

# **Programme's After Market Services NME-3 Series Transceivers**

## **JBD-2 User Guide**

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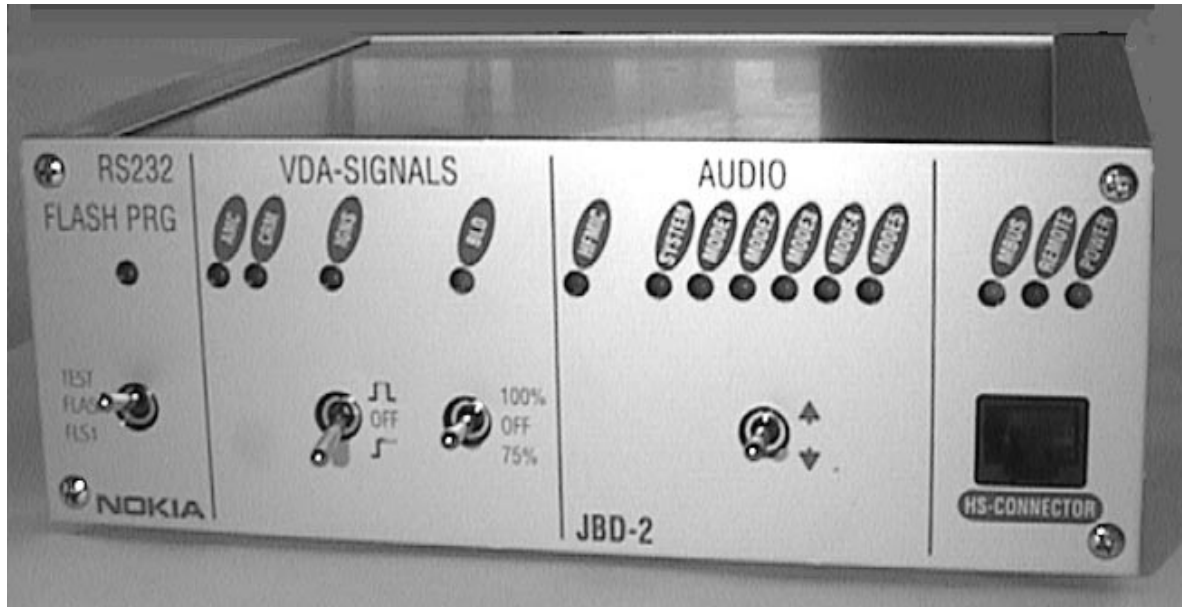
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## Introduction

JBD-2 is used to test the NME-3 in the Service Center. It is possible to use the JBD-2 for testing, analyzing, repairing, and fault logging of the Radio Unit (RU) and the Handset (HS).



JBD-2 is an interface between the phone and the computer when WinTesla service software is running.

With the JBD-2, it is possible to simulate a normal call, to check all interfaces are working and to run a final test via WinTesla service software. The JBD-2 will test all the hardware (HW) interfaces that can not be checked by using WinTesla.

## Common Functional Description

In the Test Interface Box (JBD-2), the different audio signal paths are switched with relays. The actual setting is displayed with LED's. In addition the original handsfree equipment can be connected.

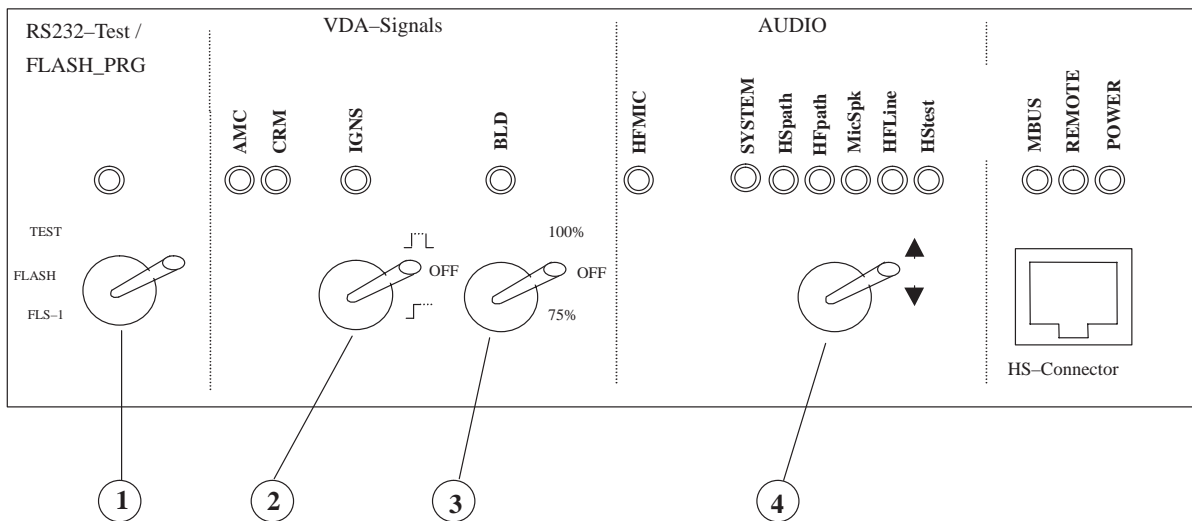
Two VDA-signals (IGNS and BLD) will be set from the JBD-2. The AMC and CRM signals are tested from the JBD-2.

The RS-232 from NME-3 can be tested by using WinTesla together with RS232 test circuit of the Test Interface Box.

WinTesla communicates with the RU and the HS via the MBUS. The MBUS is connected transparently.

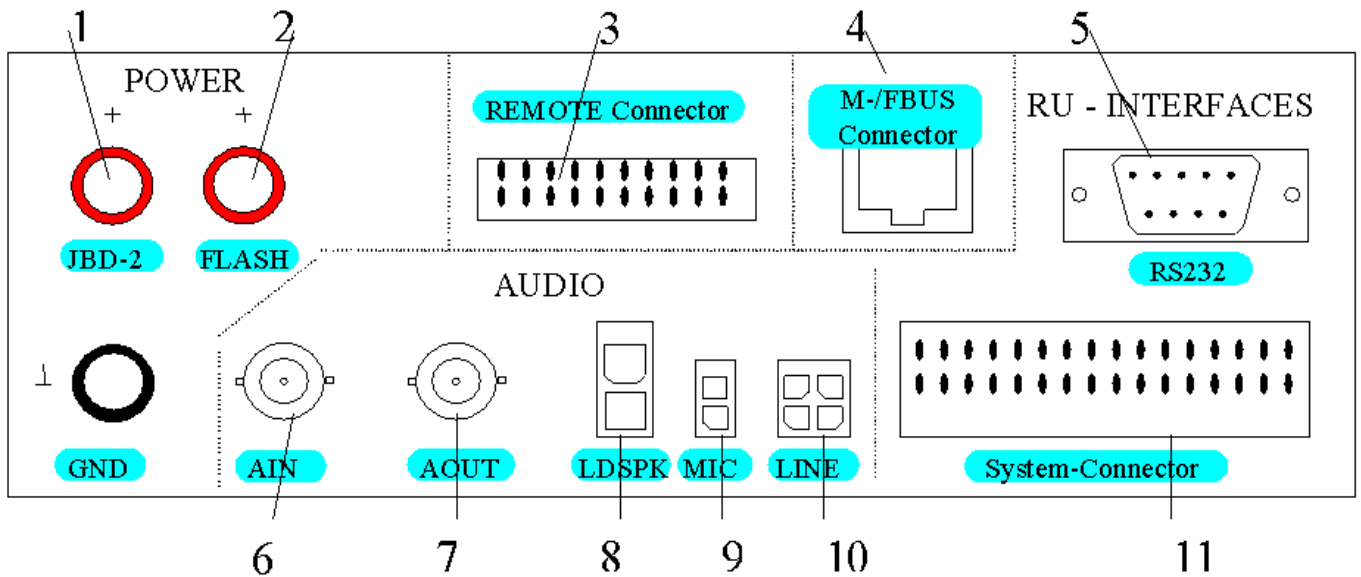
A remote connector optionally controls all settings.

