

After Sales Technical Documentation

COMPACT HANDSFREE UNIT PHF-3

COMPACT HANDFREE UNIT PHF-3

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Introduction

General

The PHF-3 is a handsfree unit for handportable (NHE-6 and NHK-6) phones. It provides rapid charging for the phone and a possibility to use HF-operation. The PHF-3 cannot be connected directly to the phone but via the external antenna unit AAH-1D and mobile holder MBT-5 or other devices that provide the HF connector.

Technical Summary

Operation

The PHF-3 has external connections to car battery, ignition sense, car radio muting, external microphone and external speaker. The unit has a HF-connector that provides an interface to the phone via external antenna unit. The connection can be made directly or using the extension cable between PHF-3 and AAH-1D. There is also an internal speaker inside the handsfree unit.

The unit consists of a switching mode rapid charger, HF-speaker and HF-microphone amplifiers, volume control circuit, voltage regulators, control circuit (microprocessor) and a CAP compatible interface.

The PHF-3 is always connected to the car battery. To save the car battery, PHF-3 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:	Material Code:
HF speaker module DC9	0200656
Assembly parts MPH-3	0260681

Basic Specifications

Function:	Value:
Input voltage	11.3 ... 16 V
Current consumption	2 A dc max
Power source	car battery

Modes of 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. PHF-3 is only waiting a phone to be connected.

Phone connected (active mode):

When the phone is connected to the PHF-3 it goes into the active mode. In the active mode the device provides charging current to the phone via SMPS. It also can provide hands free call option using the internal or the external speaker (if connected) and the external microphone. If more private call wants to be made, the phone itself can be used as a handset without losing the external antenna connection.

The phone controls all the basic functions of PHF-3 that are required for making calls. In the active mode the PHF-3 follows the commands received from the phone via mbus.

PHF-3 also provides car radio mute function during call. This is possible only in those radios which support that function.

PHF-3 can control the mobile antenna motor if it is installed to the car.

External Signals and Connections

D.C. Supply Connector X100

Pin:	Signal name:	Function:
1, 2	+VB	Input from car battery <ul style="list-style-type: none"> • min/max voltage: 8.0...13.5...16 V dc
3	IGNS	Ignition sense low <ul style="list-style-type: none"> • max 1.8 V Ignition sense high <ul style="list-style-type: none"> • min/nom/max 8...13.5...32 V
4	CRM	Car radio mute off <ul style="list-style-type: none"> • nom 0 mA / open collector output • max 16 V Car radio mute on <ul style="list-style-type: none"> • nom 150 mA / current limiting value • nom/max 12...15.5 V / at max. current
5	AMC	Antenna motor control off <ul style="list-style-type: none"> • nom 0 mA / open collector output Car radio mute on <ul style="list-style-type: none"> • nom 150 mA / current limiting value • nom/max 12...15.5 V / at max. current
6,7,8	GND	Ground

System Connector X400

Pin	Signal name:	Function:
1	GND	Digital ground
2	XMIC	Microphone signal <ul style="list-style-type: none"> • nominal voltage: 60 mVrms
3	MBUS	MBUS line low <ul style="list-style-type: none"> • min/max voltage: 0...0.5 V MBUS line high <ul style="list-style-type: none"> • min/max voltage: 2.4...3.2 V
4	SGND	Signal ground
5	XEAR	Speaker signal <ul style="list-style-type: none"> • typ voltage: 60 mV
6	IGNS	Ignition sense <ul style="list-style-type: none"> • typ voltage: 13.5 V

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Pin	Signal name:	Function:
7,8	+VC	Supply voltage <ul style="list-style-type: none"> • typ/max voltage: 10.3...10.8 V / unloaded • typ/max current: 780...832 mA / current limit
9...12	GND	Ground

External Microphone Connector X200

Pin:	Signal name:	Function:
1	GND	Ground
2	HFMIC	Microphone signal typ voltage: 0 V Microphone bias typ voltage: 2.5 V dc

