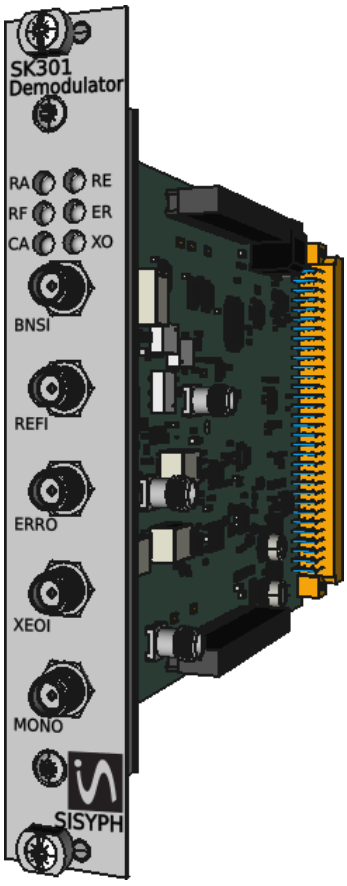
User's Guide

SK301 *Vidourle*
RF Demodulator

SK-Series Modules



SISYPH
Signals & Systems for Physics

www.sisyph.com

Certification

Signals and Systems for Physics certifies that this product met its published specifications at the time of shipment.

Warranty

This *Signals and Systems for Physics* product is warranted against defects in materials and workmanship for a period of one (1) year from the date of shipment.

Service

Do not install substitute parts or perform any unauthorized modifications to this instrument. For warranty service or repair, this product must be returned to a *Signals and Systems for Physics* authorized service facility. Contact *Signals and Systems for Physics* before returning this product for repair.

Information in this document is subject to change without notice.

Signals and Systems for Physics
BP90406
16 place saint-Georges
F31000 Toulouse France
Phone (+33) 781 547 391
www.sisyph.com.

General Information

Scope

This document provides the user with information on how to operate the SK301 *RF Demodulator* module.

Safety and Preparation for Use

Because of the variety of uses for the SK301 *RF Demodulator*, 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 SK301 *RF Demodulator* 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 SK301 *RF Demodulator* 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 SK301 *RF Demodulator* 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

Complete 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 SK301 *RF Demodulator*. 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 SK301 *RF Demodulator* was primary designed for use in laser frequency stabilization applications where the frequency offset between the laser source and the optical reference requires tight and fast control. Indeed, when used in a Pound-Drever-Hall locking scheme, the SK301 provides a voltage related to the frequency offset under control. This error signal is further processed by a compensator in order to drive the laser frequency actuator. The SK301 actually performs a phase sensitive detection of a photodetector output in order to translate its spectrum from the RF domain to a base-band error signal. In complement with this basic frequency mixer operation, the SK301 provides the user with several useful functionalities in this specific context. Refer to the *Functional Block Diagram* online for a synthetic presentation of these functionalities. The SK433 *High-Speed Compensator* is an additional module designed to complete the laser frequency control loop. It operates from the error signal provided by the SK301 *RF Demodulator* and features two configurable loop filters. Refer to the SK433 product page online for more information.

Like all modular instruments of the SK-Series, the SK301 can be operated stand-alone or within a platform where several modules can be assembled to configure a specific control or measurement system. Indeed, SPK-Series platforms accommodate up to eight instruments and provide power, clock synchronization, communications, and module status. For stand-alone operation, the SKN10 and SKN11 *Adapters* can be used for connecting the module to the power supplies and remote host computer.

1.2 Front-Panel Connections

1.2.1 Beat-Note Signal Input (BNSI)

(12) The beat-note signal provided by the photodetector is connected to the mixer's RF-input using the **BNSI** connector. The input signal passes through several intermediate stages before the phase sensitive detection. Use 50-Ω cable only for this connection.

1.2.2 Reference Input (REFI)

(13) The reference signal is routed to the mixer's LO-input. Connect the local oscillator providing the reference phase to the **REFI** receptacle. Use 50-Ω cable only for this connection.

1.2.3 Error Output (ERRO)

(14) The **ERRO** receptacle is wired to the error output signal. For connecting the compensator input to the error signal, a 50-Ω cable is not required, but recommended.

1.2.4 External Error Offset Input (XEOI)

(15) The external error offset input is provided for applying a DC-coupled voltage to the error output signal. This functionality is controlled *via* the `XEOE` remote command. For connecting the offset voltage source to the **XEOI** receptacle, a 50-Ω cable is not required, but recommended. Can be left open if not used.

