

FL3X TAP 100BASE-T1 (PLUS) FL3X TAP 1000BASE-T1 (PLUS)

Instructions for Use



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			Page 2 of 37

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Any semiconductor devices have an inherent chance of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.

The safety and handling instructions in this document must be followed strictly.

EC Conformity

The FL3X TAP (all variants) complies with the essential requirements of the following applicable European Community Directive(s) including current amendments, and carries the CE marking accordingly:

- 2014/30/EU EMC Directive

The following standard(s) have been used to assess the product:

- IEC 61000-4-2:2009
- IEC 61000-4-3:2020
- IEC 61000-4-4:2012
- IEC 61000-4-5:2014 + A1:2017
- IEC 61000-4-6:2013
- IEC 61000-6-2:2019
- IEC 61000-6-3:2021
- IEC 61326-1:2012
- CISPR 11:2015 A1:2016 + A2:2019

This product is compliant with the European Community Directive 2011/65/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).

Created by	STAR ELECTRONICS GmbH & Co. KG		
Date created	2026-02-10	Date modified	2026-02-17
			Page 3 of 37


Revision History

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Version	Date	Description
D1V0-4	04.08.2025	Preliminary Release
D1V0-F	10.02.2026	Release

Related Hardware / Software Versions

Product	Reference No.	Version	Remarks
FL3X TAP 1000BASE-T1	3-01100A01	01	
FL3X TAP 1000BASE-T1 PLUS	3-01100D01	01	
FL3X TAP 100BASE-T1	3-01100E01	01	
FL3X TAP 100BASE-T1 PLUS	3-01100F01	01	

	NOTICE
	<p>In general, the information in this document applies to all FL3X TAP hardware variants. Any variant specific information is marked with the affected variant name.</p>

Contents

1	General	6
1.1	Intended User Group	6
1.2	Intended Use	6
1.3	Used Pictograms	7
1.4	Safety and Handling Instructions	7
1.5	Meaning of Text Styles	8
2	Product Description	9
2.1	FL3X TAP (all variants) at a glance	9
2.2	Accessory Parts	9
3	Technical Data	10
3.1	Electrical Characteristics	10
3.2	Physical Characteristics	10
3.3	Environmental Conditions	10
3.4	Interfaces	10
3.4.1	Power connector (M9, Series 711) and Power LED	11
3.4.2	Upstream Ethernet (SFP+ modules)	12
3.4.3	Configuration ETH Port (RJ45)	12
3.4.4	Automotive Ethernet TAP 1A/B – TAP 6A/B (H-MTD) and LEDs	13
3.4.5	DIO connector (D-Sub)	14
4	Getting Started	16
4.1	Assembly and Line-up	16
4.2	Configuration and Operation	16
4.2.1	Power Up behavior FL3X TAP PLUS variants	16
4.2.2	FL3X Diagnostics Website	16
5	Firmware Update	30
6	Reset Behavior	31
6.1	Factory Reset	31
6.2	Hard Reset	31
7	Shipping, Maintenance and Disposal	32
8	Troubleshooting	33
9	Ordering Information	34
9.1	FL3X TAP	34
9.2	Accessory Parts	34
9.3	Related Documents	34
10	Appendix	35
10.1	Appendix A: Guideline for handling ESD sensitive Products	35
10.2	Appendix B:	35
10.2.1	Acronyms and Abbreviations	35
10.2.2	List of Tables	35
10.2.3	List of Figures	36


1 General


1.1 Intended User Group

This document is written for expert technicians and/or engineers who are familiar with electronic components and systems.

Each person involved with setup or operation of the product must

- be a qualified technician or engineer
- strictly adhere to this manual
- receive a briefing by an authorized person

	NOTICE
	If you are unsure of how to use the product as intended or have any questions about the use of the product, please discontinue use of the product immediately and contact the STAR ELECTRONICS GmbH & Co. KG Support (support-ee@star-cooperation.com).

	WARNING
	The product may only be used by expert technicians and/or engineers who are qualified and familiar with electronic components and systems! The use of the product by non-professionals is not permitted and strictly forbidden!


1.2 Intended Use


The FL3X TAP is a testing equipment. It was developed to test the communication behavior of Automotive Ethernet together with “Electronics Control Units” and sensors in a fully controlled testing and/or laboratory environment.


For this intended use, the FL3X TAP offers the following options:


- Extract data from Automotive Ethernet communication (e.g. Use Case “Test Access Point”).
- Change physical layer between two Automotive Ethernet interfaces (e.g. Use Case “Change physical layer from 100BASE-T1 to 1000BASE-T1 and vice versa”)

Any deviation from the intended use and/or installation in a testing vehicle is only permitted with specific **prior written approval** of STAR ELECTRONICS GmbH & Co. KG.

	WARNING
	The FL3X TAP may be used to communicate with networked electronic systems. E.g. Ethernet. Any use of the product outside a fully controlled testing and/or laboratory environment may result in death or serious injury due to unpredictable behaviour of a vehicle and/or potentially missing, deactivated, or malfunctioning safety devices on a vehicle! The user is responsible to ensure the safety of the entire system. This includes amongst other things a safety shutdown.

	NOTICE		
	The device is not a calibrated measurement device. STAR ELECTRONICS GmbH & Co. KG accepts no liability whatsoever for the correctness of any measurement results.		




	⚠ WARNING		
	<p>The FL3X TAP is NOT designed, intended, or authorized and may NOT be used for or in connection with the following purposes and/or devices:</p> <ul style="list-style-type: none"> - use as part of medical systems - life support applications - aviation, space, nuclear, or military applications - use in areas where combustible or explosive gas mixtures are likely to occur - any other purposes/devices deviating from the intended use of the product specified by STAR ELECTRONICS GmbH & Co. KG. 		

	⚠ WARNING		
	<p>The product may only be used by expert technicians and/or engineers who are qualified and familiar with electronic components and systems!</p> <p>The use of the product by non-professionals is not permitted and strictly forbidden!</p>		

1.3 Used Pictograms

The meaning of used pictograms is shortly described below.

Follow the specific instructions in the document where these pictograms are placed.

	⚠ WARNING		
	Used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.		
	NOTICE		
	Used to indicate a situation which may result in an operating failure. Damage of the product may occur, but there is no hazard of injury if not avoided.		
	Product marking which shows the compliance of the product with the European Waste Electrical and Electronic Equipment Directive 2012/19/EU.		

1.4 Safety and Handling Instructions

Please read the instructions for use carefully. To protect the device or the application against damage, or to avoid personal injury the FL3X TAP have to be handled as described herein.


Changes or modifications of the FL3X TAP are not allowed for safety and warranty reasons!

STAR ELECTRONICS GmbH & Co. KG is not liable for any damages arising from non-observance of the product information.

Created by	STAR ELECTRONICS GmbH & Co. KG			
Date created	2026-02-10	Date modified	2026-02-17	Page 7 of 37

Follow the

- a) specific safety and handling instructions placed at dedicated document positions
- b) general safety and handling instructions below:

NOTICE	
	<p>To prevent damage to the FL3X TAP, or consequential damages:</p> <p>Do not connect any other signals to the interfaces as described in the chapter 3.4 Interfaces. Ensure that all signals are within the specified range.</p> <p>Use only adapter cables from <i>STAR ELECTRONICS GmbH & Co. KG</i> for connecting the FL3X TAP.</p> <p>High temperatures can damage the FL3X TAP. Keep the FL3X TAP away from heaters, stoves, fireplaces, and other sources of heat.</p> <p>Do not expose the FL3X TAP to rain or use it near water.</p> <p>Do not use the FL3X TAP in areas of explosion hazard.</p>

1.5 Meaning of Text Styles

In this document *filenames* are marked with a different text format.

Created by	STAR ELECTRONICS GmbH & Co. KG		
Date created	2026-02-10	Date modified	2026-02-17
			Page 8 of 37

2 Product Description

2.1 FL3X TAP (all variants) at a glance

The FL3X TAP is an Automotive Ethernet TAP with 12x 100/1000BASE-T1 connectors and 2x SFP+ 1000BASE-T/10GBASE-T ports. With the FL3X TAP, it is possible to examine multiple Automotive Ethernet networks and log the network communication for diagnostic purposes.


There are four FL3X TAP variants available which are described in the following table. The “PLUS” version bridges each port A and port B when not powered on.

Product	Reference No.	Supported automotive Ethernet	Relays for bridging Port A and B
FL3X TAP 1000BASE-T1	3-01100A01	100 & 1000BASE-T1	No
FL3X TAP 1000BASE-T1 PLUS	3-01100D01	100 & 1000BASE-T1	Yes
FL3X TAP 100BASE-T1	3-01100E01	100BASE-T1	No
FL3X TAP 100BASE-T1 PLUS	3-01100F01	100BASE-T1	Yes

- Altera Cyclone 10
- 4 GByte DDR3 RAM
- 12x Marvell 88Q2221M-B2 transceiver
- 12x H-MTD connector (Rosenberger)
 - 100 Mbit/s and 1000 Mbit/s BASE-T1 mode (depends on variant)
- 2x SFP+ connector for 1000/10GBASE-T (used for upstream)
- 1x RJ45 connector for 100BASE-TX (used for configuration)
- 1x D-Sub 9 pin for 2x DIO
- Supply voltage: 8 – 30 V DC
- Status LEDs
- IP20
- Temperature range -40°C to +80°C

2.2 Accessory Parts

For further information about accessories for the FL3X TAP (all variants) see chapter 9.2 Accessory Parts.

	NOTICE
	Use only accessory parts from STAR ELECTRONICS GmbH & Co. KG listed in chapter 9.2 Accessory Parts to ensure proper function and for warranty reasons! Other accessories without prior written consent of STAR ELECTRONICS GmbH & Co. KG must not be used.

3 Technical Data

3.1 Electrical Characteristics

Supply voltage			
	Min.	Typ.	Max.
Operating	+8.0 V	-	+30.0 V
Absolute maximum (non-operating)	-36.0 V	-	+36.0 V
Startup time	Typical 400 ms (from power up to link up automotive ethernet)		
Latency between Port TAP A and B	Overall approx. 8 μ s		
- 100BASE-T1	Overall approx. 6 μ s		
- 1000BASE-T1			
Supply current - operating	Typical 2000 mA @ 12 V with 2x SFP+ modules		
Supply current - sleeping	Typical 2.7 mA @ 12 V (Power LED off, relays off) Typical 3.2 mA @ 12 V (Power LED on, relays off) Typical 111 mA @ 12 V (Power LED off, relays on) Typical 112 mA @ 12 V (Power LED on, relays on)		

Table 1: Electrical characteristics

3.2 Physical Characteristics

Connectors	
- Power	M9, Series 7 11, 2 Pin
- Automotive Ethernet (BASE-T1)	H-MTD (TAP 1A to TAP 6B)
- Ethernet (BASE-TX)	RJ45 (ETH Port)
- Ethernet (SFP+)	SFP+ (SFP+ 1 and SFP+ 2)
- I/O	D-Sub, 9 Pin
Weight approx.	1380 g
Dimensions approx. L x W x H	
- With mounting plate	225 mm x 195 mm x 60 mm
- Without mounting plate	225 mm x 175 mm x 58 mm

Table 2: Physical Characteristics

The FL3X TAP (all variants) is delivered with pre-assembled mounting plates. The attached mounting plates have openings spacing of 120 mm in length and 180 mm in width.