## Technical Description



- 1- Main Switch (testing/flashing) (FLS-1 for future use)
- 2- Ignition sense (pulsed / off / on)
- 3- Back light dimming (on / off / 75% brightness = 50% duty cycle)
- 4- DC power for HF mic activen(above &V)
- 5- Audio path switch
- 6- HS connector

Figure 1. Front Panel Map



- 1- 13,5V 5A power supply for JBD-2 and CD949  
 2 - power from FLA-7 during flashing the phone via JBD-2  
 3 - remote connector (for future use)  
 4 - M-bus connection from TDC-4 / FLA-7  
 5 - RS232 connection to CD949

- 6 - Audio in  
 7 - Audio out  
 8 - HF loudspeaker HFM-10  
 9 - HF microphone HFM-15  
 10- Line out  
 11- System connector to CD949

Figure 2. Rear Panel Map

## Modes of Operation

JBD-2 has three operation modes. They are selectable with the switch <sup>①</sup> (TEST/FLASH/FLS1). The general mode is TEST. In this case, the box is testing all interfaces from NME-3.

In FLASH mode the JBD-2 support the old FLASH concept and in FLS1 mode the JBD-2 box support the new flash concept with FLS-1

### Operation Mode TEST

In this mode, the JBD-2 box together with WinTesla or PCI-/HCI-Test is able to test all interfaces from NME-3.

**Possible Audio Test Paths**

There are six different audio modes. All audio modes are selectable with the switch .

Set the switch into the upper position then change the JBD-2 into the next mode. Switching to the next mode will be indicated by a shift of the indicator LED one position to right. On the end of the LED line, there is a wrap around with the next push up.

If you actuate the switch in its bottom position then the JBD-2 will change into the previous audio mode. On the left end of the LED line, there is a wrap around with the next push down.

**SYSTEM Mode**

SYSTEM Mode tests the normal mobile mode.

The audio signals (HSMICP/N & HSEARP/N) will be routed via a matrix to the handset.

Additionally it will be connecting the following signals HFMICP and SPKP/N to the handsfree accessories connectors.

— These are the default setting after the power-on.

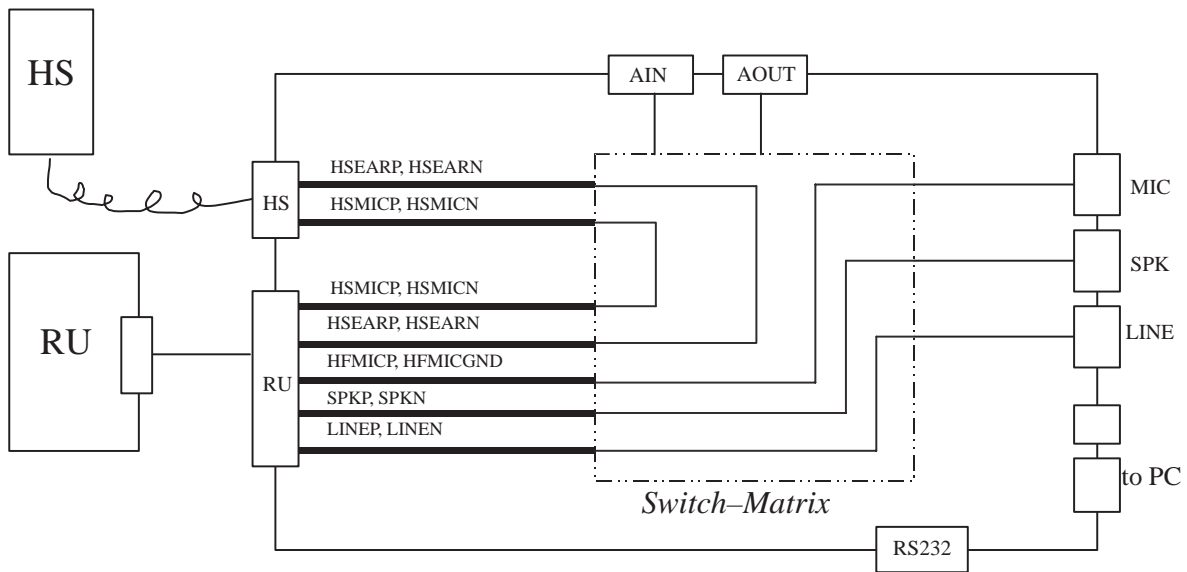


Figure 3. Routed audio path in Test mode

**Test case**

**HS path**

Tests the HS path from the RU.

The audio signals (HSMICP/N & HSEARP/N) are routed via switch matrix to AIN and AOUT. They are converted with electronics from an unbalanced to balanced signal and vice versa.



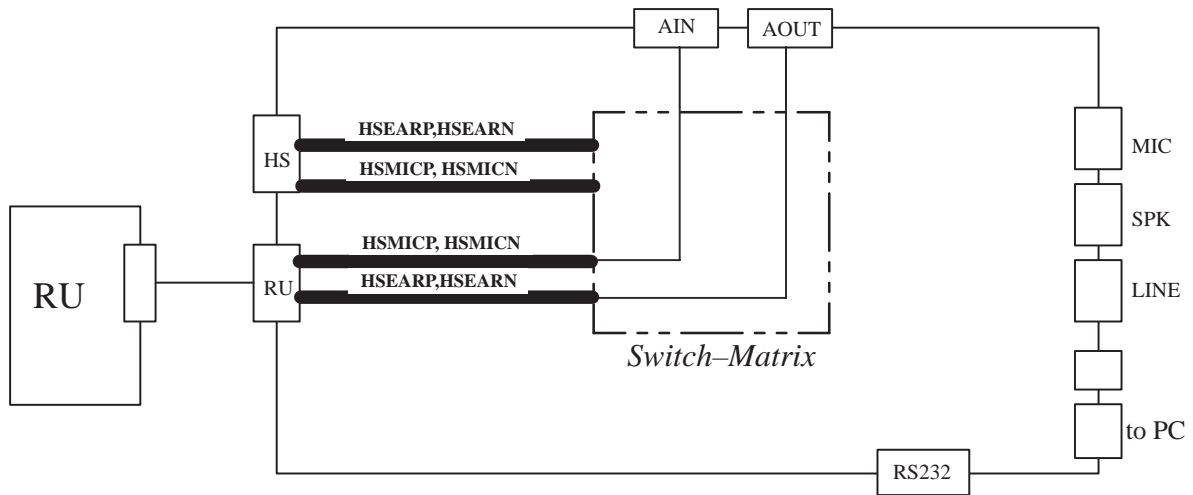
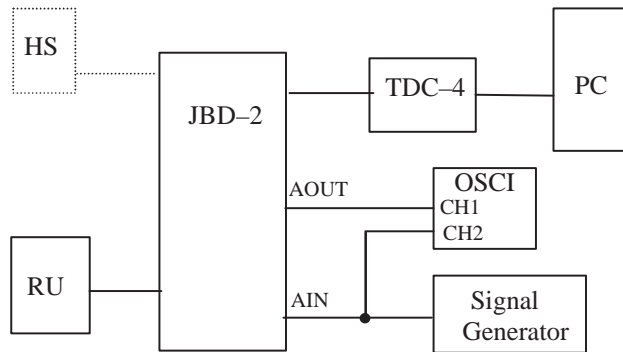


Figure 4. Routed audio path in HS path

**Test Setup**



**Measure Application**

This describes one of several measure possibilities.

In order to test to the complete HSMIC and HSEAR path, the RU must be set on internal audio-loop. Then inject a HSMIC signal in AIN and measure the HSEAR signal with oscilloscope at AOUT.

If it is not possible to set the RU on the internal audio-loop, it is possible to create it on the RF side with an external audio-loop and a GSM tester.

**HF path**

Tests the HF path from the RU.

The audio signals (HFMICP & SPKP/N) are routed via switch-matrix to AIN and AOUT.

— The audio signal SPKP/N is a balanced signal. (A balanced-to-unbalanced converter is used).

