Users Guide

FERROFISH PULSE16 / PULSE16 MX

Professional 16 x 16-channel A/D – D/A converter

FERROFISH
advanced audio applications

FERROFISH – Brüderstrasse 10, 53545 Linz am Rhein
www.ferrofish.de

Version 2.0b

IMPORTANT SAFETY INSTRUCTIONS

Safety symbols used in this manual:

This symbol alerts that there are important maintainance and operating instructions in the literature.

This symbol warns the user of uninsulated potentially dangerous voltage inside the unit that can cause an electric shock.

This symbol warns the user that the output connectors of the power supply contain voltagest hat can cause dangerous potentially lethal shocks.

- **Read** this Instructions
- **Keep** this instructions
- **Heed** all warnings.
- **Follow** all instructions.

1. Do not use this device near water.
2. Clean only with a dry cloth. Do not spray liquid cleaner onto the faceplate or into the ventilation slots. This may damage the front panel or cause a dangerous condition.
3. Only install in accordance with the instructions oft he manufacturer.
4. Do not install or operate near heat sources as stoves, radiators or other devices that may produce heat.
5. NEVER defeat the safety purpose of the grounding plug type. When the provided plug doesn't fit into the outlet, please consult an qualified electrician for further help.
6. Use power adaptors and accessories specified by the manufacturer only.
7. Protect the power cord from being pinched or walked on.
8. Unplug this device during lightning storms or when not in use for longer periods of time.

9. Refer all servicing to qualified service personnel only. Servicing is requires when the device has been damaged in any way, such as when liquids have been spilled of objects have been fallen into the device or the device has been dropped. Also when the device does no longer work normally or has been exposed to rain or moisture.
10. This unit generated heat when operated normally. Operate in a well ventilated environment with at least 1RU space between any other peripherial equipment.
11. This product in combination with headphones or other external amplifiers and speakers may produce sound levels that could lead to a permanent hearing loss. Do not operate at higher or uncomfortable volume levels for a longer time. If you are experiencing ringing in your ears, a loss of high frequency sound information or other hearing loss, please contact an audiologist immediately.
12. WARNING: To reduce the risk of an electric shock or fire, do not expose the device to rain or moisture.
13. This power supply of this audio device may cause electronic interference to surrounding objects. If you find that this or any surrounding unit is malfunctioning, try resetting the device, relocating it or a install a powerline conditioner by an electrician.

14. Always use a stand, 19" rack or table designed for the use of pro audio equipment. In a permanent installation make sure that damage or even injury will not result from the mounting of the device or from cables pulling on the device. When using a cart, use caution when moving the device inside the cart to avoid injury from tipping-over.

Introduction

Dear customer,

thank you for purchasing our product. We are very pleased that you have chosen the PULSE16 series from our product range. The PULSE16 let you simultaneously convert 16 analog channels to digital and 16 channels to analog. As digital interfaces, you can choose between ADAT and MADI (Pulse16 MX and MADI Option only), and you can freely route between them in groups of 8 channels. We also added a headphone output so you can monitor mono or stereo channels from an arbitrary source.
Two TFT screens show all analog input and output levels at a time. The intuitive one knob operation makes using the PULSE16 a breeze. We sincerely hope that you will enjoy using your PULSE16 as much as we enjoyed developing it. If you have any suggestions, praise or criticism for us, please visit us on Facebook or at www.ferrofish.com.

Best greetings from Linz near the river Rhine.
The Ferrofish Team

Scope of Delivery

This package includes:
1x PULSE16 device
1x Instructions (German & English)
1x Power supply 12V

Symbols used in this manual


This symbol indicated sections of detailed explanation.

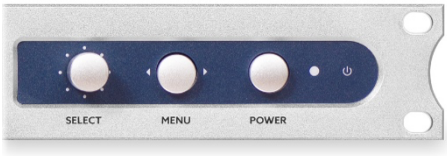

Paragraphs showing this symbol require the readers attention.