3.3 Environmental Conditions

Temperature	Operating:	-40°C to +80°C
	Non-operating:	-40°C to +80°C
	Storage:	-40°C to +80°C
Relative Humidity	0% - 90% r. H., non-condensing	

Table 3: Environmental Conditions

3.4 Interfaces

The FL3X TAP (all variants) has twelve H-MTD connectors for 100/1000BASE-T1 (Automotive Ethernet) each with 2 LEDs and one D-Sub 9 connector for I/O-Interface also with two LEDs, see the following figure.

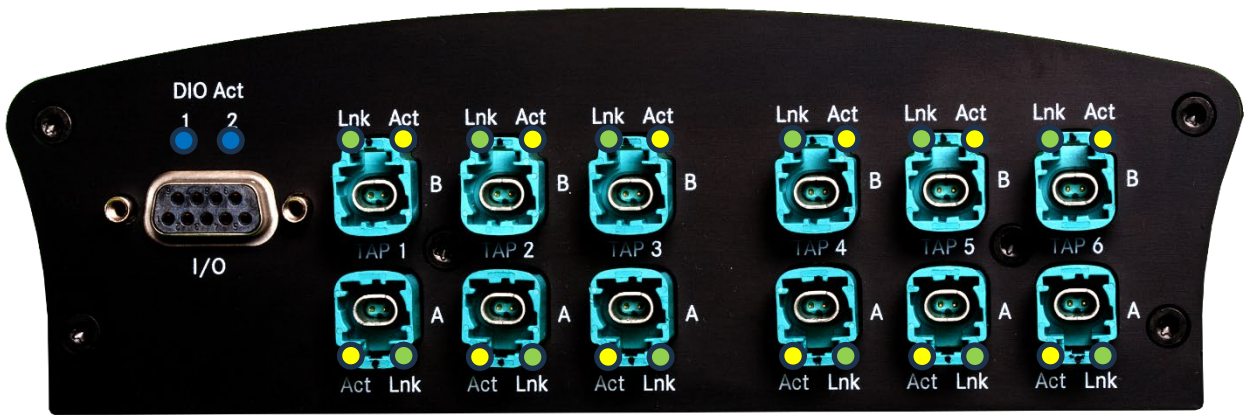


Figure 1: Bus cover with 12x H-MTD Automotive Ethernet and 1x D-Sub 9 I/O

The other side has one M9 series 711 connector for power supply with one LED, one RJ45 connector for 100BASE-TX Ethernet with two LEDs and two SFP+ connectors each with two LEDs. There is also a button for Wakeup (see chapter 4.2.2.4) and/or Reset (see chapter 6). The following figure shows the position of the connectors and the button.



Figure 2: Power cover with 100BASE-TX, push button, 2x SFP+ and power connector

3.4.1 Power connector (M9, Series 711) and Power LED

The valid range of the power supply for the FL3X TAP (all variants) is within 8 - 30 V DC. The power supply input is reverse protected. The power consumption is up to 35 W.

The green LED near the power connector shows the power supply status, if the LED is on, the power is OK.


	NOTICE
<p>In sleep mode, the power LED can be deactivated to reduce power consumption (see FL3X Diagnostics Website).</p>	



Figure 3: Power connector M9 2pol with LED

Power LED	Description
On	The device is powered on

Table 4: Description of the Power LED


The following table describes the connector assignment.

Power connector		
Pin	Signal Name	Description
1	GND	Ground signal
2	Uin	Power in allowed in the range from 8 - 30 V DC

Table 5: Description of the Power connector

3.4.2 Upstream Ethernet (SFP+ modules)

The FL3X TAP (all variants) supports 10GBASE-TX interfaces at the SFP+ 1 and SFP+ 2 connectors. These connectors support up to 10 Gbit/s in full-duplex mode. Each module has two LEDs, green and yellow.

NOTICE	
	The maximum allowed length of the Ethernet cable is 30 m.
	The following BASE-T SFP+ copper modules are tested:
	<ul style="list-style-type: none"> - LO-SP-10G-RJ-80I from lightoptics - SFP-10GM-T-30 from FS
	The standard SFP+ connector assignment is used.

The following figure shows the SFP+ connectors and the LEDs.

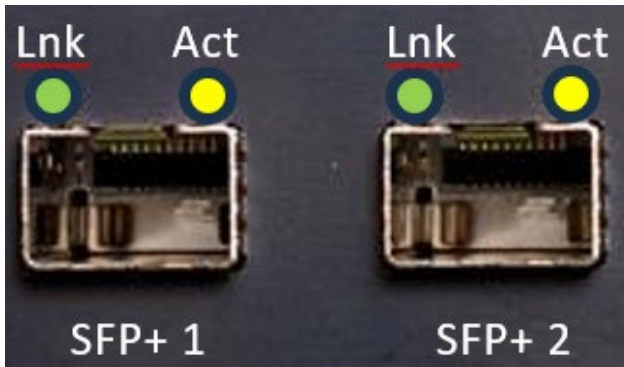


Figure 4: SFP+ connectors with LEDs

The following table describes the LED color and blinking scheme.

SFP+ 1 & 2 (upstream ethernet) LEDs		
Green LED (Link)	Yellow LED (Active)	Description
On	Off	The link is established, no data exchange occurring
On	Blinking	Data exchange is in progress
Off	Off	No link is established; the data exchange is not possible

Table 6: Description of the SFP+ 1 & 2 (upstream Ethernet) LEDs

3.4.3 Configuration ETH Port (RJ45)

The FL3X TAP (all variants) can be configured via the configuration port named ETH. The port has an RJ45 connector with two LEDs, green and yellow. The usage of the configuration port is described in chapter 4.2 Configuration and Operation.



Figure 5: ETH Port, RJ45 connector with LEDs

ETH Port (configuration ethernet) LEDs		
Green LED (Link)	Yellow LED (Active)	Description
On	Off	The link is established, no data exchange occurring
On	Blinking	Data exchange is in progress
Off	Off	No link is established; the data exchange is not possible

Table 7: Description of the ETH Port (configuration ethernet) LEDs

3.4.4 Automotive Ethernet TAP 1A/B – TAP 6A/B (H-MTD) and LEDs

The FL3X TAP (all variants) supports twelve 100/1000BASE-T1 Ports (H-MTD connector) marked TAP 1A/B to TAP 6A/B. These support, depending on the variant of the FL3X TAP and settings, 100 or 1000Bit/s in full-duplex mode.

The "PLUS" version includes relays to connect ports A and B when the power is off. In sleep mode the relays are powered, and ports A and B are not connected together to receive ethernet wakeup signals. The behavior can be configured, see chapter 4.2.2.1 and Figure 15: FL3X Diagnostics Website - General configuration options for FL3X TAP 100/1000BASE-T1 PLUS.

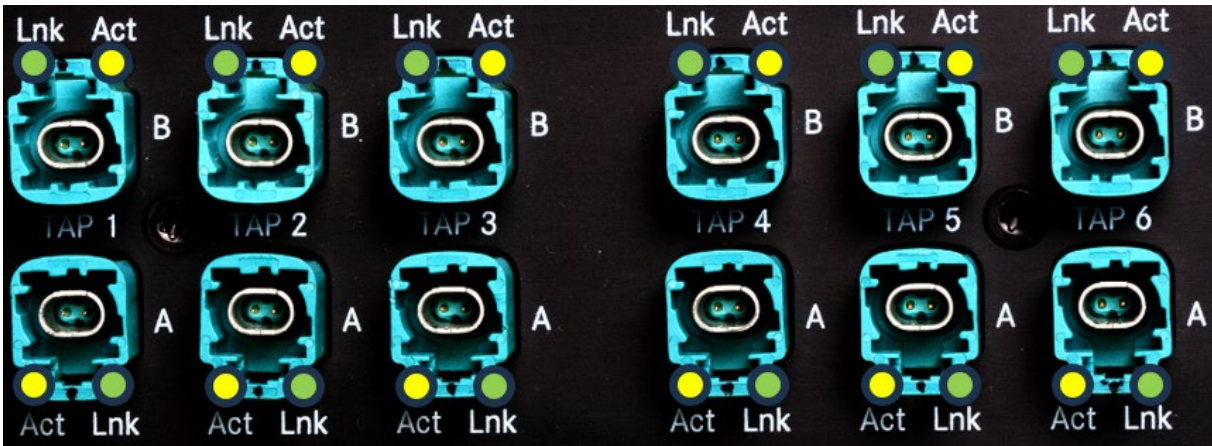


Figure 6: Automotive Ethernet H-MTD connector side with LEDs

	NOTICE
	The maximum allowed length of the 100/1000BASE-T1 cable is 30 m.

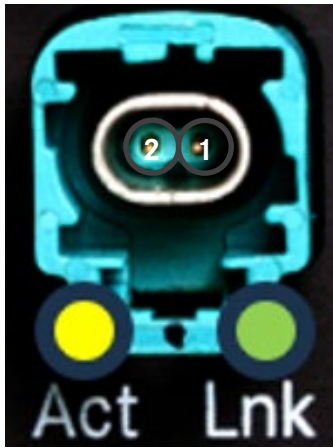


Figure 7: H-MTD Ethernet connectors TAP 1A/B to TAP 6A/B with yellow and green LEDs

The following table describes the LED color and blinking scheme.

Connector H-MTD (Automotive Ethernet) LEDs		
Green LED (Link)	Yellow LED (Active)	Description
On	Off	The link is established, no data exchange occurring
On	Blinking	Data exchange is in progress
Off	Off	No link is established; the data exchange is not possible

Table 8: Description of the Automotive Ethernet LEDs

The following table shows the H-MTD connector assignment.

Connector H-MTD (Automotive Ethernet)		
Pin	Signal Name	Description
1	ETH_BP	100/1000BASE-T1 bus plus signal
2	ETH_BM	100/1000BASE-T1 bus minus signal

Table 9: Connector assignment for H-MTD (automotive Ethernet)

3.4.5 DIO connector (D-Sub)

The FL3X TAP (all variants) has one female D-Sub 9 pin connector with two DIO signals. The DIO signal lines can be configured as input or output. These signals are used for Sleep and Wakeup and are configured over the FL3X Diagnostics Website (see chapter 4.2.2.4). Two blue LEDs show the status of the pins.



Figure 8: D-Sub DIO connector with two blue LEDs


The following table shows the D-Sub connector assignment.

Created by	STAR ELECTRONICS GmbH & Co. KG			
Date created	2026-02-10	Date modified	2026-02-17	Page 14 of 37

Connector D-Sub (DIO)		
Pin	Signal Name	Description
1	GND	Ground signal, max 200 mA
2	GPIO_WL_1	General Purpose I/O Signal 1
3	GPIO_WL_2	General Purpose I/O Signal 2
4	NC	No internal connection
5	NC	No internal connection
6	+5V0	+5.0 V power out, max 200 mA
7	+Vin_F	Power out in the range from Power In, max 200 mA
8	NC	No internal connection
9	NC	No internal connection

Table 10: Sub-D connector assignment for DIO

The fuses (F980-2) for power supply outputs are from type polyfused, which have self-recovery function.

