ScreenLinq

FPD-Link III and CAN-FD 2:1 Multiplexer

Engineering Notes, Version 1.0.0

Classification:	Internal
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Changes

Version	Date	Change description	Changed by	Approved by
0.0.9	11.06.2025	Start of the writing	Jan Brabec	Jan Brabec
1.0.0	13.06.2025	Initial release	Tomáš Penk	Michal Havelka

1 About This User Manual

Company reserves the right to make technical changes to the equipment or changes to this document without any prior notice. No guarantee is given for the information provided. No part of this manual may be reproduced in any form or by any means without the written permission of the publisher. All technical information, drawings, screenshots etc. are liable to law of copyright protection.

We are grateful for references to mistakes or for suggestions for improvement to be able to offer you even more efficient products in the future.

2   Safety Instruction

Dear customer, the following safety instructions are intended not only for the protection of your health but also for the protection of the product.

This section gives an overview of all important aspects of safety for the protection of individuals and to ensure safe and trouble-free operation.

The warranty/guarantee will become void if damage is incurred resulting from non-compliance with these operating instructions. We do not assume any liability for consequential damage!

We also do not assume any liability for damage to other property or personal injury caused by improper use or failure to observe the safety instructions. In such cases the guarantee/warranty will become void!

Therefore, read the following items very carefully before connecting the product and taking it into operation.

2.1   General Safety Instructions

- The product may only be set up, started or serviced after gaining familiarity with the appropriate Operating Instruction.
- The products, equipment and device must only be used indoors.
- Do not use this product near water or in wet areas to avoid fire or injury of electric current.
- Use the product, equipment and device only for its intended purpose as described in Product Specification.
- The product, equipment and devices should not be operated in potentially explosive atmospheres.
- During operation of the product, equipment and device, do not permit any work method that hinders the safety of the product, equipment and device.
- Always keep the working area of the unit clean and orderly in order to avoid danger from dirt or scattered parts.
- Do not exceed the technical performance data specified for each product, equipment and device.
- Keep all safety precautions and hazard descriptions with the product, equipment and device in legible condition and replace the descriptions as needed.
- Operation as well as work on the products, equipment and devices must only be carried out by trained personnel.
- In case of malfunction, immediately stop the unit.
- Have any fault corrected by appropriately trained personnel.
- The device has to be placed in an open space to ensure sufficient cooling of its parts.
- Always turn off the product when you do not use it or before a revision.
- Colours of wires and connectors may not comply with VW standards.

3 Preface

3.1 About The ScreenLinq FPD-Link III Multiplexer

The ScreenLinq FPD-Link III Multiplexer is developed to the engineering sample extent, so it is not released yet. These engineering notes are aimed to guide you just in short curt points. If you have doubts or questions, please feel free to contact our support:
support.products@digiteqautomotive.com.

3.2 Mechanical and Electrical Properties

Table 1: Mechanical and electrical properties

| Interfaces	2x FPD-Link III Input (dual-link capable)
	1x FPD-Link III Output (dual-link capable)
	2x CAN-FD
	1x LIN Slave (not implemented in FW)
Operating Voltage	12 – 15 VDC nominal
User interface	USB 2.0 TYPE B
Operating temperature	0° C to 60° C if humidity condensation prevented
Storage temperature	-40° C to 85° C if humidity condensation prevented
Dimensions (W x D x H)	105 x 95 x 26 mm (including connectors and control elements)
Weight	215 g
Water resistance	IP30

