musway M12 12-Channel Class D Amplifier M12 with 16-Channel DSP Instruction Manual

Contents

musway M12 12-Channel Class D Amplifier M12 with 16-Channel DSP

TECHNICAL SPECIFICATIONS

POWER SUPPLY	
Voltage:	8 - 15 VDC
Idle current:	3.2 A
Switched off:	<0.1 mA
Remote IN:	7,5 - 15 VDC (1 mA)
Remote OUT:	11 - 15 VDC (200 mA)
Fuse:	40 A x 2

AMPLIFIER STAGE	
Distortion - THD (1 kHz @ 4 Ω, 90% Power):	0.05 %
Bandwidth (-3 dB, 2 V RMS, 4Ω):	15 Hz - 22 kHz
S/N ratio @ A weighted, 1 V, Max. Power:	95 dB A
Damping factor @ 1 kHz, 2 V RMS, 4 Ω:	> 70
Input sensitivity:	8 - 24 V RMS (High-level); 2 - 6 V RMS (Low-level); 1 - 8 V RMS (AUX)
Input impedance:	13 Ω (High-level); 47 kΩ (Low-level)
LOAD IMPEDANCE (MIN):	
@ 12CH:	2 Ω
@ Bridged:	4 Ω
OUTPUT POWER (RMS) @ 14.4 VDC, 1% THD*:	
@ 4 Ω:	85 W
@ 2 Ω:	120 W
Bridged @ 4 Ω:	240 W

SIGNAL OUTPUTS

- RCA OUT CH13/14 & CH15/16: 5 V RMS Max.
- In typical multi-channel applications (2- / 3-way systems + rear speakers + subwoofer)

DIGITAL SIGNAL PROCESSOR (64 bit Clock speed: 295 MHz)

Crossover:	Full / Hi Pass / Lo Pass / Band Pass
Crossover type and slope:	Bessel / Butterworth / Linkwitz @ 6/12/18/24/30/36/42/48 dB
Crossover Frequency:	1 Hz step @ 20 Hz - 20 kHz
Phase inversion:	0° / 180°
Output Equalizer:	31-Band Parametrical Equalizer: ±12 dB
Time Alignment Distance:	0 - 692 cm
Time Alignment Delay:	0 - 17 ms
Time Alignment Step:	0,08 ms; 2,8 cm
Time Alignment Fine Set:	0,02 ms; 0,7 cm
Presets (Local Stored):	6 Presets

GENERAL REQUIREMENTS	
PC connections	Micro USB (1.1 / 2.0 / 3.0)
Software/PC requirements:	Microsoft Windows (32/64 bit): XP, Vista, Windows 7, Windows 8, Windows 10
Graphic card min. resolution:	1024 x 768
Ambient operating temperature range:	0 - 55 °C

SIZE / WEIGHT	
Size without brackets (mm):	340 x 48 x 171,5
Net Weight (kg):	3,2

SCOPE OF DELIVERY

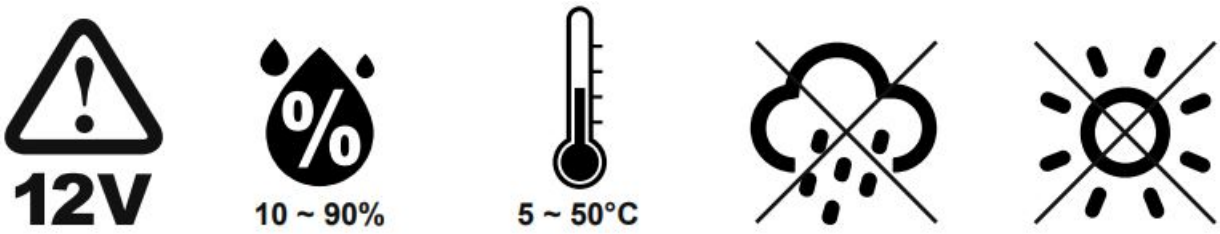
- 1 x M12 DSP Amplifier
- 1 x 1,5 m USB Cable
- 1 x 24-pole Cable Adapter (High Level Inputs)
- 1 x 24-pole Cable Adapter (Speaker Outputs)
- 1 x 4-pole Cable Adapter (REM IN/OUT)
- 1 x Mounting Plate incl. Screws
- 1 x Owner’s Manual (English/German)
- 2 x 40 A replacement fuse
- 1 x 3 mm hex key

SAFETY INSTRUCTIONS

- THE PURCHASED DEVICE IS ONLY SUITABLE FOR AN OPERATION WITH A 12V ONBOARD ELECTRICAL SYSTEM OF A VEHICLE.
    - Otherwise fire hazards, risk of injury and electric shock consist.