Software and Updates

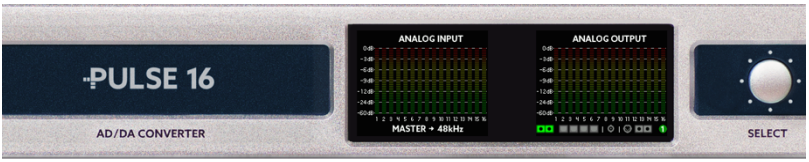
For more information, updates and support please visit our website: www.ferrofish.com

Operation

The PULSE16 can be operated completely from the front panel by using the SELECT pot and the MENU button. The POWER button can be used as a “home button” and for switching the unit on and off. For switching it off, keep the button pressed for over 3 seconds. When you do, a countdown will be shown on the screen to prevent accidentally shutting down the unit. You can control the PULSE16 over the integrated 5-pin MIDI Port or via MIDI-over-MADI (MX or MADI option only).



The main screen shows the levels of all 16 analog inputs and outputs as well as important status information. Press POWER to get back into this screen from every sub menu.



The status bar below the level I/O’s show:

- Wordclock sync source and sample frequency
- MADI I/O (MX or MADI option only): grey = no connection, yellow = signal detected, green = locked on sample frequency
- Status of the ADAT inputs 1-4. Same color coding like MADI.
- BNC Wordclock Input
- MIDI input indicator
- MIDI-over-MADI I/O (MX or MADI option only)
- Active preset number

The sync master port (ADAT, BNC or MADI) highlighted.

Headphones

When turning the SELECT pot inside the main screen the headphone menu is shown. You can select the volume of the headphone output now:

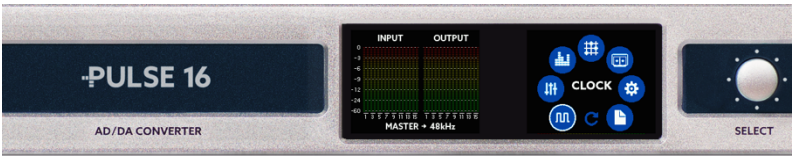
Press the MENU key to select:

- Source: You can choose between ANALOG IN / OUT, ADAT IN / OUT and MADI IN / OUT (MX or MADI option only)
- Channel: Select the desired channel. The first cycle contains all available channels in mono, the second cycle lets you listen to the channels grouped in stereo pairs.

Please note that using headphones at high sound pressure levels for a longer time can result in permanent hearing loss or hearing damage. Take care of your ears – you only have this single pair.

Main Menu

By pressing the MENU button you engage the main menu. Use the SELECT pot to navigate to the desired menu point and press MENU to select it.



Inside the Main Menu you can choose between:

CLOCK

Here you select if the PULSE16 should generate the wordclock signal by itself (Master/Leader) or if it should listen to an wordclock signal (Slave/Follower) from an external source. If choosing Master you can also set the sample rate here.

GAINS

Here you can set the sensitivity of the 16 analog inputs individually.

LEVELS

Here you can set the level of the 16 analog outputs individually.

ROUTING

In this menu you can determine the routing of the inputs and outputs.

MADI SFP (MX or MADI option only)

Here you can unlock the PULSE16 with an optional unlock code and an optional SFP hardware module to turn it into a PULSE16 MX with full MADI support. The Pulse16 MX shows parameters of the SFP module.

SETUP

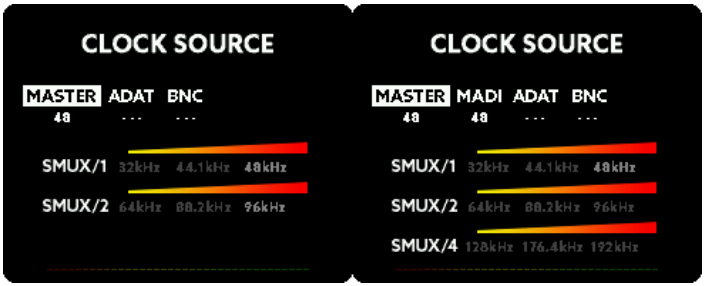
The setup menu lets you control various settings

PRESET

You can load or save presets to one of a total six preset slots.

