User's Guide

TEB

TDIF Expansion Board
for DIGI96/8 Series, Hammerfall Series
HDSP 9632 and HDSP 9652

Contents

1. Introduction

Thank you for choosing the RME EXB technology. The TDIF Expansion Boards adds an 8-channel TDIF interface to all ADAT-capable RME cards. Special features include manual choice of clock reference, status LEDs and a word clock output.

2. Package Contents

Please ensure that all the following parts are included in the TEB's packaging box:

- TDIF Expansion Board
- 2 Data cable 2-core
- 1 Cable adapter 5 ¼" to 2 x 3,5"
- Manual (PDF on RME Driver-CD)

3. Hardware Requirements

TEBs can only be used with RME cards.

DIGI96 Series

TEBs use the internal ADAT interface of the DIGI cards. Therefore they do not work with the DIGI96 (which did not support ADAT).

One TEB can be connected and operated.

Hammerfall Series

An operation with the Hammerfall or Hammerfall Light requires board revision 1.5 or higher, because the internal connector ADAT1Out was not implemented in earlier versions.

One TEB can be connected and operated. Additionally one AEBx-O can be used simultaneously.

HDSP 9632

One TEB can be connected and operated.

HDSP 9652

Two TEBs can be connected and operated simultaneously. One TEB can be used together with either one AEBx-I or AEBx-O.

Hammerfall DSP Multiface / Digiface

Multiface and Digiface use the Hammerfall DSP PCI card. This card has no internal inputs or outputs. Therefore no Expansion Boards can be used.

4. Technical Specifications

- TDIF Port: D-sub 25-pin
- **Double Line mode:** 4 channels at 88.2 kHz and 96 kHz (not with DIGI96 series)
- **Supported sample rates:** 44.1 kHz, 48 kHz, varispeed (33 - 57 kHz)
- Resolution: 24 bit
- **Word clock out:** BNC, low-impedance driver stage, 4 Vss into 75 Ohms, short-circuit-proof
- Sync source: ADAT (PCI card) or TDIF
- Power supply uses 3.5" floppy connector, 5 V DC, 100 mA
- Standard bracket, board dimensions: 75 x 95 mm

5. Hardware Installation

Important: Switch off the computer and remove the power cable from the power supply before fitting the TEB.

