

# **PAMS Technical Documentation**

## **NSD-3 Series Transceivers**

# **HFU-2**

## CONTENTS

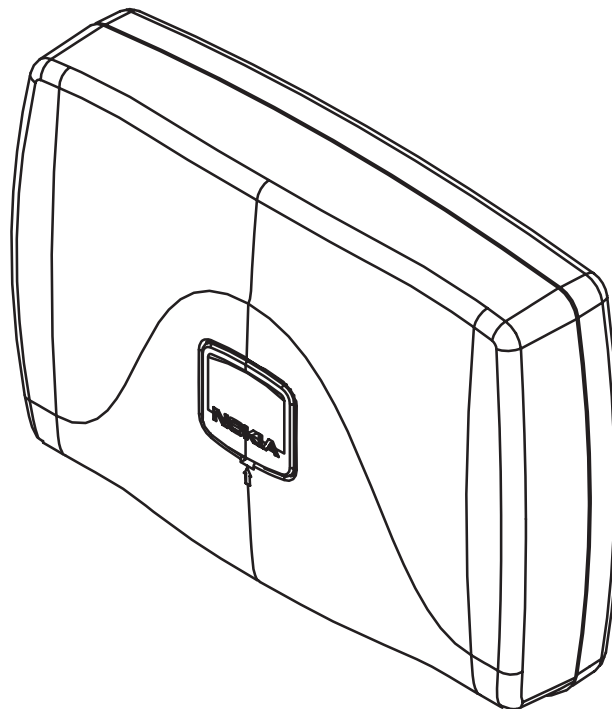
Introduction .....	3
Technical Summary .....	3
List of Modules .....	4
Operation .....	4
Supply Voltage and Power Consumption .....	4
Charging voltage limits within current specifications fulfilled .....	5
Audio Specifications, electrical .....	5
HFS-12 Audio Specifications, acoustic .....	6
HFM-8 Audio Specifications, acoustic .....	6
Audio signal levels .....	6
Signals and Connections .....	6
Block Diagram .....	7
Exploded View of HFU-2 .....	8
Parts list of ED2 (EDMS Issue 9.0) Code: 0200948 .....	9

Schematic Diagrams of ED2 (at the back of the binder, A3 size)

Circuit Diagram of Power and Charging (Version 7.0 Edition 104) layout 07	C-1
Circuit Diagram of Audio (Version 7.0 Edit 96) for layout version 07 .....	C-2
Layout Diagram of UD2 (Version 07) .....	C-3

## Introduction

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



## Technical Summary

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

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

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

## List of Modules

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

## Operation

Phone not connected (sleep mode):

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

Phone connected (active mode):

