

# ISP nano

## Series IV-ATE



## ISP nano Series IV - ATE Production ISP Programmer *Hardware User Manual*



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## Equinox Warranty Information

This product is guaranteed by Equinox Technologies UK Limited for a period of **24 months (2 years)** after the date of purchase against defects due to faulty workmanship or materials. The guarantee covers both parts and labour. This is a **'Return to manufacturer'** warranty. The customer is responsible for all shipping + customs clearance costs for returning the programmer to Equinox and for Equinox returning the programmer back to the customer. 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

#### 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.

#### 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.

#### Short-circuit damage

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

#### Programmer 'Line Driver Circuitry' damage.

The programmer features **'Line Driver Circuitry'** which interfaces to the Target system (DUT). This circuitry is protected via ESD protection diodes. If these diodes become damaged during operation of the programmer then it is likely that the programmer driver circuitry is also damaged. This warranty does not cover damage to the programmer **'Line Driver Circuitry'**.

#### 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 '**ISPnano Programming Module**' 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 '**ISPnano Programming Module**' with the same care as you would these types of devices. Always ensure that you are not carrying a static charge yourself before handling the product. Wearing an earthed anti-static wrist strap is recommended.

Equinox has 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.
- Ensure that any residual charge stored in capacitors on the Target System has been discharged BEFORE connecting or disconnecting the programmer.

### 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:**

- ▶ **User Manual**
- ▶ **Application Notes**

- ▶ **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 / download page for the **'ISPnano programmer range'** can be found at:

<http://www.equinox-tech.com/products/details.asp?ID=1440&displ=tl>

- ▶ **E-mail**

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

[support@equinox-tech.com](mailto: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 and Software

## Overview

This manual provides an overview of the contents of the **'ISPnano Programming Range'** 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/details.asp?ID=1440&displ=t>

Software:	
	<p><b>EQTools Script Builder – Manual</b></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"> <li>• Installation and Getting Started Guide</li> <li>• Help file</li> </ul>
	<p><b>ASCII Text Communications Protocol – Application Note</b></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"> <li>• Application Note – AN110</li> </ul>
	<p><b>ISP Pro – Manual</b></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"> <li>• Installation and User Manual</li> <li>• Help File</li> </ul>

 <p><b>Upload Wizard</b></p>	<p><b>Upload Wizard - Standalone Project Upload Utility</b></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"> <li>• Please follow the on-screen instructions within the Upload Wizard utility itself.</li> <li>• Application Note – AN117</li> </ul>
	<p><b>Labview – Remote Application Control – Application Note</b></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"> <li>• Application Note – AN109</li> </ul>
	<p><b>Remote Application Control – Application Note</b></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>The following sources of documentation are available for this software:</p> <ul style="list-style-type: none"> <li>• Application Note – AN109</li> </ul>
	<p><b>ConsoleEDS Pro – Application note</b></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"> <li>• Application Note - AN111</li> </ul>
	<p><b>JTAG In-System (ISP) Upgrade – Application Note</b></p> <p>This license upgrade enables the 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>The following sources of documentation are available for this software:</p> <ul style="list-style-type: none"> <li>• Application Note – AN105</li> </ul>

## Documentation and software for the ISPnano programmer

In line with our policy of continuous improvement, the software and associated documentation for this product are updated on a regular basis. You can download the latest software, firmware, User Manuals and application notes for the ISPnano programmer from the following page on the Equinox website:

<http://www.equinox-tech.com/products/details.asp?ID=1440&displ=tl>

You may be asked to register / log in to download some of these files.

## Device algorithm - Application notes

The table below lists the Application Notes available for helping to create '*Programming Projects*' for different device families.

Application Note	Device Family	Programming Interface
AN100	Atmel - AT89Sxxxx FLASH microcontrollers	SPI
AN101	Atmel - AVR FLASH microcontrollers via the SPI Interface	SPI
AN105	Atmel - AVR FLASH microcontrollers via the JTAG Interface	JTAG
AN118	Generic I2C 24xxx Serial EEPROM memories	I2C
AN122	Atmel - AT91SAM7 ARM7 FLASH microcontrollers	JTAG
AN127	Atmel – XMEGA AVR FLASH microcontrollers via the 2-wire PDI interface	PDI
AN128	NXP – LPCxxx ARM7 FLASH microcontrollers	JTAG
AN130	Zensys – ZWxxx – Z-WAVE Series	SPI
AN132	Atmel ATtiny AVR microcontrollers via the TPI interface	TPI
AN133	Atmel AT45D Serial DataFlash programming	SPI
AN134	Austriamicrosystems – magnetic encoder programming	AMS 1-wire SPI I2C
AN135	Xilinx Spartan FPGA – external Serial DataFLASH programming method	SPI

These application notes can be found in PDF format on the CD-ROM which was supplied with the programmer. You can also find the very latest versions on the "*ISPnano Download Page*" on the Equinox website.

## Programmer related - Application notes

The table below lists the Application Notes available for the ISPnano programmer range which describe the USB driver installation, the different control methods available, firmware update procedure and '**AVR Oscillator Calibration**' procedure.

Application Note	Description
AN109	Remote Application Control of Equinox ISP Programmers using ISP-PRO Utility
AN110	ASCII Text Control (ATC) Protocol for Remote Control of Equinox Programmers
AN111	ConsoleEDS Protocol for Remote Control of Equinox Programmers
AN112	Firmware Update instructions for Equinox ISP Programmers
AN114	Accurate on-chip Oscillator Calibration for Atmel AVR microcontrollers
AN121	Equinox EQTools – Release Notes
AN123	Controlling an Equinox ISP Programmer from a Remote System via the Remote 4-wire TTL Port
AN126	USB Driver Installation instructions for PPM4-MK1 and ISPnano programmers

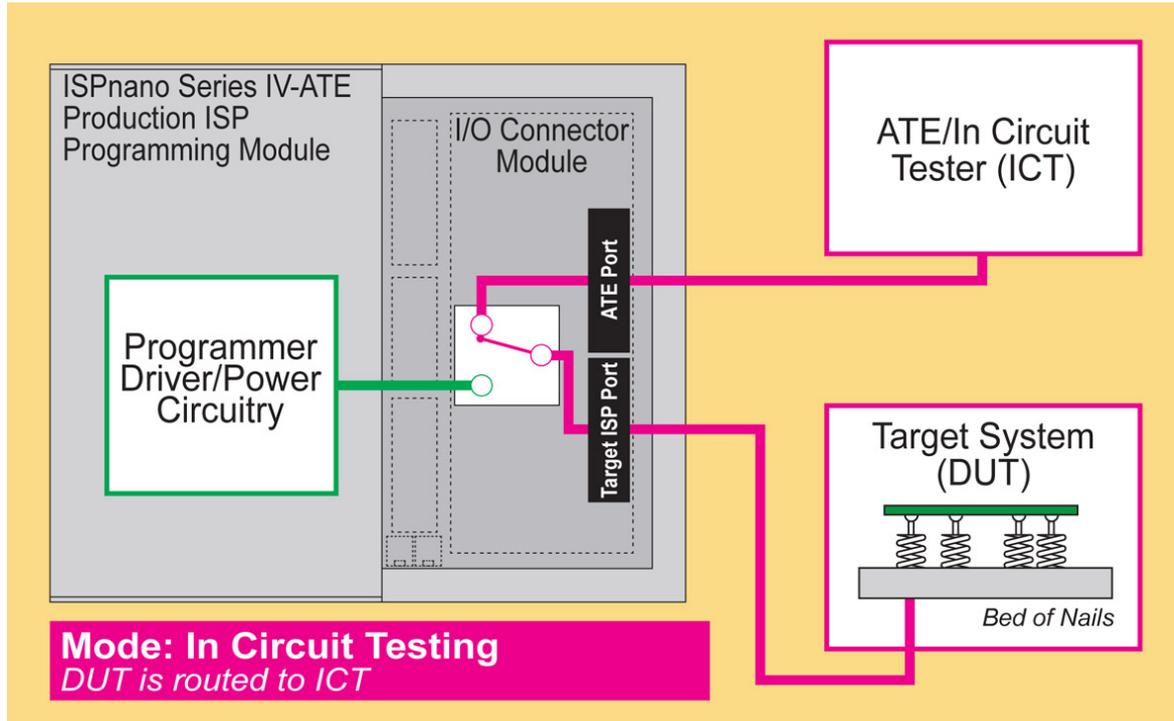
These application notes can be found in PDF format on the CD-ROM which was supplied with the programmer. You can also find the very latest versions on the "**ISPnano Download Page**" on the Equinox website.

