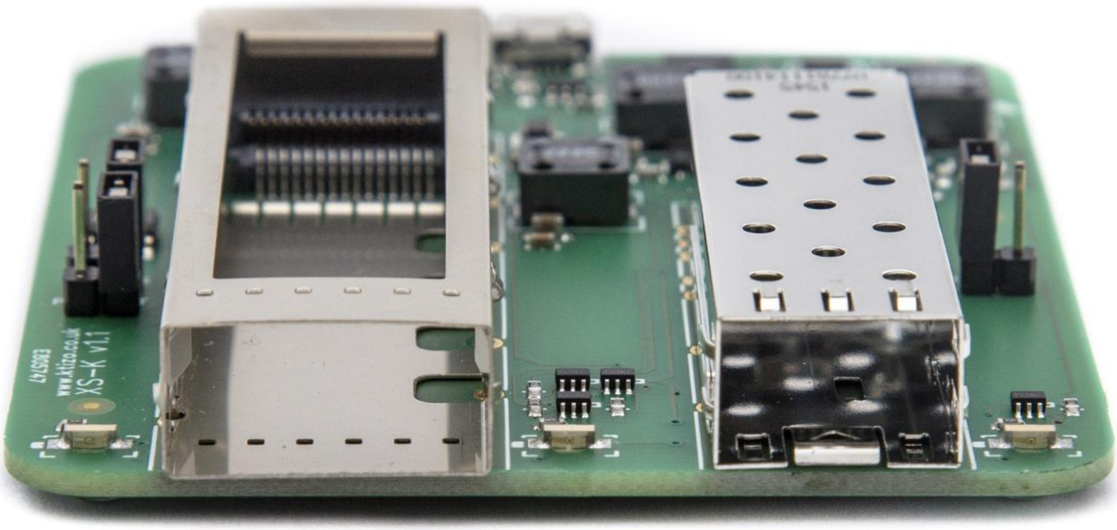
XFP-SFP Programmer (XS-K)

Datasheet

v1.1, October 2016

PCB version 1.1



Revision History

v1.1

- Added support for PCB v1.1 which has better inrush current performance and adds manual control of PD/RST and TxDIS via jumpers.
- Combined this document with the Custom Programming Guide and the Customisation Options.
- Corrected typos & updated product photos.

v1.0

- Original issue

Contents

Intended Purpose

All suppliers of fibre-optic modules need to program the on-board EEPROM. In the past this was done at the factory but in recent times, there is a trend towards programming optics in the field. This reduces costs and provides a faster response time to the end user as less inventory has to be kept.

This board is intended to be used in the lab or in the field, for programming the EEPROM. It is suitable for all types of SFP (SFP, SFP+, Tuneable SFP, DWDM SFP, Bi-Di SFP) and all types of XFP (XFP, CWDM XFP, DWDM XFP, Tuneable XFP).

The XFP-SFP programmer is designed as a demonstration proof-of-concept device which is available off-the-shelf. Although this design is available in volume, most users will prefer to have a customized design to suit their exact needs.

See the section about Customization Options.

Functional description

Power

The programmer is powered entirely from the USB port. Internal power supply characteristics: Regulated 5.0V, 3.3V and 1.8V supplies (2% voltage tolerance), compatible with the SFP and XFP MSAs. Each supply is capable of sourcing 1.0A maximum although the USB port itself is likely to shut down before that level is reached.

Module slots

SFP and XFP module slots are provided. Each module slot has an associated yellow LED. This lights automatically when an appropriate module is inserted, indicating the programmer is ready for use.

If more than one optical module is inserted, the board shuts down power to both modules, preventing overloading and communication errors.

Some optical modules are known to lock the bus when they are unpowered. The programmer has a system which prevents this from occurring.

Power monitoring & switching

There are 2 power monitors in the programmer, which monitor the power supplies to the 2 module slots. This can be helpful for diagnostic purposes.

LED indicators

A green LED is provided to show power is applied to the board.

Yellow LEDs are provided, one for each module slot, to show which is powered up.

Header options

The default state with all the jumpers disconnected allows programming of almost all SFP and XFP modules. A few types of optical modules might require the laser to be turned on (for example, a tuneable SFP). Headers are provided that allow this.

