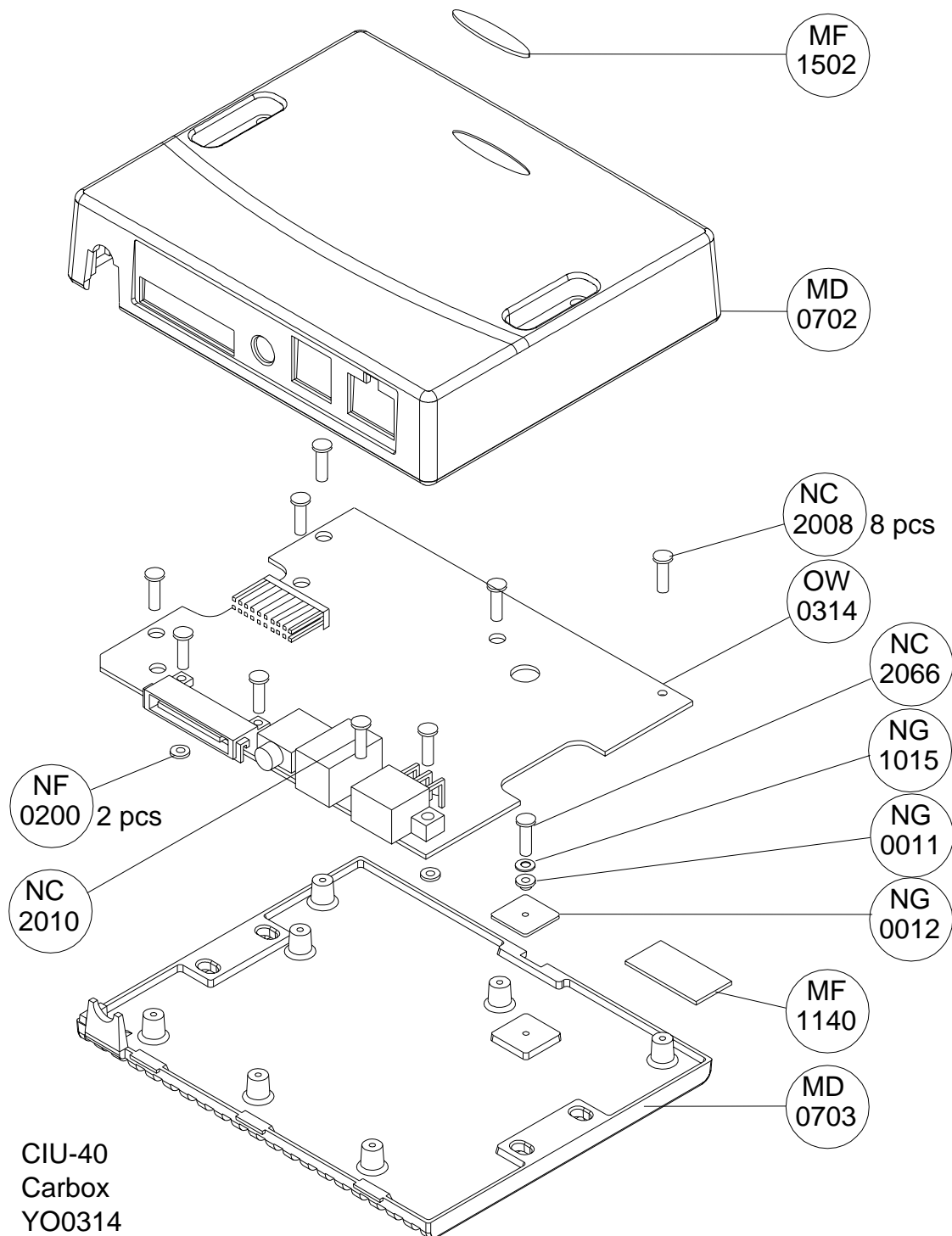


Product	YC0244	Benefon Oy
Module no	000247	
Pcb no	P00242	Date 12-May-95
Title	TITLE	Designer MA
File	000247	Sheet 1 of 1

8.0 CAR ASSEMBLY KIT

YO0314

8.1 CARBOX



8.1.1 Including attached functions:

- power supply filter
- voltage regulators
- processor controlled battery charger
- controls for external relays (AL, MUTE)
- handsfree amplifiers
- PC/HANDSET connector.

8.1.2 Connector descriptions:

8.1.2.1 EXTVB

1	MUTE	car radio mute	max 500mA
2	SPKRGND	speaker ground	
3	GND	ground	
4	AL	external alarm control	max 500mA
5	SPKR	HF-speaker	4 ohm 1.5 W
6	VBATT	operating voltage	10.8-31V max 3A

8.1.2.2 EXTMIC

1	GND	ground
2	HFMIC	HF-microphone

8.1.2.3 PC/EXTHS

1 NC	not connected	
2 NC		
3 9V	PC/handset operating voltage	9V 500mA
4 NC		
5 HSMIC	handset microphone	400mV RMS
6 GND	ground	
7 GND	ground	
8 HSERP	handset earphone	200mV RMS
9 PTT	external tangent	
10 I2CINT	I2C interrupt	
11 SCL	I2C clock	
12 SDA	I2C data	
13 TXD	RS232	
14 RXD	RS232	
15 EXTIO	extra-IO	
16 NC		

8.1.2.4 BOX

1 V-CHARGE	battery charging current	max 2A/9V
2 V-CHARGE		
3 V-BAT	battery voltage	
4 NC		
5 EXTMIC	external microphone signal	400mV RMS
6 GND	ground	
7 GND		
8 EXTERP	external ERP-signal	200mV RMS
9 PTT	external tangent	
10 I2CINT	I2C interrupt	
11 SCL	I2C clock	
12 SDA	I2C DATA	
13 TXD	RS232	
14 RXD	RS232	
15 EXTIO	extra- IO	
16 CHGCONT	charging control from the processor	

8.1.3 Operation

Operating voltage is fed to pin EXTVB/6. L001/C005 filters the power supply, and D001 limits any voltage peaks. When the handportable is placed in its handset, a voltage occurs at the BOX/3 pin which triggers Q101 and Q102 open.

The regulator I101 feeds 9V to the audio stage and PC/EXTHS pin, and I102 feeds 5V to other functions. External relay controls Q104 and Q106 get their control from the circuit I103.

The HF microphone gets its bias voltage through resistors R311 and R212. I304 serves as the microphone amplifier and I105 as a low-pass filter with a border frequency of 3.3 kHz.

The analog switch I302 connects the HF microphone or external device microphone signal to the EXTMIC-line.

The analog switch I307 connects the audio signal from the EXTERP-line to either the external device HSERP line or to the audio stage I309.

8.1.4 Parts list OW0314

OW0314

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CD0222	C100	SMD capacitor	2.2 nF 5% 50 V NP0	Philips	
CD0222	C101	SMD capacitor	2.2 nF 5% 50 V NP0	Philips	
CD0223	C102	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CD0223	C103	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CE0109	C104	Al-elko	1000uF/40V 12.5x30mm	Philips	2222 021 17102
CD0222	C105	SMD capacitor	2.2 nF 5% 50 V NP0	Philips	
CD0222	C106	SMD capacitor	2.2 nF 5% 50 V NP0	Philips	
CD0102	C110	SMD capacitor	1 nF 5 % NP0	Philips	
CD0102	C111	SMD capacitor	1 nF 5 % NP0	Philips	
CD0471	C112	SMD capacitor	470 pF 5% 50 V NP0	Philips	
CD0101	C120	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C121	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C122	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C123	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C124	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C125	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C130	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C131	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C132	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C133	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C134	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C135	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C136	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C137	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C138	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C139	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C140	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C141	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0223	C200	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CD0223	C201	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CU1106	C202	SMD tantal	10uF/16V	AVX	TAJB106M016R
CH0105	C203	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C204	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CD0223	C205	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CD0223	C210	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CU1106	C211	SMD tantal	10uF/16V	AVX	TAJB106M016R
CD0223	C220	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CD0222	C230	SMD capacitor	2.2 nF 5% 50 V NP0	Philips	
CD0222	C240	SMD capacitor	2.2 nF 5% 50 V NP0	Philips	
CU0105	C300	SMD tantal	1uF/16V 20% 3.2x1.6mm	Matsushita	ECST1CY 105R
CD0223	C301	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CD0222	C302	SMD capacitor	2.2 nF 5% 50 V NP0	Philips	
CD0223	C303	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CD0680	C304	SMD capacitor	68 pF 5% 50 V NP0	Philips	
CD0270	C306	SMD capacitor	27pF 5% 50V NPO	Philips	
CD0270	C307	SMD capacitor	27pF 5% 50V NPO	Philips	
CD0101	C320	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0223	C321	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CH0105	C322	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CD0471	C323	SMD capacitor	470 pF 5% 50 V NP0	Philips	
CD0270	C324	SMD capacitor	27pF 5% 50V NPO	Philips	
CD0270	C325	SMD capacitor	27pF 5% 50V NPO	Philips	
CD0270	C326	SMD capacitor	27pF 5% 50V NPO	Philips	
CD0270	C327	SMD capacitor	27pF 5% 50V NPO	Philips	
CD0223	C328	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CD0104	C329	SMD capacitor	100 nF 10% 50 V X7R	Philips	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CU0105	C330	SMD tantal	1uF/16V 20% 3.2x1.6mm	Matsushita	ECST1CY 105R
CD0104	C331	SMD capacitor	100 nF 10% 50 V X7R	Philips	
CD0222	C332	SMD capacitor	2.2 nF 5% 50 V NP0	Philips	
CD0680	C333	SMD capacitor	68 pF 5% 50 V NP0	Philips	
CD0223	C334	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CD0221	C335	SMD capacitor	220 pF 5% 50 V NP0	Philips	
CD0270	C336	SMD capacitor	27pF 5% 50V NPO	Philips	
CD0270	C337	SMD capacitor	27pF 5% 50V NPO	Philips	
CU0105	C340	SMD tantal	1uF/16V 20% 3.2x1.6mm	Matsushita	ECST1CY 105R
CD0223	C401	SMD capacitor	22 nF 10% 50 V X7R	Philips	
CH0105	C402	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CU0226	C411	SMD tantal	22uF/16V 10% 7.3x4.3mm	Kyocera	TAJD226K016R
CU0226	C413	SMD tantal	22uF/16V 10% 7.3x4.3mm	Kyocera	TAJD226K016R
CD0104	C414	SMD capacitor	100 nF 10% 50 V X7R	Philips	
CE0476	C415	Al elko	47 uF/25 V 7x7mm	Philips	2222 097 56479
CD0104	C416	SMD capacitor	100 nF 10% 50 V X7R	Philips	
CU1106	C417	SMD tantal	10uF/16V	AVX	TAJB106M016R
CU0225	C418	SMD tantal	2.2uF/16V 20% 4.7x2.6mm	Matsushita	ECST1CB 225R
CH0105	C419	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C420	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C421	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C430	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C431	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CD0270	C432	SMD capacitor	27pF 5% 50V NPO	Philips	
CD0270	C433	SMD capacitor	27pF 5% 50V NPO	Philips	
CD0101	C440	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0104	C441	SMD capacitor	100 nF 10% 50 V X7R	Philips	
CD0220	C443	SMD capacitor	22 pF 5% 50 V NP0	Philips	
CD0220	C444	SMD capacitor	22 pF 5% 50 V NP0	Philips	
CH0105	C460	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C461	SMD capacitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CU0225	C462	SMD tantal	2.2uF/16V 20% 4.7x2.6mm	Matsushita	ECST1CB 225R
CU1106	C463	SMD tantal	10uF/16V	AVX	TAJB106M016R
CD0104	C464	SMD capacitor	100 nF 10% 50 V X7R	Philips	
CE0337	C465	Al elko	330uF/16V 20% 15x8mm	Philips	222213555331
CE0476	C466	Al elko	47 uF/25 V 7x7mm	Philips	2222 097 56479
CE0337	C467	Al elko	330uF/16V 20% 15x8mm	Philips	222213555331
CD0104	C468	SMD capacitor	100 nF 10% 50 V X7R	Philips	
CD0103	C469	SMD capacitor	10 nF 10% 50 V X7R	Philips	
CU0105	C480	SMD tantal	1uF/16V 20% 3.2x1.6mm	Matsushita	ECST1CY 105R
CD0473	C500	SMD capacitor	47 nF 10% 50 V X7R	Philips	
CE3106	C501	Al-elko	10uF/63V +-20% 11x5mm	Panasonic	ECEA1JU100
CP0155	C502	Polyester cap	1.5uF 20% 50V	Roerdestei	MKT 1826-515/05
CD0473	C503	SMD capacitor	47 nF 10% 50 V X7R	Philips	
CU1106	C504	SMD tantal	10uF/16V	AVX	TAJB106M016R
CD0101	C505	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0104	C506	SMD capacitor	100 nF 10% 50 V X7R	Philips	
CD0473	C510	SMD capacitor	47 nF 10% 50 V X7R	Philips	
CD0101	C511	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C512	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C513	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0101	C514	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0103	C515	SMD capacitor	10 nF 10% 50 V X7R	Philips	
CD0103	C516	SMD capacitor	10 nF 10% 50 V X7R	Philips	
CD0101	C517	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0473	C518	SMD capacitor	47 nF 10% 50 V X7R	Philips	
CD0101	C519	SMD capacitor	100 pF 5% 50 V NP0	Philips	
CD0103	C520	SMD capacitor	10 nF 10% 50 V X7R	Philips	
CD0103	C521	SMD capacitor	10 nF 10% 50 V X7R	Philips	
CD0102	C522	SMD capacitor	1 nF 5% NP0	Philips	

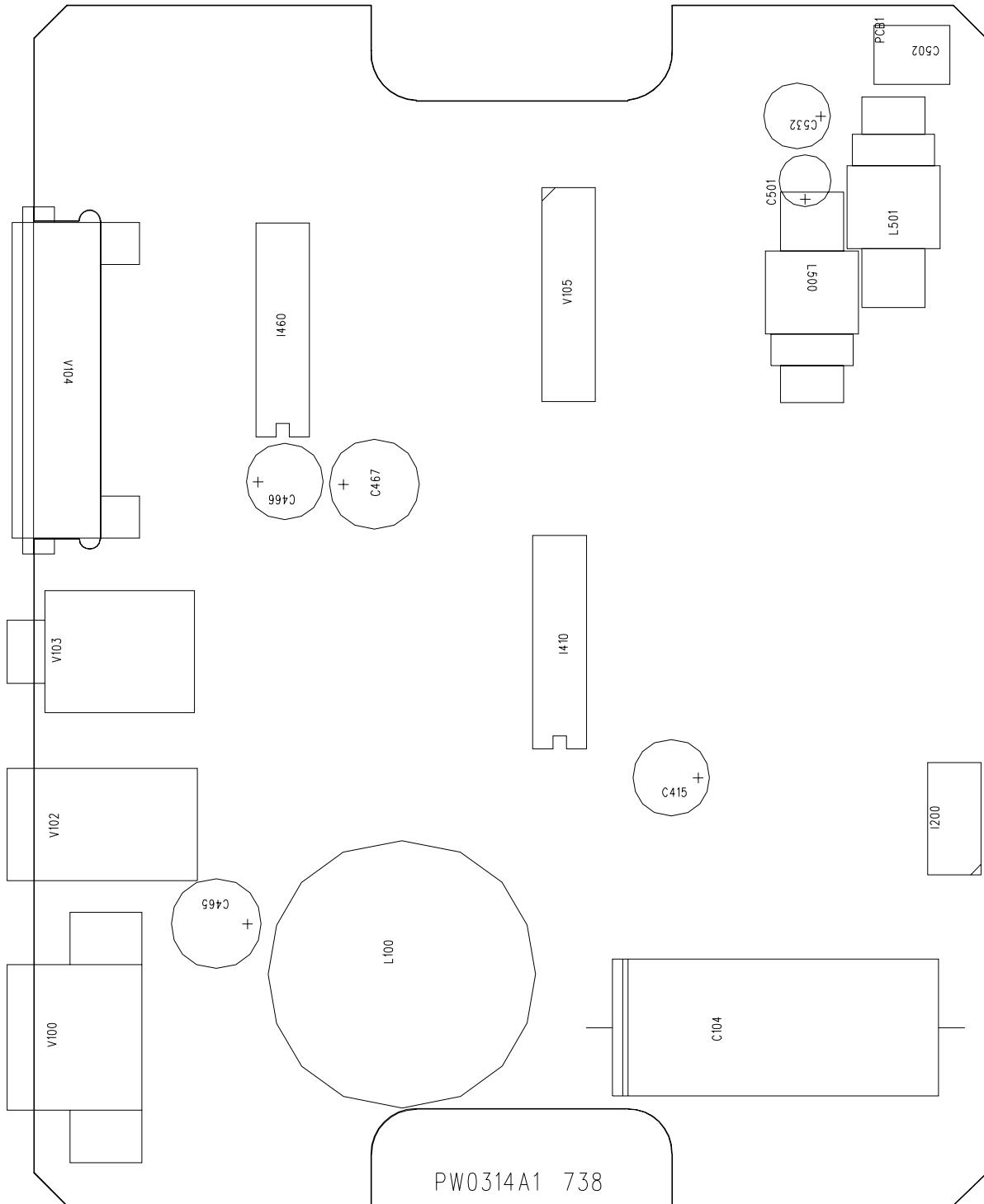
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CD0101	C523	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0471	C530	SMD capasitor	470 pF 5% 50 V NP0	Philips	
CD0101	C531	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CE0127	C532	Al elko	120uF/16V 6.3x11,5	NCC	SXE16VB120MJF11
DT0033	D100	SMD Transil	33V71500W	SGS-Thomso	SM15T33A
DZ0180	D200	SMD zener	18V 5% 300mW	Philips	BZX84C18
DT0033	D230	SMD Transil	33V71500W	SGS-Thomso	SM15T33A
DT0033	D240	SMD Transil	33V71500W	SGS-Thomso	SM15T33A
DZ0569	D500	SMD zener	5V6 5% 300mW	Philips	BZX84C5V6
DS0056	D501	SMD diode pair	70V/100mA common anode	Philips	BAW 56
DS0099	D510	SMD diode	70 V 200 mA	Philips	BAV 99
DS0099	D511	SMD diode	70 V 200 mA	Philips	BAV 99
DS0099	D530	SMD diode	70 V 200 mA	Philips	BAV 99
IR1317	I200	Adjustable regulator	1.2-37V 1.5A	National S	LM317AT
IR2951	I210	Regulator	100mA 5V adj. 5%	National	LP2951CM
II8574	I220	8 bit I/O	I2C	Philips	PCF8574T
IA7550	I300	Single op.amp.		Toshiba	TA 75S01F-TE85L
IC0453	I320	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L
IA7550	I321	Single op.amp.		Toshiba	TA 75S01F-TE85L
IC0453	I322	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L
IA7550	I330	Single op.amp.		Toshiba	TA 75S01F-TE85L
IA1905	I410	Audio power amplifier	5W/20V/4ohm	SGS/Thomso	TDA1905
IC0453	I430	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L
IC0453	I431	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L
IA7550	I440	Single op.amp.		Toshiba	TA 75S01F-TE85L
IA1905	I460	Audio power amplifier	5W/20V/4ohm	SGS/Thomso	TDA1905
IA2902	I500	Low power quar op-amp.		NationalSe	LM2902M
IC0011	I510	4x2-input nand	CMOS		4011 B
LA3117	L100	Inductor	110uH 3A R=0.07ohm	Fuji	SL03B111BE
LA1391	L500	Choke horizontal	90uH +-10%	Trafocomp	TJ1391
LA1391	L501	Choke horizontal	90uH +-10%	Trafocomp	TJ1391
PO0314	PCB1	*** EI KOODATTU VARAS-TOON ***			
QF9024	Q200	SMD p-channel FET	60V 9A Rds=0.28	I&R	IRFR9024TR
QF7002	Q201	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QSB858	Q230	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
QS1054	Q231	SMD transistor	NPN 1.5A/45V	Philips	BCP 54
QSB858	Q240	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
QS1054	Q241	SMD transistor	NPN 1.5A/45V	Philips	BCP 54
QSB848	Q400	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QF7002	Q401	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QSB848	Q402	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q450	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q500	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB858	Q520	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
QSB858	Q521	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
QSB858	Q522	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
QSB848	Q523	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB858	Q530	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
QF7002	Q531	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
000000	Q532	*** EI KOODATTU VARAS-TOON ***			
QSB858	Q533	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
RD0101	R100	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0101	R101	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0224	R200	SMD resistor	220 k 5% 0.125 W	Kamaya	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RD0103	R201	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0104	R202	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0103	R203	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0152	R204	SMD resistor	1.5 k 5% 0.125 W	Kamaya	
RD1241	R205	SMD resistor	240R 1% 0.125 W	Kamaya	RGC 1/10
RD0103	R210	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0101	R220	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0101	R221	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0103	R230	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0102	R231	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0103	R232	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R240	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0102	R241	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0103	R242	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R300	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0102	R301	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0103	R302	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0224	R303	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0153	R304	SMD resistor	15 k 5% 0.125 W	Kamaya	
RD0103	R305	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R306	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0333	R307	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0224	R320	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0103	R321	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0224	R322	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0103	R323	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R330	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0102	R331	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0183	R332	SMD resistor	18 k 5% 0.125 W	Kamaya	
RD0224	R333	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0153	R334	SMD resistor	15 k 5% 0.125 W	Kamaya	
RD0103	R335	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R336	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0333	R337	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0104	R340	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0683	R341	SMD resistor	68 k 5% 0.125 W	Kamaya	
RD0473	R400	SMD resistor	47 k 5% 0.125 W	Kamaya	
RD0104	R401	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R402	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R403	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0333	R404	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0103	R405	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R406	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R407	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0101	R410	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0103	R411	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0339	R412	SMD resistor	3.3 R 5% 0.125 W	Kamaya	
RD0102	R413	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0102	R414	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0183	R415	SMD resistor	18 k 5% 0.125 W	Kamaya	
RD0104	R416	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0333	R430	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0333	R431	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0333	R432	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0104	R440	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R441	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0473	R442	SMD resistor	47 k 5% 0.125 W	Kamaya	
RD0103	R443	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0473	R450	SMD resistor	47 k 5% 0.125 W	Kamaya	
RD0103	R451	SMD resistor	10 k 5% 0.125 W	Kamaya	

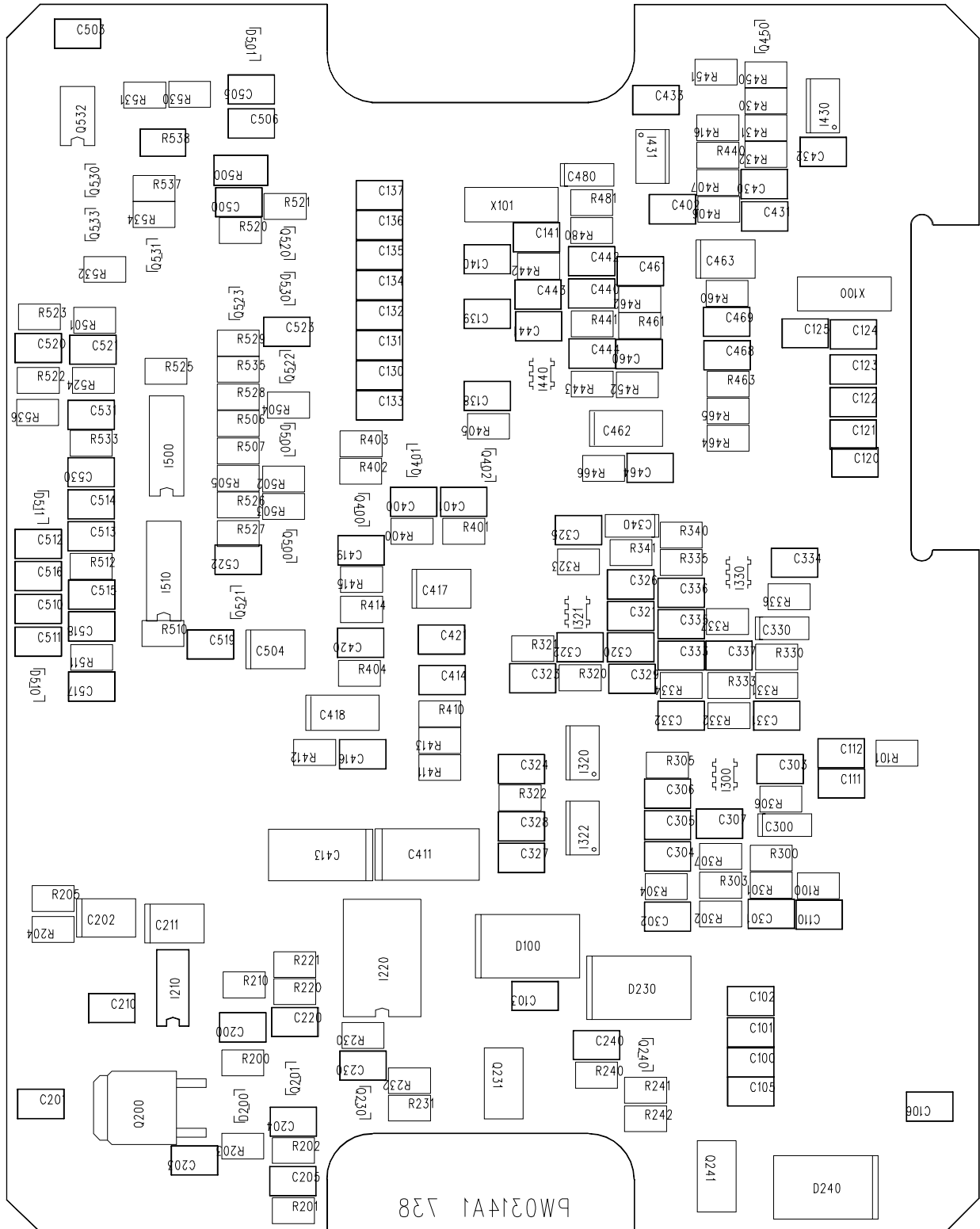
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RD0223	R452	SMD resistor	22 k 5% 0.125 W	Kamaya	
RD0223	R460	SMD resistor	22 k 5% 0.125 W	Kamaya	
RD0102	R461	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0223	R462	SMD resistor	22 k 5% 0.125 W	Kamaya	
RD0101	R463	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0103	R464	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0561	R465	SMD resistor	560 R 5% 0.125 W	Kamaya	
RD0339	R466	SMD resistor	3.3 R 5% 0.125 W	Kamaya	
RD0104	R480	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0683	R481	SMD resistor	68 k 5% 0.125 W	Kamaya	
RC0108	R500	SMD resistor	0.1 R 5% 0.25W	Philips	232272496002
RD0103	R501	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R502	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0560	R503	SMD resistor	56 R 5% 0.125 W	Kamaya	
RD0272	R504	SMD resistor	2.7 k 5% 0.125 W	Kamaya	
RD0332	R505	SMD resistor	3.3 k 5% 0.125 W	Kamaya	
RD0332	R506	SMD resistor	3.3 k 5% 0.125 W	Kamaya	
RD0222	R507	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RD0332	R510	SMD resistor	3.3 k 5% 0.125 W	Kamaya	
RD0683	R511	SMD resistor	68 k 5% 0.125 W	Kamaya	
RD0683	R512	SMD resistor	68 k 5% 0.125 W	Kamaya	
RD0122	R520	SMD resistor	1.2 k 5% 0.125 W	Kamaya	
RD0272	R521	SMD resistor	2.7 k 5% 0.125 W	Kamaya	
RD0224	R522	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0154	R523	SMD resistor	150 k 5% 0.125 W	Kamaya	
RD0105	R524	SMD resistor	1 M 5% 0.125 W	Kamaya	
RD0224	R525	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0103	R526	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0332	R527	SMD resistor	3.3 k 5% 0.125 W	Kamaya	
RD0685	R528	SMD resistor	6.8 M 5% 0.125 W	Kamaya	
RD0332	R529	SMD resistor	3.3 k 5% 0.125 W	Kamaya	
RD0471	R530	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0470	R531	SMD resistor	47 R 5% 0.125 W	Kamaya	
RD0271	R532	SMD resistor	270 R 5% 0.125 W	Kamaya	
RD0104	R533	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0103	R534	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0564	R535	SMD resistor	560 k 5% 0.125 W	Kamaya	
RD0102	R536	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0224	R537	SMD resistor	220 k 5% 0.125 W	Kamaya	
RC0108	R538	SMD resistor	0.1 R 5% 0.25W	Philips	232272496002
VW0106	V100	Connector	male 6-pin	Molex	5569-06-A1
VN0003	V102	Modular jack	4-pin	AMP	215875-1
VN0005	V103	Stereo jack	3.5mm	Zupami	3.5 EJW-C386
VM0242	V104	SMD system connector	1x16 pin	AMP	188227-1
VM0116	V105	Contact strip angle	2x8	NB-electr.	H4-6-16G
LF0061	X100	SMD EMI suppression filt	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472
LF0061	X101	SMD EMI suppression filt	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472

