SMH Technologies®

FlashRunner 2.0 Series

High-Performance, Standalone In-System Programmer

User's Manual

Revision 2.0 — Oct 2025

SMH Technologies®

UNIVERSAL PRODUCTION IN-SYSTEM PROGRAMMING

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SMH Technologies S.r.l.

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Attaching additional wiring to this product or modifying the product operation from the factory default as shipped may affect its performance and cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures should be taken.

Note: *updated version of FlashRunner 2.0 Software is available on SMH Technologies website (www.smh-tech.com).*
Please check it out before continuing reading this documentation.

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Note: *Keep FlashRunner 2.0 always in a well-ventilated area in order to prevent product overheating, which could affect product performances and, if maintained for long time, it could damage product hardware components.*

FlashRunner 2.0 is a low-voltage device. However, when integrating it inside an automatic test equipment or when interfacing it with other systems, take all precautions in order to avoid electrical shocks due to, for example, different ground references.
Make all connections to the target system before applying power to the instrument.
To protect FlashRunner 2.0 against electrostatic discharge (ESD), always connect yourself to ground (e.g. via wrist straps) when handling the instrument. Always store FlashRunner 2.0 inside an antistatic bag when not in use.

Disclaimer: *when integrating FlashRunner 2.0 please pay attention to place it in a well-ventilated area to avoid overheating related damages. FlashRunner 2.0 has been designed to reach 90 °C (194 °F) in normal operating conditions over its ends.*

FlashRunner 2.0 has been designed to be immune to electromagnetic interference. FlashRunner 2.0 functionalities include operating with external target devices *(e.g. serial memories, microprocessors…).* To avoid any issue during the interaction with target devices and to guarantee task reliability, FlashRunner 2.0 is able to correctly detect **critical fault conditions** and take suitable mitigating measures such as *fail-safe state* and *functional reset procedure*.

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Introduction

FlashRunner 2.0 is a highly-integrated In System gang programmer, based on the new and innovative FlashRunner 2.0 cutting-edge technology. FlashRunner 2.0 is designed for programming multi-PCB panel assemblies, with microcontrollers, processors, serial memories, eMMC memories, parallel NOR memories and parallel NAND memories.

This means:

- extremely fast programming (fastest in-system programming system on the market);
- standalone operations for easy ATE integration;
- brand new Graphical User Interface focused on Setup, Production and Cybersecurity features;
- compact and robust design for production environments.

FlashRunner 2.0 programming system is composed by a master board that hosts up to 8 programming channels and an optional additional slave board that allow to reach up to 16 channels. The master board implements the high performing features of the FlashRunner 2.0 core technology in a very compact format.

FlashRunner 2.0 supports up to 8/16 channels so it allows to interface in parallel up to 8/16 independent and heterogeneous devices. The customers choose the required model with the needed channels (4, 8, 12 or 16) according to their project requirements and, eventually, extends the programming system capabilities, in terms of number of channels, through a **simple software license update**.

Description	Part Number
FlashRunner 2.0 – 8 channel – 4 channels enabled	FR2P0-04CH
FlashRunner 2.0 – 8 channel – 8 channels enabled	FR2P0-08CH
FlashRunner 2.0 – Upgrade from 4 to 8 channels	FR2P0-UPG08
FlashRunner 2.0 – 16 channel – 12 channels enabled	FR2P0-12CH
FlashRunner 2.0 – 16 channel – 16 channels enabled	FR2P0-16CH
FlashRunner 2.0 – Upgrade from 12 to 16 channels	FR2P0-UPG16

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Figure 1: FlashRunner 2.0 – 8 channels programming system



Figure 2: FlashRunner 2.0 – 16 channels programming system

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General features

- Fastest programming algorithms approved by silicon manufacturers - as fast as target device's memory technology limit;
- up to 8/16 universal, parallel and independent device channels;
- easy ATE and fixture integration;
- stand-alone operations through an isolated parallel control interface;
- host-controlled operations through isolated LAN Ethernet interface and isolated USB-UART interface;
- supports the most common ISP low level protocols: BDM, DAP, CSI, eMMC, JTAG, SPI, QSPI, OCTO-SPI, Parallel-NAND, I2C, ICSP, EICSP, ISSP, MON, ICC, PDI, SCI, SD, SWD, UART, USART and many others;
- supports CAN, CAN-FD, LIN, FASTLIN, PPM protocols with proper external signal conditioning circuits;
- flexible, fully configurable;
- compact and robust design for production environments.

Hardware features

- multi-core high performance processor for system management;
- highly programmable and powerful logic section to implement low level protocol;
- 1GB on-board RAM memory;
- upgradable and replaceable storage memory for user data files and system files: 64 GB in the default configuration and up to 256 GB upon request;
- on-board timekeeper and calendar (battery supplied) for system time reference;
- 10/100/1000 LAN Ethernet isolated interface;
- USB-UART isolated interface;
- isolated parallel Control Interface for stand-alone operations;
- for each In-System Programming device interface (i.e. device channel)
    - 8 Digital Input/Output communication lines (DIOs);
    - 2 independent voltage-programmable Power lines (VPROGs);
    - Ground Reference line for each communication or power lines (GNDs);
    - Voltage and Current measurement and monitoring[1].

[1] Although the programmer's monitoring provides valuable information regarding signal levels, ensuring the correctness of voltage and current during flashing procedures remains the sole responsibility of the end customer.

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Software features

- Linux Embedded based operating system;
- very extensive library of supported devices - enabled through software licensing;
- configurable number of channels – 4, 8, 12, or 16 active channels according to the customer's requirement – easily upgradeable through software licensing;
- FlashRunner 2.0 WorkBench Graphical user Interface - the most user-friendly way to discover and exploit the remarkable features of SMH Technologies programming systems (Windows, Linux and Mac compatible);
- controllable by any host system through a simple terminal utility and ASCII protocol;
- advanced Interface Library DLL to control the programming system through a user-written applications (C/C++, C#, Labview, TestStand);
- optional customer binary file cryptography to ensure user data antipiracy protection with a more secure and advanced encryption method;
- advanced system protection and access according to user settings and permission management;
- file integrity check and file authenticity check to prevent data alterations;
- flashing cycles control to limit the number of board produced;
- user data management and device-specific dynamic data management (e.g. serial number, password, configuration data, …);
- very detailed log file completed with time-stamp for programming system full monitoring;
- extensive range of flashing and verifying operations according to the target device (mass erase, sector erase, blank-check, program, verify with complete device read, verify with CRC check, read and dump data to file, device-specific operations);
- very easy software/firmware update (Operating System, Device Drivers, Licenses).

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Hardware overview

Power and control connectors

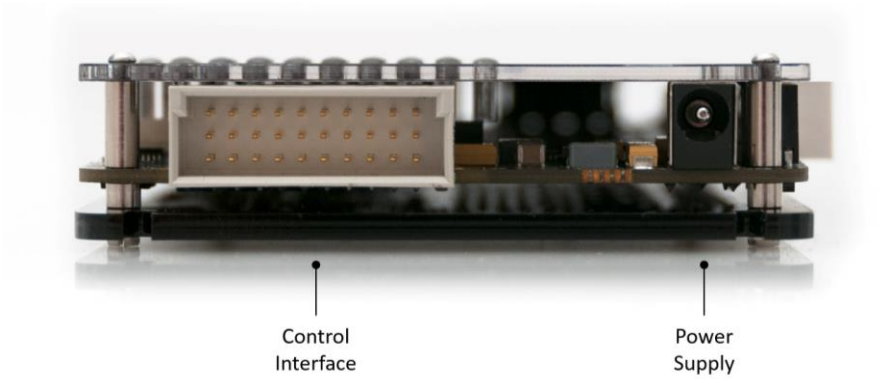


Figure 3: FlashRunner 2.0 – 8 channels: power supply and control interface (right side)

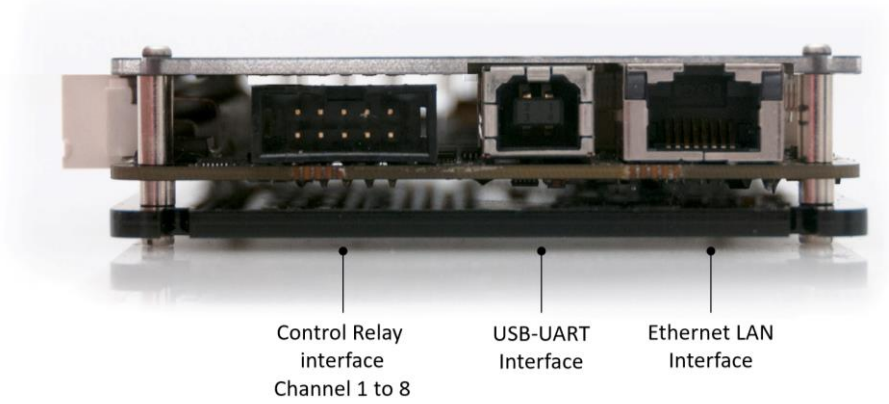


Figure 4: FlashRunner 2.0 – 8 channels: control relay interface, USB-UART interface and Ethernet LAN interface (left side)

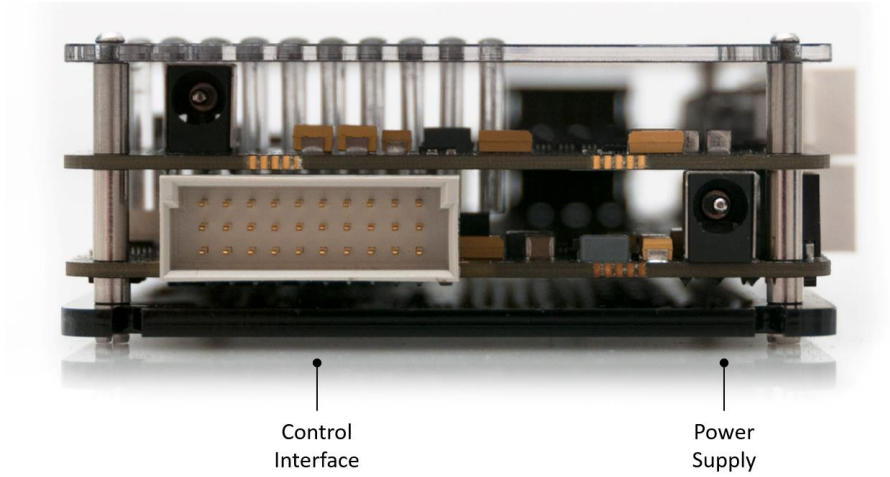


Figure 5: FlashRunner 2.0 – 16 channels: power supply and control interface (right side)

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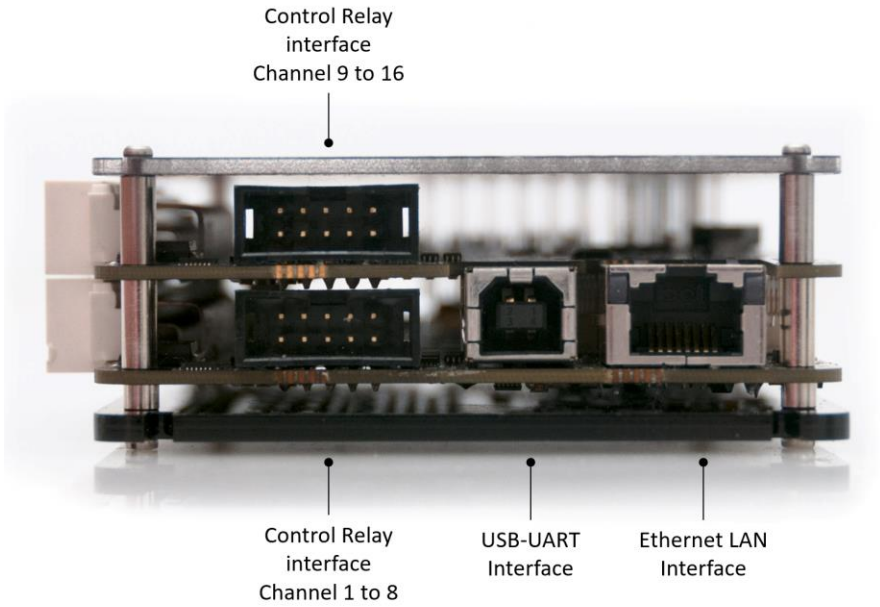


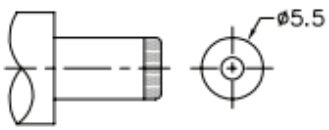
Figure 6: FlashRunner 2.0 – 16 channels: control relay interface, USB-UART interface and Ethernet LAN interface (left side)

Power supply

FlashRunner 2.0 is powered through a 15V power supply (up to 5A) connected to a DC power jack connector. Please refer to Technical Specification for a detailed parameters description.

Connector part-number: Same Sky (formerly CUI Devices) PJ-047AH
Mating plug connector: Same Sky (formerly CUI Devices) PP3-002AH





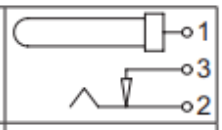
SCHEMATIC	
Model	PJ-047AH
Center Pin	Ø2.0 mm

Figure 7: FlashRunner 2.0 - power jack plug connector

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Control Interface

Control Interface is used for the integration in an automatic programming equipment and to drive the programming system in stand-alone mode when the LAN Ethernet or USB-UART connection are not available.

Through the Control Interface connector, the following procedures can be triggered:

- to select among 32 different projects already stored into the programming system;
- to start the selected project;
- to check the current programming system state (BUSY, READY);
- to check the individual ISP device interface state (BUSY, PASS, FAIL).