NOTICE	
	<p>DIO lines are protected against input signals up to +/- 30 V.</p> <p>When DIO 1 or 2 is configured as an output, the maximum current is limited to 25 mA.</p> <p>The maximum output voltage that can be generated via DIO lines is lower than the supply voltage.</p> <p>Supply voltage = 08 V, output voltage approximately 06.8 V (reduced by 1.2 V) Supply voltage = 12 V, output voltage approximately 10.6 V (reduced by 1.4 V) Supply voltage = 30 V, output voltage approximately 27.9 V (reduced by 2.1 V)</p> <p>Using DIO I/Os at an ambient temperature of 80°C can lead to malfunctions of the FL3X TAP due to increased board temperatures when the DIO pins are under maximum load.</p>

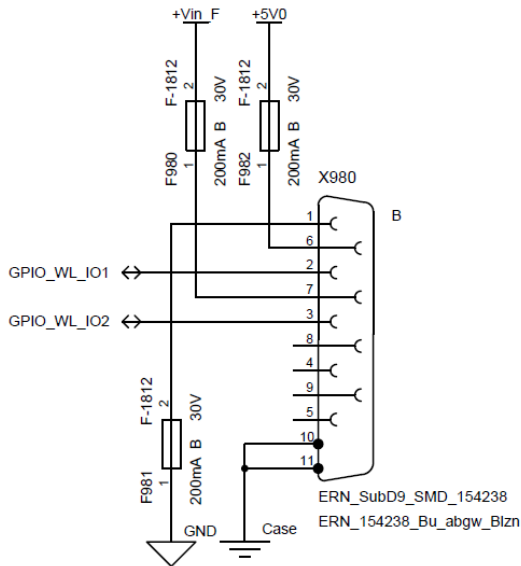



Figure 9: Sub-D 9 pin DIO pinout

4 Getting Started

4.1 Assembly and Line-up

Read and follow these instructions when connecting and using the FL3X TAP.

NOTICE	
	<p>Ensure that all signal lines connected to the FL3X TAP are in the allowed range.</p> <p>Be sure to connect all cables as described in this manual.</p> <p>Never insert anything metallic into the openings of the FL3X TAP.</p> <p>Ensure to grasp the plug and not the cable when disconnecting the FL3X TAP.</p>


4.2 Configuration and Operation

Use the power connector of the FL3X TAP to connect with a power-supply within the correct voltage range.

Connect the 1000BASE-T1 and 10GBASE-T (SFP+) Ethernet with their networks. Check the pinouts.


Check the state of the LEDs.

The FL3X TAP (all variants) comes with a default configuration. The ports TAP 1A/B – TAP 6A/B are configured as 100BASE-T1 Slave mode (for FL3X TAP 100BASE-T1 (PLUS)) or 1000BASE-T1 Slave mode (for FL3X TAP 1000BASE-T1 (PLUS)).

NOTICE	
	<p>When multiple FL3X TAP ports are used, the startup time may increase.</p>

4.2.1 Power Up behavior FL3X TAP PLUS variants

The FL3X TAP PLUS variants have integrated relays at the Automotive Ethernet connectors (TAP A and TAP B) for bridging when power is off. When the TAP is powered, these relays switch, and the TAP ports are routed through the FL3X TAP PLUS. Data loss may occur during this process, as the switching takes some time.

NOTICE	
	<p>Data packets are lost during power up the FL3X TAP PLUS.</p>

4.2.2 FL3X Diagnostics Website

To change settings on the FL3X TAP (all variants), use the FL3X Diagnostics Website, which is reachable via HTTP (Default IPv4: <http://192.168.1.15>) on port 80.

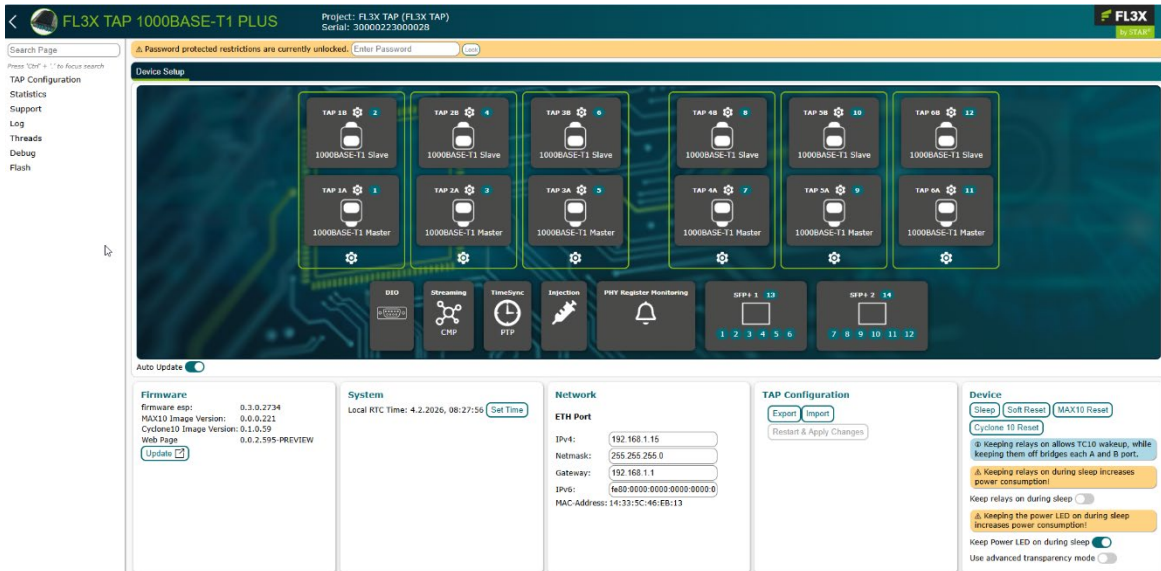


Figure 10: FL3X Diagnostics Website - Overview

NOTICE

Changing the device configuration has no immediate effect. The user must explicitly perform a reboot. Use the [Restart & Apply Changes] button which automatically gets enabled once the user configures anything (see also Figure 11).

There is no way to undo any changes. With a reboot of the device, all changes are applied and active.

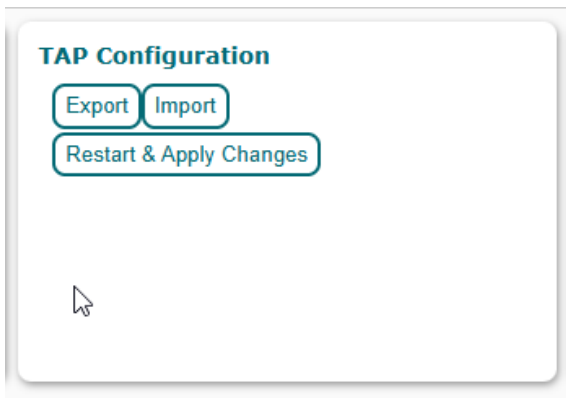


Figure 11: FL3X Diagnostics Website - TAP Configuration – Button [Restart & Apply Changes]

4.2.2.1 General / Network Configuration

On the top of the configuration page the user can specify a password and lock the configuration of the device down until they enter the password again to unlock.

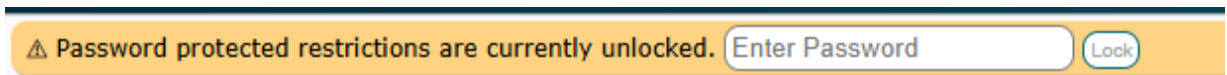


Figure 12: FL3X Diagnostics Website - Password protection

After locking the device restrictions, the page reloads and everything is in a read-only state.

NOTICE

If the password is forgotten, a Factory Reset must be performed to unlock the device again (see chapter 6.1).

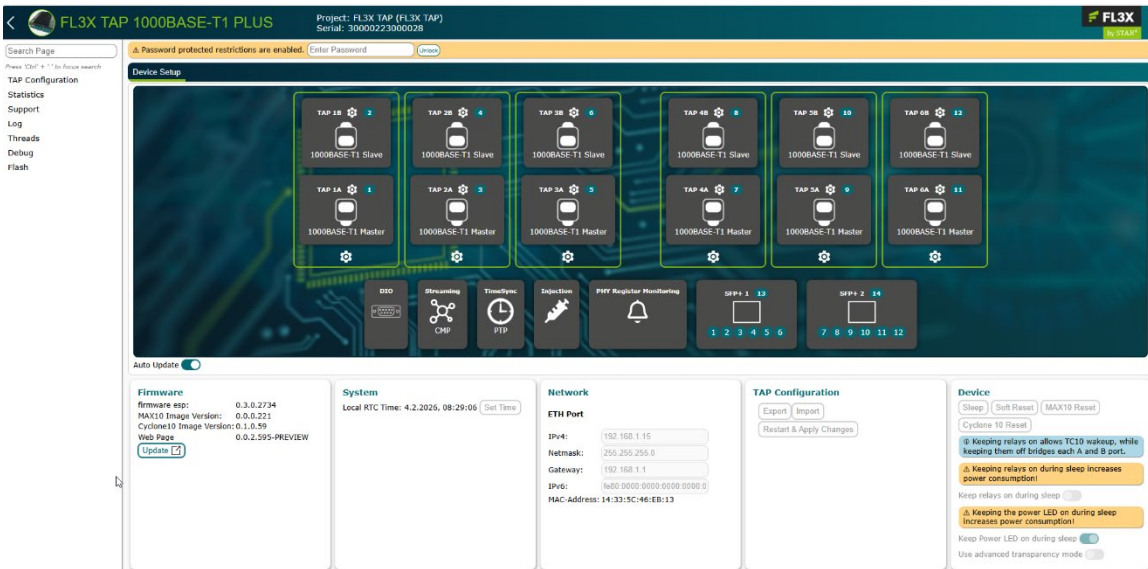


Figure 13: FL3X Diagnostics Website - Read only state

On the bottom of the configuration page, there are various general configuration options.

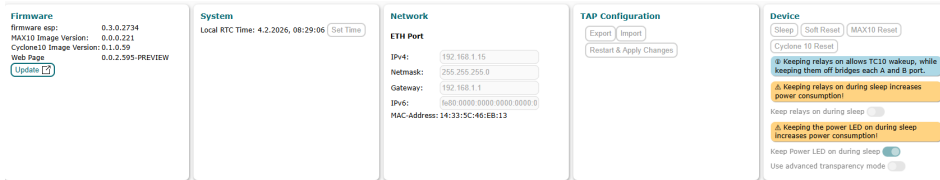


Figure 14: FL3X Diagnostics Website - General configuration options for FL3X TAP 100/1000BASE-T1

The FL3X TAP PLUS variants have an option to set the behavior of the relays in the sleep state.

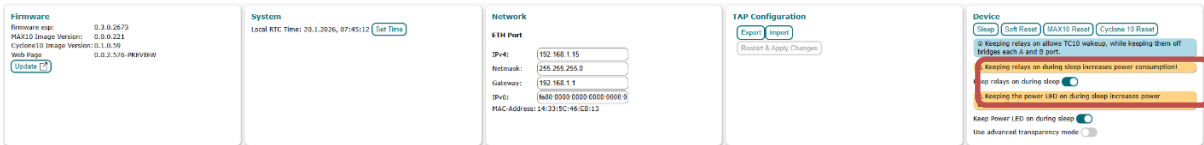


Figure 15: FL3X Diagnostics Website - General configuration options for FL3X TAP 100/1000BASE-T1 PLUS

Here, the user can:

- **Firmware:** navigate to the flashing page to update the firmware
- **System:** update the RTC clock time to the UTC time of the user's computer
- **Network:** configure the network settings of the ETH connector
- **TAP Configuration:** import/export the complete device configuration or restart to apply new changes
- **Device:** run various debugging commands and modify the behavior of the power LED while in sleep mode and in the case of FL3X TAP PLUS variants, modify the behavior of the relays connected to the TAP ports while in sleep mode and enable advanced transparency mode (see 4.2.2.3 for more Information).