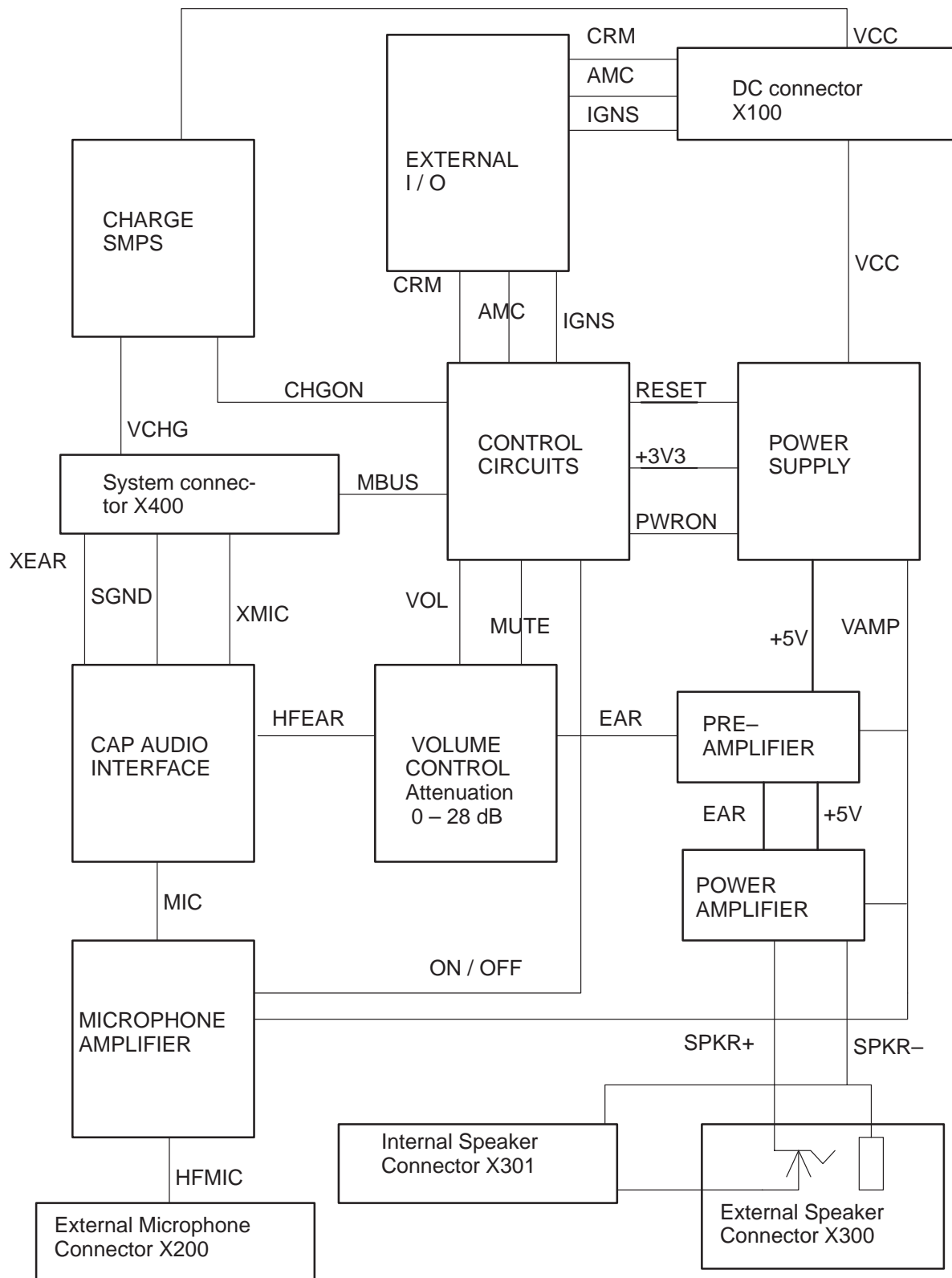
External Speaker Connector X300

Pin:	Signal name:	Notes:
1	Speaker –	8 Ω speaker, 3.2 mm jack
2	Speaker +	

Circuit Description

The circuit blocks are described in the following subsections. Refer to block diagram in next section. The complexity for each block is given. Note that every operational amplifier are calculated as a component whereas there actually might be several amplifiers in one physical (IC) component.

Block Diagram



Audio Interface

This block converts signal levels and also provides single-ended to differential and level conversions as well as hook pulldown and device identification.