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

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

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

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

## Supply Voltage and Power Consumption

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

## Charging voltage limits within current specifications fulfilled

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

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

## Audio Specifications, electrical

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

**HFS-12 Audio Specifications, acoustic**

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

**HFM-8 Audio Specifications, acoustic**

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

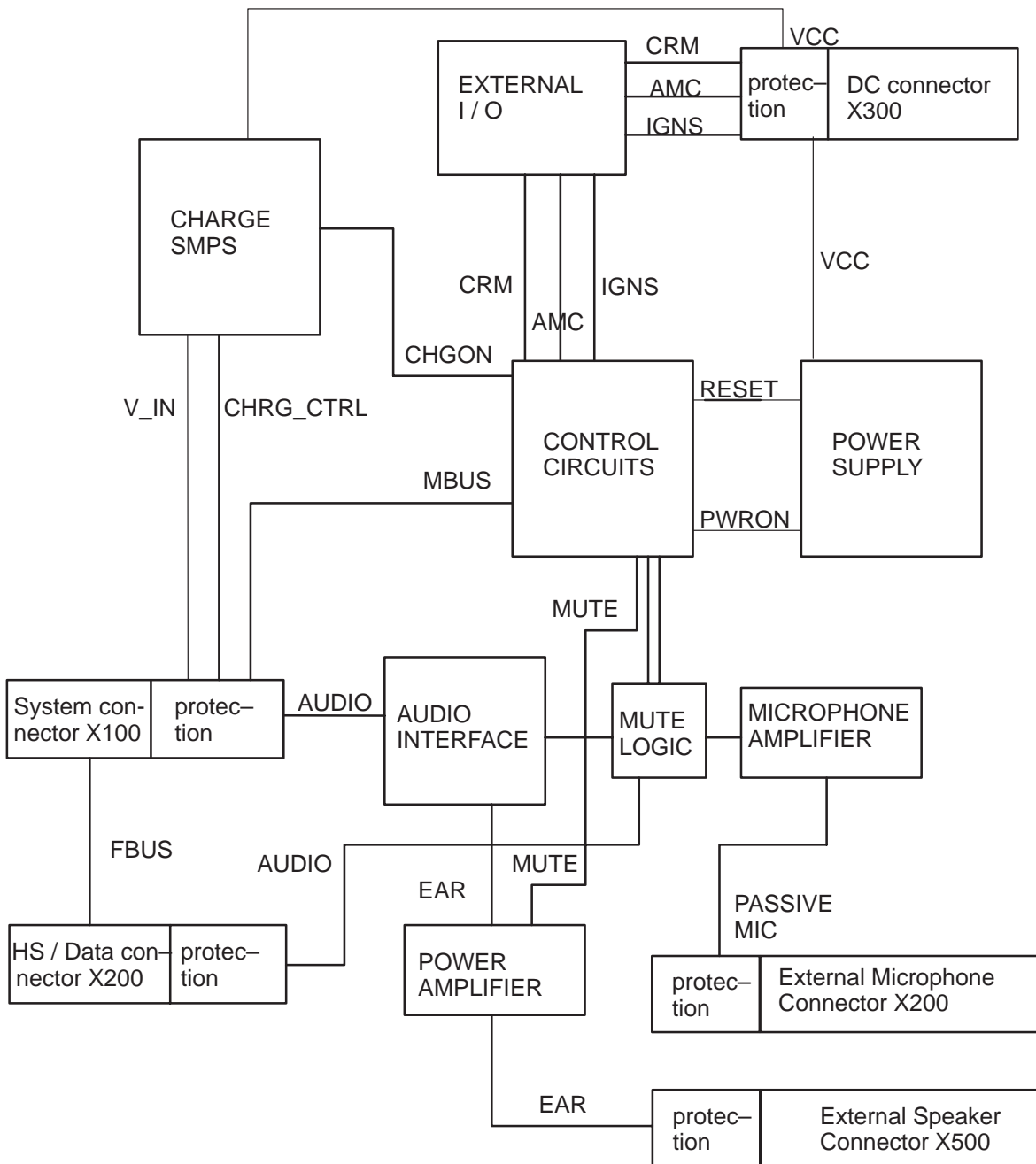
**Audio signal levels**

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

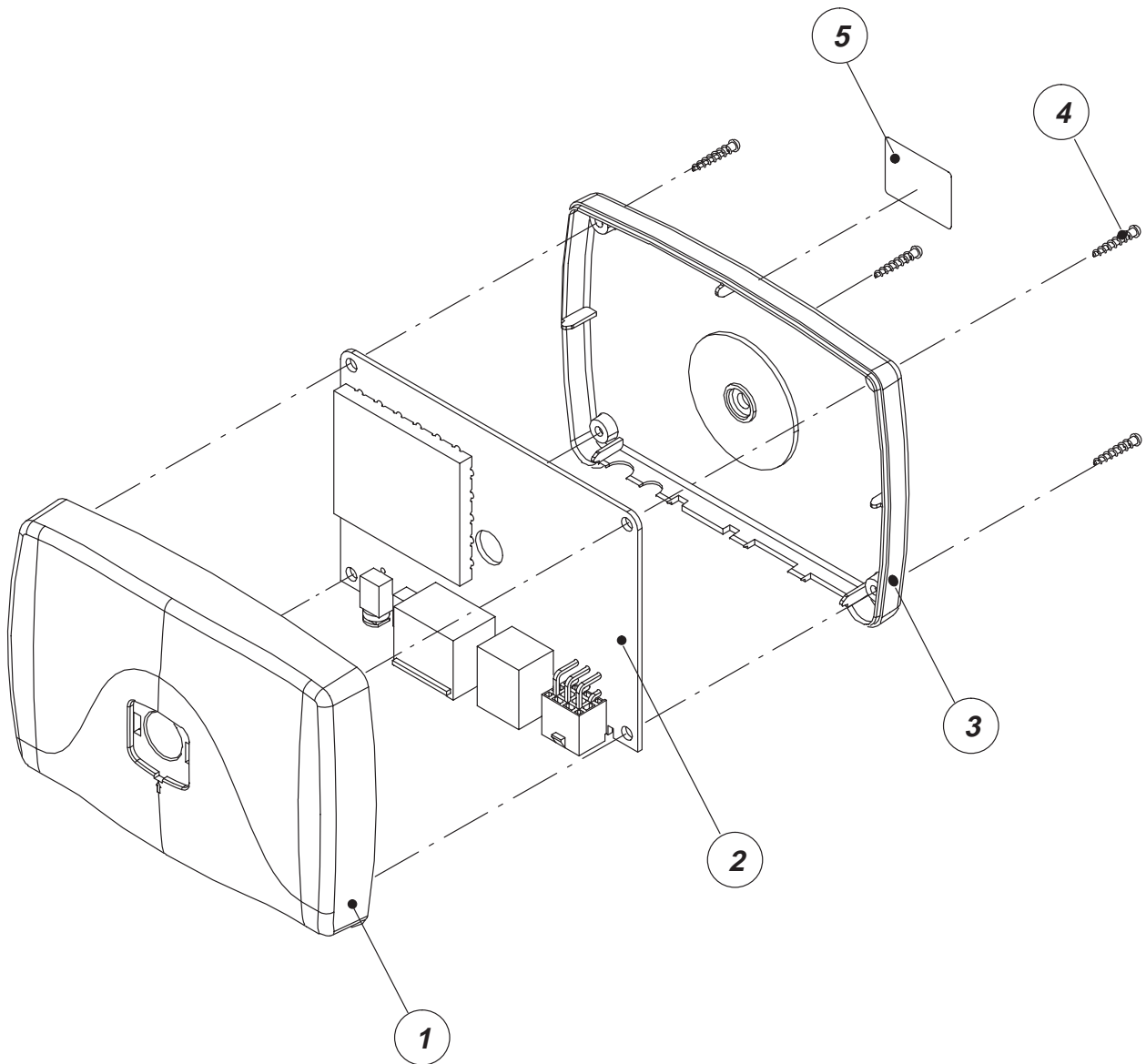
**Signals and Connections**

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

**Block Diagram**



## Exploded View of HFU-2





**Parts list of ED2** (EDMS Issue 9.0)

Code: 0200948

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R200	1415960	Melf resistor	33.2 k	1 % 0.2 W 0204
R201	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R202	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R203	1413829	Chip resistor	10	5 % 0.1 W 0805
R204	1413829	Chip resistor	10	5 % 0.1 W 0805
R205	1419007	Chip resistor	0.22	2 % 1210
R206	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R207	1416393	Melf resistor	221 k	1 % 0.2 W 0204
R209	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R210	1415791	Melf resistor	100	1 % 0.2 W 0204
R211	1413716	Chip resistor	220 k	5 % 0.1 W 0805