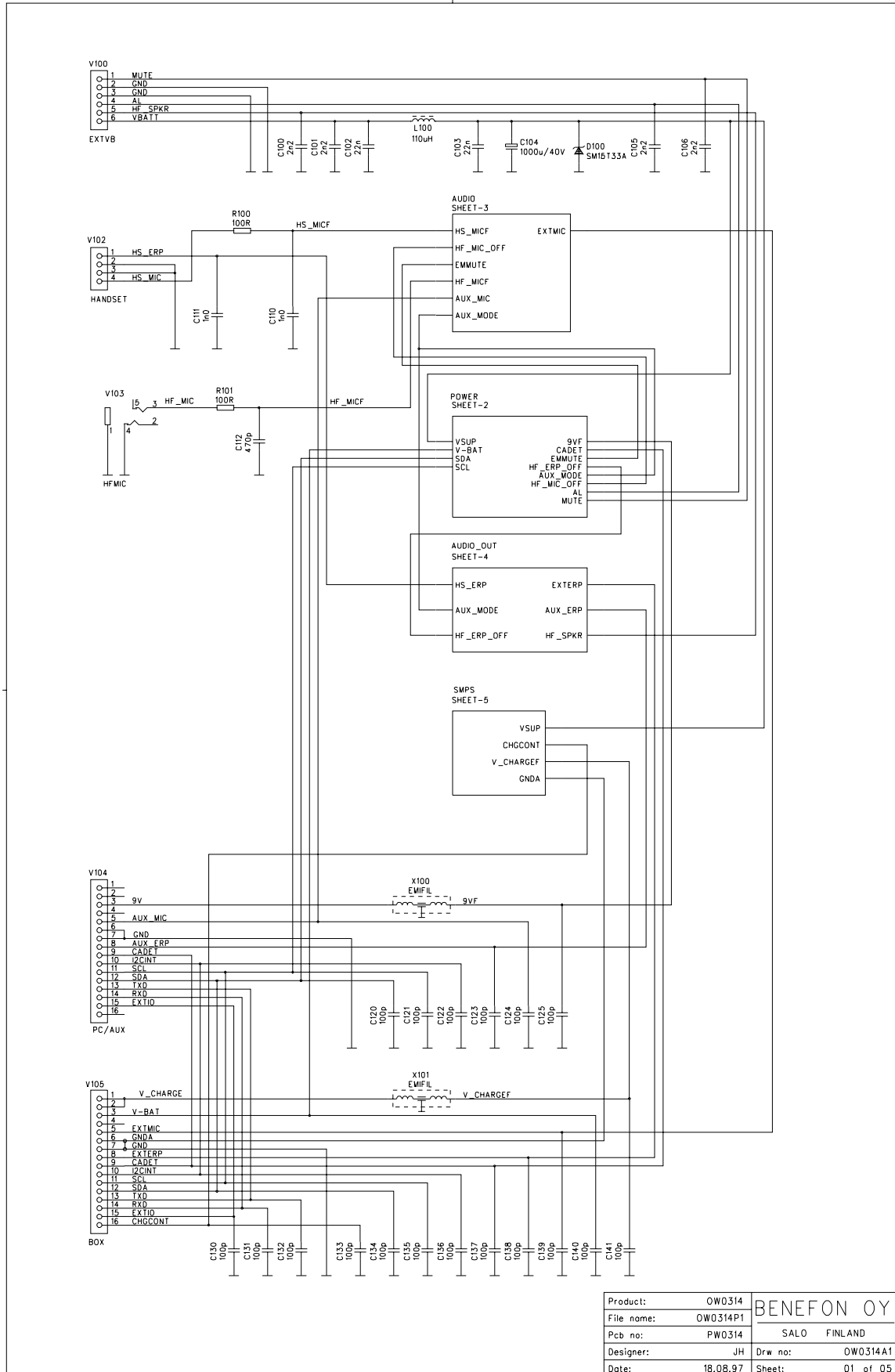
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19.09.97

The Top Side Layout PW0314A1

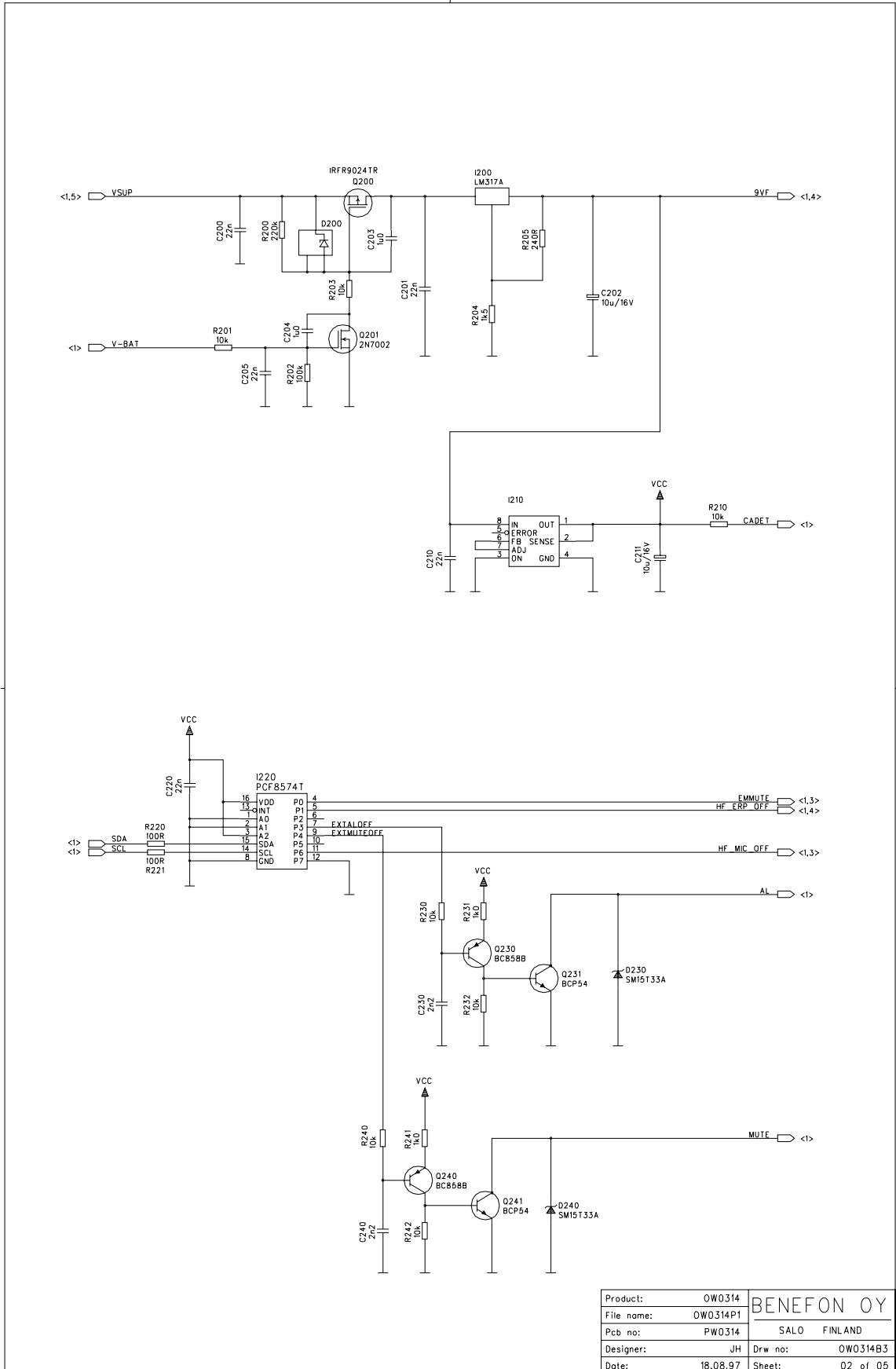


The Bottom Side Layout PW0314A1

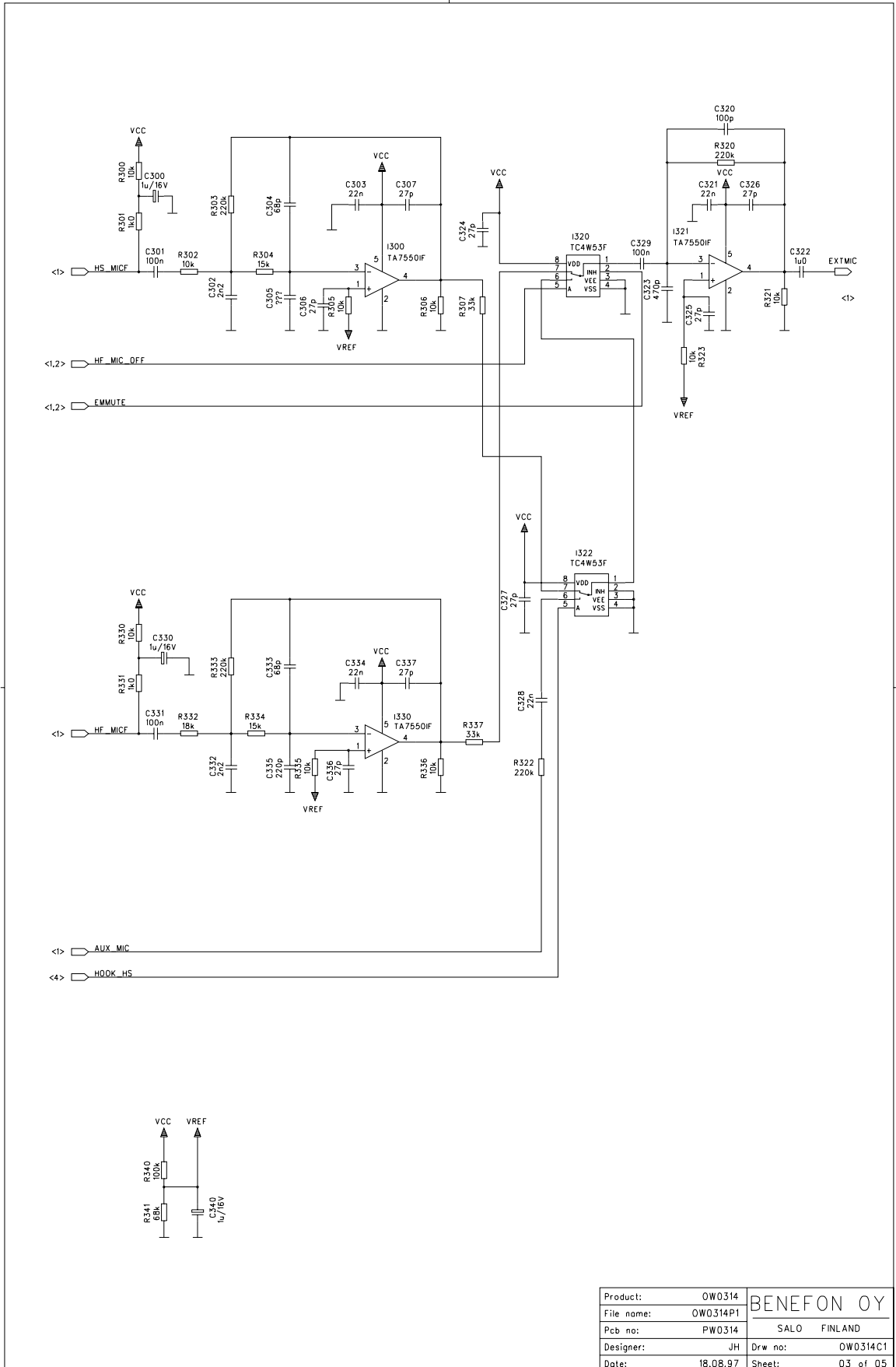




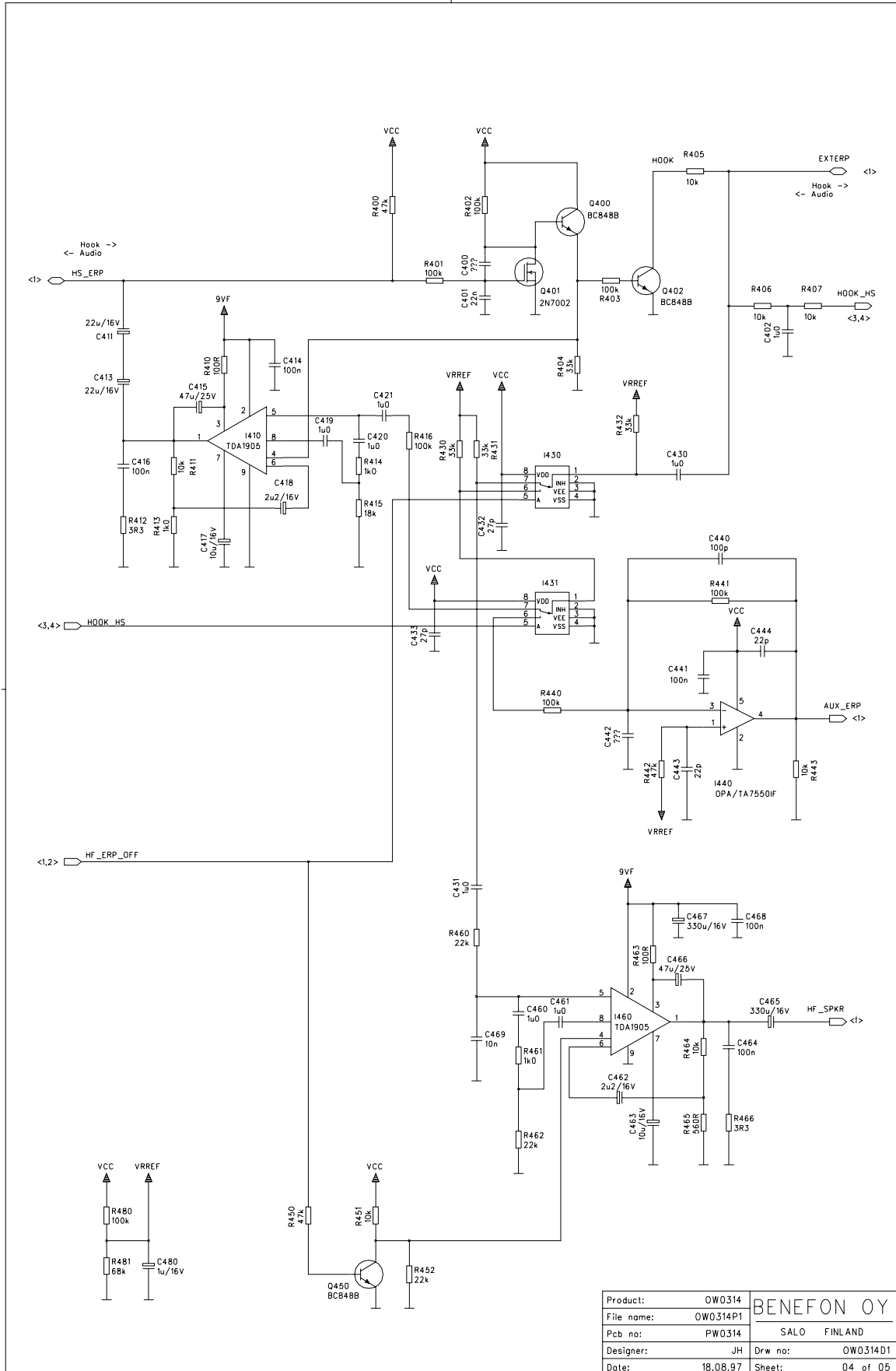
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File name:	OW0314P1		
Pcb no:	PW0314		SALO FINLAND
Designer:	JH		Drw no: OW0314A1
Date:	18.08.97		Sheet: 01 of 05

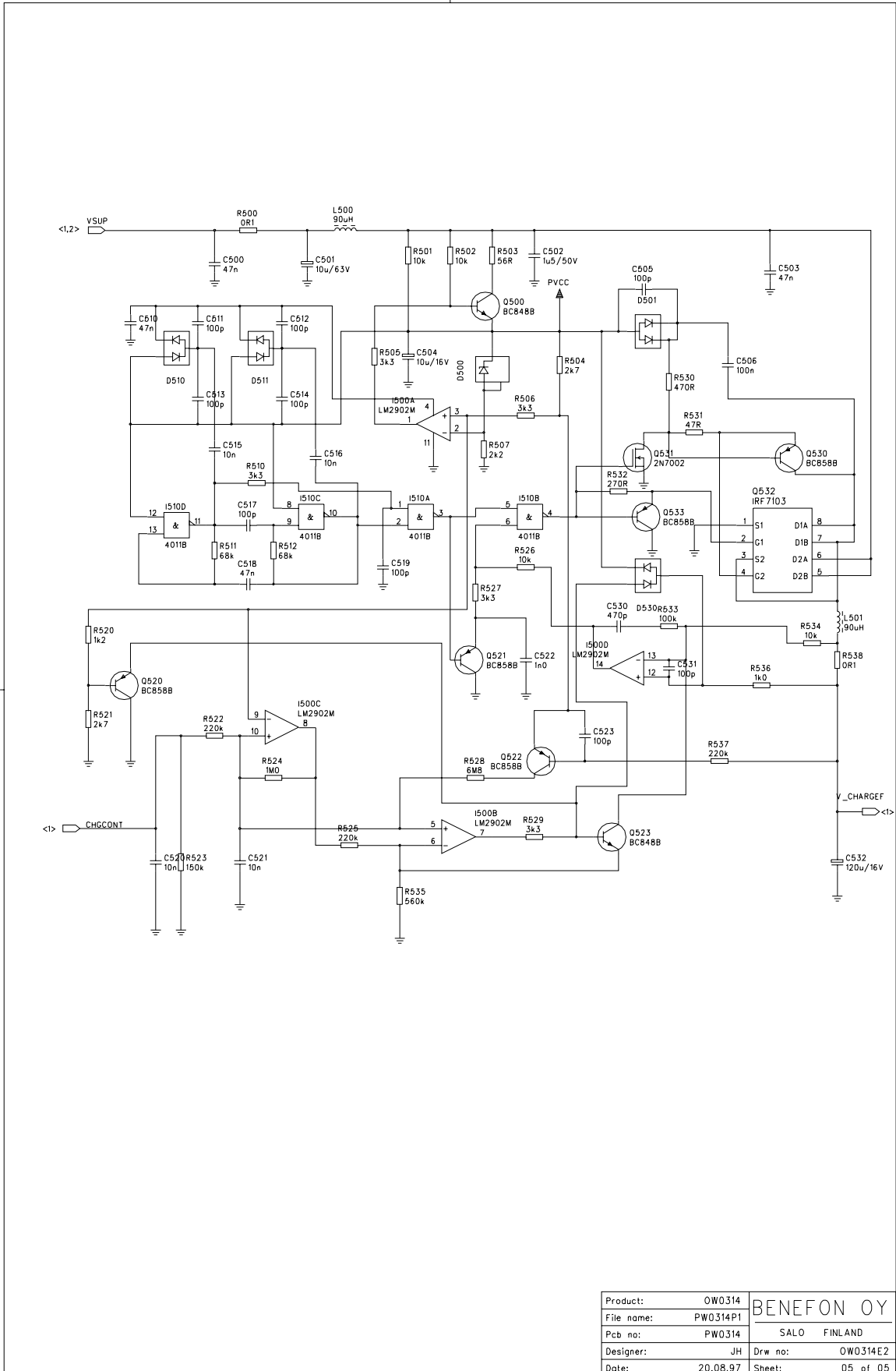


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File name:	OW0314P1	
Pcb no:	PW0314	SALO FINLAND
Designer:	JH	Drw no: OW0314B3
Date:	18.08.97	Sheet: 02 of 05



Product:	OW0314	BENEFON OY
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Pcb no:	PW0314	SALO FINLAND
Designer:	JH	Drw no: OW0314C1
Date:	18.08.97	Sheet: 03 of 05

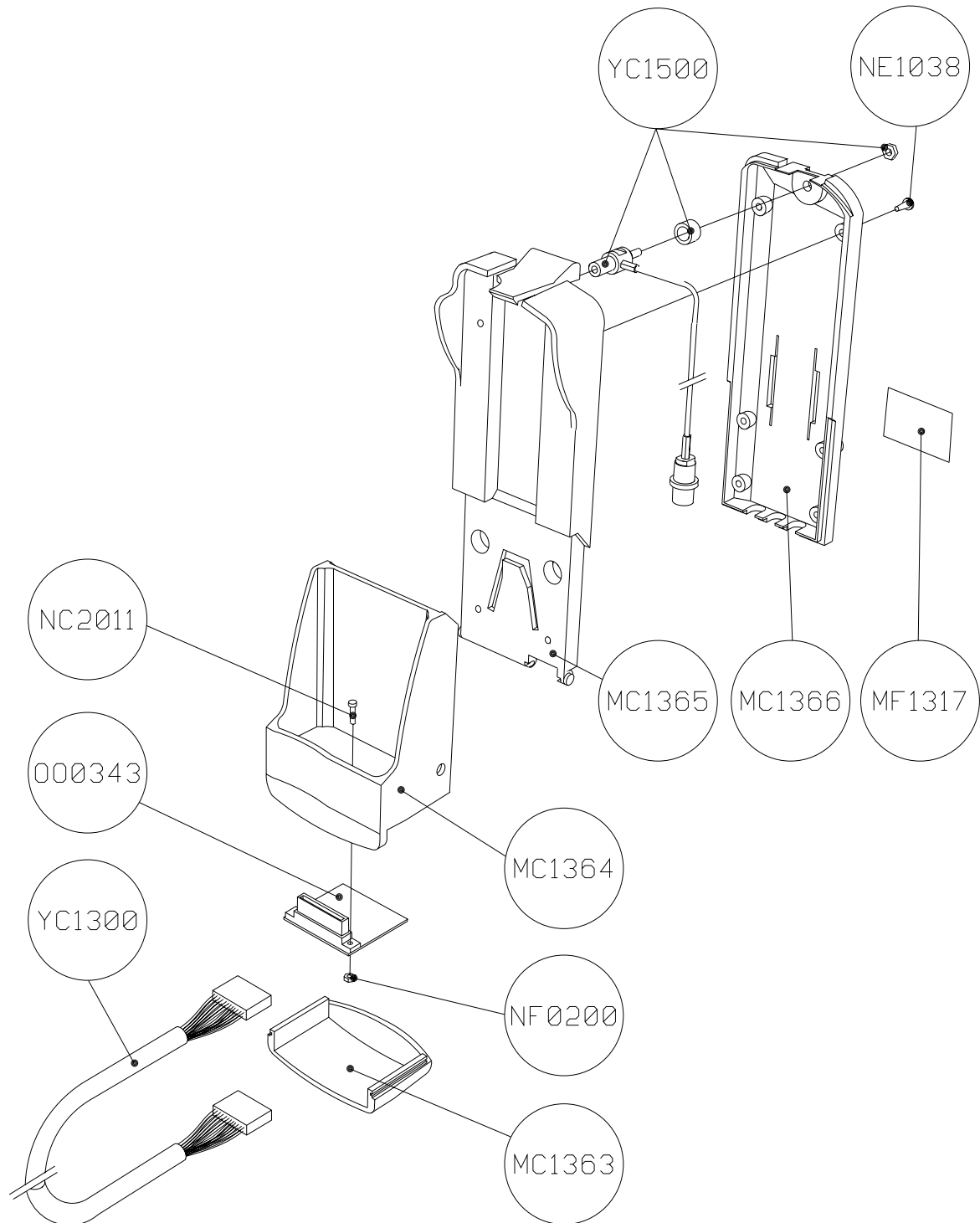




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Pcb no:	PW0314	SALO FINLAND
Designer:	JH	Drw no: OW0314E2
Date:	20.08.97	Sheet: 05 of 05

