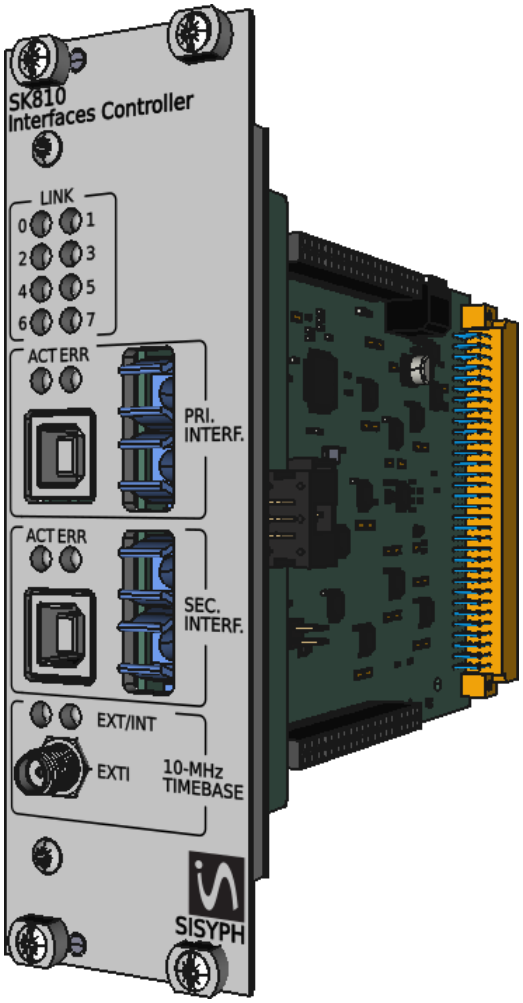
User's Guide

SK810 *Tarn*
Interfaces Controller

SK-Series Modules



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General Information

Scope

This document provides the user with information on how to operate the SK810 Interfaces Controller module.

Safety and Preparation for Use

Because of the variety of uses for the SK810, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The SK810 is not designed, intended, or sold for use in hazardous environments requiring fail-safe operation, including without limitation, operation of nuclear facilities, aircraft or spacecraft control systems, and life support or weapons systems. The user must assure that any failure or misapplication of the SK810 cannot lead to a consequential failure of any interconnected equipment that could lead to loss of life or limb, or property damage.

The illustrations, charts, and discussions shown in this manual are intended solely for purposes of example. Since there are many variables and requirements associated with any particular control application, *Signals and Systems for Physics* does not assume responsibility or liability for actual use based upon the examples shown in this publication.

Do not install substitute parts or perform any unauthorized modifications to this instrument.

The SK810 is a module designed to be used with the SPK-Series Platforms. Do not turn on the power to the platform or apply voltage inputs to the module until the module is completely inserted and locked in place. Do not exceed the specified voltages at any input or output connector.

Specifications and Related Documentation

More information (specifications, datasheet, programming guide, block diagram ...) is available online. These additional documents can be downloaded from the product page at www.sisyph.com.

Contents

1 Getting Started

This section provides the user with the necessary information to get started quickly with the SK810 Interfaces Controller. Each part of the front-panel as well as the rear and the top sides of the module are explained in the following sections. Circled numbers beginning a paragraph help the user to locate these features on the module sides (see Figs 1 and 2).

1.1 Overview

The SK810 *Tarn* Interfaces Controller is a communications bridge to connect up to 8 modular instruments of the Sisyph SK-Series. Two interfaces are provided for the host computer to communicate with the instruments *via* USB or optical interfaces. The SK810 is designed as a sub-system of the SPK-Series Platform where the modular instruments are installed on the same backplane. The SK810 also provides clock synchronization, individual module status and power supply monitoring.

1.2 Front-Panel Connections

The front panel of the SK810 (Figure 2) provides simple monitoring of the status of the remote interfaces and connections for the host computer.

1.2.1 Primary Interface USB (PUSB)

(13) The USB connection for the **Primary Interface** is made through this USB receptacle.

1.2.2 Secondary Interface USB (SUSB)

(15) The USB connection for the **Secondary Interface** is made through this USB receptacle.