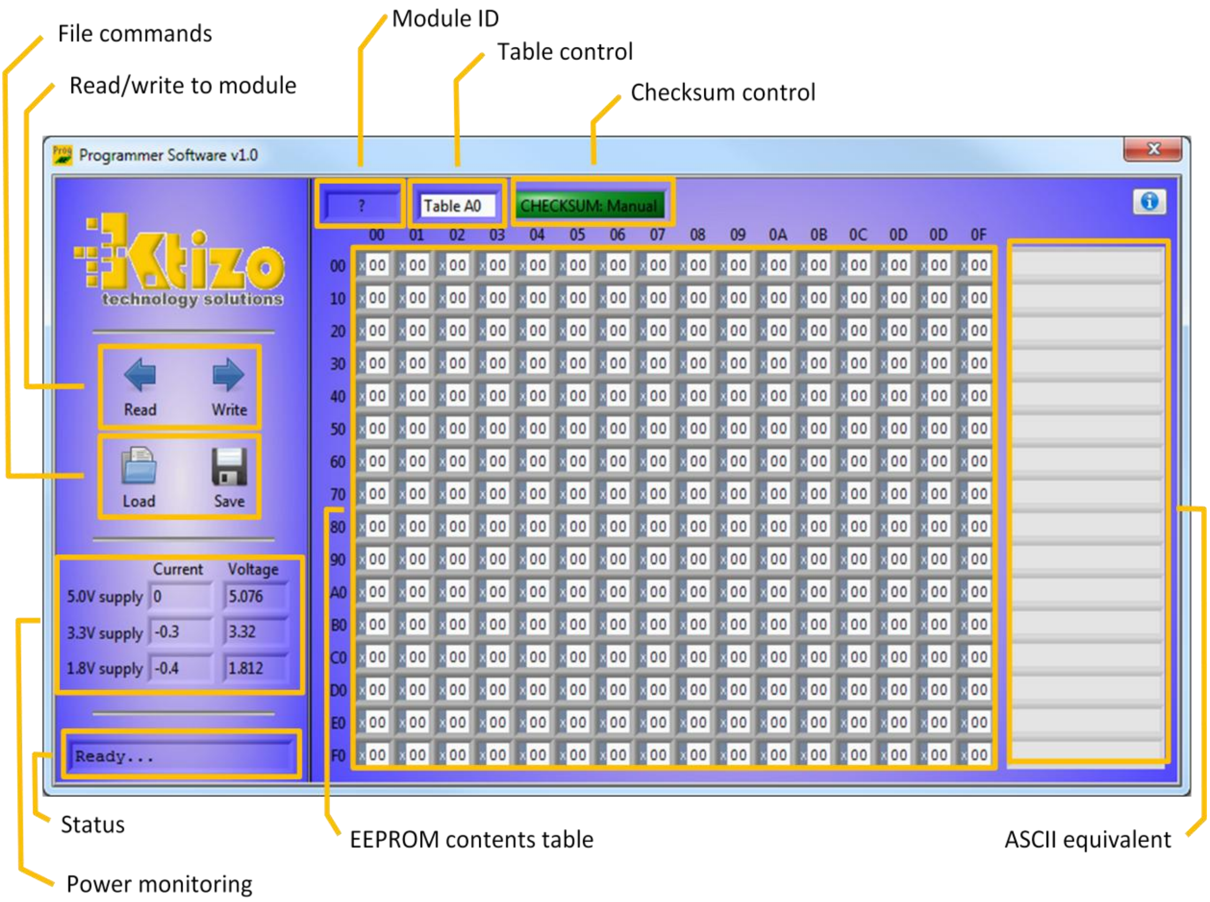
		Jumper disconnected	Jumper connected
XFP	TX-DIS	Tx disabled	Tx enabled
XFP	PD/RST	Low power mode	High-power mode
SFP	TX-DIS	Tx disabled	Tx enabled

Using the demo software

Installation

The software is a free download from the Ktizo website: www.ktizo.co.uk

The installer should automatically install all the associated drivers.



EEPROM Contents table

The contents of the module EEPROM is displayed here, in hex. If a cell is changed, the software will attempt to write that value to the module. A message will briefly appear in the *Status* box to show whether it was successful or not.

Table control

This selects the A0 or A2 tables.

ASCII equivalent

The ASCII equivalent of the hex for each cell is shown here. Any non-ASCII characters are replaced with a “-“.

Module ID

The software monitors the module slots and attempts to determine what kind of module is inserted, based on the EEPROM contents.