4.2.2.2 Port Configuration

To configure the base settings of the TAP ports, click on their respective tile to open a dialogue.

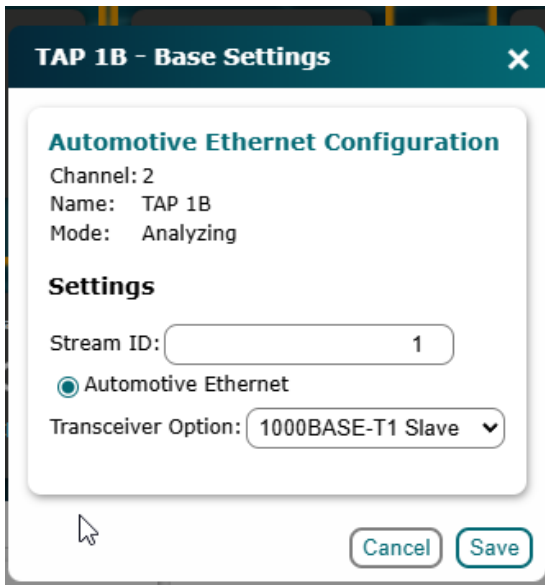


Figure 16: TAP Port - Base Settings

In this view the user can modify the ASAM-CMP Stream ID for the port and select the link speed (100BASE-T1 or 1000BASE-T1) and mode (Master or Slave). Clicking on “Save” stores the new configuration on the device which gets applied after the next reboot.

The SFP+ ports can be configured in the same manner by clicking on their respective tile.

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Date created	2026-02-10	Date modified	2026-02-17
			Page 19 of 37

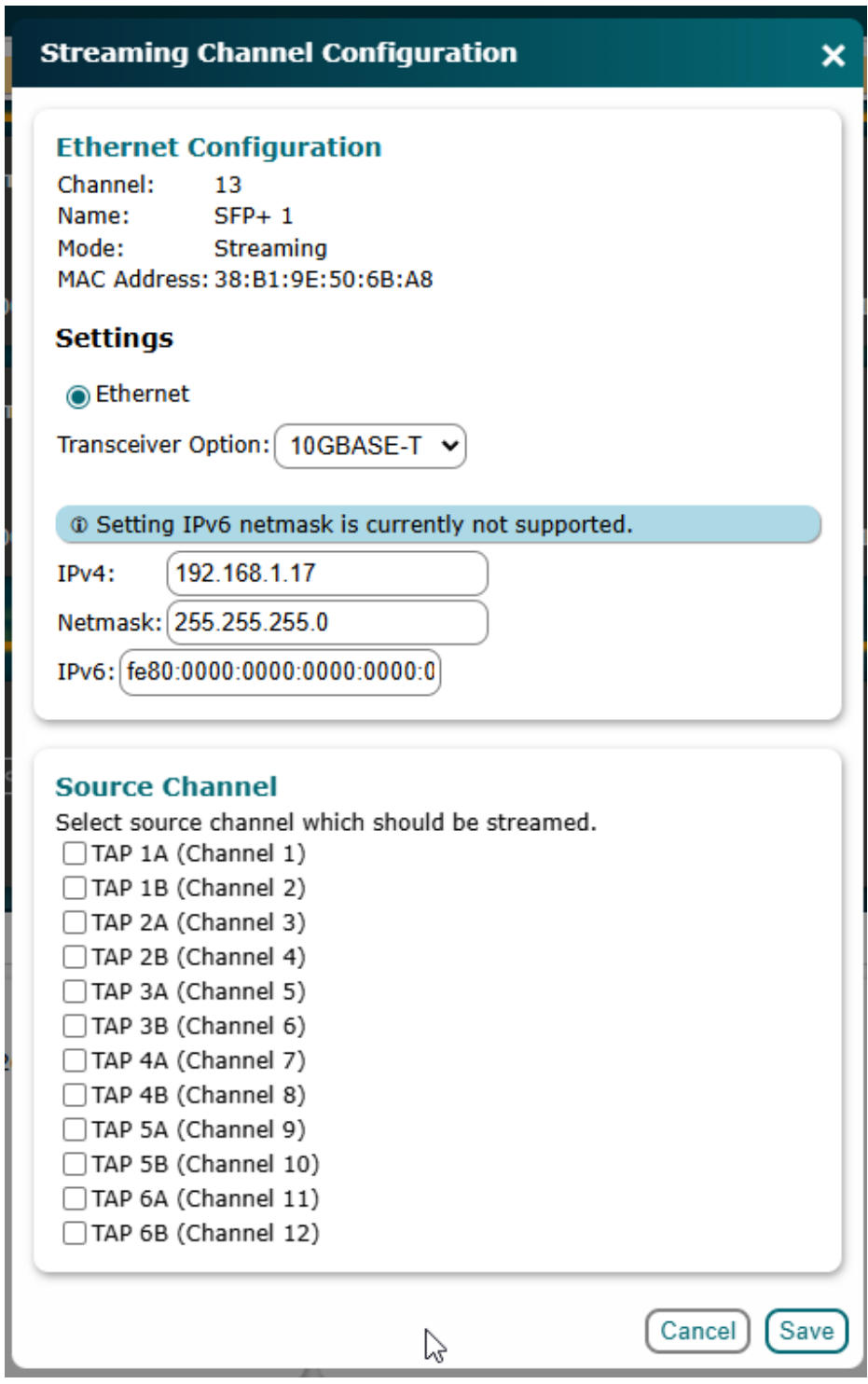


Figure 17: SFP+ 1/2 - Streaming Channel Configuration

In this view the user has the ability to change the port's link speed (100BASE-T, 1000BASE-T or 10GBASE-T), the assigned IPv4 and IPv4 netmask and the assigned IPv6 address. At the bottom, TAP ports can be selected to stream their data through that SFP+ port.

4.2.2.3 Bus Configuration

Each TAP port pair (A and B) have shared configuration parameters. Clicking on the cogwheel surrounding the TAP ports opens up the configuration dialogue.

3-01100a01-d11_f13x_tap_100base-t_instruction_for_use_d1v0-f.docx

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Date created	2026-02-10	Date modified	2026-02-17
			Page 20 of 37

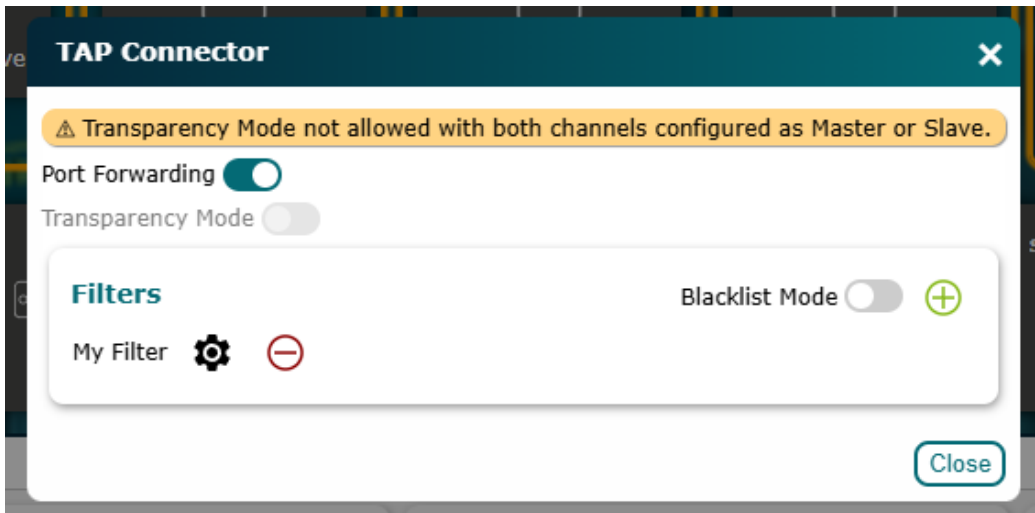


Figure 18: TAP port pair – shared configuration parameters – Transparency Mode disabled

In this view, the user can disable port forwarding, preventing the TAP ports from sending received data back through their partner port, or enable transparency mode once the ports have different link modes.

Transparency mode is a feature which causes both TAP ports' link state to depend on each other. This means that when port A loses its link, port B will lose its link as well and vice versa. The same applies to link up.

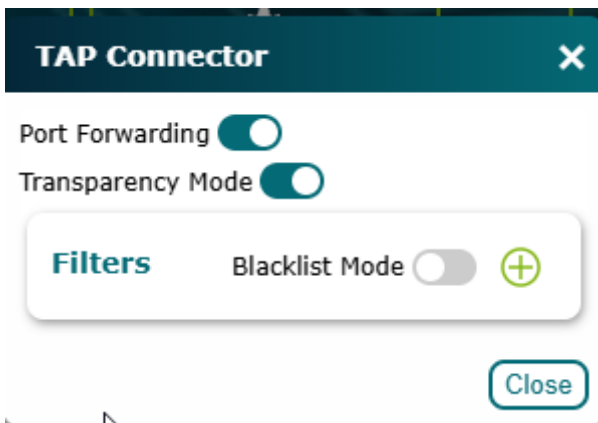


Figure 19: TAP port pair – shared configuration parameters – Transparency Mode disabled

The advanced transparency mode (see Figure 20) changes the behavior of the transparency mode. The two TAP ports go through the following state machine:

1. Put both ports into passive mode (i.e. disable linkup)
2. Monitor the slave port for a link partner attempting to link up
3. Enable the master port and wait until it has a link
4. Unblock the link procedure on the slave port
5. If any port loses its link, go back to step 1.

The main benefit of the advanced transparency mode is the ability to block the link immediately after booting up the device. However, unlike the normal transparency mode, this requires the link partners to support TC10 functionality.

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Date created	2026-02-10	Date modified	2026-02-17	Page 21 of 37

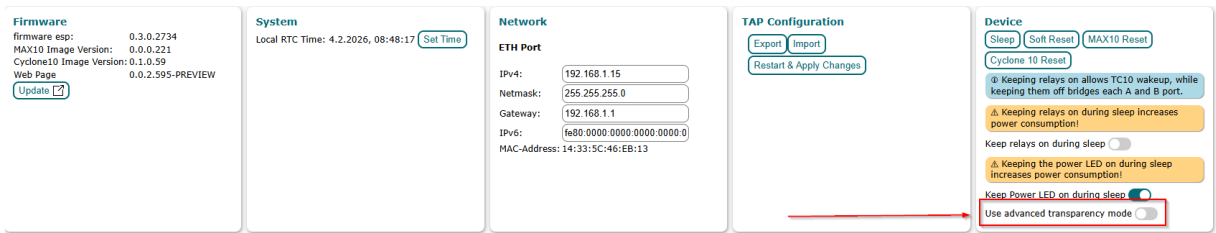


Figure 20: FL3X Diagnostics Website - General configuration options – Advanced Transparency Mode

NOTICE

The “Use advanced transparency mode” toggle switch applies globally. There is no support for selecting between normal and advanced transparency mode for each TAP port pair.

