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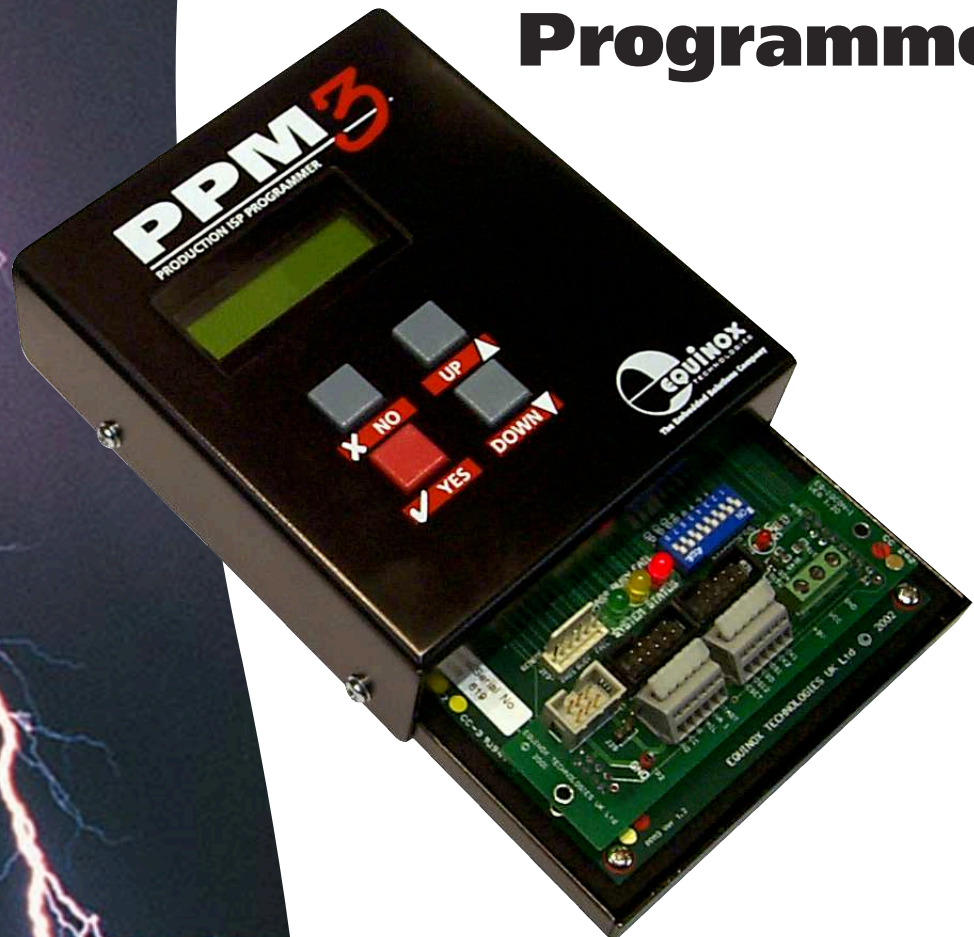
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PPM3 MK2

**Production ISP
Programmer**



User Guide



The Embedded Solutions Company

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Equinox Warranty Information

This product is guaranteed by Equinox Technologies UK Limited for a period of 12 months (1 year) after the date of purchase against defects due to faulty workmanship or materials. One guarantee covers both parts and labour. Service under the guarantee is only provided upon presentation of reasonable evidence that the date of the claim is within the guarantee period (e.g. completed registration/guarantee card or a purchase receipt).

The guarantee is not valid if the defect is due to accidental damage, misuse or neglect and in the case of alterations or repair carried out by unauthorised persons. A number of exceptions to the warranty are listed in the 'Exceptions to warranty' section below. Service (during and after guarantee period) is available in all countries where the product is distributed by Equinox Technologies UK Limited.

Exceptions to warranty

i. **Over-voltage damage**

This warranty does not cover damage to the programmer due to voltages beyond the specified voltage limits being applied to the 'DC Power Input' (CON1) or any of the ISP Headers. The user must ensure that sufficient care is taken to avoid over-voltage and static conditions on any of the 'ISP Header' I/O pins.

ii. **Over-current damage**

This warranty does not cover damage to the programmer due to excessive current being drawn from the programmer power supply. The user must ensure that there is sufficient over-current protection within the test fixture to protect against short circuit loads.

iii. **Short-circuit damage**

This warranty does not cover damage to the programmer due to short-circuit loads being placed across programmer I/O lines.

Warning!

Any damage caused to the programmer by Electrostatic Discharge (ESD) through inadequate earthing is not covered under the warranty of the product.

Disclaimer

Whilst every effort has been made to ensure that programming algorithms are correct at the time of their release, it is always possible that programming problems may be encountered, especially when new devices and their associated algorithms are initially released. It is Equinox's Company Policy to endeavour to rectify any programming issues as quickly as possible after a validated fault report is received.

It is recommended that high-volume users always validate that a sample of a devices has been programmed correctly, before programming a large batch. Equinox Technologies UK Ltd. can not be held responsible for any third party claims which arise out of the use of this programmer including 'consequential loss' and 'loss of profit'.

Equinox Technologies UK Ltd. cannot be held responsible for any programming problems which are 'out of our control'. This type of problem is usually listed in the 'Errata Sheet' for the particular device being programmed and is available from the silicon vendor.

Information contained in this manual is for guidance purposes only and is subject to change. E&OE.

Electromagnetic Compatibility (EMC) Compliance

The 'PPM3 MK2 Programmer' is a CE Approved Product. It is designed for use in an ESD controlled environment i.e. development or production. This means, therefore, that the user must ensure that there is no possibility of damage from electrostatic discharge (ESD). Since the devices and equipment to which this product is likely to be connected may well themselves be susceptible to ESD, this should not pose any difficulty.