Power Supply

The circuit provides regulated operation voltages to every block. It regulates +3V3 for the operating voltage of MCU, +10V for operating voltage to audio amplifiers, +5V for bias voltage to audio amplifiers and for the microphone. +2V is for bias voltage to audio attenuation switches. The power supply voltages has been designed to achieve maximum ripple voltage rejection.

Microphone Amplifier

This block is a high performance handsfree microphone amplifier. The microphone and microphone amplifier are biased from the +5V. +10V is used as operating voltage for the amplifier. The amplifier gain is 30 dB nominal and input impedance is 2 k Ω . The output AC voltage is about 100 mV. The output impedance is as low as possible. The circuit performs the sum operation with minimum phase shift. The amplifier can be muted with the MCU. When microphone is not connected, the input of the microphone amplifier is grounded.

Xear Amplifier

The circuit performs differential to single-ended conversion of incoming audio signal. The circuit gain is 0 dB. Output DC bias in XEAR line is 1.8 V, input is AC coupled and the stage tolerates about ± 1.5 V combined common mode and differential mode input swing without clipping.

Volume Control and Mute

The circuit is the audio attenuator. Attenuation is performed with operational amplifiers and audio switches. The circuit performs 8 different audio levels (one is mute). Attenuation is adjustable with 4 dB steps from 0 dB to 28 dB and mute. MCU controls attenuation switches with 4 IO-lines, where one of them is the mute.

Speaker Amplifiers

The Preamplifier

The preamplifier is an AC coupled single ended input stage for the power amplifier. The preamplifier makes most of the XEAR signal amplifying. It uses the +10 V operating voltage and it is biased to +5 V. Preamplifier has a fixed gain.

The Power amplifier (PA)

The power amplifier is an AC coupled full bridge output stage with fixed gain. Its output impedance is 8 Ω and it is also biased to +5 V. Operating voltage is +10 V. The both speaker outputs SP+ and SP- are connected to the internal speaker connector via the external speaker connector. When the external speaker is connected, the internal speaker is then muted.

Total gain for both pre- and power amplifier is about 28 dB. Maximum output power with the internal speaker is 1.6 W and 3.1 W with the external speaker.

Charger

Charger is the switching mode power supply type. The nominal output voltage of charger is 10.2 V without load. Limits of the output voltage with all tolerances are 9.3 V to 10.8 V. Nominal output current is 780 mA and limits with tolerance are 714 mA to 832 mA. MCU controls functioning of the charger and checks the output voltage. Charger is short circuit protected.

Control Circuit (MCU)

Micro controller unit (MCU) controls all the functions of the PHF-3. It communicates with the phone by using the MBUS-line. It has an 8-bit AD-converter and several IO-lines to control functioning of the other blocks.

External I/O and AD-converters

This block is used to measure specified voltages. It also controls the mobile antenna motor (AMC) and the car radio mute (CMR). Specified voltages are car battery voltage +VB, ignition sense voltage (IGNS) and phone charging voltage +VC. For CRM and AMC current are also controlled by this block.

Connectors

There are 4 external connectors to other units, and one internal speaker connector. These external connectors are the car connector, the system connector, the microphone connector and the speaker connector.