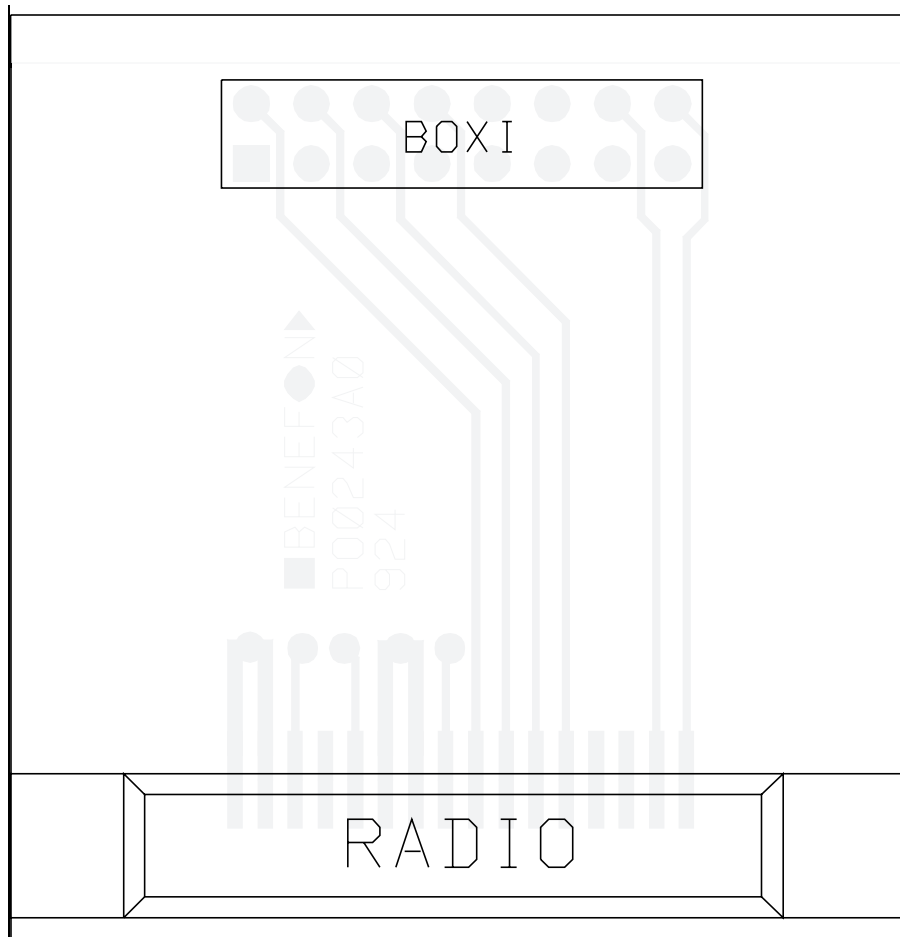
8.2 PHONE HOLDER

YM0024



Component Side Layout

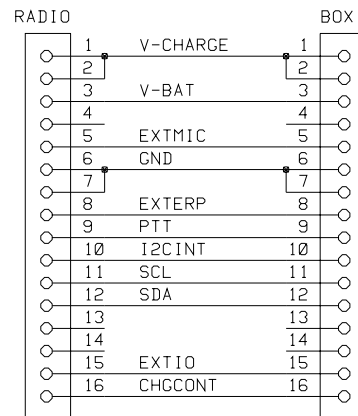
PO0243



Solder Side Layout



OO0343-module

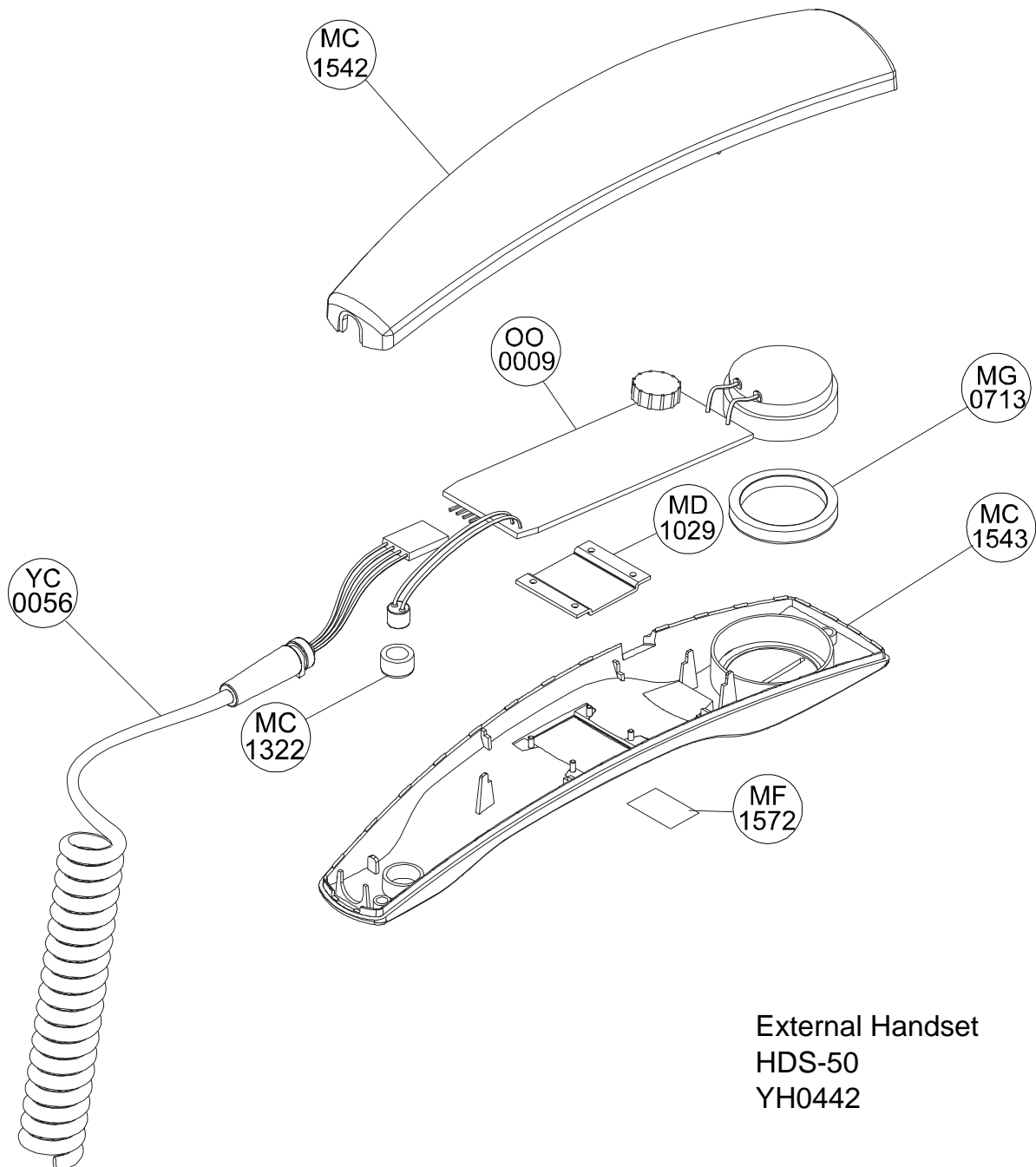


Product	TDP-40-TN2	Benefon Oy
Module no	000343	
Pcb no	P00243	Date 12-Jun-95
Title	TITLE	Designer JES
File	PIDIN1	Sheet 1 of 1

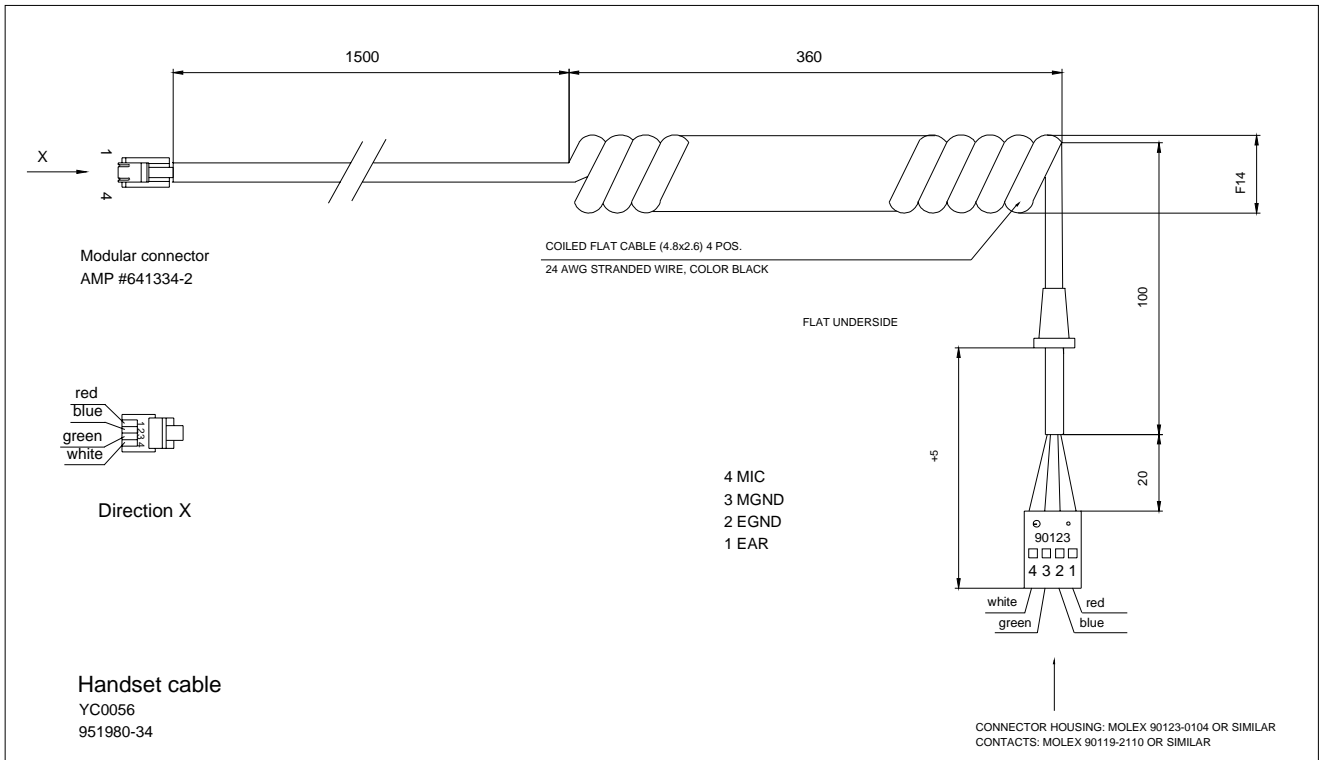
8.3 EXTERNAL HANDSET WITH CRADLE HDS-50

8.3.1 External Handset (not serviceable)

8.3.1.1 Mechanics



8.3.1.2 Cable



Outer Sheath

Material:

Coloured PVC
Black, BS 6748
TYPE TM2 and
BT M140C

Colour:

Matt

Length:

Finnish:

5 ±0,2 m

Total:

Coiled length:

3 ±0,2 m

Number of conductors:

4

Size:

AWG 26 stranded wire

Resistance:

< 100 mohm/m

Number of strands

Multiwire (30 x 0.08 mm
PCW)

Insulation material:

Coloured polypropylene

Strain relief:

Shall be firmly attached to
the cable

8.3.2 General

The external handset is designed for use together with the hands-free car kit. The external handset includes a microphone, an earphone and a reed switch. The handset kit contains a handset with a cable and a modular connector, a cradle, and mounting devices. A reed element shall be used to switch the audio signals to the handset when the handset is hooked off.

8.3.3 Connector XIN Signals

1	ERP	earphone input, HOOK state
2	GND	ground
3	GND	ground
4	MIC	microphone output

8.3.4 Microphone

Sensitivity:	-43 dB \pm 6 dB
Vendor and part no:	Hosiden KUC2023 or KUB2023
RF decoupling capacitor:	33 pF; Size: 0805; Mounted on the microphone element.

8.3.5 Speaker

Sensitivity	95 dB \pm 5 dB
Vendor and part no:	Hosiden KDR0928-IE-0030
Impedance:	min 120 ohm
Resistance (DC):	max 3 kohm

8.3.6 Hook

The hook operation is done by use of a reed switch. Hook operation is connected to the handset earphone terminal.

The operation is as follows:

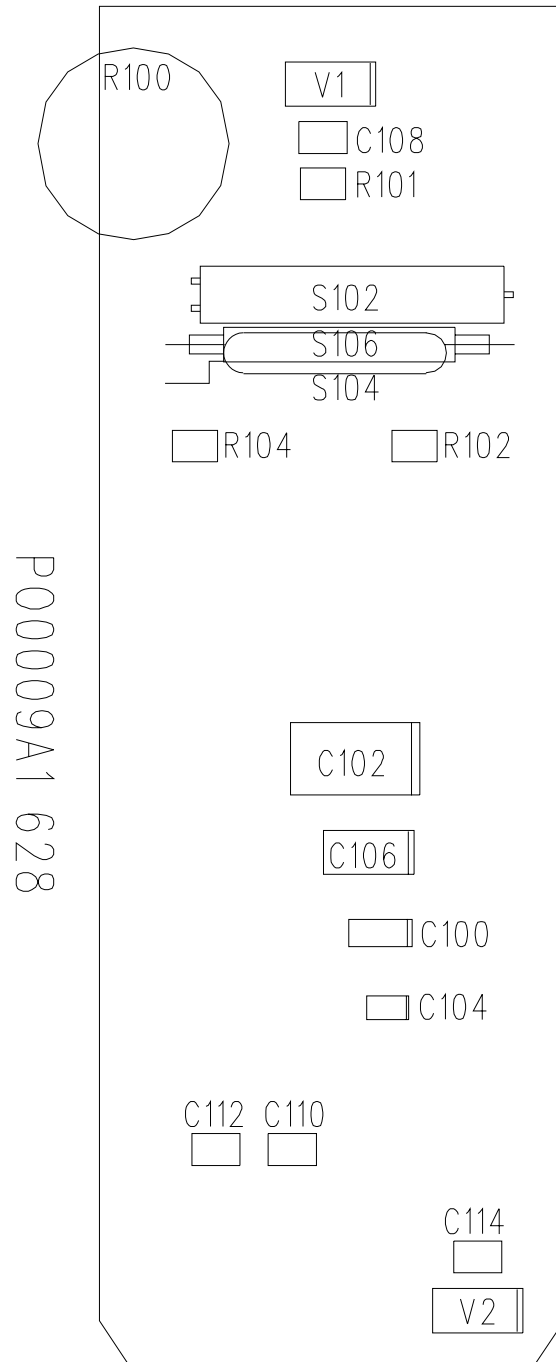
ON_HOOK	HIGH DC IMPEDANCE (SWITCH OPEN)
OFF_HOOK	LOW DC IMPEDANCE (SWITCH CLOSED), 2.2 KOHM RESISTANCE

8.3.7 Parts list OO0009

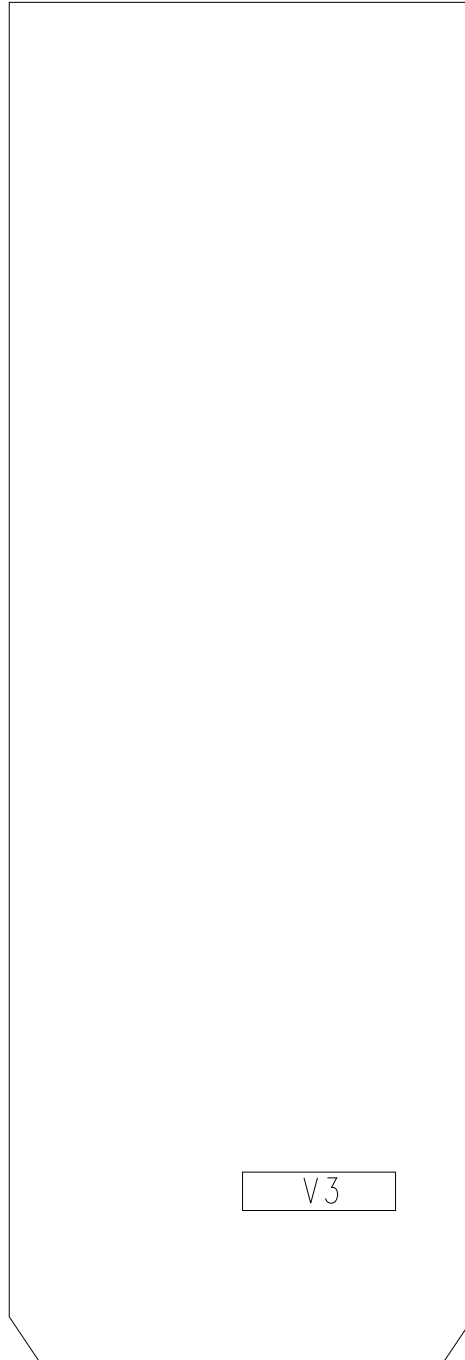
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CU0475	C106	SMD tantal	4.7uF/16V 20% 4.7X2.6MM	Matsushita	ECST1CB 475R
CD0221	C108	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CD0221	C110	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CD0221	C112	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CD0221	C114	SMD capasitor	220 pF 5% 50 V NP0	Philips	
PO0009	M100	PCB for OO0900			
RP0222	R100	Edge control pot.	2.2k 0.1W LOG.	Ruwido	0037-006 2k2 log
RD0222	R102	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
AR0016	S102	Reed-relay		Hamlin	59160-031
AE0018	XERP	Assembled earphone unit	150ohm/94-+3dB/60mW	Hoside	KDR0928-1E-0300
AM2024	XMIC	Assembled microphone unit	Electret condenser -43-+4dB	Hoside	KUB2023-030444SB
VM0204	XIN	Contact strip angle	1 x 4		

Last
update
16.05.97

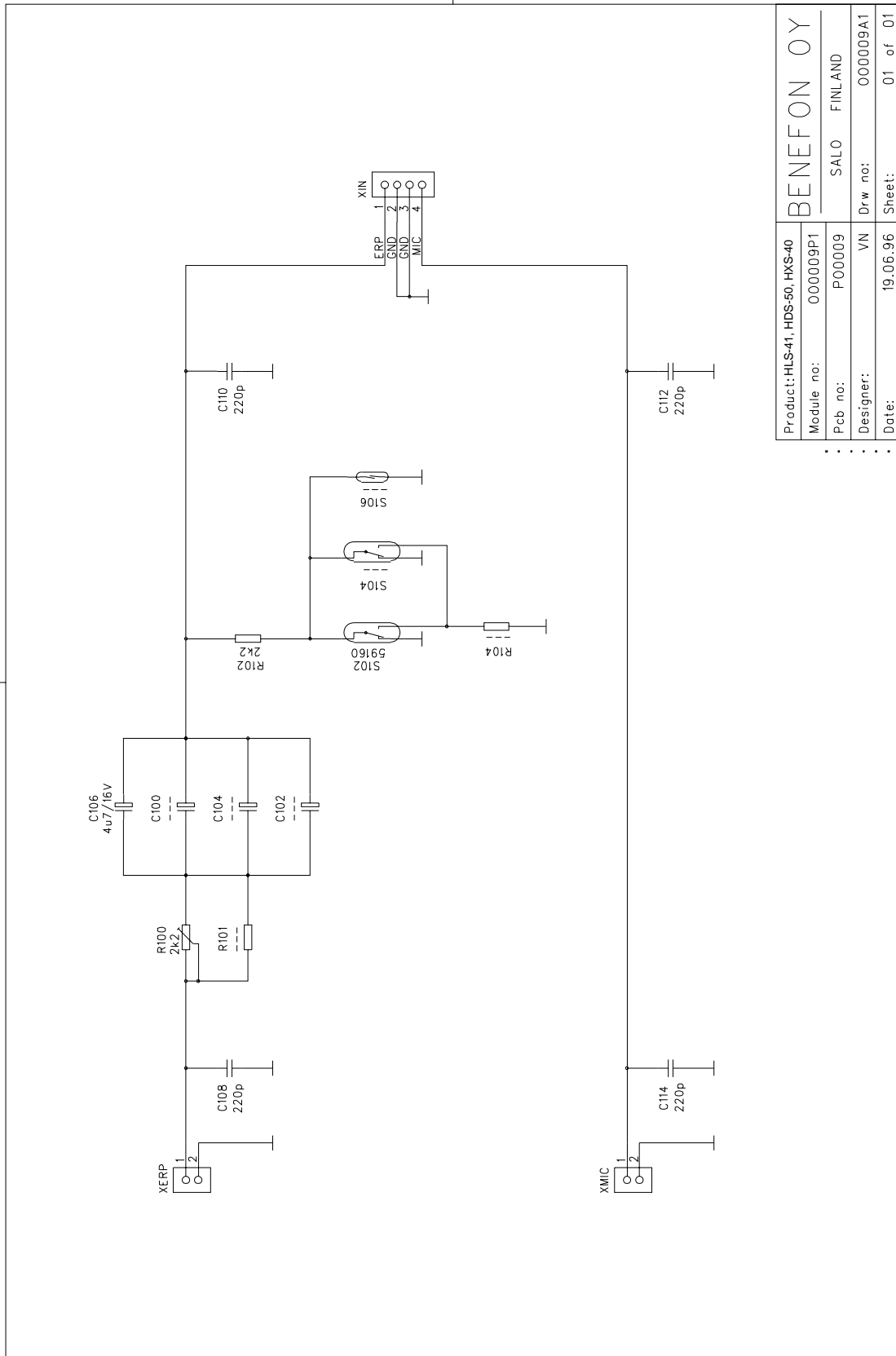
The Top Side Layout PO0009A1 (Schematic OO0009A1)



The Bottom Side Layout PO0009A1 (Schematic OO0009A1)



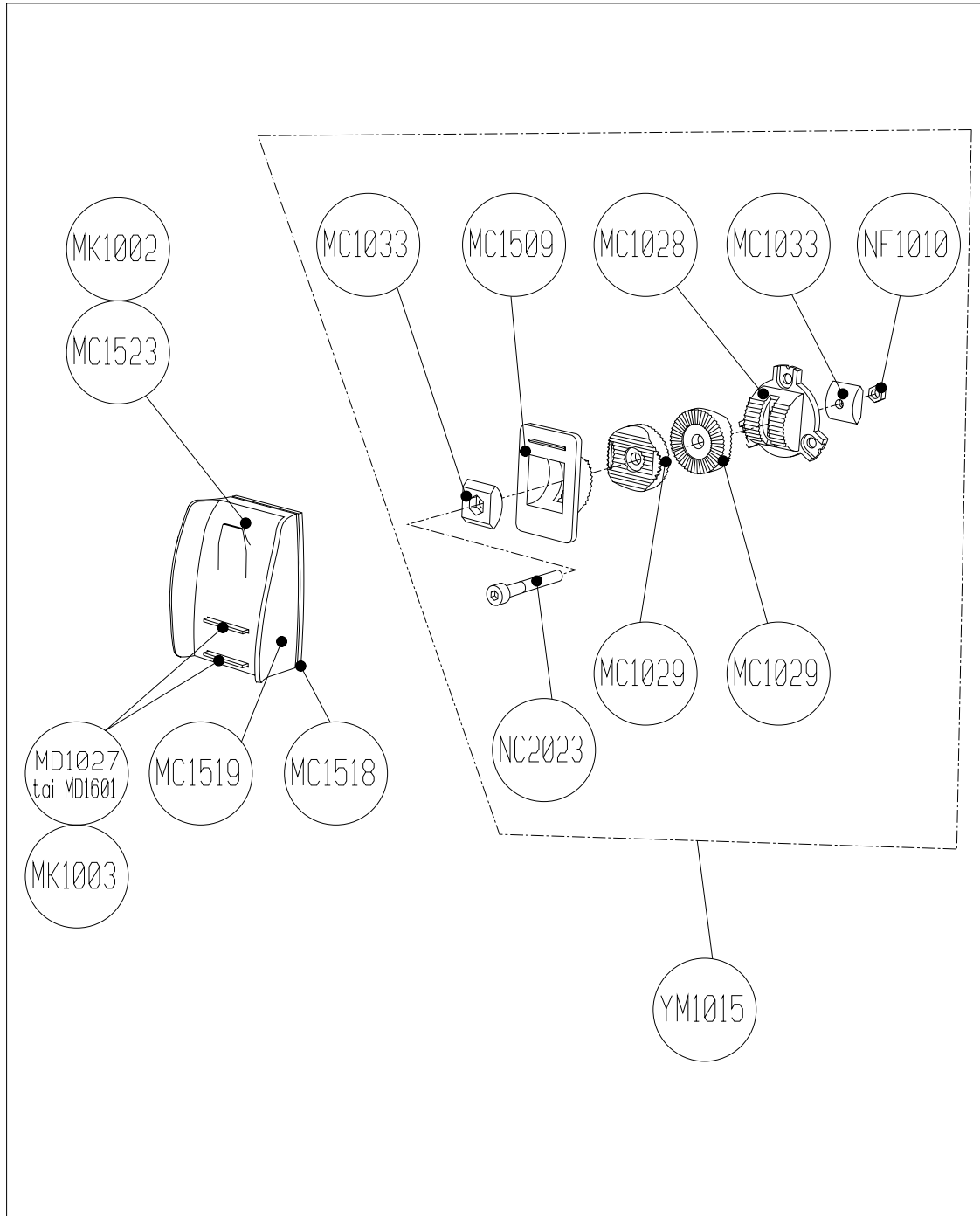
PO0009A1 058



Product: HLS-41, HDS-50, HXS-40		BENEFON OY	
Module no:	000009P1	SALO	FINLAND
Pcb no:	P00009	Drw no:	000009A1
Designer:	VN	Date:	19.06.96
		Sheet:	01 of 01

8.3.8 Cradle

8.3.8.1 Mechanics



UNMARKED TOLERANCES		BENEFON OY Salo, Finland	Project	KURKI	Product		Scale	Designer/Date	KH/20.01.94
Dimensions	Tolerance		Benefon code		File	\KURKI\KIIN.DWG			
>0.5 ≤ 6	± 0.1		Name		HSH-40				
>6 ≤ 30	± 0.2		Drawing number						
>30 ≤ 120	± 0.3								
>120 ≤ 315	± 0.5								
>315 ≤ 1000	± 0.8								

9.0 OFFICE SET



OFFICE SET

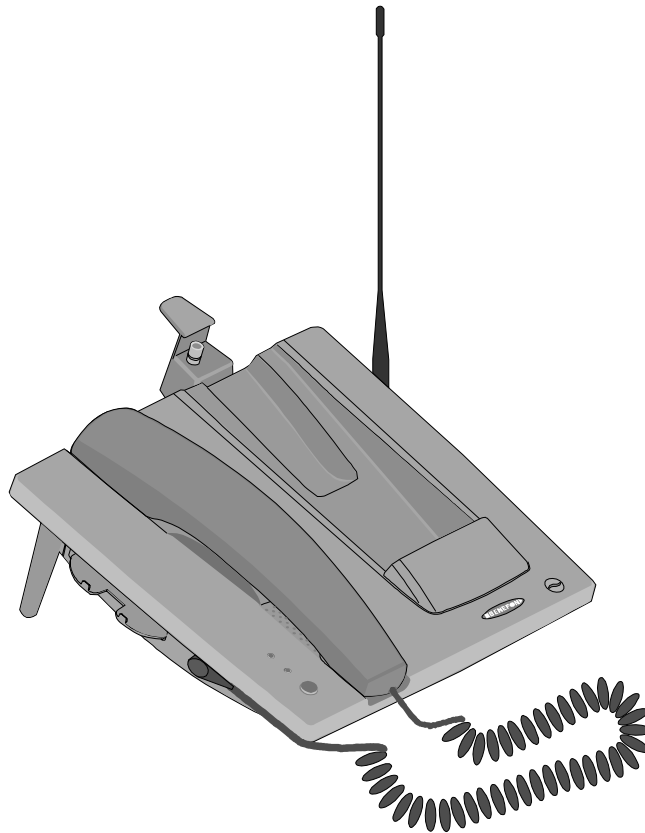
9.1 OFFICE SET DDS-40

YO0310

9.1.1 General

Main features of the office set are:

- Hands Free microphone and speaker
- Handset
- connection for external antenna
- intelligent charge functions for both the phone battery and the spare battery
- connection for additional accessories



Office set DDS-40

The office set is designed to make the use of the mobile phone easier and more effective both at home and at workplace.