- PLEASE DO NOT MAKE ANY OPERATION OF THE SOUND SYSTEM, WHICH DISTRACT YOU FROM A SAFE DRIVING.
    - Do not make any procedures, which demand longer attention. Perform these operations not until you have stopped the vehicle on a safe place.
    - Otherwise, the risk of accident consists.
- ADJUST THE SOUND VOLUME TO AN APPROPRIATE LEVEL, THAT YOU ARE STILL ABLE TO HEAR EXTERIOR NOISES WHILE DRIVING.
    - High-performance sound systems in vehicles may generate the acoustic pressure of a live concert.
    - Permanent listening to extreme loud music may cause the loss of your hearing abilities.
    - The hearing of extreme loud music while driving may derogate your cognition of warning signals in the traffic.
    - In the interests of the common safeness, we suggest to drive with a lower sound volume.
    - Otherwise the risk of accident consists.
- DO NOT COVER COOLING VENTS AND HEAT SINKS.
    - Otherwise this may cause heat accumulation in the device and fire hazard consists.
- DO NOT OPEN THE DEVICE. Otherwise fire hazard, risk of injury and electric shock consists.
    - Also this may cause a loss of the warranty.
- REPLACE FUSES ONLY WITH FUSE WITH THE SAME RATING.
    - Otherwise fire hazard and risk of electric shock consists.
- DO NOT USE THE DEVICE ANY LONGER, IF A MALFUNCTION OCCURS, WHICH REMAINS NOT REMEDIED.
    - Refer in this case to the chapter
- TROUBLESHOOTING. Otherwise risk of injury and the damage of the device consists. Commit the device to an authorized retailer. INTERCONNECTION AND
- INSTALLATION SHOULD BE ACCOMPLISHED BY SKILLED STAFF ONLY.
    - The interconnection and installation of this device demands technical aptitude and experience. For your own safeness, commit the interconnection and installation to your car audio retailer, where you have purchased the device.
- DISCONNECT THE GROUND CONNECTION FROM THE VEHICLE’S BATTERY BEFORE INSTALLATION.
    - Before you start with the installation of the sound system, disconnect by any means the ground supply wire from the battery, to avoid any risk of electric shock and short circuits.
- CHOOSE AN APPROPRIATE LOCATION FOR THE INSTALLATION OF THE DEVICE.
    - Look for an appropriate location for the device, which ensures a sufficient air circulation.
    - The best places are spare wheel cavities, and open spaces in the trunk area.
    - Less suitable are storage spaces behind the side coverings or under the car seats.
- DO NOT INSTALL THE DEVICE AT LOCATIONS, WHERE IT WILL BE EXPOSED TO HIGH HUMIDITY AND DUST.
    - Install the device at a location, where it will be protected from high humidity and dust.
    - If humidity and dust attain inside the device, malfunctions may be caused.
- MOUNT THE DEVICE AND OTHER COMPONENTS OF THE SOUND SYSTEM SUFFICIENTLY.
    - Otherwise the device and components may get loose and act as dangerous objects, which could cause serious harm and damages in the passenger room.
- ENSURE CORRECT CONNECTION OF ALL TERMINALS.