In the bottom card the user can also add / remove / modify filters which apply on both ports and choose whether the filter list shall be interpreted as a blacklist or whitelist.

Filters get applied on all incoming bus data from both ports and act as a filter between bus data and upstream logging data. With this feature, the user has the ability to specify what kind of data they want to stream out to the logger and which not.

4.2.2.3.1 Adding Filters

Clicking on the plus symbol opens up a new dialogue, allowing the user to specify and name their new filter.

NOTICE

You cannot add filters with same parameters and same names.

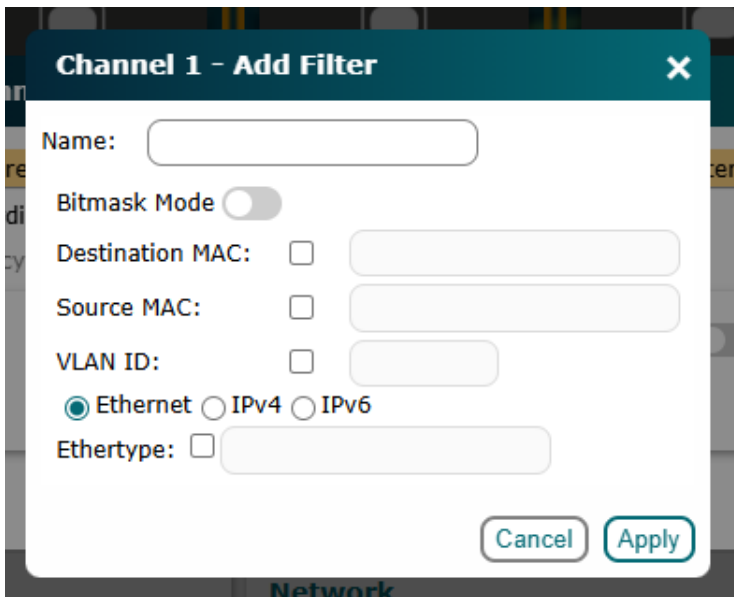


Figure 21: Channel Filters - Parameters

Specifying a filter can be done in two ways. In the default mode, the user can select different parameters to filter as seen in Figure 21. The second way is accessed through the “Bitmask Mode” toggle switch.

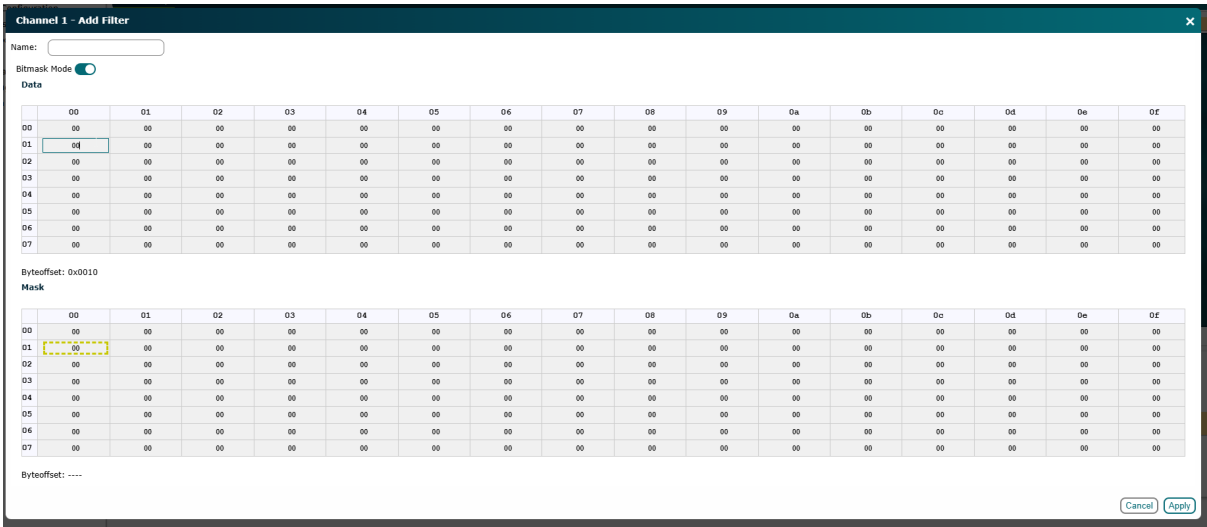


Figure 22: Channel Filters - Bitmask

In this mode, the user can specify a bitmask to filter the first 128 bytes of an ethernet frame. The top table specifies what values the bytes shall have, and the bottom table is a bitmask telling the filter what bits exactly are relevant for the filter.

Example:

Bitmask Mode

Data

	00	01	02
00	00	00	00
01	00	AE	00
02	00	00	00
03	00	00	00
04	00	00	00
05	00	00	00
06	00	00	00
07	00	00	00

Byteoffset: 0x0011

Mask

	00	01	02
00	00	00	00
01	00	FF	00
02	00	00	00

Figure 23: Channel Filters - Bitmask example

In this case, the filter will filter for ethernet frames that have a value of exactly 0xAE at offset 0x0011.

4.2.2.4 Sleep/Wakeup Configuration

Clicking on the “DIO” tile opens up the DIO Sleep/Wakeup configuration dialogue.

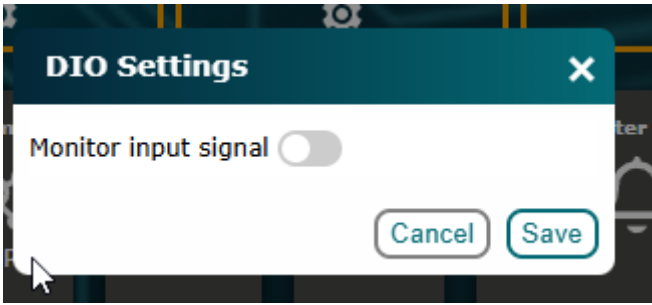


Figure 24: DIO Settings 1/2

The DIO settings allow the user to configure the Sleep/Wakeup functionality of the device. When enabled, a low signal on the input pin of the DIO port will cause the device to enter sleep, shutting down most components of the device. By default, Sleep/Wakeup functionality is disabled. Enable the Sleep/Wakeup configuration via the option “Monitor input signal”.

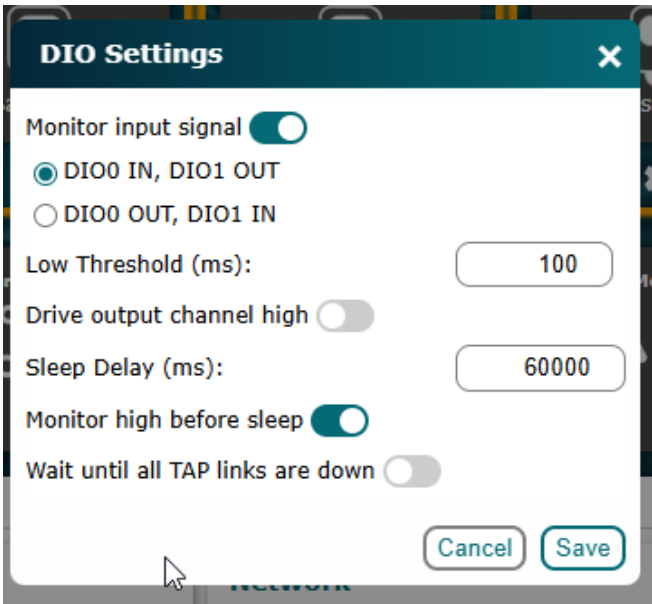


Figure 25: DIO Settings 2/2

Here the user can specify which of both pins on the DIO port shall act as output and which as input.

The “Low Threshold” specifies how long the input signal shall stay on LOW until the FL3X TAP accepts it as a sleep signal.

The user can also enable the output channel to be driven high, in which case the FL3X TAP will pull the output signal HIGH while it is powered on and pull it LOW once it goes to sleep.

The “Sleep Delay” specifies how long the FL3X TAP shall delay going to sleep after it recognized a sleep signal. The sleep procedure will be cancelled if the input goes back to HIGH while the device is in this waiting condition.

By default, the “Monitor high before sleep” condition is enabled, which specifies that the input signal has to have been HIGH at least once while the device is powered on in order for LOW signals to be processed.

Finally, there is also an optional condition to wait until all TAP ports have their link down before going to sleep. The sleep procedure will also be canceled here if the input signal goes back to HIGH.

4.2.2.5 Streaming Configuration

The streaming configuration dialogue can be opened by clicking on the “Streaming Settings” tile.

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Date created	2026-02-10	Date modified	2026-02-17	Page 24 of 37

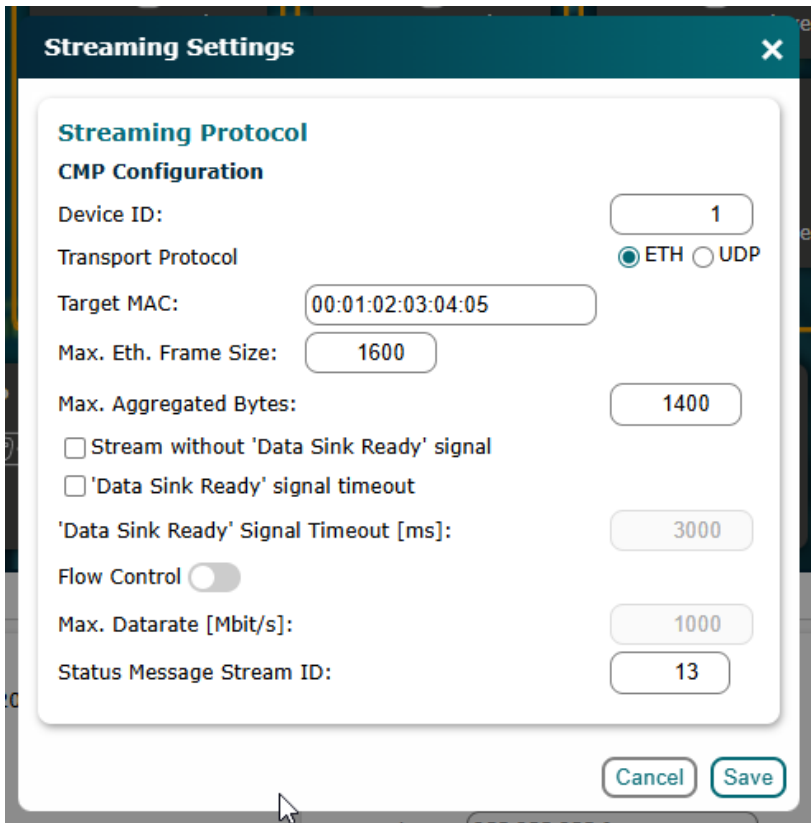


Figure 26: Streaming Settings

Here, the user can configure various parameters related to the stream traffic towards the data sink.

The “Device ID” field sets the device ID to be used in the ASAM-CMP headers.

The user can choose which “Transport Protocol” to use for the ASAM-CMP protocol by selecting the respective radio button. Currently, the available options are Ethernet (“ETH”) or UDP over IPv4.

In the case of Ethernet, a maximum output ethernet frame size can be specified. This causes the FL3X TAP to split an ASAM-CMP frame up into multiple segregated frames if the frame size surpasses this limit.

