Program your MCUs with new FlashRunner LAN 2.0 NXG Relay Barrier with Cable Interface

Application note

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UNIVERSAL PRODUCTION IN-SYSTEM PROGRAMMING

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Introduction

SMH Technologies offers a new Relay Barrier tool dedicated to FlashRunner LAN 2.0 NXG to allow galvanic isolation between the programming system and the Devices Under Test (DUTs) in a typical In-System Programming (ISP) application.

This version of the relay barrier is also equipped with channel connectors fully compliant, in terms of connector type and pinout, with FlashRunner 2.0 Cable Interface. This gives the chance to employ the ensemble between FlashRunner LAN 2.0 NXG and FlashRunner LAN 2.0 NXG Relay Barrier with Cable Interface using all the tools already available for SMH Technologies programming system integration.

In this document, many different integration scenarios are proposed, considering the integration of the programming system inside or outside of the Interchangeable Test Adapter (ITA) commonly referred as fixture. For each setup, several best practice rules are recommended to improve the signal transmission quality and, consequently, the programming performance and efficiency.

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Relay Barrier versions

FlashRunner LAN 2.0 NXG supports up to 4 channels so it allows to interface in parallel up to 4 independent and heterogeneous devices. The customers choose to enable the needed channels (1, 2, 3 or 4) according to their project requirements and, eventually, extend the programming system capabilities, in terms of number of channels, through a simple software license update.

Relay Barrier with Cable Interface is available in two different versions:

- FlashRunner LAN 2.0 NXG Relay Barrier 2-channels
- FlashRunner LAN 2.0 NXG Relay Barrier 4-channels

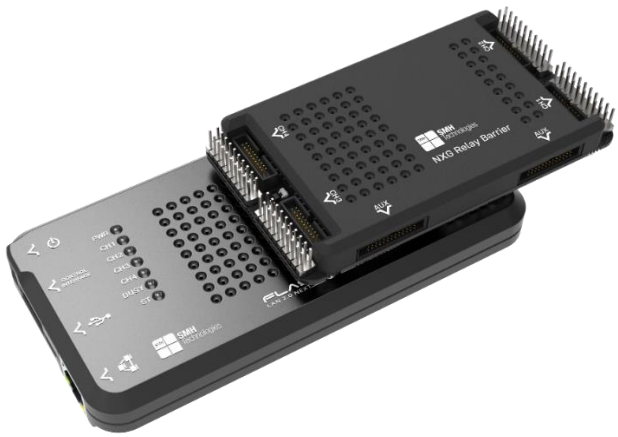

Figure 1: FlashRunner LAN 2.0 NXG Closed Case with 4-channels Relay Barrier

Figure 2: FlashRunner LAN 2.0 NXG Closed Case with 2-channels Relay Barrier

Description	Part Number
FlashRunner LAN 2.0 NXG Relay Barrier with Cable Interface - 2 channels	FRNXGRB02
FlashRunner LAN 2.0 NXG Relay Barrier with Cable Interface - 4 channels	FRNXGRB04

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Relay Barrier operation

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.

Relay Barrier is normally open, separating programmer's lines and ISP programmable devices but connecting Auxiliary Connector to ISP device connector. Relay command and power supply are provided directly through the FlashRunner LAN 2.0 NXG ISP connectors.