R212	1416548	Melf resistor	562 k	1 % 0.2 W 0204
R213	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R214	1430089	Chip resistor	120 k	5 % 0.063 W 0603
R215	1430105	Chip resistor	560 k	5 % 0.063 W 0603
R216	1416072	Melf resistor	105 k	1 % 0.2 W 0204
R218	1412328	Chip resistor	820	5 % 0.1 W 0805
R219	1416798	Melf resistor	681	1 % 0.2 W 0204
R222	1410003	Chip resistor	33 k	1 % 0.1 W 0805
R223	1410001	Chip resistor	22 k	1 % 0.1 W 0805
R224	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R225	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R226	1413716	Chip resistor	220 k	5 % 0.1 W 0805
R227	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R228	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R233	1430015	Chip resistor	470	5 % 0.063 W 0603
R240	1430001	Chip resistor	100	5 % 0.063 W 0603
R245	1416798	Melf resistor	681	1 % 0.2 W 0204
R246	1412239	Chip resistor	120	5 % 0.1 W 0805
R270	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R300	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R301	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R302	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R303	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R304	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R306	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R307	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R310	1412261	Chip resistor	100	5 % 0.1 W 0805
R311	1430073	Chip resistor	27 k	5 % 0.063 W 0603
R312	1430073	Chip resistor	27 k	5 % 0.063 W 0603
R313	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R315	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R316	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R317	1430087	Chip resistor	100 k	5 % 0.063 W 0603