DIN 41612 - Right Angle Male Connector - 30-position, 3-row, 2.54mm pitch
Part Number: Harting 09251306571
Mating connector:

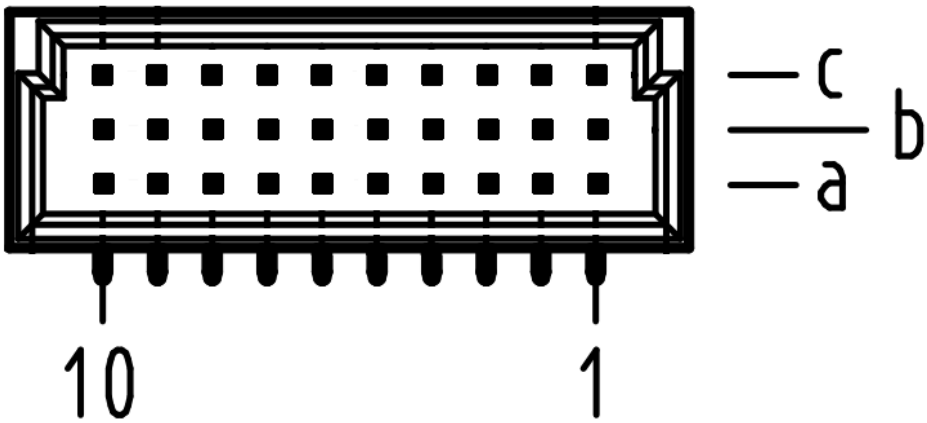


Figure 8: FlashRunner 2.0 Module – control interface connector

Note: *all control signals are ground-referenced to GND_I (separated from FlashRunner common ground) and power-referenced to 5V_I_FUSE (both obtained with an isolated DC/DC converter). This allows a host system to safely communicate with FlashRunner 2.0 even when the target boards have different ground reference compared to the host system's (and it is not allowed to connect them together).*

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Pin #	Signal Name	Signal Type	Description
A1	SEL0	I	Project Selection 0 - ref. GND_I
A2	SEL1	I	Project Selection 1 - ref. GND_I
A3	SEL2	I	Project Selection 2 - ref. GND_I
A4	SEL3	I	Project Selection 3 - ref. GND_I
A5	SEL4	I	Project Selection 4 - ref. GND_I
A6	GND_I	-	Isolated Ground
A7	PASS/FAIL1	O	Programming Channel 1 PASS/FAIL - ref. GND_I
A8	PASS/FAIL2	O	Programming channel 2 PASS/FAIL - ref. GND_I
A9	PASS/FAIL3	O	Programming channel 3 PASS/FAIL - ref. GND_I
A10	PASS/FAIL4	O	Programming channel 4 PASS/FAIL - ref. GND_I
B1	START	I	Selected Project START - ref. GND_I – active low
B2	5V_I_FUSE	P	5V Isolated Power Supply - ref. GND_I
B3	5V_I_FUSE	P	5V Isolated Power Supply - ref. GND_I
B4	GND_I	-	Isolated Ground
B5	GND_I	-	Isolated Ground
B6	GND_I	-	Isolated Ground
B7	PASS/FAIL5	O	Programming channel 5 PASS/FAIL - ref. GND_I
B8	PASS/FAIL6	O	Programming channel 6 PASS/FAIL - ref. GND_I
B9	PASS/FAIL7	O	Programming channel 7PASS/FAIL - ref. GND_I
B10	PASS/FAIL8	O	Programming channel 8 PASS/FAIL - ref. GND_I
C1	GND_I	-	Isolated Ground
C2	PASS/FAIL9	O	Programming channel 9 PASS/FAIL - ref. GND_I
C3	PASS/FAIL10	O	Programming channel 10 PASS/FAIL - ref. GND_I
C4	PASS/FAIL11	O	Programming channel 11 PASS/FAIL - ref. GND_I
C5	PASS/FAIL12	O	Programming channel 12 PASS/FAIL - ref. GND_I
C6	BUSY	O	Selected Project BUSY - ref. GND_I – active low
C7	PASS/FAIL13	O	Programming channel 13 PASS/FAIL - ref. GND_I
C8	PASS/FAIL14	O	Programming channel 14 PASS/FAIL - ref. GND_I
C9	PASS/FAIL15	O	Programming channel 15 PASS/FAIL - ref. GND_I
C10	PASS/FAIL16	O	Programming channel 16 PASS/FAIL - ref. GND_I

Table 1: Control Interface Connector pinout

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Setting PRJ_SEL[4..0] allows to select among 32 different projects stored in advance into the programming system (i.e. SDCARD). Selectable projects are named as *project0.prj*, *project1.prj*, …, *project30.prj*, *project31.prj*.

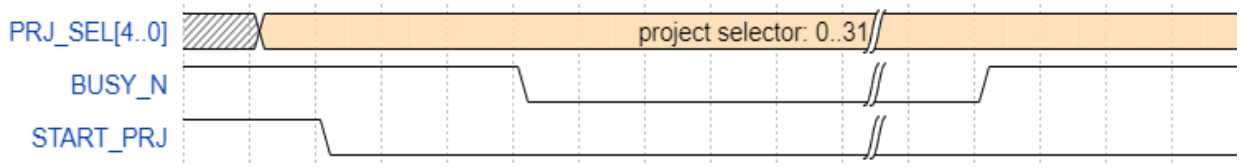


Figure 9: Control Interface: project start timing diagram (100ms/div)

A typical sequence of commands given through the Control Interface is listed in the following:

- drive PRJ_SEL[4..0] input signals to select up to 32 different projects previously stored into FlashRunner 2.0 programming system;
- if the programmer is not BUSY_N, drive the START_PRJ input signal to trigger the project start;
- before the end of the overall project execution, if a single channel finishes its task, the result (High: PASS; Low: FAIL) is reported on the related output;
- when the last channel terminates its task, all the results are reported and the BUSY_N signal goes high (end of project execution).

In the following picture, a typical usage of the control interface connector is shown. This approach can be employed both with START signal and with SEL[4..0] signals.

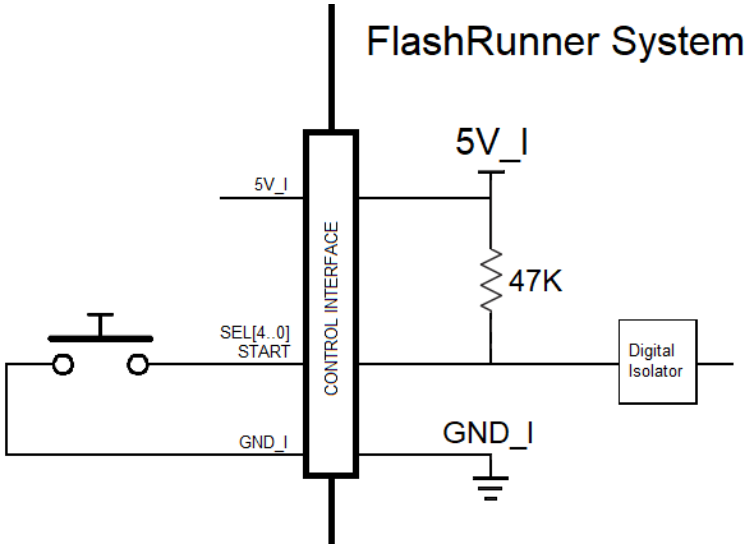


Figure 10: FlashRunner 2.0 – typical usage of the control interface input signals

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Ethernet LAN connector

Ethernet LAN Connector is used to communicate with a host PC system. Please, use provided cable to connect FlashRunner 2.0 with your PC. Employed Ethernet transceiver is a 10/100/1000 Mbps single chip suitable for IEEE 802.3 applications. The automatic MDI/MDI-X feature eliminates the need to determine whether to use a straight cable or a crossover cable between the ethernet transceiver and its link partner. An isolation transformer with symmetrical transmit and receive data paths is also integrated into RJ45 connector.



Figure 11: FlashRunner 2.0 - Etherner LAN RJ45 connector – LEDs

RJ45 connector is equipped with two LEDs:

- Green LED is on when the Etherent link is up (any speed);
- Orange LED blinks when there is TX/RX activity on the link.

For more information, please refer to FlashRunner Programmer's Manual in order to correctly setup your host PC system.

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USB-UART connector

Alternatively, communication with the host PC can be done with the USB type-B connector through a UART serial connection. USB signals are referenced to its related ground, that is separated from the programmer's ground and from the isolated ground of the Control Interface. Use the provided USB cable to connect FlashRunner 2.0 with your PC. For more information, please refer to FlashRunner Programmer's Manual in order to correctly setup your host PC system.



Figure 12: FlashRunner 2.0 – USB-UART connector (USB type-B)

Control Relay connector

Optionally, an external relay barrier gives the chance to separate the programmer lines and the ISP programmable devices when other operations such as In-Circuit Test procedures are carried out by the machinery. The signals of the Control Relay connector allow to drive the relay devices of the external relay barrier as they are connected to the collector of a Darligton transistor. The same signals can employed also to drive an external demultiplexer tool.

With the command RLYCLOSE (please refer to the following section dedicated to Relay Barrier for more details) the specific channel is activated independently and the current can flow through the external relay coils closing the channel relays. The command RLYOPEN stops the current flow releasing the relays.

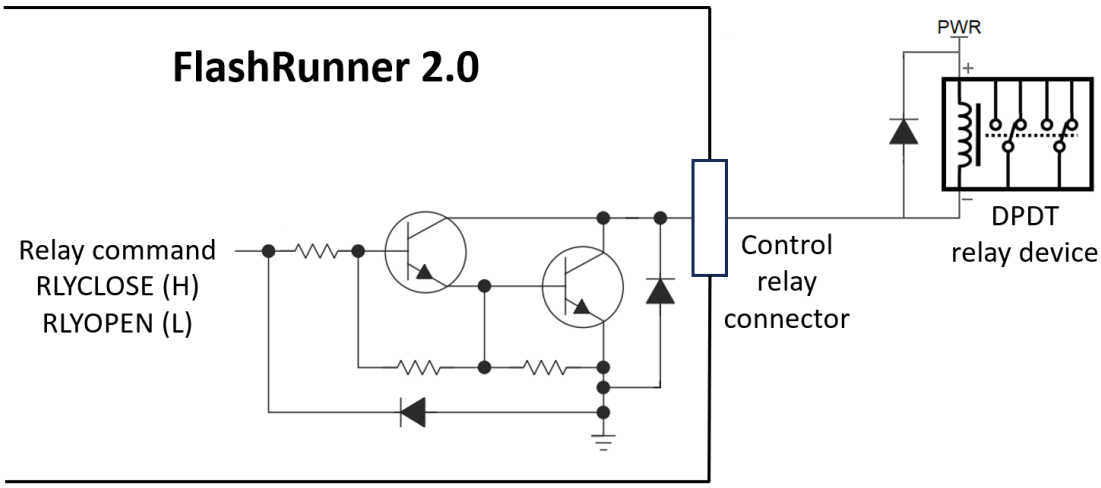


Figure 13: FlashRunner 2.0 – Control Relay connector – Darlington transistor for relay device management

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Figure 14: FlashRunner 2.0 – Control Relay connector

Pin #	Signal Name	Description
1	1RLY	Channel 1 Darlington collector output
2	2RLY	Channel 2 Darlington collector output
3	3RLY	Channel 3 Darlington collector output
4	4RLY	Channel 4 Darlington collector output
5	5RLY	Channel 5 Darlington collector output
6	6RLY	Channel 6 Darlington collector output
7	7RLY	Channel 7 Darlington collector output
8	8RLY	Channel 8 Darlington collector output
9	GND	Ground
10	GND	Ground

Table 2: FlashRunner 2.0 master board – channel 1 to 8 – Control Relay connector pinout

Pin #	Signal Name	Description
1	1RLY	Channel 9 Darlington collector output
2	2RLY	Channel 10 Darlington collector output
3	3RLY	Channel 11 Darlington collector output
4	4RLY	Channel 12 Darlington collector output
5	5RLY	Channel 13 Darlington collector output
6	6RLY	Channel 14 Darlington collector output
7	7RLY	Channel 15 Darlington collector output
8	8RLY	Channel 16 Darlington collector output
9	GND	Ground
10	GND	Ground

Table 3: FlashRunner 2.0 slave board – channel 9 to 16 – Control Relay connector pinout

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LEDs

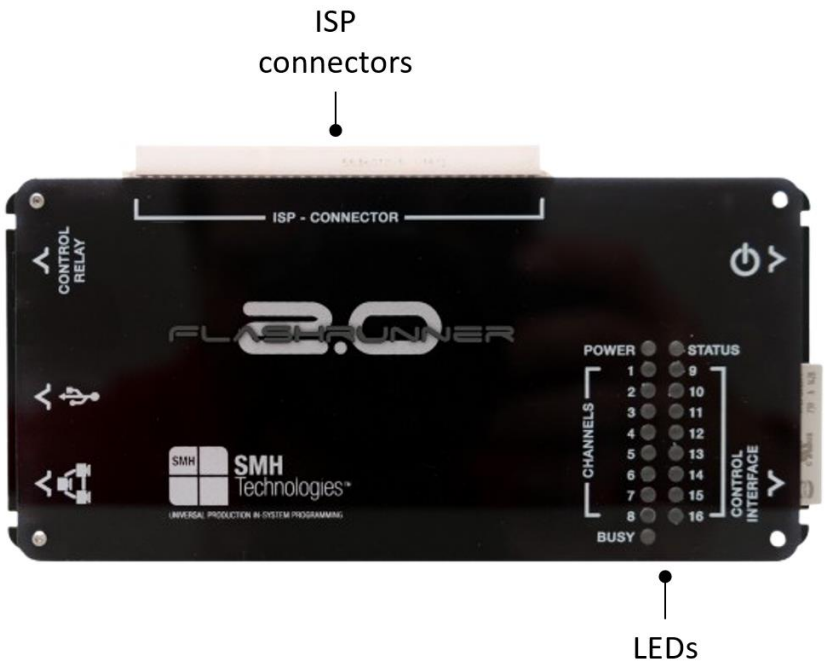


Figure 15: FlashRunner 2.0 – top side – LEDs and ISP connectors

On the top layer of the FlashRunner 2.0 case several LEDs are available to show the general programming system status and also the programming procedure status and results.

Following the layout order:

- POWER — programming system power supplied (orange)
- CH1..8 STATUS — PASS (green) – FAIL (red) – RUN (orange)
- BUSY — programming system busy:
  RUN (orange) – STANDBY (switched off)
- STATUS — programming system status at the end of the boot sequence:
  OK (orange)
  SYSTEM FAIL (blinking or switched off)
- CH9..16 STATUS — PASS (green) – FAIL (red) – RUN (orange)
  available only on 16 channels version

STATUS LED shows whether the general hardware self-test sequence, running during the boot phase, has been successful. CH1..CH16 STATUS LED show whether the hardware self-test on the related channel has been carried out successfully.

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ISP Connectors



Figure 16: FlashRunner 2.0 – 8 channels or 16 channels - ISP device connector

Each ISP device connector is a DIN41612 96-pin connectors that conveys all the signals to communicate with up to 8 devices to be connected and interfaced. FlashRunner 2.0 8 channels is equipped with one ISP connector (one on the master board) and FlashRunner 2.0 16 channels is equipped with two ISP connectors (one on the master board and one on the slave board).