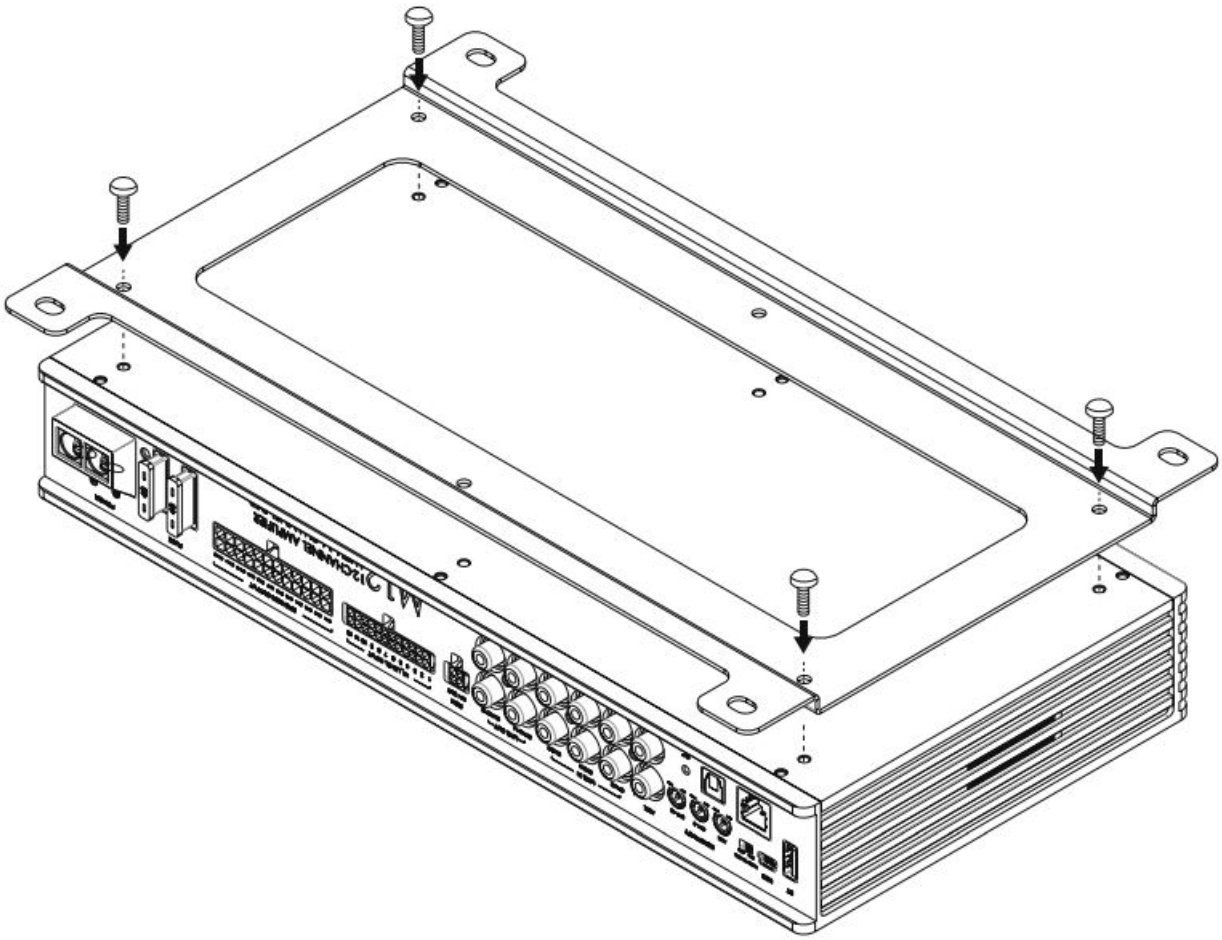
    - Faulty connections may could cause fire hazard and lead to damages of the device
- MOUNT THE DEVICE AND OTHER COMPONENTS OF THE SOUND SYSTEM SUFFICIENTLY.
    - Otherwise the device and components may get loose and act as dangerous objects, which could cause serious harm and damages in the passenger room.
- ENSURE NOT TO DAMAGE COMPONENTS, WIRES AND CABLES OF THE VEHICLE WHEN YOU DRILL THE MOUNTING HOLES.
    - If you drill the mounting holes for the installation into the vehicle's chassis, ensure by any means, not to damage, block or tangent the fuel pipe, the gas tank, other wires or electrical cables.
- DO NOT INSTALL AUDIO CABLES AND POWER SUPPLY WIRES TOGETHER.
    - Ensure while installation not to lead the audio cables between the head unit and the processor together with the power supply wires on the same side of the vehicle. The best is a areal separated installation in the left and right cable channel of the vehicle. Therewith a overlap of interferences on the audio signal will be avoided. This stands also for the equipped bass-remote wire, which should be installed not together with the power supply wires, but rather with the audio signal cables.
- ENSURE THAT CABLES MAY NOT CAUGHT UP IN CLOSE-BY OBJECTS.
    - Install all the wires and cables like described on the following pages, therewith these may not hinder the driver. Cables and wires which are installed close-by the steering wheel, gear lever or the brake pedal, may caught up and cause highly dangerous situations.
- DO NOT SPLICE ELECTRICAL WIRES.
    - The electrical wires should not be bared, to provide power supply to other devices. Otherwise the load capacity of the wire may get overloaded. Use therefor a appropriate distribution block. Otherwise fire hazard and risk of electric shock consists.
- DO NOT USE BOLTS AND SCREW NUTS OF THE BRAKE SYSTEM AS GROUND POINT.
    - Never use for the installation or the ground point bolts and screw-nuts of the brake system, steering system or other securityrelevant components. Otherwise fire hazard consists or the driving safety will be derogated.
- ENSURE NOT TO BEND OR SQUEEZE CABLES AND WIRES BY SHARP OBJECTS.
    - Do not install cables and wires not close-by movable objects like the seat rail or may be bent or harmed by sharp and barbed edges. If you lead a wire or cable through the hole in a metal sheet, protect the insulation with a rubber grommet.
- KEEP AWAY SMALL PARTS AND JACKS FROM CHILDREN.
    - If objects like these will be swallowed, the risk of serious injuries consists. Consult promptly a medical doctor, if a child swallowed a small object.