You can charge the phone battery and charge and discharge the spare battery in the desk top stand. The desk top stand also offers a fixed microphone and loudspeaker for a hands free function. An external antenna and various terminal appliances can also be connected to the desk top stand. A handset guarantees privacy for your conversation and improves audibility in a noisy environment.

9.1.2 Connectors

9.1.2.1 Main module OO0300

AUX/PWR_IN_1, AUX/PWR_IN_2

PIN #	NAME	DESCRIPTION	LEVEL
1,2	VB	power in	max. 10 V, 1,5 A
3	PH_VOLT	mobile battery voltage	
4	nc		
5	AUX_MIC	auxiliary microphone signal	
6,7	GND	ground	
8	AUX_ERP	auxiliary earphone signal	
9	nc		
10	I2CINT	I2C bus interrupt	
11	SCL	I2C bus clock	
12	SDA	I2C bus data	
13	TxD	RS-232 TxD	
14	RxD	RS-232 RxD	
15	nc		
16	VB_CTRL	power supply control	0 - 5 VDC

V2

PIN #	NAME	DESCRIPTION	LEVEL
1	GND	ground	
2	HS_MIC	Handset microphone signal	
3	HS_ERP	Handset earphone signal	
4	PH_R	phone charge indicator led, red	0 / 5 VDC
5	PH_G	phone charge indicator led, green	0 / 5 VDC
6	B_R	battery charge indicator led, red	0 / 5 VDC
7	B_G	battery charge indicator led, green	0 / 5 VDC
8	SWITCH	battery discharge switch	0/ 5 VDC

V4

PIN #	NAME	DESCRIPTION	LEVEL
1	V_CHG	charge current for phone	max. 10 V, 1.5 A
2	V_BATT	mobile battery voltage	
3	EXTMIC	microphone signal	
4	GND	ground	
5	EXTERP	earphone signal	
6	CADET	office kit indicator for phone	5 VDC
7	I2CINT		I2C bus interrupt
8	SCL		I2C bus clock
9	SDA		I2C bus data
10	TxD		RS-232 TxD
11	RxD		RS-232 RxD
12	PH_CTRL	charger control from phone	0 - 5 VDC

V5, V13

PIN #	NAME	DESCRIPTION	LEVEL
	I_BATT	charge current for battery	max. 10 V, 1.5 A

V6, V11

PIN #	NAME	DESCRIPTION	LEVEL
	BMEM	battery pack data	

V7

PIN #	NAME	DESCRIPTION	LEVEL
	B_TEMP	battery pack temperature	0 - 5 VDC

V8, V12

PIN #	NAME	DESCRIPTION	LEVEL
	GND	ground for battery pack	

V9

PIN #	NAME	DESCRIPTION	LEVEL
1	HF_MIC	Hands Free microphone	
2	GND	ground	

V10

PIN #	NAME	DESCRIPTION	LEVEL
1	HF_SPKR	Hands Free speaker	
2	GND	ground	

9.1.2.2 Led module OO0301

V1

PIN #	NAME	DESCRIPTION	LEVEL
1	GND	ground	
2	HS_MIC	Handset microphone signal	
3	HS_ERP	Handset earphone signal	
4	PH_R	phone charge indicator led, red	0 / 5 VDC
5	PH_G	phone charge indicator led, green	0 / 5 VDC
6	B_R	battery charge indicator led, red	0 / 5 VDC
7	B_G	battery charge indicator led, green	0 / 5 VDC
8	SWITCH	battery discharge switch	0 / 5 VDC

V2

PIN #	NAME	DESCRIPTION	
1	GND	ground	
2	HS_ERP	Handset earphone signal	
3	HS_MIC	Handset microphone signal	

9.1.2.3 Connector module OO0302

V1

PIN #	NAME	DESCRIPTION	LEVEL
1	V_CHG	charge current for phone	max. 10 V, 1.5 A
2	V_BATT	mobile battery voltage	
3	EXTMIC	microphone signal	
4	GND	ground	
5	EXTERP	earphone signal	
6	CADET	office kit indicator for phone	5 VDC
7	I2CINT	I2C bus interrupt	
8	SCL	I2C bus clock	
9	SDA	I2C bus data	
10	TxD	RS-232 TxD	
11	RxD	RS-232 RxD	
12	PH_CTRL	charger control from phone	0 - 5 VDC

V2

PIN #	NAME	DESCRIPTION	LEVEL
1,2	V_CHG	charge current for phone	max. 10 V, 1.5 A
3	V_BATT	mobile battery voltage	
4	nc		
5	EXTMIC	microphone signal	
6,7	GND	ground	
8	EXTERP	earphone signal	
9	CADET	office kit indicator for phone	5 VDC
10	I2CINT	I2C bus interrupt	
11	SCL	I2C bus clock	
12	SDA	I2C bus data	
13	TxD	RS-232 TxD	
14	RxD	RS-232 RxD	
15	nc		
16	PH_CTRL	power supply control	0 - 5 VDC

9.1.3 Operation

9.1.3.1 General

Power supply unit is connected to one of the connectors on the back of the unit. Connections on these two connectors are identical to each other. Supply voltage (VB) turns on regulator I124 which is used to generate +5 VDC supply (VCC) for processor and other electronics. Note that the power amplifiers of the earphone signal, I499 and I528 do not use VCC but VB instead. Once the VCC signal has risen, also the signal CADET is activated. This makes the phone communicate with the I2C circuit and find out that office kit is present.

9.1.3.2 Processor / charging

The processor I264 is National Semiconductor COPCF888. Used crystal frequency is 8,00 MHz.

I/O pins/signals are as follows:

I/O SIGNALS		DIRECTION
C0	spare battery discharge switch	IN
C7	battery pack memory	IN / OUT
D0	phone charge fet control	OUT
D1	spare battery charge fet control	OUT
D2	spare battery discharge control	OUT
D3	phone detect current control	OUT
D4	phone charge indicator (red) control	OUT
D5	phone charge indicator (green) control	OUT
D6	spare battery charge indicator (red) control	OUT
D7	spare battery charge indicator (green) control	OUT
G3	power supply control	OUT
I0	charger control from phone	IN
I1	spare battery temperature	IN
I2	phone battery voltage	IN
I3	spare battery voltage	IN
I4	PWM_CHK (not used)	IN

A/D input I3 is used to measure the voltage of the spare battery. Amplifier I277 converts the input voltage level into new range which is suitable for the A/D input. Output G3 is a PWM signal which is converted with R291 and C293 into analog DC signal. This signal is used to control the output current of the power supply unit. Outputs D0 and D1 are used to turn on charging current for phone and spare battery. P-channel fets Q211 and Q221 are normally in non-conducting state (gate voltage tied to VB) and are turned on with fets Q212 and Q222 as the control signal has been activated. In normal operation fets Q211 and Q221 are never simultaneously in conducting state.

Spare battery discharge is controlled with signal D2. High level on output switches transistors Q287 and Q285 into conducting state which makes current flow through resistors R280-283 and transistor Q285. Nominal value of discharge current is ~ 180 mA.

Signal D3 is used to turn on/off the detect current supply I234. Logic high signal turns the regulator off and logic low on. When the phone is present, the state of this pin is usually low. Only when the charge control line I0 has a value greater than 4 VDC is this output turned to high state. Regulator I234 output is ~ 7 VDC, I_{max} 150 mA.

Charge indicator leds are turned on using the signals D4 to D7. Logic high signals switch transistors Q303, Q305, Q313 and Q315 into conducting state. The emitter pins of the transistors are directly connected to the anode pins of the leds.

9.1.3.3 Audio

The signal P1 (HF_OFF) of the I2C circuit I203 is used to control the analog switches I435 and I437. Q512 inverts this signal for switch I484. The inverted signal is also used for controlling the MUTE pin of the power amplifier I528. Low level signal turns MUTE on and high level signal (3 V) off respectively. Switch I481 and MUTE pin of power amplifier I499 are controlled with signal HS_CTRL. This signal is inverted from the DC level of the handset earphone signal.

HOOK signal is controlled with the handset. Whenever the handset has been placed on the holder, the DC level of the HS_ERP signal should be ~ 4,2 V. Removing the handset from the holder makes the voltage drop to a value of 0,4 VDC. This signal and the transistors Q474 and Q475 are used to control the DC level of the EXTERP signal. ON_HOOK level is ~ 5 VDC, OFF_HOOK ~ 0,6 VDC.

9.1.4 Parts list OO0300

OO0300

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CD0101	C100	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C101	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C102	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C103	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C104	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C105	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C106	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C107	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C108	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C109	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C111	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C112	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C113	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C114	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C115	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C116	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C117	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C118	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C119	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0473	C120	SMD capasitor	47 nF 10% 50 V X7R	Philips	
CU0226	C121	SMD tantal	22uF/16V 10% 7.3x4.3mm	Kyocera	TAJD226K016R
CD0223	C123	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU0226	C125	SMD tantal	22uF/16V 10% 7.3x4.3mm	Kyocera	TAJD226K016R
CD0223	C126	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0104	C127	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CD0101	C130	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C131	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C140	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C141	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C142	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C143	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C144	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C145	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C146	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C147	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C148	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0101	C149	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0680	C160	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CD0680	C161	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CD0223	C202	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU1106	C232	SMD tantal	10uF/16V	AVX	TAJB106M016R
CD0223	C233	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU1106	C235	SMD tantal	10uF/16V	AVX	TAJB106M016R
CD0680	C242	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CD0223	C247	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0223	C252	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0223	C255	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0223	C258	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0220	C260	SMD capasitor	22 pF 5% 50 V NP0	Philips	
CD0220	C263	SMD capasitor	22 pF 5% 50 V NP0	Philips	
CD0473	C265	SMD capasitor	47 nF 10% 50 V X7R	Philips	
CD0473	C267	SMD capasitor	47 nF 10% 50 V X7R	Philips	
CD0223	C272	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0101	C275	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0223	C279	SMD capasitor	22 nF 10% 50 V X7R	Philips	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CD0223	C292	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CH0105	C293	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C402	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CD0104	C403	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CD0222	C406	SMD capasitor	2.2 nF 5% 50 V NP0	Philips	
CD0680	C408	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CD0223	C409	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CH0105	C422	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CD0104	C423	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CD0222	C426	SMD capasitor	2.2 nF 5% 50 V NP0	Philips	
CD0680	C428	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CD0223	C429	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0101	C441	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0223	C442	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0104	C445	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CD0104	C446	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CU2105	C452	SMD tantal	1uF/10V	AVX	TAJR105M010R
CU2105	C455	SMD tantal	1uF/10V	AVX	TAJR105M010R
CD0101	C461	SMD capasitor	100 pF 5% 50 V NP0	Philips	
CD0223	C463	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0223	C472	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CD0104	C477	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CH0105	C485	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CU0226	C490	SMD tantal	22uF/16V 10% 7.3x4.3mm	Kyocera	TAJD226K016R
CU0226	C491	SMD tantal	22uF/16V 10% 7.3x4.3mm	Kyocera	TAJD226K016R
CD0104	C492	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CD0104	C496	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CE0476	C498	Al elko	47 uF/25 V 7x7mm	Philips	2222 097 56479
CU1106	C500	SMD tantal	10uF/16V	AVX	TAJB106M016R
CU0225	C501	SMD tantal	2.2uF/16V 20% 4.7x2.6mm	Matsushita	ECST1CB 225R
CE0337	C502	Al elko	330uF/16V 20% 15x8mm	Philips	222213555331
CH0105	C503	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C506	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C507	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CD0222	C520	SMD capasitor	2.2 nF 5% 50 V NP0	Philips	
CH0105	C523	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C526	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CD0104	C527	SMD capasitor	100 nF 10% 50 V X7R	Philips	
CU0225	C529	SMD tantal	2.2uF/16V 20% 4.7x2.6mm	Matsushita	ECST1CB 225R
CE0476	C531	Al elko	47 uF/25 V 7x7mm	Philips	2222 097 56479
CU1106	C532	SMD tantal	10uF/16V	AVX	TAJB106M016R
CE0337	C535	Al elko	330uF/16V 20% 15x8mm	Philips	222213555331
CE0337	C536	Al elko	330uF/16V 20% 15x8mm	Philips	222213555331
CD0104	C537	SMD capasitor	100 nF 10% 50 V X7R	Philips	
DY0006	D224	Shottky diode	60V/3.3A	I&R	30WQ06F
DS0070	D236	SMD diode pair	70V/100mA common cathode	Philips	BAV 70
IR2952	I124	Regulator	100mA 5V adj. 0.5%	Micrel	MIC2951-02BM
II8574	I203	8 bit I/O	I2C	Philips	PCF8574T
IR2952	I234	Regulator	100mA 5V adj. 0.5%	Micrel	MIC2951-02BM
IP8880	I264	Microcontroller	Single-Chip CMOS	NationalSe	COP888CF-XXX/V
IA7550	I277	Single op.amp.		Toshiba	TA 75S01F-TE85L
IA7550	I410	Single op.amp.		Toshiba	TA 75S01F-TE85L
IA7550	I430	Single op.amp.		Toshiba	TA 75S01F-TE85L
IC0453	I435	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L
IC0453	I437	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L
IA7550	I443	Single op.amp.		Toshiba	TA 75S01F-TE85L
IA7550	I464	Single op.amp.		Toshiba	TA 75S01F-TE85L
IC0453	I481	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L
IC0453	I484	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L

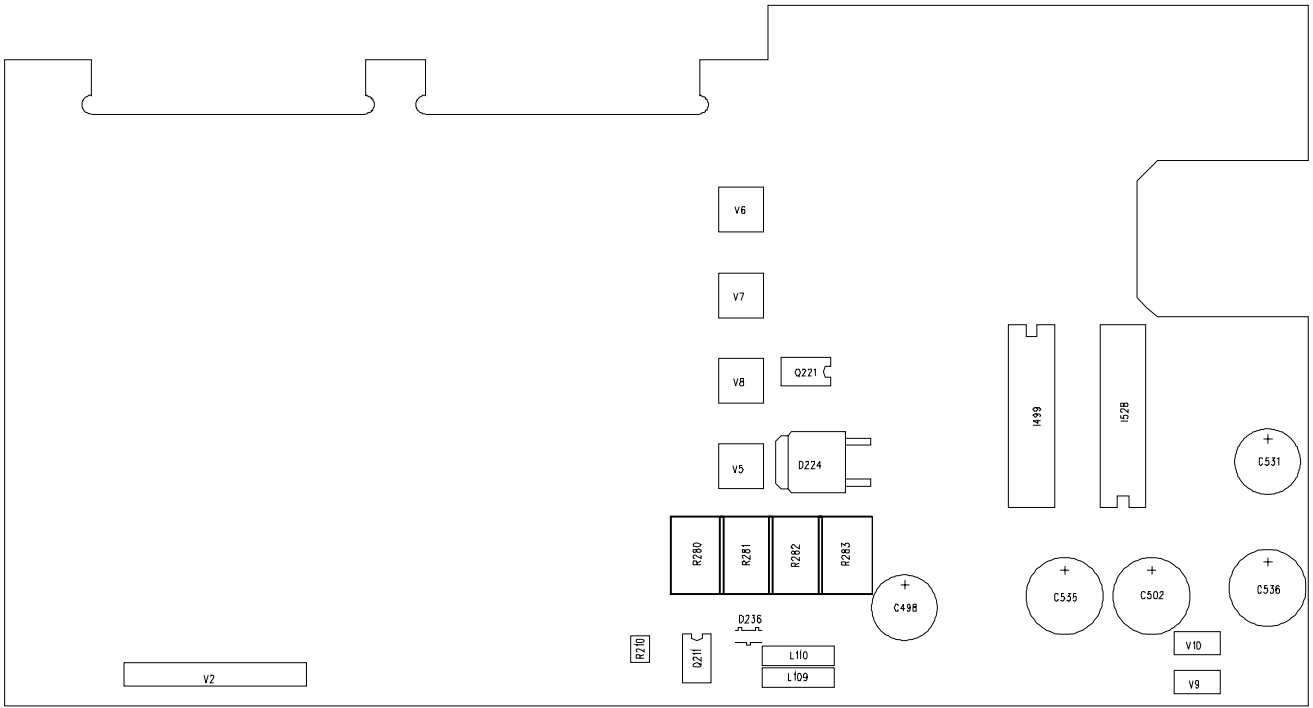
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
IA1905	I499	Audio power amplifier	5W/20V/4ohm	SGS/ Thomso	TDA1905
IA1905	I528	Audio power amplifier	5W/20V/4ohm	SGS/ Thomso	TDA1905
LF0061	L109	SMD EMI suppression filit	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472
LF0061	L110	SMD EMI suppression filit	4700pF/2A 1.6x6.8mm	Murata	NFM61R30T472
QF9430	Q211	SMD p-channel MOSFET	20V/4,8A/Rds=0.06	Siliconix	Si9430DY
QF7002	Q212	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QF9430	Q221	SMD p-channel MOSFET	20V/4,8A/Rds=0.06	Siliconix	Si9430DY
QF7002	Q222	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QS0054	Q285	SMD transistor	NPN 1.5A/45V	Philips	BCX 54
QSB848	Q287	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q303	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q305	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q313	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q315	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QF7002	Q474	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QSB848	Q475	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q479	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
QSB848	Q512	SMD transistor	NPN 0.1A/30V F=2dB	Philips	BC 848 B
RD0474	R100	SMD resistor	470 k 5% 0.125 W	Kamaya	
RD0103	R113	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0104	R119	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0103	R122	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0101	R200	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0101	R201	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0104	R210	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R213	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R220	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R223	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0473	R230	SMD resistor	47 k 5% 0.125 W	Kamaya	
RD0103	R231	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0100	R240	SMD resistor	10 R 5% 0.125 W	Kamaya	
RD0562	R241	SMD resistor	5.6 k 5% 0.125 W	Kamaya	
RD0104	R245	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0103	R246	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R251	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0104	R253	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R254	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0223	R256	SMD resistor	22 k 5% 0.125 W	Kamaya	
RD0103	R257	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0105	R262	SMD resistor	1 M 5% 0.125 W	Kamaya	
RD0104	R270	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0473	R271	SMD resistor	47 k 5% 0.125 W	Kamaya	
RD0104	R273	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0823	R274	SMD resistor	82 k 5% 0.125 W	Kamaya	
RD0473	R276	SMD resistor	47 k 5% 0.125 W	Kamaya	
RD0103	R278	SMD resistor	10 k 5% 0.125 W	Kamaya	
RK0131	R280	SMD resistor	130 ohm 1W 5%	Vitrohm	509-0
RK0131	R281	SMD resistor	130 ohm 1W 5%	Vitrohm	509-0
RK0131	R282	SMD resistor	130 ohm 1W 5%	Vitrohm	509-0
RK0131	R283	SMD resistor	130 ohm 1W 5%	Vitrohm	509-0
RD0102	R286	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0471	R288	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0103	R289	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R290	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R291	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R300	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R301	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0471	R302	SMD resistor	470 R 5% 0.125 W	Kamaya	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RD0471	R304	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0103	R310	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R311	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0471	R312	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0471	R314	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0103	R400	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0102	R401	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0183	R404	SMD resistor	18 k 5% 0.125 W	Kamaya	
RD0224	R405	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0153	R407	SMD resistor	15 k 5% 0.125 W	Kamaya	
RD0103	R411	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0223	R412	SMD resistor	22 k 5% 0.125 W	Kamaya	
RD0103	R420	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0102	R421	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0183	R424	SMD resistor	18 k 5% 0.125 W	Kamaya	
RD0224	R425	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0153	R427	SMD resistor	15 k 5% 0.125 W	Kamaya	
RD0103	R431	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0333	R432	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0224	R436	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0224	R440	SMD resistor	220 k 5% 0.125 W	Kamaya	
RD0103	R444	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0104	R450	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0683	R451	SMD resistor	68 k 5% 0.125 W	Kamaya	
RD0104	R453	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0683	R454	SMD resistor	68 k 5% 0.125 W	Kamaya	
RD0103	R460	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0104	R462	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R465	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0333	R466	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0223	R470	SMD resistor	22 k 5% 0.125 W	Kamaya	
RD0104	R471	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0104	R473	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0103	R476	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0104	R477	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0223	R478	SMD resistor	22 k 5% 0.125 W	Kamaya	
RD0333	R480	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0333	R482	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0333	R483	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0333	R485	SMD resistor	33 k 5% 0.125 W	Kamaya	
RD0339	R493	SMD resistor	3.3 R 5% 0.125 W	Kamaya	
RD0103	R494	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0102	R495	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0101	R497	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0104	R505	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0102	R508	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0183	R509	SMD resistor	18 k 5% 0.125 W	Kamaya	
RD0104	R510	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0103	R511	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0223	R513	SMD resistor	22 k 5% 0.125 W	Kamaya	
RD0104	R521	SMD resistor	100 k 5% 0.125 W	Kamaya	
RD0102	R524	SMD resistor	1 k 5% 0.125 W	Kamaya	
RD0153	R525	SMD resistor	15 k 5% 0.125 W	Kamaya	
RD0101	R530	SMD resistor	100 R 5% 0.125 W	Kamaya	
RD0103	R533	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0471	R534	SMD resistor	470 R 5% 0.125 W	Kamaya	
RD0339	R538	SMD resistor	3.3 R 5% 0.125 W	Kamaya	
VM0242	V1	SMD system connector	1x16 pin	AMP	188227-1
VM0242	V3	SMD system connector	1x16 pin	AMP	188227-1
NI0507	V5	Battery contact spring	for DDS-40		95196740

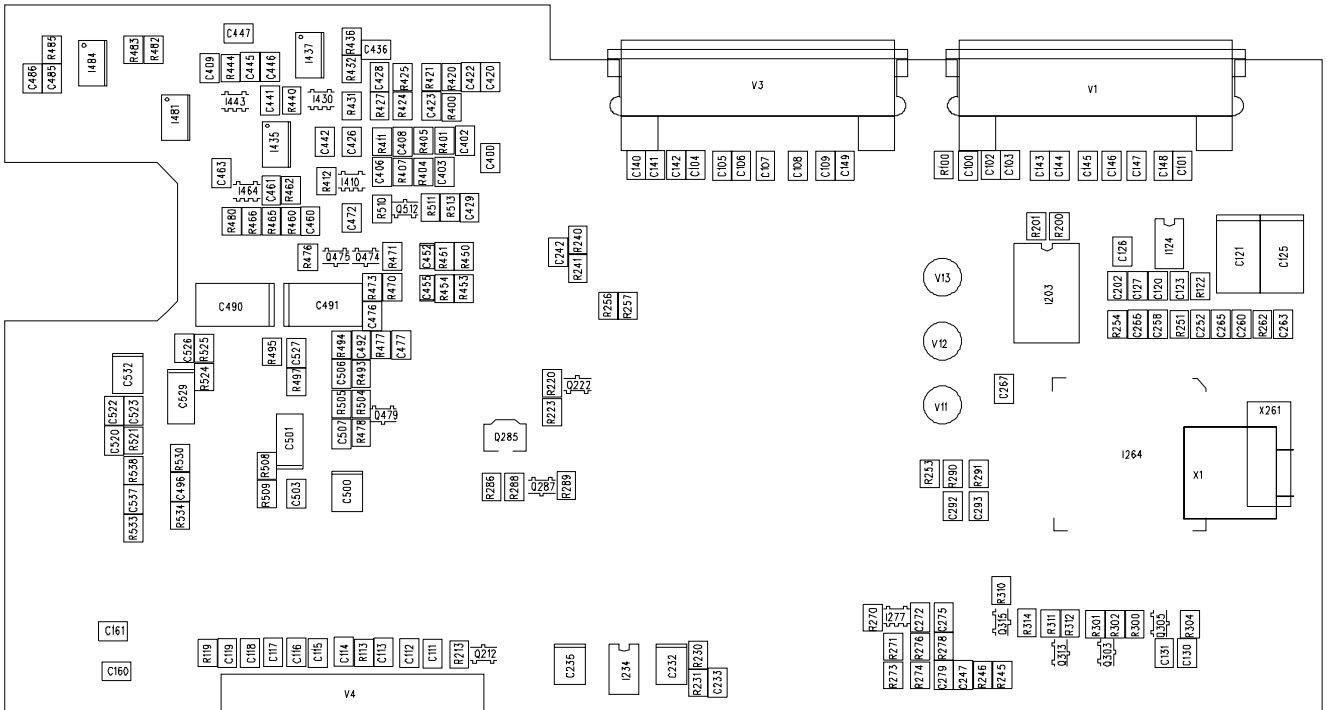
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
NI0507	V6	Battery contact spring	for DDS-40		95196740
NI0507	V7	Battery contact spring	for DDS-40		95196740
NI0507	V8	Battery contact spring	for DDS-40		95196740
X80006	X1	Crystal	8.0000 MHz	Telequartz	8.00MHZ/B
X80007	X261	SMD crystal	8.000MHz Hold.HC-49/USMD-B	Toyocom	TQC-210C-6RB
PO0300	Y15	PCB for the office kit	Delta DDS-40		
NC2015	Y16	Cross recessed screw	M2x5 DIN7985A pozidrive	Ruuvitalo	
NC2015	Y17	Cross recessed screw	M2x5 DIN7985A pozidrive	Ruuvitalo	
NC2015	Y18	Cross recessed screw	M2x5 DIN7985A pozidrive	Ruuvitalo	
NC2015	Y19	Cross recessed screw	M2x5 DIN7985A pozidrive	Ruuvitalo	
NF0200	Y20	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
NF0200	Y21	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
NF0200	Y22	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
NF0200	Y23	Nut	M2 SFS2067 / DIN943	Ruuvitalo	