1. Disconnect the power cable and all other cables from the computer.
2. Remove the PC housing; further information on how to do this can be obtained from your computer´s instruction manual.
3. Neutralize the static build up by touching the PC metal-chassis before unpacking the TEB from the protective bag.
4. Connect TEB and PCI-card using the two supplied 2-wire cables. Plug one end into the connector **DIGOUT/SYNCOUT** on the PCI card, the other end into **DIGIN** on the TEB.
5. Connect the TEB's **DIG OUT** and the PCI-card's **CD-IN / SYNCIN / AEBIN** using the supplied 2-wire cable. Watch out for correct polarity: The shield wire is black, and must be connected to the pin marked **GND** on the PCI-card (the right one).
6. Connect power supply: The TEB uses a floppy power connector (3,5"). In case no such connector is available, use the supplied adapter cable to connect the TEB to any free 5 ¼' power connector.
7. Insert the TEB into a free slot, press and fasten the screw. The TEB needs no slot on the motherboard, but includes a stabilizing edge, which fits in both PCI and ISA slots.
8. Re-insert the PCI-card in a PCI slot and fasten the screw.
9. Re-place the PC housing and tighten the screws.
10. Re-connect the power cable and all other cables/connections.
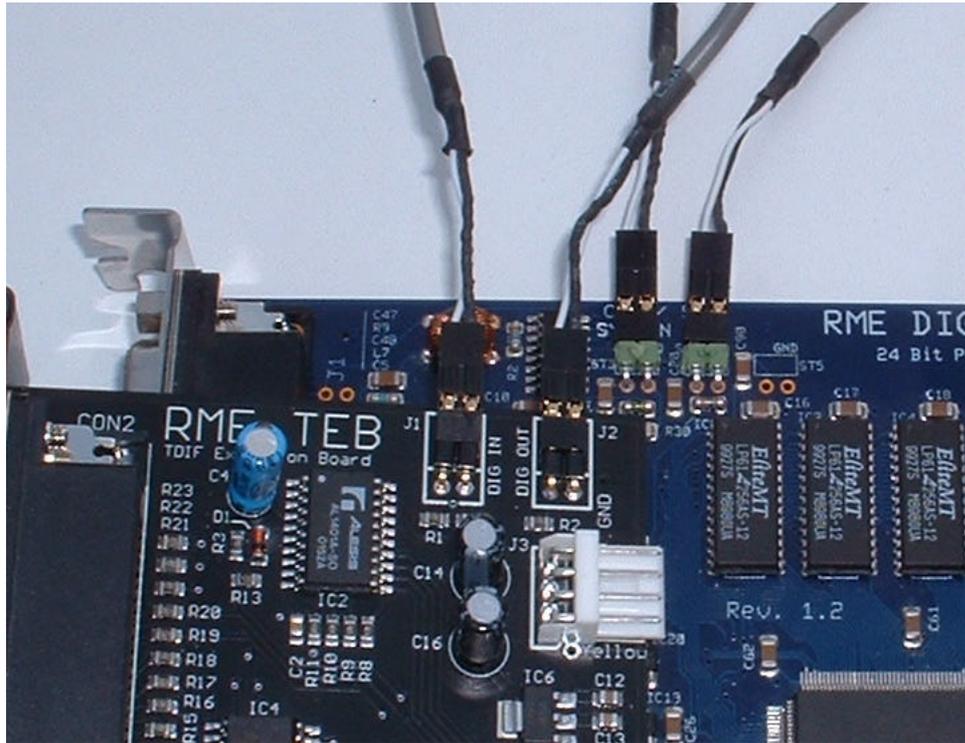
Connecting a TEB to a DIGI96/8 PRO/PAD
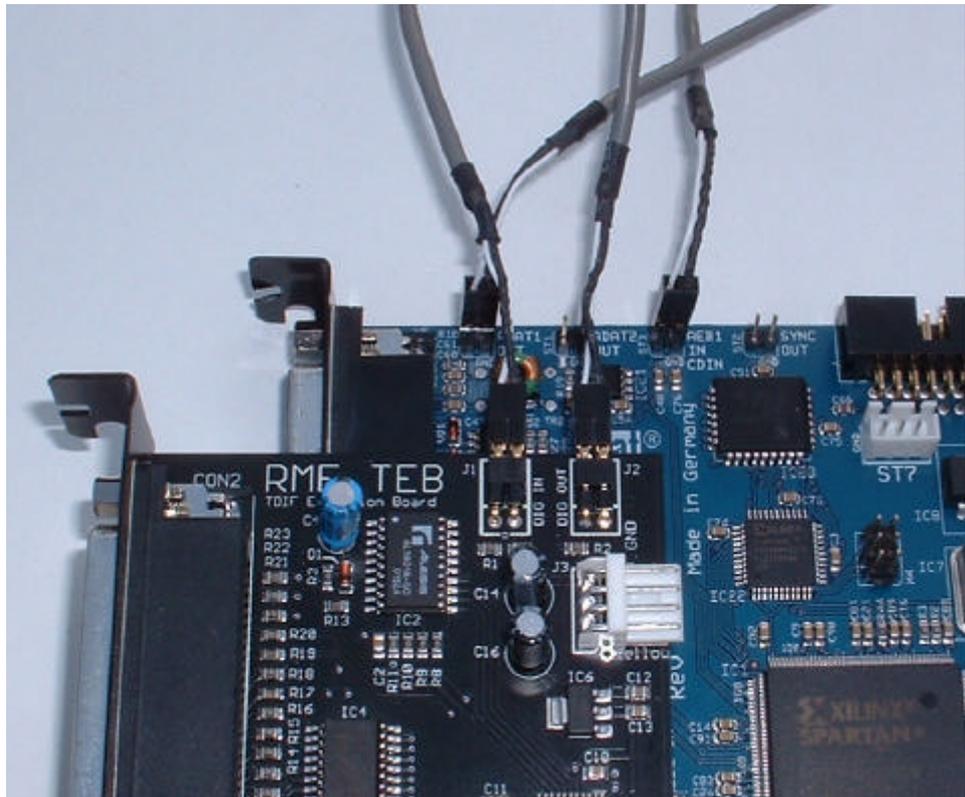
Connecting a TEB to a HDSP 9652
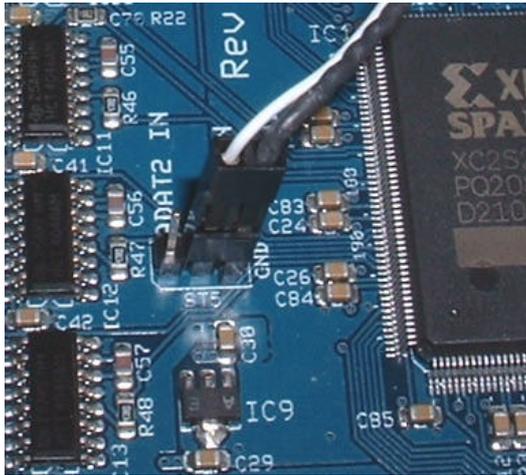
Connecting a TEB to the second ADAT In of a HDSP 9652. Remove the jumper ST5, plug DIGOUT of the TEB on both right and middle pin of ST5.