1.2.5 Monitoring Output (MONO)

(16) The monitoring output is provided for test and diagnostic purposes since copies of some SK301's signals can be routed to this output. Use the `MONS` remote command to select which signal is routed to this SMA receptacle. For connecting an oscilloscope to **MONO**, a 50-Ω cable is not required, but recommended. Can be left open if not used.

1.3 Front-Panel Indicators

The front panel of the SK301 *RF Demodulator* (Figure 2) provides minimal information about the status of the instrument.

1.3.1 Remote Interface Activity (RA)

(6) Any data coming from or going to the host interface will cause this indicator to flash green.

1.3.2 Remote Interface Error (RE)

(6) Command errors or buffer overruns will cause the error indicator to illuminate red. Because this led reflects the state of **RXQ**, **EXE** and **CMD** flags of the Event Status register (**EVTS**), the indicator can be switched off by invoking any remote commands clearing these flags. For instance, executing `CLS?` will switch the error indicator off.

1.3.3 Mixer Power Alarm (RF)

(11) This indicator illuminates red when the mixer's inputs (either **LO** or **RF**) are overdriven, *i.e.* $P_{\mathrm{RF}} \geq +3\,\mathrm{dBm}$ or $P_{\mathrm{LO}} \geq +10\,\mathrm{dBm}$. *In this case, the user must reduce the power of the related input to prevent damage.* Because this indicator reflects the state of the **MRF** and **MLO** flags of the Overload Condition (**OVLC**) register, it is automatically switched off when these conditions disappear.

1.3.4 Error Alarm (ER)

(11) This indicator illuminates red when the error output voltage is outside its allowed range (±100 mV). Because this indicator reflects the state of the **ERN** and **ERP** flags in the Overload Condition (**OVLC**) register, it is automatically switched off when these conditions disappear. Note that the error alarm does not indicate a saturation of the error signal, which is reached for voltages exceeding ±3 V, but rather an unlocked operation.

1.3.5 Calibration Input (CA)

(11) This indicator illuminates green when the calibration input is enabled. This functionality is controlled *via* the `CALE` remote command.

1.3.6 External Error Offset Input (XO)

(11) This indicator illuminates green when the external error offset input is enabled. This functionality is controlled *via* the `XEOE` remote command.

1.4 Backplane Connector

(1) The primary connection to the SK301 module is the rear DIN41612-96C connector (see Fig.3 for its generic pin assignments). Typically, the module is mated into the backplane of an SPK-Series Platform using this connector. It is also possible to operate the SK301 directly, without any platform. In such stand-alone operation, the user has to externally wire all required signals and power supplies through the DIN41612 connector. To help the user in this operation, *Signals and Systems for Physics* provides several module adapters (see SKN-Series *Module Adapters* online). DIN41612 connector's pins are used to power the module and connect its communications lines to the remote controller. Some pins are also used for sharing signals with other slave modules plugged on the same backplane. Wiring external signals to the module from the rear-side of the backplane is also provided using dedicated terminal blocks.

1.4.1 Power Supply

The pins used for powering the SK301 module are listed in the following table. It mentions only pins that are effectively used. For detailed information on power requirements, refer to the *Datasheet* available online.

CAUTION - *Because the SK301 uses some power supplies without any local post-regulation circuitry, always use clean, well regulated power sources with adjustable current limitation.*

Pin	Label	Functionality	Source	Destination
A2, B2, C2	P5V	Digital +5 V	Platform	SK301
A27, B27, C27	P15V	Analog +15 V	Platform	SK301
A31, B31, C31	N15V	Analog −15 V	Platform	SK301
A3, B3, C3	DGND	Digital Ground (0 V)	Platform	SK301
A7, B7, C7				
A7, B7, C7				
A11, B11, C11				
A24, B24, C24	AGND	Analog Ground (0 V)	Platform	SK301
A28, B28, C28				
A32, B32, C32				
C14	Power Good	Monitoring	Platform	SK301
A1	Chassis	Chassis Ground - Earth	Platform	SK301

Table 1: SK301's power supplies – DIN4161 connector pin assignments.

The +5 V power supply is connected to the module through the **P5V** and **DGND** pins. This power supply is used for the digital circuits. Their analog counterparts are powered from the +15 V and −15 V sources connected through the **P15V**, **N15V** and **AGND** pins. The Earth safety line is routed to the module *via* the **Chassis Ground** pin, which is used for grounding the mechanical parts. The SK301 also uses the **Power Good** signal provided by the SPK-Platform for monitoring the power supply inputs. This signal is asserted-low by the platform whether one or more power supply is under its nominal operating value.