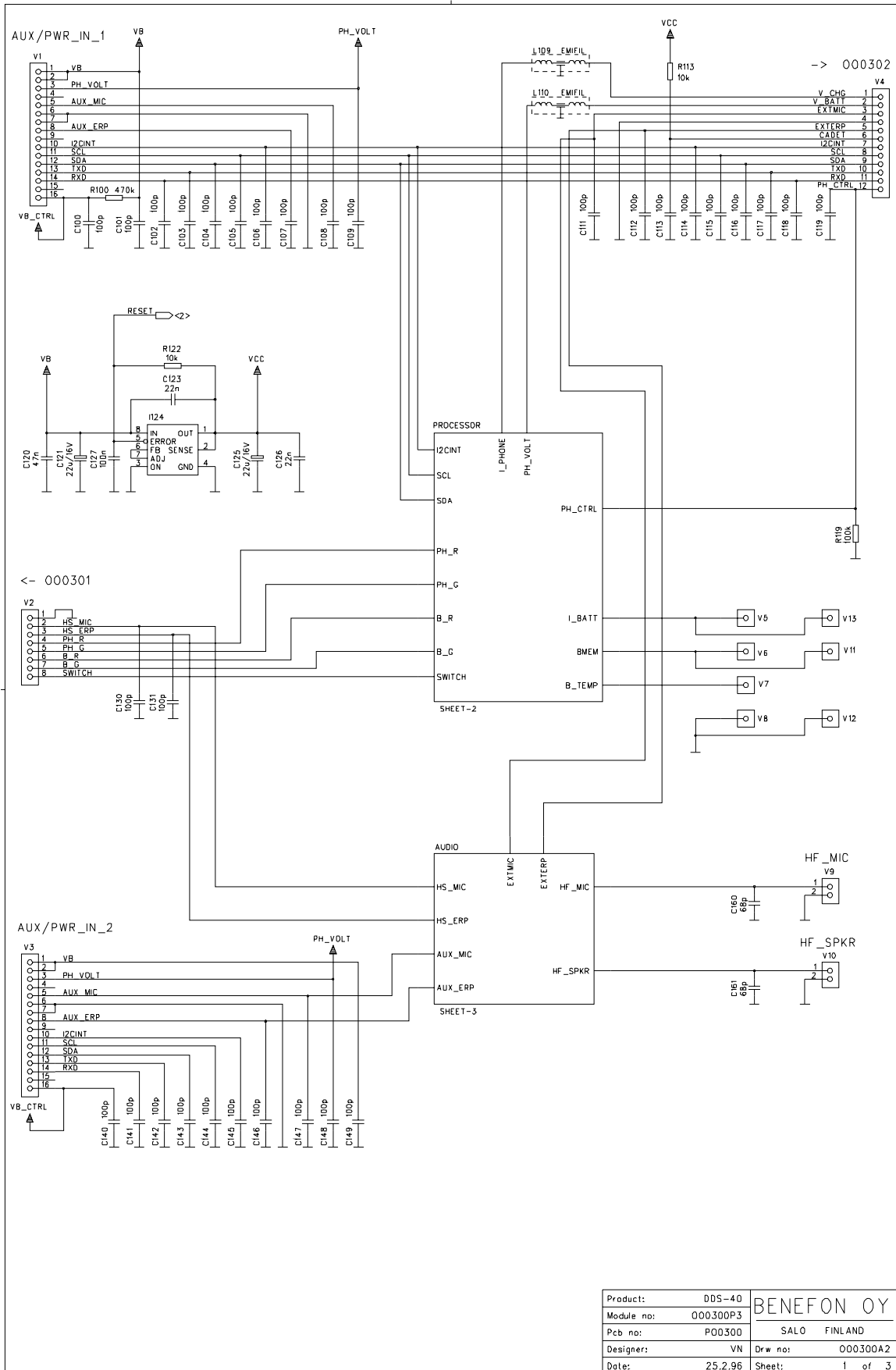
Last
update
13.11.96

The Top Side Layout PO0300A0

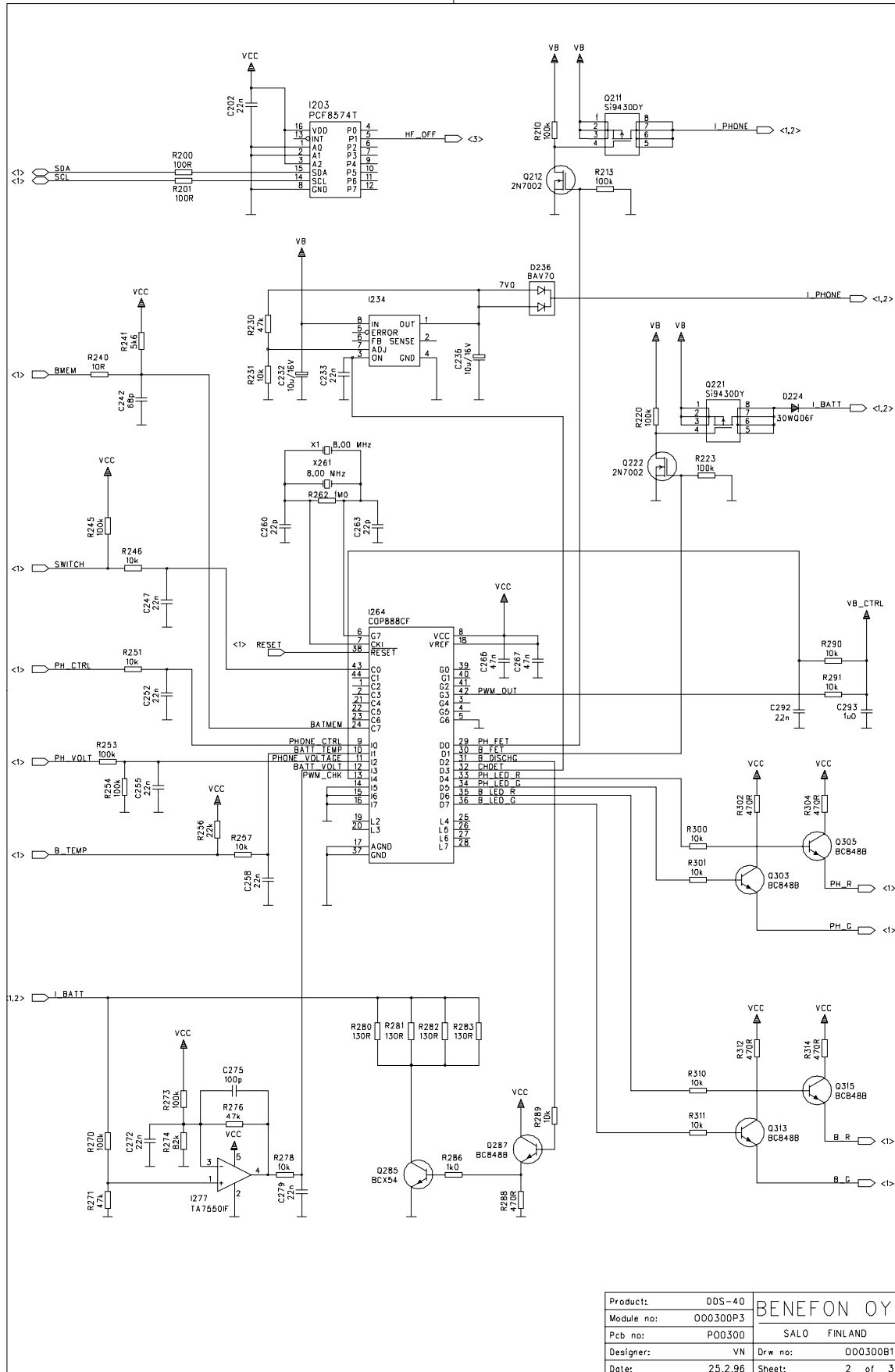


The Bottom Side Layout PO0300A0

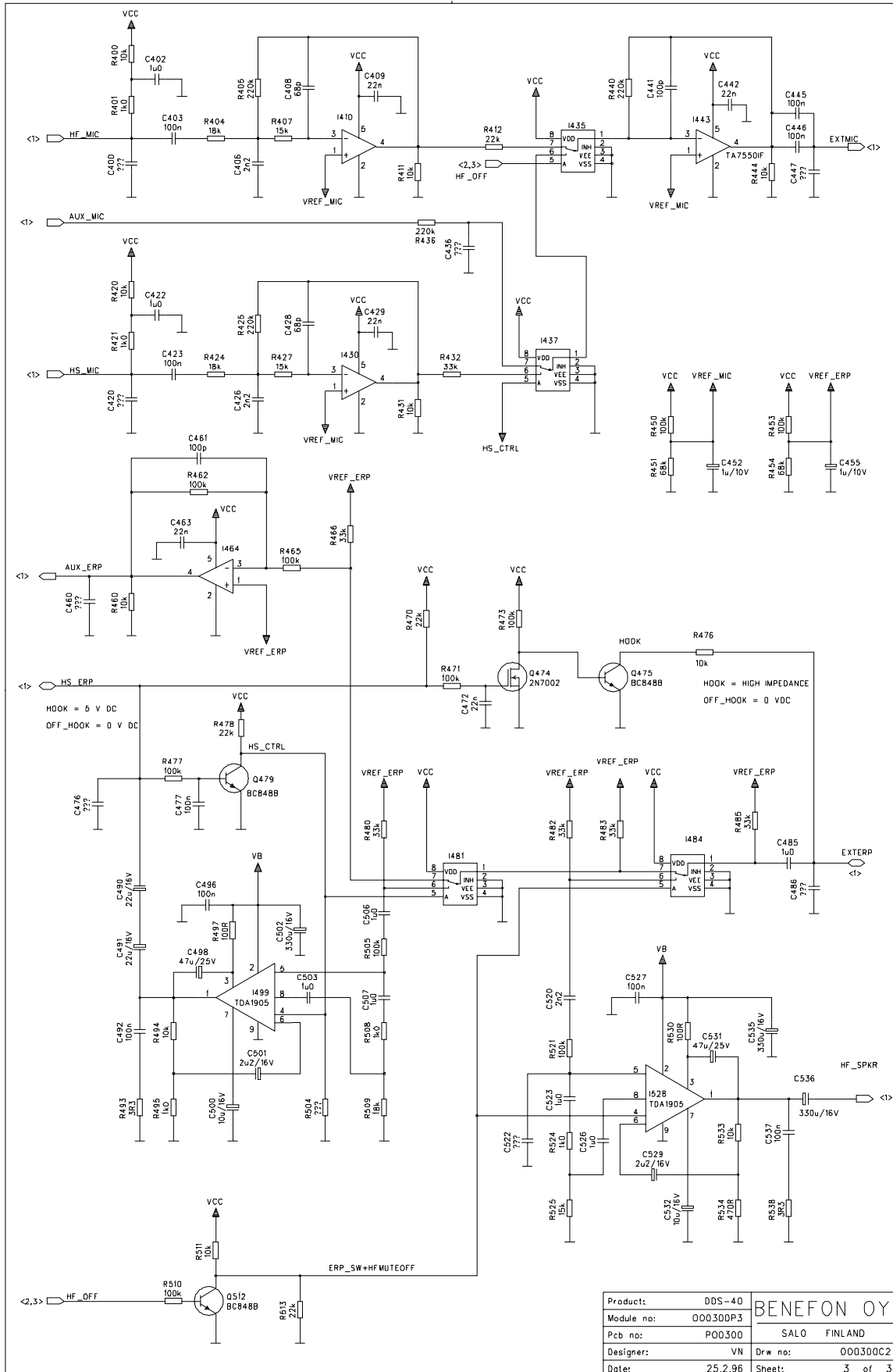




Product:	DDS-40	BENEFON OY
Module no:	OO0300P3	
Pcb no:	PO0300	SALO FINLAND
Designer:	VN	Drw no: OO0300A2
Date:	25.2.96	Sheet: 1 of 3



Product:	DDS-40	BENEFON OY
Module no:	000300P3	
Pcb no:	P00300	
Designer:	VN	
Date:	25.2.96	
		SALO FINLAND
		Drw no: 000300B1
		Sheet: 2 of 3



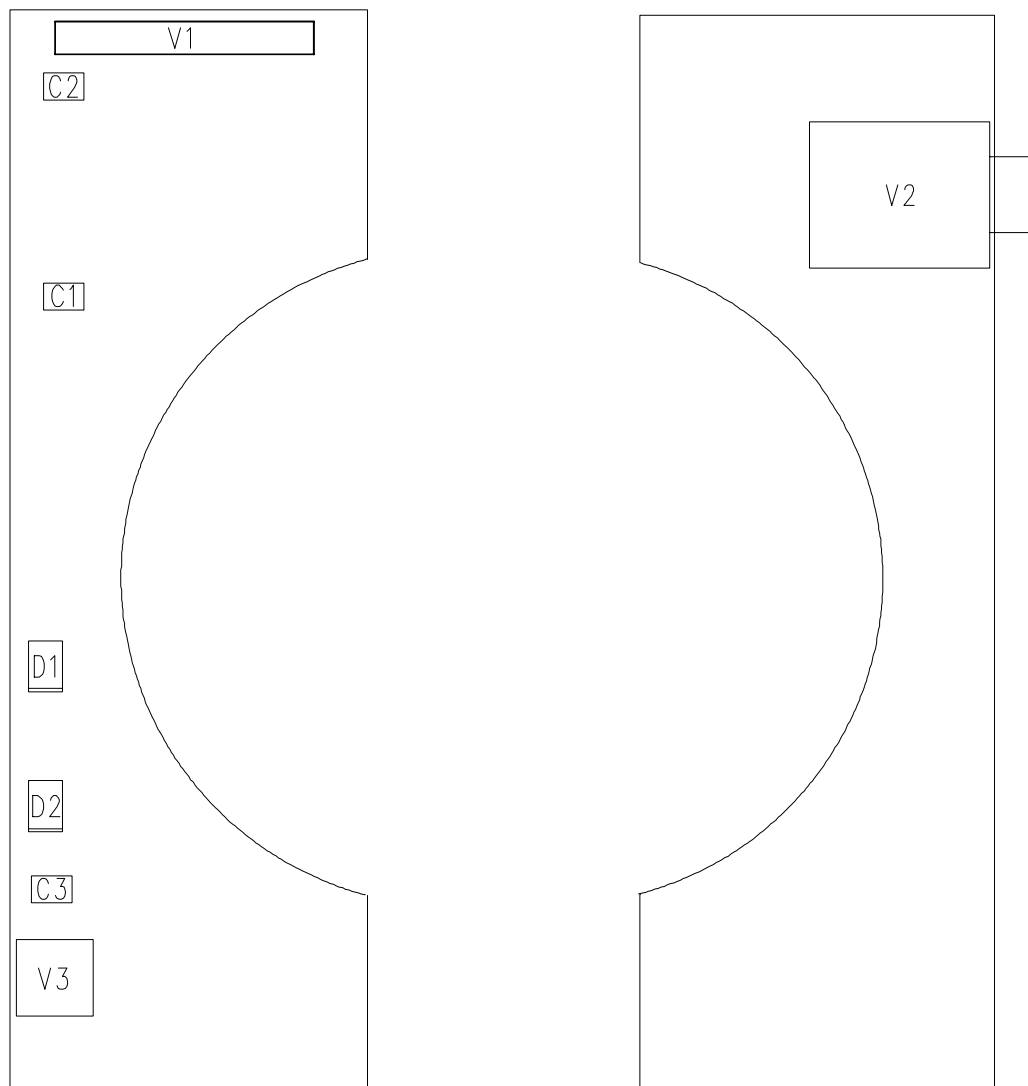
9.1.5 Parts list OO301

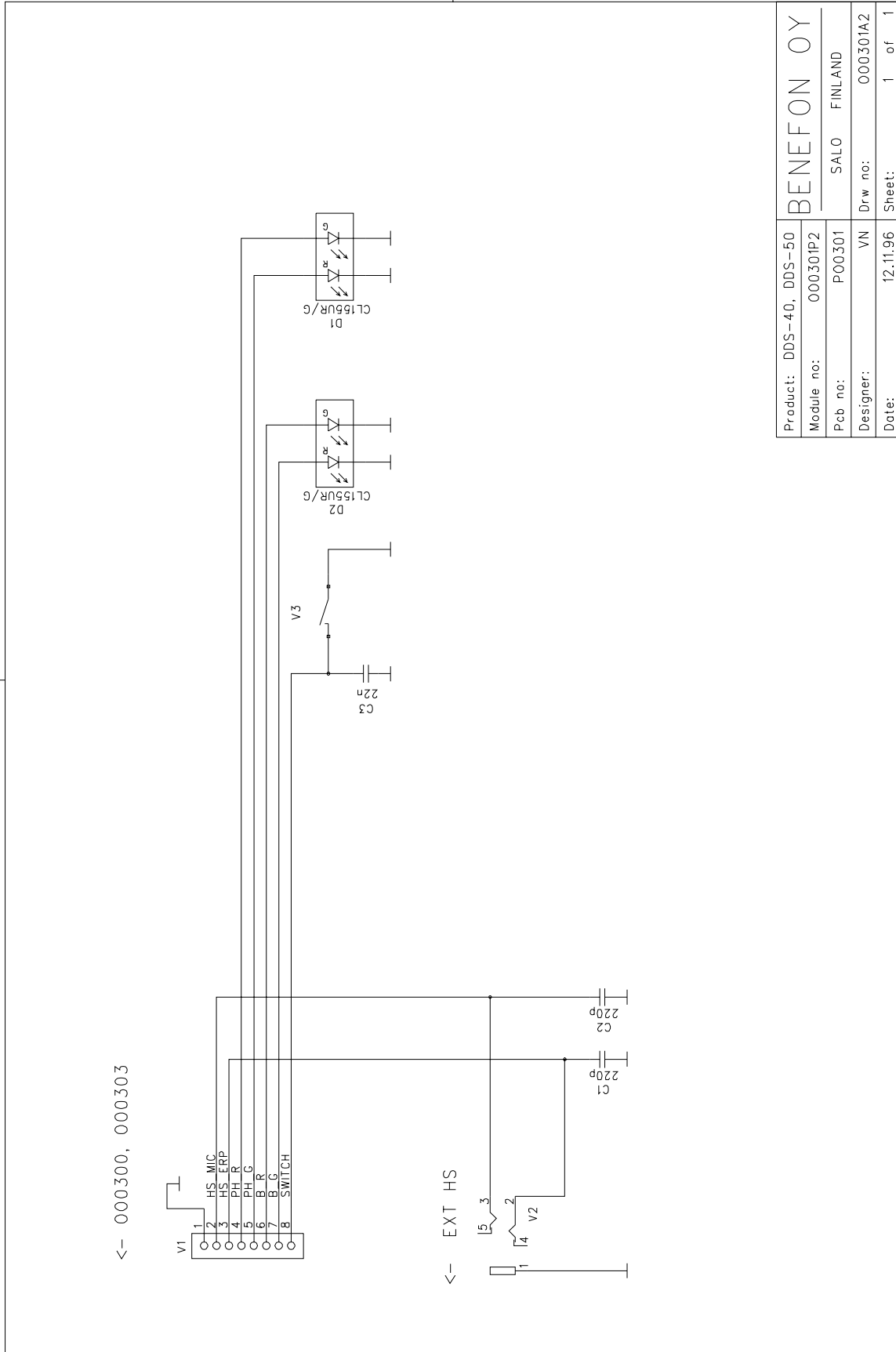
OO0301

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CD0221	C1	SMD capacitor	220 pF 5% 50 V NP0	Philips	
CD0221	C2	SMD capacitor	220 pF 5% 50 V NP0	Philips	
CD0223	C3	SMD capacitor	22 nF 10% 50 V X7R	Philips	
DLG155	D1	SMD bicolor	Green/red 25mcd/20mA	Citizen	CL-155UR/G
DLG155	D2	SMD bicolor	Green/red 25mcd/20mA	Citizen	CL-155UR/G
VN0005	V2	Stereo jack	3.5mm	Zupami	3.5 EJW-C386
AS0105	V3	Tact switch	h=9,5mm	Alps	SKHHAP
PO0301	Y8	Connector PCB for office	kit Delta DDS-40		

Last
update
12.11.96

The Top Side and the Bottom Side Layouts PO0301A3





Product: DDS-40, DDS-50	BENEFON OY		
Module no: 000301P2	SALO FINLAND		
Pcb no: P00301	Designer: VN	Draw no: 000301A2	Sheet: 1 of 1
Date: 12.11.96			