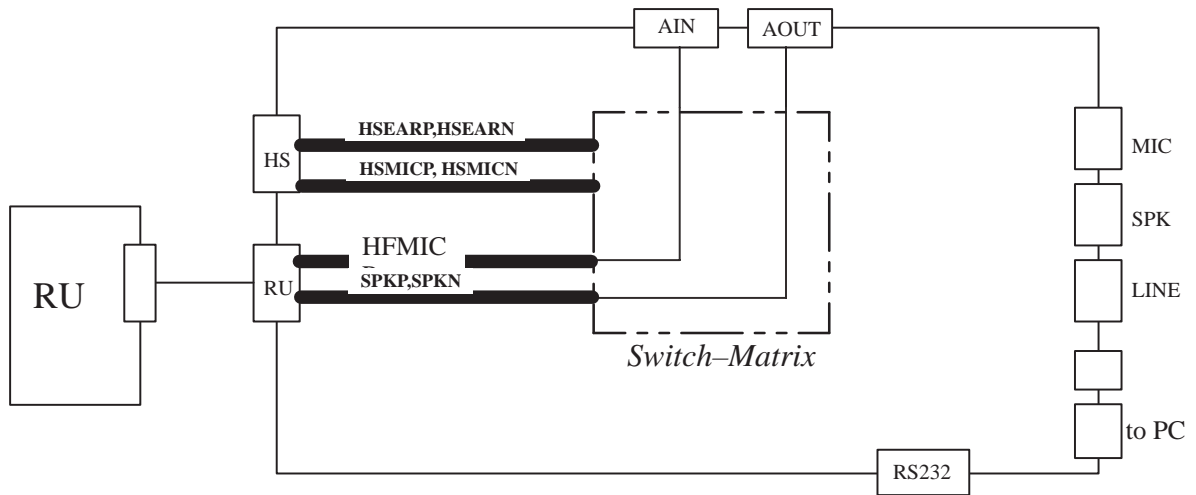
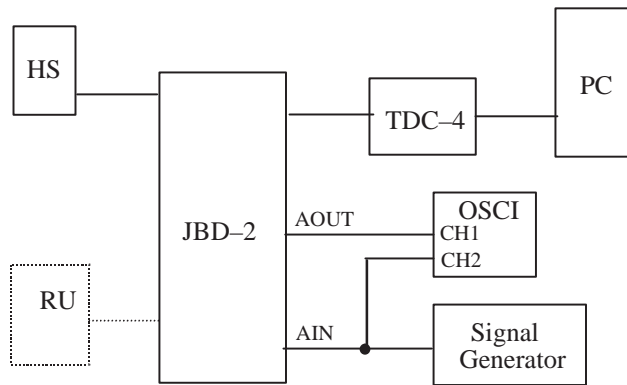


Figure 5. Routed audio path in HF path

**Test Setup**



**Test Application**

One of several measuring possibilities is to test the complete audio path HFMIC-SPK with the help of a signal generator and an oscilloscope. The RU must be switched into the internal audio loop between the HFMIC path and the SPK path. The HFMIC signal has to be injected at AIN AC coupled. Then measure the SPK signal at AOUT with an oscilloscope.

**MicSpk**

MicSpk tests the HF path from the RU with the original accessories. The audio signals (HFMICP & SPKP/N) are routed via matrix to the handsfree accessories.

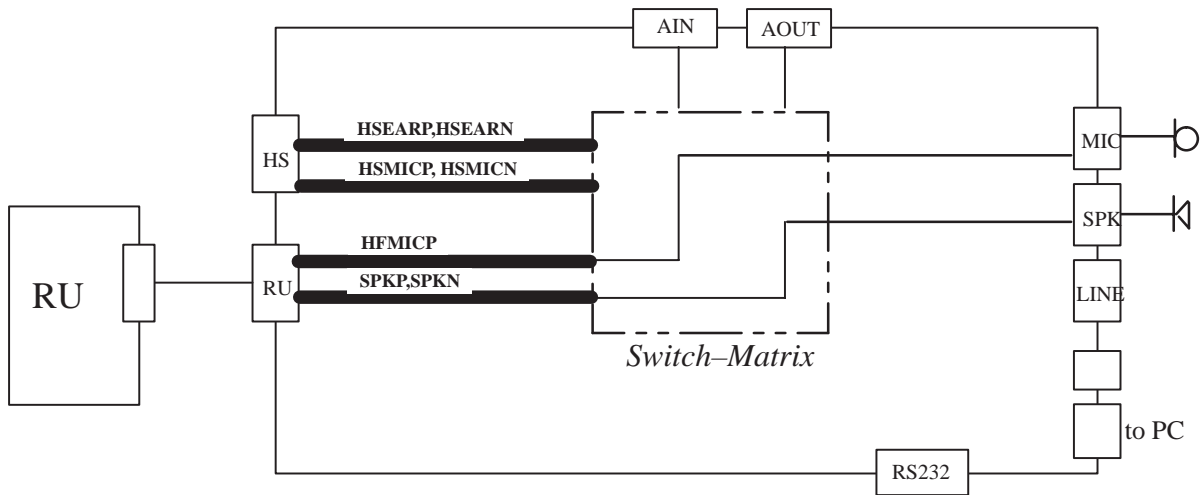


Figure 6. Routed audio path in MicSpk

**HF Line**

Tests the Lineout path from the RU.  
 The audio signals LINEP/N&HFMICP are routed via switch matrix to AOUT and AIN.

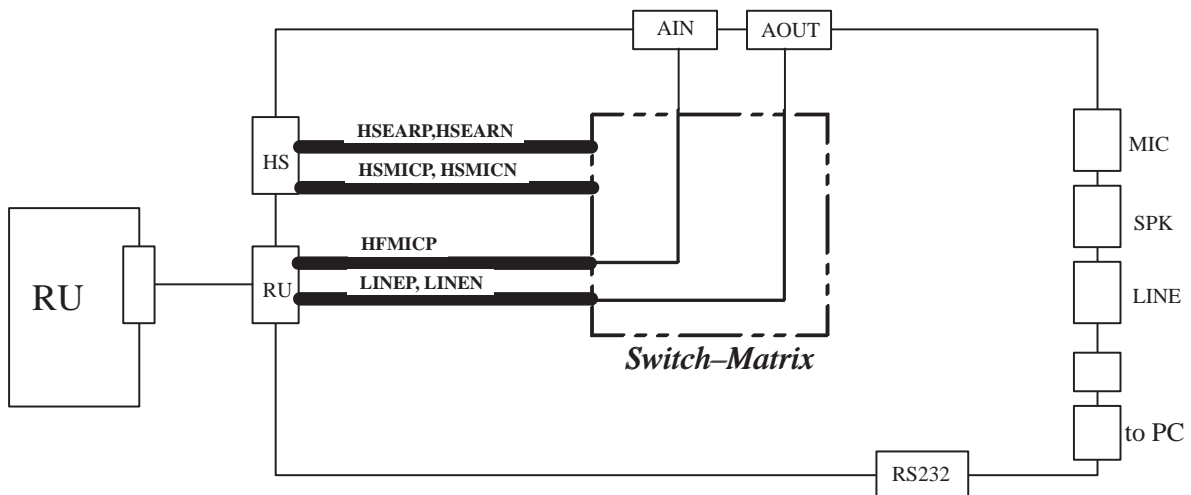
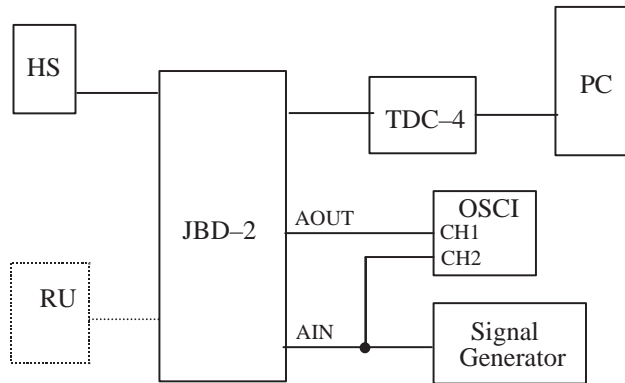


Figure 7. Routed audio path in HF Line

**Test Setup**



**HS test**

Tests the HS path from the HS.  
 The audio signals (HSMICP/N & HSEARP/N) are routed via switch matrix to AOUT and AIN where they are converted with to an unbalanced to balanced signal and vica versa.