For example, if you are handling microcontrollers and EEPROMS etc. then you will already be used to appropriate precautions, such as the use of anti-static mats, wrist straps and so on. You should treat your 'PPM3 MK2 Programmer' with the same care as you would these types of devices. Always ensure that you are not yourself carrying a static charge before handling the product. Wearing an earthed anti-static wrist strap is recommended.

Equinox have taken great care in designing this product to be compliant with the European EMC directive. When using the equipment be sure to follow the instructions provided. Although RF emissions are within prescribed limits, care should be taken if you are using the product near to sensitive apparatus. If you experience any difficulty please refer to Equinox Technical Support.



ESD Points to remember

- Work in a static-free environment.
- Wear an earthed wrist strap when handling either the programmer and/or any programmable device.
- Ensure that the PC, programmer and Target system are connected to the same EARTH (0V) potential.
- Do NOT plug the ISP cable of the programmer into a Target System when the Target power is ON.

Warning!

Any damage caused to the programmer by Electrostatic Discharge (ESD) through inadequate earthing is not covered under the warranty of the product.

Technical Support

It is often the case that users experience problems when installing or using a product for the first time.

If you have a technical support problem, please consult the following list for help:

▶ **Manual**

▶ **On-line help**

Press <F1> for help at any time when running EQTools or ISP-PRO.

The help system is context-sensitive. Simply press <F1> on any error message and the Possible causes of the error should be listed. This help system is updated on a regular basis. Please see software update details for information on keeping up-to-date with software revisions.

▶ **Internet Web Site**

The support page for all Equinox ISP Programmers can be found at:

<http://www.equinox-tech.com/products/downloadsearch.asp>

▶ **E-mail**

Please e-mail any technical support questions about this product to:

support@equinox-tech.com





▶ **Fax**







Please fax any technical support questions about this product to: +44 (0) 1942 844181

Equinox will try our best to answer your questions about this product as quickly as possible. However, we cannot promise an immediate reply. Please consult our web site for new software updates as the problem that you are enquiring about may have already been fixed in a new version.

Product Documentation

This manual provides an overview of the contents of the PPM3 Programming System plus associated hardware and software. References may be made to other hardware and software products which are not covered in detail in this manual. Please refer to the table below for a list of sources of documentation and/or browse to <http://www.equinox-tech.com/products/downloadsearch.asp>

Software:	
	<p>EQTools Script Builder – Manual</p> <p>This software is used to create and upload ‘Programming Projects’ to the programmer.</p> <p>The following sources of documentation are available for this software:</p> <ul style="list-style-type: none"> • Installation and Getting Started Guide (pdf manual) • Help file
	<p>ASCII Text Communications Protocol – Application Note</p> <p>This protocol can be used to control the programmer from an external controller via RS-232.</p> <p>The following sources of documentation are available for this protocol:</p> <ul style="list-style-type: none"> • Application Note – AN110 for a full description.
	<p>ISP Pro – Manual</p> <p>This software is used to control the programmer in a production environment. It is not supplied as standard with this programmer.</p> <p>The following sources of documentation are available for this software:</p> <ul style="list-style-type: none"> • Installation and User Manual • Help File
	<p>Upload Wizard - Standalone Project Upload Utility</p> <p>This software utility is used to upload Programming Projects to any Equinox programmer. These projects can then be used in Standalone Mode, i.e. without a PC.</p> <ul style="list-style-type: none"> • Please follow the on-screen instructions within the Upload Wizard utility itself.

	<p>Configit – Firmware Upgrade Utility</p> <p>This utility is used to upgrade the firmware of the programmer if the firmware version is < 3.00. A firmware update may be required to add support for new devices and to correct any firmware issues.</p>
	<p>Labview – Remote Application Control – Application Note</p> <p>This upgrade allows a production facility to control a single programmer from a ‘Labview for Windows’ application. The Application note describes how to control the programmer using a custom Labview (from National Instruments) application.</p> <p>The following sources of documentation are available for this software:</p> <ul style="list-style-type: none"> • Application Note - Remote Application Control of ISP-PRO
	<p>Remote Application Control – Application Note</p> <p>Describes how to control the programmer using a custom Remote Application written in e.g. Visual Basic, C++, C Builder, Delphi etc.</p>
	<p>ConsoleEDS Pro – Application note</p> <p>This software utility allows any Equinox programmer to be controlled via simple Command Line instructions from a Command Window within Windows.</p> <p>The following sources of documentation are available for this software:</p> <ul style="list-style-type: none"> • Application Note 111 – ConsoleEDS Manual
	<p>JTAG In-System (ISP) Upgrade – Application Note</p> <p>This license upgrade enables the PPM3 Programmer to support high-speed In-System Programming (ISP) of the Atmel ATmega microcontroller family using the JTAG algorithm. Support is offered for both single and multiple JTAG devices in a JTAG Chain.</p> <p>Please refer to the following application note for further information:</p> <ul style="list-style-type: none"> • Application Note 101
	<p>Error Message Descriptions</p> <p>This document lists all the possible error messages which can be generated by the EQTools / ISP-PRO applications.</p>