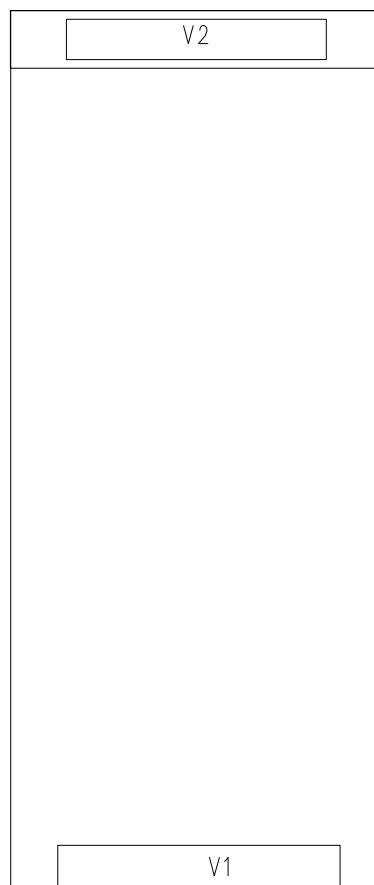
9.1.6 Parts list OO0302

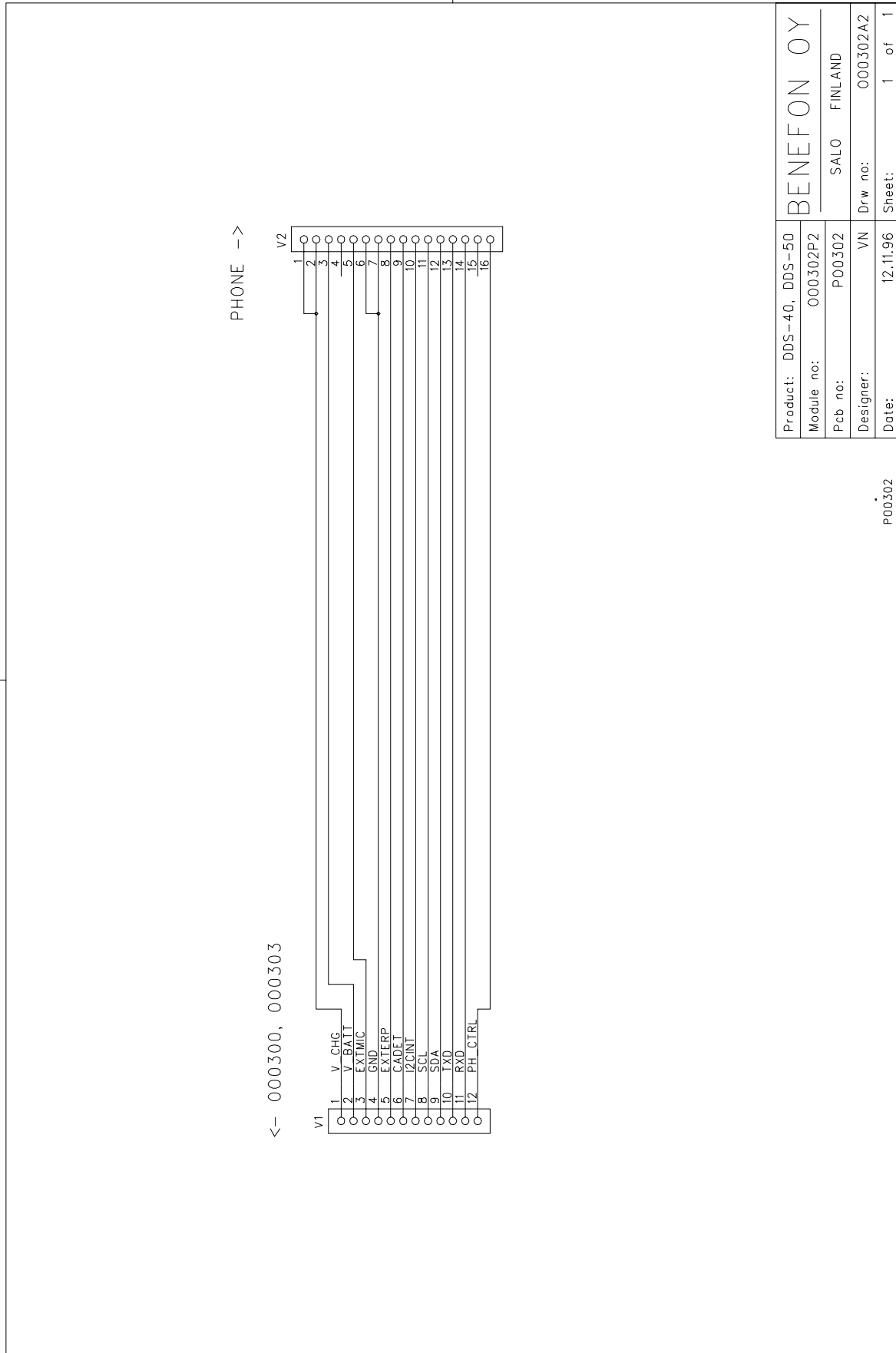
OO0302

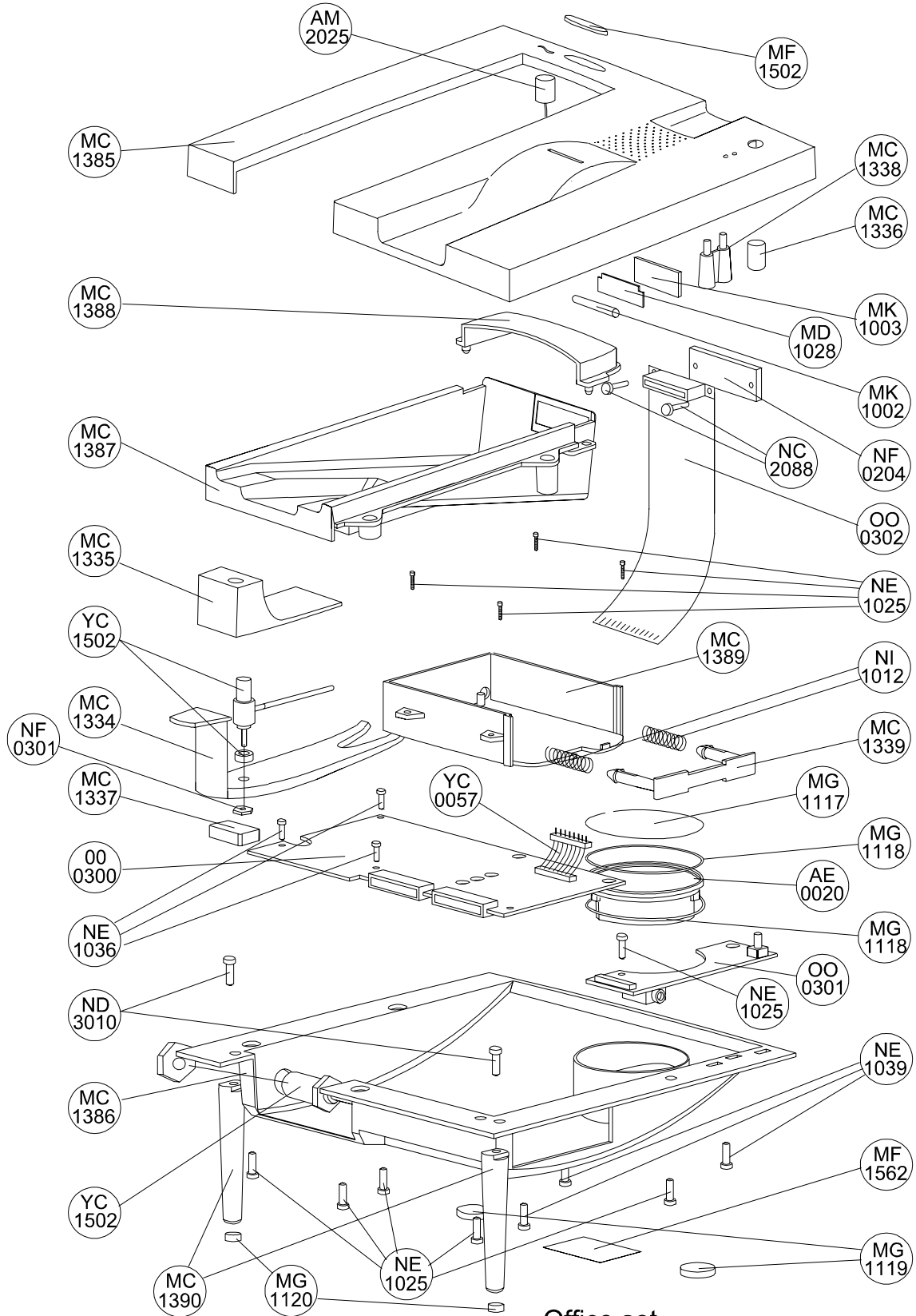
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
VN0242	V2	SMD system conn.	(holder)	AMP	
PO0302	Y1	Flexible PCB for OO0302	DDS-40	Simflex	

Last
update
12.11.96

The Bottom Side Layout PO0302A1







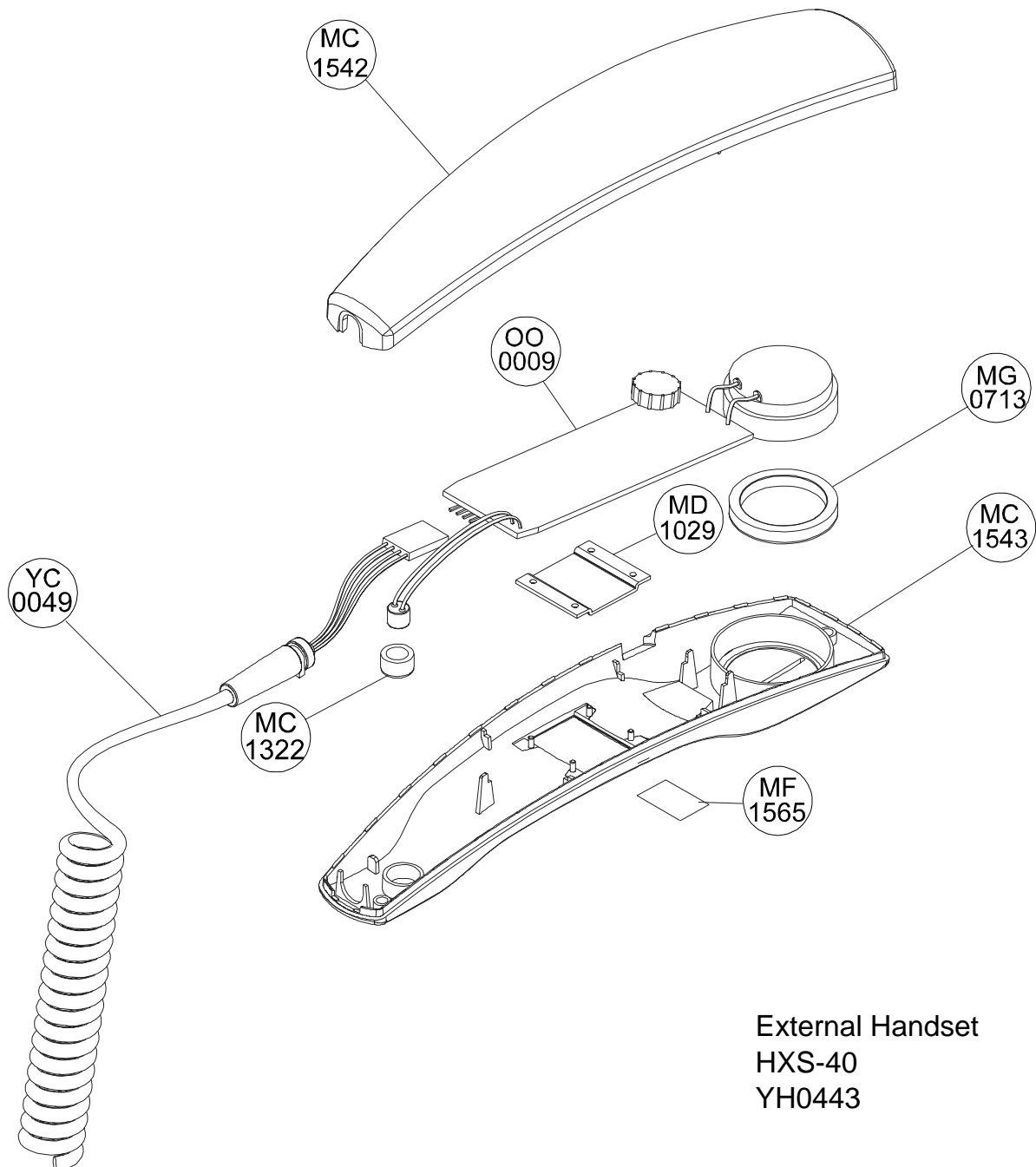
Office set
DDS-40
YO0310

95207741

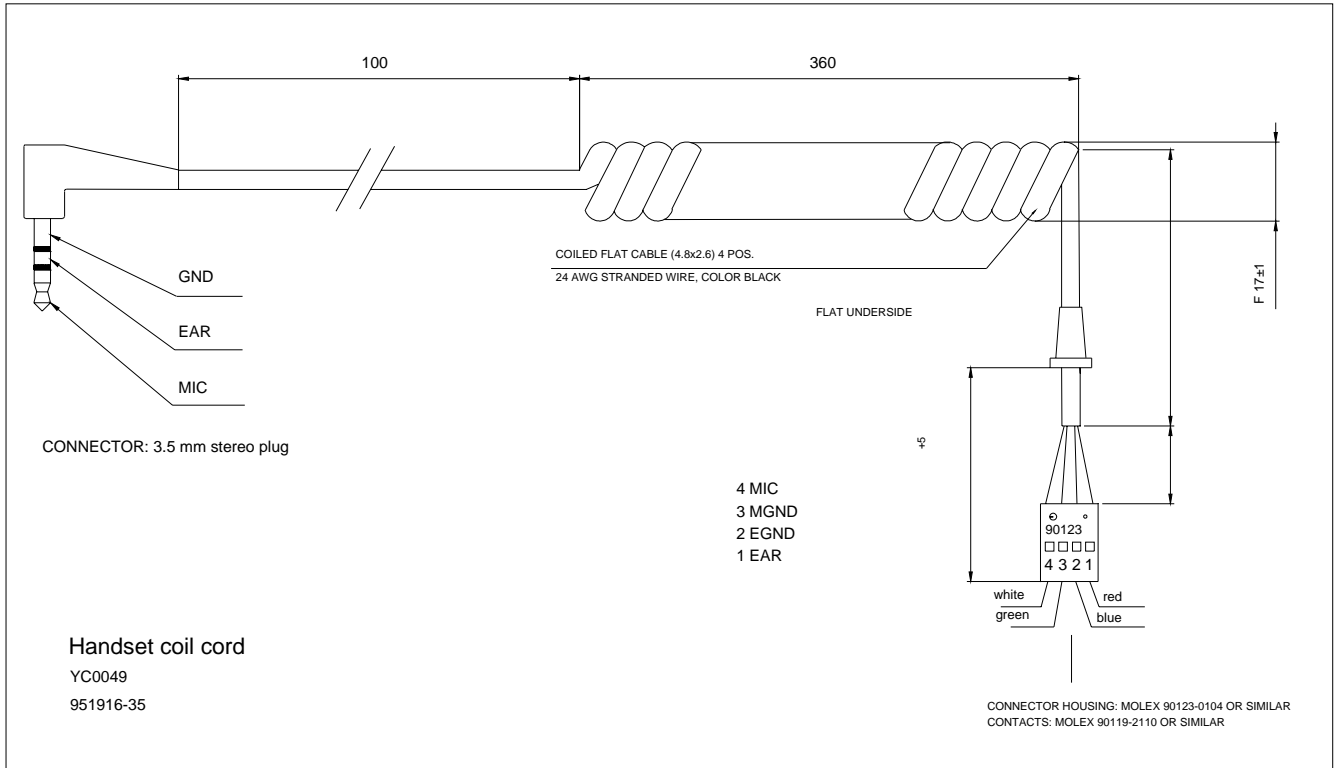
9.2 EXTERNAL HANDSET HXS-40

9.2.1 External Handset (not serviceable)

9.2.1.1 Mechanics



9.2.1.2 Cable



Outer Sheath

Material:

Coloured PVC

Black, BS 6748
TYPE TM2 and
BT M140C

Colour:

Matt

Length:

Finnish:

5 \pm 0,2 m

Total:

Coiled length:

3 \pm 0,2 m

Number of conductors:

4

Size:

AWG 26 stranded wire

Resistance:

< 100 mohm/m

Number of strands

Multiwire (30 x 0.08 mm
PCW)

Insulation material:

Coloured polypropylene

Strain relief:

Shall be firmly attached to
the cable

9.2.2 General

The external handset is designed for use together with the office set. The external handset includes a microphone, an earphone and a reed switch. A reed element shall be used to switch the audio signals to the handset when the handset is hooked off.

9.2.3 Connector XIN Signals

1	ERP	earphone input, HOOK state
2	GND	ground
3	GND	ground
4	MIC	microphone output

9.2.4 Microphone

Sensitivity:	-43 dB ± 6 dB
Vendor and part no:	Hosiden KUC2023 or KUB2023
RF decoupling capacitor:	33 pF; Size: 0805; Mounted on the microphone element.

9.2.5 Speaker

Sensitivity	95 dB ± 5 dB
Vendor and part no:	Hosiden KDR0928-IE-0030
Impedance:	min 120 ohm
Resistance (DC):	max 3 kohm

9.2.6 Hook

The hook operation is done by use of a reed switch. Hook operation is connected to the handset earphone terminal.

The operation is as follows:

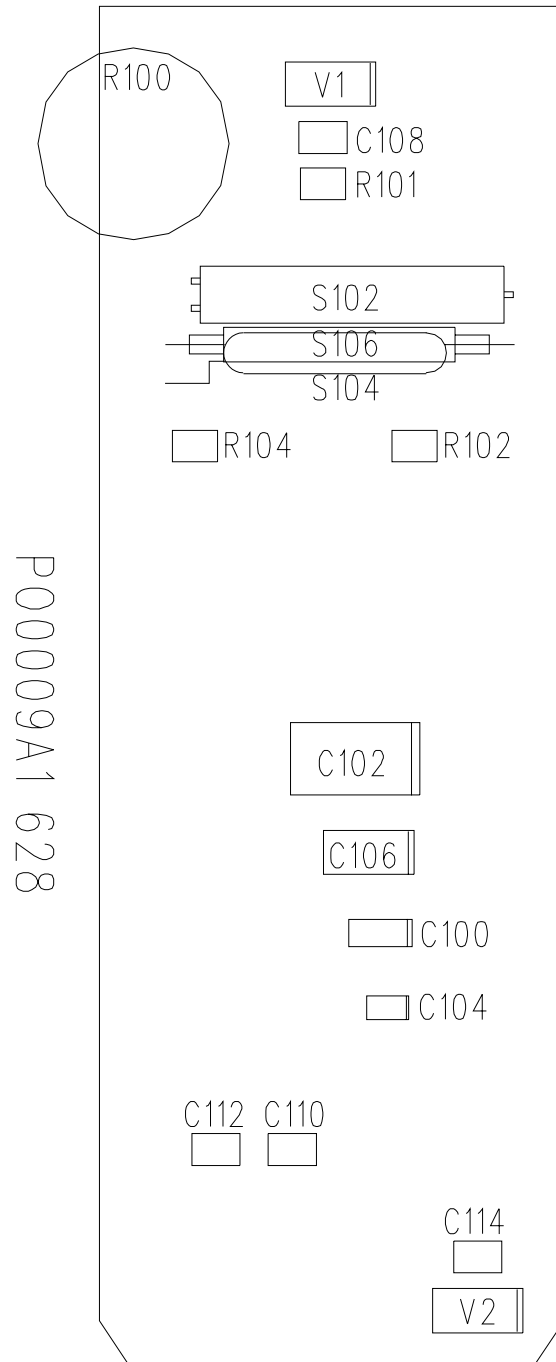
ON_HOOK	HIGH DC IMPEDANCE (SWITCH OPEN)
OFF_HOOK	LOW DC IMPEDANCE (SWITCH CLOSED), 2.2 KOHM RESISTANCE

9.2.7 Parts list OO0009

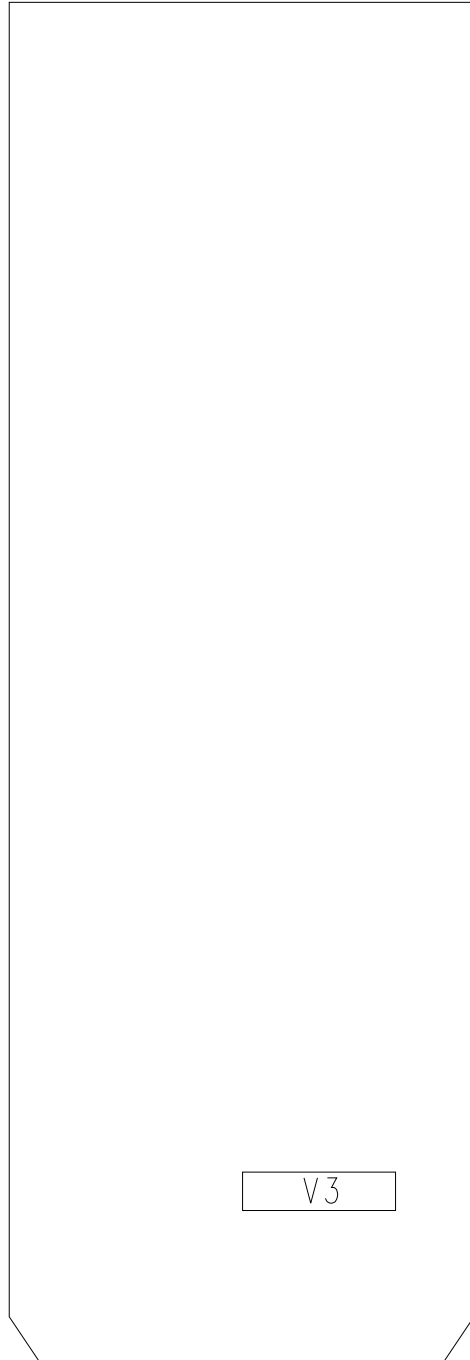
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CU0475	C106	SMD tantal	4.7uF/16V 20% 4.7X2.6MM	Matsushita	ECST1CB 475R
CD0221	C108	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CD0221	C110	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CD0221	C112	SMD capasitor	220 pF 5% 50 V NP0	Philips	
CD0221	C114	SMD capasitor	220 pF 5% 50 V NP0	Philips	
PO0009	M100	PCB for OO0900			
RP0222	R100	Edge control pot.	2.2k 0.1W LOG.	Ruwido	0037-006 2k2 log
RD0222	R102	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
AR0016	S102	Reed-relay		Hamlin	59160-031
AE0018	XERP	Assembled earphone unit	150ohm/94-+3dB/60mW	Hoside	KDR0928-1E-0300
AM2024	XMIC	Assembled microphone unit	Electret condenser -43-+4dB	Hoside	KUB2023-030444SB
VM0204	XIN	Contact strip angle	1 x 4		

Last
update
16.05.97

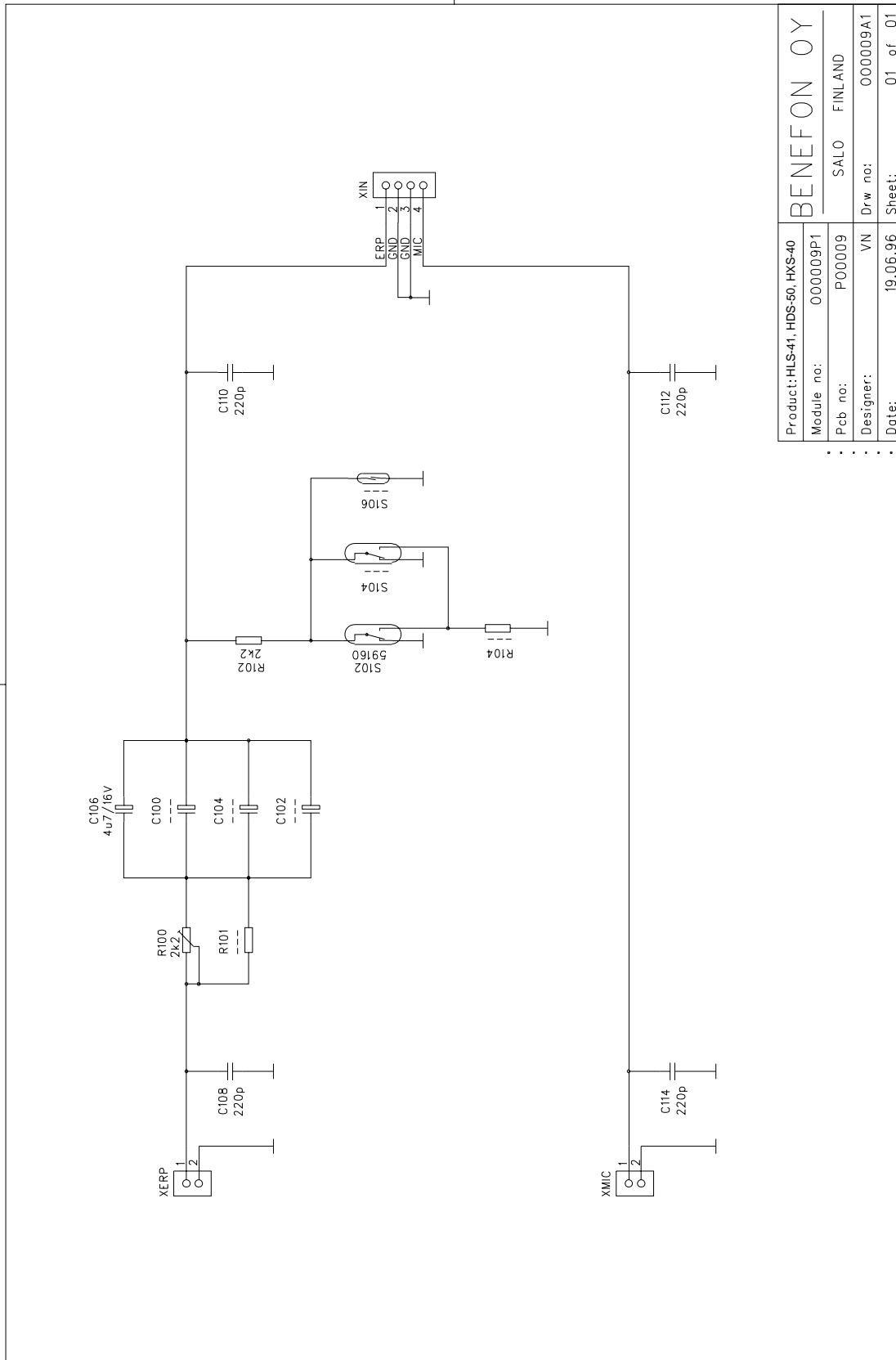
The Top Side Layout PO0009A1 (Schematic OO0009A1)



The Bottom Side Layout PO0009A1 (Schematic OO0009A1)

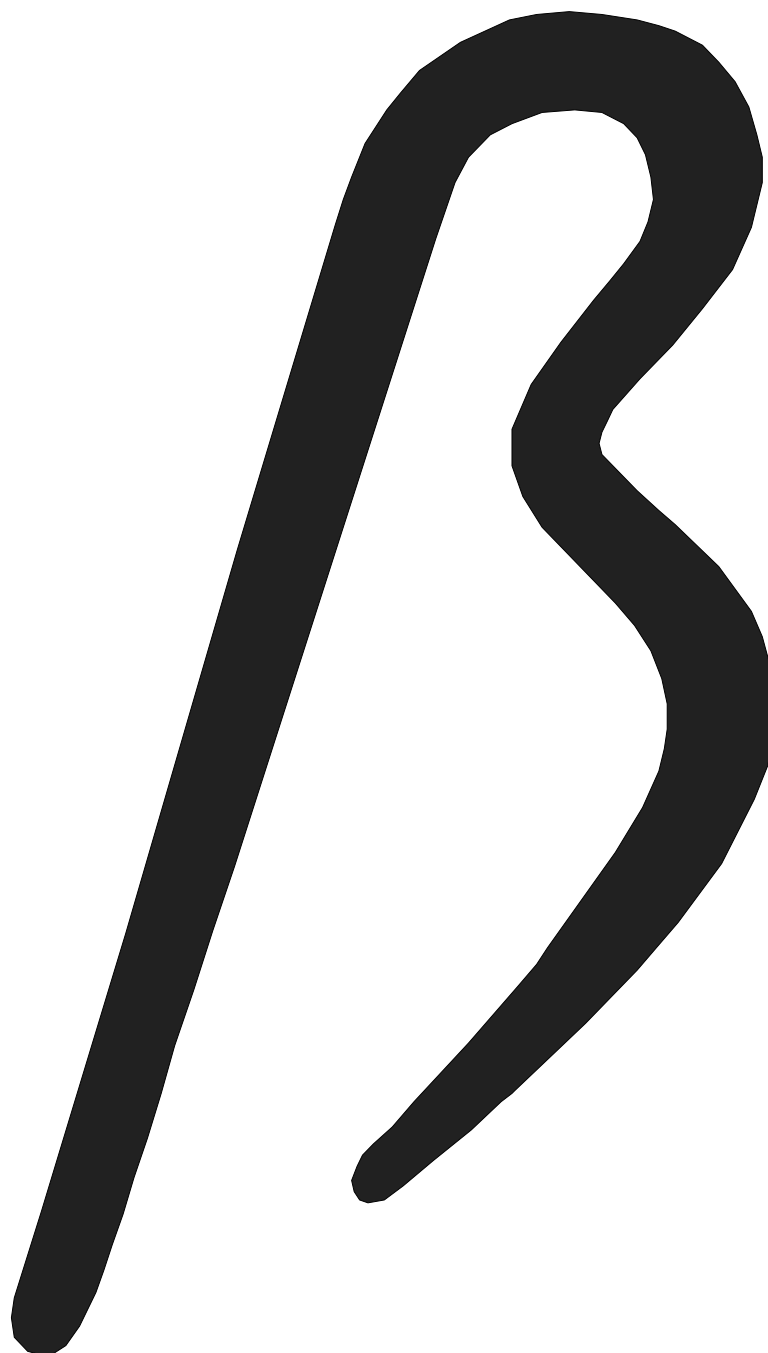


PO0009A1 058



Product: HLS-41, HDS-50, HXS-40		BENEFON OY	
Module no:	000009P1	SALO	FINLAND
Pcb no:	P00009	Drw no:	000009A1
Designer:	VN	Date:	19.06.96
		Sheet:	01 of 01

10.0 OTHER ACCESSORIES



OTHER ACCESSORIES

10.1 LINE INTERFACE LIF-40

YO0245

10.1.1 General

The line interface is an accessory for a Benefon phone to enable a tele-device approved for the general network to be connected to the handportable. The tele-device should be approved for connection to a fixed line network.