1.4.2 Grounding

The **AGND** and **DGND** power lines of the backplane connector are not tied together by the internal circuitry of the SK301. They are instead connected through back-to-back Schottky diodes, so the digital and analog grounds cannot be more than ±350 mV apart. When the SK301 module is assembled into an SPK-Platform, its digital and analog ground lines are tied together through the backplane to a single point (star connection).

Caution – *When the module is used stand-alone, the digital and analog ground lines should be separately wired to a single, low-impedance ground source at the power supply.*

(2A) (2B) (2C) Alternative grounding schemes can be also wired using the dedicated optional jumpers, which are accessible from the top-side of the printed circuit board.

1.4.3 Host Interface

The pins used for operating the SK301 module over the host interface are listed in the following table. It mentions only pins that are effectively used. For detailed information on serial communications settings, refer to the *Programming Guide* available online.

Pin	Label	Functionality	Source	Destination
B1, C1, B4, C4	ID[3-0]	Slot identification	Platform	SK301
A20	/STATUS	Master Summary Status	SK301	Platform
A23	/SLOT	Occupied slot	SK301	Platform
A9	UART-TX	Async data	Platform	SK301
A16	UART-RX	Async data	SK301	Platform

Table 2: SK301's host interface – DIN41612 connector pin assignments.

The SK301 communicates with the host through **TX-** and **RX-UART** lines without any hardware handshaking. The **Slot Identification** lines are used by the module to retrieve the number of the slot (0 to 15) where the module is mated. Because these lines are coded by the platform hardware, no such identification can be provided for a stand-alone operation. In this case, the identification pins are automatically asserted-high by the internal module hardware to detect a stand-alone operation, which corresponds to the virtual slot number 255. The /**STATUS** line is driven by the module to indicate whether one or more of the enabled status messages in the Master Summary Status (**MSTS**) register is true. The signal is then asserted-low and remains in this state until the register has been queried by the `MSTS?` remote command. When the SK301 is used with an SPK-Platform, the /**STATUS** signal is monitored and reported to the host controller *via* the communications link. The /**SLOT** line, which is driven-low by the module, is used by the platform circuitry to detect whether or not a module occupies this slot.

1.4.4 Shared Lines

Some pins of the DIN41612 connector are reserved for sharing signals with others modules through the backplane. *Always contact us before using this functionality.*

This functionality is not used in SK301.

1.4.5 User's Terminal Blocks

SPK-Series Platforms feature a backplane where each slot is provided with 16 additional User's Terminal Blocks (**UTB**). These connectors, located at the rear-side of the backplane, are wired to the module through dedicated pins of its DIN41612 connector. They can be used for specific module wiring, *e.g.* for connecting some signals to the rear-panel of the platform. *Always contact us before using this functionality.* The SK301's pins routed to the terminal blocks are listed in the following table.

Pin	Label	Functionality	Direction
B16	DBG0/RFU	Debugging	Digital I/O
B17	DBG1/RFU	Debugging	Digital I/O
B18	/STATUS	Status monitoring	Digital Output
B23	DGND	Digital Ground (0 V)	
C16	CALI	Calibration	Analog Input
C17	XEOI	External Error Offset	Analog Input
C21	MONO	Monitoring	Analog Output
C22	ERRO	Error	Analog Output
C23	AGND	Analog Ground (0 V)	

Table 3: SK301 User's terminal blocks – DIN41612 connector pin assignments.

1.4.6 Synchronization

The SPK-Platform distributes a **Synchronization timebase** of 10 MHz to the modular instruments *via* the (**SYN-P**, **SYN-N**) backplane lines. The SK301 uses this differential pair to synchronize the clock of its microcontroller. When operating stand-alone, the SK301 module automatically switches the 10-MHz clock to an internal source. Whether the module is synchronized or not is reported by the **IKS** bit in the Instrument Status register (**INSS**).

Pin	Label	Functionality	Source	Destination
A14	SYNC-N	Negative Synchronization	Platform	SK301
B14	SYNC-N	Positive Synchronization	Platform	SK301

Table 4: SK301 Synchronization – DIN41612 connector pin assignments.