1.2.3 External Timebase Input (EXTI)

(17) This SMA coaxial connector is provided for connecting the 10-MHz **External Timebase**. Connect the 50-Ω output of a function generator to this input using a coaxial cable. Can be left open if not used. The **External Timebase** is selected by executing the `SYNS` remote command.

1.2.4 Primary Interface Optical Port (POPT)

(18) The optical fibre for the **Primary Interface** is connected through this receptacle. When mating the fiber optic cable, be sure the small flange protrusion is oriented rightwards. Once oriented and aligned, press the cable connector inwards until it "clicks" in place.

1.2.5 Secondary Interface Optical Port (SOPT)

(18) The optical fibre for the **Secondary Interface** is connected through this receptacle. When mating the fiber optic cable, be sure the small flange protrusion is oriented rightwards. Once oriented and aligned, press the cable connector inwards until it "clicks" in place.

1.3 Front-Panel Indicators

The front panel of the SK810 (Figure 2) provides minimal information about the status of the remote interfaces and the linked slot.

1.3.1 Linked Slot (LINK)

(11) When the SK810 operates in linked mode, the position of the slot actually linked with the **Primary Interface** is indicated by the corresponding **LINK** indicator.

1.3.2 Primary Interface Status (ACT/ERR)

(12) Any data coming from or going to the **Primary Interface** will cause the **ACT** indicator to flash green. Command errors or buffer overruns will cause the error indicator **ERR** to illuminate red. Because this led reflects the state of the flags RXQ, EXE and CMD in the Event Status register, the indicator can be cleared by invoking any remote commands clearing these flags. For instance, executing `CLS?` will clear the error indicator.

1.3.3 Secondary Interface Status (ACT/ERR)

(14) Any data coming from or going to the **Secondary Interface** will cause the **ACT** indicator to flash green. Command errors or buffer overruns will cause the error indicator **ERR** to illuminate red. Because this led reflects the state of the flags RXQ, EXE and CMD in the Event Status register, the indicator can be cleared by invoking any remote commands clearing these flags. For instance, executing `CLS?` will clear the error indicator.

1.4 Backplane Connector

(1) The SK810 is plugged into the SPK-Platform's backplane *via* the DIN41612-96C connector (see Figure 3 for the pin assignments). In this situation, the SK810 acts as a communications bridge between the host computer and the modular instruments. Whereas the SK-Series slave modules can use any slots, the SK810 must occupy the master's position, which is by construction always located at the rightmost location (see Figure 4).

1.4.1 Power Supply

(1) Although the SK810 module is powered from the +5 V only, all power supplies present on the backplane (±15 V, ±5 V and +24 V) are used by the SK810 for monitoring purpose. Refer to the remote command `PMON` for reading these power supply voltages.

1.4.2 Communications with Instruments

(1) The SK810 communicates with the modular instruments through 8 pairs of TX and RX lines (**TX#0-7** and **RX#0-7**) without any hardware handshaking. Nevertheless, 8 other pairs of /RTS and /CTS lines (/**RTS#0-7** and /**CTS#0-7**) are also provided even if the SK-Series modules do not actaully implement such flow control. For instance, these lines could be used for specific applications in order to trigger a synchronization of the modules from the host computer. Refer to the *Programming Guide* for related commands.

1.4.3 Individual Instrument Status

(1) The /STATUS line of each slave module (/**STATUS#0-7**) is routed to the SK810 to be monitored by the host computer. This feature is useful to report a service request from a modular instrument.

1.4.4 Instruments Detection

(1) By construction, each instrument plugged into the backplane asserts its respective /SLOT line. This information is retrieved by the SK810 for detecting what are the slots (/**SLOT#0-7**) actually occupied. Refer to the *Programming Guide* for more information.

1.4.5 Power Good Signal

(1) The SK810 monitors all available power supplies present on the backplane for detecting an under-voltage operation. When such an event has been detected, the **PWRGOOD** line is driven low (0 V) to prevent the modular instruments, which monitor this line, to operate in bad conditions. The **PWRGOOD** line is open (high-impedance) otherwise. The action of the under-voltage detector is configured through the `PCFG` remote command.