## 1.0 Overview

The "**ISPnano Series IV ATE**" is a state-of-the-art ISP Programmer designed for high-speed In-System Programming (ISP) of FLASH Microcontrollers and Serial Memory devices in a production environment. It has been specially developed to allow simple integration with Automatic Test Equipment (ATE) systems and In-Circuit Testers (ICTs) used in high-volume production systems.



The programmer supports automated relay switching of all Target System programming and power signal lines between external test equipment e.g. an external ATE / ICT system and the programmer. This allows the programmer to be completely out-of-circuit during normal ATE testing operation.



A dedicated '**ATE Interface**' also allows the ATE / ICT to control the operation of the programmer in '**Standalone Mode**' (no PC required).

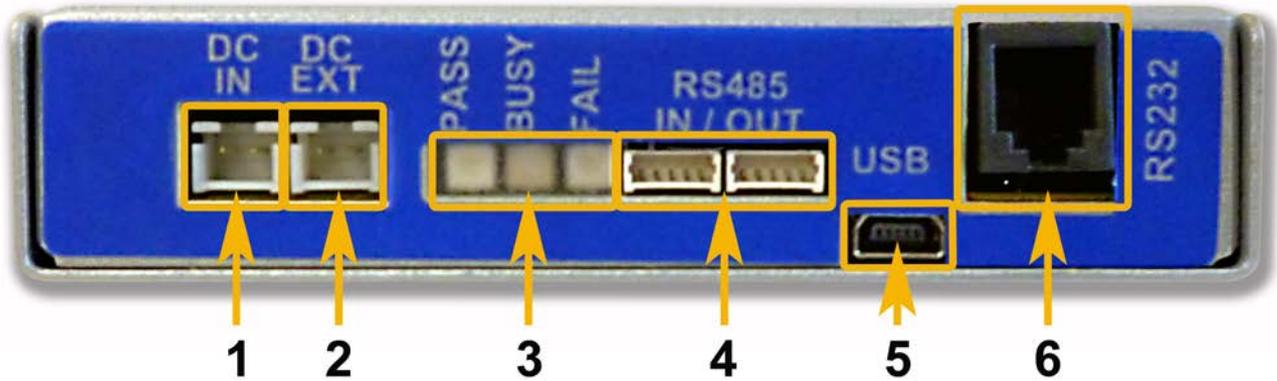
## 1.1 Main Features

### Features

- Integrated '**ISPnano Series IV ATE**' programmer (see separate features for this module)
- Compact enclosure featuring integrated programmer and interchangeable '**I/O Connection Module**'
- All programmer I/O signal lines are isolated from both the Target System (DUT) and external test equipment e.g. ATE / ICT via relays
- All power lines (Target Vcc, Target Vpp and GROUND) are independently switched via relays.
- The ATE / ICT is routed to the Target System (UUT) by default so the programmer is completely isolated from the UUT.
- When a programming operation starts, the Target System (DUT) ISP I/O and power signals are automatically switched to the programmer and the ATE / ICT is then completely isolated from the programmer.
- At the end of a programming operation, the Target System (DUT) is automatically re-connected to the ATE / ICT.
- Simple integration with ATE / ICT as the programmer controls the relay switching
- Supports signal routing of an external '**JTAG Boundary Scan Tester**' via the ATE Port to the Target System (UUT).

### 1.2 Front panel layout

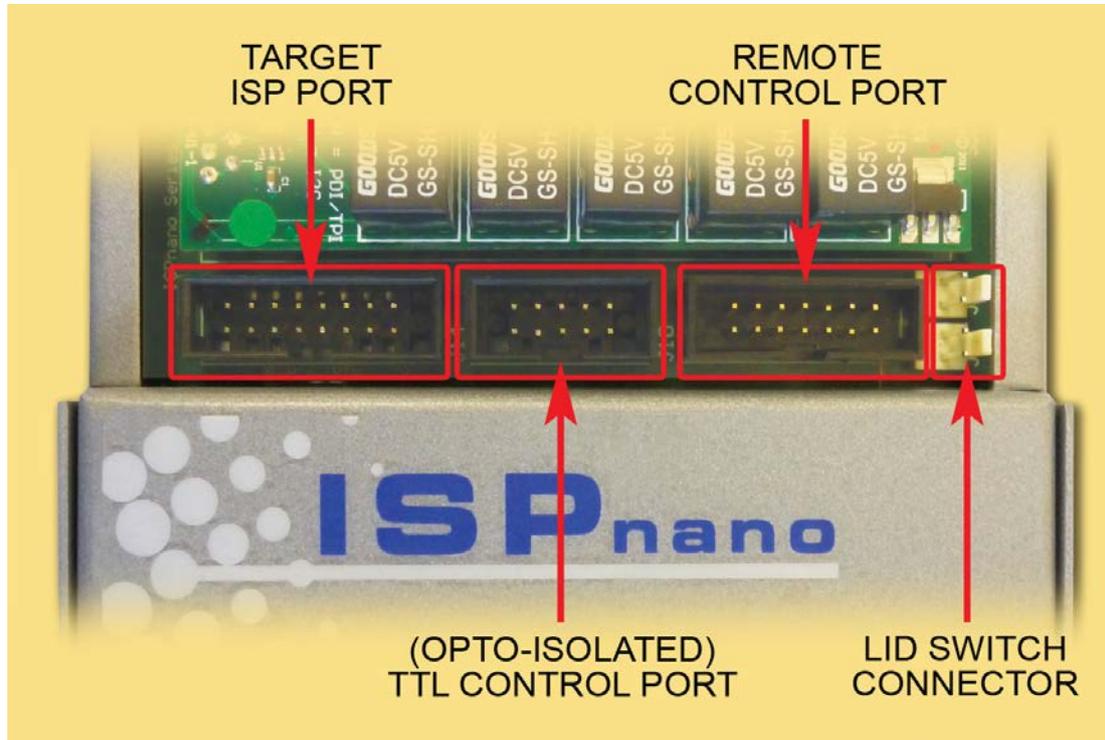
The layout of the front panel of the programmer is shown below.