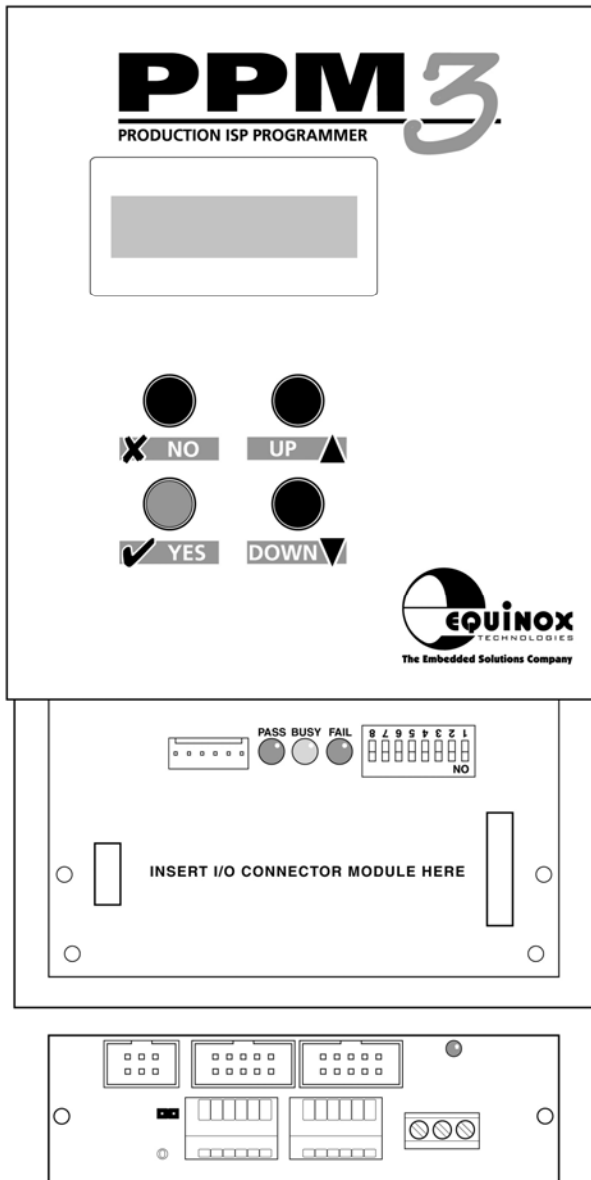
Downloading up-to-date documentation and software:

In line with our policy of continuous improvement, the software and associated documentation for this product are updated on a regular basis. For the most up-to-date software, firmware and documentation, please refer to the **<Downloads>** page on our website.

1.0 Programmer Overview

1.1 System Contents

The PPM3-MK2 Module is supplied as a Programmer Module along with two plug-in I/O Connector Modules, cables and software. Please see the full contents list detailed below.



Hardware

- PPM3 MKII Programmer – including SFM V1.0 Module (fitted internally)
- EQ-IOCON-1 – I/O Connection Module
- EQ-IOCON-2 – I/O Connection Module
- External Power Supply Adaptor (9V DC regulated @ 1500 mA)

Cables

- DC Power Cable (jack to bare wires)
- 9-way Female to 9-way Male Serial Cable
- 25-way Female to 9-way Male Serial Adaptor
- 10 way ISP Cable
- 6 way ISP Cable

Miscellaneous

- 4 x Rubber Feet
- 1 x Jumper Link for re-flashing programmer

Software

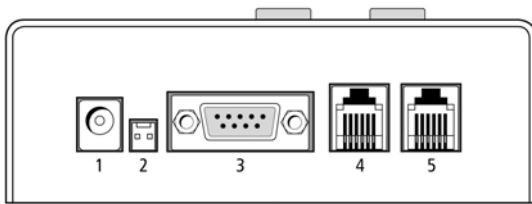
(Supplied on an Equinox CD-ROM)

- EQTools
(Project Management Utility for Equinox Production ISP Programmers)

Documentation

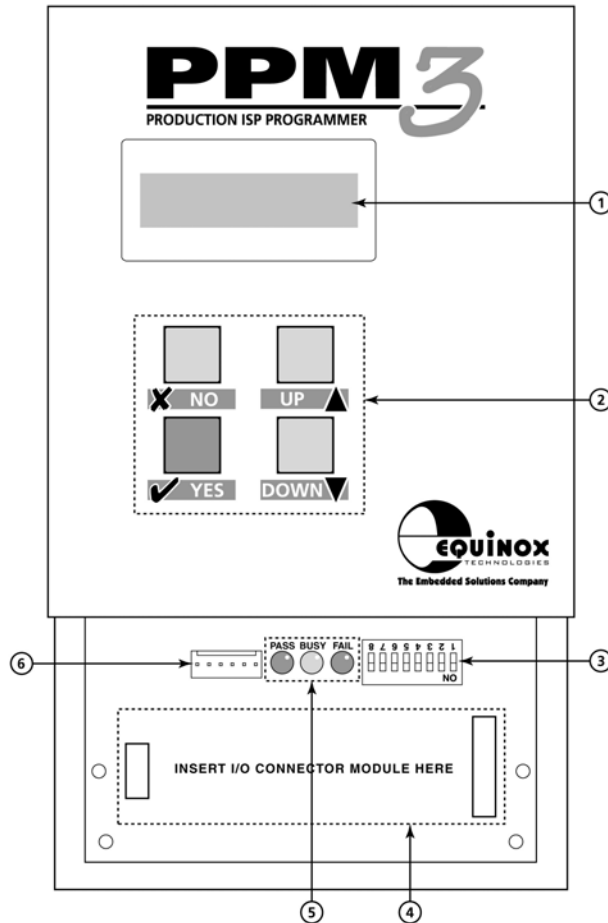
- PPM3 MK2 - User Guide

1.2 Hardware Overview (external layout)



Rear Panel

1. DC Power Input - Jack Socket
2. DC Power Input - Molex Connector
3. RS-232 Communications Port
4. RS-485 Communications Port (IN)
5. RS-485 Communications Port (OUT)