R319	1430079	Chip resistor	47 k	5 % 0.063 W 0603
R321	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R323	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R324	1410003	Chip resistor	33 k	1 % 0.1 W 0805
R325	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R327	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R328	1410003	Chip resistor	33 k	1 % 0.1 W 0805
R331	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R332	1430055	Chip resistor	6.8 k	5 % 0.063 W 0603
R333	1430055	Chip resistor	6.8 k	5 % 0.063 W 0603
R334	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R335	1410003	Chip resistor	33 k	1 % 0.1 W 0805
R336	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R337	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R350	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R351	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R352	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R353	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R380	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R399	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R400	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R402	1430073	Chip resistor	27 k	5 % 0.063 W 0603
R403	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R404	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R405	1430167	Chip resistor	47	5 % 0.063 W 0603
R406	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R407	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R408	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R409	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R410	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R411	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R412	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R415	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R416	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R417	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R421	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R422	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R423	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R425	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R426	1430142	Chip resistor	4.7	5 % 0.063 W 0603
R427	1430142	Chip resistor	4.7	5 % 0.063 W 0603
R429	1430167	Chip resistor	47	5 % 0.063 W 0603
R430	1430167	Chip resistor	47	5 % 0.063 W 0603
R431	1414533	Chip resistor	56 k	1 % 0.1 W 0805
R432	1415230	Melf resistor	11.0 k	1 % 0.2 W 0204
R433	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R434	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R435	1430095	Chip resistor	220 k	5 % 0.063 W 0603

R436	1430159	Chip resistor	22	5 % 0.063 W 0603
R437	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R438	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R439	1415230	Melf resistor	11.0 k	1 % 0.2 W 0204
R440	1416266	Melf resistor	140 k	1 % 0.2 W 0204
R441	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R442	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R443	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R444	1430167	Chip resistor	47	5 % 0.063 W 0603
R446	1430039	Chip resistor	1.5 k	5 % 0.063 W 0603
R447	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R449	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R465	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R466	1430055	Chip resistor	6.8 k	5 % 0.063 W 0603
R467	1430001	Chip resistor	100	5 % 0.063 W 0603
R468	1430001	Chip resistor	100	5 % 0.063 W 0603
R469	1430001	Chip resistor	100	5 % 0.063 W 0603
R471	1430053	Chip resistor	5.6 k	5 % 0.063 W 0603
R472	1430053	Chip resistor	5.6 k	5 % 0.063 W 0603
R473	1430053	Chip resistor	5.6 k	5 % 0.063 W 0603
C201	2503072	Electrol. cap.	470 u	20 % 16 V 10x16
C202	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C203	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C205	2320475	Ceramic cap.	R 1 n	10 % 50 V 0603
C206	2503073	Electrol. cap.	470 u	20 % 25 V 10x16
C207	2320475	Ceramic cap.	R 1 n	10 % 50 V 0603
C208	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C209	2503072	Electrol. cap.	470 u	20 % 16 V 10x16
C210	2503072	Electrol. cap.	470 u	20 % 16 V 10x16
C211	2604093	Tantalum cap.	2.2 u	20 % 35 V 6.0x3.2x2.5
C212	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C213	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C214	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C218	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C219	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C220	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C221	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C301	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C304	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C306	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C308	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C309	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C316	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C318	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C321	2320059	Ceramic cap.	100 p	5 % 50 V 0603
C322	2320059	Ceramic cap.	100 p	5 % 50 V 0603
C323	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C326	2320107	Ceramic cap.	10 n	5 % 50 V 0603