#	Connector Name	Description / comment
1	DC Power Input	<b>DC Power Input to power the programmer</b> <ul style="list-style-type: none"> <li>Voltage range: 9.0 – 24.0 V DC (right-hand pin positive)</li> </ul>
2	EXTERNAL TARGET VCC INPUT	<b>EXTERNAL TARGET VCC INPUT</b> <ul style="list-style-type: none"> <li>DC Power Input to power relay coils</li> </ul>
3	Programmer STATUS LEDs	<b>Programmer 'Status' LEDs</b> <ul style="list-style-type: none"> <li>PASS (GREEN), BUSY (YELLOW), FAIL (RED)</li> </ul>
4	RS485 Ports	<b>RS485 Ports (1) + (2) - Serial Communications Ports</b> <ul style="list-style-type: none"> <li>These ports can be used to control the programmer via an RS485 link from a PC.</li> <li>Up to 32 x ISPnano programmers can be connected on the RS485 bus.</li> <li>The connectors are connected in parallel internally so it does not matter which is used as the RS485 INPUT or OUTPUT.</li> <li>The connector is a 5-pin 2.54mm Molex.</li> </ul>
5	USB Port	<b>High-speed USB Port</b> <ul style="list-style-type: none"> <li>This port can be used to control the programmer via a USB link from a PC.</li> </ul>
6	RS232 Port or Remote Display Keypad Port	<b>RS232 Port - Serial Communications Port</b> <ul style="list-style-type: none"> <li>This port can be used to control the programmer via an RS232 link from a PC or other Test Equipment.</li> <li>A '<b>Remote Display / Keypad Module</b>' can also be connected to this port allowing the programmer to be remote controlled.</li> <li>The connector is a 4-pin RJ11 connector.</li> </ul>

### 1.3 Rear Panel IDC Connector Ports and signal routing

The 'ISPnano Series IV ATE' programmer features three 'IDC Ports' as detailed in the illustration below.



The purpose of each connector is described in the table below.

Connector name	Description	Connector type
<b>Target ISP Port</b>	This port connects to the Target Device (UUT) on the Target System. It bypasses any connections to the I/O Connector Module.	16-way IDC
<b>TTL Control Port (opto-isolated)</b>	This port is used to remotely control the programmer from an external ATE / ICT or PLC. All signals are opto-isolated.	10-way IDC
<b>Remote Control Port</b>	This port is used to remotely control the programmer from an external ATE / ICT or PLC.	14-way IDC
<b>Lid Switch Connector</b>	This connector allows a test fixture lid switch to trigger the execution of a standalone programming project.	2-way molex

## 2.0 Getting Started Guide

### 2.1 Overview

This section of the manual details how to power the programmer and connect it to the PC.

### 2.2 System contents

The '*ISPnano Series 4 ATE*' programmer is available as the '*ISPnano Series IV ATE*' - Programmer Module only or as a '*Programmer Kit*' which includes the Programmer Module along with a power supply, connector module, cables and software.

The full contents list of the '*ISPnanoS4-ATE Programmer Kit*' (Order code: *ISPnano-S4ATEKIT*) is detailed below.



#### Hardware

- ISPnano Programming Module (ISPnano-S4ATE version)
- Mains Power Supply Wall Adaptor (9V DC regulated @ 1.7A fitted with 2-pin JST connector)
- ISPnano – CONMOD Connector Module (ISPnano-CONMOD)
- ISPnano – EVAL Module (ISPnano-EVAL)

#### Cables

- DC Power Cable (2-pin JST to bare wires)
- RS232 Serial Cable (RJ11 to 9-way D connector)
- RS232 Extension Cable (9-way Female to 9-way Male Serial Cable)
- 6-way IDC ribbon cable
- 10-way IDC ribbon cable
- 16-way IDC ribbon cable
- 20-way IDC ribbon cable

#### Software

- EQTools (Project Management Utility for Equinox Production ISP Programmers)
- Upload Wizard (used to upload Standalone Projects to the programmer)

#### Miscellaneous

- 4 x Rubber mounting feet (separate packet)



## 2.3 Hardware setup

The hardware setup instructions for the '*ISPnano Series IV ATE*' programmer are detailed below.

### 2.3.1 Powering the programmer

Connect a suitable power supply to the '**DC-IN**' connector of the programmer  
→ This powers the 'Programmer internal electronics'

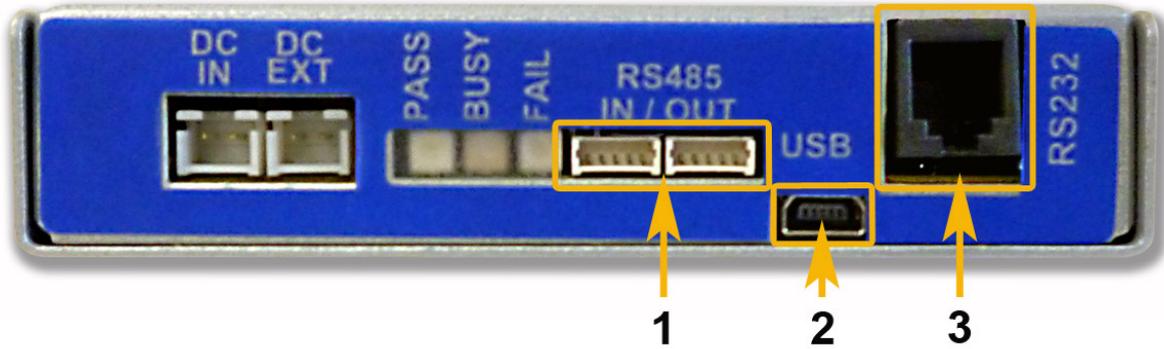


**Programmer Power Supply**  
+9.0V to +24.0V @ 150mA  
min

You may use the 'Mains DC power supply' which comes as part of the kit or you can use your own external power supply.

### 2.3.3 Connecting the programmer to the PC

The programmer can be controlled from a PC using any one of the **‘Communications Ports’** detailed in the illustration / table below.

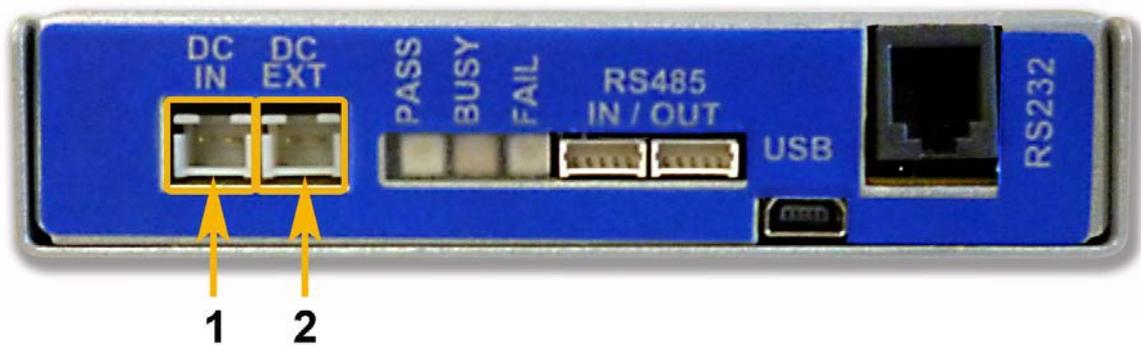


Key No	Function	Further description
1	RS-485 Input (& output)	RS-485 - Input/output. Connector: 5-pin 2.5mm Molex
2	USB Port	USB - Input/output Connector: miniUSB connector
3	RS-232 Communications Port or Remote Display / Keypad	RS232 + LCD +5V power. Connector: RJ11

## 3.0 Power Supply requirements

### 3.1 Overview

The '*ISPnano Series IV ATE*' programmer only requires a single power supply which is used to power both the '*programmer electronics / Target System*' and the '*relay coils*'.