Each one of the device channel is composed by:

- 8 Digital Input/Output (DIO0..DIO7);
- signals related ground references (GND);
- 2 independent programmable voltages as power supplies:
    - DIO signal voltage level and output power supply (VPROG0);
    - additional output power supply for the board (VPROG1).

DIN41612 connector, 96-position, 3-row, 2.54mm pitch, male, right-angle, type C/2
Part-number: Harting 09031967921 or TE connectivity 5536010-5 or similar

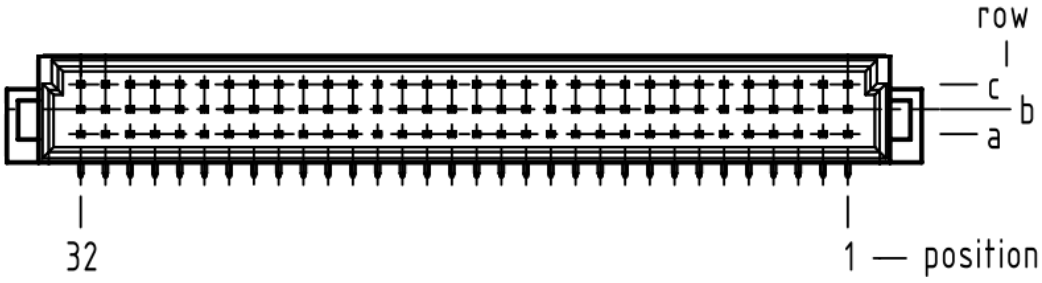


Figure 17: FlashRunner 2.0 – 8 channels or 16 channels - ISP device connector

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Note: *ISP and I/O signals are not isolated and are referenced to the programming system common ground GND (power supply and signals ground). Additionally, in order to avoid undesired current loops between FlashRunner 2.0 power supply and target board, a power supply with a floating output (ground not referenced to the earth potential) should be used.*

Pin #	Signal Name	Description
A1	1DIO0	ISP Channel 1: Digital input/output 0
A2	1DIO3	ISP Channel 1: Digital input/output 3
A3	1DIO6	ISP Channel 1: Digital input/output 6
A4	1VPROG0	ISP Channel 1: Programmable voltage 0
A5	2DIO0	ISP Channel 2: Digital input/output 0
A6	2DIO3	ISP Channel 2: Digital input/output 3
A7	2DIO6	ISP Channel 2: Digital input/output 6
A8	2VPROG0	ISP Channel 2: Programmable voltage 0
A9	3DIO0	ISP Channel 3: Digital input/output 0
A10	3DIO3	ISP Channel 3: Digital input/output 3
A11	3DIO6	ISP Channel 3: Digital input/output 6
A12	3VPROG0	ISP Channel 3: Programmable voltage 0
A13	4DIO0	ISP Channel 4: Digital input/output 0
A14	4DIO3	ISP Channel 4: Digital input/output 3
A15	4DIO6	ISP Channel 4: Digital input/output 6
A16	4VPROG0	ISP Channel 4: Programmable voltage 0
A17	5DIO0	ISP Channel 5: Digital input/output 0
A18	5DIO3	ISP Channel 5: Digital input/output 3
A19	5DIO6	ISP Channel 5: Digital input/output 6
A20	5VPROG0	ISP Channel 5: Programmable voltage 0
A21	6DIO0	ISP Channel 6: Digital input/output 0
A22	6DIO3	ISP Channel 6: Digital input/output 3
A23	6DIO6	ISP Channel 6: Digital input/output 6
A24	6VPROG0	ISP Channel 6: Programmable voltage 0
A25	7DIO0	ISP Channel 7: Digital input/output 0
A26	7DIO3	ISP Channel 7: Digital input/output 3
A27	7DIO6	ISP Channel 7: Digital input/output 6
A28	7VPROG0	ISP Channel 7: Programmable voltage 0
A29	8DIO0	ISP Channel 8: Digital input/output 0

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Pin #	Signal Name	Description
A30	8DIO3	ISP Channel 8: Digital input/output 3
A31	8DIO6	ISP Channel 8: Digital input/output 6
A32	8VPROG0	ISP Channel 8: Programmable voltage 0
B1	1DIO1	ISP Channel 1: Digital input/output 1
B2	1DIO4	ISP Channel 1: Digital input/output 4
B3	GND	Ground
B4	1VPROG1	ISP Channel 1: Programmable voltage 1
B5	2DIO1	ISP Channel 2: Digital input/output 1
B6	2DIO4	ISP Channel 2: Digital input/output 4
B7	GND	Ground
B8	2VPROG1	ISP Channel 2: Programmable voltage 1
B9	3DIO1	ISP Channel 3: Digital input/output 1
B10	3DIO4	ISP Channel 3: Digital input/output 4
B11	GND	Ground
B12	3VPROG1	ISP Channel 3: Programmable voltage 1
B13	4DIO1	ISP Channel 4: Digital input/output
B14	4DIO4	ISP Channel 4: Digital input/output 4
B15	GND	Ground
B16	4VPROG1	ISP Channel 4: Programmable voltage 1
B17	5DIO1	ISP Channel 5: Digital input/output 1
B18	5DIO4	ISP Channel 5: Digital input/output 4
B19	GND	Ground
B20	5VPROG1	ISP Channel 5: Programmable voltage 1
B21	6DIO1	ISP Channel 6: Digital input/output 1
B22	6DIO4	ISP Channel 6: Digital input/output 4
B23	GND	Ground
B24	6VPROG1	ISP Channel 6: Programmable voltage 1
B25	7DIO1	ISP Channel 7: Digital input/output 1
B26	7DIO4	ISP Channel 7: Digital input/output 4
B27	GND	Ground
B28	7VPROG1	ISP Channel 7: Programmable voltage 1
B29	8DIO1	ISP Channel 8: Digital input/output 1
B30	8DIO4	ISP Channel 8: Digital input/output 4
B31	GND	Ground
B32	8VPROG1	ISP Channel 8: Programmable voltage 1
C1	1DIO2	ISP Channel 1: Digital input/output 2
C2	1DIO5	ISP Channel 1: Digital input/output 5
C3	1DIO7	ISP Channel 1: Digital input/output 7

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Pin #	Signal Name	Description
C4	GND	Ground
C5	2DIO2	ISP Channel 2: Digital input/output 2
C6	2DIO5	ISP Channel 2: Digital input/output 5
C7	2DIO7	ISP Channel 2: Digital input/output 7
C8	GND	Ground
C9	3DIO2	ISP Channel 3: Digital input/output 2
C10	3DIO5	ISP Channel 3: Digital input/output 5
C11	3DIO7	ISP Channel 3: Digital input/output 7
C12	GND	Ground
C13	4DIO2	ISP Channel 4: Digital input/output 2
C14	4DIO5	ISP Channel 4: Digital input/output 5
C15	4DIO7	ISP Channel 4: Digital input/output 7
C16	GND	Ground
C17	5DIO2	ISP Channel 5: Digital input/output 2
C18	5DIO5	ISP Channel 5: Digital input/output 5
C19	5DIO7	ISP Channel 5: Digital input/output 7
C20	GND	Ground
C21	6DIO2	ISP Channel 6: Digital input/output 2
C22	6DIO5	ISP Channel 6: Digital input/output 5
C23	6DIO7	ISP Channel 6: Digital input/output 7
C24	GND	Ground
C25	7DIO2	ISP Channel 7: Digital input/output 2
C26	7DIO5	ISP Channel 7: Digital input/output 5
C27	7DIO7	ISP Channel 7: Digital input/output 7
C28	GND	Ground
C29	8DIO2	ISP Channel 8: Digital input/output 2
C30	8DIO5	ISP Channel 8: Digital input/output 5
C31	8DIO7	ISP Channel 8: Digital input/output 7
C32	GND	Ground

Table 4: ISP Device Connector Signals (Channels 1..8) – master board ISP connector (type C/2)

Pin #	Signal Name	Description
A1	9DIO0	ISP Channel 9: Digital input/output 0
A2	9DIO3	ISP Channel 9: Digital input/output 3
A3	9DIO6	ISP Channel 9: Digital input/output 6
A4	9VPROG0	ISP Channel 9: Programmable voltage 0
A5	10DIO0	ISP Channel 10: Digital input/output 0
A6	10DIO3	ISP Channel 10: Digital input/output 3

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Pin #	Signal Name	Description
A7	10DIO6	ISP Channel 10: Digital input/output 6
A8	10VPROG0	ISP Channel 10: Programmable voltage 0
A9	11DIO0	ISP Channel 11: Digital input/output 0
A10	11DIO3	ISP Channel 11: Digital input/output 3
A11	11DIO6	ISP Channel 11: Digital input/output 6
A12	11VPROG0	ISP Channel 11: Programmable voltage 0
A13	12DIO0	ISP Channel 12: Digital input/output 0
A14	12DIO3	ISP Channel 12: Digital input/output 3
A15	12DIO6	ISP Channel 12: Digital input/output 6
A16	12VPROG0	ISP Channel 12: Programmable voltage 0
A17	13DIO0	ISP Channel 13: Digital input/output 0
A18	13DIO3	ISP Channel 13: Digital input/output 3
A19	13DIO6	ISP Channel 13: Digital input/output 6
A20	13VPROG0	ISP Channel 13: Programmable voltage 0
A21	14DIO0	ISP Channel 14: Digital input/output 0
A22	14DIO3	ISP Channel 14: Digital input/output 3
A23	14DIO6	ISP Channel 14: Digital input/output 6
A24	14VPROG0	ISP Channel 14: Programmable voltage 0
A25	15DIO0	ISP Channel 15: Digital input/output 0
A26	15DIO3	ISP Channel 15: Digital input/output 3
A27	15DIO6	ISP Channel 15: Digital input/output 6
A28	15VPROG0	ISP Channel 15: Programmable voltage 0
A29	16DIO0	ISP Channel 16: Digital input/output 0
A30	16DIO3	ISP Channel 16: Digital input/output 3
A31	16DIO6	ISP Channel 16: Digital input/output 6
A32	16VPROG0	ISP Channel 16: Programmable voltage 0
B1	9DIO1	ISP Channel 9: Digital input/output 1
B2	9DIO4	ISP Channel 9: Digital input/output 4
B3	GND	Ground
B4	9VPROG1	ISP Channel 9: Programmable voltage 1
B5	10DIO1	ISP Channel 10: Digital input/output
B6	10DIO4	ISP Channel 10: Digital input/output 4
B7	GND	Ground
B8	10VPROG1	ISP Channel 10: Programmable voltage 1
B9	11DIO1	ISP Channel 11: Digital input/output 1
B10	11DIO4	ISP Channel 11: Digital input/output 4
B11	GND	Ground
B12	11VPROG1	ISP Channel 11: Programmable voltage 1

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Pin #	Signal Name	Description
B13	12DIO1	ISP Channel 12: Digital input/output 1
B14	12DIO4	ISP Channel 12: Digital input/output 4
B15	GND	Ground
B16	12VPROG1	ISP Channel 12: Programmable voltage 1
B17	13DIO1	ISP Channel 13: Digital input/output 1
B18	13DIO4	ISP Channel 13: Digital input/output 4
B19	GND	Ground
B20	13VPROG1	ISP Channel 13: Programmable voltage 1
B21	14DIO1	ISP Channel 14: Digital input/output 1
B22	14DIO4	ISP Channel 14: Digital input/output 4
B23	GND	Ground
B24	14VPROG1	ISP Channel 14: Programmable voltage 1
B25	15DIO1	ISP Channel 15: Digital input/output 1
B26	15DIO4	ISP Channel 15: Digital input/output 4
B27	GND	Ground
B28	15VPROG1	ISP Channel 15: Programmable voltage 1
B29	16DIO1	ISP Channel 16: Digital input/output 1
B30	16DIO4	ISP Channel 16: Digital input/output 4
B31	GND	Ground
B32	16VPROG1	ISP Channel 16: Programmable voltage 1
C1	9DIO2	ISP Channel 9: Digital input/output 2
C2	9DIO5	ISP Channel 9: Digital input/output 5
C3	9DIO7	ISP Channel 9: Digital input/output 7
C4	GND	Ground
C5	10DIO2	ISP Channel 10: Digital input/output 2
C6	10DIO5	ISP Channel 10: Digital input/output 5
C7	10DIO7	ISP Channel 10: Digital input/output 7
C8	GND	Ground
C9	11DIO2	ISP Channel 11: Digital input/output 2
C10	11DIO5	ISP Channel 11: Digital input/output 5
C11	11DIO7	ISP Channel 11: Digital input/output 7
C12	GND	Ground
C13	12DIO2	ISP Channel 12: Digital input/output 2
C14	12DIO5	ISP Channel 12: Digital input/output 5
C15	12DIO7	ISP Channel 12: Digital input/output 7
C16	GND	Ground
C17	13DIO2	ISP Channel 13: Digital input/output 2
C18	13DIO5	ISP Channel 13: Digital input/output 5

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Pin #	Signal Name	Description
C19	13DIO7	ISP Channel 13: Digital input/output 7
C20	GND	Ground
C21	14DIO2	ISP Channel 14: Digital input/output 2
C22	14DIO5	ISP Channel 14: Digital input/output 5
C23	14DIO7	ISP Channel 14: Digital input/output 7
C24	GND	Ground
C25	15DIO2	ISP Channel 15: Digital input/output 2
C26	15DIO5	ISP Channel 15: Digital input/output 5
C27	15DIO7	ISP Channel 15: Digital input/output 7
C28	GND	Ground
C29	16DIO2	ISP Channel 16: Digital input/output 2
C30	16DIO5	ISP Channel 16: Digital input/output 5
C31	16DIO7	ISP Channel 16: Digital input/output 7
C32	GND	Ground

Table 5: ISP Device Connector Signals (Channels 9..16) – slave board ISP connector (type C/2)