MECHANICAL INSTALLATION

- Avoid any damages on the components of the vehicle like air bags, cables, board computer, seat belts, gas tank or the like.

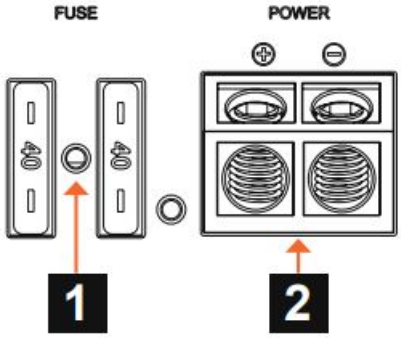
- Ensure that the chosen location provides a sufficient air circulation for the amplifier. Do not mount the device into small or sealed spaces without air circulation near by heat dispersing parts or electrical parts of the vehicle.
- Do not mount the amplifier on top of a subwoofer box or any other vibrating parts, whereby parts could loosen inside.
- The wires and cables of power supply and the audio signal must be as short as possible to avoid any losses and interferences.



INTERCONNECTION

BEFORE CONNECTING

For the professional installation of a sound system, car audio retail stores offers appropriate wiring kits. Ensure a sufficient profile section (refer to the table below) and a suitable fuse rating and the conductivity of the cables when you purchase your wiring kit. Clean and remove rust-streaked and oxidized areas on the contact points of the battery and the ground connection. Make sure that all screws are fixed tight after the installation, because loose connections cause malfunctions, insufficient power supply or interferences.



FUSE
The inserted fuses (2 x 40 A) are protecting the amplifier from shorts and capacity overload. If you need to replace the fuse, make sure to use the same type of fuse with the same rating.

POWER
Connect the POWER + terminal with the +12V pole of the vehicle's battery. Use a suitable cable with a sufficient cross-section (refer to the table below). Connect the POWER terminal with a suitable contact ground point on the vehicle's chassis. The ground wire must be as short as possible and must be connected to a blank metallic point at the vehicle's chassis. Ensure that this ground point has a stable and safe electric connection to the negative "–" pole of the battery. Check this ground wire from the battery to the ground point if possible and enforce it if required. Use a ground wire with a sufficient cross-section (refer to the table below) and the same size like the +12V power supply wire

ADDITIONAL CABLE FUSE (NOT INCLUDED)
Install an extra fuse (not included) for the +12V power cable near the battery to secure the power cable. The distance between the fuse and the battery should not exceed 30 cm. The fuse size must be adapted to the cable cross-section of the installed power cable (see table below).

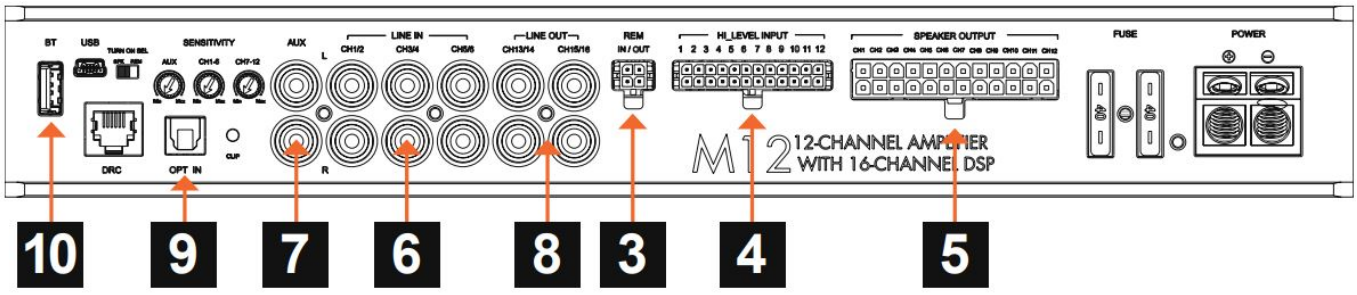
	Cable length in meters							
Fuse Value	**0 - 1,2**	**1,2 - 2,1**	**2,1 - 3,1**	**3,1 - 4,0**	**4,0 - 4,9**	**4,9 - 5,8**	**5,8 - 6,7**	**6,7 - 8,5**
20 - 35 A	4	6	10	10	16	16	16	20
35 - 50 A	6	10	10	16	16	20	20	20
50 - 65 A	10	10	16	20	20	20	20	35
65 - 85 A	16	16	20	20	35	35	35	50
85 - 105 A	16	16	20	35	35	35	35	50
105 - 125 A	20	20	20	35	35	50	50	50
	Minimum cable cross-section in mm²							

IMPORTANT: The fuse on the battery does not protect the amplifier, but the cable between the battery and the amplifier against short circuits.