Main Menu – CLOCK

Inside this menu you can select the source of the wordclock and the sample frequency of the PULSE16 when running as Master/Leader:



Clock Screen PULSE16 (left) – Clock Screen PULSE16 MX (right)

The numbers below the labels show the internal generated clock frequency when set to Master/Leader or the measured external sample frequency. If no sample rate is detected "---" is shown.

MASTER

If the clock source is set to Master/Leader, the internal wordclock generator of the PULSE16 is used. All other digital devices attached have to be set to Slave/Follower.

ADAT + MADI (MX or MADI option only)

The wordclock is extracted and conditioned from the ADAT or MADI data stream and send to the Wordclock output. The conditioning is done via a proprietary circuit.

BNC

When using an external wordclock on the BNC IN of the PULSE16, the wordclock signal will also be routed thru the jitter reduction stage and sent back to the BNC OUT.

Main Menu – CLOCK - SMUX modes

Although the PULSE16 always works using the 16 analog input and output channels, the number of ADAT channels is dependent on the sample frequency and the SMUX mode:

SMUX/1

The SMUX/1 mode allows sampling rates from 32kHz up to 48kHz.

SMUX/2

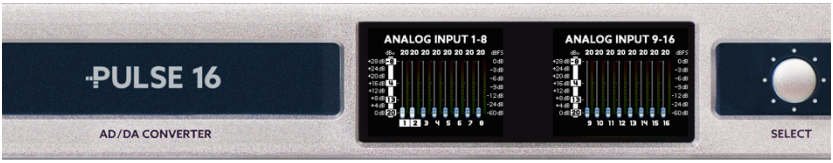
When using higher sampling rates in SMUX/2 mode (64kHz to 96kHz), the digital channels are being split into channel pairs (**S**ignal **MU**ltiple**X**ing). For this reason, the number of channels is reduced by half. To overcome this limitation the digital ADAT I/O's of the PULSE16 are available as a double configuration. So, you can run all 16 analog inputs and outputs at sample rated up to 96kHz in SMUX/2 mode.

SMUX/4 (MX or MADI option only)

At even higher sampling rates from 128kHz up to 192kHz the SMUX/4 mode is used. In this mode, an analog channel is being split up to four digital channels.

Using the optional MADI interface all 64 x 64 digital channels are used for 16 analog inputs and 16 analog outputs. In other words: A single PULSE16 unit can handle all full 16 inputs and outputs at 192kHz without any limitation of the total channelcount.

The analog inputs of the PULSE16 can be set to different sensitivities in the range from -8dBu up to +20dBu in single steps of 1dB.



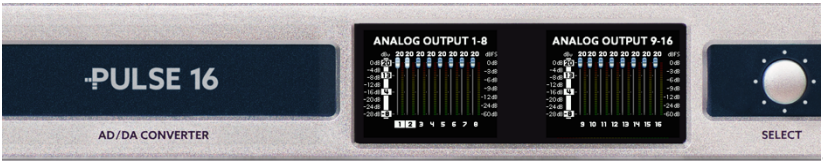
The number above the fader shows the maximum level in dBu, which the input can handle. When the fader is set to “20” like in the picture above the input can handle an maximum input level of +20dBu. Avoid exceeding this maximum level to prevent digital clipping.

In addition to the fader you see the input level meters of the analog inputs of the unit. This makes input setting easier. The dB scale on the right side shows the resolution of these level meters.

The value of -8dBu is chosen on purpose, because it’s close to the level of analog consumer gear (-10dBV = -7.78dBu)

Main Menu – LEVELS

The LEVELS screen is similar to the GAINS screen described before. Same as with the inputs also the outputs can be adjusted in 1dB steps between -8dBu to +20dBu.