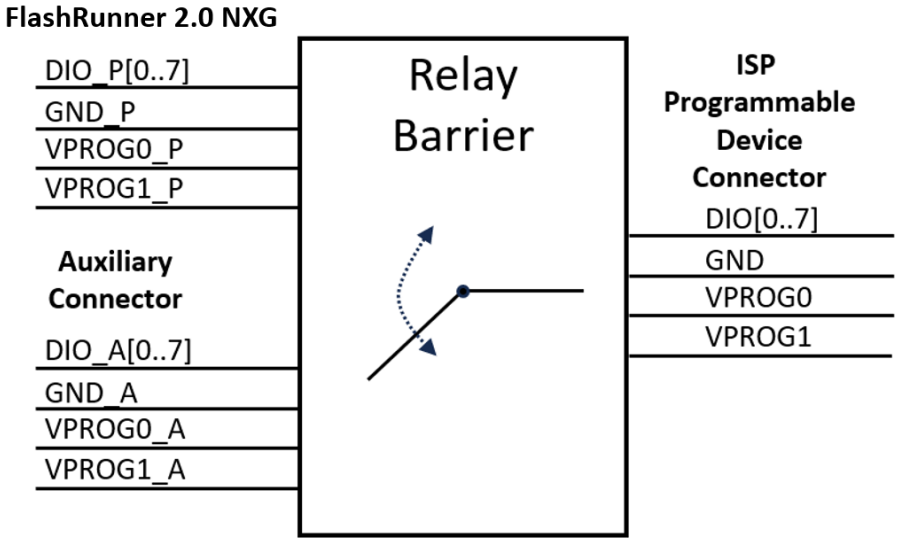

Figure 3: FlashRunner LAN 2.0 NXG Relay Barrier – realy devices operating scheme

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 Active Module line**

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Integration guidelines

Option 1.A – programmer placed on the machinery side – ODU4 interconnection

In this integration setup, the programmer is mounted on the machine side (i.e. outside the fixture) and it is connected to the ODU4 interconnection on the machine side with up to 4 flat cables (FRCABLEs) provided by SMH Technologies. The usage of these cables together with the Cable Interface help to preserve the quality of the signal transmission.

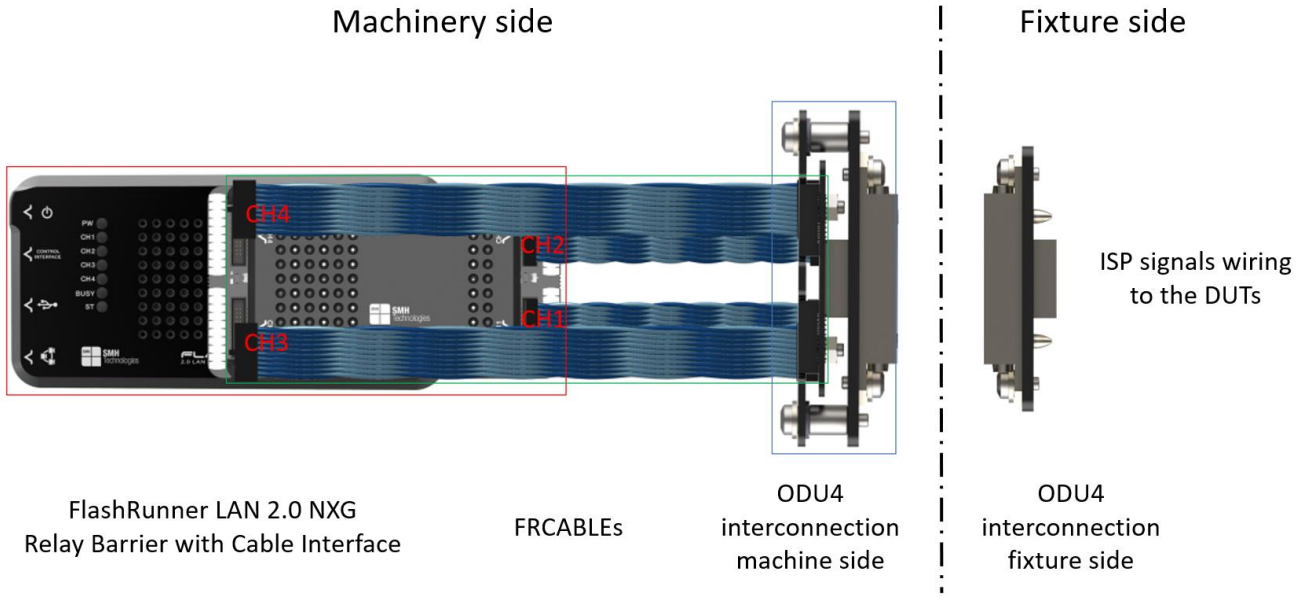

Figure 3: ODU4 integration scheme of a FlashRunner LAN 2.0 NXG with Relay Barrier placed on the machinery side

FRCABLEs are available in several different lengths. The ISP signals and ground references assignment to the flat cable wires makes the **signal propagation very efficient and protected**. According to the basic concepts about signal transmission and, also, to the test conducted, **the shorter is the flat cable, the better is the signal integrity**.