1.4.6 Synchronization

(1) The differential pair (**SYN-P**, **SYN-N**) is distributed to all modules *via* the dedicated backplane lines. These lines can be driven by the SK810 by using the remote command `SYNS` to provide a **Synchronization Timebase** of 10 MHz.

1.4.7 Shared Lines

(1) Some pins of the backplane connector are reserved for sharing signals between the modular instruments through the backplane. Among these lines, only **DIO#3** is actually used by the SK810 for its own /**STATUS** line. A jumper has to be mounted in order to route this line to its associated shared line : for instance, if one has to connect /**STATUS** output to the backplane, a jumper must be installed across the pins 1 and 2 of the header **J12** (**STS** label on board).

Pin	Label	Functionality	Direction	Jumper
B17	DIO#0	not connected		
A17	DIO#1	not connected		
B18	DIO#2	not connected		
A18	DIO#3	/**STATUS**	output	J12-1/2
A15-B15-C15	PWRDIO#4	reserved		

Table 1: Pin assignments of the Backplane connector – SK810 shared lines

1.5 Expansion Connectors

(3A) and (3B) These connectors are reserved for customization or factory testing purposes.

1.6 PCB Settings

Some functionalities of the SK810 are controlled or configured using switches located on its printed circuit board.

1.6.1 Configuration Switch - Baudrate Selection

(4) The first element of this 4-position switch array is used to select the baudrate of the host interfaces. When **CFG1** is in top (resp. bottom) position, the selected baudrate is 9600 Baud (resp. 115 200 Baud). These settings apply for both **Primary and Secondary Interfaces**, whatever the physical port in use (USB or optical). Note that this baudrate selection does not apply for the communications between the SK810 and the modular instruments, which always use 9600 Baud. Refer to the *Functional Block Diagram* available online for more information.

1.6.2 Grounding Jumper

A jumper is provided to modify the initial arrangement for connecting the ground lines. By default, this jumper is not mounted. It must be left open if not used.
(2) Mounting this jumper will tie the digital ground to the chassis ground.

1.6.3 Shared Line Jumper

(10) Use this jumper to connect the /**STATUS** signal of the SK810 to its dedicated shared line.

1.7 Operating the Interfaces Controller

1.7.1 Connecting the Host Computer

Two interfaces can be used to communicate with the modular instruments mounted into the SPK-Platform. The **Primary Interface** provides the user with both commanding the SK810 with regular commands and linking the host computer with one instrument. The **Primary Interface** can be connected either *via* its USB or optical ports. Because this interface is no longer available for regular commands when it operates in linked mode, the **Secondary Interface**, which remains available, can be used for querying the SK810' registers or for reconfiguring its operation. If no such configuration were required during linked operation, only the **Primary Interface** could be used to control the instruments.
Both USB and optical ports can be used for connecting the **Primary and Secondary Interfaces**. For each interface, these ports are simultaneously active. It is therefore not recommended to connect both USB and optical ports for a same interface. Although such setup should not happen in practical situations, it could be useful to for debugging purpose.
The host computer must use standard UART protocol (see *Programming Guide*) to communicate with the SK810. The baudrate for the **Primary and Secondary Interfaces** can be selected between 9600 baud and 115 200 baud using the dedicated configuration switch. This baudrate applies for both host interfaces, whatever the physical port in use (USB or optical). Note that this baudrate selection does not apply for the communications between the SK810 and the modular instruments, which always use 9600 Baud. Refer to the *Functional Block Diagram* available online for more information.

1.7.2 Monitoring the Power Supply Voltage

The SK810 provides the user with monitoring the power supply voltages distributed through the backplane. The `PMON` remote command is indeed provided to read these voltages. An under-voltage detector operates from these measured values to determine whether a power supply's level is too low (−10 %) for a safe operation of the instruments. Which power supply is monitored by the under-voltage detector is selected using the `PCFG` command. The **PWRGOOD** line is driven by the detector to indicate a power supply failure to the instruments.

1.7.3 Selecting the Synchronization Source

The synchronization lines are distributed to all slots for delivering to some instruments a precise 10-MHz timebase. Indeed, by synchronizing clocks, low-frequency mixing products (beat tones) of independently running module clocks is avoided. A common timebase also allows precision time and frequency modules to be synchronized. This feature can be enabled or disabled using the `SYNS` remote command. An **External Clock** signal can be also used, instead of the internally generated one, to provide the 10-MHz the **Synchronization Timebase**.