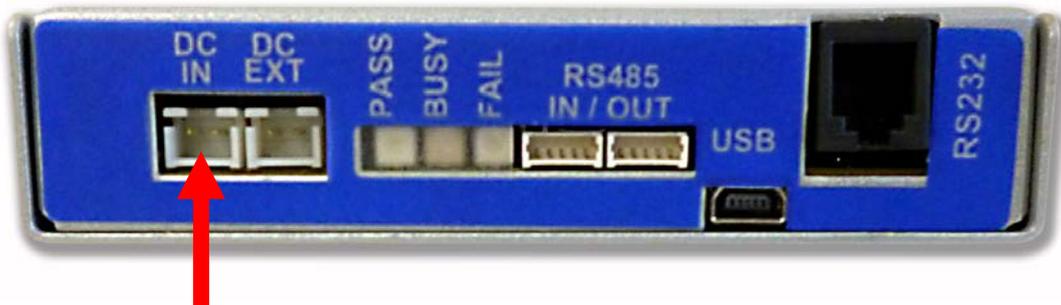


Please refer to the table below for the details of the power supply requirements.

Designator	Description	Voltage range (Volts)	Current Requirement (mA)
<b>(1) DC IN</b>	<b>DC Input to power the programmer</b> <ul style="list-style-type: none"> <li>Powers programmer internal electronics</li> <li>Also Powers 'Target System' (UUT) if 'Programmer controlled Power Supply' is enabled.</li> </ul>	9.0 – 24.0	150mA minimum (depends on Target System current)
<b>(2) EXT IN</b>	<b>External switched DC supply</b> An optional external power supply can be switched via the programmer using the 'EXT-IN' connector.	1.8 – 24.0	300 mA

### 3.2 Power Supply connections

The '*ISPnano Series IV ATE*' programmer requires a separate +12V power supply to power the RELAY coils.



#### Programmer Power Supply

+9.0V to +24.0V @  
150mA min

#### Instructions:

- Connect a +9.0V to +24.0V power supply to the '**DC IN**' connector.

### 3.3 Programmer Power Supply recommendations

The '**DC-IN**' connector is used to supply power to the internal programmer electronics. If the programmer is not powering the Target System, then the programmer will only draw around 150mA @ 9.0V. However, if the '**Programmer controlled Target Power Supply**' is enabled, then the programmer will also supply power to the Target System which could take a significant amount of current. It is therefore recommended that a suitable power supply capable of supplying at least 500mA on load is used.

Although the '**DC-IN**' connector is rated for any voltage from 9.0V to 24.0V, it is recommended where possible to use 12.0V instead of 24.0V. In the event of a short circuit or other problem, the programmer over-voltage protection will better protect the internal electronics if the supply voltage is only 12.0V.

## 4.0 Programmer / ATE Signal routing

### 4.1 Overview

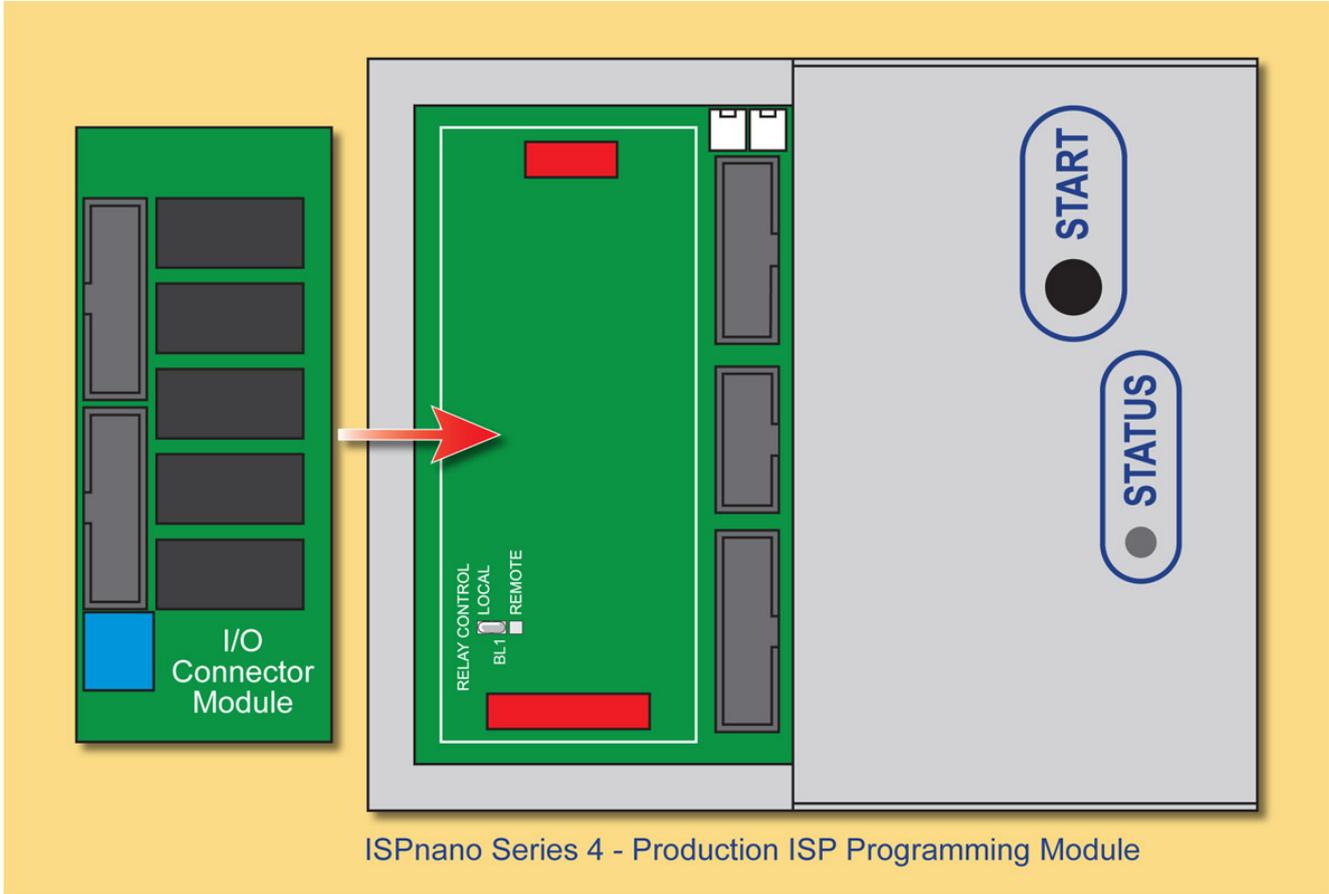
The ISPnano Series 4 programmer is designed to accept a single user-replaceable '**I/O Connector Module**'. This plug-in connection module concept allows a DUT to connect to the module instead of the programmer directly. In the event of a programmer failure, the module can simply be unplugged from the programmer and then programmer replaced without having to re-wire the fixture.

A range of different '**I/O Connector Modules**' are available which are designed to suit different signal routing requirements. The table below shows the range of '**I/O Connector Module**' which are currently available....