Description	Part Number
Flat cables .025 Flat 30AWG – 30 cm	FRCABLE30
Flat cables .025 Flat 30AWG – 50 cm	FRCABLE50

Figure 4: FlashRunner 2.0 Cable Interface flat cable – FRCABLE

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ODU4 interconnection is designed using a mating couple of ODU MAC-L silver line industrial connector to guarantee a high-performance in terms of signal frequency and maximum mating cycles. **On the machine side**, there is the pin frame connector assembled with an adapter circuit board to allow FRCABLEs plugs direct insertion.

Figure 5: FlashRunner 2.0 ODU4 interconnection – machine side

On the fixture side, there is the socket frame connector prepared to be directly wired to the DUTs. Once the ISP signals are into the ITA/fixture, they are, then, easily brought to the bed of nails (i.e. DUTs) through direct wiring. An **as short as possible and properly ground-twisted connection** inside the fixture is required to preserve an optimal signal integrity.

Figure 6 - FlashRunner 2.0 ODU4 interconnection – fixture side

Description	Part Number
Pin frame ODU MAC-L - 8 units - machinery side	JB-ODU4-FLAT20-MAC
Socket frame ODU MAC-L - 8 units - fixture side	JB-ODU4-FLAT20-FIX

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Option 1.B – programmer placed on the machinery side – Pylon Block interface

The present scenario is very similar to the previous one except for the machine-fixture interconnection that in this case is a Pylon Block interface. The adapter circuit board assembled with the Pylon Block interconnection on the machine side allows to plug FRCABLEs directly.

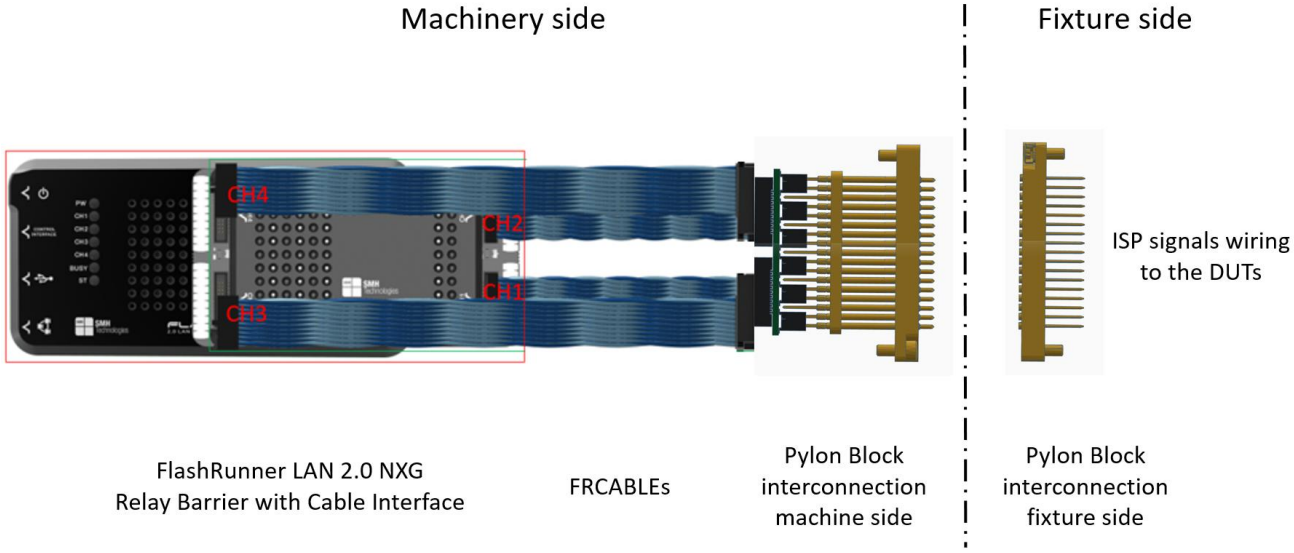

Figure 7: Pylon Block integration scheme of a FlashRunner LAN 2.0 NXG with Relay Barrier placed on the machinery side

The same suggestions about FRCABLEs given in the previous section (option 1.A) have to be taken into account.

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Pylon Block interconnection is designed using a common 170-pin mating couple of pylon block interfaces. Pylon Block interfaces are certainly an efficient, at a reasonable cost and then commonly employed method, to bring several ISP signals into ITA/fixtures. Using connectors and cables compliant with previously described integration scenario, this solution offers a very compact interface board to connect **up to 8 device channels to a single 170-pin pylon block interface**.