1.7.4 Turning On Power

The SK810 retains the values of the parameters in nonvolatile memory. Upon power-on, those settings are restored to their values before the last execution of the `*SAV` command. When the module is powered for the first time, the factory default values are used instead. The power-on configuration of the remote interface and the default parameters' values are detailed in the *Programming Guide* available online.

1.7.5 Restoring the Default Configuration

To reset the SK810 to its factory defaults, execute the remote command `*RST`. The reset values of the parameters are shown in bold in the *Programming Guide* available online.

2 Remote Operation

This chapter describes how to operate the SK810 over the host interface.

2.1 Link Model

The SK810 uses a link framework for providing communications between a host computer and the downstream instruments assembled in a SPK-Series platform connected by USB or an optical fibre. In this model, when a link is established, the **Primary interface** is linked to a single instrument : data bytes received from the **Primary interface** (USB or optical fibre) are relayed directly to the instrument and response data are relayed back to the **Primary Interface**. When linked, the front panel indicator for the selected instrument is illuminated.
The **Secondary interface**, which can not be linked, remains available for regular commanding to the SK810. This interface can be used to reconfigure the SK810 or to query the status registers, or any other command documented in the *Programming Guide*. The linked **Primary Interface**, however, will not be processed (parsed) and commands transmitted to the SK810 *via* the linked remote interface will be relayed byte-for-byte to the linked instrument, and not interpreted as SK810 commands.
The link state can be exited by transmitting the escape character from the host computer to the linked **Primary Interface**. The escape character is the "!" character (ASCII code 33). When operating in not-linked mode, the **Primary Interface** can process regular SK810's commands; there is no difference between **Primary and Secondary Interfaces** in this mode.

2.2 Commands

For a complete and detailed information, please refer to the *Programming Guide* available online at the product page.

2.3 Status Model

The *Block Diagram* of the SK810's status registers is available online at the product page. The *Programming Guide* also provides the user with detailed information about these registers.

3 Accessories and Related Products

This chapter describes related products and accessories that are available for use with the SK810. These optional parts must be ordered separately.

3.1 USB Cables

Two cables are required for the communications with SK810 over the USB interface. If any USB 2.0 cable (type A male to type B male) can be used, the cable length should be limited to 1 meter. These cables can be also ordered from Sisyph (P/N SMC841).

3.2 Optical Fibres

The HFBR-RMD010Z is the manufacturer's part name of the 10-m cable, which is equipped with standard duplex connectors (HFBR-0500Z). The typical attenuation of this plastic optical fibre is specified for 0.22 dB/m. Its 3-m version is the HFBR-RMD003Z. These cables can be ordered from Sisyph (see SK810's *Datasheet* for ordering codes) or directly from the manufacturer (Broadcom). Contact us for custom length cables.

3.3 USB-to-Optical Bridge

The SM301 *Nemausus* is an USB-to-optical bridge for connecting the fibres to the remote computer side. It is powered from the USB port used for the communications with the PC and features a pair of receptacles for the fibres (RX and TX), providing the user with connecting one optical cable to the SK810 *Interfaces Controller*. Two SM301 are required for connecting both Primary and Secondary Interfaces.