The “Max. Aggregated Bytes” field specifies how many bytes maximum shall be aggregated together into a single ASAM-CMP data message. The FL3X TAP will try to fit as many full ethernet frames as it can without overstepping this limit, before it starts with a new ASAM-CMP data message.

On the bottom of the dialogue is also a field which specifies which stream ID the ASAM-CMP status messages shall use.

4.2.2.5.1 Data Sink Ready Signal

By default, the FL3X TAP will buffer all incoming bus data until the data sink sends out a “Data Sink Ready” control message. This behavior can be disabled via the checkbox as seen in Figure 26.

There is also an optional timeout, which leads to the FL3X TAP going back to buffering once the data sink stops sending the “Data Sink Ready” message after this time.

4.2.2.5.2 Flow Control

Flow control is an optional feature which allows the user to specify a maximum data rate with which the FL3X TAP shall stream the bus data from its internal buffer onto the SFP+ ports. Note that the data rate applies on the buffer and thus across both SFP+ ports together.

	NOTICE
The value of flow control must not exceed the total configured bitrate on the upstream.	

4.2.2.6 Time Sync Configuration

The time sync configuration dialogue can be accessed via the “TimeSync Settings” tile.

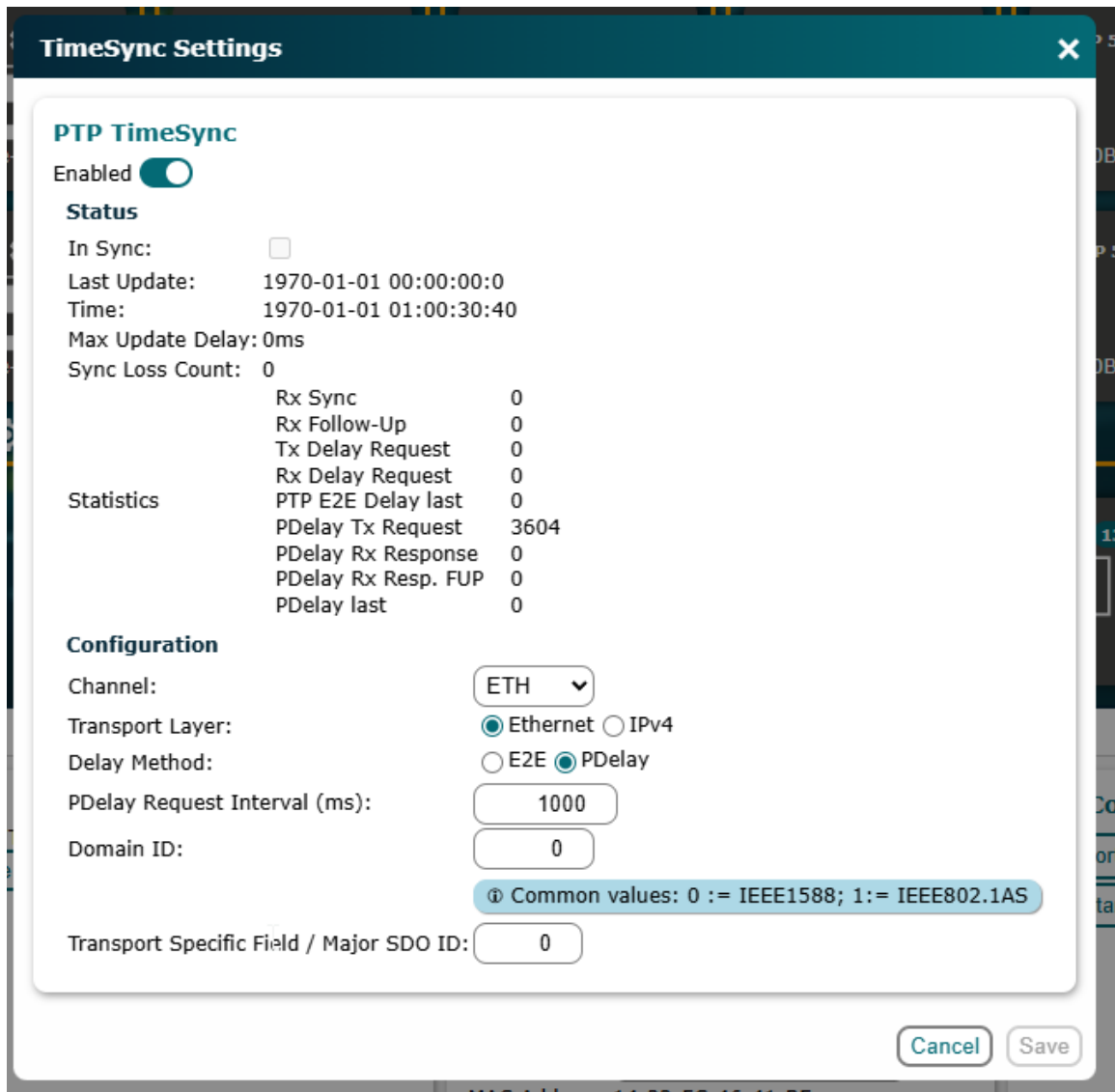



Figure 27: TimeSync Settings

In this view the time sync functionality can be toggled on or off altogether and if enabled it shows whether the FL3X TAP is currently synced to the master and various statistics. The FL3X TAP always acts as a time sync slave.

Below the statistics the user can modify the PTP configuration. The channel on which to run time sync on can be selected (ETH or SFP+ 1), the transport layer (Ethernet or IPv4/UDP), which delay method to use and in the case of PDelay, in which interval to send PDelay request messages. Lastly, the domain ID field and the Transport Specific Field / Major SDO ID can be specified.

4.2.2.7 Injection Configuration

Injection is a feature which allows the data sink to communicate with the vehicle bus directly through the FL3X TAP. The traffic caused by injection is **not** captured in the logging protocol.

	NOTICE
<p>Injections on the FL3X TAP port A are forwarded to the FL3X TAP port partner B and vice versa.</p> <p>Injection only works with ports that are also selected to stream to one of the two upstream ports; if this is not the case, no packets will be routed from the corresponding TAP port to the upstream, even if there is an injection entry.</p>	

Clicking on the “Injection Settings” tile opens the configuration dialogue.

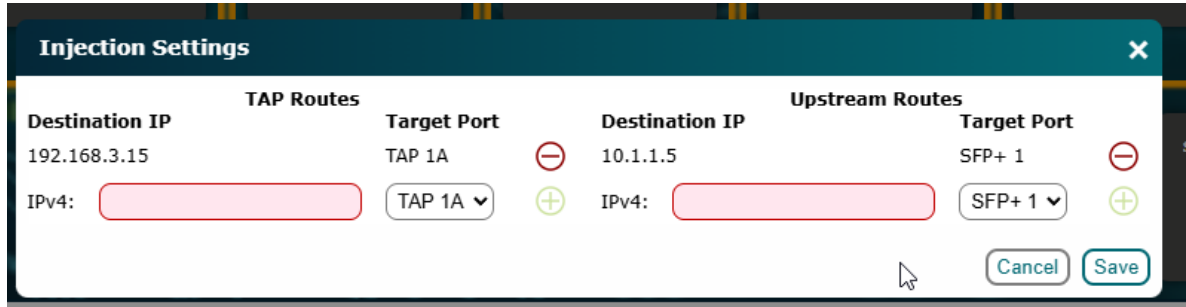


Figure 28: Injection Settings

In this view, the user can add or remove injection routes on both sides of the FL3X TAP. On the left side is the routing table towards the vehicle bus. Here the user can specify which IPv4 destination address corresponds to which TAP port. On the right side are the IPv4 associations for the SFP+ ports.

In this example configuration, all IPv4 frames coming from the data sink that has the destination IP address “192.168.3.15” will get injected into TAP port 1A and all IPv4 frames coming from any TAP port with the destination IP address “10.1.1.15” will get injected into the “SFP+ 1” port without being captured in the logging traffic.

Both sides are not associated with one another. This means that traffic coming from any TAP port will get checked for destination IP addresses matching the right side of this configuration and traffic coming from any SFP+ port will get checked for destination IP addresses matching the left side of this configuration, thus the user can for example define a single IP on the Upstream side and multiple IP addresses on the TAP side to communicate with multiple device in the vehicle bus network via a single Upstream IP address.

4.2.2.8 PHY Register Monitoring Configuration

The user may also monitor specific register of the TAP port PHYs by sending cyclic ASAM-CMP control messages. For this, the configuration dialogue can be opened by clicking on the “PHY Register Monitoring” tile.

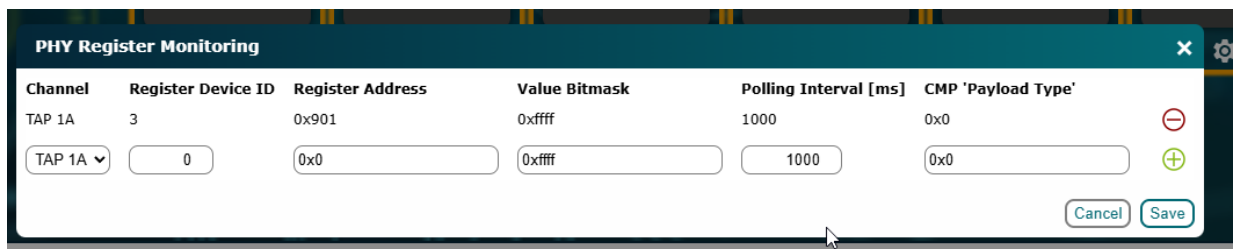


Figure 29: PHY Register Monitoring

Here, the configured registers can be removed, or new ones can be specified.

The user has to specify which TAP port to access, the register device ID and address, a bitmask for the register value, the polling interval and the value for the “Payload Type” field for the ASAM-CMP vendor specific control message header.

For the register device ID and address, please refer to the PHY datasheet.

The control messages will be sent in the specified polling interval, configurable in 100ms steps. Additionally, to the polling interval, the value bitmask is used to compare the register value every 100ms for changes, in which case the control message will be sent out early to signal a change in the value.

4.2.2.9 Statistics Page

The statistics page displays Rx statistics for each TAP port and Tx & Rx statistics for the SFP+ and ETH ports. It also calculates the respective current loads in Mbit/s every second and displays the maximum recorded load.

Chart	Channel	Name	Bus Type	Status	Received*	Transmitted	Rx Error	Tx Error	Tx impossible	Rx Load	Max (MBit/s)	Tx Load	Max (MBit/s)	Tx Queue	Max	Rx TS Good	Bad	Tx TS Good	Bad
<input type="checkbox"/>	1	TAP 1A (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	2	TAP 1B (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	3	TAP 2A (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	4	TAP 2B (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	5	TAP 3A (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	6	TAP 3B (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	7	TAP 4A (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	8	TAP 4B (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	9	TAP 5A (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	10	TAP 5B (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	11	TAP 6A (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	12	TAP 6B (undefined)	Automotive Ethernet	Link Down	0	0	0	0	0	0.00	0.00								
<input type="checkbox"/>	13	SFP+ 1 (undefined)	Ethernet	Link Down	0	2	0	0	0	0.00	0.00	0.00	0.00						
<input type="checkbox"/>	14	SFP+ 2 (undefined)	Ethernet	Link Down	0	2	0	0	0	0.00	0.00	0.00	0.00						
<input type="checkbox"/>	15	ETH (undefined)	Ethernet	Link Up	0	0	0	0	0	0.00	0.00	0.00	0.00						

Total load: 0.00 MBit/s (max. 0.00 MBit/s)

(*): The behavior of receive counter differs depending on the bus system:
 CAN-HS: All frames received on bus are counted
 Ethernet: Only data frames needed by configuration are counted (e.g. no SOME/IP-SD, ARP)
 Others: Only frames needed by configuration are counted

Auto Update

Figure 30: Channel Statistics

4.2.2.10 Log Page

The log page displays recent log messages of the device. The device internally stores the last 30 messages. Navigating to the log page and enabling Auto Update keeps all the log messages received from the device until leaving the page.