10.1.1.1 Telefax devices and modems

An error correcting modem (e.g. MNP, LAPM), and telefax (Level III or newer) are recommended for data transfer. Check that the recipient also uses an equivalent protocol, otherwise the error correction feature will not operate.

The data transfer speed will depend on the quality of the call. Whenever possible, use a fixed baud rate. An automatic baud rate selector does not necessarily work with a cellular phone.

The modem/telefax may suffer interference from a powerful radio field. Check this by testing with e.g. a magnetic antenna.

10.1.1.2 Fixed line telephones

Check that the telephone does not suffer interference from the handportable radio field. Connect the line interface to the desired tele-device. Make a call from the device and move the hand-phone antenna around the vicinity of the device.

10.1.1.3 Cordless telephones

These are not recommended for use with the line interface.

10.1.1.4 Other tele-devices

Before connecting the device to the line interface, make sure that the device has been type-approved and meets the standards required for connection to a fixed line network.

10.1.2 Using the line interface

10.1.2.1 Calling from the tele-device

When the dialling tone is heard through the tele-device handset, dial the area code and number (max.23digits). The number dialled will appear in the handportable display.

About 7 s. after the last entry, the hand-phone will initiate the call. If the call is unsuccessful, a busy tone will be heard from the handset.

When the dialling tone is heard, there is approx. 30 s. time to start dialling the number.

The number may also be dialled from the handportable keyboard.

10.1.2.2 Answering a call with the tele-device.

A call is answered normally by lifting the tele-device handset or allowing the device to answer automatically.

If the call has been answered by the handportable, it can be transferred to the tele-device as follows: Lift the tele-device handset (or press ON LINE from the telefax), and press the handportable HF key.

10.1.2.3 Terminating a call.

The call is terminated normally by returning the handset to its cradle.

The call may also be terminated by pressing the lightning key on the handportable. The busy signal will then be heard from the tele-device handset. Do not forget to replace the tele-device handset, as the line interface uses power from the handportable battery.

10.1.2.4 Making and receiving a call with the hand-phone

A call can be made and received normally from the handportable as long as the tele-device handset has not been lifted.

10.1.3 Technical information

The line interface only consumes power when the tele-device handset is lifted.

The phone battery can be charged and the line interface used simultaneously by connecting the charger and line interface to the handportable through a branching unit.

Performance values:

Current consumption	200 mA
Line current	25 mA
Line impedance	860 ohm / 39 nF
Dialling/busy tone	400 Hz
Frequency range	300...3400 Hz \pm 1 dB
Ring voltage	60 VAC

10.1.3.1 TROUBLE SHOOTING

When moving about or in an area with poor reception, radio fade and changes between base stations will interrupt radio contact. Typical symptoms of data transfer errors are random characters, missing characters, loss of contact, drop in data transfer speed, missing lines and error lines in telefaxes.

The data transfer device and program should withstand momentary breaks.

An error correcting modem is only of value if it is available at both ends of the transmission.

It is recommended to stay in one place during data transfer, and to select a location with as strong field strength as possible.

The line interface takes its power from the hand-phone battery, so allow for the increased consumption by first charging the battery or by connecting the charger using the branching unit.

Use the cellular phone exchange data transfer service to eliminate problems caused by channel changing.

Modem settings:

- long elapsed time range for carrier wave control (ATS10=30)
- short data blocks (AT&BS0)
- error correction ON (AT&E2)
- speed select (AT\$MB2400)

There are tele-devices that take their power from the telephone line, in which case the line interface supply of 25 mA will not be enough. These, generally non-approved devices are not recommended for use with the line interface.

Typically, problems arise from modem or telefax internal settings (see tele-device operating manual). Data transfer may function normally with a fixed telephone line, but not with the handportable. Frequently the settings for radio transmission have to be found by experimentation.

10.1.3.2 Functional Description

You can use the line converter for connecting your Benefon handportable to any two-wire data terminal approved for use in the public telephone network. The line converter receives its operation power from the handportable battery; a separate branching unit enables a charging device to be simultaneously connected to the handportable. The line converter consists of the following operations: ring voltage and line current generation, audio input and output, line current detection (HOOK), and low-power standby mode.

The line converter can be divided into seven different functional units: audio, frequency divider, chopper, current sink, I2C connection, free/reserved tone generation, line switches for ring signal, and HOOK detection.

10.1.3.3 Connectors

X120

1	EXTMIC	MIC input for hand-portable	400 mVrms
2	GND	Signal ground	
3	EXTERp	ERP output from hand-portable	200 mVrms
4	VBAT	NiCd battery voltage	7.2 V
5	I2CDAT	I2C-connection data line	0/5 V
6	I2CCLK	I2C-connection clock line	0/5 V
7	I2CINT	I2C-connection interrupt	0/5 V

X121

1	LB	Two-wire connection to data terminal	
2	LA		

10.1.3.4 Audio

The audio unit consists of operation amplifiers I100C and I100D and their peripheral components. The low-frequency alternating current passing through the two-wire data terminal is formed by a current coming from the I100D output through resistor R109 (signal received by the data terminal) and by a current coming through resistor R109 to I100C (signal transmitted by the data terminal). R109/C111 is used for generating the line impedance appropriate to the data terminal.

The -3 dBm level (549 mVrms / 600 ohm) causes a 400 mVrms voltage in the EXT-MIC line and a ± 3 kHz deviation in the transmitter. Likewise, the ± 3 kHz deviation in the receiver causes a 400 mVrms voltage in the EXTERP line and a -16 dBm level (123 mVrms / 600 ohm) in the data terminal.

10.1.3.5 Basic Frequencies

Components R114, R115, C109 and I105 form an oscillator vibrating at a frequency of approx 220 kHz. This frequency is divided within I105 into frequencies 430 Hz (free/reserved tone) and 26 Hz (ring frequency).

10.1.3.6 Switched Mode Voltage Converter

The basic chopper connection consists of operation amplifier I100A, quad NAND I101, MOSFET Q100, and coil L100. Saw wave to the I101A input pin 2 is generated from the basic frequency 220 kHz by using resistor R131 and capacitor C121. By changing the dc-level of the saw wave, the operation amplifier I100A controls the pulse width at gate Q100.

An extended width pulse from the basic frequency is brought to the I101A input pin 1 in order to make sure that the MOSFET is led to be momentarily non-conductive in every cycle.

While Q100 is conducting, the energy flows through resistor R108 to the coil L100. When the switch Q100 stops conducting, the energy received by L100 is discharged through the rectifier diode D100 to the capacitor C106. The fet is protected by C122 and C123 against excessive voltage peaks, while L101/C107 functions as a low-pass filter for filtering the ripple voltage. The output voltage in capacitor C107 pins depends on the RINGON signal mode, being approx 50V in the ring mode (RINGON=1) and 15 ± 3 VDC in the normal mode (RINGON=0).

10.1.3.7 Current Sink

The current passing through the two-wire data terminal is kept constant by a constant-current load formed by I103A, Q101 and Q102. The closed-loop current is 25 ± 5 mA.

10.1.3.8 Connection of I2C

The control connection is made with the I2C circuit I104, which controls the switching-on of the voltage, call and free/reserved tone according to the commands coming from the portable. Data received by the portable is a HOOK mode, the change of which is identified by the portable as interruption.

In addition, one of the I104 inputs (pin 7) has been connected to the ground so that the portable receives interruption every time the voltage is switched on.

10.1.3.9 Free/Reserved Tone

The free/reserved tone is connected by transistor Q106 to a filter consisting of the operation amplifier I100B. In this filter, the tone is reduced to a suitable level, and the square wave received from Q106 is made more gentle.

10.1.3.10 Line Switches

The double fet switches Q107/Q110 and Q109/Q108 form the line switches which switch on the ring voltage to the two-wire connection. While conducting, Q104 switches the double fet Q107/Q110 to conduct, whereby the current passes in line connection from pin LB to pin LA. While conducting, Q103 switches the double fet Q109/Q108 to conduct, whereby the current passes in line connection from pin LA to pin LB.

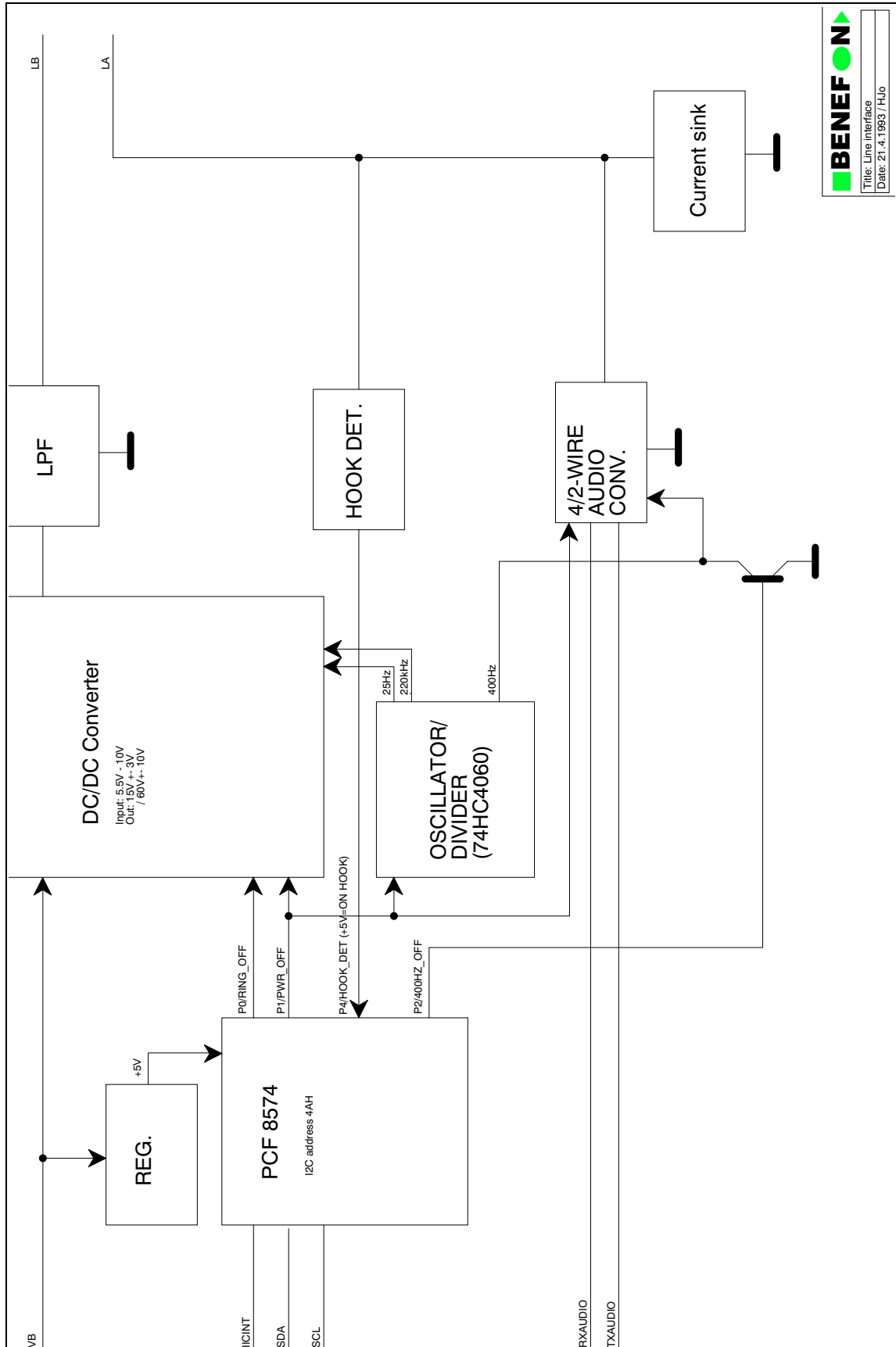
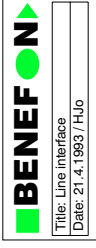
Q111 ensures that only one of the switches Q103 and Q104 is conducting and that R144/R145 form the voltage distribution which will prevent the VDD from overflowing through VCC 1102 in standby mode.

10.1.3.11 HOOK Detection

HOOK detection is carried out by operation amplifier I103B which controls the data terminal current coming from resistors R123/R124. The threshold level is changed according to the power mode in order to detect the OFF-HOOK mode using a low battery voltage and to make sure the OFF-HOOK mode is not switched on too easily during a call.

10.1.4 Manufacturers Declaration for BAPT/SITS/85/22

- a) The electrical conditions present at the terminal apparatus connector are as follows:
- i) 5-10 VDC depending on the battery voltage of the portable
 - ii) as above
 - iii) ringing voltage 50 Vrms, $f = 26$ Hz
maximum REN driving capability = 1
 - iv) free/reserved tone 430 Hz, $I = 25 \pm 5$ mA
- b) Maximum loop resistance of possible extension cable between line interface and terminal apparatus is 25 ohms.
- c) This line interface apparatus does not cause the Mobile Station to operate contrary to the requirements of BAPT/SITS/84/13.

Title: Line interface
Date: 21.4.1993 / HJo

10.1.5 Parts list OO0245

OO0245

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CF0680	C100	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0680	C101	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0680	C102	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0223	C103	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C104	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CF0223	C105	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CP0105	C106	Polyester cap	1uF 20% 50V	Wima	MK5
CP0105	C107	Polyester cap	1uF 20% 50V	Wima	MK5
CB0224	C108	SMD capasitor	220 nF 20% 50 V X7R	Philips	
CF0151	C109	SMD capasitor	150pF 5% 50V NP0	Philips	
CF0222	C110	SMD capasitor	2.2 nF 5% 50 V NP0	Philips	
CC0393	C111	SMD capasitor	39 nF 10% 50V X7R	Philips	
CB0224	C112	SMD capasitor	220 nF 20% 50 V X7R	Philips	
CF0223	C113	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CE0105	C114	Al elko	1uF/63V 4x7mm	Philips	2222 097 58108
CU0106	C115	SMD tantal	10uF/16V 20% 6x3.2mm	Matsushita	ECST1CC 106R
CF0223	C116	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CU0106	C117	SMD tantal	10uF/16V 20% 6x3.2mm	Matsushita	ECST1CC 106R
CB0224	C118	SMD capasitor	220 nF 20% 50 V X7R	Philips	
CF0680	C119	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CC0473	C120	SMD capasitor	47 nF 10% 50 V X7R	Philips	
CF0151	C121	SMD capasitor	150pF 5% 50V NP0	Philips	
CK0680	C122	Cer capasitor	68pF 100V +-10%	Philips	
CK0680	C123	Cer capasitor	68pF 100V +-10%	Philips	
CU0106	C124	SMD tantal	10uF/16V 20% 6x3.2mm	Matsushita	ECST1CC 106R
CK0680	C125	Cer capasitor	68pF 100V +-10%	Philips	
CF0680	C126	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0680	C127	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0680	C128	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0680	C129	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0822	C130	SMD capasitor	8.2nF 10% 50V	Philips	
CF0680	C131	SMD capasitor	68 pF 5% 50 V NP0	Philips	
CF0223	C132	SMD capasitor	22 nF 10% 50 V X7R	Philips	
CC0103	C222	SMD capasitor	10 nF 10% 50V X7R	Philips	
DS0070	D100	SMD diode pair	70V/100mA common cathode	Philips	BAV 70
DS0032	D101	SMD diode	75V/0.45A	Philips	BAS32L
DS0032	D102	SMD diode	75V/0.45A	Philips	BAS32L
DS0032	D103	SMD diode	75V/0.45A	Philips	BAS32L
DS0032	D104	SMD diode	75V/0.45A	Philips	BAS32L
AF1103	F100	SMD fuse	3.5A nanofuse	Littelfuse	R271 03.5
IA0324	I100\	4 x opamp			LM324
IH0000	I101\	4x2-inp NAND	HCMOS		74HC00
IC7S08	I102\	2-input and	C2MOS	Toshiba	TC7S08F
IA0272	I103\	2 x op.amp.	LinCMOS Low noise,power	Texas	TLC27M2ID
II8574	I104	8 bit I/O	I2C	Philips	PCF8574T
IH4060	I105	14-bit bin.counter	Si-gate CMOS	Philips	74HC4060T
IR2951	I106	Regulator	100mA 5V adj. 5%	National	LP2951CM
YC0206	IN	Line converter cable	6-100611-2+cable		931549 30
LF0157	L100	RF-inductor	100uH/1.13A/0.221ohm/20Q	Toko	262LYF-0092K
LF0157	L101	RF-inductor	100uH/1.13A/0.221ohm/20Q	Toko	262LYF-0092K
PO0245	M100	PCB for OO0245	50x60mm/4-layer FR4	Metalex	
NE1014	M101	PT-screw	2,2x8 FeZnA	Konetuote	KB22x8 WN1442
NE1014	M102	PT-screw	2,2x8 FeZnA	Konetuote	KB22x8 WN1442
NE1014	M103	PT-screw	2,2x8 FeZnA	Konetuote	KB22x8 WN1442
NE1014	M104	PT-screw	2,2x8 FeZnA	Konetuote	KB22x8 WN1442

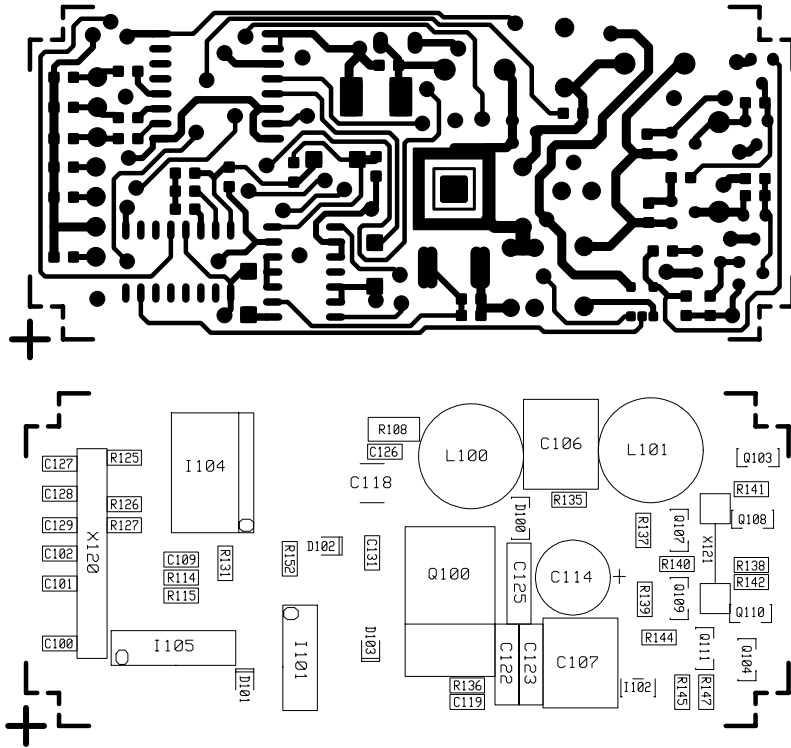
CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
MC1280	M105	Charger case		Tamplast	
MF1405	M108	Type plate	LIF-40	ScreenHous	931652 40
QF0024	Q100	SMD n-channel	60V/15A/Rds=0.1	I&R	IRFR024
QF7002	Q101	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QS1054	Q102	SMD transistor	NPN 1.5A/45V	Philips	BCP 54
QF7002	Q103	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QF7002	Q104	SMD n-channel FET	60V 0.115A Rds7.5	Siliconix	2N7002-T1
QF0610	Q105	SMD p-channel fet	Rds=10R max, IDmax=120mA	Siliconix	TP0610T
QSB858	Q106	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
QF0610	Q107	SMD p-channel fet	Rds=10R max, IDmax=120mA	Siliconix	TP0610T
QF0610	Q108	SMD p-channel fet	Rds=10R max, IDmax=120mA	Siliconix	TP0610T
QF0610	Q109	SMD p-channel fet	Rds=10R max, IDmax=120mA	Siliconix	TP0610T
QF0610	Q110	SMD p-channel fet	Rds=10R max, IDmax=120mA	Siliconix	TP0610T
QSB858	Q111	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
QSB858	Q112	SMD transistor	PNP 0.1A/30V F<10dB	Philips	BC 858 B
RF0103	R100	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R101	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0562	R102	SMD resistor	5.6 k 5% 0.125 W	Kamaya	
RF0103	R103	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R104	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R105	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R106	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R107	SMD resistor	10 k 5% 0.125 W	Kamaya	
RC0229	R108	SMD resistor	2R2 5% 0.125 W	Kamaya	
RF0102	R109	SMD resistor	1 k 5% 0.125 W	Kamaya	
RF0223	R110	SMD resistor	22 k 5% 0.125 W	Kamaya	
RF0103	R111	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0104	R112	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R113	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0123	R114	SMD resistor	12 k 5% 0.125 W	Kamaya	
RF0223	R115	SMD resistor	22 k 5% 0.125 W	Kamaya	
RF0472	R116	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0222	R117	SMD resistor	2.2 k 5% 0.125 W	Kamaya	
RF0104	R118	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0103	R119	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0563	R120	SMD resistor	56 k 5% 0.125 W	Kamaya	
RF0104	R121	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0103	R122	SMD resistor	10 k 5% 0.125 W	Kamaya	
RC0151	R123	SMD resistor	150 R 5% 0.125 W	Kamaya	
RC0151	R124	SMD resistor	150 R 5% 0.125 W	Kamaya	
RF0221	R125	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0221	R126	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0221	R127	SMD resistor	220 R 5% 0.125 W	Kamaya	
RF0153	R128	SMD resistor	15 k 5% 0.125 W	Kamaya	
RF0183	R129	SMD resistor	18 k 5% 0.125 W	Kamaya	
RF0473	R130	SMD resistor	47 k 5% 0.125 W	Kamaya	
RF0223	R131	SMD resistor	22 k 5% 0.125 W	Kamaya	
RF0103	R132	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0272	R133	SMD resistor	2.7 k 5% 0.125 W	Kamaya	
RF0473	R134	SMD resistor	47 k 5% 0.125 W	Kamaya	
RF0154	R135	SMD resistor	150 k 5% 0.125 W	Kamaya	
RF0104	R136	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R137	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R138	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R139	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0104	R140	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0473	R141	SMD resistor	47 k 5% 0.125 W	Kamaya	
RF0473	R142	SMD resistor	47 k 5% 0.125 W	Kamaya	
RF0472	R143	SMD resistor	4.7 k 5% 0.125 W	Kamaya	
RF0473	R144	SMD resistor	47 k 5% 0.125 W	Kamaya	

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
RF0103	R145	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0104	R146	SMD resistor	100 k 5% 0.125 W	Kamaya	
RF0103	R147	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R148	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0103	R149	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0223	R150	SMD resistor	22 k 5% 0.125 W	Kamaya	
RF0103	R151	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0223	R152	SMD resistor	22 k 5% 0.125 W	Kamaya	
RF0103	R153	SMD resistor	10 k 5% 0.125 W	Kamaya	
RF0275	R201	SMD resistor	2.7 M 5% 0.125 W	Kamaya	
RC0562	R203	SMD resistor	5.6 k 5% 0.125 W	Kamaya	
VR0407	TEL	Line conv.modular cable			