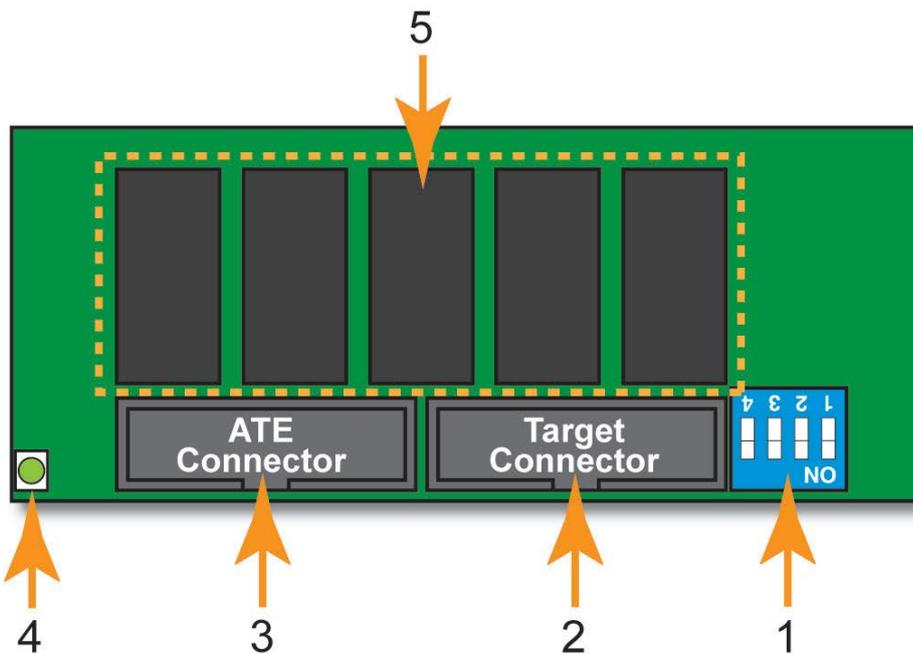
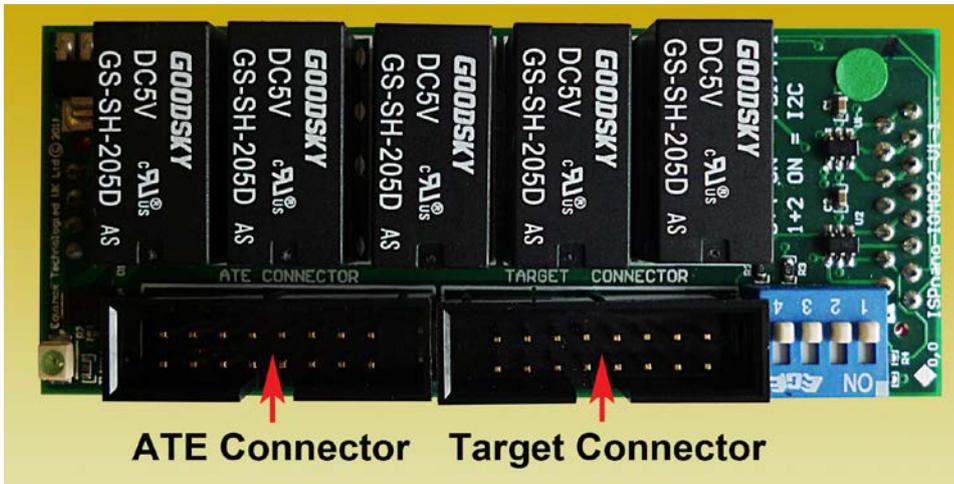
Module name	Module description	Overview of module signal routing
IO-MOD1	I/O Connector Module 1	<ul style="list-style-type: none"> <li>• Only TVCC and TVPP are switched (isolated) through relays.</li> <li>• All other signals are routed directly from the programmer to the DUT.</li> </ul>
IO-MOD2	I/O Connector Module 2	<ul style="list-style-type: none"> <li>• All programming and power signals are routed through relays.</li> <li>• The DUT is routed to the '<b>ATE Port</b>' by default and only routed to the programmer when a programming operation is in progress.</li> </ul>

### 4.2 Inserting an 'I/O Connector Module'

The '*I/O Connector Module*' is programmer is capable of isolating the programmer from the Target system when not in programming mode.



## 4.2 I/O Connector Module overview



Key No	Function	Further description
1	DIP-Switch	Configures pull-up resistors for I2C, PDI and TPI
2	Target Connector	Connect to Target System (DUT) Target System signals and power connections
3	ATE Connector	Connect to external ATE or ICT External ATE / ICT signals and power connections
4	Relay Power indicator	Illuminates when the relay coils are energised
5	Relays	These relays route the Target System signals between the external ATE / ICT or the programmer

### 4.3 Connecting the DUT and ATE to the 'I/O Connector Module'

The instructions below detail how to connect the '*Target System*' and external ATE / ICT equipment to the '*I/O Connector Module*'.

**Instructions:**

- Connect the '*Target System*' (UUT) to the 16-way '**Target ISP Port**'.
- Connect the external '*ATE System*' or other control system to the '**ATE ISP Port**'.
- If you plan to remote control the programmer, connect the relevant remote control signals to the '**Remote Control Port**'.

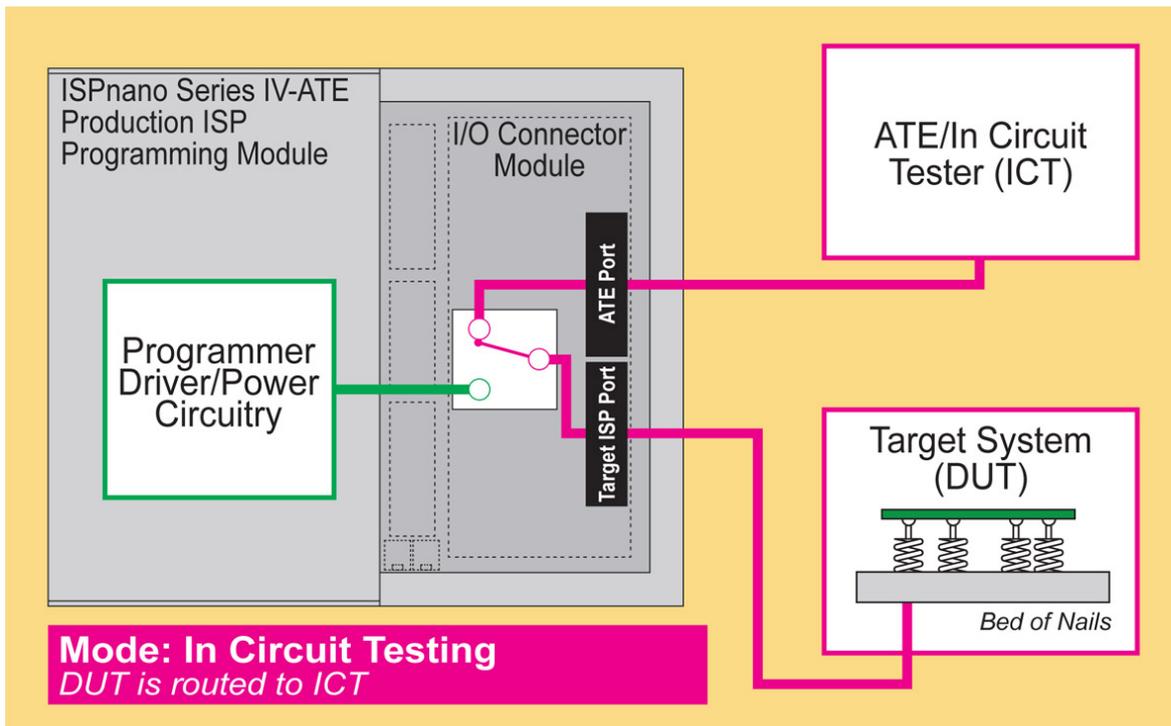
The signal routing depends on whether the relays are energised (ON) or de-energised (OFF) – see table below.