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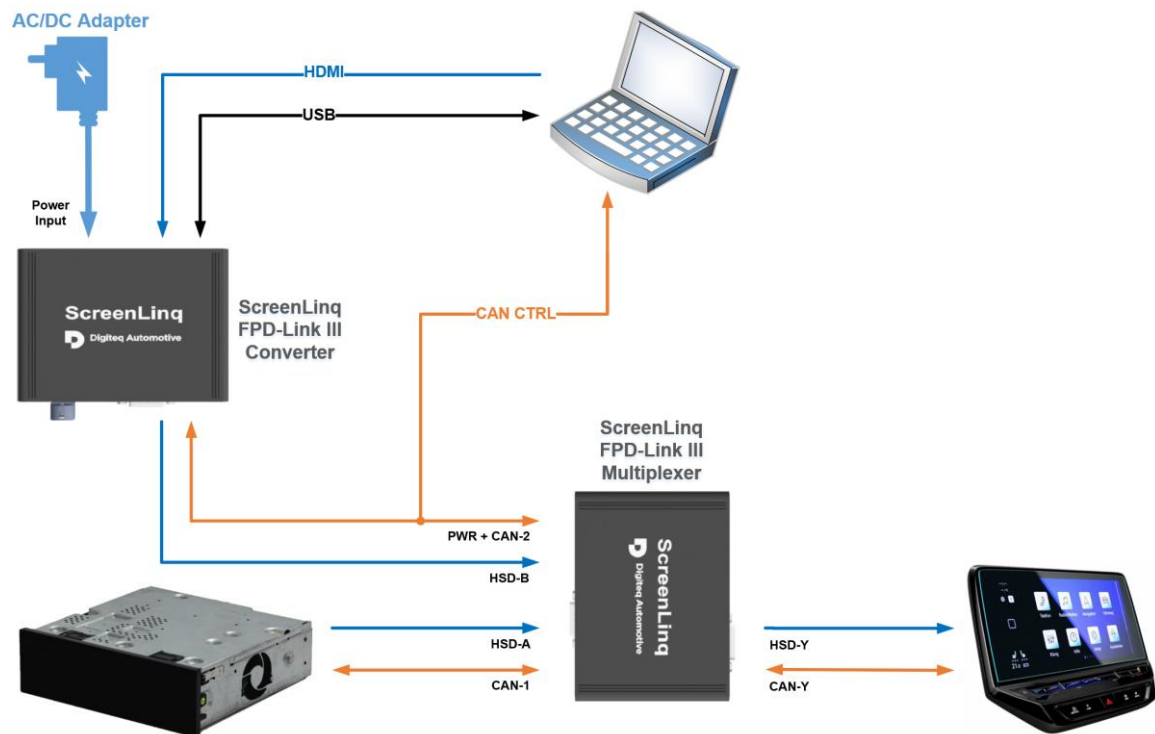
4 Connection

Figure 1: ScreenLinq schematic connection

ScreenLinq Multiplexer CAN Inputs:

CAN 1 (pins 2+7) to MIB

CAN 2 (pins 4+8) to ScreenLinq CAN 2 (same pins) and to PC for control

ScreenLinq Multiplexer CAN Switch:

CAN Y (pins 2+7) to ABT

ScreenLinq Multiplexer has a compatible pinout with ScreenLinq Converter:
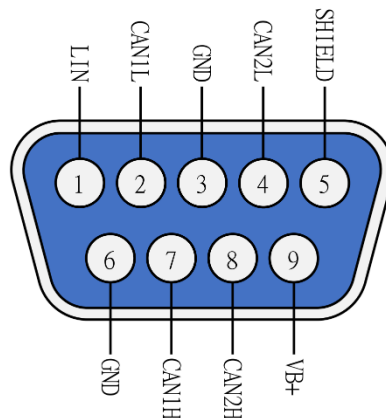
Figure 2: CANON pinout

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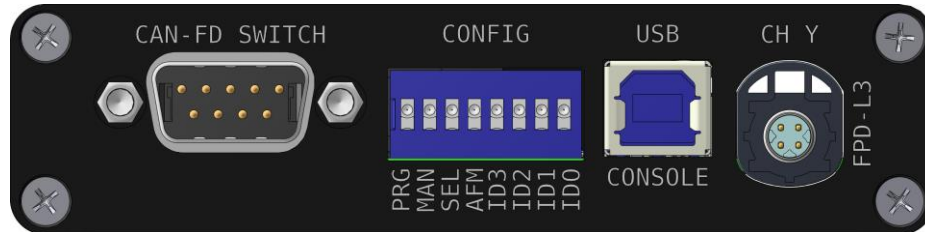
5 Configuration

5.1 Configuration Switches Description

- PRG   OFF   - normal functionality
  ON   - firmware update mode
- MAN   OFF (remote control)
  - SEL   OFF   - multiplexer is controlled by CAN messages (via CAN)
  - SEL   ON   - multiplexer is controlled by logical input (via GPIO)
- MAN   ON (manual control)
  - SEL   OFF   - CH Y (output to ABT) is connected to CH A (input from MIB)
  - SEL   ON   - CH Y (output to ABT) is connected to CH B (input from ScreenLinq FPD-Link III Converter)
- AFM   reserved (unused)
- ID0 – ID3   - ID of the device

6 Functional Overview

6.1 Switching The Image Input

A switch request for the image input is processed according to the following steps:

1. The image output is disabled for 40 ms.
2. The image output is changed to the requested input channel. If needed, CAN input is switched in the same moment accordingly (see below).
3. After another 40 ms, the output is enabled.