Front Panel

1. Liquid Crystal Display (LCD) – 16 x2 characters
2. Keypad (4 button)
3. Programmer Configuration DIP Switches
4. I/O Connector Module interface
5. Programmer Status LED's
6. 'Remote System Status' LED port (6-way Square Pin Molex Connector)

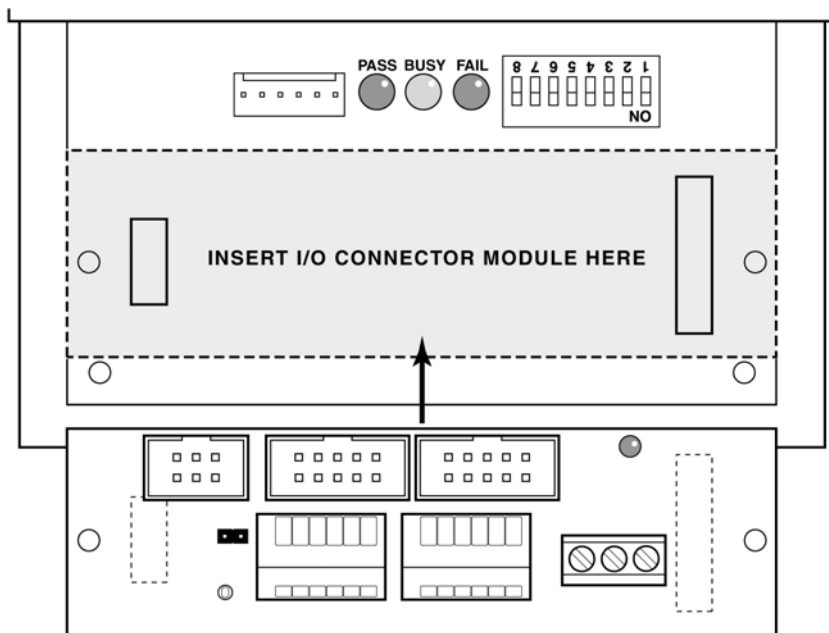
1.3 I/O Connector Modules

1.3.1 Overview

Equinox has developed a range of plug-in user-replaceable 'I/O Connector Modules' which are designed to interface the Equinox 'PPM3 Programming Module' to a variety of different Target Systems. This interchangeable approach allows the required connection system to be tailored to a particular Target System or Test Fixture without the requirement for unwiring the Test Fixture.

The required I/O Connector Modules simply plugs into the mating connectors at the end of the programmer as detailed in the figure below.

Fig. 1.3.1 PPM3 – Inserting the I/O Connector Module



The currently available 'I/O Connector Modules' are as follows:

- EQ-IOCON-1 (supplied as standard)
- EQ-IOCON-2 (supplied as standard)
- EQ-IOCON-3 (must be purchased separately)
- EQ-CALCON (must be purchased separately)

Please refer to the separate manual 'PPM3 – I/O Connector Modules' for a full description of all the available modules.

Features:

- Plug-in 'I/O Connector Modules' – simply plugs into the mating sockets on the PPM3 Module
- Different connector methods for interfacing to the Target System can be implemented by simply plugging in the relevant 'I/O Connector Module'.
- Programmer or Test Fixture can be easily swapped out without the requirement for unwiring the Test Fixture
- One programmer can easily be used with multiple Test Fixtures
- New connection systems can be implemented using a new 'I/O Connector Module' without requiring any redesign of the PPM3 Module.
- IO-CON-2 Module supports 'wire-wrap' connections
- IO-CON-1 / -2 support clip-in wire 'Fast Connect' wiring system
- Target Vcc LED - illuminates when the 'Target Vcc' is detected
- Auxiliary Power available via screw-terminal connections

1.3.2 Connector Systems currently supported

The following ISP connector systems are currently supported

- Atmel 10-way ISP Header (SPI)
- Atmel 6-way ISP Header (SPI)
- Atmel 10-way ISP Header (JTAG)
- Equinox 10-way ISP Header for Atmel T89C51Rx2 microcontrollers
- Equinox 10-way ISP Header for Philips P89C51Rx2 and P89C66x microcontrollers
- Wire-wrap (all devices)
- Fast-Connect - plug-in wired connectors (all devices)

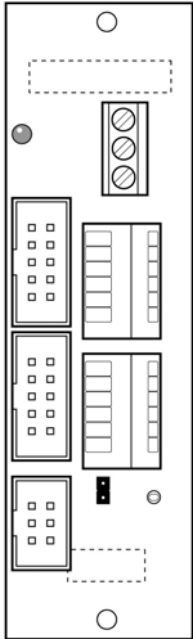
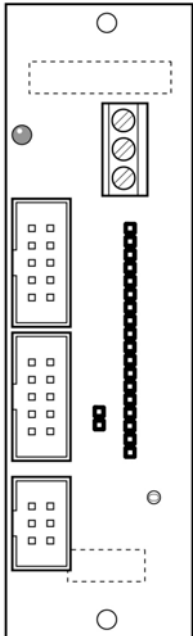
1.3.3 Programmers supported

The I/O Connector Modules are compatible with the following Equinox programmers:

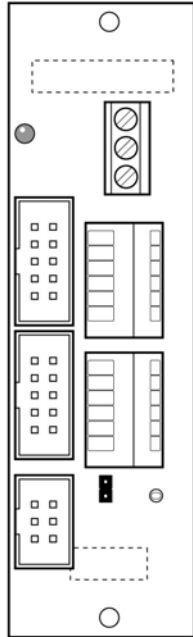
- PPM3 MK1 – Production ISP Module Version 1
- PPM3 MK2 – Production ISP Module Version 2

1.3.4 Overview of I/O Connector Modules

There are currently four different I/O Connector Modules available as detailed in the table below:

Order Code	Description
<p>EQ-IOCON-1</p> 	<p>I/O Connector Module 1 (SPI) – Fast Connect Version</p> <p>I/O connector module for In-System Programming (ISP) of Atmel microcontrollers using SPI protocol (Fast Connect version)</p> <p>This module plugs into the PPM3 and provides the relevant I/O connectors for SPI programming of Atmel devices.</p> <p>Features:</p> <ul style="list-style-type: none"> • Plugs into suitable Equinox programmer eg. PPM3 Module • Atmel 10-way IDC ISP Header • Atmel 6-way IDC ISP Header • Equinox 10-way IDC ISP header • 'Fast Connect' clip-in connectors for direct wiring to Test Fixture i.e wires from bed-of-nails probe wires • Screw terminals for power connections • Target Vcc Status LED • Link to connect / isolate the programmer Vcc from the Target Vcc
<p>EQ-IOCON-2</p> 	<p>I/O Connector Module 2 (SPI) – Wire-wrap version</p> <p>I/O connector module for In-System Programming (ISP) of Atmel microcontrollers using SPI protocol (wire-wrap version)</p> <p>Features:</p> <ul style="list-style-type: none"> • Plugs into suitable Equinox programmer e.g. PPM3 Module • Atmel 10-way IDC ISP Header • Atmel 6-way IDC ISP Header • Equinox 10-way IDC ISP header • Single-in-line header with all programmer I/O brought out for wire-wrapping to bed-of-nails probe wires • Screw terminals for power connections • Target Vcc Status LED • Link to connect / isolate the programmer Vcc from the Target Vcc

EQ-IOCON-3



I/O Connector Module 3 (JTAG) – Fast Connect Version

I/O connector module for In-System Programming (ISP) of Atmel microcontrollers using JTAG protocol

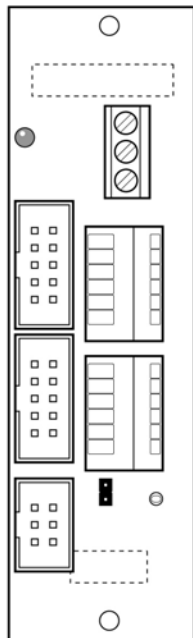
Features:

- Plugs into suitable Equinox programmer e.g. PPM3 Module
- Atmel 10-way JTAG IDC ISP connector (same as JTAG-ICE)
- Atmel 6-way IDC ISP Header
- Equinox 10-way IDC ISP header
- Single-in-line header with all programmer I/O brought out for wire-wrapping to bed-of-nails probe wires
- Screw terminals for power connections
- Target Vcc Status LED
- Link to connect / isolate the programmer Vcc from the Target Vcc

Please note

The 'Atmel AVR JTAG License' (Order code: PPM3A1-UPG7) is also required to enable the PPM3 to program Atmel AVR devices via JTAG.

EQ-CALCON



EQ-CALCON Module

The EQ-CALCON Module is a special plug-in I/O Connector Module for the PPM3-MK2 programmer which is used to facilitate very accurate calibration of the Internal Oscillator of an Atmel ATmega or ATtiny AVR microcontroller. The module features an on-board high accuracy 32kHz Oscillator Module which can be connected to the target AVR microcontroller MOSI pin during the Oscillator Calibration Procedure as described in the Atmel Application Note 'AVR053: Calibration of the Internal Oscillator'.

Features:

- Plugs into suitable Equinox programmer e.g. PPM3 Module
- Atmel 10-way JTAG IDC ISP connector (same as JTAG-ICE)
- Atmel 6-way IDC ISP Header
- Equinox 10-way IDC ISP header
- Screw terminals for power connections
- Target Vcc Status LED
- Link to connect / isolate the programmer Vcc from the Target Vcc

Please note

The use of this module requires development of / purchase of suitable 'Calibration Firmware' for the chosen ATmega AVR microcontroller.

1.4 Special Function Modules (SFM)

1.4.1 SFM Module - Overview

The PPM3-MK2 programmer features an interchangeable '**Special Function Module**'. This module contains all the '**I/O Driver Circuitry**' which interfaces the programmer to the Target System. In the event of damage to the programmer driver circuitry, it is possible to remove the complete Special Function Module and replace it with a new one. This allows the programmer to be repaired in-situ without the need to send it back to Equinox thereby saving valuable lost production time.

- The PPM3-MK2 is fitted with the 'EQ-SFM-1' module as standard.
- There are also other SFM modules available which offer faster SPI / JTAG speeds and better ESD / Over-voltage protection.

1.4.2 SFM Module – Selection Guide

The SFM Modules which are currently available are listed in the table below:

Order Code	Description
EQ-SFM-1	Standard Special Function Module V1.0 <ul style="list-style-type: none"> • Fitted to all PPM3-MK2 programmers as standard • Supports JTAG speeds up to approx 900 kHz • Supports SPI speeds up to approx 500 kHz • Limited ESD and over-voltage protection • Not recommended for driving capacitive or inductive loads • Not recommended if the Target System power is not supplied / controlled from the programmer.
EQ-SFM-MAX-1.2	High-speed High Current SFM Module V1.2 <ul style="list-style-type: none"> • Supports JTAG speeds up to approx 1.3 MHz • Supports SPI speeds up to approx 4 MHz • Enhanced ESD protection • Enhanced over-voltage / fault protection • Safe to use when Target System is independently powered • Better at driving capacitive or inductive loads • Requires programmer firmware 3.04 or above
EQ-SFM-MAX-1.3	High-speed High Current SFM Module with 32kHz Oscillator V1.3 <ul style="list-style-type: none"> • Supports JTAG speeds up to approx 1.3 MHz • Supports SPI speeds up to approx 4 MHz • Integrated 32 kHz Oscillator for performing accurate calibration of Atmel AVR on-chip oscillators (replaces the CALCON module) • Enhanced ESD protection • Enhanced over-voltage / fault protection • Safe to use when Target System is independently powered • Better at driving capacitive or inductive loads • Requires programmer firmware 3.04 or above