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Programming system sizes

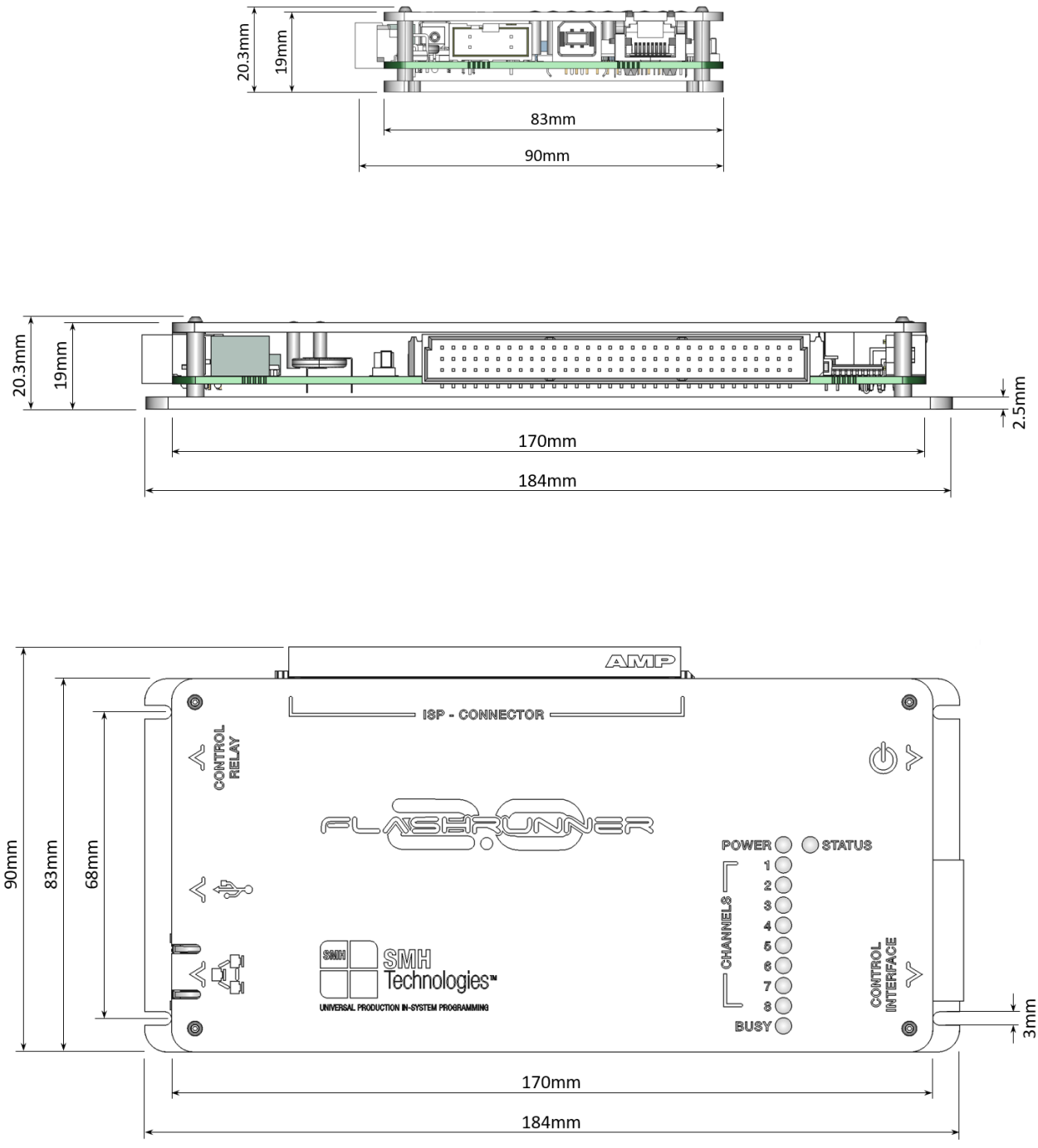


Figure 18: FlashRunner 2.0 - 8-channels programming system – sizes

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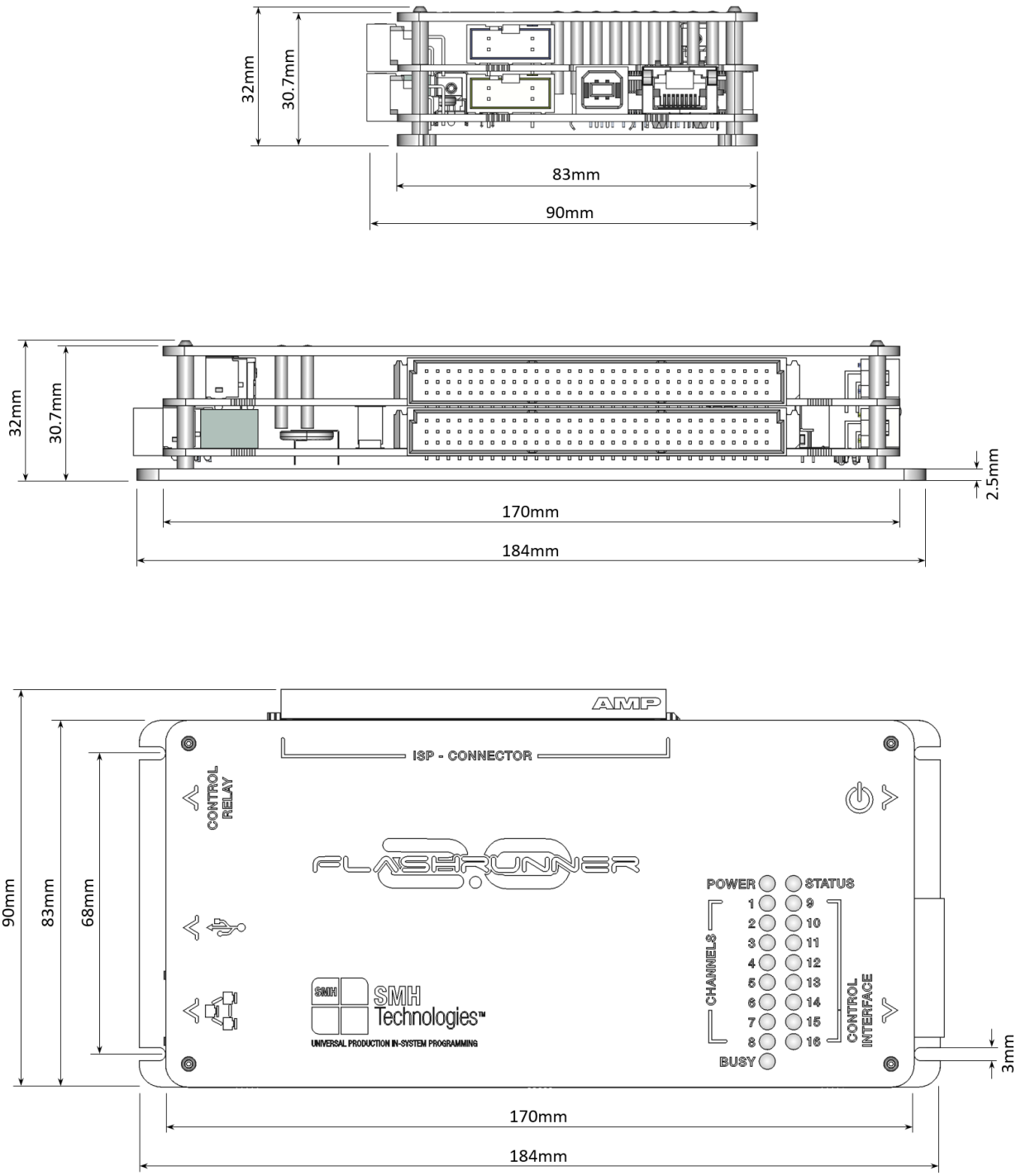


Figure 19: FlashRunner 2.0 - 16-channels programming system – sizes

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Programming system package checklist

Qty.	Description
1	FlashRunner 2.0 programming system: FR2P0-4CH or FR2P0-8CH
1	15V 60W AC/DC Wall Switching Power Adapter
1	Ethernet cross cable 2 meter RJ45
1	USB type-A cable 1.8 meter
1	FlashRunner 2.0 Quick start guide
1	3-Year Warranty sheet
1	DC10860 – FlashRunner 2.0 Drilling template to fix - leaflet
1	DC10876 – FlashRunner 2.0 Drilling template to fix - leaflet
1	DC10877 – FlashRunner 2.0 Drilling template to fix - leaflet
1	DC10878 – FlashRunner 2.0 tools - leaflet

Table 6: FlashRunner 2.0 – up to 8 channels programming system package checklist

Qty.	Description
1	FlashRunner 2.0 programming system: FR2P0-12CH or FR2P0-16CH
1	15V 90W AC/DC Wall Switching Power Adapter
1	Ethernet cross cable 2 meter RJ45
1	USB type-A cable 1.8 meter
1	FlashRunner 2.0 Quick start guide
1	3-Year Warranty sheet
1	DC10860 – FlashRunner 2.0 Drilling template to fix - leaflet
1	DC10876 – FlashRunner 2.0 Drilling template to fix - leaflet
1	DC10877 – FlashRunner 2.0 Drilling template to fix - leaflet
1	DC10878 – FlashRunner 2.0 tools - leaflet

Table 7: FlashRunner 2.0 – up to 16 channels programming system package checklist

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Programming system technical specifications

Absolute Maximum Ratings

Parameter	Value
Power Connector	
Supply voltage on line POWER (reference GND)	+16V
Control Connector	
Maximum input voltage on lines START, SEL[4..0]	-2V to +10V
Maximum current on lines BUSY, PASS/FAIL_CH[1..16]	±10mA
ISP Connectors	
Maximum input voltage on lines DIO	-0.5V to +6.5V
Maximum current on lines DIO	±50mA
Maximum current on the VPROG0 line	250 mA
Maximum current on the VPROG1 line	200 mA
Relays Control Connector	
Coil Supply Voltage	50V
Max Collector Current per Channel	500mA

Table 8: FlashRunner 2.0 – Absolute maximum ratings

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DC Characteristics and Functional Operating Range

Parameter	Condition	Value		
		Min	Typ	Max
Power Connector				
Supply voltage		14.8V	-	15.5V
Power consumption 8CH		-	-	5A
Power consumption 16CH		-	-	8A
Control Connector				
V_{IL} (input low voltage) on lines START, SEL[4..0]		0V	-	0.8V
V_{IH} (input high voltage) on lines START, SEL[4..0]		2.4V	-	15V
V_{OL} (output low voltage) on lines BUSY, PASS/FAIL_CH[1..16]	I_{OL} = 4mA	-	-	0.8V
V_{OH} (output high voltage) on lines BUSY, PASS/FAIL_CH[1..16]		4.5V	-	5.5V
Relay Control Connector				
Coil Supply Voltage			12V	50V
Collector Current per Channel				500mA
VCE(sat)	ICOIL = 200mA		1V	1.3V
ISP Connectors				
V_{IL} (input low voltage) on lines DIO		-	-	$0.3V_{PROG0}$
V_{IH} (input high voltage) on lines DIO	Configured as digital lines	$0.7V_{PROG0}$	-	V_{PROG0}
V_{OL} (output low voltage) on lines DIO, CLKOUT	Configured as digital lines, V_{PROG0} = 3V, I_{OL} = 12mA	-	-	0.36V
V_{OH} (output high voltage) on lines DIO, CLKOUT	Configured as digital lines, V_{PROG0} = 3V, I_{OH} = 12mA	2.56V	-	-
V_{OL} (output low voltage) on lines DIO, CLKOUT	Configured as digital lines, V_{PROG0} = 5.5V, I_{OL} = 24mA	-	-	0.36V
V_{OH} (output high voltage) on lines DIO, CLKOUT	Configured as digital lines, V_{PROG0} = 5.5V, I_{OH} = 24mA	4.86V	-	-
I_{OH} current (source) on lines DIO	Configured as input with active pull-ups	-	3.8mA	-
VPROG0 output voltage		1.65V	-	5.5V
VPROG0 current (source)		-	-	250mA
VPROG1 output voltage		6.0V	-	13.5V
VPROG1 current (source)		-	-	200mA

Table 9: FlashRunner 2.0 – DC Characteristics and Functional Operating Range

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AC Characteristics

Parameter	Condition		Value		
			Min	Typ	Max
t_{RISE} on DIO lines when configured as digital output push-pull	V_{PROG0} = 1.8V	Load: 2KΩ//15pF	2.1ns	-	15.5ns
	V_{PROG0} = 3.3V		0.7ns	-	5.8ns
	V_{PROG0} = 5V		0.7ns	-	4.4ns
t_{FALL} on DIO lines when configured as digital output push-pull	V_{PROG0} = 1.8V	Load: 2KΩ//15pF	2ns	-	12.6ns
	V_{PROG0} = 3.3V		0.8ns	-	5ns
	V_{PROG0} = 5V		0.7ns	-	4ns
t_{RISE} on line VPROG0	V_{PROG0} = 0-1.8V	Load: 15Ω//10mF	-	10ms	-
	V_{PROG0} = 0-3.3V	Load: 22Ω//10mF	-	15ms	-
	V_{PROG0} = 0-5.5V	Load: 22Ω//10mF	-	20ms	-
t_{FALL} on line VPROG0	V_{PROG0} = 1.8-0V	Load: 10mF	-	300ms	-
	V_{PROG0} = 3.3-0V		-	350ms	-
	V_{PROG0} = 5.5-0V		-	350ms	-
t_{RISE} on line VPROG1	V_{PROG1} = 0-3V	Load: 10Ω//1mF	-	1.3ms	-
	V_{PROG1} = 0-5V	Load: 47Ω//1mF	-	1.8ms	-
	V_{PROG1} = 0-13.5V	Load: 94Ω//1mF	-	13ms	-
t_{FALL} on line VPROG1	V_{PROG1} = 3-0V	Load: 1mF	-	18ms	-
	V_{PROG1} = 5-0V		-	30ms	-
	V_{PROG1} = 13.5-0V		-	45ms	-

Table 10: FlashRunner 2.0 – AC Characteristics

Physical and Environmental Specifications

Parameter	Value
Operating temperature	0-50°C
Operating humidity	90% max (without condensation)
Storage temperature	0-70°C
Storage humidity	90% max (without condensation)
EMC (EMI/EMS)	CE, FCC

Table 11: FlashRunner 2.0 – Physical and Environmental Specifications

Note: *Keep FlashRunner 2.0* ***always in a well-ventilated area*** *in order to prevent product overheating, which could affect product performances and, if maintained for long time, it could damage product hardware components.*

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Programming system setup

The present section explains how to set up FlashRunner 2.0 for the first time from a software and hardware point of view. In the following, **it gives some fundamental directions on how to manage correctly the software update in a production environment**.

Workbench Graphical User Interface (GUI)

FlashRunner 2.0 Workbench GUI offers several fundamental features to set up quickly the programming system according to the project requirements:

- check projects features through the **Project Setup** tab;
- run projects through the **Production Control** tab;
- create a new project using the wizard application to be guided in device selection, protocol parameters selection, ISP channels management, user data selection, programming phases and parameters choice;
- modify an existing project through the wizard application or manual **Project Editor** tab;
- open a previously created project;
- user data management to be guided in a proper programming data generation according to the device memory map;
- discover the programming system ISP connector pinout according to the current project;
- explore, upload and download data stored into the programming system (projects, user data, device drivers, licenses, log files,…);
- send commands through text terminal;
- check programming system time-stamped activities through Real-Time Log;
- setup Cybersecurity features through **Cyber Security** tab.