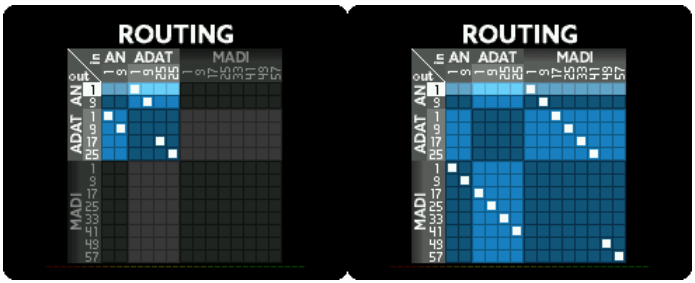
The dB scale on the right side shows the resolution of the metering levels. This scale does not show the level value of the fader!

The number above the fader shows the maximum level in dBu, which the output is able to give out. When the fader is set to 20 like shown in the picture above, the output of a digital signal with 0dBFS will be +20dBu on the analog output.

The value of -8dBu is chosen on purpose, because it's close to the level of analog consumer gear (-10dBV = -7.78dBu)

Main Menu – ROUTING

The PULSE16 offers an intuitive routing matrix. This matrix is shown as a grid inside the ROUTING menu. The inputs are shown in the columns, while the rows represent the outputs. A solid square between these lines indicates a connection. *The routing is done in channel blocks of eight channels.*



Routing Screen PULSE16 (left), Routing Screen PULSE16 MX (right)

To change the routing, please do the following:

- Choosing an output: Use the SELECT pot to select one block of eight channels (one of the rows).
- Choosing an input: now press MENU to select an input for this output. Use SELECT to select an input (one of the columns).
- Repeat this process as desired.

Keep the MENU button pressed longer to exit this menu.

Main Menu – MADI SFP MX Option

The PULSE16 can be upgraded with an optical MADI SFP module, called "MADI SFP MX Option", and in fact turns your PULSE16 to a full featured PULSE16 MX. Other SFP Modules will be released later.

The PULSE16 MADI-Option Upgrade consists of **two** parts:

a) the Ferrofish MADI SFP module (available at your dealer)
b) paid unlock code from the Ferrofish webshop

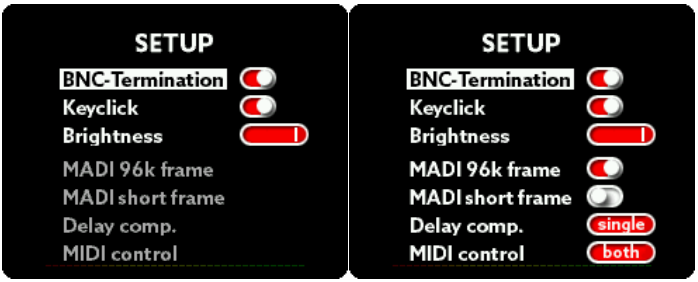
Only use genuine Ferrofish MADI SFP modules. Modules from third party manufacturers are not supported!

After installing the SFP module you need to purchase an upgrade license from the Ferrofish webshop. After entering the correct unlock code in the screen shown, the PULSE16 is permanently upgraded to an PULSE16 MX. The MADI SFP module is available as a single-mode and a multi-mode version. Most devices on the market use the multi-mode standard. The single-mode version is used for distances longer then 2km. Please refer to the exact specifications of your other MADI devices for more information.

SFP Parameter Display (Pulse16 MX)

The Pulse16 MX shows the parameters of the SFP module installed. This can be helpful in troubleshooting or bugfixing.

In the SETUP menu the following settings can be done:



Setup Screen PULSE16 (left) and PULSE16 MX (right)

BNC Termination

The PULSE16 wordclock is terminated internally by default with a 75 ohms resistor. When daisy-chaining the wordclock of several units, you should leave this option set to ON. If you're using T-connectors for connecting several units, set this option to OFF.

Keyclick

Let's you switch the Keyclick sound on or off.

Brightness

Here you can set the brightness of the displays. In case the PULSE16 is not operated the display will be dimmed after some seconds.

MADI 96k frame (MX or MADI option only)

When using the SMUX/2 mode, there exist two transmission standards for MADI:

- 48k frame: Transmission is identical to the SMUX/1 mode, except two channels are grouped to one channel, resulting in 32 channels.
- 96k frame: Instead of grouping channels, the channels are sent directly, but using a shorter packet consisting of 32 channels.