Relay position	Relays ON Indicator	Signal routing
OFF (default)	OFF	'Target ISP Port' signals are routed to the 'ATE ISP Port'
ON	ON	'Target ISP Port' signals are routed to the 'Internal Programmer Power and I/O Driver Circuitry'

## 4.4 DUT routed to External ATE System (default)

When the programmer is powered up but not running a **'Programming Project'**, the relay coils are **not** energised so the **'Target System (UUT)'** connections are routed via the **'Target ISP Port'**, through the relays to the **'ATE Port'** where they then connect to the **'External ATE / ICT System'**. The signal direction depends on the particular signal I/O line, GROUND or power line being routed.

The path of a single signal or passive power / GROUND line is shown in the schematic below.



**Please note:**

- When the relays are not energised, the programmer electronics are completely isolated from both the **'Target System'** and the **'External ATE System'**.

## 4.5 DUT routed to External ATE System – Pin routing

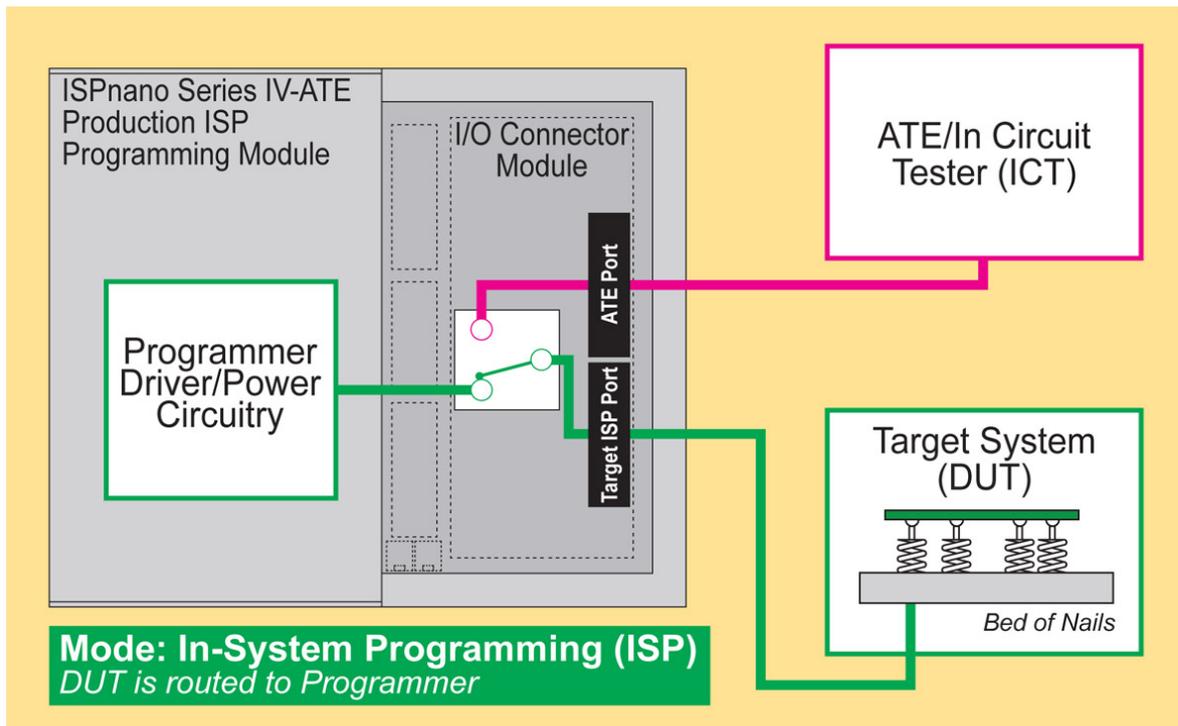
By default the RELAYs are **OFF** and the '**ATE Port**' signals are routed to the '**Target ISP Port**' pins as detailed in the table below.

Target ISP Port Pin Number	ATE Port Pin Number	Programmer Pin name	Notes
1 + 2	1 + 2	TARGET_VCC	<b>Target VCC</b> This pin should be connected to the Target System Vcc.
3 + 4	3+4	EXT_VCC	<b>Target External VCC</b> No connection required as EXT-VCC is being used to control the RELAY coils.
5 + 6	5 + 6	PROG_GND	<b>Signal Ground Connection (1)</b> 0V to which the programmer JTAG, SPI, I2C, PDI, TPI signal lines are referenced to.
7a 7b 7c	7a 7b 7c	<ul style="list-style-type: none"> <li>I2C_SCL</li> <li>PDI_CLK</li> <li>TPI_CLK</li> </ul>	<ul style="list-style-type: none"> <li>I2C_SCL clock signal</li> <li>XMEGA PDI CLOCK Signal</li> <li>ATtiny TPI CLOCK Signal</li> </ul>
8a 8b 8c	8a 8b 8c	<ul style="list-style-type: none"> <li>I2C_SDA</li> <li>XMEGA_PDI_DAT A</li> <li>ATTINY_TPI_DATA</li> </ul>	<ul style="list-style-type: none"> <li>I2C_SDA data signal</li> <li>XMEGA PDI DATA Signal</li> <li>ATtiny TPI DATA Signal</li> </ul>
9	N/C	OP6	<b>Spare Output (used for PDI / TPI)</b>
10	N/C	Programmer I/O5	Spare I/O pin
11	11	Programmer I/O4	This pin is used for JTAG Target Systems only.
12	12	Programmer I/O3	This pin can be used for JTAG or SPI Target Systems.
13	13	Programmer I/O2	This pin can be used for JTAG, SPI, UART, XMEGA PDI and ATtiny TPI Target Systems.
14	14	Programmer I/O1	This pin can be used for JTAG, SPI or UART Target Systems.
15	15	PROG_VPP	<b>Vpp Voltage</b>
16	16	PROG_RESET	<b>Target RESET control pin</b>

## 4.6 DUT routed to internal programmer (RELAYS ON)

When the relay coils are energised, the **'Target System (UUT)'** connections are routed to the **'Internal Programmer'**. The **'External ATE / ICT System'** is at this point completely disconnected (out of circuit). This allows the programmer to power up and program the **'Target Device'** without any problems related to the external system loading the power or programmer signal lines.

The path of a single signal or passive power / GROUND line is shown in the schematic below.