On the machine side, there is the pylon block interface pin connector assembled with an adapter circuit board to allow FRCABLEs plugs direct insertion. **On the fixture side**, there is the pylon block interface socket connector ready to be directly wired to the DUTs. Once the ISP signals are into the ITA/fixture, they are, then, easily brought to the bed of nails (i.e. DUTs) through direct wiring. As already said, an **as short as possible and properly ground-twisted connection** inside the fixture is required to preserve an optimal signal integrity.

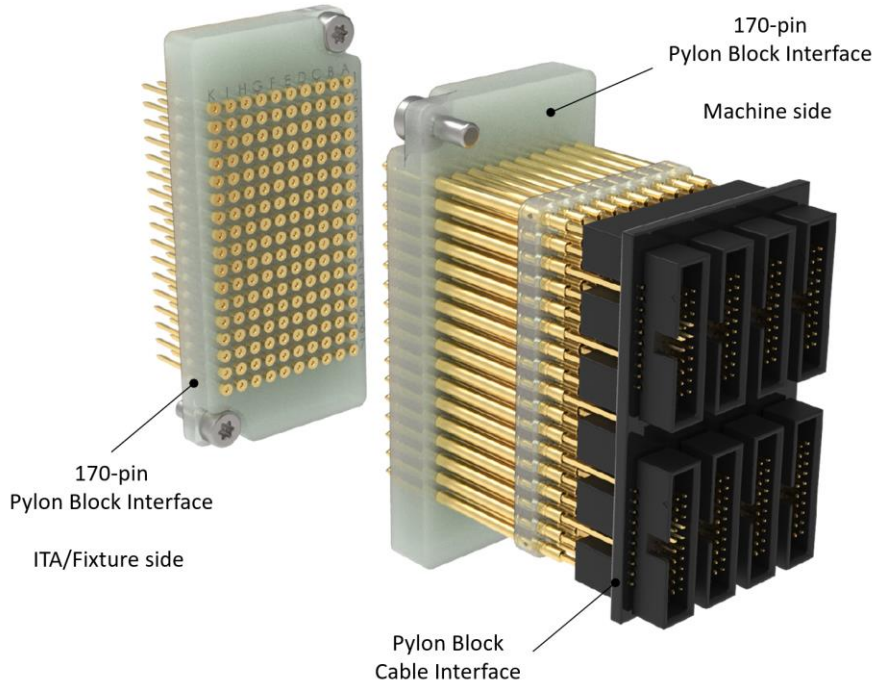

Figure 8: FlashRunner 2.0 Pylon Block interconnection – machine and fixture side

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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Option 2.A – programmer placed on the fixture side

In this integration setup, the programmer is mounted inside the fixture and it is connected to the DUTs through FRCABLEs and Cable Interface Header boards. According to the available room inside the fixture, this is the most efficient and performing way to place the programming system. The short distance allows to connect the DUTs with very short wiring and, consequently, to employ the maximum frequency of the communication signals.