Both modes transfer the same amount of channels (32), but the 96k frame mode has the advantage, that the receiver can distinguish the SMUX/1 and SMUX/2 modes, so it can switch automatically between 48kHz and 96kHz for example. 96k frame is the preferred setting if the receiver can recognize it.

MADI short frame (MX or MADI option only)

The most common MADI configuration is 64 channels (SMUX/2: 32 channels, SMUX/4: 16 channels). This uses the full bandwidth of the MADI interface. When enabling the short frame option, the PULSE16 will send only 56 channels (SMUX/2: 28 channels, SMUX/4: 14 channels) instead of 64 channels. This option corresponds to an older standard, where the bandwidth of the missing eight channels is used to be able to change the speed of the MADI signal within some percent up or down.

Delay Compensation (MX or MADI option only)

When connecting several PULSE16 units in daisy-chain the MADI data will be routed thru the first unit to the second unit and so on. This results in a small delay of the data on the second, third and fourth unit. To compensate this delay you have to tell the PULSE16 which order it is inside the MADI chain:

- Single: only one unit connected.
- 1 of 4: first device in the MADI chain
- 2 of 4: second device in the MADI chain
- 3 of 4: third device in the MADI chain
- 4 of 4: fourth device in the MADI chain

MIDI control (MX or MADI option only)

Here you can set from which port the PULSE16 should receive remote commands:

- From the 5-pin-MIDI input only
- From the MIDI-over-MADI input only.
- From both sources.

Main Menu – PRESET

The PULSE16's parameters GAINS, LEVELS and the routing can be permanently stored in one of six preset slots. This lets you pre-configure the PULSE16 before the gig and save you time later.
Inside the PRESET menu you can choose which preset you want to load:

After selecting the desired preset by using the SELECT pot and MENU to load it a second screen appears. This screen lets you choose what should be loaded: The GAINS of the analog inputs, the LEVELS of the analog outputs, the routing – or all three items.

To store a current setting into a preset slot, enter the STORE menu:

Inside this menu you can permanently store the current settings at one of total six preset slots.

Locking the PULSE16

The front panel (except the headphone screen) can be locked to avoid maloperation or manipulation of the settings. To lock the PULSE16's front panel, enter the PIN that's printed on the downside of the unit:

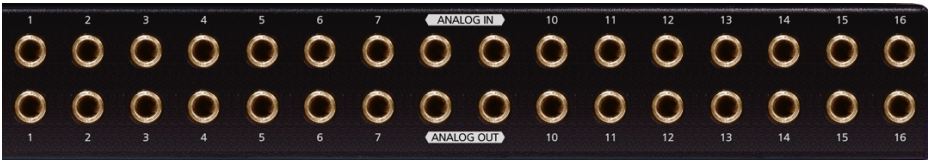
After entering the correct PIN, keep the MENU button pressed for one second. The device is locked now. Follow the same procedure to unlock the device again.

The PIN of the PULSE16 is fixed and cannot be modified to avoid abusive manipulation in sensitive environments.

We strongly recommend saving the PIN of your PULSE16 on several safe places, for example as the last six digits of a cellular phone book entry. There is no PIN-Reset shortcut for this device!

Locking the PULSE16 via a PIN Code:
A lost PIN Code can just be restored thru a complex recovery procedure by the manufacturer. This procedure is liable to pay costs. Keep your PIN code stored at one or more safe places.

PULSE16 I/O's – analog inputs and outputs



All analog inputs and output can be found on in balanced ¼" (6.3mm) TRS jacks, and can be set independently to a level/sensivity between -8dBu and +20dBu. All inputs and outputs are fully balanced.

The reference levels on the analog side mean a value of 0dBFS on the digital side, when set to an input sensitivity of +4dBu and feeding the input with a signal level of +4dBu (1.22Vrms).