Recommended minimum cable cross-section to guarantee full amplifier performance:

- Up to a length of 3 m: 20 mm2 / Full OFC cable
- From a length of 3 m: 25 mm2 / Full OFC cable

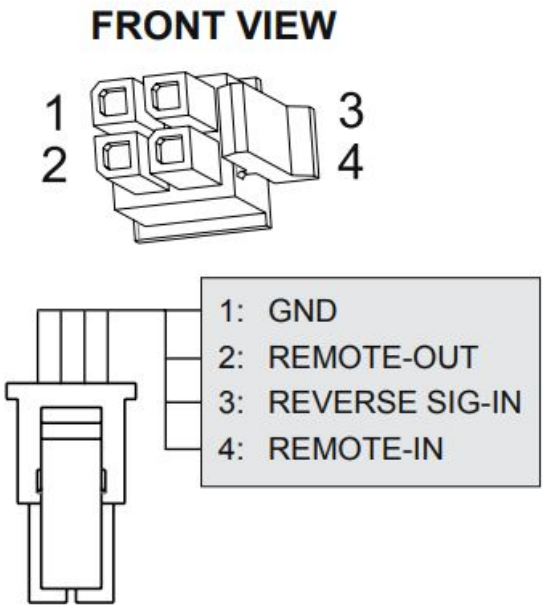
INTERCONNECTION



REM IN / OUT

- **REMOTE-IN** is suited to turn on the M12 if a turn-on signal from the head unit / car stereo is available. The voltage must be between 7.5 and 16 VDC.

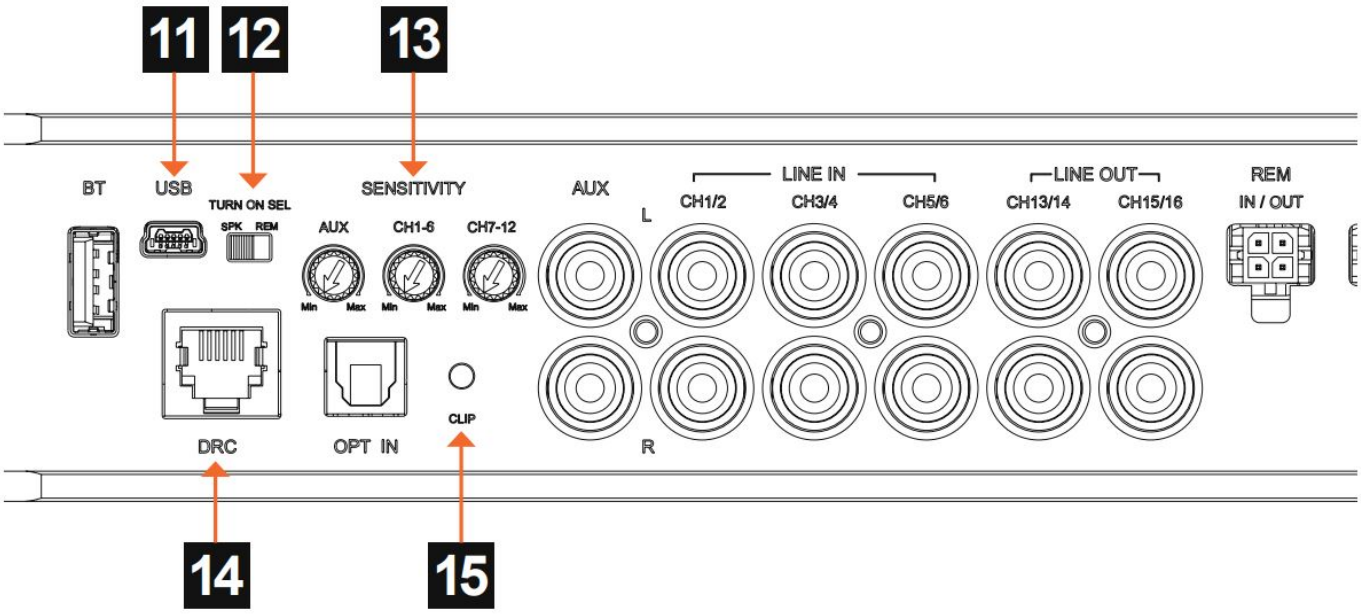
- **REMOTE-OUT** is suited to turn on external amplifiers. The 200 mA output current capability can also drive an auto-motive relay.
- **REVERSE SIG-IN** is suited to switch the M12 from Bluetooth® mode to car host mode if the reverse gear is engaged. This means that the audio signals from the parking sensors can be heard through the sound system. Connect the +12 V reverse gear signal or power supply for the reversing light here. GND (Ground) must be connected with a suitable contact ground point on the vehicle's chassis