### Please note:

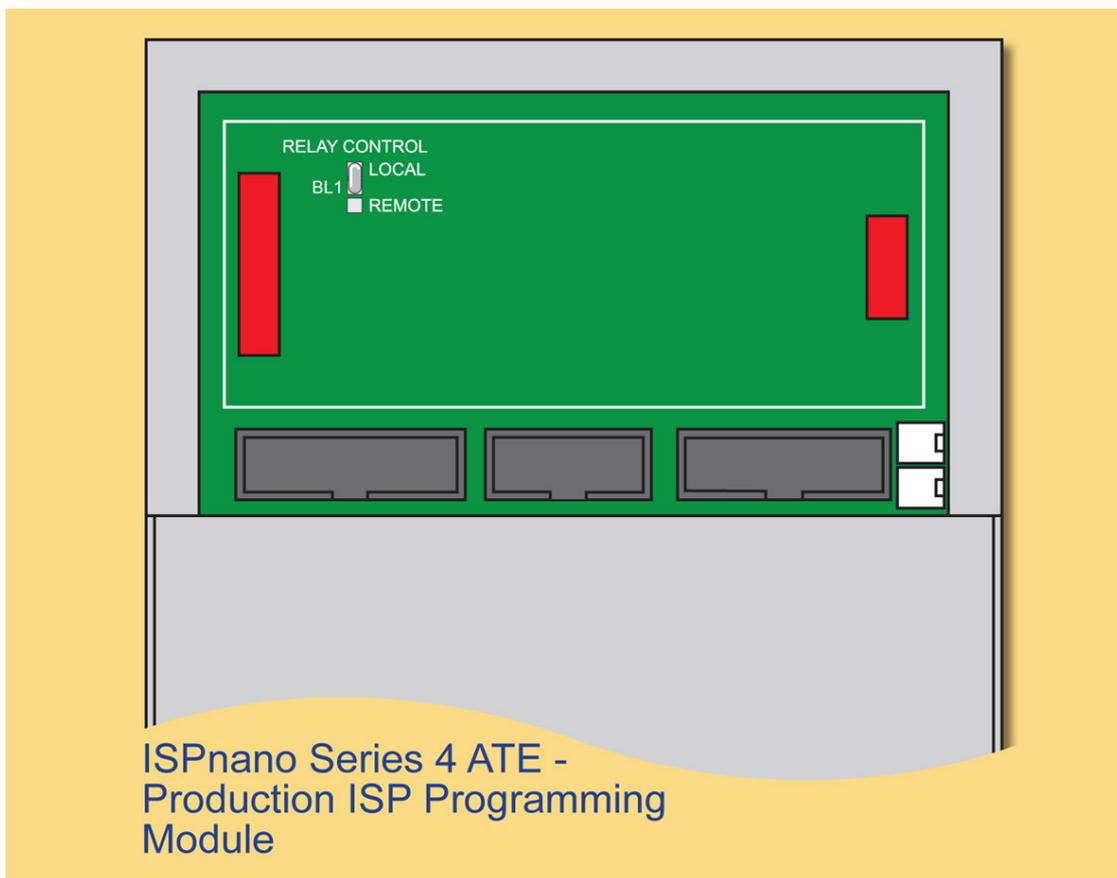
- When the relays are in this state, the **'External ATE System'** is completely isolated from both the **'Target System'** and the **'Internal Programmer electronics'**.
- All **'Target System'** I/O signals, power and GROUND are now routed to the internal **'Programmer Driver / Power Circuitry'**.
- The relays are automatically energised (switched ON) by the programmer when a programming operation is started.
- It is also possible to control the relay switching from an external system if required.

### 5.0 Relay Control Configuration

The relays on the **'I/O Connector Module'** are controlled by the programmer by default. The relays are automatically energised whenever a programming operation commences and remain energised until the programming operation is completed. This is the preferred setup as it means that the programmer is only ever connected to the DUT when in programming mode. It is disconnected from the DUT at all other times.

On **'ISPnano Series IV ATE'** programmer hardware V1.1 and above, it is possible to control the relays from a 'Remote System' e.g. an external ATE or PLC. This could be useful if the relay switching is to be coordinated with other operations within the scope of a more complex test / programming fixture.

The illustration below shows the location of the **'Relay control'** link underneath the **'I/O connector Module'**:



The control of the relays is set using the solder link BL1 as detailed in the table below.

BL1 Link position	Relay control method
<b>LOCAL (default)</b>	Programmer controls the operation of the relays
<b>REMOTE</b>	Remote System controls the operation of the relays.

If '**REMOTE**' relay control is selected, then the ????? pin on the 10-way Remote Control Port (J14) is used to control the relays.

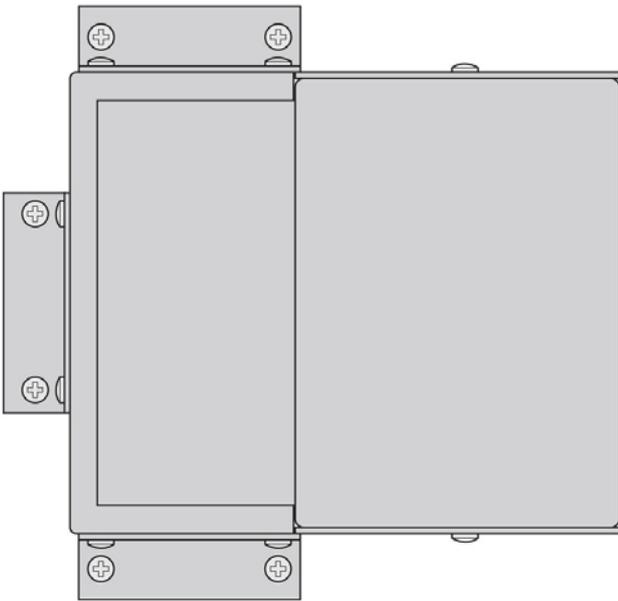
### 6.0 Programmer mounting arrangements