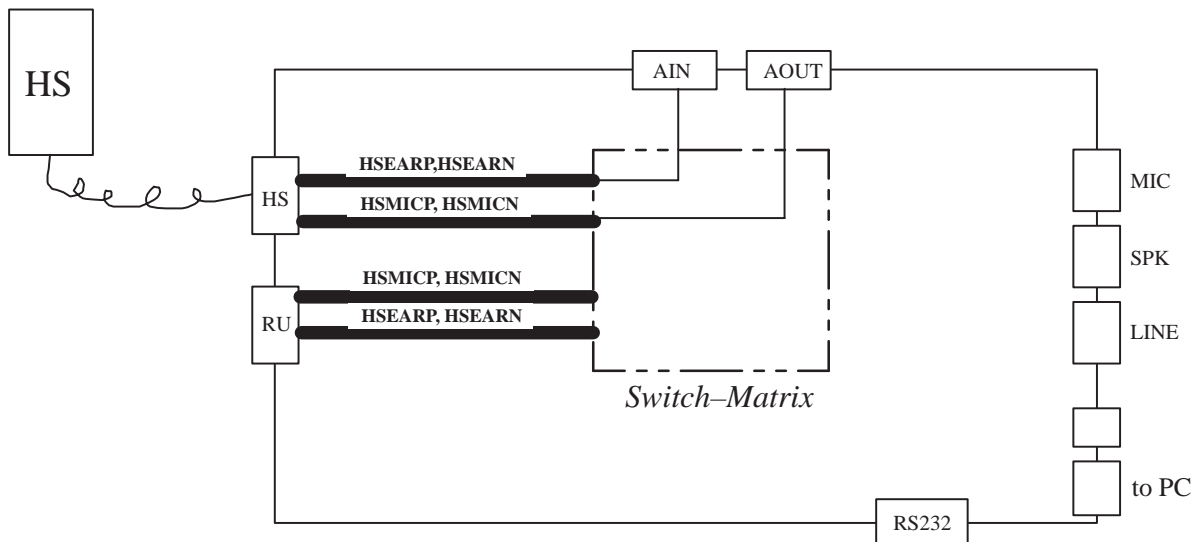
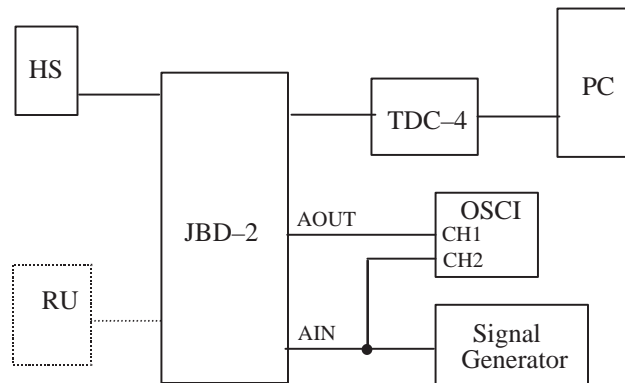


Figure 8. Routed audio path in HS test

## Test Setup



## Measure Application

The ear path can be tested by injecting a sinusoidal signal to AIN then a tone can be detected on the HS.

To test the microphone path, inject a tone in the microphone of HS and measure the signal with oscilloscope at AOUT.

In addition, with an acoustic coupler between ear and microphone in HS you can estimate the audio HS path with an oscilloscope.

Additional measure applications:

- Set backlight in the HS to 100%, 75% and OFF with MBUS commands.
  - WinTesla creates the MBUS commands.
  - The result must be checked visually.
- Keyboard test
  - 1st step: WinTesla sends MBUS commands to HS, which create characters on HS display.
  - 2nd step: Press the required character on the keyboard manual.
  - 3rd step: WinTesla read the pressed character via MBUS and compare it with the required character.
- SIM-connector test controlled about WinTesla with MBUS commands

**VDA Tests** only this must be converted by means of electronics.

The JBD-2 can check four VDA signals. The signals AMC and CRM are checked permanently. The other signals IGNS and BLD generates the box. Make these tests only in the audio modes 1-4 and system.

**Note** : It is important that the power supply is adjusted to 13.5V.

**AMC**

The integrated test circuit checks the line continually, if the signal is active and it meets the specification, the dedicated green LED will be lit.

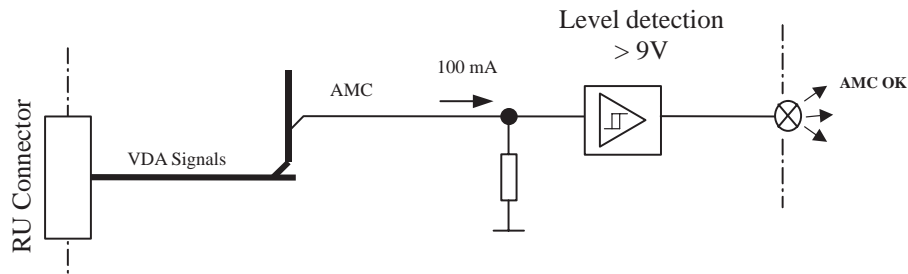
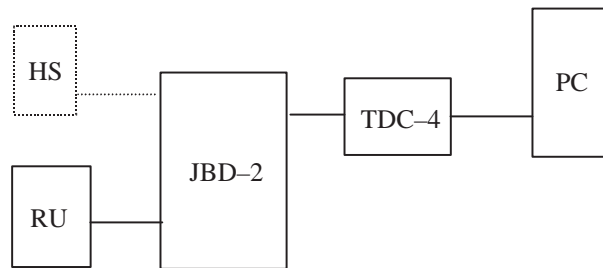


Figure 9. AMC Circuit

LED-State	Explanation
On (is lit)	Signal meets the specification. (The drive current ~100 mA)
OFF	Signal doesn't meet the specification.

**Test Setup**



**Measure Application**

Activate AMC signal with MBUS commands. WinTesla or PCI-Tests create the MBUS commands.

The indication LED illuminates if the signal meets the VDA specification.

Do not activate AMC into WinTesla or PCI-Test. Then the LED has to be switched off.

**CRM**

The line will be observed permanently. If the signal is active and it meets the specification, a green LED will be lit.

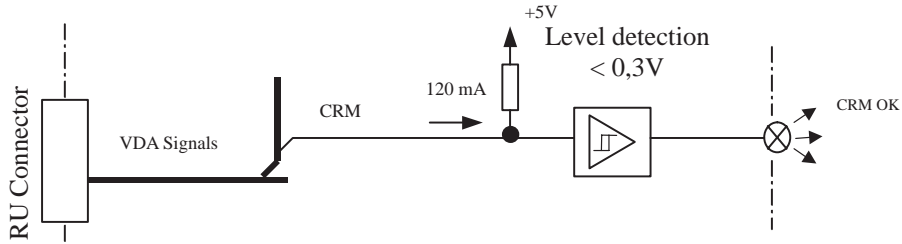
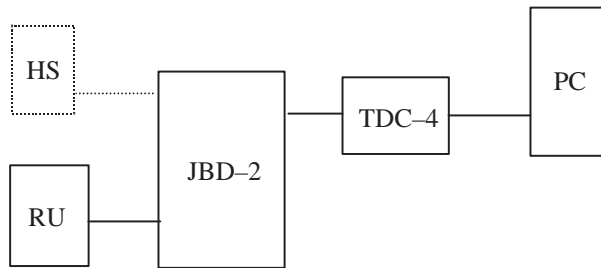


Figure 10. CRM Circuit

LED State	Explanation
ON (is lit)	Signal meets the specification; i.e. the level of signal will be driven at lower than 0,3 V.
OFF	Signals don't meet the specification.