- **HI LEVEL INPUT**
  - Input for the enclosed 24-pole cable adapter. Connect the speaker outputs from your head unit / car stereo to the cable adapter accordingly. The inputs can manage 8 – 24 V .
- **SPEAKER OUTPUT**
  - The speaker outputs are amplified and can be operated in BLT mode (bridged). It is recommended to connect here a passive subwoofer bridged (4 Ohms) or an speaker pair (2 – 4 Ohms) for each channel pair
- **LINE IN CH1-6 (low-level inputs):**
  - If you want to use the signal input section with low-level signals (e.g. with the pre-amplifier outputs from your head unit / car stereo), connect here the RCA plugs acCordingly. The inputs can manage 2-6V RMS.
- **AUX**
  - These stereo RCA inputs are suited for an auxiliary low level input signal from an external stereo pre-amplifier source such as a game console or a media player. The inputs can manage 1-8 V RMS.
- **LINE OUT CH13/14 & CH15/16 (processed by DSP)**
  - Use the pre-amplifier RCA outputs for driving an additional amplifier or an active powered subwoofer. The outputs deliver 5 V RMS Max.
- **IN**
  - The amplifier accepts through its Optical input PCM stereo signals up to 192 kHz / 24-bit sampling frequency rate. Multi-channel signals coming from audio/video sources (such as the audio tracks of a film in DVD) can not be reproduced. Connect a fiber optic cable with a TOSLINK connector.
- **BT**
  - This USB input is suited for an external MUSWAY Bluetooth dongle with wireless audio streaming

function wth/or adjusting the DSP by an APP through a smartphone/mobile device. The compatible dongles are BTS, BTS-HD and BTA2. Check the website “www.musway.de” for more information or ask your car audio retailer.

FUNCTIONAL CONTROLS



- **USB**
  - This USB input is suited for the connection with a PC/laptop computer, where the MUSWAY DSP V3.x software is installed. The connection is USB 1.1/2.0/3.0 compatible. For downloading the software please visit “www.musway.de/dsp“.
- **TURN ON SEL**
  - The ampliier can be tumed on/off by using the following methods: SPK: Slide the switch into position SPK, if you want to turn on/off the amplifier through the CH1 input channel of the high level speaker inputs and its Auto Tum-On function. Refer to page 8 and section 4 for more details. REM: Slide the switch into position REM, if you want to tum on/off the amplifier through the REM and a turn-on signal from head unit/ car stereo. Refer to page 8 and section 3 for more details.
- **SENSITIVITY AUX, CH1-6 & CH7-12**
  - With these controllers you can adjust the input sensitivity for each input section separately. This function is suited to match the output voltage of the connected signal source with the amplifier.
- **DRC**
  - This input is suited for the external MUSWAY DRC1 digital remote controller. Check the website “www.musway.de” for more information or ask your car audio retailer.
- **CLIP**
  - This LED lights up red if one of the high level inputs (CH1-6& CH7-12) is overdriven. The LED has no function when an input signal is applied to the Optical input and the Bluetooth” input. If this LED lights up, reduce the input sensitivity by using the regarding “Sensitivity” controller until the LED goes out.

SYSTEM CONFIGURATION

- In order to configure the inputs, amplified speaker Outputs and pre-amplified power outputs, EQ and time delays tor the amplitier, it must be intertaced with the PC.

- When you get to this point you must already be aware of what type of system you intend to set up. In order to avoid complications in preparation, make sure the following points before you start:
- The type of signals that will be assigned to the inputs (e.g.: front left or center or subwoofer, etc.).
- The speakers in the system (e.g.: 3-way front or sub stereo or 2-way rear, etc.).
- IF there are passive crossovers that manage groups of speakers (e.g.: 3-way systems with active midrange).
- If you intend to use an external mono amplifier to drive a subwoofer.
- If you intend to use the amplified outputs of the amplifier bridged (BLT mode), thus increasing the power on the output.