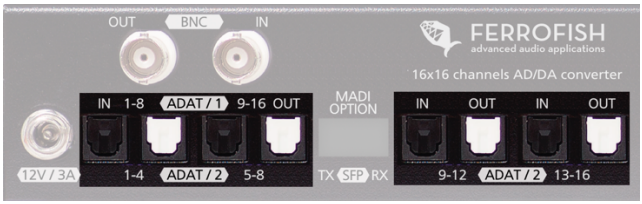
The pinout of the TRS connections is:
Tip = hot, Ring = cold, Shield = ground.

When using balanced (TRS) cables, always make sure that all three contacts are connected. When using TRS plugs with unbalanced (2wire) cables, make sure that RING and SLEEVE are connected with each other.

PULSE16 I/Os – ADAT

ADAT® is a digital multichannel interface standard by Alesis®. It can transfer eight channels of audio data at 48kHz via an optical plastics fibre. The maximum length of an ADAT connection is limited to 10 meters.

The PULSE16 has four pairs of ADAT I/O ports. The ports with white doors are the outputs, the black ones are the inputs.



Each ADAT interface can transfer eight channels at SMUX/1. When using SMUX/2 the channel count reduces to 4. Since the PULSE16 is equipped with four ADAT interface In/Out pairs, transfer of all analog 16 input and 16 output channels is still possible.

SMUX/4 (up to 192kHz) is only enabled when the MADI MX upgrade is installed. In this case only two channels are transferred over a ADAT cable, resulting in 8 input and 8 output channels in total, unsing the four interface pairs.

Frequency	ADAT channels in+output
32kHz, 44.1kHz, 48kHz (SMUX/1)	32+32
64kHz, 88.2kHz, 96kHz (SMUX/2)	16+16
128kHz, 176.4kHz, 192kHz (SMUX/4)	8+8*

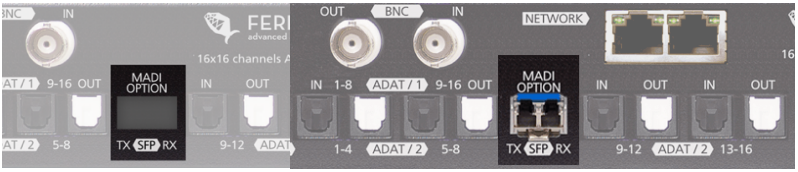
* SMUX/4 is only available for Pulse16 MX or Pulse16 with MADI option installed

PULSE16 I/O's – MADI (MX or MADI option)

MADI is a professional audio interface format which can transfer 64 channels over up to 2 kilometers in multi-mode.

Connect several MADI devices in series by putting them in a daisy chain. This means that you connect the output of the first device to the input of the second device. The output of the second device will be connected to the input of the third device and so on. So, you can daisy-chain up to four units to transmit 64 analog inputs and 64 outputs at 48kHz.

The PULSE16 MX features an optical MADI-SFP connector. To connect other MADI devices, you can use a LC – SC cable as the one included.



MADI section Pulse16 (left), Pulse16 MX or Pulse16 w/ MADI option (right)

When using sample rates higher than 48kHz, channels are bundled to transport that higher data rate. As a result, the maximum number of transferrable channels is reduced. The following chart shows the amount of digital audio channels for a single MADI port:

Frequency	MADI channels
32kHz, 44,1kHz, 48kHz (SMUX/1)	64 (56) channels
64kHz, 88,2kHz, 96kHz (SMUX/2)	32 (28) channels
128kHz, 176,4kHz, 192kHz (SMUX/4)	16 (14) channels

The original MADI standard utilized a maximum channel count of 56 channels for a single MADI connection. These 56 digital channels allow a sample rate variation of +/- 10%. These numbers are shown in brackets in the chart. Today, using 64 channels is preferred, since rate variations are not often used anymore.

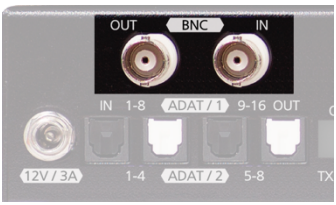
Your PULSE16 automatically detects if 64 or 56 channels are received. Use the SETUP menu to switch, if either 64 or 56 channels should be sent.