The screenshot shows the 'Log' page for 'FL3X TAP 1000BASE-T1'. It features a search bar, a 'Runtime Log' section with 'Clear', 'Clear View', and 'Options' buttons, and a 'Delta Time' and 'Auto Update' toggle. The log messages include:

```

(00:00:14.752) WARNING ptp_c Sent PDELAY_REQ, E3: 176960959472581656
(00:00:13.726) WARNING ptp_c Sent PDELAY_REQ, E3: 1769609597466601256
(00:00:11.720) WARNING ptp_c Sent PDELAY_REQ, E3: 17696095950466057396
(00:00:11.714) WARNING ptp_c Sent PDELAY_REQ, E3: 17696095954546688696
(00:00:10.708) WARNING ptp_c Sent PDELAY_REQ, E3: 1769609594447836544
(00:00:09.702) WARNING ptp_c Sent PDELAY_REQ, E3: 1769609593943765094
(00:00:08.695) WARNING ptp_c Sent PDELAY_REQ, E3: 1769609592435837464
(00:00:07.689) WARNING ptp_c Sent PDELAY_REQ, E3: 1769609591420857184
(00:00:06.683) WARNING ptp_c Sent PDELAY_REQ, E3: 1769609590423090952
(00:00:05.677) WARNING ptp_c Sent PDELAY_REQ, E3: 1769609589427948664
(00:00:04.671) WARNING ptp_c Sent PDELAY_REQ, E3: 176960958841207244
(00:00:04.314) WARNING eth_port Got IPv6 event: Interface "eth_port: eth" address: fe80:0000:0000:0000:0000:00
(00:00:04.308) WARNING eth_port Got IPv6 event: Interface "eth_port: eth" address: fe80:0000:0000:0000:0000:00
(00:00:04.298) WARNING eth_port Added IPv6 to netif!
(00:00:04.282) WARNING eth_port Ethernet Link Up
(00:00:03.665) WARNING ptp_c Failed to send PDelay_Req. (returnval: -1)
(00:00:03.660) ERROR TPTM_SYNC_PTP Failed to send ETH PTP message: ESP_ERR_ESP_NETIF_IF_NOT_READY
(00:00:02.655) WARNING ptp_c Failed to send PDelay_Req. (returnval: -1)
(00:00:02.650) ERROR TPTM_SYNC_PTP Failed to send ETH PTP message: ESP_ERR_ESP_NETIF_IF_NOT_READY
(00:00:01.646) WARNING ptp_c Failed to send PDelay_Req. (returnval: -1)
(00:00:01.641) ERROR TPTM_SYNC_PTP Failed to send ETH PTP message: ESP_ERR_ESP_NETIF_IF_NOT_READY
(00:00:00.635) WARNING ptp_c Failed to send PDelay_Req. (returnval: -1)
(00:00:00.630) ERROR TPTM_SYNC_PTP Failed to send ETH PTP message: ESP_ERR_ESP_NETIF_IF_NOT_READY
(00:00:00.622) WARNING MAIN Failed to read PTP config from NWS-Flash
(00:00:00.612) WARNING Cyclic Message Generator Cyclic message gen start!
(00:00:00.605) WARNING MAIN No exported config stored. (No such file or directory)
(00:00:00.512) WARNING MAIN Using partition www_factory
(00:00:00.506) ERROR MAIN Failed to fetch selected www partition, using factory partition..
(00:00:00.500) WARNING upstream ethernet io driver eth upstream port 0 = sfp plugged
(00:00:00.491) WARNING Device Config NWS No register monitoring configuration stored.
(00:00:00.482) WARNING Device Config NWS No ip table configuration stored.
(00:00:00.477) WARNING EEPROM IC Driver Set speed to 100
(00:00:00.471) WARNING EEPROM IC Driver SFP vendor: FS , product_name: SFP-100H-T-30 , type: 3, type_ext: 4
(00:00:00.457) WARNING UPSTREAM_PORT_NETIF I: IP2V: netif, IPNAME: en3, ID: 4
(00:00:00.451) WARNING UPSTREAM_PORT_NETIF B: IPv6: netif, IPNAME: en2, ID: 3
    
```

Figure 31: FL3X TAP Log page

4.2.2.11 Threads & Debug Pages

The threads and debug pages are primarily used for debugging purposes and give additional information for the STAR support team.

The debug page allows the user to execute various special commands for debugging purposes and read memory data from different chips on the device.

NOTICE

Accessing wrong address message space may lead to crashes or unexpected behaviour.

Do not interact with any elements on this webpage unless you are explicitly instructed by the STAR support to do so.

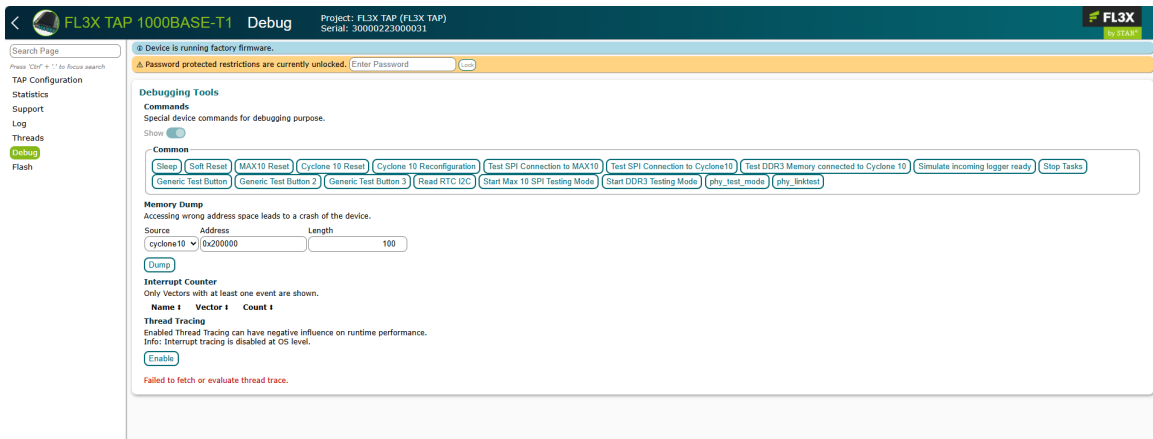


Figure 32: FL3X TAP Debug page

4.2.2.12 Support Page

The support page collects various device information which are necessary for the STAR support team.

When navigating to the support page, it will automatically start to prepare a HTML file with all information. After finishing the procedure, the button [Save device information to disk] will be shown. Click on this button, save the HTML file and send it to the STAR support team.

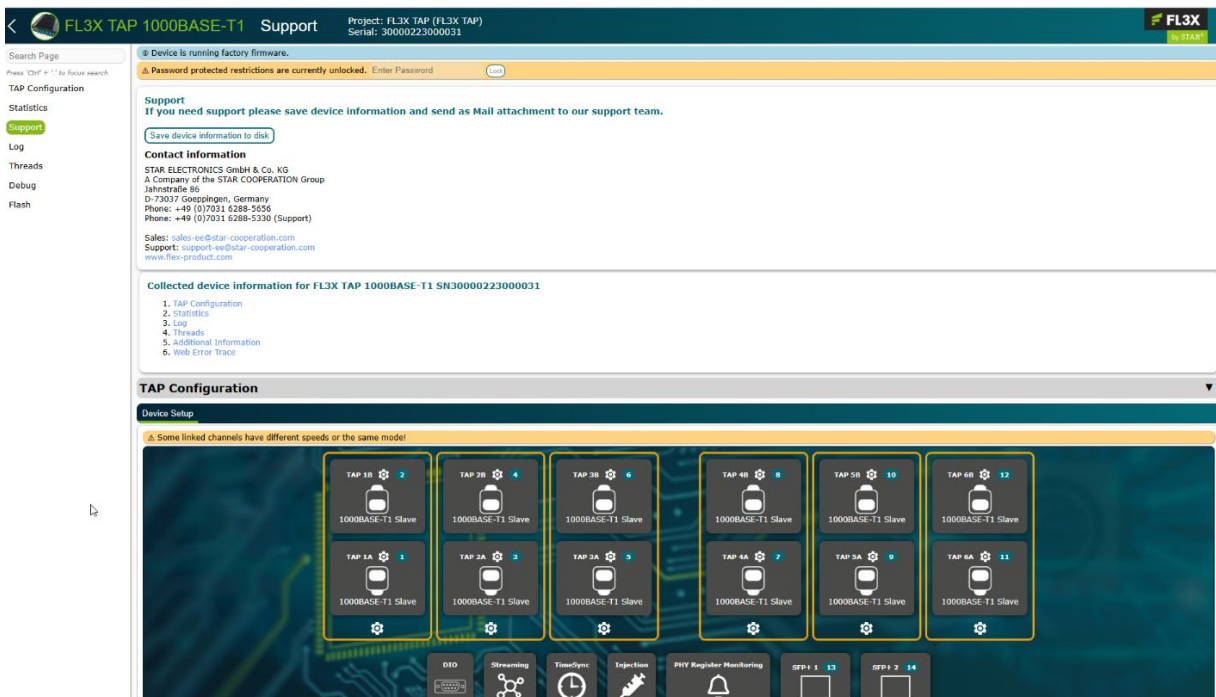



Figure 33: FL3X TAP Support page

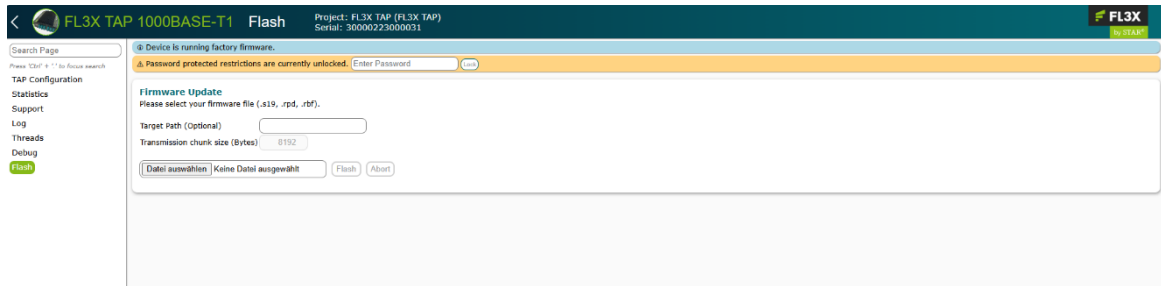
Created by	STAR ELECTRONICS GmbH & Co. KG			
Date created	2026-02-10	Date modified	2026-02-17	Page 29 of 37

5 Firmware Update

To update or upgrade the firmware of FL3X TAP (all variants) it is important to have a stable network connection between the used PC and FL3X TAP (all variants).