6.2 Switching The CAN Input

The CAN bus is handled according to the described procedures.

Galvanic connection and relay

There is a relay mounted in the device (see Fig. 4). When the device is without power the relay physically connects CAN Y to CAN 1. After power on the device waits for first CAN message on CAN 1/CAN Y. Immediately after receiving it the relay changes its position and physically connects CAN Y to CAN 2. If no CAN message is received on CAN 1/CAN Y in 100 ms after power on, the relay change is done when the timeout expires.

Microprocessor gateway

1. When the device control (manual, remote via GPIO or remote via CAN) requests switching CAN Y from CAN 1 to CAN 2, the microprocessor immediately stops routing CAN messages between CAN 1 and CAN 2. The indication value in CAN Status message is updated.
2. When the device control (manual, remote via GPIO or remote via CAN) requests switching CAN Y from CAN 2 to CAN 1, the microprocessor starts 20 ms timeout. After its expiration the microprocessor starts routing CAN messages between CAN 1 and CAN 2. The indication value in CAN Status message is updated. This 20 ms delay between the request and the change is implemented in favour of ScreenLinq Converter (refer to the corresponding paragraph in its user manual).
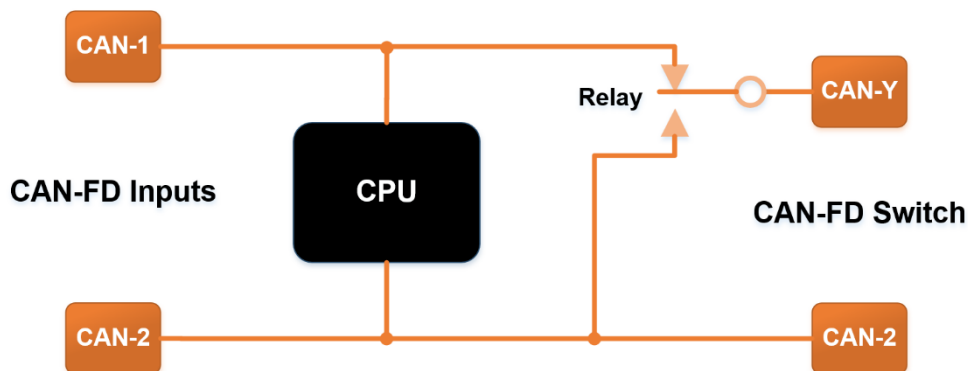

Figure 4: Relay Schematic Connection

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NM High watch

When the device is controlled *remotely* via CAN message, it watches network management messages coming on CAN 1. If the NM High goes into PBS/BS state, the relay switches CAN Y from CAN 2 back to CAN 1. Afterwards, no other CAN change is processed unless the device receives a switch request from channel 1 to channel 2.

6.3   Switching The HID Input

Switching the HID input is implemented purely as routing the appropriate CAN messages. It means that a request to connect HID output with HID input on channel 1 results in routing HID protocol messages between CAN 1 and CAN 2, whereas request to connect HID output with HID input on channel 2 results in blocking (no routing between CAN 1 and CAN 2) of HID protocol messages.

7 GPIO Switching

Pin 1 on the device connector can serve as an analogue signal that switches the input (see pin "LIN" on Fig. 2). If configured as logical input (cf. chapter "Configuration"), there is 12 V power on it. Leaving it disconnected means input from channel 1, i.e. output is switched to input A for all image, CAN and HID. If you connect the pin to ground ("GND" pin 6 on Fig. 2), the output is switched to input channel 2 (output from input B).

8   CAN Messages

8.1   ScreenLinq Multiplexer Status Message

Identifier: 0x1FFFEEX1, where X is the ID of the device

Structure:

- bit 0: unused

- bit 1: 0 = REMOTE control, 1 = MANUAL control

- bit 2:
    - for remote control: 0 = via CAN, 1 = via GPIO
    - for manual control: 0 = input from CH A (all image, HID and CAN), 1 = input from CH B (all image, HID and CAN)

- bit 3: 0 = AFM off, 1 = AFM on

- bits 7 to 4: device ID

- bit 8: image input
    - 0 = channel 1
    - 1 = channel 2

- bit 9: CAN input
    - 0 = channel 1
    - 1 = channel 2

- bit 10: HID input
    - 0 = channel 1
    - 1 = channel 2

- bit 11: relay state
    - 0 = CAN Y is connected to CAN 1
    - 1 = CAN Y is connected to CAN 2