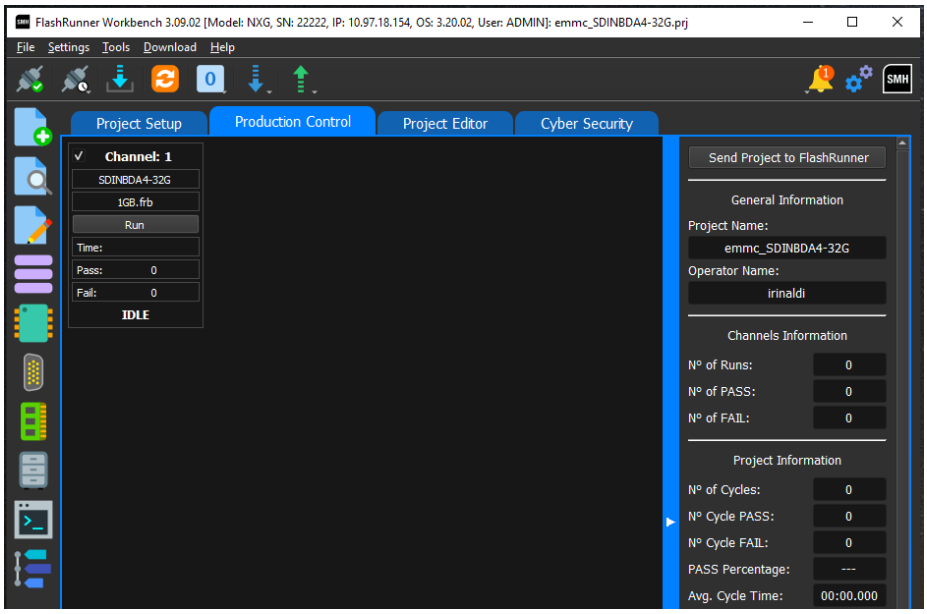


Figure 20: FlashRunner Workbench Graphical User Interface (GUI)

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Workbench GUI application can be used when the programming system is connected to a host-system such as a PC system through LAN Ethernet or USB-UART interface in **host mode**.

The programming system can be driven also through the Control Interface in **stand-alone mode**. Projects previously defined and stored into the programming system, together with their user data, can be easily triggered. Morover, the results of the programming sequence can be detected in a concise manner.

Please refer to FlashRunner 2.0 Programmer's Manual for further details.

Hardware setup

Please follow the steps below to set up FlashRunner 2.0 programming system:

- interface FlashRunner 2.0 with the target devices (i.e. devices to be flashed);
- connect FlashRunner 2.0 to a host system (host mode);
- power up FlashRunner 2.0;
- setting up LAN Ethernet or USB-UART of the programming system.

Interface FlashRunner 2.0 with the target device

Build the required ISP cables to establish a connection between FlashRunner 2.0 ISP connectors and the target devices. The best way to discover the ISP connectors pinout is through the Pin Map tool of the Workbench GUI software application (working also when the programming system is not connected). Moreover, similar information regarding this matter can be spotted in the ISP connectors section of this document and on the Project Setup tab of the Workbench GUI software application.

Note: *connect very carefully communication lines, ground references and power supply lines of target devices and boards; an incorrect connection of the devices can cause a severe damage both to the customer's hardware and to the programming system.*

Connecting to a host system

Assuming to employ the programming system in host mode, we can connect FlashRunner 2.0 to a host system, such as a PC system, through USB-UART interface or LAN Ethernet interface. The connectors used have been already described in the Hardware overview section. Moreover, the proper cables are included into the programming system package.

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Power up the programming system

Using the included power supply adapter and cable, provide the power supply to the programming system. Please refer to the Hardware overview for further details.

Setting up connection parameters

To connect the programming system through LAN Ethernet connection, use the **factory default IP address 192.168.1.100**, or, if it is unknown, configure it through the USB-UART connection following the below steps:

- connect the programming system to the host system through USB-UART interface using the included USB cable;
- open the Workbench GUI;
- open Workbench Settings window clicking on Settings/Settings;
- chose Serial as FlashRunner Connection Type and chose the proper Com Port;
- close Workbench Settings window clicking OK;
- connect the host system to the programming system clicking the button 
- open the Terminal window and click on the SETIP button;
- insert the proper network parameters and wait for the automatic system reboot;

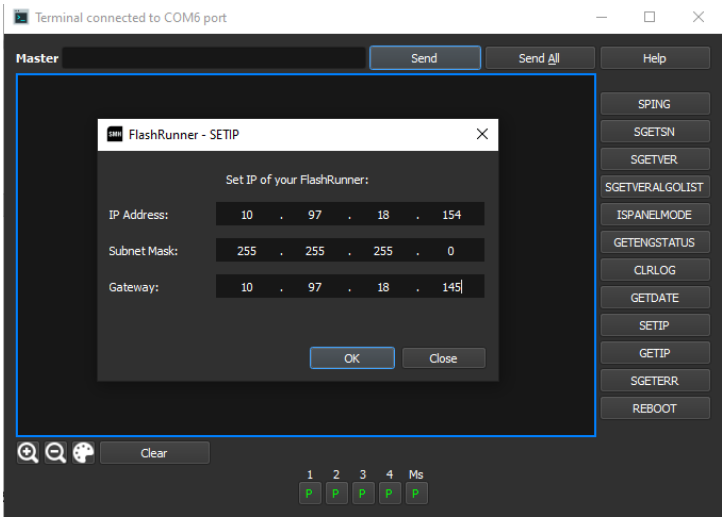


Figure 21: FlashRunner Workbench Graphical User Interface (GUI) – SETIP function

- once the system has completed the reboot, open Workbench Settings window clicking on Settings/Settings;
- chose LAN as FlashRunner Connection Type and chose the proper LAN IP address;
- close Workbench Settings window clicking OK;
- connect the host system to the programming system clicking the button 

Please refer to FlashRunner 2.0 Programmer's Manual for further details.

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Software update in production environment

FlashRunner 2.0 programming systems employ a comprehensive set of software packages, also known as **Operating System**, to guarantee the programmer's general operations and several **Device Drivers**, also known as algorithm**,** to support the specific communication protocols and devices.

Operating System and Device Drivers evolve in order to introduce new features and parameters, to increase performance in terms of programming speed and, although rarely, to correct inaccuracies in the previous versions. When such software packages are updated, the new software released is subjected to in-depth testing procedures using several ISP devices that well represents those available in the relevant device class to that device driver. The new software is therefore released with the guarantee of having tested the updated software along substantial number of hardware configurations with complete coverage of the configuration parameters.

Please consider that the software is used on a hardware system (i.e. programming system, integration wiring and connections, bed of nails) that is only partially controlled by SMH Technologies. Infact the programming setup implemented by the customer, fully verified and validated by the customer itself, is rarely disclosed and cannot be replicated by SMH Technologies.



If the customer decides, for any reasons, to update the programming system software (i.e. operating system, device drivers) in a already verified and validated hardware/software configuration, **the customer must proceed on its own with a new verification and validation procedure**.

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Programming system optional tools

FlashRunner 2.0 programming system is an advanced and comprehensive platform including, beside the 8-channel and 16-channel programming solutions, a wide portfolio of optional tools to add functionalities and to ease the integration inside an overall production machinery. These additional tools can be easily combined to satisfy the project requirements.



Figure 22: FlashRunner 2.0 platform – endless possible combinations

The flexibility in the combination of the different functionalities is guaranteed by a robust and industrial connection system carried out through DIN41612 connectors properly employed. As we have seen in the previous section dedicated to the ISP connector of the programming system, the ISP device signals, power supplies and ground signals related to the multi-channel interface are conveyed on a DIN41612 96-position 3-row 2.54mm pitch connector.

To guarantee the mix and match of the different modules:

- the *output* connectors are always male connectors with the same pinout corresponding to the programming system pinout (please refer to the table related to ISP connector of the programming system);
- the *input* connectors are always female connectors with a pinout compliant with the programming system pinout.

Identifying *output* and *input* connectors when the conveyed signals are mostly bidirectional is not straightforward and can be misleading. Please consider as *output* connectors that ones towards the DUTs and as *input* connectors that ones towards the programming system.

Note on DIN41612 connectors: The use of these connectors implies that the pin assignment of a possible type C/2 male connector (e.g. ISP connectors of the programming system) will be mirrored over the rows with respect to the pin assignment of the R/2 female connector. Therefore, pin A1 of the C/2 male will correspond to A32 on the R/2 female, B1 will correspond to B32 and so forth.

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Cable Interface

FlashRunner 2.0 Cable Interface allows to connect up to 8, 16 or 32 device interfaces to DUTs through SMH Technologies flat cables (FRCABLE) and breakout boards for wire wrapping helping to maintain a good signal integrity. Cable Interface 8-channel and 16-channel are designed to be combined respectively to FlashRunner 2.0 8-channel and 16-channel. Cable Interface 32-channel is specifically designed to be combined with FlashRunner Demultiplexing system 16 channels to 32 channels.

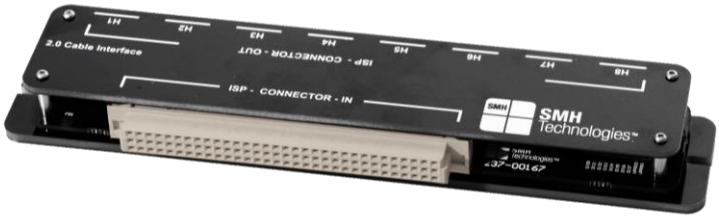


Figure 23: FlashRunner 2.0 – 8 channels – Cable Interface



Figure 24: FlashRunner 2.0 – 16 channels – Cable Interface



Figure 25: FlashRunner 2.0 – 32 channels demultiplexing system – Cable Interface

Description	Part Number
FlashRunner 2.0 Cable Interface - 8 channels	FR2P0INTF08
FlashRunner 2.0 Cable Interface - 16 channels	FR2P0INTF16
FlashRunner 2.0 Cable Interface - 32 channels demultiplexing system	FR2P0INTF32

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Connector towards programming system

DIN41612 connector, 96-position, 3-row, 2.54mm pitch, female, right-angle, type R/2
Part-number: Amphenol 86093968813755V1LF

ISP connectors towards DUTs

Right-angle 20-pin 2-row 1.27mm pitch
Part-number: CNC Tech 3220-20-0200-00
Mating connector: CNC Tech 3230-20-0102-00

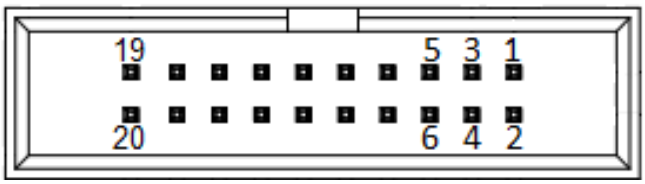


Figure 26: FlashRunner 2.0 Cable Interface ISP connector pinout

Please refer to the following table for the connector pinout definition.

Pin #	Signal Name	Input/Output or Power	Description
1	DIO0	I/O	Digital Input-Output 0
2	GND	-	Ground – GND
3	DIO1	I/O	Digital Input-Output 1
4	GND	-	Ground – GND
5	DIO2	I/O	Digital Input-Output 2
6	GND	-	Ground – GND
7	DIO3	I/O	Digital Input-Output 3
8	GND	-	Ground – GND
9	DIO4	I/O	Digital Input-Output 4
10	GND	-	Ground – GND
11	DIO5	I/O	Digital Input-Output 5
12	GND	-	Ground – GND
13	DIO6	I/O	Digital Input-Output 6
14	GND	-	Ground – GND
15	DIO7	I/O	Digital Input-Output 7
16	GND	-	Ground – GND
17	VPROG0	P	Programmable Voltage 0 – VP0
18	GND	-	Ground – GND
19	VPROG1	P	Programmable Voltage 1 – VP1
20	GND	-	Ground – GND

Table 12: FlashRunner 2.0 Cable Interface – connectors pinout

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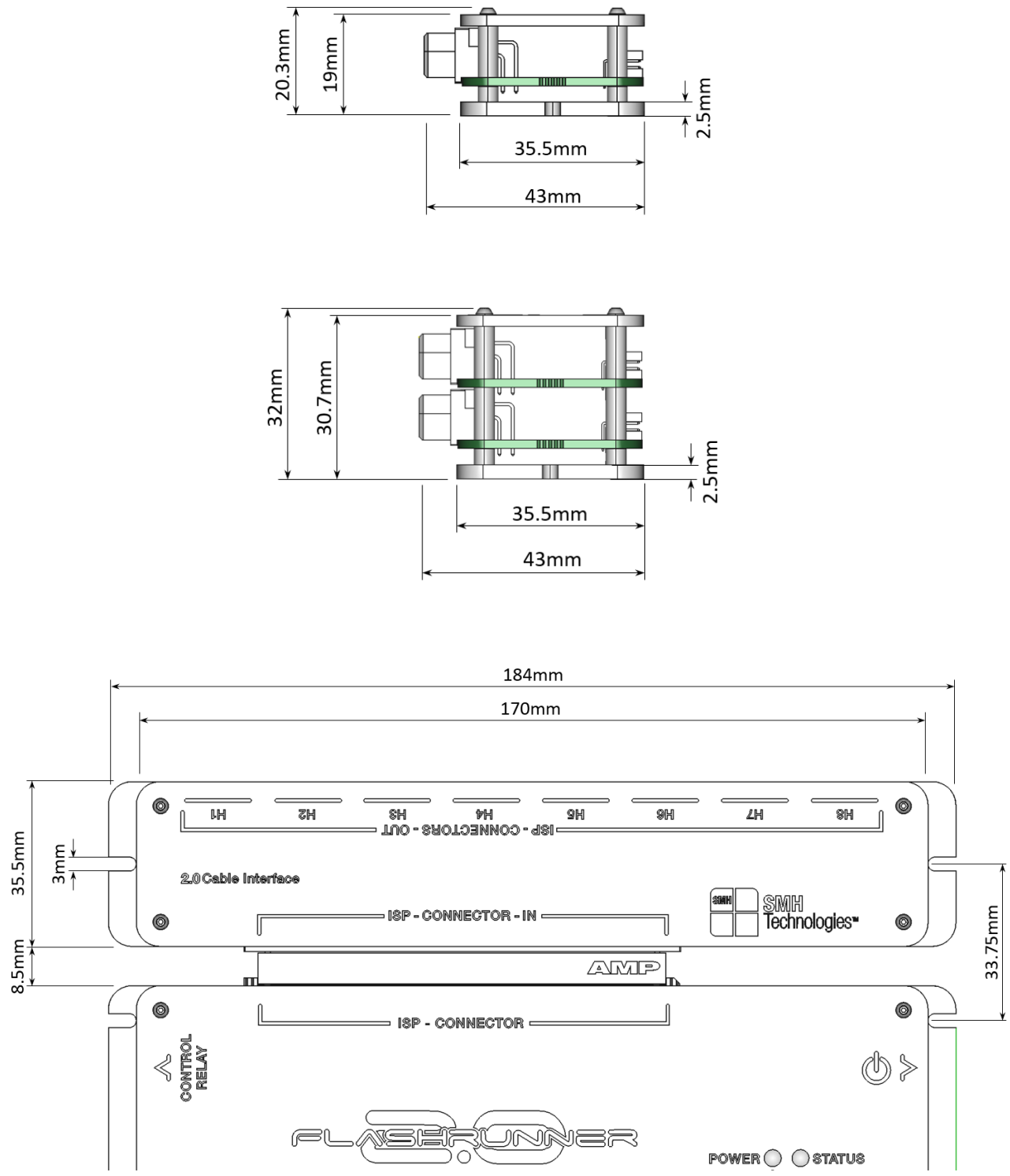


Figure 27: FlashRunner 2.0 Cable Interface – sizes

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Communication cables and breakout boards

SMH Technologies provides also **communication cables** and **breakout wire wrapping boards**, specifically chosed and designed to be used with Cable Interfaces and other products of the FlashRunner 2.0 family. Moreover, these additional tools shall be conveniently used to preserve as much as possible the signal quality especially when a long communication path is needed.