C329	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C334	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C335	2503073	Electrol. cap.	470 u	20 % 25 V 10x16
C338	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C339	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C340	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C400	2320471	Ceramic cap.	270 p	5 % 50 V 0603
C402	2320473	Ceramic cap.	680 p	5 % 50 V 0603
C403	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C404	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C405	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C406	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C407	2320475	Ceramic cap.	R 1 n	10 % 50 V 0603
C408	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C409	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C410	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C412	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C413	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C414	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C415	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C416	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C417	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C418	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C419	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C420	2320475	Ceramic cap.	R 1 n	10 % 50 V 0603
C421	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C422	2320475	Ceramic cap.	R 1 n	10 % 50 V 0603
C423	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C425	2320475	Ceramic cap.	R 1 n	10 % 50 V 0603
C427	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C428	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C429	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C430	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C431	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C432	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C433	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C434	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C435	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C436	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C437	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C438	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C439	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C440	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C441	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C442	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C443	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C444	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C445	2320063	Ceramic cap.	150 p	5 % 50 V 0603



C446	2320475	Ceramic cap.	R 1 n	10 % 50 V 0603
C447	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C449	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C450	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C453	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C454	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C455	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C456	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C457	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C458	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C460	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C465	2320475	Ceramic cap.	R 1 n	10 % 50 V 0603
C466	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C467	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C470	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C490	2320043	Ceramic cap.	22 p	5 % 50 V 0603
L200	3609001	Coil	100 u	10 % Q=20/796 kHz Q20/796 kHz 8X11
L201	3609001	Coil	100 u	10 % Q=20/796 kHz Q20/796 kHz 8X11
L301	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L302	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L303	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L304	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L400	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L401	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
Z300	4507733	Cer.reson 1.0mhz+-0.5% 8.0x5.0smd		8.0x5.0smd
Z400	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
Z401	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
Z402	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
V200	4110195	Zener diode	BZX84	5 % 18 V 0.3 W SOT23
V201	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V202	4211423	MosFet	MTB30	D2PAK
V203	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V204	4200909	Transistor	BC858B/BCW30	pnp 30 V 100 mA SOT23
V205	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V207	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V208	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V300	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V301	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V302	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V304	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V306	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V307	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V309	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V310	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V311	4210096	Transistor	BCP54	npn 45 V 1.5 A SOT223
V312	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23

V313	4210020	Transistor	BCP69-25	pnp 20 V 1 A SOT223
V314	4200917	Transistor	BC848B/BCW32	nnp 30 V 100 mA SOT23
V315	4100218	Trans. supr.	LDP24A	100 V 30A/40 ms AG
V318	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
D300	4370315	IC, MCU		QFP44
D400	4309431	IC, 4 x bi.switch	4066	SO14S
N200	4340127	Mic29152 reg ld adj 1.5a	to263-5	TO263-5
N201	4305733	IC, 4 x comp	LM2901	SO14S
N202	4340067	IC, regulator	LP2951	3.3 V 100 mA
N204	4340067	IC, regulator	LP2951	3.3 V 100 mA
N400	4301182	IC, 2 x op.amp.	LM2902	SO14S
N401	4340125	L2726 2xop.amp pw5w1a	4-28v so20w	SO20W
N402	4301199	IC, 2 x op.amp.	LM2904	SO8S
S001	9510365	RF shield dmd02481	hf-1	
X100	5400087	Modular jack 15pol f	p2.04 90deg	90DEG
X200	5400103	Pc modular jack 10pol	p1.27 90deg	90DEG
X300	5400093	PC board	POWER	conn2x3m p4.2 8a 90de90DEG
X400	5409057	Jack 2.5mm+sw+lock f	4pol str. s	SM
X500	5409059	Jack 3.5mm+sw+lock f	3pol str. s	SM
	9854195	PCB ED2 110.0X75.0X1.6	D 4/PA	