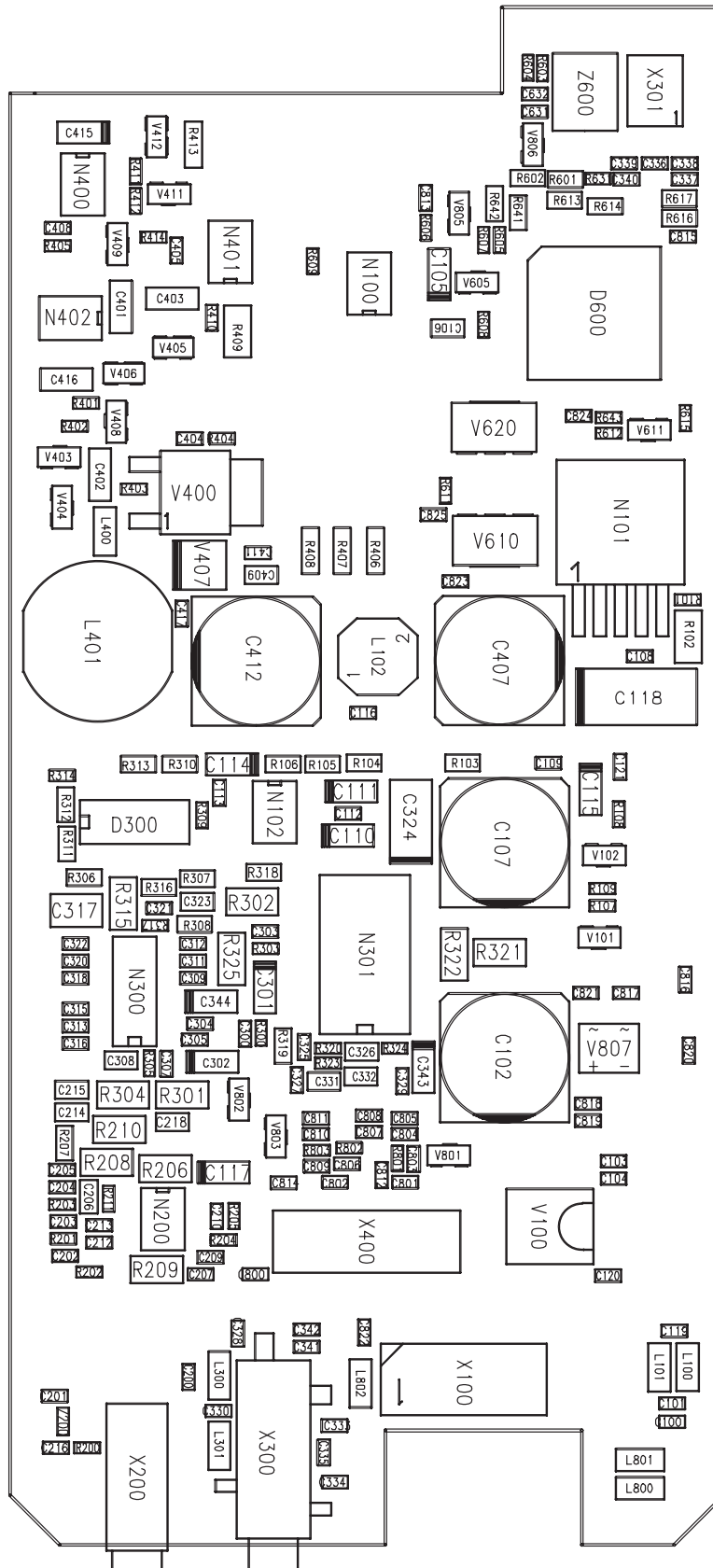
Input Protection

The purpose of the input protection is to prevent ESD, RF and high or negative input voltages to damage the module. Contacts that are subject to ESD are protected with diode pairs. All inputs are protected from RF.

Circuit Diagram of DC9

Circuit Diagram of DC9

Layout Diagram of DC9 (version 08)



Parts List of DC9 (EDMS Issue 8.2 Code 0200656)

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R101	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R102	1415960	Melf resistor	33.2 k	1 % 0.2 W 0204
R103	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R104	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R105	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R106	1414533	Chip resistor	56 k	1 % 0.1 W 0805
R107	1430079	Chip resistor	47 k	5 % 0.063 W 0603
R108	1430079	Chip resistor	47 k	5 % 0.063 W 0603
R109	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R200	1430167	Chip resistor	47	5 % 0.063 W 0603
R201	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R202	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R203	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R204	1430071	Chip resistor	22 k	5 % 0.063 W 0603
R205	1430095	Chip resistor	220 k	5 % 0.063 W 0603
R206	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R207	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R208	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R209	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R210	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R211	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R300	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R301	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R302	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R304	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R305	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R306	1414533	Chip resistor	56 k	1 % 0.1 W 0805
R307	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R308	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R309	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R310	1414283	Chip resistor	100 k	1 % 0.1 W 0805
R311	1414300	Chip resistor	68 k	1 % 0.1 W 0805
R312	1414452	Chip resistor	10 k	1 % 0.1 W 0805
R313	1414533	Chip resistor	56 k	1 % 0.1 W 0805
R314	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R315	1415784	Melf resistor	4.75 k	1 % 0.2 W 0204
R316	1414533	Chip resistor	56 k	1 % 0.1 W 0805
R317	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R318	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R319	1414533	Chip resistor	56 k	1 % 0.1 W 0805
R320	1430159	Chip resistor	22	5 % 0.063 W 0603
R321	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R322	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204