1.4.3 SFM Module – how to fit a new module

To fit a new SFM Module to the programmer:

- Make sure the programmer is powered off
- Remove all cables from the programmer
- Remove the four fixing screws in the side of the programmer case
- Carefully slide the lid of the programmer upwards and then off
- You can find the existing SFM Module underneath the keypad PCB
- Carefully remove the existing SFM Module by applying pressure from underneath at both sides of the circuit board → the SFM module should pop out of the red connectors
- Fit the new SFM Module in the same position and orientation as the one you have just take out (make sure to line up the long red connector on the main PCB to the long red connector on the SFM module)
- Push the new SFM Module down gently until it locks into place
- Replace the programmer lid
- Replace the programmer screws

1.4.4 SFM Module – declaring the module in a Programming Project

The EQ-SFM-1 and EQ-SFM-V1.2 / V1.3 modules actually use slightly different firmware in the programmer. It is therefore necessary to specify which SFM Module is fitted in each Programming Project.

To specify the correct SFM Module in a Programming Project:

In EDS (Development Mode):

- Open your EDS (*.eds) development project
- Select the **<Programmer and device>** tab
- Locate the **'Special Function Module fitted'** list box
- Select the relevant SFM Module which you have fitted to your programmer

In Project Builder:

- Open your Programming Project (*.ppm) project
- Select the **<Programmer and Project Type>** tab
- Locate the 'Special Function Module fitted' list box
- Select the relevant SFM Module which you have fitted to your programmer
- Re-compile your project to save the changes

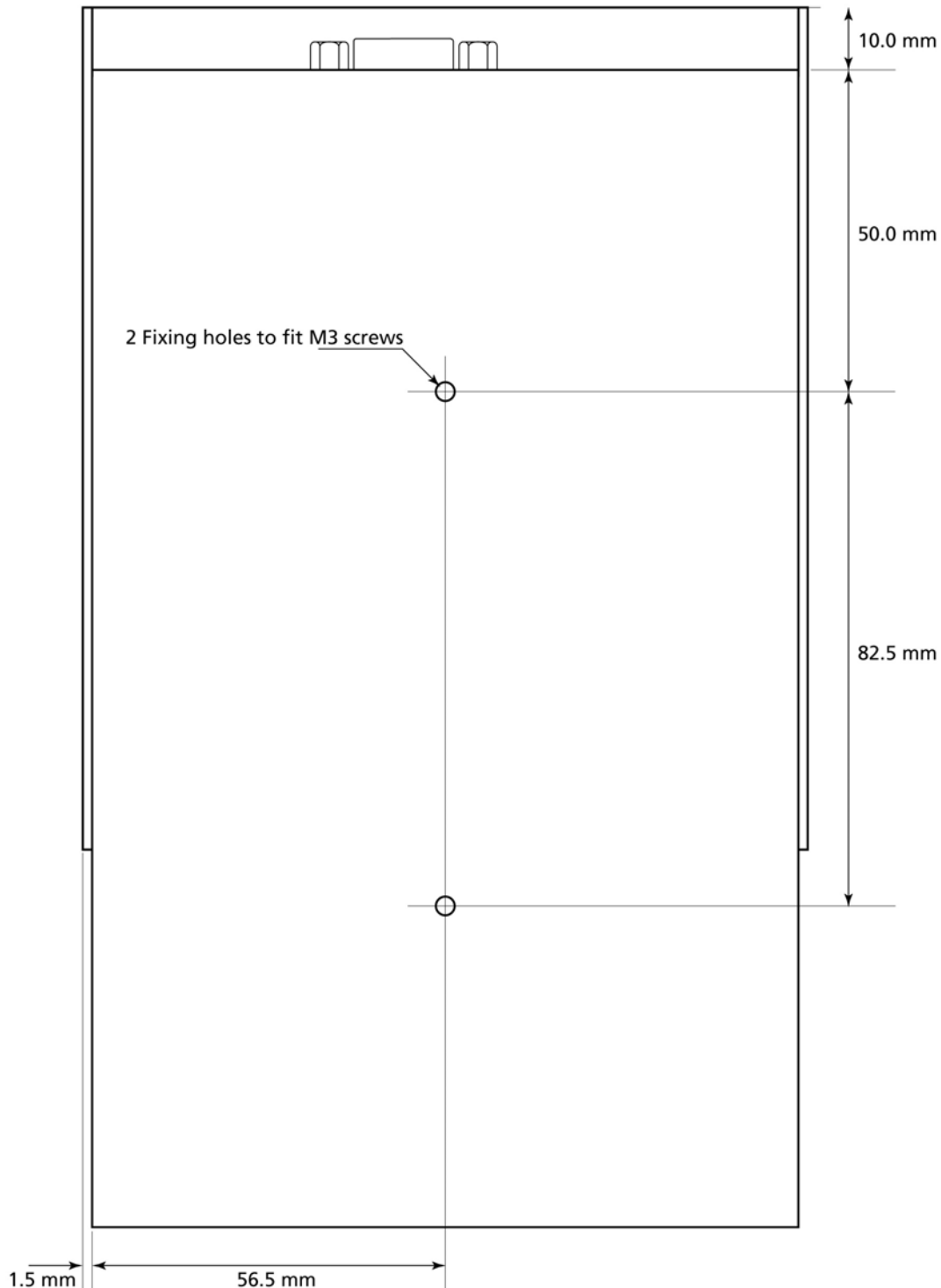
Important notes:

- Failure to specify the correct SFM Module can result in erratic operation of the programmer.
- If you have existing projects which use the standard EQ-SFM module, these projects will need to be recompiled for the new EQ-SFM-MAX 1.2 or 1.3 Modules.