6. Operation and Usage

Switch on the computer and boot the OS. The green LED on the TEB is lit when the power supply is present. The red LED will be off as soon as the TEB receives a valid ADAT input signal via the DIG IN connector.

DIGI96 series

- Start the Settings dialog of the DIGI96/8 series, select the internal input (Input 'Internal'), set Clock Mode to 'Master'.
- Connect the external device, which must be in clock mode slave, to the TDIF jack
- Connect the word clock output of the TEB with the word clock input of the TDIF device
- Verify that the clock select switch of the TEB is pressed

The Input Status must now show 'ADAT, 44.1 kHz, Internal' (or 48 kHz). In case 'No Lock' is shown either the clock mode is not set up correctly, or the TEB is not connected correctly.

Hammerfall series and HDSP 9632/52

- Start the Settings dialog of the Hammerfall, select the internal input (AEB 'ADAT1 Internal'), set Clock Mode to 'Master'.
- Connect the external device, which must be in clock mode slave, to the TDIF jack
- Connect the word clock output of the TEB with the word clock input of the TDIF device
- Verify that the clock select switch of the TEB is pressed

The Input Status in the field SyncCheck must now show 'ADAT1 In SYNC'. In case 'Lock' or 'No Lock' is shown either the clock mode is not set up correctly, or the TEB is not connected correctly.

Clock Select Switch

The Clock Select switch of the TEB defines which reference clock is used by the TEB.

- Pushed: ADAT (PCI card)
- not pushed: TDIF (external device)

We recommend to set the switch according to the device being the current clock master. When the external TDIF device is master: switch not pushed. With PCI card being master: switch pushed.

7. Word Clock

In the analogue domain one can connect any device to another device, a synchronization is not necessary. Digital audio is different. Correct interpretation of digital audio data is dependent upon a definite sample frequency. Signals can only be correctly processed or transferred between devices if these all share the same clock. Otherwise digital signals are misinterpreted, causing distortion, clicks/crackle and even dropouts.

AES/EBU, SPDIF and ADAT optical are self-clocking (seen from a non-technical view TDIF too, as word clock is embedded inside the TDIF cable), so an additional line for word clock could be considered redundant. In practice however, using several devices at the same time can cause problems. For example, if devices are connected in a loop without there being a defined 'master' device, self-clocking may break down. Besides, the clocks of all devices must be synchronized from a single source. Devices without SPDIF inputs (typically playback devices such as CD- players) cannot be synchronized via self-clocking. Finally there are 'problematic' devices, which are nearly un-usable without a word clock attached anyway.

TDIF plays a special role in the world of digital audio formats. Although all necessary signals are present inside the D-sub connector, most devices of the company Tascam require an additional word clock connection, providing a word clock signal shifted by 90°. Also many devices with TDIF interface suffer from an incomplete clock design, causing clock noise by wrong synchronisation when in master mode. The latter forced us to implement a clock select switch which solves any compatibility problem.

In digital studios, synchronization requirements can be met by connecting all devices to a central sync source. For instance, the master device could be a mixing desk, sending a reference signal - word clock - to all other devices. However, this will only work if all the other devices have word clock or sync inputs (e.g. some professional CD-players), allowing them to run as slaves. This being the case, all devices will receive the same clock signal, so there is no fundamental reason for sync problems when they are connected together.

The TDIF format is especially critical with respect to word clock:

When the TEB is slave, no additional word clock connection is necessary. In case DA88 and/or DA38 are slave, the word clock output of the TEB has to be connected to the word clock input of the first (master) recorder. When using more than one recorder a special sync cable (Tascam part number PW-88S) is needed.