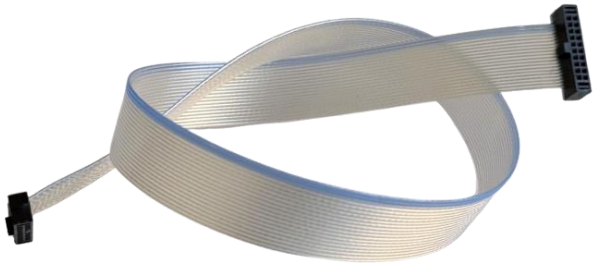


Figure 28: FlashRunner 2.0 Cable Interface – special communication cable

Description	Part Number
FlashRunner ISP special communication cable - 30 cm	FRCABLE30
FlashRunner ISP special communication cable - 50 cm	FRCABLE50
FlashRunner ISP special communication cable - 80 cm	FRCABLE80
FlashRunner ISP special communication cable - 100 cm	FRCABLE100

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The following breakout board can be connected directly to the special communication cables and provides all the signals related to a single programmer channel to a DB15 connector (FlashRunner traditional line -compliant pinout) or to a wire wrapping header.

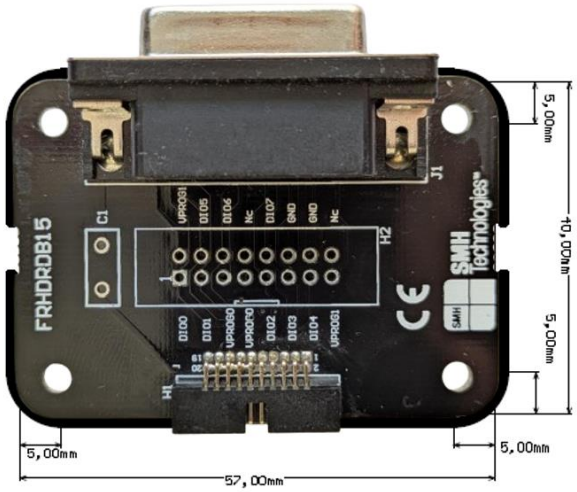


Figure 29: FlashRunner 2.0 – wire wrapping breakout board for a single programming channel

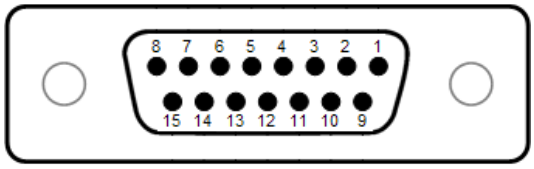


Figure 30: FlashRunner 2.0 wire wrapping breakout board for a single programming channel - DB15 connectors pinout

Pin #	Signal Name	Input/Output or Power	Description
1	DIO0	I/O	Digital Input-Output 0
2	DIO1	I/O	Digital Input-Output 1
3	VPROG0	P	Programmable Voltage 0 – VP0
4	VPROG0	P	Programmable Voltage 0 – VP0
5	DIO2	I/O	Digital Input-Output 2
6	DIO3	I/O	Digital Input-Output 3
7	DIO4	I/O	Digital Input-Output 4
8	VPROG1	P	Programmable Voltage 1 – VP1
9	VPROG1	P	Programmable Voltage 1 – VP1
10	DIO5	I/O	Digital Input-Output 5
11	DIO6	I/O	Digital Input-Output 6
12	NC	-	
13	DIO7	I/O	Digital Input-Output 7
14	GND	-	Ground – GND
15	GND	-	Ground – GND

Table 13: FlashRunner 2.0 wire wrapping breakout board for a single programming channel - DB15 connectors pinout

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A further model of breakout board supporting up to 8 programming channel is shown in the below picture. It can be connected directly to the special communication cables and provides all the signals related to 8 programmer channels. Version with 4 programming channels is also available.

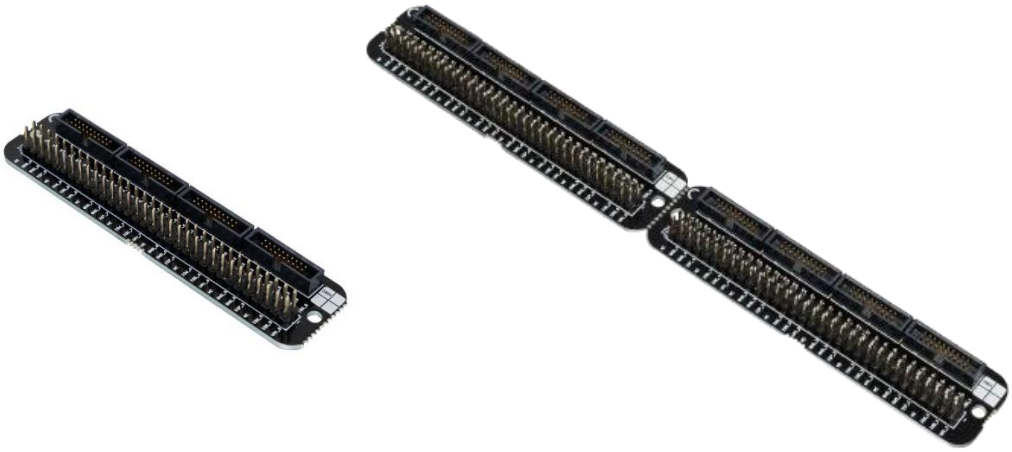


Figure 31: FlashRunner 2.0 wire wrapping breakout board for 4 or 8 programming channels

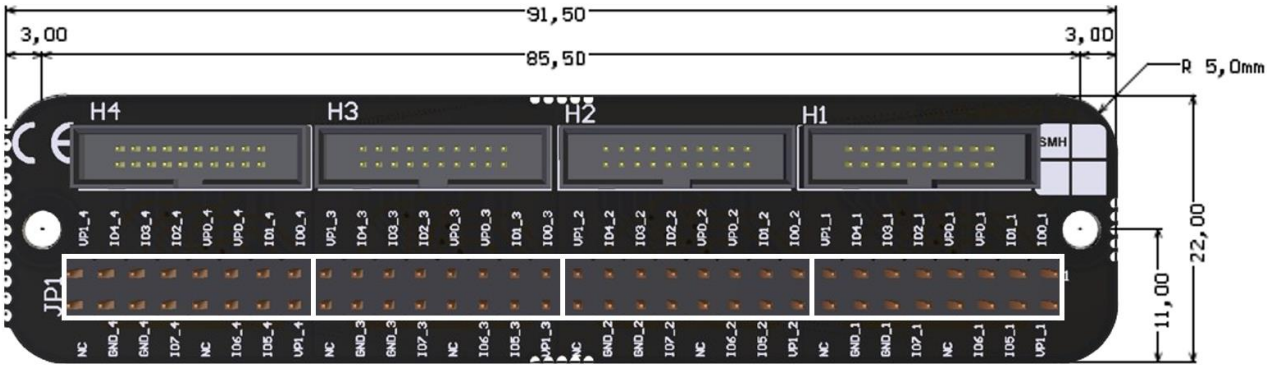


Figure 32: FlashRunner 2.0 wire wrapping breakout board for 4 programming channels – pinout

Wire wrapping header pinout is reported on the PCB silkscreen where IO stands for DIO, VP stands for VPROG and the number following the underscore symbol is the number *n* of the channel correnspondig to the 20-position connector H*n* (e.g. for H1 connector: IO0_1 = DIO0, …, IO7_1 = DIO7, VP0_1 = VPROG0, VP1_1 = VPROG1).

Description	Part Number
FlashRunner 2.0 – Breakout wire wrapping board with DB15 – 1 channel	FRHDRDB15
FlashRunner 2.0 – Breakout wire wrapping board – 4 channel	FR2P0HDRPSTR4
FlashRunner 2.0 – Breakout wire wrapping board – 8 channel	FR2P0HDRPSTR8

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Relay Barrier

FlashRunner 2.0 Relay Barrier gives the chance to separate the programmer lines and the ISP programmable devices (DUTs) when other operations such as In-Circuit Test procedures are carried out by the machinery.

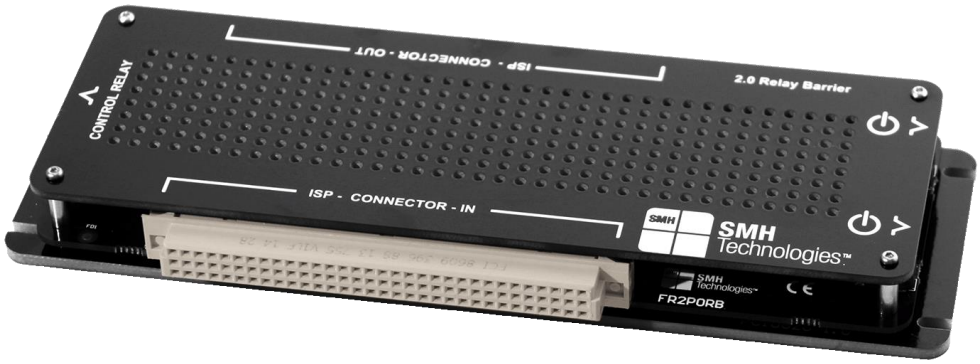


Figure 33: FlashRunner 2.0 – 8 channels – Relay Barrier



Figure 34: FlashRunner 2.0 – 16 channels – Relay Barrier

Description	Part Number
FlashRunner 2.0 Relay Barrier - 8 channels	FR2P0RB08
FlashRunner 2.0 Relay Barrier - 16 channels	FR2P0RB16

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Power supply connection

Relay Barrier shall be powered by connecting the 15 V supply adapter to supply input on the right side (please consider to provide power to both master board and slave board of the system in case of FlashRunner 2.0 Relay Barrier with 16 channels). The power connector is the same of FlashRunner 2.0 programming system. Each board (i.e. master and slave) of the Relay Barrier is equipped with two electrically connected supply connectors to provide power, in cascade mode, also to FlashRunner 2.0 programming system or to another board of the Relay Barrier as shown in the below pictures. Proper power jumper cables shall be provided together with the Relay Barrier.



Figure 35: FlashRunner 2.0 - 8 channels with Relay Barrier – power supply connection



Figure 36: FlashRunner 2.0 - 16 channels with Relay Barrier – power supply connection



Figure 37: FlashRunner 2.0 - Relay Barrier power jumper cable

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Relay Barrier is normally open, separating programmer's lines and ISP programmable devices.

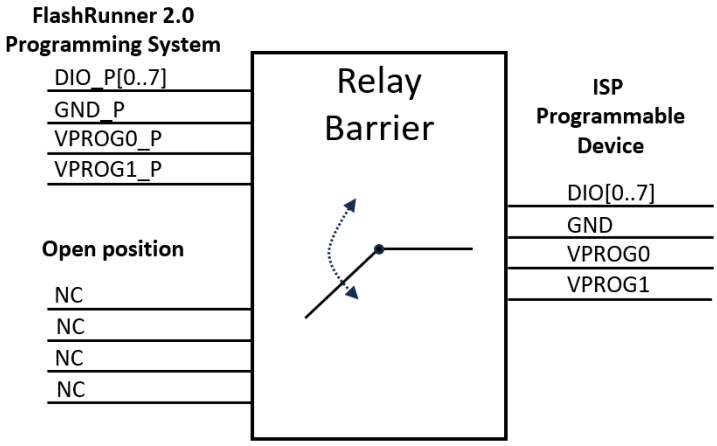


Figure 38: FlashRunner 2.0 Relay Barrier – operating scheme

Relay device part-number: Omron DPDT G6K-2F-Y-DC12

With the command RLYCLOSE (please check FlashRunner 2.0 Programmer's Manual for more details) the specific channel is activated and the current can flow through the external relay coils closing the relay. The command RLYOPEN stops the current flow releasing the relays.

RLYOPEN command

the relay switches go in the (normally) OPEN position
the **ISP device connector lines of the barrier are connected to the auxiliary connector**

RLYCLOSE command

the relay switches go in the CLOSED position
the **ISP device connector lines are connected to the programming system lines**

Relay Barrier control connection

Relay Barrier commands are provided by the Relay Barrier Control connector of FlashRunner 2.0 programming system to the Control connector on the Relay Barrier (please consider to connect both master board and slave board in case of FlashRunner 2.0 Relay Barrier with 16 channels by linking the corresponding levels of the system). Proper Control connector flat cables shall be provided together with the Relay Barrier.