1.5 Expansion Connectors

These connectors are reserved for customization or factory testing purposes. *Always contact us before using this functionality.*

1.5.1 Analog I/O Expansion

(3B) The following table provides the pin assignments of the Analog I/O Expansion connector. Refer to the Section 2.1 for more information.

Pin	Label	Functionality	Direction
1	MONO	Monitoring signal	Output
3	ERRO	Error signal	Output
7	OFS	DAC Error Offset	Output
11	IF	Intermediate Error signal	Output
13	PREF	Reference power detector	Output
15	PBNS	Beat-Note power detector	Output
22	CALI	Calibration signal	Input
24	XEOI	External Error Offset signal	Input
35, 36	P15V	+15 V power supply	Output
37, 38	N15V	−15 V power supply	Output
9, 10, 19, 20, 39, 40	AGND	Analog ground (0 V)	Output
Not listed pins are used for factory test and diagnostic.			

Table 5: SK301 Analog I/O Expansion connector – Pin assignments.

1.5.2 Digital I/O Expansion

(3A) The following table provides the pin assignments of the Digital I/O Expansion connector.

Pin	Label	Functionality	Direction
1	DBG0	Debugging/RFU	Not defined.
2	DBG1	Debugging/RFU	Not defined.
27	/STATUS	Status monitoring	Output
37, 38	P5V	+5 V power supply	Output
9, 10, 19, 20, 39, 40	DGND	Digital ground (0 V)	Output
Not listed pins are used for factory test and diagnostic.			

Table 6: SK301 Digital I/O Expansion connector – Pin assignments.

1.6 On-Board Settings and Connectors

Some functionalities of the SK301 are controlled or configured using switches located on its printed circuit board. Connectors can be also installed on the component-side of the board when they are rarely used, *e.g.* for test or calibration purposes.

1.6.1 Analog Ground

(17) The **AGND** receptacle provides a clean ground reference voltage (0 V).

1.6.2 Beat-Note Monitoring Output

(18) A copy of the beat-note input signal is available through the **BNSO** receptacle, which is wired to the mixer's RF-input through a power splitter and a directional coupler. Use 50-Ω cable only for this connection.

1.6.3 Calibration Input

(19) The calibration signal is applied to the **CALI** receptacle. When this functionality is enabled, the calibration signal can be used to bypass the mixer's IF-output A 50-Ω cable is not required but recommended for connecting the signal source.

1.6.4 Additional DC-Gain

(20) This 4-pin header can be used to increase the DC-gain of the error signal. Place the jumper between pins 1 & 2 (resp. 3 & 4) of **BUFG** to set the additional gain to 0 dB (resp. +6 dB).

1.6.5 Configuration Switches

(4) This 4-position switch array is not used in this version of the module. Nevertheless, it is populated for future use or software customization purpose.

1.6.6 Grounding Jumpers

Three jumpers are provided to modify the initial arrangement for connecting the ground lines. By default, these jumpers are not mounted. They must be left open if not used.

(2A) Mounting this jumper will tie the digital ground to the chassis ground (power earth).

(2B) Installing this jumper will tie the analog ground to the chassis ground (power earth).

(2C) This jumper can be used to tie the digital and analog ground lines together since they are connected only through back-to-back Schottky diodes. When the SK301 is mounted into a platform, the digital and analog ground lines are tied together through the backplane to a single point.

1.6.7 Configuration Switch

(4) This functionality is not used in SK301.

1.7 Module Interfacing

The primary connection to the SK301 *RF Demodulator* is the backplane connector. Typically, the SK301 is mounted into a platform, but it is also possible to operate the SK301 directly, without using any platform. This section provides details on the interface.

1.7.1 Interfacing through SPK-Series Platform

The SKP-Series Platform is designed to assemble a system based on SK-Series modules. The platform carries all the power and communications lines to the mounted modules through the internal backplane. The platform also provides an USB interface for communications with the host controller (see SK810 *Interfaces Controller* module online). The power supply voltages are provided to the platform by external sources *via* a rear panel DSUB7W2 connector. This should reduce the exposition of the modules to the power supplies' EMI.

1.7.2 Direct Interfacing

It is also possible to operate the SK301 module directly, without using any platform.