Checksum control

If this button is selected, the software will recalculate the checksums in the EEPROM automatically, based on the current EEPROM contents table.

Read/write to module

The read control reads the EEPROM and displays the contents in the EEPROM table.

The write control writes the EEPROM table to the module EEPROM.

In both cases, a message will briefly appear in the *Status* box to show whether it was successful or not.

File commands

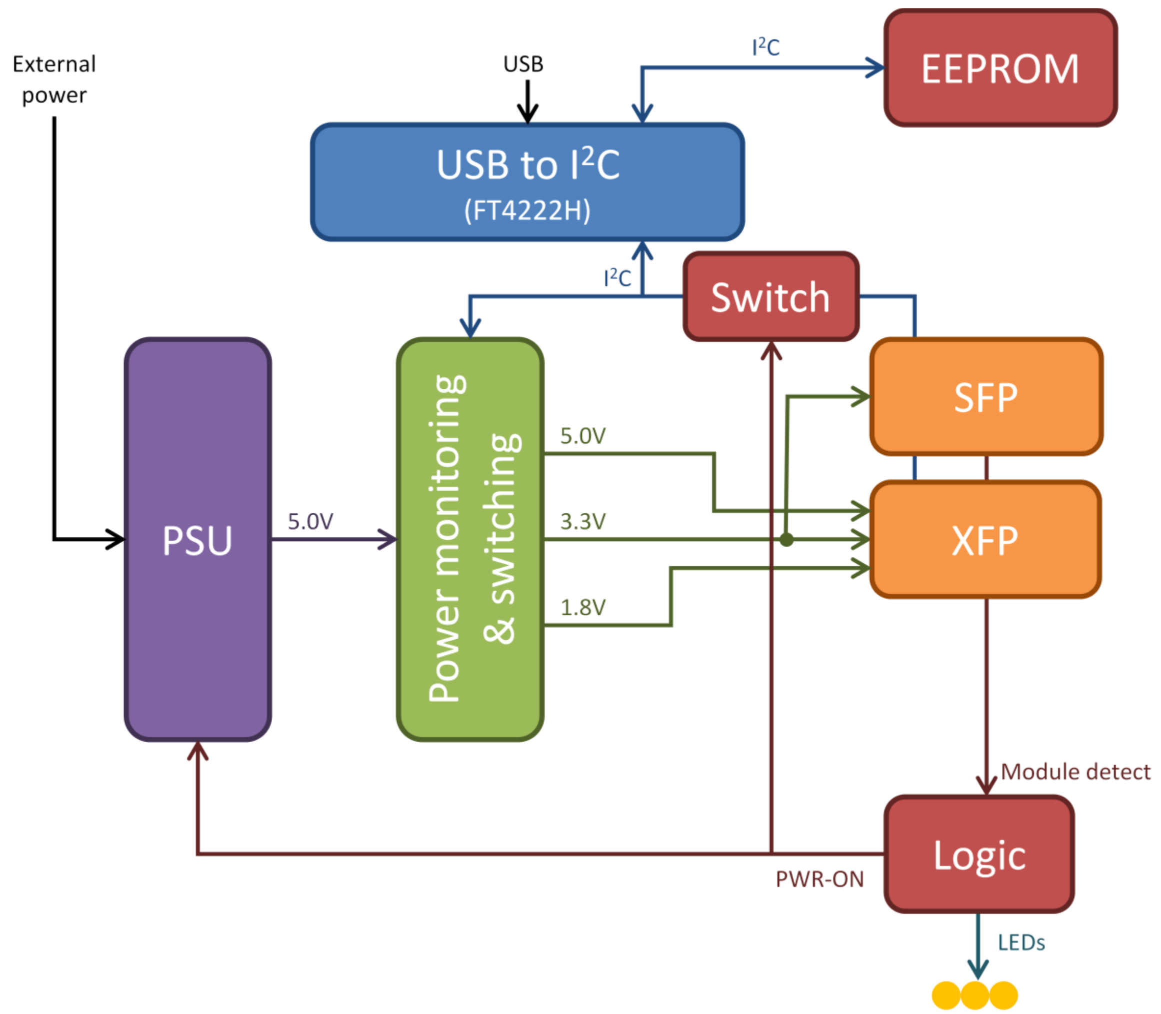
The write control takes the EEPROM table and writes it to a txt file.