1.5 Programmer dimensions and mounting holes

The PPM3 programmer can be mounted to a Test Fixture by using the two mounting holes provided. The mounting holes are threaded to accept an M3 bolt. The bolt thread must not penetrate more than 6mm into the box otherwise it may short onto the circuit board.

Fig. 1.5 Programmer dimensions and mounting holes



1.6 Programmer Specifications

The table below details the hardware specifications for the programmer. Please refer to the stated section for further information about any specific parameter.

#	Parameter	Description / comment	Refer to section
1	Target Device Support	See Device Support List	1.7.1
2	Target Device Programming Interfaces	The programmer supports the following programming interfaces: <ul style="list-style-type: none"> • Atmel Low Voltage SPI • Atmel High Voltage SPI (+12V Vpp) • Atmel AVR JTAG (chargeable update) • Atmel (formerly Temic) 8051 Boot loader ISP • Philips (NXP) 8051 - Boot Loader ISP • Generic I2C (SDA + SCL) 	1.7.2
3	Operating modes	The programmer supports the following operating modes: <ul style="list-style-type: none"> • Development Mode (PC controlled) • Project Upload Mode (PC controlled) • Standalone Mode - Keypad + LCD operation • Standalone Mode – Automatic Target Connect / Disconnect Sensing • Standalone Mode - Remote Controlled via 'ASCII Text Communications' RS-232 Serial Protocol • Standalone Mode - Remote Controlled via 4-wire TTL Remote Control Port • PC controlled via ISP-PRO software (chargeable upgrade) • PC controlled via ConsoleEDS utility (chargeable upgrade) 	2.4
4	On-board FLASH Memory Store	32 Mbits (4 MBytes) FLASH Memory	
5	Project storage in Memory Store	64 x Programming Projects	
6	Keypad entry	4 x Push Button - <YES>, <NO>, <UP>, <Down>	
7	Status LED's	<ol style="list-style-type: none"> 3 x Status LED's located on the programmer: <PASS>, <BUSY>, <FAIL> 3 x remote Status LED's can also be connected off-board on a Test Fixture via the 'Remote System Status' port. 	
8	Programmer Display	2 x 16 Back-lit LCD	
9	Target Vcc Voltage Detection LED	This LED is located on the I/O-CON Module: <ul style="list-style-type: none"> • Target Vcc (POWER) LED will light when Target Vcc is detected. • Threshold detection voltage: approx 3.1V 	

10	PC Control Software	The programmer can be controlled using: <ul style="list-style-type: none"> • EQTools (as standard) • ASCII Text Communications Mode (as standard) • ISP-PRO (chargeable upgrade) 	2.3
11	EQTools / ISP-PRO PC requirements	PC running Windows 95 / 98 / 2000 / ME / NT4 / XP	2.3
12	Power Supply Options	There are 3 possible modes for powering the Programmer / Target System: <ul style="list-style-type: none"> • Programmer controls power to the Target System • Programmer and Target System are independently powered • Target System powers the Programmer (+5V only) 	4.0
13	Voltage range	<ul style="list-style-type: none"> • Device Programming voltage range: 3.0 – 5.0V • Programmer Controlled Power Supply range: 3.0 – 5.0V • Possible Target System voltage range: 3.0 – 5.0V 	4.4
14	Vpp Voltage Generator	On Board +12.0V Vpp Voltage Generator (Applies +12.0V to RESET pin for Atmel ATtiny HV programming)	
15	DC Power Connector (jack socket)	DC Power Connector <ul style="list-style-type: none"> • 2.5 mm Jack Socket – Centre Positive • 9.0 – 12.0V DC regulated @ 500mA (worst case) • Mates with Power Supply Adaptor supplied with programmer • DC Power Lead also supplied with programmer if a customer power supply is to be used. 	4.2
16	DC Power Connector (Molex)	DC Power Connector <ul style="list-style-type: none"> • 2-pin pluggable Molex Connector • 9.0 – 12.0V DC regulated @ 500mA (worst case) 	
17	Max. current through programmer	This refers to the maximum current which the programmer can supply from the 'controlled' power supply. Max current = 300 mA.	
18	Target SPI Frequency	<p>Software SPI algorithm:</p> <ul style="list-style-type: none"> • SLOW SPI: 0 – 490.2 kHz (user selectable) • MEDIUM SPI: 0 – 490.2 kHz (user selectable) <p>(SPI speeds are estimations only due to uneven mark/space ratio and non-continuous waveforms)</p> <p>Hardware SPI algorithm (requires firmware 3.04 or greater):</p> <ul style="list-style-type: none"> • SLOW SPI: 115.2 kHz to 3.6864 MHz (user selectable) • FAST SPI: 115.2 kHz to 3.6864 MHz (user selectable) • SPI speeds > 500kHz require the fitting of the faster EQ-SFM-MAX V1.2 or V1.3 SFM Modules 	