INITIAL SYSTEM START-UP

- Download and save the MUSWAY DSP V3.x software via “www.musway.de/dsp” before connecting the amplifier to your personal computer
- Install the amplifier in your vehicle before you connect a computer to it.
- Turn the ignition key to the ACC or ON position.
- Connect a PC/Laptop with the USB terminal of amplifier by using the enclosed USB cable.
- After you have open the DSP software, you can set/adjust all the audio settings on the computer.
- The amplifier is on when the logo on the top lights up in orange. After 10 seconds it becomes operative.

TROUBLESHOOTING

NO FUNCTION / THE POWER LED IS NOT ILLUMINATED

First check the fuse of the routed power cable on the vehicle battery

The fuse is defective

Replace the defective fuse with an equivalent one, never with a higher value.

- The fuse fails again.

  In this case there appears to be a short circuit between the fuse and the amplifier. To do this, check the + 12V power cable along its entire length from the battery to the amplifier for damage and whether there is a short circuit to ground, e.g. a contact with the vehicle chassis or the body. If necessary, replace the defective power cable.

The fuse is apparently okay

Use a standard 12 volt voltmeter to check the voltage between the + 12V connection and the ground connection on the amplifier.

- There is no voltage.

  Use the voltmeter to check the fuse, which is located close to the vehicle battery, to see whether there is voltage between the output and ground.

  If there is no voltage there, either the fuse holder or the fuse is defective, although it appears to be okay. If necessary, replace the fuse holder or fuse.

- There is voltage.

  If you operate the amplifier with a pre-amplifier signal (RCA), you must have laid a remote turn-on wire from the head unit to the REM terminal of the amplifier. The AUTO TURN-ON switch must be in the OFF position. However, you can test the AUTO TURN-ON switch to SIG. to see if the amplifier then turns on. If so, there is a problem with the control line..

  - A remote turn-on wire is connected to the REM terminal at the amplifier.

    Use the voltmeter to check whether there is voltage between the REM terminal of the amplifier and ground. The head unit must be switched on.

    There is no voltage.

    - Check the remote turn-on wire from the amplifier to the head unit for a short circuit or damage. If necessary, replace the control line..

    There is voltage.

    - The amplifier is probably malfunctioning or defective. Contact your retailer.

  If you operate the amplifier with the loudspeaker signals (high level mode), the AUTO TURN-ON switch must be switched to DC.

  - The AUTO TURN-ON switch is in the DC position, but the amplifier remains off.

    Check the speaker cables from the head unit to the amplifier for short circuits or damage. If necessary, replace the speaker cables or insulate the damaged area.

THE POWER LED IS ON, BUT NO SOUND COMES FROM THE SPEAKERS
Check the following steps:
Low level mode: Are the RCA cables on the head unit and on the amplifier correctly connected? • The RCA cables are correctly connected. Then an RCA cables could be defective. Check the function of the RCA cables on another audio device. If necessary, replace the defective RCA cables.
High level mode: Are the loudspeaker cables on the head unit and the high level inputs of the amplifier or on the high level cable plug correctly connected? • The speaker cables are connected correctly. A speaker cable could be defective. If necessary, replace the speaker cable or insulate the damaged area.
Are the speaker cables correctly connected between the speakers or the subwoofer at the speaker outputs of the amplifier? • The speaker cables are connected correctly. A speaker cable could be defective. If necessary, replace the speaker cable or insulate the damaged area.
Is the high pass filter or subsonic filter set higher than the low pass filter on the amplifier? Then slowly turn down the controller for the high pass filter or subsonic filter until the sound can be heard.
Is the input mode switch on the amplifier set correctly? Check the setting and change the switch position if necessary.
Are the crossover switches on the amplifier set correctly? Check the settings and change the respective switch position if necessary.
Are the speakers or the subwoofer working? Hold a standard 9 volt block battery to the terminals of each loudspeaker or the subwoofer. • A faint cracking sound can be heard. The speaker or subwoofer is fine. • There is nothing to be heard. The loudspeaker or subwoofer could be defective. If necessary, replace the defective speaker or subwoofer.
Are the settings on the head unit set correctly? • Check the fader and balance settings • Check whether the mute function is activated • Check whether a high pass or low pass filter is activated • Check whether playback has been paused • Check the source settings • Check whether any existing subwoofer output is activated

DISTORTION OR HISSING NOISE CAN BE HEARD FROM THE SPEAKERS
Check the following steps:
Is a input level controller on the amplifier set too high? Slowly turn the controller back until you hear a clean audio signal.
Is the Bass Boost controller on the amplifier set too high? Slowly turn the controller back until you hear a clean audio signal.
Is the loudness function on the head unit set too high? Deactivate loudness or turn the loudness setting back until you can hear a clean audio signal.
Are the EQ and sound settings on the head unit set too high? Turn down the settings for Treble, Middle and Bass or deactivate the equalizer until you can hear a clean audio signal.