**Test Setup**

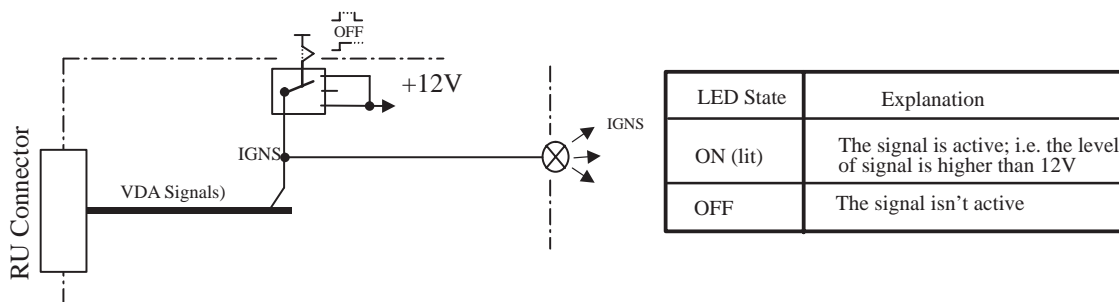


**Test Application**

In WinTesla or PCI-Test, you can switch on and off the CRM signal. The dedicated LED will be showing the actual test result. The LED is lit only when the CRM level is lower than 0,3 V and NME-3 can drive 100 mA to low114.

**IGNS**

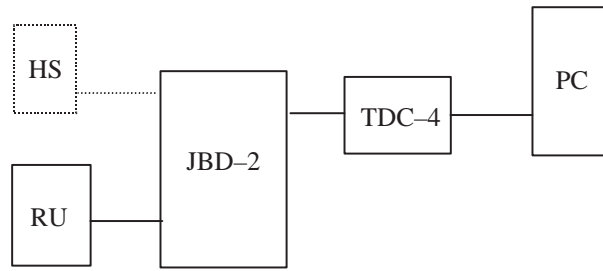
The signal can be superimposed with a pulse or it can be switched on continuously. If the signal is activated a green LED will be lit.



LED State	Explanation
ON (lit)	The signal is active; i.e. the level of signal is higher than 12V
OFF	The signal isn't active

Figure 11. IGNS Circuit

### Test Setup



### Measure Application

Activate the switch, NME-3-RU has to be running.

While the RU is running press the IGNS switch (operates/stroke) for a short time in the other position, WinTesla will show the changes in a window.

### BLD

The signal can be superimposed (supercharged) with fixed values of a PWM. If the backlight signal is active the green LED (BLD), has to be lit.

- If a handset is available, the test path can be checked visually.
- If no HS is available the converted value can be read from the RU and compared with the expected value. This is a semi-automatic test.

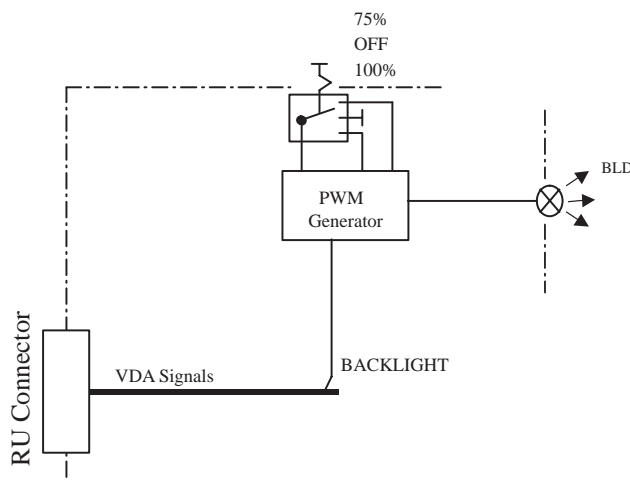
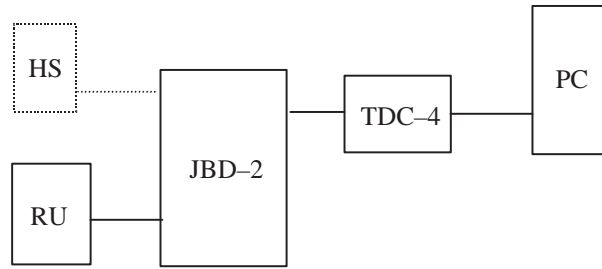


Figure 12. PWM Circuit

Note: 100% – maximum brightness  
75% –  $\frac{3}{4}$  of maximum brightness (conforms a duty cycle with 50%)



**Test Setup**



**Measure Application**

With the tappet switch it is possible to inject a specific PWM signal. E.g., 75% and WinTesla reads the converted signal from NME-3-RU and show it in the correct window. Check if the signal value meets the expected value.

**RS232 Test**

Connect to the RS232 interface to test the functionality of the connector. If Service SW starts the interface test, the test signals pass the Loop Adapter and will be sent back, if the interface is working correct.

Loop Adapter circuit :

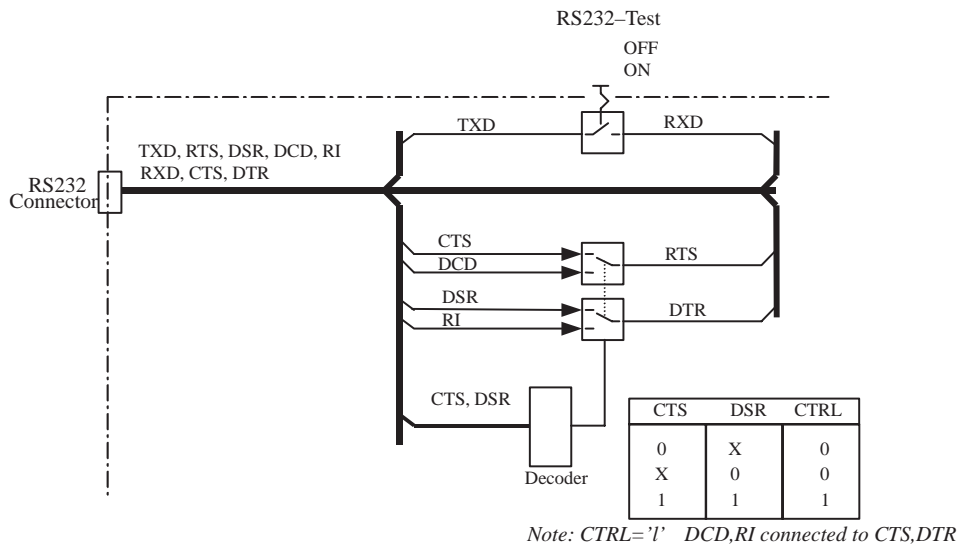


Figure 13. RS232 Test Circuit

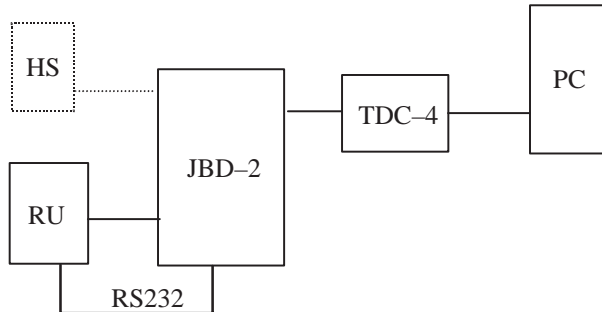
The test circuit has two possible states. The first state is the 'normal-loop' mode and the second condition is the 'advance-loop' mode. The CTS and DSR lines can control the switching between the two modes.

- In the *normal-loop* mode, the lines RX/TX, RTS/CTS and DSR/DTR can be checked.

The service software must be regarded that the CTS and the DSR line never take the logical value '1' at the same time.

- In the *advance-loop* mode check the RI and DCD lines.  
 The service SW has to ensure care that the lines CTS & DSR are activate during measurement.

**Test Setup**



**Measure Application**

Activate the loop-back test in WinTesla. The test result will be displayed in a window of WinTesla.

Additionally the RS232 control lines can be tested discretely. This is using the settings in WinTesla. Test sequence are listed in **"Test Sequences of RS232 CTR-Lines"**. at the end of this document.

**Operation Mode FLASH**

In this case, the switch has to be in the position FLASH and the power connector "FLASH" must be connected to the service battery cable from FLA-7.

In addition, the power supply at the power connector "JBD-2" must be +13.5 V.