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R323	1430142	Chip resistor	4.7	5 % 0.063 W 0603
R324	1430142	Chip resistor	4.7	5 % 0.063 W 0603
R325	1415939	Melf resistor	22.1 k	1 % 0.2 W 0204
R401	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R402	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R403	1430159	Chip resistor	22	5 % 0.063 W 0603
R404	1430159	Chip resistor	22	5 % 0.063 W 0603
R405	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R406	1421101	Melf resistor	1.5	1 % 0.2 W 0204
R407	1421101	Melf resistor	1.5	1 % 0.2 W 0204
R408	1421101	Melf resistor	1.5	1 % 0.2 W 0204
R409	1415600	Melf resistor	1.0 k	1 % 0.2 W 0204
R410	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R411	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R412	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R413	1421103	Melf resistor	3.16 k	1 % 0.2 W 0204
R414	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R601	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R602	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R603	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R604	1430081	Chip resistor	56 k	5 % 0.063 W 0603
R605	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R606	1430159	Chip resistor	22	5 % 0.063 W 0603
R607	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R608	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R609	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R611	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R612	1430055	Chip resistor	6.8 k	5 % 0.063 W 0603
R613	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R614	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R615	1430035	Chip resistor	1.0 k	5 % 0.063 W 0603
R616	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R617	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R631	1430051	Chip resistor	4.7 k	5 % 0.063 W 0603
R641	1414276	Chip resistor	47 k	1 % 0.1 W 0805
R642	1414536	Chip resistor	200 k	1 % 0.1 W 0805
R643	1430055	Chip resistor	6.8 k	5 % 0.063 W 0603
R801	1430001	Chip resistor	100	5 % 0.063 W 0603
R802	1430001	Chip resistor	100	5 % 0.063 W 0603
R803	1430001	Chip resistor	100	5 % 0.063 W 0603
R806	1430095	Chip resistor	220 k	5 % 0.063 W 0603
C100	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C101	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C102	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C103	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C104	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C105	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C106	2310784	Ceramic cap.	100 n	10 % 25 V 0805

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C107	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C108	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C109	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C110	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C111	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C112	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C113	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C114	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C115	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C116	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C117	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C118	2604110	Tantalum cap.	10 u	20 % 25 V 7.3x4.4x2.8
C119	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C120	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C121	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C200	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C201	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C202	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C203	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C204	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C205	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C206	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C207	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C210	2320071	Ceramic cap.	330 p	5 % 50 V 0603
C212	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C213	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C214	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C215	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C216	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C218	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C300	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C301	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C302	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C304	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C305	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C307	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C308	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C309	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C312	2320075	Ceramic cap.	470 p	5 % 50 V 0603
C315	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C316	2320075	Ceramic cap.	470 p	5 % 50 V 0603
C317	2312292	Ceramic cap.	470 n	20 % Y5 V 1210
C318	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C321	2320075	Ceramic cap.	470 p	5 % 50 V 0603
C322	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C323	2340014	Ceramic cap.	47 n	10 % 25 V 0805
C324	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C325	2320079	Ceramic cap.	680 p	5 % 50 V 0603

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C326	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C327	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C328	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C329	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C330	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C331	2312208	Ceramic cap.	15 n	10 % 50 V 0805
C332	2312208	Ceramic cap.	15 n	10 % 50 V 0805
C333	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C334	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C335	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C336	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C337	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C338	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C339	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C340	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C341	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C342	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C343	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C344	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C401	2309517	Ceramic cap.	100 n	10 % 50 V 1206
C402	2309517	Ceramic cap.	100 n	10 % 50 V 1206
C403	2309517	Ceramic cap.	100 n	10 % 50 V 1206
C404	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C405	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C407	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C408	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C409	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C411	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C412	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C415	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C416	2309517	Ceramic cap.	100 n	10 % 50 V 1206
C631	2320059	Ceramic cap.	100 p	5 % 50 V 0603
C632	2320059	Ceramic cap.	100 p	5 % 50 V 0603
C800	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C803	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C804	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C805	2320083	Ceramic cap.	1.0 n	5 % 50 V 0603
C807	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C808	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C809	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C810	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C811	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C812	2320043	Ceramic cap.	22 p	5 % 50 V 0603
C813	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C814	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C815	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C816	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C817	2320063	Ceramic cap.	150 p	5 % 50 V 0603