4 Figures

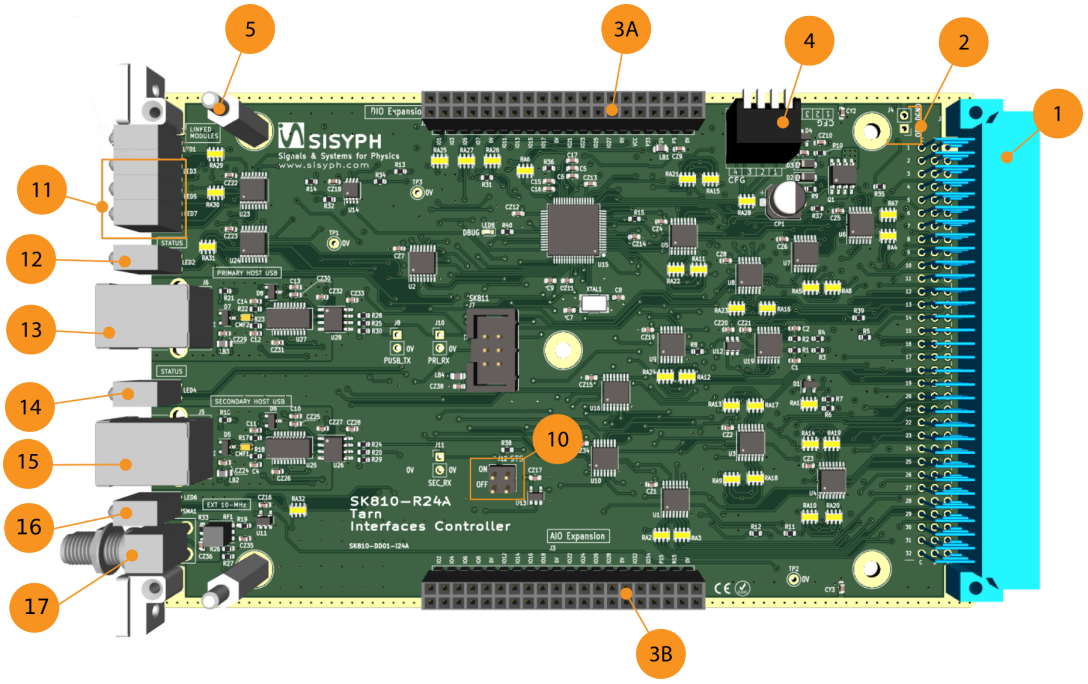

Figure 1: View of the SK810's top side where neither the secondary board, which supports the optical fibre receptacles, nor the front-panel are shown. Circled numbers refer to features detailed in the Section 1.

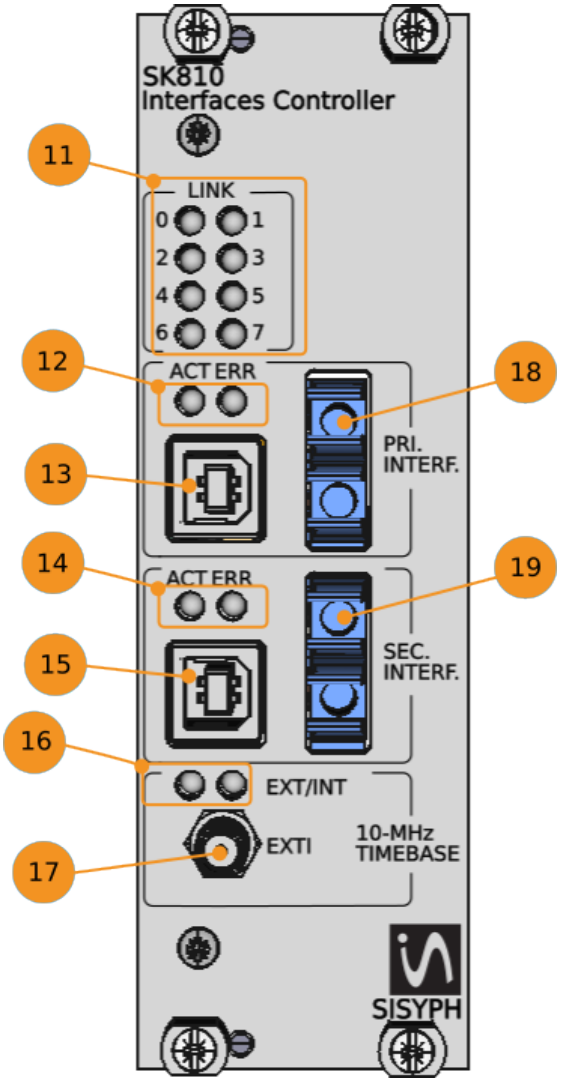

Figure 2: SK810's frontview. Circled numbers refer to features detailed in the Section 1.