The read control takes a txt file of the appropriate format and puts it in the EEPROM table.

Power monitoring

The current voltage and supply current for the 3 on-board supplies is shown here.

Hardware Overview



USB to I2C

The USB to I²C function is performed by an FTDI FT4222H chip. It controls one I²C bus which is shared by a the module slots and the power monitoring system and the system EEPROM.

PSU

The programmer is powered entirely from the USB port.

Internal power supply characteristics: Regulated 5.0V, 3.3V and 1.8V supplies (2% voltage tolerance), compatible with the SFP, XFP and QSFP MSAs. Each supply is capable of sourcing 1.0A maximum although the USB port itself is likely to shut down before that level is reached.

SFP, XFP slots

Each module slot has an associated yellow LED. This lights when DUT-PWR-ON is high, and the appropriate module is inserted.

Power monitoring & switching

There are 3 power monitors in the programmer, which monitor the power supplies to the module slots.

System EEPROM

An EEPROM is also provided on the I2C bus, at address 0x57. The first 16 bytes are reserved for the serial number of the board. The rest of the EEPROM is available for read/write.

Software development

Most users write their own software to fit with their own company's systems.

Drivers

The programmer has at its core an FTDI FT4222H USB to I2C converter chip. A USB driver is required, which provides two DLLs for the software to communicate with.

http://www.ftdichip.com/Drivers/D2XX.htm

http://www.ftdichip.com/Support/Documents/ProgramGuides/D2XX_Programmer%27s_Guide%28FT_000071%29.pdf

Lots of software examples are also provided by FTDI:

http://www.ftdichip.com/Support/SoftwareExamples/LibFT4222.zip

After installing the driver, plug in the USB lead. Windows should automatically find the correct drivers and complete the installation.

Where the function name starts with FT, it refers to the ftd2xx.dll

Where the function name starts with FT4222, it refers to the LibFT4222.dll

Please refer to the FTDI documentation:

http://www.ftdichip.com/Support/Documents/ProgramGuides/D2XX_Programmer%27s_Guide%28FT_000071%29.pdf

http://www.ftdichip.com/Support/Documents/AppNotes/AN_329_User_Guide_for_LibFT4222.pdf

Initialisation

The first operation is to find the programmer and open a handle to it.

Use ***FT_Open*** to open *iDevice = 0*. This will open one programmer. If more than one programmer is connected to the same PC, another way will have to be used. There are several ways listed in the D2XX Programmer Guide.

ftHandle is returned which is then used for all subsequent commands.

Configure I^2C

Use ***FT4222_I2CMaster_Init*** with *kbps = 100* to set internal I^2C communication to 100kb/sec.

Get serial number, date code, hardware version

Use ***FT4222_I2CMaster_Write*** with

deviceAddress = 0x57

buffer = 0x00

Use ***FT4222_I2CMaster_Read*** with

deviceAddress = 0x57

bufferSize = 13

A 13-character hex-encoded ASCII string is returned: **wwyyvvmbnnnnn,** where:

ww is week number of manufacture

yy is year of manufacture

vv is major hardware version

m is minor hardware version

b is hardware build number

nnnnn is the serial number

Communication with Optical Modules

Write

Use ***FT4222_I2CMaster_Write*** with

deviceAddress = 0x50 (to access the “A0” area)

buffer = 0xYY 0xZZ, where YY is the memory location; ZZ is the data to write

Read

Use ***FT4222_I2CMaster_Write*** with

deviceAddress = 0x50 (to access the “A0” area)

buffer = 0xYY, where YY is the desired memory location

then,

Use ***FT4222_I2CMaster_Read*** with

deviceAddress = 0x50 (to access the “A0” area)

bufferSize = as required

Read power monitors

There are 3 power monitors, one for each of the 3 power supplies:

I^2C Slave Address	Nominal voltage	Function
0x40	5.0V	XFP
0x41	3.3V	XFP, SFP, QSFP
0x42	1.8V	XFP

Current

Use ***FT4222_I2CMaster_Write*** with

deviceAddress = slave address as required

buffer = 0x01

Use ***FT4222_I2CMaster_Read*** with

deviceAddress = slave address as required

bufferSize = 2 (signed 16)