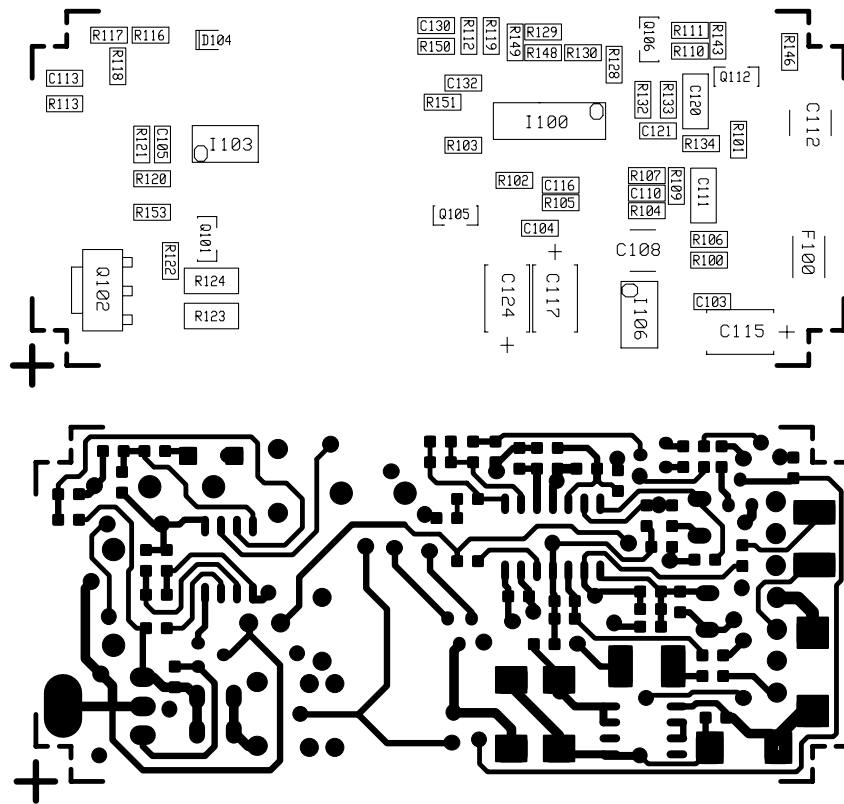
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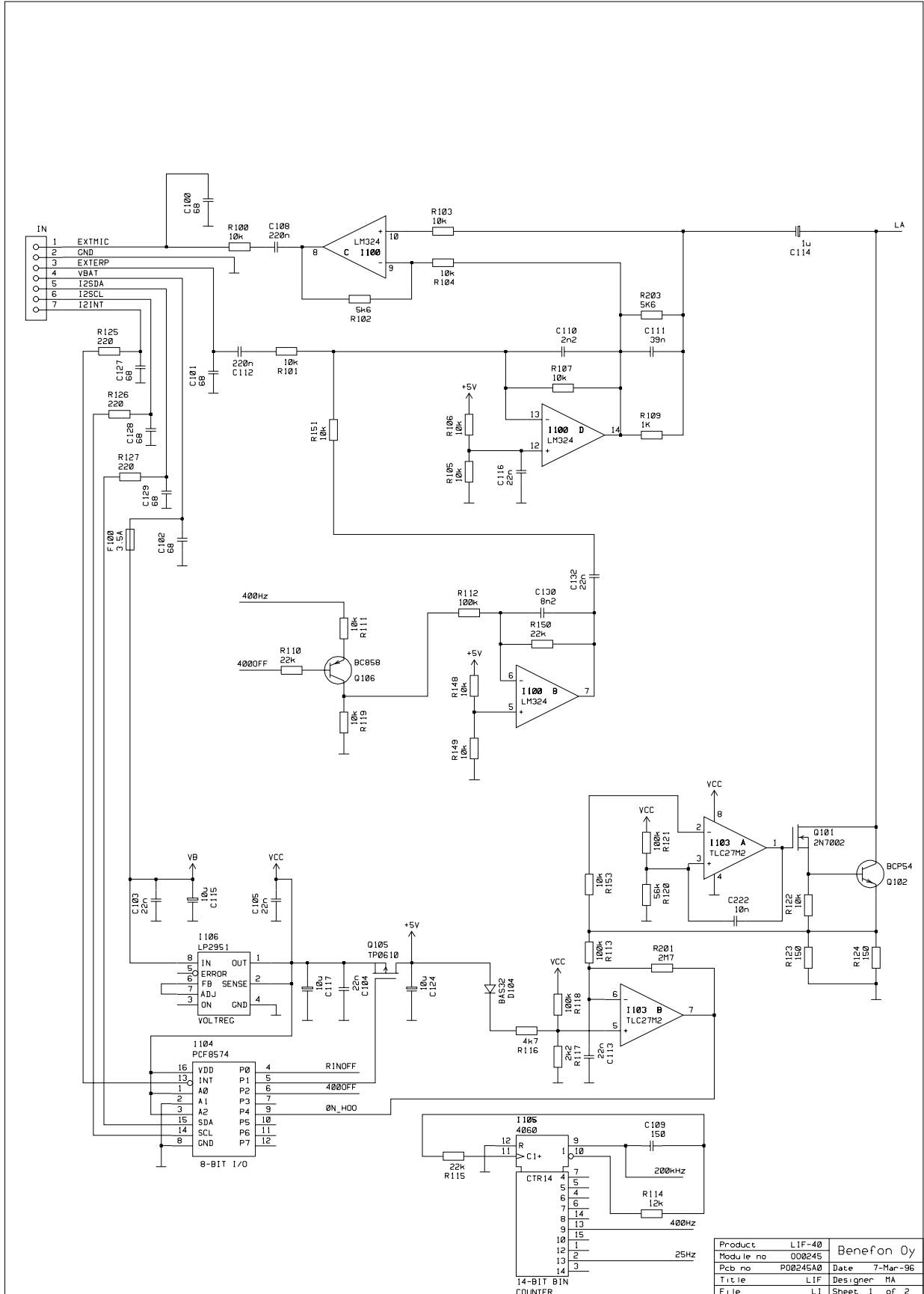
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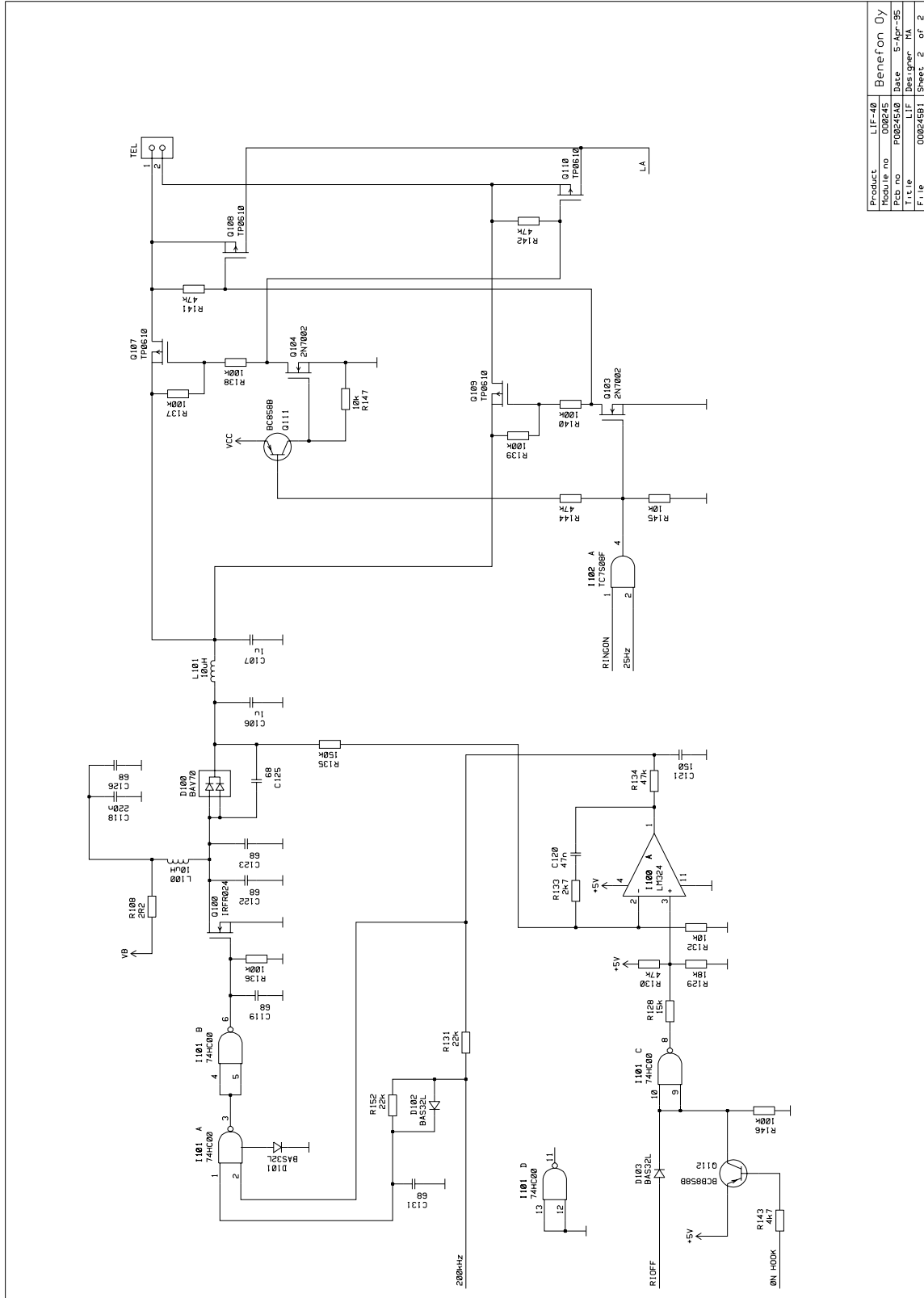
Component Side Layout PO0245A0



Solder Side Layout PO0245A0



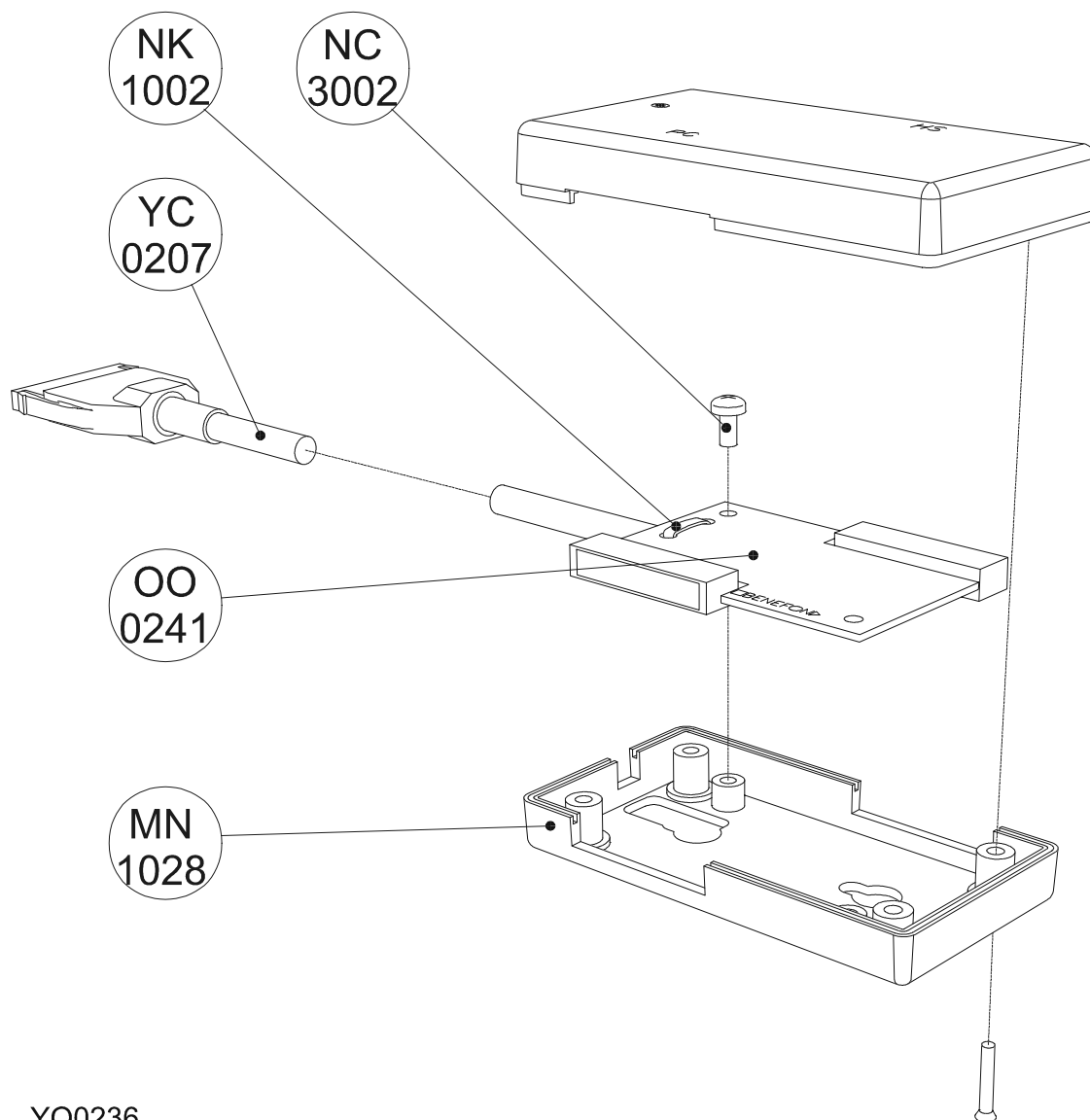




Product	LIF-40	Benefon Oy
Model no	OO0245	
Pcb no	P0224510	Date
		5-Apr-95
Title	LIF	Designer
		MA
File	OO0245B1	Sheet 2 of 2

10.2 BRANCHING UNIT

YO0236

YO0236
951898-40

10.2.1 General

With the branching box you can simultaneously connect several accessories, such as an external handset and a line converter, to the car installation kit and the hand-portable.

10.2.2 Connectors

10.2.2.1 Connector PC/HS Signals

1 and 2	V-CHARGE	Battery charging voltage 2 A in
3	+9V	Operation voltage for accessories 0.5 A in
4	TXD	Rs232 0/5V out
5	HSMIC	Ext audio from microphone 1 kHz/ 400 mVrms
6 and 7	GND	Ground
8	HSERP	Ext audio for earphone 1 kHz/200 mVrms
9	RXD	Rs232 0/5 V in
10	I2CINT	I2c interruption, input to radio 0/5 V
11	SCL	I2c clock 0/5 V
12	SDA	I2c data 0/5 V
13	CHCONT	Voltage for controlling charger current 0...5 VDC analog
14	EXTIO	Extra-IO

10.2.2.2 CONNECTOR HS SIGNALS

1 and 2	V-CHARGE	Battery charging voltage 2A in
3	9V	Operation voltage for accessories 0.5 A out
5	HSMIC	Ext audio from microphone 1 kHz / 400 mVrms
6 and 7	GND	Ground
8	HSERP	Ext audio for loudspeaker amplifier 1 kHz / 200 mVrms
10	I2CINT	I2c interruption, input to radio 0/5 V
11	SCL	I2c clock 0/5 V
12	SDA	I2c data 0/5 V
13	TXD	Rs232 0/5 V out
14	RXD	Rs232 0/5 V in
16	CHCGONT	Voltage for controlling charger current 0...5 VDC analog

10.2.2.3 Connector PC Signals

1 and 2	V-CHARGE	Battery charging voltage 2 A in
3	9V	Operation voltage for accessories 0.5 A out
5	PCMIC	Ext audio from microphone 1 kHz / 400 mVrms
6 and 7	GND	Ground
8	PCERP	Ext audio for loudspeaker amplifier 1 kHz / 200 mVrms
10	I2CINT	I2c interruption, input to radio 0/5 V
11	SCL	I2c clock 0/5 V
12	SDA	I2c data 0/5 V
13	TXD	Rs232 0/5 V out
14	RXD	Rs232 0/5 V in
16	CHCGONT	Voltage for controlling charger current 0...5 VDC analog

10.2.3 Operation

Audio routes for either an external handset or a line converter are selected using audio switches I201 (mic) and I202 (erp). The operation is controlled by the HOOK data coming from the XHSERP line. OFF HOOK audio signals have been routed to connector HS, and ON HOOK audio signals to connector PC. Voltage regulation is done by components R205, C207 and D201.

10.2.4 Parts list OO0241

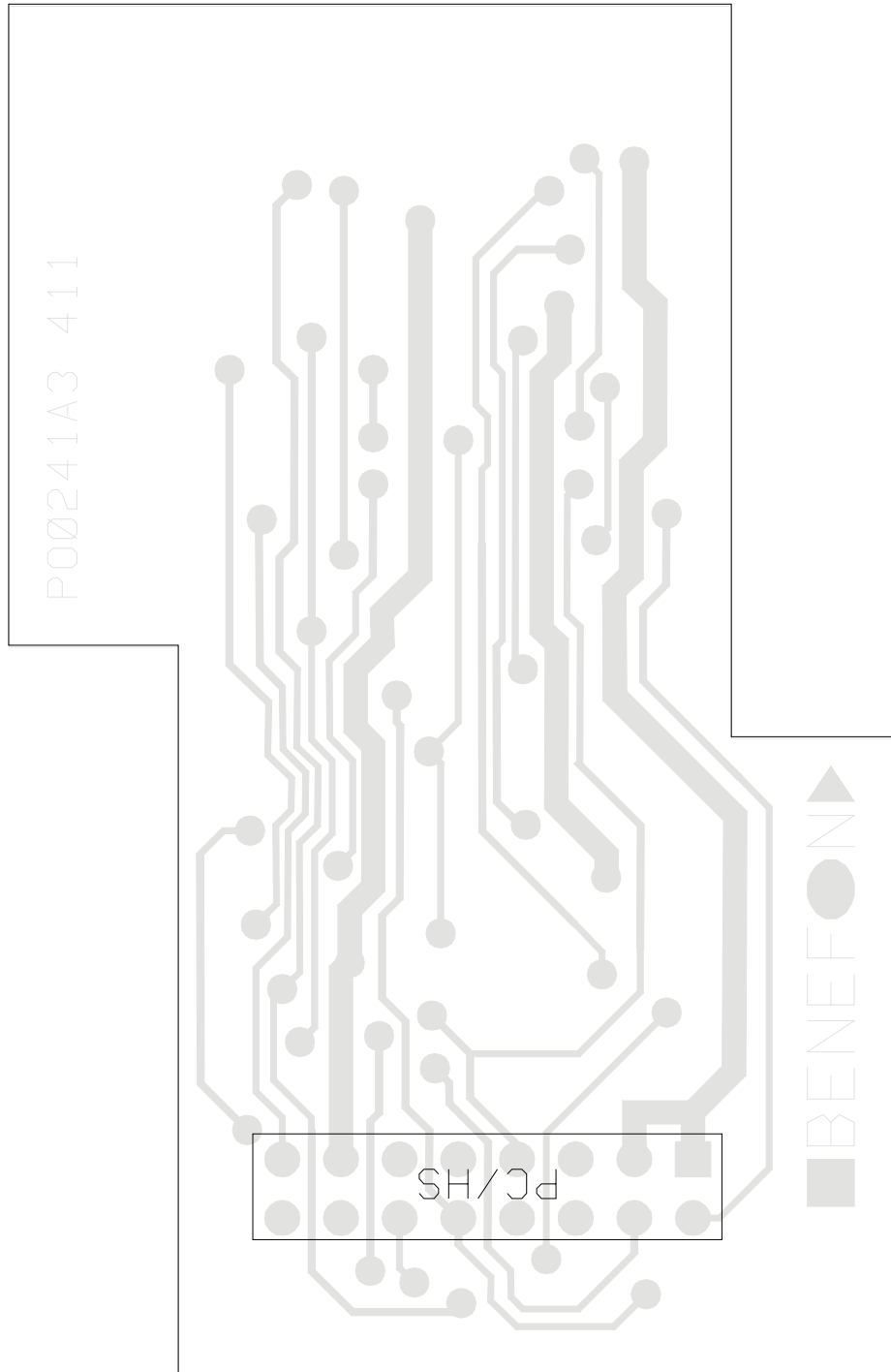
OO0241

CODE	PART	DESCRIPT.	VALUE	MANUF.	TYPE
CH0105	C201	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C202	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C203	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C204	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C205	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C206	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CH0105	C207	SMD capasitor	1uF/-20/+80%/16V	TaiyoYuden	EMK212 F105Z00T
CD0180	C208	SMD capasitor	18 pF 5% 50 V NPO	Philips	
CD0180	C209	SMD capasitor	18 pF 5% 50 V NPO	Philips	
CD0180	C210	SMD capasitor	18 pF 5% 50 V NPO	Philips	
DZ0519	D201	SMD zener	5V1 5% 300mW	Philips	BZX84C5V1
VM0242	HS	SMD system connector	1x16 pin	AMP	188227-1
IC0453	I201	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L
IC0453	I202	SMD 2x multip./demultip.		Toshiba	TC4W53F-TE 12L
PO0241	M200	PCB for junction box	60x40mm FR4	Metalex	
NC2005	M201	Cross recessed screw	M2x5 SFS2977 DIN9652	Ruuvitalo	Pozidriv
NC2005	M202	Cross recessed screw	M2x5 SFS2977 DIN9652	Ruuvitalo	Pozidriv
NC2005	M203	Cross recessed screw	M2x5 SFS2977 DIN9652	Ruuvitalo	Pozidriv
NC2005	M204	Cross recessed screw	M2x5 SFS2977 DIN9652	Ruuvitalo	Pozidriv
NF0200	M205	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
NF0200	M206	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
NF0200	M207	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
NF0200	M208	Nut	M2 SFS2067 / DIN943	Ruuvitalo	
VM0242	PC	SMD system connector	1x16 pin	AMP	188227-1
VM0116	PC/HS	Contact strip angle	2x8	NB-electr.	H4-6-16G
RD0103	R201	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R202	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R203	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0103	R204	SMD resistor	10 k 5% 0.125 W	Kamaya	
RD0102	R205	SMD resistor	1 k 5% 0.125 W	Kamaya	

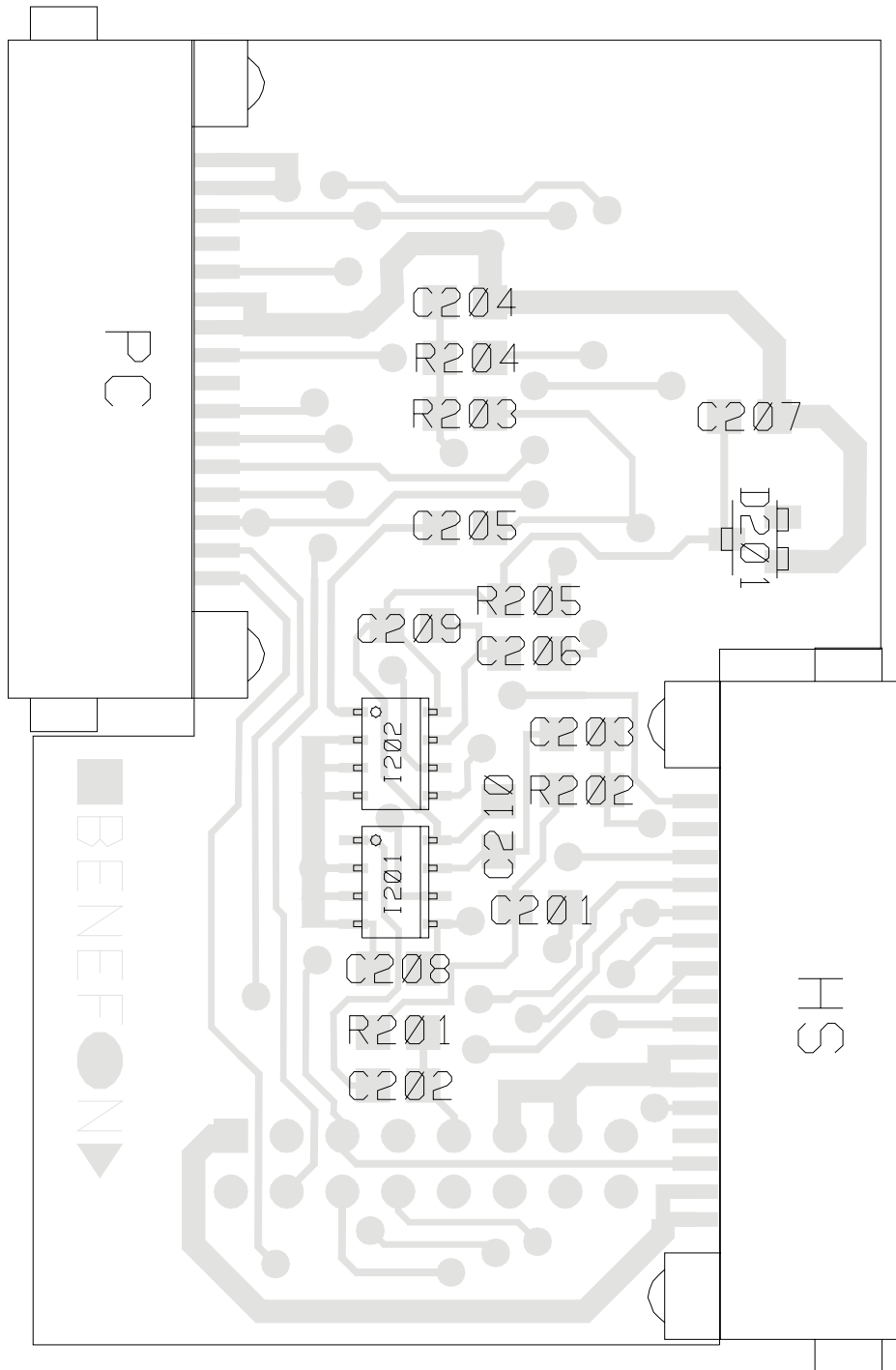
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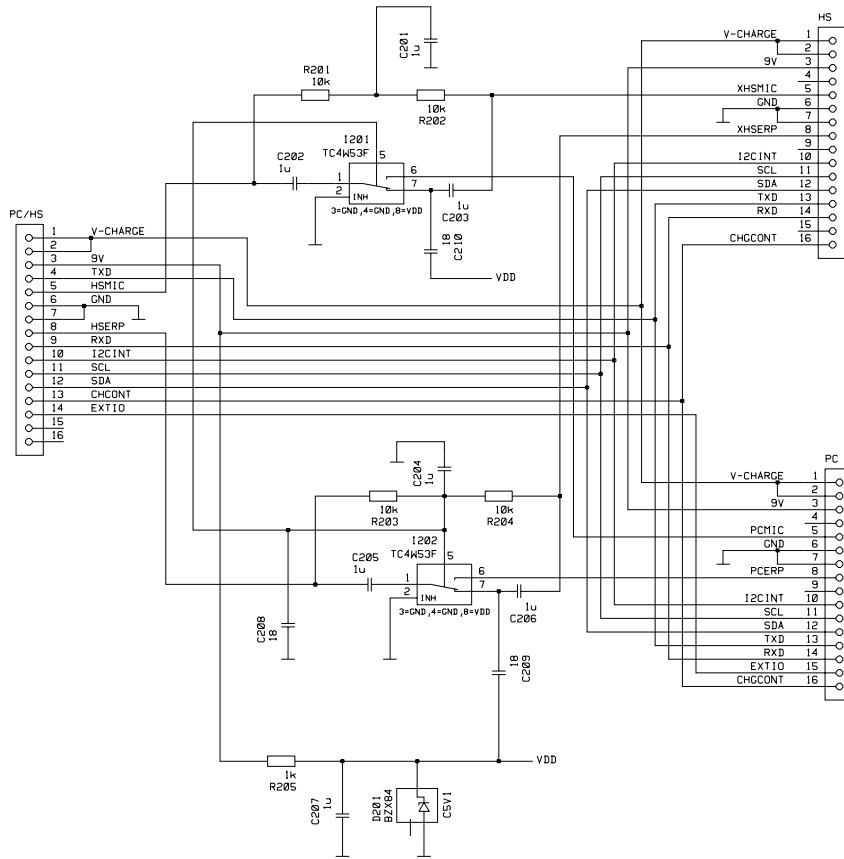
OO0241

Component Side Layout PO0241A3 (Schematic OO0241A3)



Solder Side Layout PO0241A3 (Schematic OO0241A3)





Product	DIVISION BOX	Benefon Oy
Module no	OO0241	
Pcb no	PO0241	Date 4-Aug-94
Title	PC/HSET	Designer JES
File	JAKOBOX	Sheet 1 of 1