- bits 15 to 12: detected NM High state:
    - 0 = unknown / none
    - 1 = waiting for change in relay position
    - 2 = stay active, no change detected
    - 4 = Ready Sleep / Prepare Bus Sleep detected
    - 8 = Prepare Bus Sleep / Bus Sleep detected

8.2 ScreenLinq Multiplexer Command Message

Identifier: 0x1FFFEEX0, where X is the ID of the device

- Byte 0: *Mode*
    - o value 0: INPUT
    - o value 1: SETUP

Structure for INPUT mode (this mode is used for work control):

- Byte 1 lower nibble: *image input*
    - o value 0: NONE – does nothing
    - o value 1: channel 1 – connects CH Y to CH A
    - o value 2: channel 2 – connects CH Y to CH B
- Byte 1 upper nibble: unused
- Byte 2 lower nibble: *CAN input*
    - o value 0: NONE – CAN routing is dependent on *preset value*
    - o value 1: channel 1 – CAN routing between CAN 1 and CAN Y
    - o value 2: channel 2 – no CAN routing between CAN 1 and CAN Y
- Byte 2 upper nibble: HID input
    - o value 0: NONE – HID protocol routing is dependent on *preset value*
    - o value 1: channel 1 – HID protocol routing between CAN 1 and CAN Y
    - o value 2: channel 2 – no HID protocol routing between CAN 1 and CAN Y

Structure for SETUP mode (this mode is used for defining *preset* values):

- Byte 1: lower nibble: unused
- Byte 1 upper nibble: unused
- Byte 2 lower nibble: *CAN input* (its preset value)
    - o value 0: NONE – CAN routing is dependent on current *image input*
    - o value 1: channel 1 – CAN routing between CAN 1 and CAN Y
    - o value 2: channel 2 – no CAN routing between CAN 1 and CAN Y
- Byte 2 upper nibble: HID input (its preset value)
    - o value 0: NONE – HID protocol routing is dependent on current *image input*
    - o value 1: channel 1 – HID protocol routing between CAN 1 and CAN Y
    - o value 2: channel 2 – no HID protocol routing between CAN 1 and CAN Y

The value specified via this message with setup mode is persistent, i.e. after power cycle the last value set (i.e. the *preset*) remains.

9 LED Indication

The device has two LEDs – "FPD-L3 STATUS" and "CAN-FD STATUS".

FPD-L3 STATUS LED

After power on, the LED lights cyan. When the image connection is OK, the LED lights green. When an error occurs the LED lights red.

If the image output is connected to input A, yellow colour flashes into the green. If the image output is connected to input B, blue colour flashes into the green.

CAN-FD STATUS LED

This functionality in not correctly implemented and therefore, it is recommended to ignore CAN-FD STATUS LED indication.

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10 Known Issues

This list contains known issues.

1. **CAN-FD LED Indication:** Indication of the CAN-FD LED does not work properly. It can be misleading! It cannot be easily fixed by the user.

2. **When the device is configured to be controlled *remotely* via GPIO:** After powering the device ON with leaving the GPIO pin disconnected may lead image output to be connected to input B (which is typically image from PC). In case of this it is necessary to connect this pin to ground and disconnect it back again.

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11 Service and Maintenance

Maintenance, adjustments, and repair work may only be carried out by the manufacturer or an authorized person with the manufacturer's agreement.

12 Legislative and ecology

Disposal of old electrical and electronic equipment (applicable in the European Union and other European countries with separate collection systems).
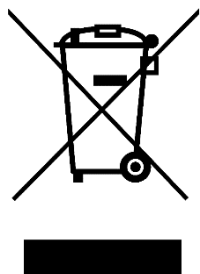
This symbol on the product or on its packaging indicates that this product shall not be treated as household waste. Instead, it shall be handed over to the applicable collection point for recycling of electrical and electronic equipment. By ensuring that this product is disposed of correctly, you will help to prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. The recycling of materials will help to conserve natural resources.

ScreenLinq's Product Page

https://products.digiteqautomotive.com/screenlinq/index.html

!	**Still looking for answers?**
	In case you are unable to find an answer to your question, do not hesitate to contact us via email: support.products@digiteqautomotive.com

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!	**Looking for a solution?**
	If you are looking for test bench accessories or new solutions to your requirements, do not hesitate to contact us via email: business.products@digiteqautomotive.com