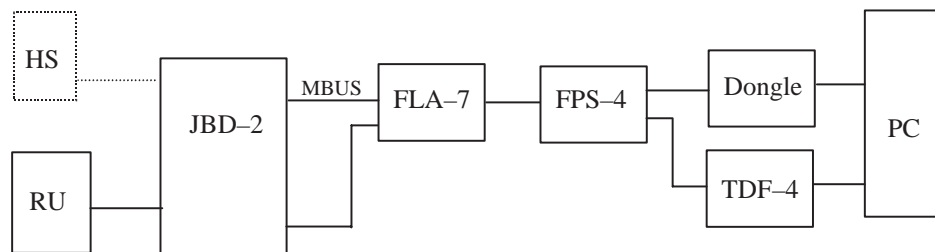


Figure 14. Principle old Flash concept

### Operation Mode FLS1

In this mode, the NME-3-RU can be reprogrammed with the new flash concept.

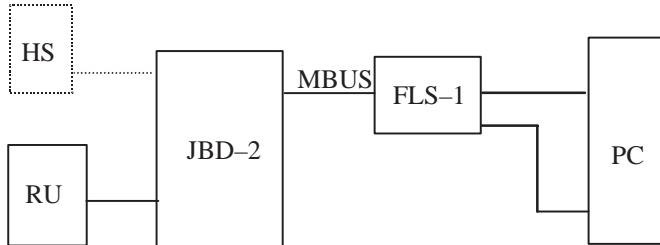


Figure 15. Principle new Flash concept

### Power Distribution Diagram

The main operational voltage is +5 and +12V, but the balanced-to-unbalanced and unbalanced-to-balanced converters need a special operating voltage: +10V. In the audio mode 5, the power supply of the handset will be supplied from the JBD-2. The level detection circuits also need +12V. This is why four voltage regulators are needed.

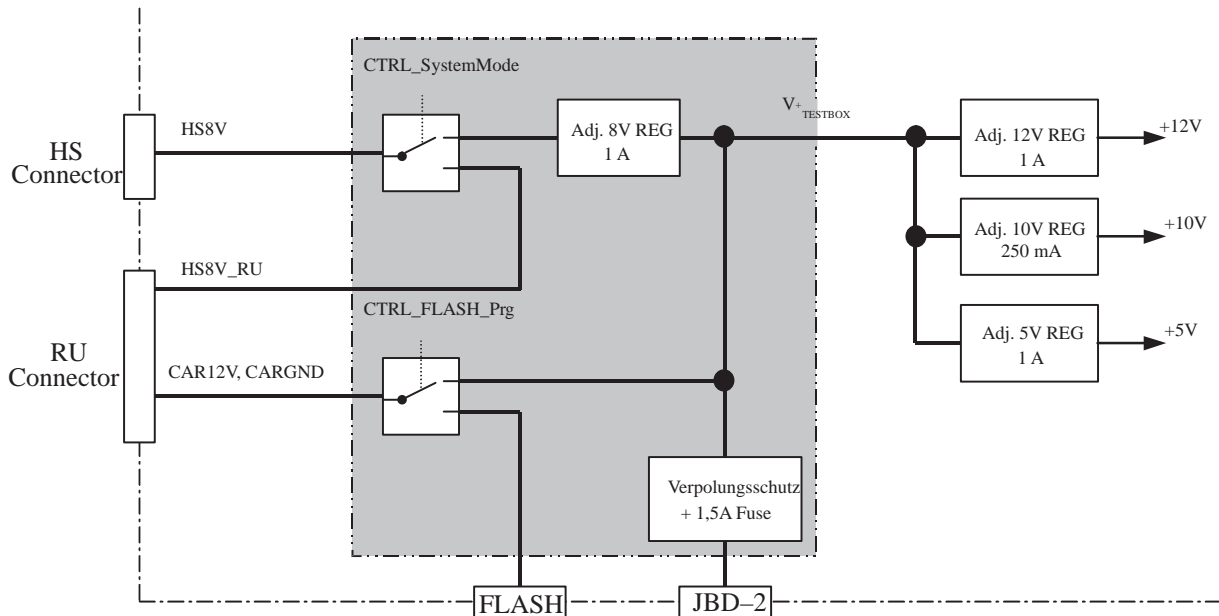


Figure 16. Power Distribution

The voltage will be controlled via dedicated control lines. The control line “CTRL13” will be activate if the switch is in its upper (TEST) position.

The control line “CTRL12” will be activated if the audio mode 5 is selected.

### Control Unit (EPLD) Description

The control unit is implemented with a programmable logic block

Functions of the EPLD:

- PWM Generator of BLD signal
- Handling of all switches on the front panel
- It links the remote control interface with the manual control elements

The EPLD was designed with the "ALTERA MAX+PLUS II" version 9.1 on a personal computer. The design is hierarchically structured. A big part of the EPLD circuit design is implemented in schematics and the rest is in VHDL-scripts and truth tables. The VHDL script is be used to design the PWM generator of the backlight circuit. The truth-tables are preferential used for decoders.

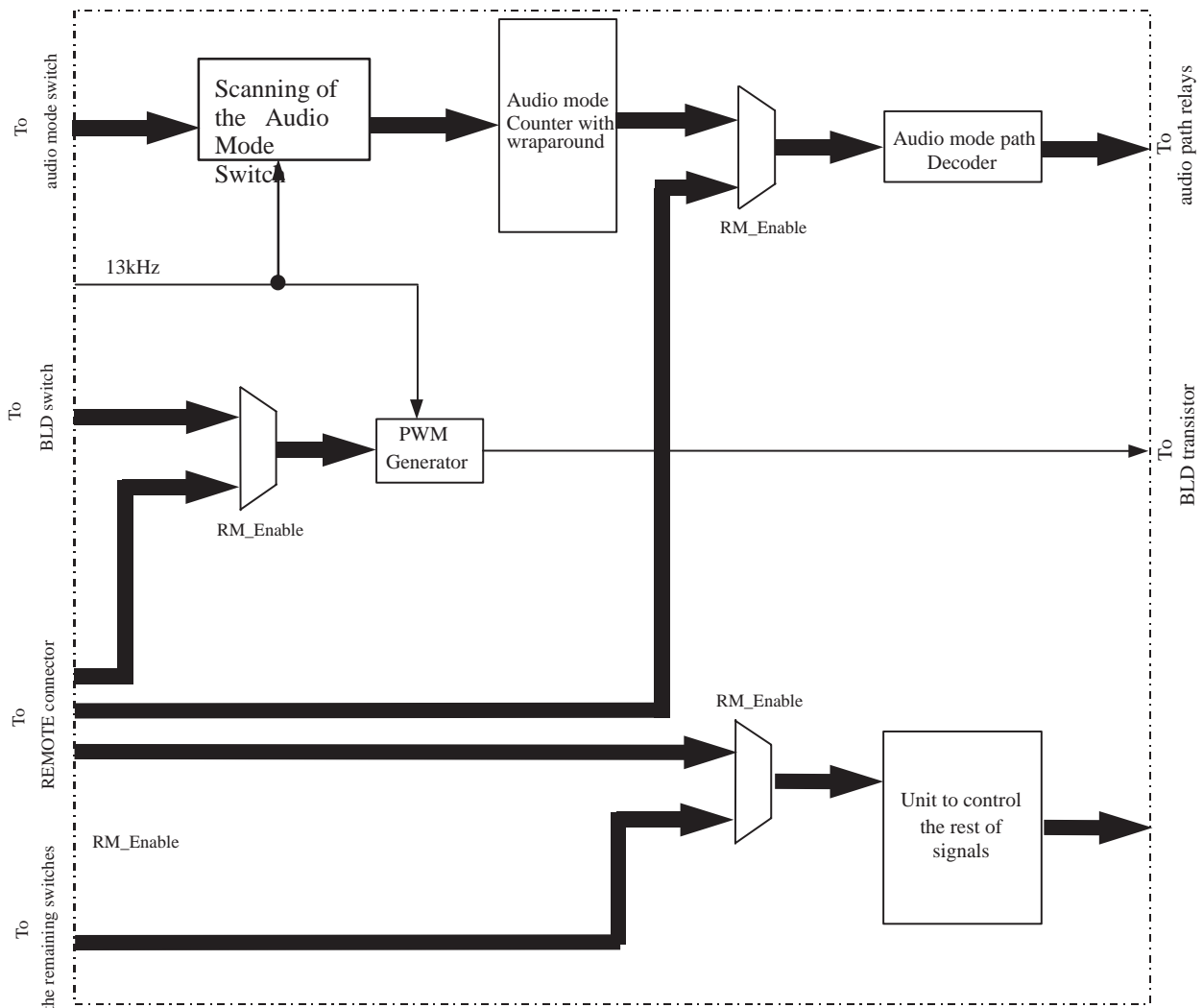


Figure 17. Simplified Block Diagram of EPLD

## Remote Interface

Remote Interface allows all manual adjustments to be controlled. The results of the VDA measurements (AMC & CRM) and the result of detecting the DC voltage level in the HFMIC path, are available as output on the interface.