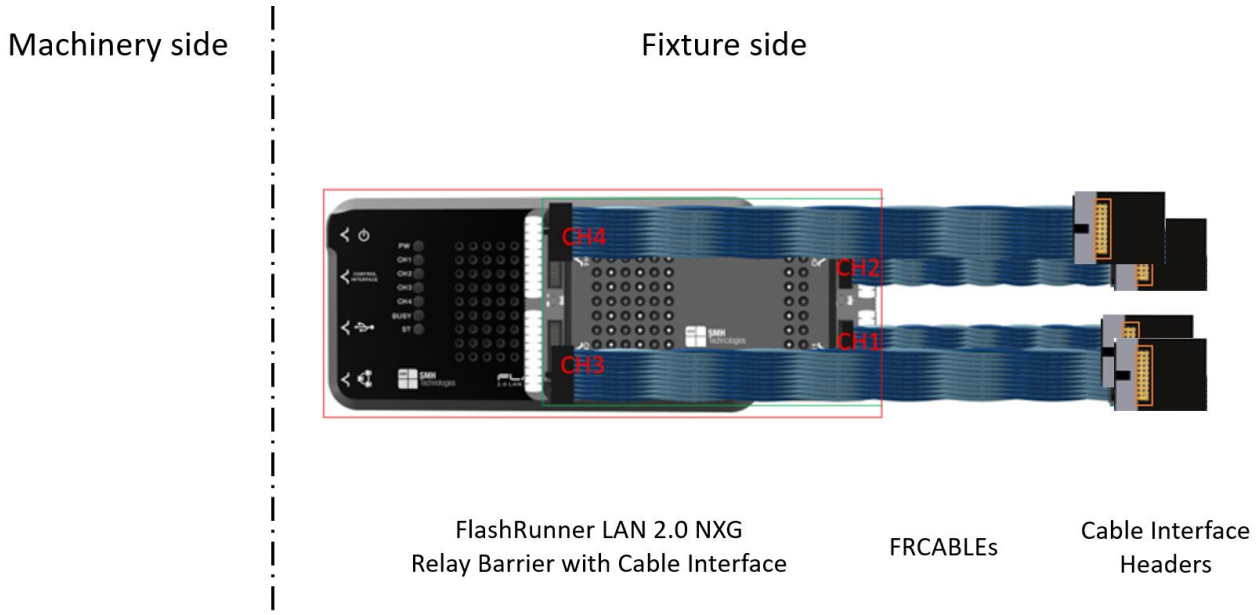

Figure 8: Integration scheme of a FlashRunner LAN 2.0 NXG with Relay Barrier placed on the fixture side

As already descripted in the previous sections, new FlashRunner LAN 2.0 NXG with Relay Barrier is equipped with Cable Interface compliant connectors and together with FRCABLEs and Cable Interface Headers (FRHDRPSTR) allows to cover the very short distance between programming system and DUTs with a very efficient and protected method. Cable Interface Header is designed to allow wire wrapping on the pin header (2.54mm pitch).

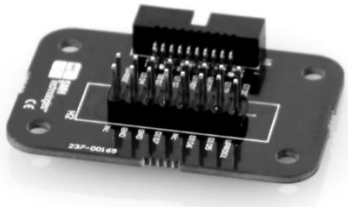

Figure 10: FlashRunner LAN 2.0 NXG Cable Interface – FRHDRPSTR

Description	Part number
Cable Interface Header – FRCABLE to HEADER	FRHDRPSTR

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Option 2.B – programmer placed on the fixture side

The present scenario is very similar to the previous one (option 2.A) except for the usage Relay Barrier connectors. In this case, the wiring to the DUTs is directly wire-wrapped on the pin strip headers of the Relay Barrier. Exactly as in the previous case, the programmer is mounted inside the fixture and the short distance allows to connect the DUTs with very short wiring and, consequently, to employ the maximum frequency of the ISP communication signals.