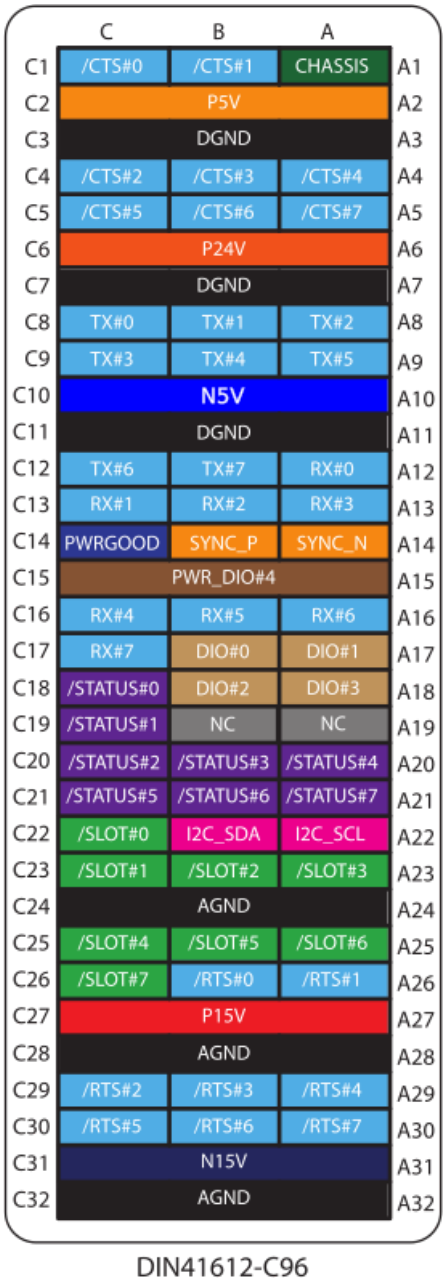

Figure 3: Pin assignments of the SK810 connector. The DIN41612-96C connector carries all the power and communication lines to the modules. Additional lines are provided for i) sharing signals with other slave modules plugged on the same backplane, ii) distribution of the 10-MHz synchronization signals and iii) module status information. The presence of a slave module on the backplane is detected using a dedicated line. Refer to the Section 1.4 for information on the pin assignments used in SK810.

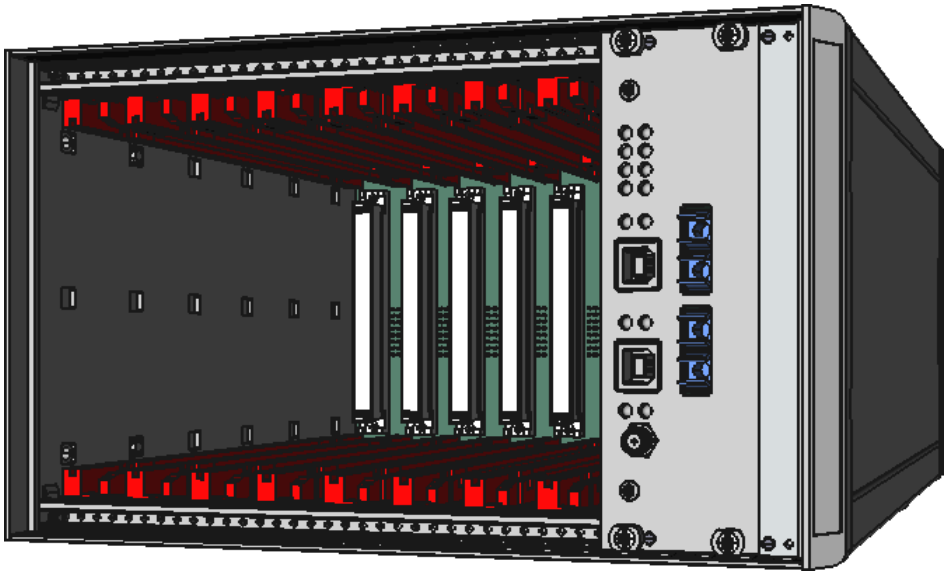

Figure 4: Using the SK810 with the SPK-Series Plaforms. The Interfaces Controller module is shown assembled into a SPK42 platform. It provides the user with interfacing up to 8 instruments (not shown here). The SK810 is inserted in its dedicated slot, which is always located at the rightmost position.

5 Document Revision History

5.1 Version Number

This document is identified by SK810-SU02-P24A.

5.2 Revision History

P24A (2024-02-15)

Initial version.