Use a PC to control the JBD-2 from the IEC-to-Parallel interface. For example: "ICS 4863 - GPIB Parallel Interface"

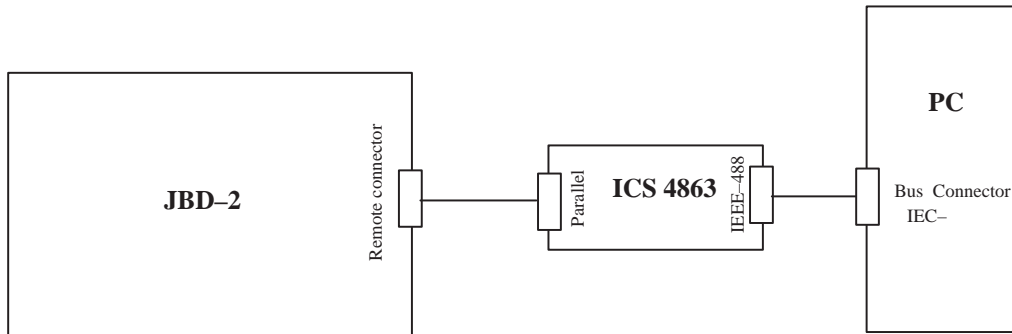


Figure 18. Remote Interface

To activate the remote control, the remote line "REMOTE\_EN" has to be set to logical level high (+5V).

The different audio paths can be selected with the three BCD coded remote lines RM\_SYSTEM, RM\_MODE1 and RM\_MODE2.

**Table 2. Significance of the RM\_SYSTEM, RM\_MODE1, RM\_MODE2**

Remote lines			Selected audio mode
RM_MODE2	RM_MODE1	RM_SYSTEM	
0	0	0	SYSTEM
0	0	1	MODE1
0	1	0	MODE2
0	1	1	MODE3
1	0	0	MODE4
1	0	1	MODE5
1	1	X	reserved

With the input lines RM\_FLS1 and RM\_TEST will be selected the differently operating modes of the JBD-2 box.

**Table 3. Significance of the RM\_FLS1, RM\_TEST**

Remote lines		Selected operating modes
RM_FLS1	RM_TEST	
0	0	Operating mode FLASH
0	1	Operating mode TEST
1	0	Operating mode FLS1
1	1	reserved

## Technical Specification

### DC Characteristics

**Table 4. Power Supply**

Pin / Conn.	Line Symbol	Minimum	Typical / Nominal	Maximum	Unit / Notes
X21	PWR	13	13.5	16	V /
X21	PWR	150	190	300 1.5	mA / only JBD-2 A / with HS&RU

### External Signals and Connections

**Table 5. System connector (X17)**

Pin	Line Symbol	Minimum	Typical / Nominal	Maximum	Unit / Notes
1	CAR12V			16	V /
2	CARGND				
3	BLD				/ dependent on the connecting device
4	AMC			16	/ dependent on the connecting device
5	FBUSTX				/ dependent on the connecting device
6	GND				
7	GND				
8	HSPower_KEY				
9	HSEARP_RU				
10	HSEARN_RU				
11	GND				
12					Not Connected
13	LINEP_RU				
14	LINEN_RU				
15					Not Connected
16					Not Connected
17	CAR12V			16	V /
18	CARGND				
19	IGNS				
20	CRM				
21	FBUSRX				/ dependent on the connecting device
22	MBUS				/ dependent on the connecting device
23	MBUS				/ dependent on the connecting device
24	HS8V_RU			8	V /
25	HSMICP_RU				
26	HSMICN_RU				
27	HFMICGND				

28	HFMICP				
29					Not Connected
30					Not Connected
31	SPKP_RU				
32	SPKN_RU				

**Table 6. NME-3 RS-232 interface connector (X25)**

Pin	Line Symbol	Parameter	Type	Mini- mum	Maxi- mum	Unit / Notes
1	DCD	Device Carrier Detect '1' '0'				V / dependent on connecting device
2	RXD	Data Transmit '1' '0'				V / dependent on connecting device
3	TXD	Data Receive '1' '0'				V / dependent on connecting device
4	DTR	Data Send Ready '1' '0'				V / dependent on connecting device
5	GND	Ground		0		V
6	DSR	Data Terminal Ready '1' '0'		-12	+12	V / It's a input
7	RTS	Clear To Send '1' '0'				V / dependent on connecting device
8	CTS	Ready To Send '1' '0'		-12	+12	V / It's a input
9	RI	Ring Indicator '1' '0'				V / dependent on connecting device

**Table 7. NME-3 Handset interface connector (X1)**

Pin	Line Symbol	Parameter	Mini- mum	Typical / Nominal	Maxi- mum	Unit / Notes
1						Not Connected
2	MBUS					V / dependent on the connecting device
3	HS8V			8		V / in MODE5 V / in SYSTEM mode depend from NME-3
4	GND					
5	HSEARP_HS					mV
6	HSEARN_HS					mV

7	HSPower_KEY	Not active Active	>0,2 0		* 0,2	V / *dependent on the connecting device
8	HSMICP_HS					
9	HSMICN_HS					
10						Not Connected

**Table 8. HF Loudspeaker connector (X14)**

Pin	Line Symbol	Parameter	Mini- mum	Typical / Nominal	Maxi- mum	Unit / Notes
1	SPKP					V / dependent on the connecting device
2	SPKN					V / dependent on the connecting device

**Note: Table1-8, All voltage levels are dependent on the connecting devices.**

**Table 9. HF Microphone connector (X15)**

Pin	Line Symbol	Parameter	Mini- mum	Typical / Nominal	Maxi- mum	Unit / Notes
1	HFMICGND					
2	HFMICP	DC-level	900		1100	mVRMS / dependent on the connect device

**Table 10. LineOut connector (X16)**

Pin	Line Symbol	Parameter	Mini- mum	Typical / Nominal	Maxi- mum	Unit / Notes
1	Shield line	Ground				
2	LINEN		900		1100	mVRMS / level between LINEN and LINEP is dependent on the connecting device
3	LINEP					
4						Not Connected

**Table 11. M-/ FBUS interface connector (X24)**

Pin	Line Symbol	Parameter	Mini- mum	Typical / Nominal	Maxi- mum	Unit / Notes
1						Not Connected
2						Not Connected
3	GND	Ground		0		V
4	MBUS	'1' '0'	2,25 0	3	3,3 0,6	V / dependent on the connecting devices
5	FBUS_RX	'1' '0'	2,25 0	3	3,3 0,4	V / dependent on the connecting devices
6	FBUS_TX	'1' '0'	2,0 0	2,8	3,5 0,6	V / dependent on the connecting devices



7	CNTRL_A					V / dependent on the connecting device
8	CNTRL_B					V / dependent on the connecting device
9						Not Connected
10						Not Connected