#### 6.1 Main programmer mounting

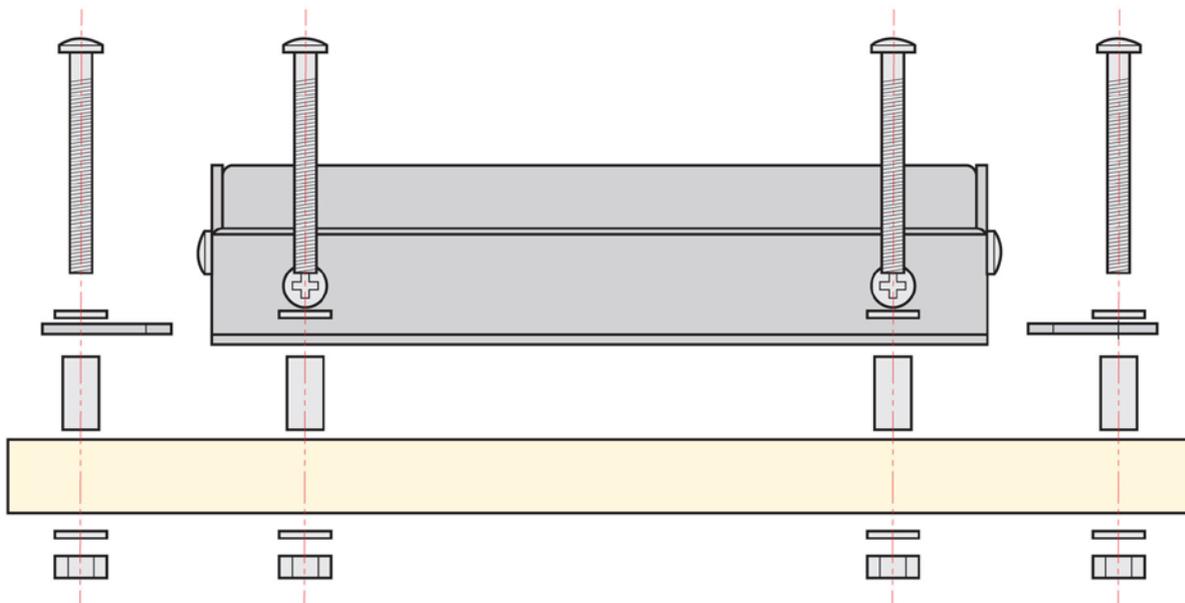
Side View



End View



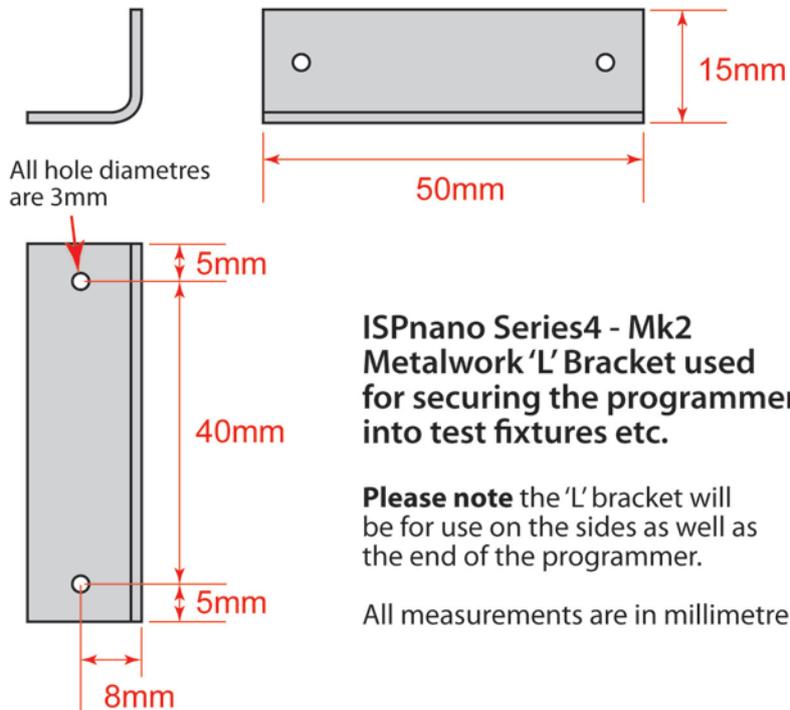
Top View



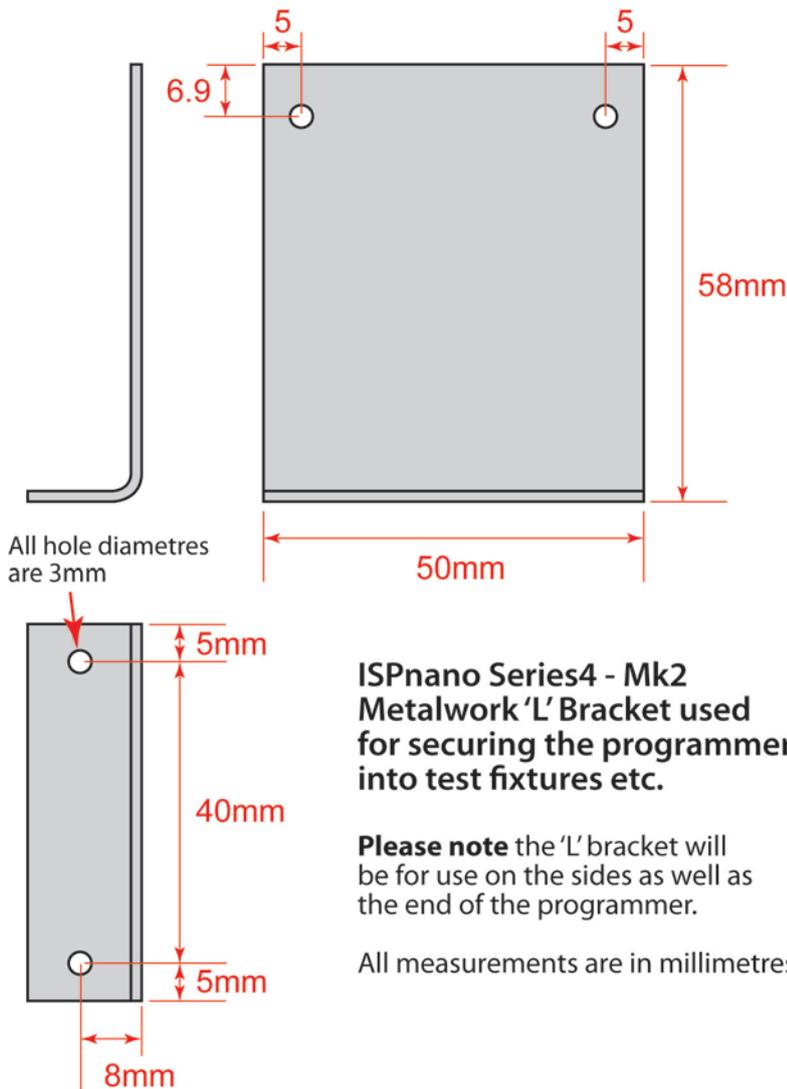
Mounting an ISPnano programmer to a test fixture using a standard 'L' bracket and spacers.

## 6.2 Mounting bracket overview

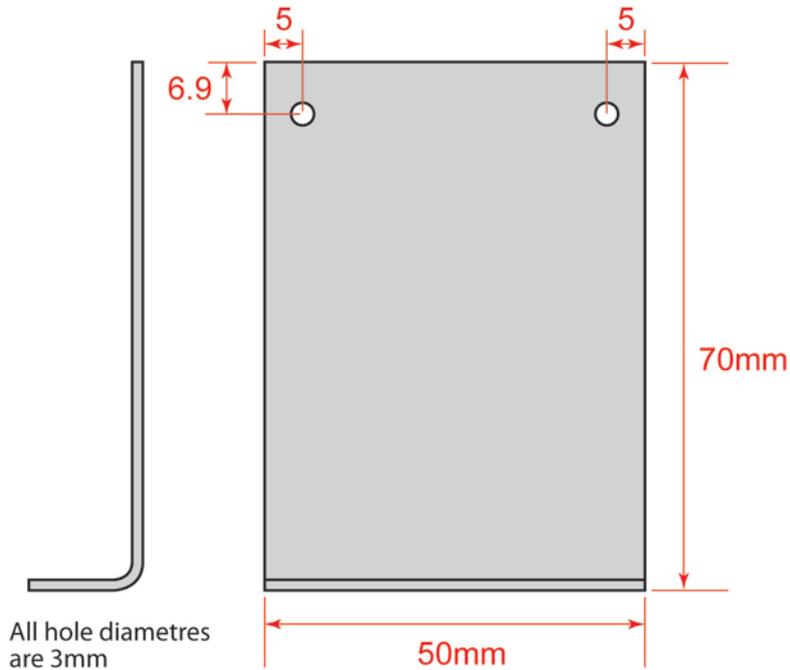
### 6.2.1 'L' bracket Version 1



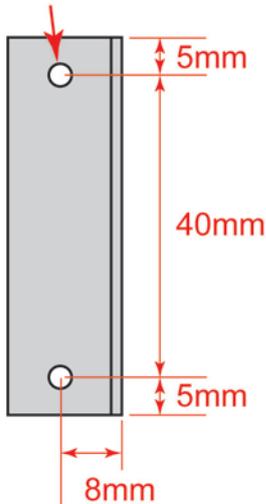
### 6.2.3 'L' bracket Version 2



### 6.2.3 'L' bracket Version 3



All hole diameters are 3mm



**ISPnano Series4 - Mk2  
Metalwork 'L' Bracket used  
for securing the programmer  
into test fixtures etc.**

**Please note** the 'L' bracket will be for use on the sides as well as the end of the programmer.

All measurements are in millimetres