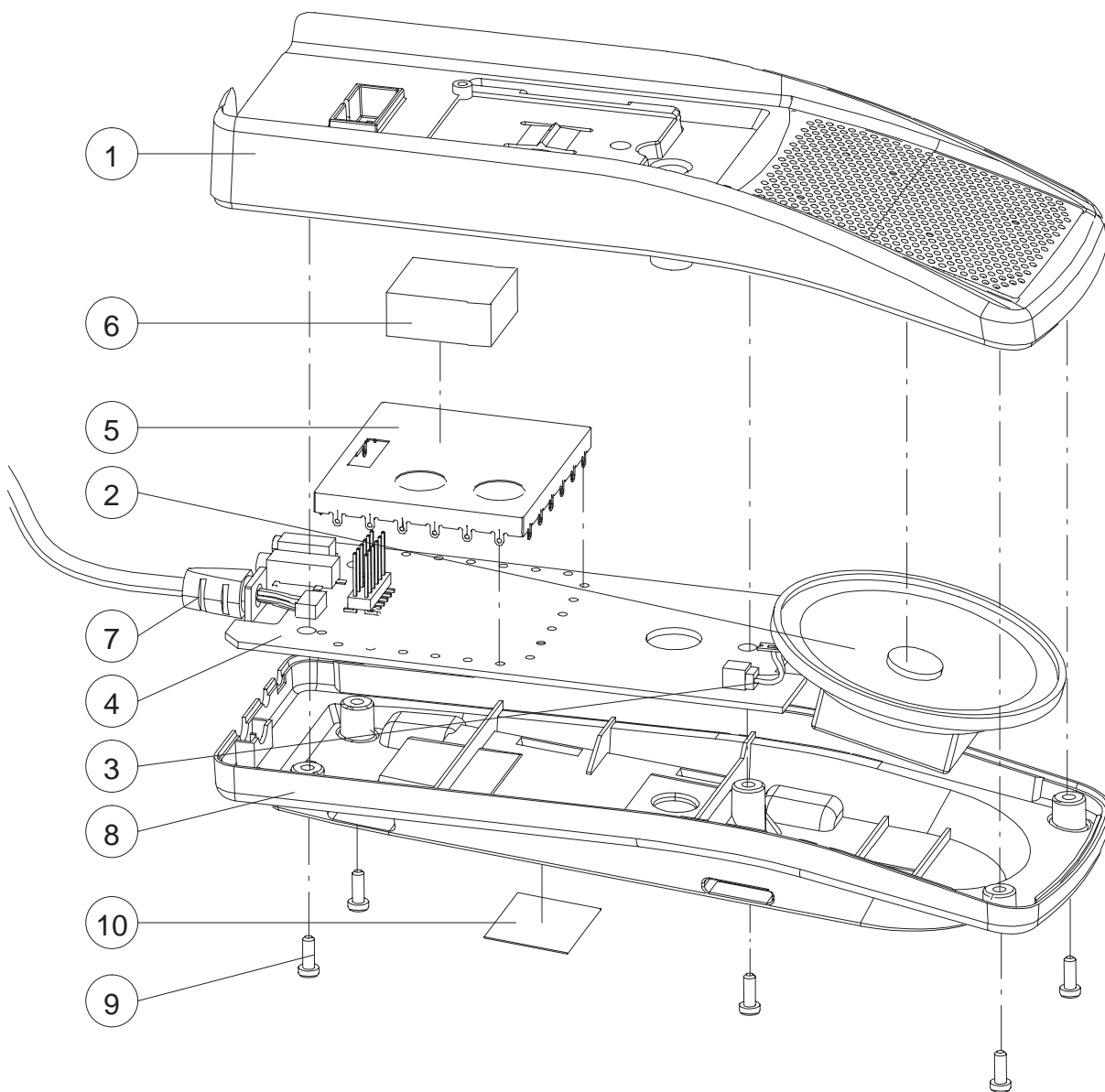
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C818	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C819	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C820	2320091	Ceramic cap.	2.2 n	5 % 50 V 0603
C821	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C822	2320110	Ceramic cap.	10 n	10 % 50 V 0603
C823	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C824	2320063	Ceramic cap.	150 p	5 % 50 V 0603
C825	2320063	Ceramic cap.	150 p	5 % 50 V 0603
L100	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L101	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L102	3640027	Chip coil	22 u	20 % 0.81 A 6.2x6.6x3
L300	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L301	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L400	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L401	3640039	Chip coil		1.26 A 12x13x6
L800	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L801	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
L802	3641262	Ferrite bead 30r/100mhz 2a	1206	1206
Z200	3640035	Filt z>450r/100m 0r7max 0.2a	0603	0603
Z600	4507733	Cer.reson 1.0mhz+/-0.5% 8.0x5.0smd		8.0x5.0smd
V100	4113933	Trans. supr.	18V	3000 W DO214AB
V101	4200909	Transistor	BC858B/BCW30	pnv 30 V 100 mA SOT23
V102	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V400	4215954	MosFet	RFD14N05	n-ch 50 V 10 A TO252
V403	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V404	4200909	Transistor	BC858B/BCW30	pnv 30 V 100 mA SOT23
V405	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V406	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V407	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V408	4110208	Zener diode	BZX84	5 % 24 V 0.3 W SOT23
V409	4110150	Zener diode	BZX84	2 % 10 V 0.3 W SOT23
V411	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V412	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V605	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V610	4210020	Transistor	BCP69-25	pnv 20 V 1 A SOT223
V611	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V620	4210096	Transistor	BCP54	npn 45 V 1.5 A SOT223
V805	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V806	4100285	Diode x 2	BAV99	70 V 200 mA SER.SOT23
V807	4103003	Diode	BRIDGE	600 V 0.5 A MBS
D300	4309488	IC, 4 x bi.switch	74HC4066	SO14S
D600	4370037	IC, MCU	uPD78081GB-513	QFP44
N100	4340067	IC, regulator	LP2951	3.3 V 100 mA
N101	4340127	Mic29152 reg ld adj 1.5a	to263-5	TO263-5
N102	4301199	IC, 2 x op.amp.	LM2904	SO8S
N200	4301199	IC, 2 x op.amp.	LM2904	SO8S
N300	4301182	IC, 2 x op.amp.	LM2902	SO14S
N301	4340125	L2726 2xop.amp pw5w1a 4-28v	so20w	SO20W