**Table 12. Remote connector (X23)**

Pin	Line Symbol	Parameter	Type	Minimum	Maximum	Unit / Notes
1	REMOTE_EN	'0' '1'	IN	0 2	0.8 5	V /
2	GND	Ground				
3	RM_IGNS	'0' '1'	IN	0 2	0.8 5	V / Ignition Sense
4	RM_BLD_75	'0' '1'	IN	0 2	0.8 5	V / Backlight 75%
5	RM_BLD_100	'0' '1'	IN	0 2	0.8 5	V / Backlight 100%
6						Not Connected
7	RM_SYSTEM	'0' '1'	IN	0 2	0.8 5	V / Lines to select the audio modes
8	RM_MODE1	'0' '1'	IN	0 2	0.8 5	
9	RM_MODE2	'0' '1'	IN	0 2	0.8 5	
10	RM_MODE3	'0' '1'		0 2	0.8 5	V.../ reserved
11	RM_MODE4	'0' '1'		0 2	0.8 5	V.../ reserved
12	RM_CNTRL_A	'0' '1'	IN	0 2	0.8 5	V.../
13						Not Connected
14	RM_CNTRL_B	'0' '1'	IN	0 2	0.8 5	V /
15	RES_AMC	'0' '1'	OUT	0 2	0.8 5	V / Test result of AntennaMotorControl
16	RES_CRM	'0' '1'	OUT	0 2	0.8 5	V / Test result of CarRadioMute
17	RES_HFMIC	'0' '1'	OUT	0 2	0.8 5	V / Test result of BIAS HF-Microphone
18	RM_PWRKEY	'0' '1'	IN	0 2	0.8 5	V / HSPWR_KEY inactive _____ " _____ active

19	RM_FLS1	'0' '1'	IN	0 2	0.8 5	V /	Lines to select the operating mode of JBD-2: FLASH 00 FLS1 01 TEST 10
20	RM_TEST	'0' '1'	IN	0 2	0.8 5	V /	

**Table 13. AIN & AOUT BNC-connectors**

Connector	Line Symbol	Parameter	Minimum	Typical / Nominal	Maximum	Unit / Notes
X12	AIN		35		2500	mV
X13	AOUT		35		2500	mV

**Table 14. DC supply connector**

Connector	Line Symbol	Parameter	Minimum	Typical / Nominal	Maximum	Unit / Notes
X21	PWR	Power supply input	13	13,5	16	V / Red banana female connector
X11	GND	Ground		0		V / Black banana female connector

**Table 15. RadioUnit DC Power Supply Connector**

Pin	Line Symbol	Parameter	Minimum	Typical / Nominal	Maximum	Unit / Notes
X22	FPWR		8	13,5	16	V / Red banana female connector
X11	GND	Ground		0		V / Black banana female connector

## Abbreviations

AMC	Antenna Motor Control
BLD	Backlight Dimming
CRM	Car Radio Mute
FLA-7	Flash Loading Adapter
FLS-1	Point of Sale Flash device
FPS-4	Flash Prommer
HS	Hand Set
HW	Hardware
IGNS	Ignition Sense
JBD-2	Test Interface Box
PKD-1	Standard Software Dongle
PKD-1CS	Central Service Dongle
RU	Radio Unit
SCD-2	Repair Place Cable
SW	Software
t.b.d.	to be defined
TDC-4	ComBox
TDF-4	Security Box

## Test Sequence of RS232 CTRL-lines

The following NME-3-Outputs has to set in WinTesla. The NME-3-Inputs represents the displayed result in WinTesla.

**Table 15. Test Sequence of RS232 CTRL-lines**

NME-3-Outputs				NME-3-Inputs		Explanation		Relay state
RI	DCD	DSR	CTS	DTR	RTS			
X1	X	0	0	0	0	DSR DTR	CTS RTS	Inactive
X	X	0	1	0	1	DSR DTR	CTS RTS	Inactive
X	X	1	0	1	0	DSR DTR	CTS RTS	Inactive
0	0	1	1	0	0	RI DTR	DCD RTS	Active
0	1	1	1	0	1	RI DTR	DCD RTS	Active
1	0	1	1	1	0	RI DTR	DCD RTS	Active
1	1	1	1	1	1	RI DTR	DCD RTS	Active

Note: 1 the value is not relevant

### Repair setup

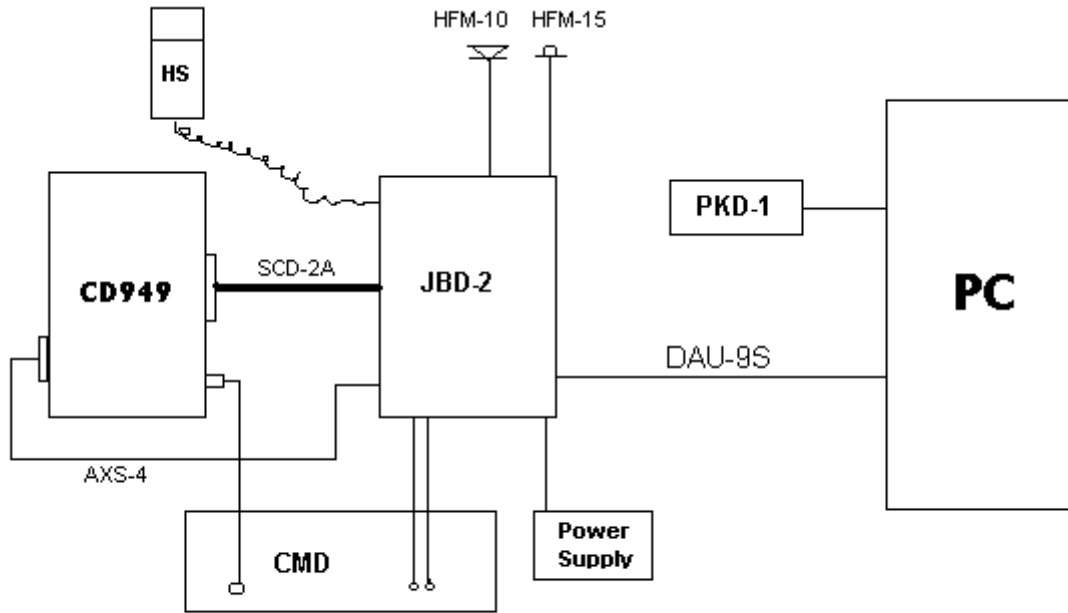


Figure 19. Repair setup

### Flash setup

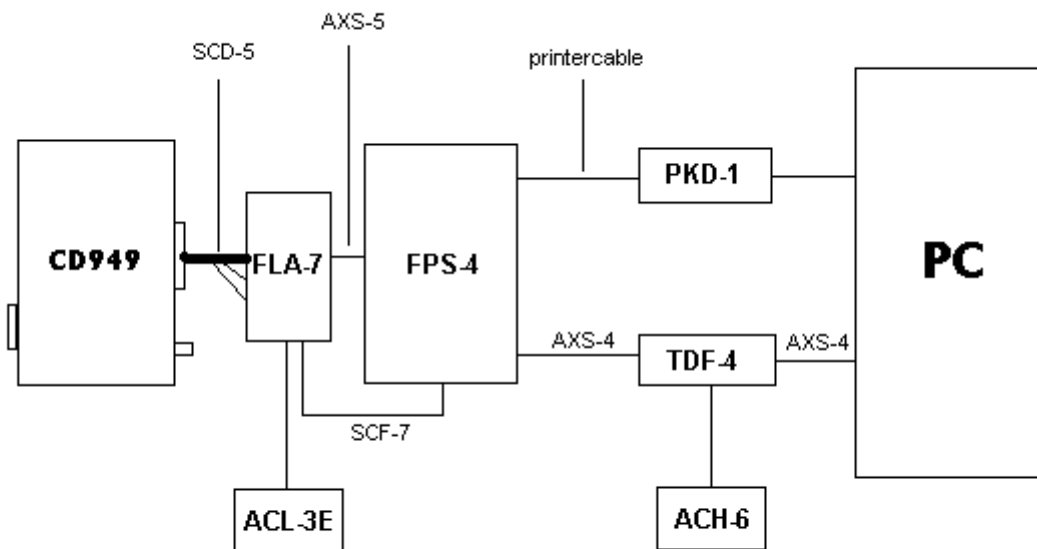


Figure 20. Flash setup