Multiply value obtained by 0.1 to obtain the current in mA

Voltage

Use ***FT4222_I2CMaster_Write*** with

deviceAddress = slave address as required

buffer = 0x02

Use ***FT4222_I2CMaster_Read*** with

deviceAddress = slave address as required

bufferSize = 2 (signed 16)

Bit-shift the value obtained right, 3 times.
Multiply by 0.004 to obtain the voltage in V

Averaging

By default, the power monitors do not do any averaging. To set averaging to x128:

Use ***FT4222_I2CMaster_Write*** with

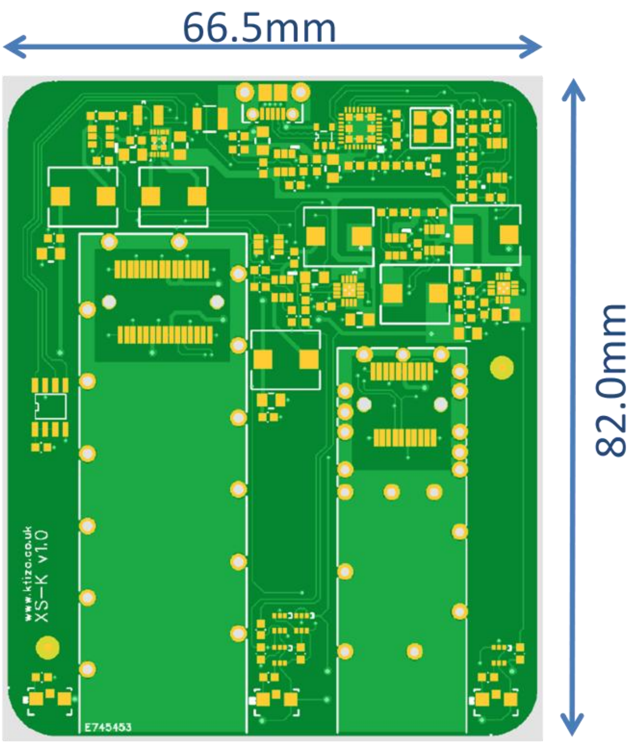
deviceAddress = slave address as required

buffer = 0x00 0x3FFF

Close

Use ***FT4222_UnInitialize*** and ***FT_Close*** to turn off and close communication with the programmer. This must be done before closing the software else the programmer will not be found next time the software is run.

Mechanical Design



The board is supplied with 4 rubber feet on the underside.

Pack contents

Each unit comprises a Programmer and USB cable, individually packed in a bubble-bag.

Customization options

The SFP-XFP programmer is designed as a demonstration proof-of-concept device which is available off-the-shelf. Although this design is available in volume, most users will prefer to have a customized design to suit their exact needs.

Many different product variations have been done in the past including all of these. Please enquire about your specific needs. Almost anything is possible!

Interfaces

- Additional optical module slots:
    - Add multiple slots for bulk factory programming. Eg: 4x SFP slots
- Add additional interface types.
    - QSFP, QSFP28, CXP, GBIC
    - XENPAK, X2, CFP, CFP2, CFP4, CFP8 etc

Control/Monitoring functions

- Access to all control/monitor lines is possible: TxEnable, LOS, TxFault, /INT, IntL, LPMode etc
- Some optical modules require a hardware “back-door” to be opened, this can be added. E.g. Pulling MD0 high.
- Add temperature monitoring

Power supplies

- Voltage and current monitoring to each optical module
- Add an external 5V supply for modules that require power more than a USB port can supply

Appearance

- LEDs
    - Change LED colours / positions
    - Add LEDs to monitor specific functions (E.g. LOS, TxEnable)
    - Add RGB LED(s) with driver – flashing, colour cycling, “pulsing” effects are possible
- Change size/shape/colour of PCB
- Add mounting holes, cut-outs to suit your case design
- Add/remove rubber feet

Packaging options

- Supplied with or without USB cable
- Supplied in a cardboard box or bulk-packed in bubble-bags
- Barcode labels on the PCB and external packaging
- Serial number can be programmed to your preferred format

For more information, visit us at www.OpticalProgrammer.com

Contact us

www.opticalprogrammer.com

sales@opticalprogrammer.com

OpticalProgrammer.com is a brand of Ktizo Technology Solutions, established in 2009.

Tel: +44 750 200 4611

Web: www.ktizo.co.uk

Mailing address: 14 Brandon Grove, Stoke-on-Trent. ST4 2DU. UNITED KINGDOM

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