Word clock signals are usually distributed in the form of a network, split with BNC T-adapters and terminated with resistors. We recommend using off-the-shelf BNC cables to connect all devices, as this type of cable is used for most computer networks. You will find all the necessary components (T-adapters, terminators, cables) in most electronics and/or computer stores.

To avoid voltage loss and reflections, both the cable itself and the terminating resistor at the end of the chain should have an impedance of 75 Ohm. If the voltage is too low, synchronization will fail. High frequency reflection effects can cause both jitter and sync failure.

The last device in a wordclock chain should be terminated using a T-adapter and a 75 Ohm resistor (available as short BNC plug). Of course devices with internal termination do not need T-adaptor and terminator plug.

8. Double Speed

Sample rates above 48 kHz were not always taken for granted, and are still not widely used because of the CD format (44.1 kHz) dominating everything. Before 1998 there were no receiver/transmitter circuits available that could receive or transmit more than 48 kHz. Therefore a work-around was used: instead of two channels, one AES line only carries one channel, of which the odd and even samples are being distributed to the former left and right channels. By this, you get the double amount of data, i. e. also double sample rate. Of course in order to transmit a stereo signal two AES/EBU ports are necessary then.

This transmission mode is being called *Double Wire* in the professional studio world, and is also known as *S/MUX* in connection with the ADAT format. The DTRS recorder DA-98HR by Tascam also uses this technique, which is called *Dual Line* here.

Not before February 1998, Crystal shipped the first 'single wire' receiver/transmitters that could also work with double sample rate. It was then possible to transmit two channels of 96 kHz data via one AES/EBU port.

Because the ADAT interface does not allow for sampling frequencies above 48 kHz (a limitation of the interface hardware), the Hammerfall and HDSP 9652 automatically use a method called *Sample Spli*. One channel's data is distributed to two channels according to the following table:

Original	1	2	3	4
DS Signal	1/2	3/4	5/6	7/8

As the transmission of double rate signals is done at standard sample rate (Single Speed) the word clock output still delivers 44.1 kHz or 48 kHz.

The wordclock output as well as all ADAT and TDIF ports always operates in Single Speed mode only. At 96 kHz, the word clock output will therefore be a 48 kHz signal.

The TDIF interface of the TDIF Expansion Board also supports the 'Double Wire' technique. This allows a recording with up to 96 kHz at halfed track numbers with every (!) DTRS device.

9. Connector Pinout D-sub

The 25 pin D-sub connector is wired according to TDIF-1, version 1.1:

Signal	Out 1/2	Out 3/4	Out 5/6	Out 7/8	Out LRCK	Out EMPH	Out FS0	Out FS1
D-sub	1	2	3	4	5	18	6	19

Signal	In FS1	In FS0	In EMPH	In LRCK	In 7/8	In 5/6	In 3/4	In 1/2
D-sub	20	8	21	9	10	11	12	13

GND is connected to pins 7, 14, 15, 16, 17, 22, 23, 24, 25.

10. Warranty

Each individual AEB undergoes comprehensive quality control and a complete test in a PC environment at RME before shipping. The usage of high grade components allows us to offer a full two year warranty. We accept a copy of the sales receipt as valid warranty legitimation.

RME's replacement service within this period is handled by the retailer. If you suspect that your card is faulty, please contact your local retailer. The warranty does not cover damage caused by improper installation or maltreatment - replacement or repair in such cases can only be carried out at the owner's expense.

RME does not accept claims for damages of any kind, especially consequential damage. Liability is limited to the value of the AEB. The general terms of business drawn up by Synthax Audio AG apply at all times.

11. Appendix

RME news, driver updates and further product information are available on our website:
http://www.rme-audio.com

If you prefer to read the information off-line, you can load a complete copy of the RME website from the RME Driver CD (in the **\rmeaudio.web** directory) into your browser.

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CE

This device has been tested and found to comply with the limits of the European Council Directive on the approximation of the laws of the member states relating to electromagnetic compatibility (EMVG) according to EN 55022 class B and EN50082-1.

FCC Compliance Statement

Certified to comply with the limits for a Class B computing device according to subpart J or part 15 of FCC rules. See instructions if interference to radio reception is suspected.

FCC Warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This device complies with part 15 of FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the seperation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

In order for an installation of this product to maintain compliance with the limits for a Class B device, shielded cables must be used for the connection of any devices external to this product.