19	Target JTAG Frequency	<p>With standard 'SFM Module' fitted: The programmer supports a user-defined JTAG frequency:</p> <ul style="list-style-type: none"> • SLOW JTAG: 0 – 833 kHz <p>With 'SFM-MAX V1.2 or V1.3' Module fitted:</p> <ul style="list-style-type: none"> • SLOW JTAG: 0 – 833 kHz • FAST JTAG: approx 1.4 MHz 	
20	JTAG Programming Modes	<p>The programmer supports the following JTAG modes:</p> <ul style="list-style-type: none"> • Single JTAG device connected to programmer • Multiple JTAG devices connected in a JTAG Chain • JTAG ID can be verified for both Atmel AVR and non-Atmel JTAG devices • JTAG chain validation is also supported 	
21	I2C Frequency	<p>The programmer supports a user-defined I2C frequency:</p> <ul style="list-style-type: none"> • SLOW I2C: 0 – 400 kHz • Supports ISP programming of both 100 kHz and 400 kHz I2C Serial EEPROMs 	
22	Target UART Speed	<ul style="list-style-type: none"> • This is the Communications Speed (BAUD rate) from the programmer to the Target Device when communicating via a Boot Loader. • The BAUD rate is configurable from 1,200 to 115 kBaud. • This settings is completely independent from the BAUD rate settings for the PC communicating with the programmer. 	
23	ISP Headers	<p>The programmer can support any ISP header by simply plugging in the relevant 'EQ-IOCON' I/O Connector Module.</p> <p>The currently supported ISP Headers are as follows:</p> <ul style="list-style-type: none"> • Atmel 10-way (SPI) • Atmel 6-way (SPI) • Atmel 10-way (JTAG) • Equinox 10-way (SPI+UART) • Fast-connect wire connectors <p>Please refer to the separate manual 'PPM3 I/O Connector Modules' for full details of each module and the connection mechanisms available.</p>	
24	Frequency generator output (SCK2)	<p>Programmer can output a configurable square wave frequency on the SCK2 pin. This is used to clock the Target Device in the absence of a Target Oscillator.</p> <ul style="list-style-type: none"> • Frequency range: 167kHz – 1.8432 MHz 	
25	AVR On-chip Oscillator Calibration	<p>If the programmer is fitted with either the 'CALCON' or 'EQ-SFM-V1.3' module, then it can be used to calibrate the internal</p>	

		oscillator of an Atmel AVR microcontroller. See 'Special Function Modules' application note for further details.	
25	PC Connection	<p>i. RS232 – Single Programmer Channel Control</p> <ul style="list-style-type: none"> • 9-way Female D Connector • Connects to spare PC COM port • All 9 connections must be made in serial cable. • Baud rate: 38,400 (fixed) <p>ii. RS-485 Multiple Programmer Channel Control</p> <ul style="list-style-type: none"> • Programmers are daisy chained via RS-485 leads • An RS-232 to RS-485 converter is required at the PC end of the chain. 	3.0
26	Temperature range	0 to 50 deg. C	
27	Dimensions	Actual Programmer Module: 185mm long x 114mm wide x 45mm high	
28	Shipped Weight	2.0 kg (dead weight – including accessories)	

1.7 Device Support

1.7.1 Devices supported by the programmer

The programmer supports the following devices:

S – Device supported as standard

U – Chargeable license upgrade required

#	Silicon vendor	Family	Programming algorithm	Device support	
1	Atmel	AT89S	LV SPI	AT89(L)S 8252/53 AT89(L)S 51/52 (including 'L' versions) AT89S 2051 / 4051	S
2	Atmel	AT90S (AVR)	LV SPI	AT90(L)S 1200(A) / 2313 / 2323 / 2333 / 2343 / 4414 / 4433 / 4434 / 8515 / 8535 (including 'L' versions)	S
3	Atmel	AT90CAN	LV SPI	AT90CAN32 / AT90CAN64 / AT90CAN128	S
4	Atmel	AT90CAN	JTAG (AVR)	AT90CAN32 / AT90CAN64 / AT90CAN128	U
5	Atmel	AT90USB	LV SPI	AT90USB1286 / AT90USB1287 / AT90USB162 / AT90USB646 / AT90USB647 / AT90USB82	S
6	Atmel	AT90USB	JTAG (AVR)	AT90USB1286 / AT90USB1287 / AT90USB646 / AT90USB647	U
7	Atmel	AT90PWM	LV SPI	AT90PMW 2/3 AT90 PWM 3	S
8	Atmel	ATmega (AVR)	LV SPI	ATmega 8 / 16 / 32 / 48(V) / 64/ 88(V) / 103 / 128 / 1280(V) / 1281(V) / 161 / 162 / 163 / 165 / 168 / 169(V) / 169PV / 2560(V) / 2561(V) / 323 / 324PV / 325 / 3250 (V) / 328P(V) / 329 / 3290(V) / 640(V) / 644(V) / 645 / 6450(V) / 649(V) / 6490 (V) 8515 / 8535 (including 'L' versions)	S
9	Atmel	ATmega (AVR)	JTAG (AVR)	ATmega 16 / 32 / 64 / 128 / 1280 / 1281(V) / 162 / 169(V) / 2560(V) / 2561(V) / 323 / 324P(V) / 325(V) / 3250(V) / 329 / 3290(V) / 406 / 640(V) / 644(V) / 645 / 6450(V) / 649(V) / 6490(V) (including 'L' versions)	U
10	Atmel	ATmega PICO (AVR)	LV SPI	ATmega 164P(V) / 168P(V) / 169P(V) / 324P / 329P(V) / 3290P(V) / 48P(V) / 644P(V) / 88P(V)	S
11	Atmel	ATmega PICO (AVR)	JTAG (AVR)	ATmega 164P(V) / 169P(V) / 324P / 329P(V) / 3290P(V) / 644P(V)	U
12	Atmel	ATtiny (AVR)	LV SPI	ATtiny 11 / 12(V) / 13 / 22 / 24(V) / 25(V) / 26 / 44(V) / 45(V) / 84(V) / 85(V) / 2313 (including 'L' versions)	S