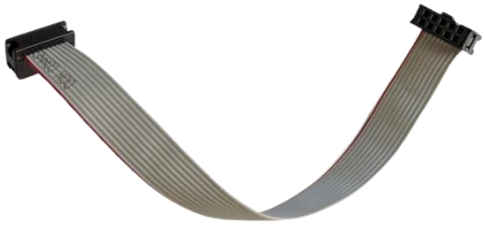


Figure 39: FlashRunner 2.0 Relay Barrier – Control connector flat cable

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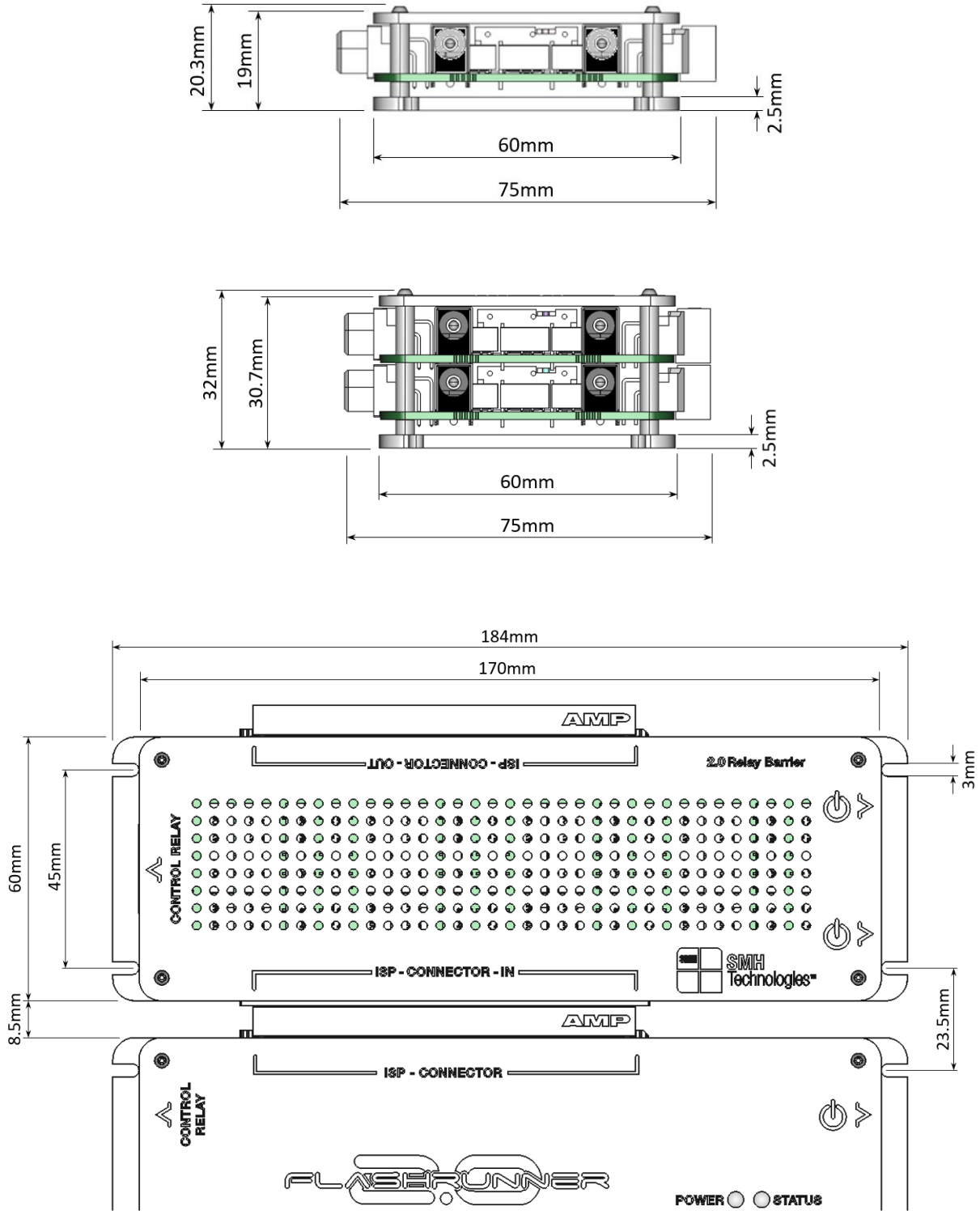


Figure 40: FlashRunner 2.0 - 8-channels with Relay Barrier – sizes

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Connector towards programming system

ISP connector towards the programming system (named ISP – CONNECTOR – IN on the cover layer) is a DIN41612 96-position right-angle female connector (type R/2) perfectly matching with the corresponding connector on the programming system.

DIN41612 connector, 96-position, 3-row, 2.54mm pitch, female, right-angle, type R/2
Part-number: Amphenol 86093968813755V1LF

ISP connectors towards DUTs

ISP connector towards the DUTs (named ISP – CONNECTOR – OUT on the cover layer) is a DIN41612 96-position right-angle male connector (type C/2) identical to that one mounted on the programming system and with exactly the same pinout.

DIN41612 connector, 96-position, 3-row, 2.54mm pitch, male, right-angle, type C/2
Part-number: Harting 09031967921 or TE connectivity 5536010-5 or similar

FlashRunner 2.0 Relay Barrier 8-channel is equipped with one *input* connector (channel 1 to channel 8) and one *output* connector (channel 1 to channel 8). FlashRunner 2.0 Relay Barrier 16-channel is equipped with two *input* connectors (channel 1 to channel 8 and channel 9 to channel 16) and two *output* connectors (channel 1 to channel 8 and channel 9 to channel 16).

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Relay Barrier with auxiliary connector

FlashRunner 2.0 Relay Barrier with auxiliary connector gives the chance to separate the programmer lines and the ISP programmable devices (DUTs) when other operations such as In-Circuit Test procedures are carried out by the machinery.
Relay Barrier is normally open, separating programmer's lines and ISP programmable devices but connecting Auxiliary Connector to DUTs. So the open position of the relay barrier allows a further usage of the ISP communication lines to the DUTs. **FlashRunner 2.0 Relay Barrier with auxiliary connector is available only with 8 channels.** The sizes of the system are exactly the same of the Relay Barrier without the auxiliary connector. Auxiliary connector pin assignment is the same of the ISP connector of the programming system (please refer to the related table).



Figure 41: FlashRunner 2.0 – 8 channels – Relay Barrier with auxiliary connector (pin A1 highlighted in red)

Auxiliary DIN41612 connector: 96-position, 3-row, 2.54mm pitch, female, vertical, type C/2
Part-number: Harting 09032966850 or TE Connectivity 5535043-5

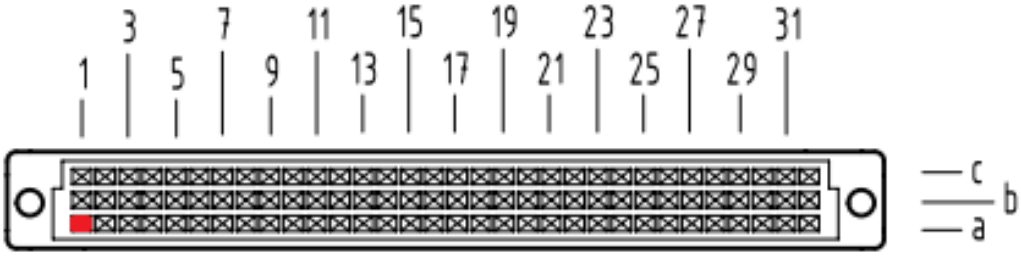


Figure 42: FlashRunner 2.0 – 8 channels – Relay Barrier with auxiliary connector

For *input* and *output* ISP connectors, please refer to previous section related to Relay Barrier.

Description	Part Number
FlashRunner 2.0 Relay Barrier - 8 channels with auxiliary connector	FR2P0RB08_2.0

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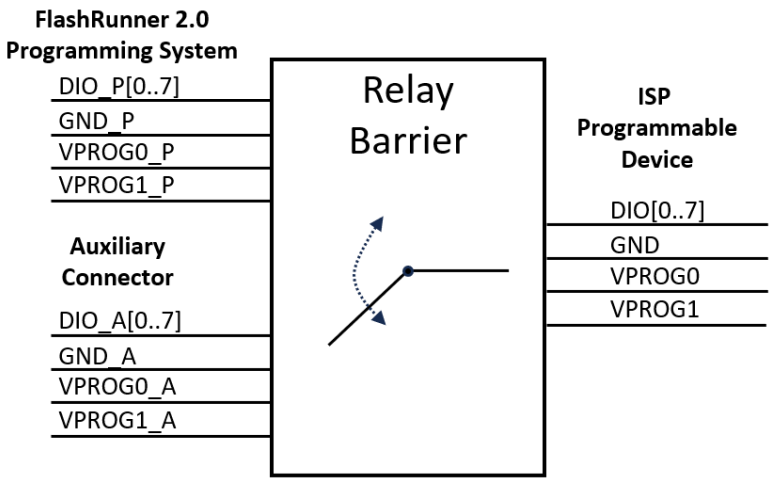


Figure 43: FlashRunner 2.0 Relay Barrier with auxiliary connector – operating scheme

Relay device part-number: Omron DPDT G6K-2F-Y-DC12

With the command RLYCLOSE (please check FlashRunner 2.0 Programmer's Manual for more details) the specific channel is activated and the current can flow through the external relay coils closing the relay. The command RLYOPEN stops the current flow releasing the relays.

RLYOPEN command

the relay switches go in the (normally) OPEN position
the **ISP device connector lines of the barrier are connected to the auxiliary connector**

RLYCLOSE command

the relay switches go in the CLOSED position
the **ISP device connector lines are connected to the programming system lines**

Power supply and Relay Barrier control connection shall be carried out as it is done for Relay Barrier (please refer to the related section).

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Demultiplexing system

FlashRunner 2.0 demultiplexing system allows to duplicate the number of the channels of the programming system connecting the obtained two groups of channels alternatively. The demultiplexing system allows also to separate the programmer lines and the ISP programmable devices (DUTs) working as a Relay Barrier.

Two different models of demultiplexing system are available:

- FlashRunner 2.0 Demux 8 channels to 16 channels for FlashRunner 2.0 with 8 channels;
- FlashRunner 2.0 Demux 16 channels to 32 channels for FlashRunner 2.0 with 16 channels.

The resulting channels (i.e. 16 or 32) are divided into two groups (i.e. 8 + 8 and 16 + 16) that can be activated alternatively. Only the channels part of the same group can be used in parallel and, consequently, the channels part of different groups are activated during different time slots in time division demultiplexing.



Figure 44: FlashRunner 2.0 – Demultiplexing system 16 channels to 32 channels

Description	Part Number
FlashRunner 2.0 Demultiplexing system 8 channels to 16 channels	FR2P0MPX16
FlashRunner 2.0 Demultiplexing system 16 channels to 32 channels	FR2P0MPX32

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ISP connectors towards DUTs

Demultiplexing brings all the signals of each *input* connector (1 to 8 and 9 to 16) on two *output* connectors according to the commands sent to the demultiplexing system and related state. Pinout of the *output* connectors fully compliant with the programming system connector.
DEMUX STATE 0 – communication lines of the programming system are isolated from DUTs
DEMUX STATE 1 – communication lines of the programming system are connected to the first *output* connector (channel 1..8 routed to J1 connector, channel 9..16 routed to J3 connector).
DEMUX STATE 2 – communication lines of the programming system are connected to the second *output* connector (channel 1..8 routed to J2 connector, channel 9..16 routed to J4 connector).

DIN41612 connector, 96-position, 3-row, 2.54mm pitch, female, vertical, type R/2
Part-number: TE connectivity 5650908-5

Power supply connection



Figure 45: FlashRunner 2.0 – Demultiplexing system 16 channels to 32 channels – power supply connection

Demultiplexer shall be powered by connecting the 15V supply adapter to one of the female plug on the right side of the demultiplexer system. The other female plug shall be connected to input power connector of the programming system through the power jumper cable (please refer to Relay Barrier section).

Demultiplexing system control connection

Demultiplexing system control connection shall be carried out as it is done for Relay Barrier (please refer to the related section). The output connector selection is allowed only on a group basis and not on a channel basis as happens for the Relay Barrier. Please refer to FlashRunner 2.0 Programmer's Manual to discover how to manage the Demultiplexing system through SETMUX command.

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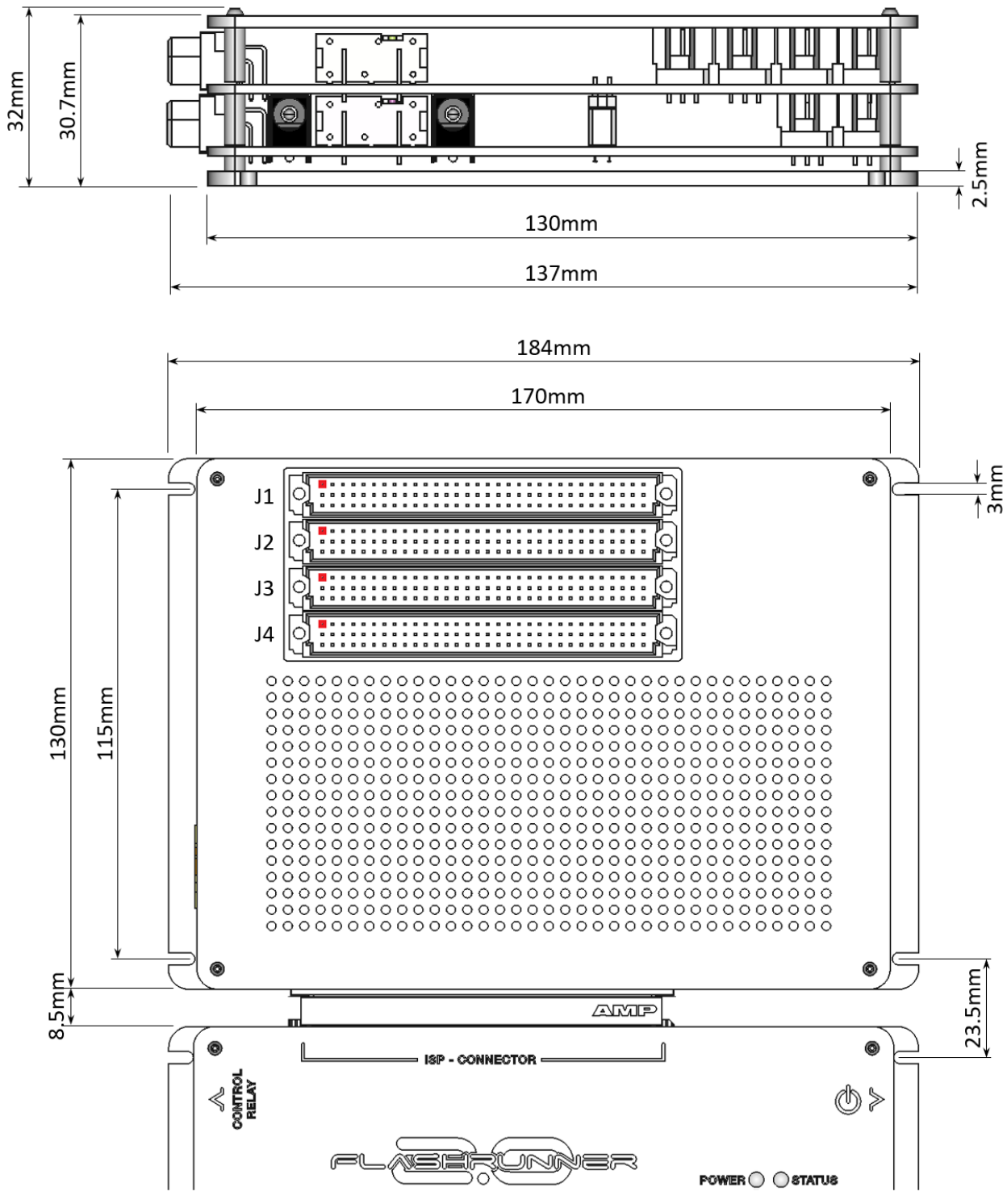


Figure 46: FlashRunner 2.0 – Demultiplexing system 16 channels to 32 channels – sizes (pin A1 highlighted in red)

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A typical application of the Demultiplexing system 16 channels to 32 channels is shown in the following picture. This ensemble include: FlashRunner 2.0 16-channel programming system, Demultiplexiing 16 channels to 32 channels and Cable Interface 32 channels.