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N400	4340067	IC, regulator	LP2951	3.3 V 100 mA
N401	4301199	IC, 2 x op.amp.	LM2904	SO8S
N402	4305236	IC, 2 x comp.	LM2903	SO8S
X100	5416638	Connector 8-pole right angle 1.5		1.5
X200	5200005	Stereo jack + switch 2.5mm. hosid		HOSID
X300	5409035	Jack stereo 3.5mm smd		SMD
X301	5416640	Pin header m1x2 p1.5 90deg 1a0r02		1A0R02
X400	5440007	12 pins connector for phf-3 and p		P
P001	9854136	PC board	DC9	54x118x1.6mm d 3/panel
	9854136	PCB DC9 54X118X1.6MM D 3/PANEL		

Exploded View of PHF-3



Technical Documentation

Assembly Parts

ITEM	Q'TY	CODE	DESCRIPTION	VALUE, TYPE
1		9450720	Front cover	DMD00351
2		5140013	Loudspeaker	1W 15R d64mm h19mm
3		5400994	Connector	2 pole + 2 wire f
4		0200656	HF speaker module DC9	
5		9510333	RF shield	DMD01230
6		9480290	Acoustic foam	DMD01270
7		9780166	Power adapter cable	DMJ00016
8		9450719	Back cover	DMD00352
9	5	6291928	PT screw KB25X7	WN1412 FeZn blk
10		9380154	Label blank	4D22419 23.8X17.5

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