Please note that the MADI MX option consists of the Ferrofish MADI SFP hardware module *and* the MADI MX unlock code which must be purchased in addition at the Ferrofish webshop. *Using just the SFP module will not work.*

PULSE16 I/Os – BNC WORDCLOCK

Every digital system needs a clock frequency to work. This clock frequency can either be generated by the system itself (master/leader mode) or it can be supplied externally (slave/follower mode). There can be only one master clock in a digital system. The number of slave/follower devices is not limited.

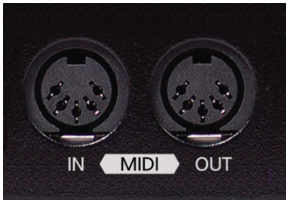
The PULSE16 can generate its own clock and share this clock with other external devices via the BNC OUT connector or it can receive an external clock from the BNC IN connector. Please use a coaxial cable with an impedance of 75 ohms.



Whether the PULSE16 runs in Master/leader or Slave/follower mode can be set inside the CLOCK settings menu.

For creating a rock-solid clock signal, the PULSE16 uses a proprietary circuit for jitter reduction. All data coming from MADI, ADAT and BNC is processed by this jitter reduction stage. This guarantees the lowest jitter on all digital channels.

PULSE16 I/O‘s – MIDI



In addition to MIDI-over-MADI (only MX or MADI option) the PULSE16 offers a 5pin MIDI I/O port. This can be used for controlling the unit over MIDI or for giving-out MADI signals coming from MIDI-over-MADI data stream or embedding MIDI signals coming from the 5pin MIDI port inside the MIDI-over-MADI data stream – which can be very handy controlling MIDI Equipment on stage over MIDI-over-MADI from the FOH. The kind of MIDI routing can be adjusted in the SETTINGS screen.

Remote Software

You can control your PULSE16 from a computer by the “RemoteFish” software. To do so you can choose between the following connection methods:

MIDI Interface

Use a MIDI interface to connect your PULSE16 to your computer. Please make sure that the MIDI interface can transmit and receive system exclusice (sysex) data.

MIDI over MADI (MX or MADI option only)

You can also use the MADI connection (MX or MADI option only) with a MADI card, which uses the MIDI-over-MADI protocol. Unfortunately not all MIDI expansion cards or MADI devices provide this feature. If you want to use MIDI-over-MADI please make sure that your device supports this feature. For further details please read the expansion cards handbook or contact the manufacturer.

After starting the software program, please first select the MIDI input and output port of the PULSE16. Then press the connect button. All connected MIDI devices will be scanned and connected.

For further information about the remote software please visit: www.ferrofish.com

Technical specifications

ADAT I/O:	4 + 4 optical ports 16 channels @32kHz, 44.1kHz, 48kHz 16 channels @64kHz, 88.2kHz, 96kHz 8 channels @128kHz, 176.4kHz, 192kHz* Latency: 2 samples
MADI I/O*: (AES10) (optional)	SFP cage for MADI single-mode or multi-mode SFP module 64 channels @32kHz, 44.1kHz, 48kHz 32 channels @64kHz, 88.2kHz, 96kHz 16 channels @128kHz, 176.4kHz, 192kHz MIDI-over-MADI implemented* Latency: 2 samples
Wordclock:	2 x BNC: In / Out Switchable input termination of 75 ohms
MIDI I/O:	MIDI Standard 1.0 / 1996 2 x 5pin I/O port for remote control Translation from MIDI to MIDI over MADI possible.*
A/D converter:	24 Bit analog / digital converter
outputs: (analog)	16 x TRS ¼" (6.3mm), female , balanced Digital gain: +20dBu...-8dBu in single steps of 1dB Latency: @48kHz: 12/fs, 0.25ms, @96kHz: 9/fs, 0.09ms, @192kHz: 5/fs, 0.03ms
D/A converter:	24 Bit digital / analog converter
inputs: (analog)	16 x TRS ¼" (6.3mm), female, balanced Digital sensitivity: +20dBu...-8dBu in single steps of 1dB Latency: @48kHz: 7.8/fs, 0.16ms, @96kHz: 5.4/fs, 0.06ms, @192kHz: 6.6/fs, 0.03ms
Op-Amps:	RC4580
Display:	2 x Color-TFT Display

*= MX only or MADI option required.