Figure 47: FlashRunner 2.0 – 16 channels with Demultiplexing system 16 channels to 32 channels and Cable Interface 32 channels

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ISP Connector Self-Test Board

FlashRunner 2.0 ISP Connector Self-Test Board allows to test the ISP interfaces of the programming system to verify if they are working properly as expected. To carry out the ISP interfaces verification, please start our FlashRunner Workbench GUI application. Run the Hardware Self-Analysis tool (Tools > Miscellaneous > Hardware Self-Analysis) and follow the instructions step by step. At the end of the test procedure, a report window shows the test result and a report file is generated in case of failure conditions on ISP interfaces.

The test can be carried out also inserting the Relay Barrier between FlashRunner 2.0 programming system and Self-Test board allowing to verify also the proper functioning of the relay devices.

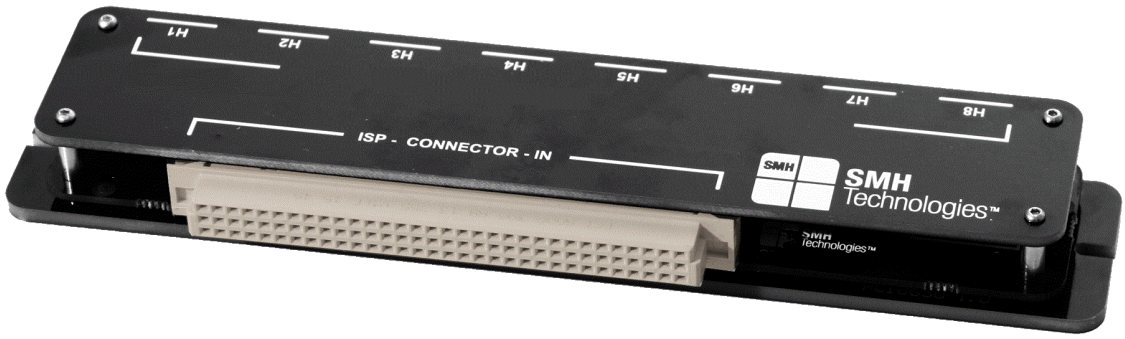


Figure 48: FlashRunner 2.0 – ISP Connector Self-Test Board

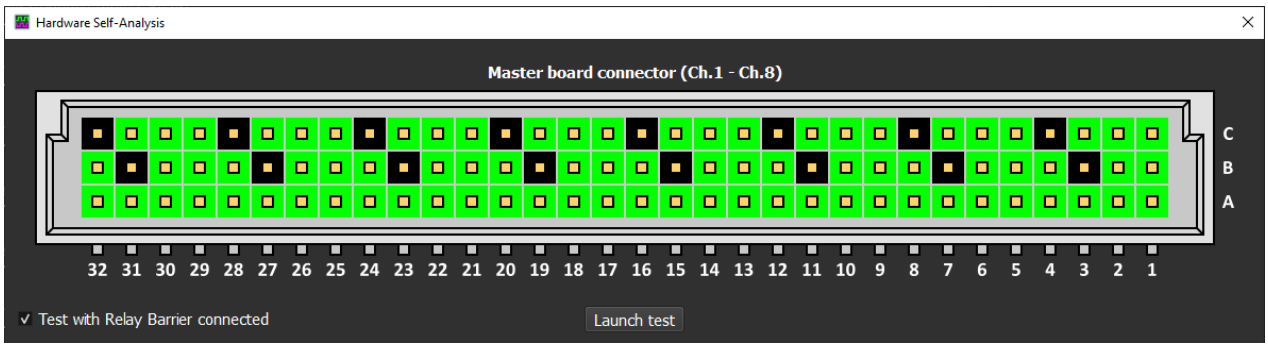


Figure 49: FlashRunner 2.0 – ISP Connector Self-Test Board

Description	Part Number
FlashRunner 2.0 Self-Test board	FR2P0_TB

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Industrial interconnections

The integration of a programming system into a programming machine or tester is not a trivial process if the expected results are to minimize the wiring effort and to get the optimal signal quality and performance. SMH Technologies aims to simplify this operation through several simple and versatile interfacing systems, also known as Junction Box, to integrate its programming system into typical manual or automatic programming machine setup.

The main unit of a programming system, such as FlashRunner 2.0, is usually placed into the test/programming machine to be used more times with different ITAs (Interchangeable Test Adapters) or simply Fixtures. This gives rise to the need of an efficient and compact interconnection system, between test/programming machine Receiver and ITA/Adapter, to provide the needed connections to the Device Under Test or Device Under Programming (DUT/DUP). The solutions provided are certainly a cost-effective and efficient way to bring several signals into the fixture.

Using connectors and cables compliant with previously described FlashRunner 2.0 Cable Interface, SMH Technologies is proud to offer the following interconnection solutions.

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ODU interconnection 4-channel



Figure 50: ODU interconnection – Machine side

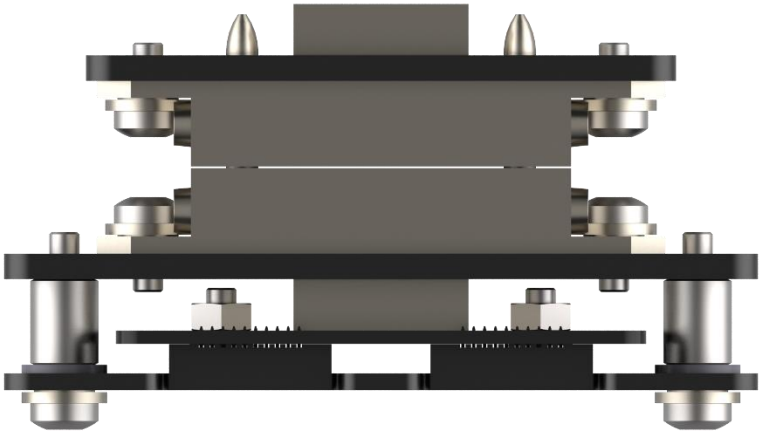


Figure 51: ODU interconnection – Machine side mated with its Fixture side

Description	Part number
ODU interconnection 4-channel – Machine side	JB-ODU4-FLAT20-MAC
ODU interconnection 4-channel – Fixture side	JB-ODU4-FLAT20-FIX

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Pylon Block 170-pin interconnection 8-channel

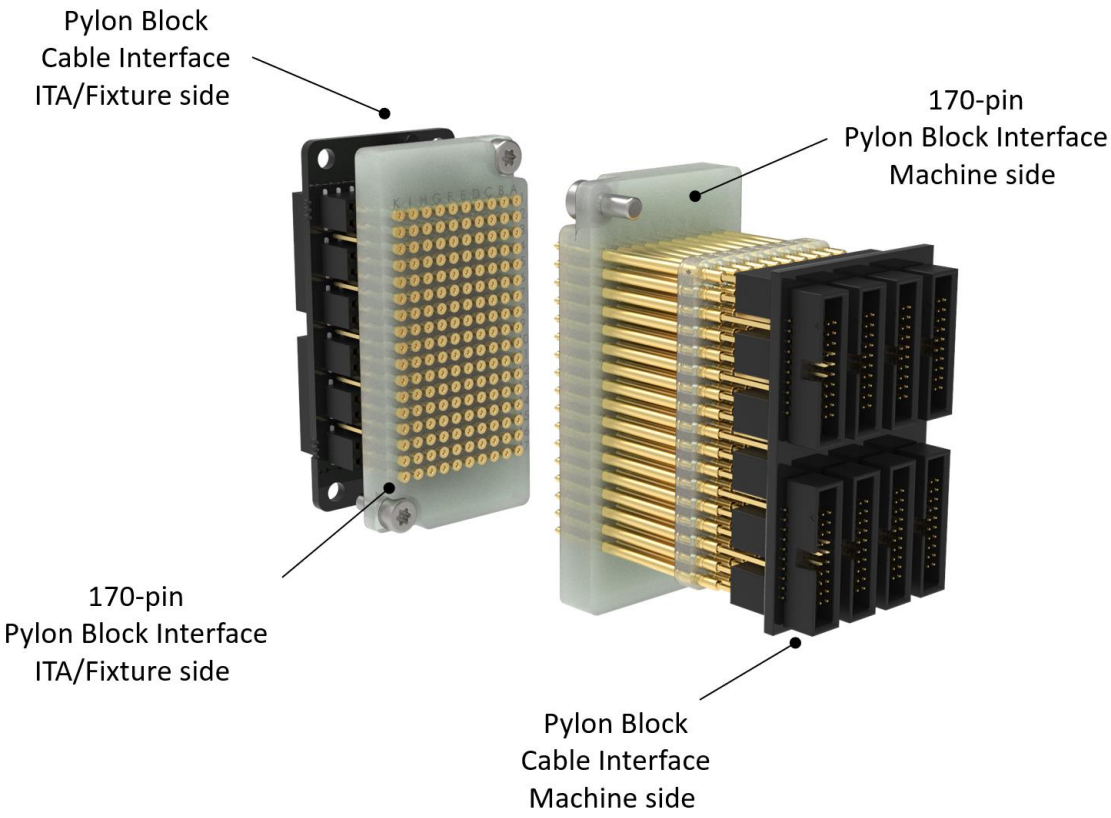


Figure 52: Pylon Block Cable Interface – Machine side and Fixture side

Description	Part number
Signal Receiver Pylon Block – Machine side	JB-PYLON-FLAT20-MAC
Interchangeable Test Adapter Pylon Block - Fixture side	JB-PYLON-FLAT20-FIX

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ODU Blue/Black line Signal Block interconnection 8-channel

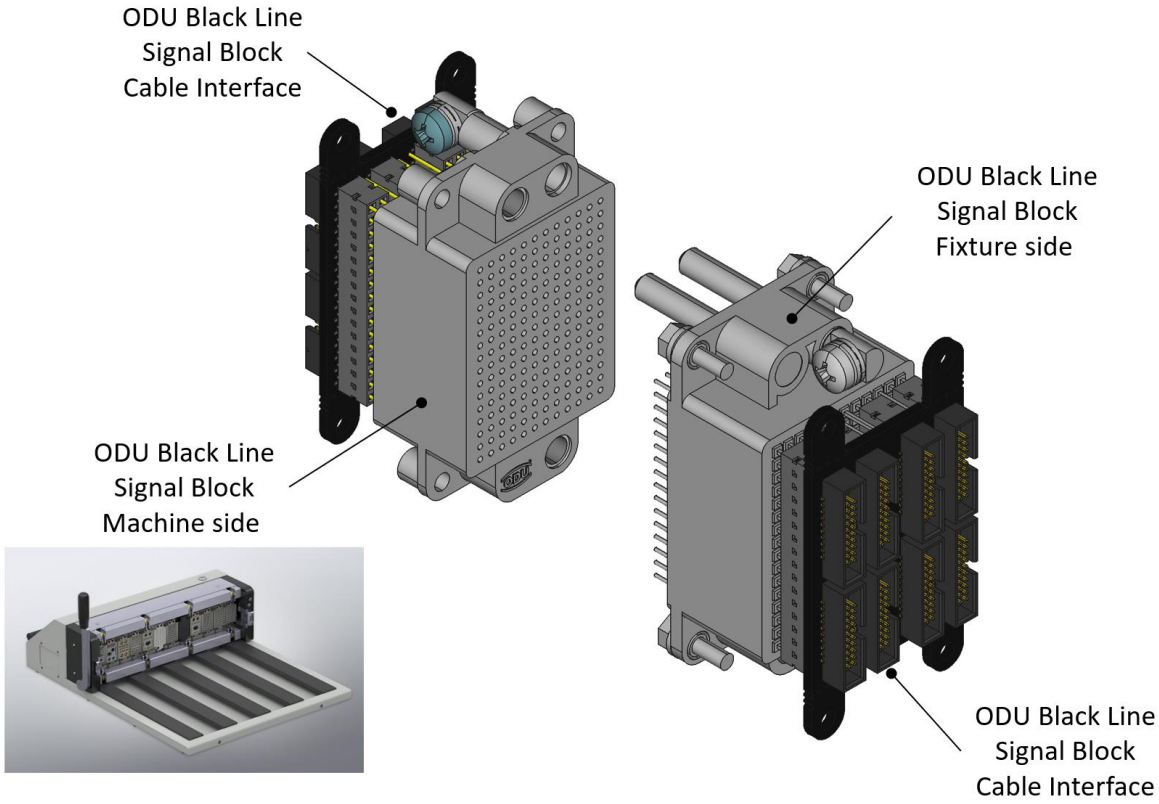


Figure 53: ODU Blue/Black line Signal Block Cable Interface – Machine side and Fixture side

Description	Part number
ODU Blue/Black line Signal Block – Machine/Fixture side	JB-ODU8-SB-FLAT20

Please refer to the specific documentation for further details.

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