Connect the FL3X TAP (all variants) via the RJ45 port to the PC. Open the FL3X Diagnostics Website (default IPv4 is <http://192.168.1.15:80>) and navigate to the “Flash” page.

	NOTICE
Supported browsers for firmware updates: Microsoft Edge, Google Chrome.	



On the flash page the user can update the microcontroller, CPLD and FPGA firmware. Supported file types are **.s19* (microcontroller), **.rbf* (Cyclone 10 FPGA) and **.rpd* (MAX 10 FPGA).

Select an update file and press the Flash button. Depending on the type of firmware update, this may take a while.

Firmware Update

Please select your firmware file (.s19, .rpd, .rbf).

Target Path (Optional)

Transmission chunk size (Bytes)

FL3X_TAP_0.3.0.2709.s19

[13:45:15.271]	MISC	File: FL3X_TAP_0.3.0.2709.s19	
[13:45:15.272]	MISC	Size: 3870 kB	
[13:45:15.272]	MISC	Last Modified: 29.01.2026 13:44:53	
[13:45:15.287]	MISC	File Type: Text	
[13:45:15.287]	MISC	Record Name: esp/application	
[13:45:15.287]	MISC	Target: esp/application	
[13:45:15.287]	MISC	Transfer started... (chunk size 8192)	
[13:45:15.287]	MISC	Transferring file	4 %

After the flashing process successfully finished, the device will load the new firmware upon the next reboot, which is also indicated by the flashing log.

Firmware Update

Please select your firmware file (.s19, .rpd, .rbf).

Target Path (Optional)

Transmission chunk size (Bytes)

FL3X_TAP_0.3.0.2709.s19

[13:45:15.271]	MISC	File: FL3X_TAP_0.3.0.2709.s19	
[13:45:15.272]	MISC	Size: 3870 kB	
[13:45:15.272]	MISC	Last Modified: 29.01.2026 13:44:53	
[13:45:15.287]	MISC	File Type: Text	
[13:45:15.287]	MISC	Record Name: esp/application	
[13:45:15.287]	MISC	Target: esp/application	
[13:45:15.287]	MISC	Transfer started... (chunk size 8192)	
[13:45:15.287]	MISC	Transferring file	100 %
[13:46:07.325]	MISC	Transfer finished in 52.038 seconds (0.07MB/s)	
[13:46:07.326]	MISC	Finalize update process...	
[13:46:07.326]	WARNING	Perform a manual power cycle to active the flashed image!	

6 Reset Behavior

The FL3X TAP has two reset functionalities available via the button “WUP RST” (see also Figure 2).

6.1 Factory Reset

The Factory Reset is triggered when the user presses the button “WUP RST” for at least two seconds and less than ten seconds.

When the Factory Reset is activated:

- 1) The device will delete the whole user configuration.
- 2) A default configuration is loaded.
- 3) A reboot is performed. The currently running firmware version will not be changed.


6.2 Hard Reset

The Hard Reset deletes the whole user configuration and resets the microcontroller firmware back to the factory image. It can be triggered in two ways:

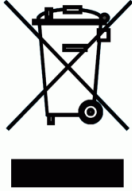
- Holding the button “WUP RST” for at least 10 seconds while the device is running
- Holding the button “WUP RST” for at least one second while powering the device on

After triggering this reset, the device will boot automatically into fallback mode. In this mode, the FPGAs will not get initialized and thus the device will not be in a functional state. This provides a stable way to update the FPGAs and the microcontroller in case there are any issues. Due to this, various information on the FL3X Diagnostics Website may display incorrectly, such as the device type or FPGA image versions.

The fallback mode can be left by rebooting the device.

NOTICE	
	<p>The hard reset will also change the ‘firmware esp’ to a specific, stable version. This version is maybe not the latest version and does not have the latest features.</p> <ul style="list-style-type: none">⇒ After a hard reset, a firmware update (see chapter 5) for the ‘firmware esp’ should be performed.⇒ The latest version can be downloaded at www.flex-product.com .

7 Shipping, Maintenance and Disposal

	Dispose off properly per regulations of the country where end-of-life occurs.
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Date created	2026-02-10	Date modified	2026-02-17
			Page 32 of 37

8 Troubleshooting

This chapter contains some frequently asked questions about the FL3X TAP.

1	Effect	The FL3X TAP configuration is not working as intended. On the FL3X Diagnostics Website -> tab 'Log', several warnings/errors are shown.
	Solution	1. Open the FL3X Diagnostics Website -> tab 'Support'. 2. Click on [Save device information to disk] and select a local folder to save the generated <i>.html</i> file. 3. Send an E-Mail to the STAR ELECTRONICS support team (see chapter Contact Information) and attach the generated <i>.html</i> file.

2	Effect	Data packets are lost during power up the FL3X TAP 100/1000BASE-T1 PLUS.
	Solution	No solution is available. For more details see chapter 4.2.

9 Ordering Information

9.1 FL3X TAP

Product	Description	Ordering number
FL3X TAP 1000BASE-T1	12 port Automotive Ethernet TAP to examine 100 & 1000BASE-T1 communication	3-V1100A01
FL3X TAP 1000BASE-T1 PLUS	12 port Automotive Ethernet TAP to examine 100 & 1000BASE-T1 communication, current less forwarding	3-V1100D01
FL3X TAP 100BASE-T1	12 port Automotive Ethernet TAP to examine 100BASE-T1 communication	3-V1100E01
FL3X TAP 100BASE-T1 PLUS	12 port Automotive Ethernet TAP to examine 100BASE-T1 communication, current less forwarding	3-V1100F01

9.2 Accessory Parts

Product	Description	Ordering number
PowerCable 200 2M9m 1BANm2	2.0 m Power cable (M9 to 2*banana)	3-00341D02
BusCable 200 2HMTDf 2HMTDf OABR	2.0 m 2 pol H-MTD female to 2 pol H-MTD female bus cable	3-00343K01
BusCable 500 2HMTDf 2HMTDf OABR	5.0 m 2 pol H-MTD female to 2 pol female H-MTD bus cable	3-00343L01
BusCable 250 9SUBDf 2HMTDf OABR	2.5 m 9 pol SUBD female to 2 pol H-MTD female bus cable	3-00343M01
BusCable 250 2SPE2m 2HMTDf OABR	2.5 m 2 pol SPE male to 2 pol H-MTD female bus cable	3-00343N01
<i>Third party accessory parts</i>		<i>Please see the latest official datasheets of the FL3X TAPs (see: www.flex-product.com)</i>
<i>Customer specific parts</i>		<i>Please contact STAR ELECTRONICS GmbH & Co. KG</i>
<i>Customer specific configuration</i>		<i>Please contact STAR ELECTRONICS GmbH & Co. KG</i>

9.3 Related Documents

Document	Description	document number
-		

10 Appendix

10.1 Appendix A: Guideline for handling ESD sensitive Products

- Any tester, equipment, or tool used at any production step or for any manipulation of semi-conductor devices must have its shield connected to ground.
- The product itself and the carrier system of the product respectively must be placed on a conductive table top or covered by an antistatic surface (superficial resistivity equal to or higher than $0.5\text{M}\Omega/\text{cm}^2$), grounded through a ground cable (conductive cable from protected equipment to ground isolated through a $1\text{M}\Omega$ resistor placed in series).
- All manipulation of finished goods has to be made at such a grounded worktable.
- The worktable must be free of all non-antistatic objects.
- An antistatic floor covering grounded through a conductive ground cable (with serial resistor between $0.9\text{M}\Omega$ and $1.5\text{M}\Omega$) should be used.
- It is recommended that you wear an antistatic wrist or ankle strap, connected to the antistatic floor covering or to the grounded equipment.
- If no antistatic wrist or ankle strap is worn, touch the surface of the grounded worktable before each manipulation of the ESD sensitive product.
- It is recommended that antistatic gloves or finger coats be worn.
- It is recommended that nylon clothing be avoided while performing any manipulation of parts.

10.2 Appendix B:

10.2.1 Acronyms and Abbreviations

Item	Definition
BD	Bus driver
BP	Bus plus
BM	Bus minus
ECU	Electronic Control Unit
EMC	Electromagnetic Compatibility
ESD	Electro Static Discharge
NC	Not Connected
PCB	Printed Circuit Board
PL	Physical Layer
SFP	Small form-factor pluggable transceiver (1 Gbit)
SFP+	Small form-factor pluggable transceiver (10 Gbit)

10.2.2 List of Tables

Table 1: Electrical characteristics	10
Table 2: Physical Characteristics	10
Table 3: Environmental Conditions.....	10
Table 4: Description of the Power LED	12
Table 5: Description of the Power connector.....	12
Table 6: Description of the SFP+ 1 & 2 (upstream Ethernet) LEDs	12
Table 7: Description of the ETH Port (configuration ethernet) LEDs	13
Table 8: Description of the Automotive Ethernet LEDs	14
Table 9: Connector assignment for H-MTD (automotive Ethernet).....	14
Table 10: Sub-D connector assignment for DIO.....	15

10.2.3 List of Figures

Figure 1: Bus cover with 12x H-MTD Automotive Ethernet and 1x D-Sub 9 I/O..... 11

Figure 2: Power cover with 100BASE-TX, push button, 2x SFP+ and power connector 11

Figure 3: Power connector M9 2pol with LED..... 11

Figure 4: SFP+ connectors with LEDs..... 12

Figure 5: ETH Port, RJ45 connector with LEDs..... 13

Figure 6: Automotive Ethernet H-MTD connector side with LEDs 13

Figure 7: H-MTD Ethernet connectors TAP 1A/B to TAP 6A/B with yellow and green LEDs..... 14

Figure 8: D-Sub DIO connector with two blue LEDs 14

Figure 9: Sub-D 9 pin DIO pinout 15

Figure 10: FL3X Diagnostics Website - Overview 17

Figure 11: FL3X Diagnostics Website - TAP Configuration – Button [Restart & Apply Changes] 17

Figure 12: FL3X Diagnostics Website - Password protection..... 17

Figure 13: FL3X Diagnostics Website - Read only state 18

Figure 14: FL3X Diagnostics Website - General configuration options for FL3X TAP 100/1000BASE-T1 18

Figure 15: FL3X Diagnostics Website - General configuration options for FL3X TAP 100/1000BASE-T1 PLUS..... 18

Figure 16: TAP Port - Base Settings 19

Figure 17: SFP+ 1/2 - Streaming Channel Configuration.....20

Figure 18: TAP port pair – shared configuration parameters – Transparency Mode disabled21

Figure 19: TAP port pair – shared configuration parameters – Transparency Mode disabled21

Figure 20: FL3X Diagnostics Website - General configuration options – Advanced Transparency Mode22

Figure 21: Channel Filters - Parameters22

Figure 22: Channel Filters - Bitmask23

Figure 23: Channel Filters - Bitmask example.....23

Figure 24: DIO Settings 1/224

Figure 25: DIO Settings 2/224

Figure 26: Streaming Settings25

Figure 27: TimeSync Settings26

Figure 28: Injection Settings.....27

Figure 29: PHY Register Monitoring27

Figure 30: Channel Statistics.....28

Figure 31: FL3X TAP Log page28

Figure 32: FL3X TAP Debug page29

Figure 33: FL3X TAP Support page.....29

Created by	STAR ELECTRONICS GmbH & Co. KG		
Date created	2026-02-10	Date modified	2026-02-17
			Page 36 of 37

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