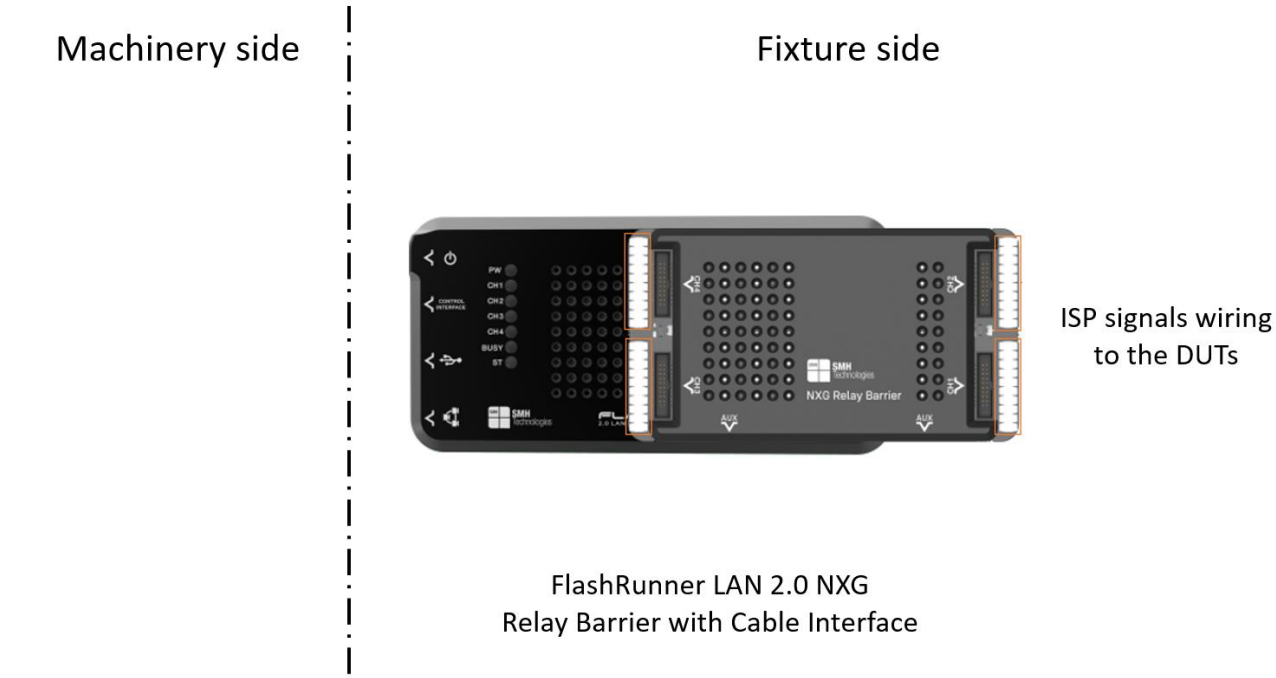

Figure 8: Integration scheme of a FlashRunner LAN 2.0 NXG with Relay Barrier placed on the fixture side

Being very close to the DUTs, the ISP communication signals are easily brought to the bed of nails (i.e. DUTs) through direct wiring to the Relay Barrier. An **as short as possible and properly ground-twisted connection** is required to preserve an optimal signal integrity.

If the distance between the programming system and the DUTs is greater than 30cm then the previous integration method (option 2.A) is strongly suggested.

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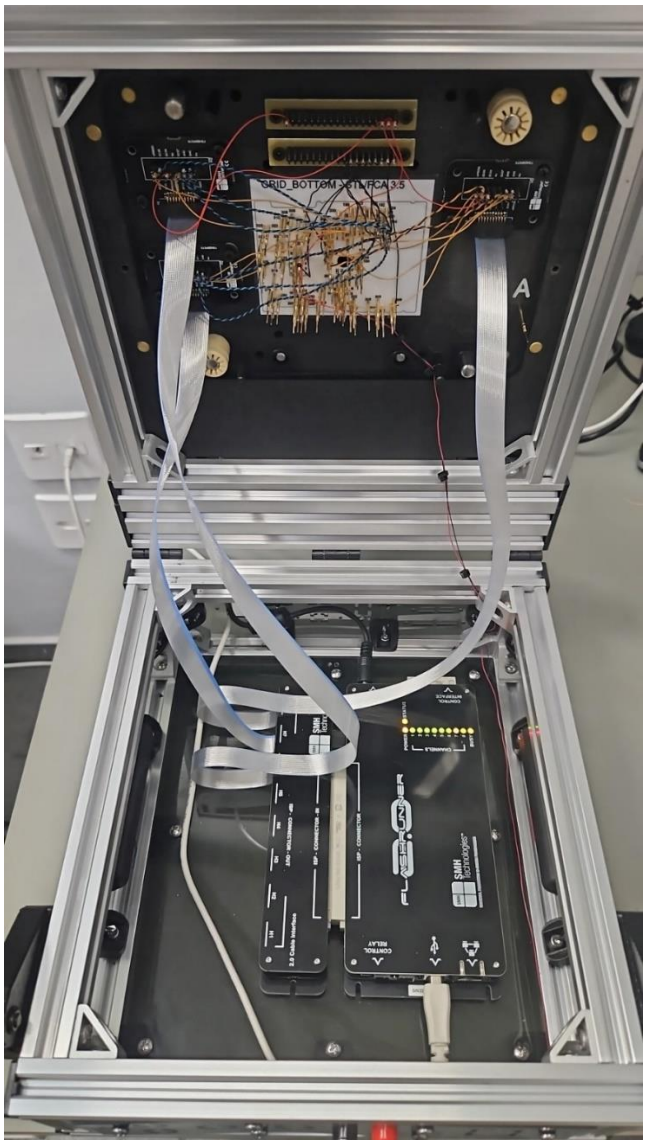
Use cases - integration examples

Integration example using Option 2.A



FlashRunner 2.0 8-channel programming system with Cable Interface
Flat cables and Cable Interface Headers
Short twisted wires to the bed of nails (i.e. DUTs)

In this example, the programming system is well integrated thanks to the Cable Interface. The usage of flat cables no longer than 50cm reaching the Cable Interface Header guarantee a very good signal quality. In the end, the ISP communication signals wire-wrapped on the Cable Interface Header are brought to the DUTs through short ground-twisted wiring that not exceed 30cm.