ENGINE SPEED DEPENDENT NOISE CAN BE HEARD FROM THE SPEAKERS
Check the following steps:
Have the RCA cables been laid separately from the power cable in the vehicle? If necessary, lay the cables again and make sure that the audio cables are laid separately from the power cable on the left and right in the vehicle.
Is the amplifier's ground connection correctly connected? Make sure that the ground connection of the amplifier is not connected directly to the negative pole of the vehicle battery. Select a suitable ground point on the vehicle body for connection. If necessary, use contact spray to improve the conductivity of the connections.
Is the conductivity of the ground cable from the vehicle battery to the body okay? Make sure that the ground connection of the vehicle battery has a stable and conductive connection to the body. If necessary, use contact spray to improve the conductivity of the connections.

AN ACTIVE OPERATED TWEETER IS DISTORTED OR CRACKED
CAUTION: Tweeters will be damaged if the frequencies are too low. Please note the manufacturer's information on which frequency setting is recommended. To be on the safe side, pause the play-back of the head unit first. Check the following steps:
Is the crossover mode switch of the relevant channel pair on the amplifier set correctly? Set the crossover mode switch to the high pass position (HP or HPF).
Is the high pass filter of the relevant channel pair set too low on the amplifier? First turn the high pass controller fully clockwise. Now start playback on the head unit. Then turn the high pass controller slowly counter-clockwise until you can hear a clean sound from the tweeters and produce a balanced sound together with the woofers/mid-range speakers. Make sure that the woofers/mid-range speakers are set correctly with the respective high pass and low pass controllers.

AMPLIFIER ACTIVATES THE PROTECTIVE CIRCUIT / THE PROTECT LED ILLUMINATES
Check the following steps:
Short circuit on the speaker cables • First disconnect all speaker cables from the amplifier. Use a multimeter to check the ohmic impedance of each loudspeaker by measuring between its plus and minus lines. With standard loudspeakers the value fluctuates between 3 and 5 ohms. The values for low-resistance subwoofers can be lower. • The measurement shows a resistance value of less than 0.5 Ohms Then there is a short circuit. Remove the wiring of the affected loudspeaker at its connections. Now use the multimeter to check the ohmic impedance directly at the loudspeaker connections by measuring between the plus and minus connections. The measurement shows a resistance value of more than 0.5 Ohms • The speaker is fine, so the speaker wire appears to be defective and causing a short circuit. Replace the defective speaker cable. The measurement shows a resistance value of less than 0.5 Ohms • The speaker appears to be defective and is shorting out. Replace the defective speaker.
The load impedance of the loudspeakers or the subwoofer is too low • Compare the ohmic impedance of the connected loudspeaker or subwoofer with the technical specifications of the amplifier. For example, if the amplifier is only designed for 2 or 4 ohm operation, no loudspeaker with less than 2 ohms may be connected.
The cross-section of the power cables is too small • If the cable cross-section is too small, this leads to an increased ohmic resistance and thus to a voltage drop (voltage loss). This indicates that the amplifier consumes more power. The increased power consumption results in a significantly higher heat development and the amplifier switches to thermal protection mode. Therefore, observe the recommended cable cross-sections in these instructions and, if necessary, lay power cables with a larger cable cross-section.
The amplifier is overheated • The heat sink of each amplifier requires sufficient air circulation to be able to dissipate the heat generated during operation. If necessary, change the installation position in favor of better cooling of the amplifier or ensure better air circulation at the installation location. • Turn off the sound system and wait about half an hour for the amplifier to cool down again. With very hot outside temperatures and strong sunlight, enormous heat develops inside the vehicle. The amplifier then activates its thermal protection circuit to prevent damage. After cooling down, the amplifier works properly again.

Documents / Resources

	musway M12 12-Channel Class D Amplifier M12 with 16-Channel DSP [pdf] Instruction Manual M12 12-Channel Class D Amplifier M12 with 16-Channel DSP, M12, 12-Channel Class D Amplifier M12 with 16-Channel DSP, Amplifier

References

- Musway - Music is the Way
- musway.de/CE
- musway.de/dsp