Headphones:	1 x ¼" (6.3mm) TRS jack, stereo. Selectable mono or stereo source Digitally controlled volume level
PLL:	Digitally controlled PLL with active jitter reduction Output jitter: 50ps ... 100ps typ.
Int. Clock:	TCXO (temp. compensated oscillator) with high accuracy Initial accuracy: +/-1.5ppm Temperature drift: +/-2.5ppm Aging: +/- 1.0ppm
Fuse:	Polyfuse, internal, self-resetting
Power supply:	external PSU (12 Volts, 3 amps) included
Power req.:	15VA in operation, 0,1VA in standby mode (Efficiency Level VI)
Dimensions	Height: 1RU, depth: 19cm (7.5") (jack dimensions included)
Weight:	2 kg (4.4lbs)
Temperature:	+5° to +45° celsius
Humidity:	< 75%, non-condensing

CE conformity

EMC

This device fully complies to all harmonised standards for the approximation of laws of the member states for the electromechanical compatibility (EMC:2014/30/EU) and European Low Voltage Directive 2014/35/EU.

RoHs

This device has been produced with lead free solder according to the EU directive 2011/65/EU and therein contained maximum permissible values for hazardous substances found in electronic devices.

FCC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. Responsible Party in USA: Synthax United States, 6600 NW 16th Street, Suite 10, Ft Lauderdale, Florida, 33313 T.:754.206.4220
Trade Name: Ferrofish, Model Number: PULSE16 / PULSE16 MX
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 equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. 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 separation 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.

WARNING: Any modifications or other changes to this unit not approved by the party responsible for compliance could void the user's authority to operate this equipment.

Note on Disposal

According to common law of the EU states directive RL2002/96/EG (WEEE – Directive on Waste Electrical and Electronic Equipment) this product must be recycled after final use and/or end of its lifetime. In case a disposal of electronic waste is not possible, the recycling can also be done by the manufacturer. For this the device has to be sent **free to the door** to: Ferrofish GmbH, Brüderstraße 10, 53545 Linz / Rhein, Germany. Not prepaid shippings will be rejected and returned on the sender's costs.

Service

No serviceable parts inside. Do not open this device.

Warranty

Every PULSE16(MX) is thoroughly checked and tested. Ferrofish grants a warranty of two years after purchase thru an authorized dealer or distributor. The invoice is needed as a proof-of-purchase. In case of an permanent malfunction or any other defect under warranty that can't be fixed by support, please contact your dealer and inquire a repair under warranty. Damages caused by improper installation or inappropriate usage are not covered by warranty. Fixing these damages will be liable to pay costs. Claim for damages of any kind, in particular consequential damage or loss are not covered.

A liability exceeding the merchandise value of an PULSE16(MX) is also not covered. We refer to the general terms and conditions of Ferrofish GmbH.

Exclusion of liability

This documentation has been created to the best of knowledge and belief on the current state of technology. Ferrofish assumes no responsibility either expressed or implied for the accuracy, completeness and correctness of this documentation. In no event Ferrofish GmbH will be liable for any kind of data loss or data error caused thru the use of our product or documentation. In particular Ferrofish GmbH excludes liability upon consequential damage caused by the use of this product or the documentation. All trademarks used in this manual are property of their respective owners and are used for descriptive purpose only. This also applies to text passages, where appropriate copyright marks or trademarks are missing. Although the contents of this users guide have been checked for errors, Ferrofish cannot guarantee that it is correct. Ferrofish does not accept responsibility for any misleading or incorrect information within this manual. Copying any part of the manual or any commercial exploitation of these media without prior permission from Ferrofish is strictly prohibited. Ferrofish reserves the right to change specifications at any time without prior notice. Product and documentation is subject to the terms and conditions of Ferrofish GmbH at the latest state.

www.ferrofish.com
info@ferrofish.com