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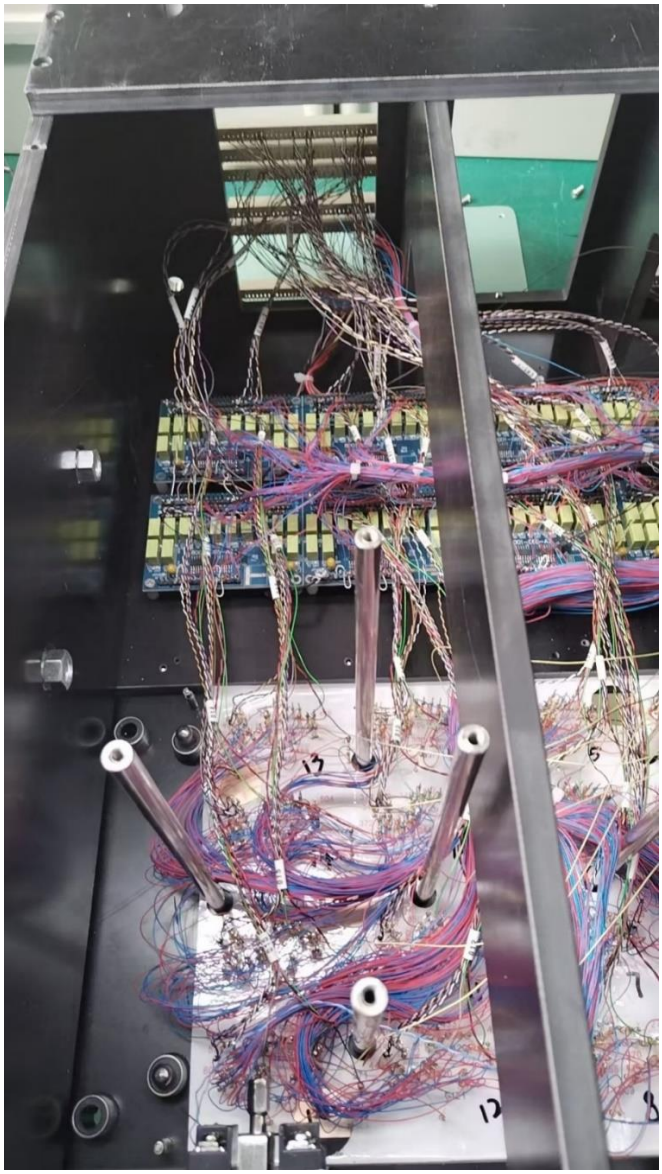
Integration example not following best practice



In this integration setup, the ISP communication signals are brought to the machine-fixture interconnection through a 150cm long connection. The signals are ground-twisted but both the length of the connections and the coexistence with other wiring not related to programming processes make this environment extremely limiting for the programmer potential and definitely not respectful of the ISP communication signals integrity and stability. Moreover, an additional relay barrier circuit is employed in the middle of the connection making even worse the signal propagation.

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General considerations

We have considered the ISP communication signal wiring to target DUTs in two common integration scenarios: programming system on the machine side or on the fixture side. For each integration setup, different alternatives have been described.

According to the explored cases, the integrators should follow these useful guidelines:

- if needed by the application, use by preference the Relay Barrier specifically designed for the programming system in use (e.g. FlashRunner LAN 2.0 NXG Relay Barrier with Cable Interface);
- use by preference the machine-fixture interconnection provided by SMH Technologies (e.g. ODU4 or Pylon Block interconnection) to guarantee a high-performance interfacing and a consistent number of minimum mating cycles;
- use by preference FRCABLEs to cover the largest portion of the distance between programming system and DUTs maintaining the signal propagation very efficient and protected;
- if additional wiring is needed it is strongly suggested to not exceed a length of 30cm; moreover ground-twisting of, possibly, all the ISP communication signals is strongly suggested to guarantee a proper return current flow, signals shielding and EMC robustness;
- keep the ISP communication lines as much separated as possible from the other cables and wirings required by the production system for purposes other than programming.

Using the tools provided by SMH Technologies and following these guidelines, it is possible to exploit the programming system at full potential without compromising communication protocol frequencies and data transfer speeds.

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