Caution – *Misapplication of power may cause circuit damage.* Signals and Systems for Physics *recommends using the SK301 together with the SPK-Platform for most applications.*

The mating connector needed is a standard 96-pin DIN41612 female receptacle. Clean, well-regulated power supplies must be provided. Refer to the Grounding section for appropriate connection of the different ground lines. The communication is possible by directly connecting the appropriate interface lines to an USB-to-UART bridge as explained in the related section. *Signals and Systems for Physics* also provides the user with several module adapters to wire the required signals and power supplies. Among them, the SKN10 features an USB-to-UART bridge and several spring clamping terminal blocks.

1.8 Operating the RF Demodulator

Refer to the *Functional Block Diagram* online for graphical information and to the *Datasheet* for detailed specifications.

1.8.1 Connecting the RF Inputs

In laser frequency control applications, the beat-note signal carries the information of the frequency offset that is controlled by the loop arrangement. This signal, which can be provided by an RF photodetector, is connected to the **BNSI** receptacle. The beat-note signal is then filtered before entering the phase-sensitive detector in order to retrieve the base-band frequency offset information. This detection is performed using the Reference signal as mixer's LO-input. Both RF inputs are transmitted to the phase-sensitive detection stage through isolating transformers in order to prevent ground loops. Input attenuators are also used as matching terminations. Two identical limiters (+13 dBm) are installed on the **BNSI** and **REFI** inputs for protecting the mixer's input ports from surges.

1.8.2 Monitoring the RF Inputs

Power levels are measured at mixer's input ports (LO and RF) through two 20-dB couplers. The `RMON` remote command allows the user to check the power level at LO and RF mixer inputs. Excessive power levels are detected and reported using the dedicated front-panel indicator and status reporting. An SMA connector (**BNSO**) is also provided for monitoring the RF-input (*i.e.* beat-note) using a signal analyzer. Power data streaming to the host computer is also provided by the `STMS`, `STMS` and `STME` commands.

1.8.3 Filtering the Beat-Note Signal

In order to prevent high-frequency components entering the phase sensitive detector, a 200-MHz low-pass filter is installed after the beat-note input's attenuator. It actually restricts the upper limit of the frequency

carrier (f_{mod}) to 150 MHz, which should be enough for most applications. When the beat-note signal is provided by a photodetector, a frequency component is also present at $2f_{\mathrm{mod}}$ in the spectrum. To prevent resulting two-tone products at the mixer's IF-port and related terms in the error output signal, the SK301 features a notch-filter centered at $2f_{\mathrm{mod}}$. This filter is enabled using the remote command `RFFE`. Because such filtering should be included in a well-designed photodetector, the SK301's RF notch-filter should be normally disabled. With a center frequency of 60 MHz, the SK301's RF notch-filter can be useful for applications where the carrier frequency of the phase modulation has been fixed to $f_{\mathrm{mod}} = 30$ MHz.

1.8.4 Using the Calibration Input

The DC-coupled calibration signal can be used instead of the mixer's IF-output for characterization purpose. Use the remote command `CALE` to switch the error signal source from the mixer output to the calibration input.

1.8.5 Offsetting the Error Signal

It can be useful to add a controlled offset voltage to the error signal. For instance, small DC-voltages can be introduced to compensate offset voltages or drifts due to the electronic circuits. Note that this operation actually modifies the effective locking-point of the servo loop. Such DC-voltages can be added to the error signal using the `OFSS` and `OFSE` commands. Since this functionality is able to provide constant offset voltage only, the external error offset can be used to extend this functionality to time-variant offset voltages. For instance, this input can be used to introduce closed-loop test signals, it can be also used to compensate the error offset voltages induced by the Residual Amplitude Modulation of the phase modulator.

1.8.6 Filtering the Error Signal

The spectrum of error signal delivered by the phase sensitive detector presents high-frequency components that must be attenuated before entering the servo loop filter (or compensator). Indeed, these frequency spectral lines can degrade the base-band error signal by introducing offset voltages due to the rectification of these RF signals by slower circuits. For example, the leakage due to the finite isolation between the LO and IF port of the mixer originates the presence of the f_{mod} spectral line in the error spectrum. To attenuate this high-frequency component, a notch-filter centered at 30 MHz can be used to remove the LO-IF leakage contribution from the error spectrum. This filter is controlled *via* the `IFFE` command. An additional low-pass filter can be also used to remove the high-frequency components on a wider band. This functionality is controlled by the remote command `LPFS`, which selects the cut-off frequency between 3 MHz and 30 MHz.

1.8.7 Using the Error Signal

The error signal must be sent to an external loop-filter in order to control the laser frequency actuator. This connection is primary made using the **ERRO** connector on the front-panel, but alternative outputs are also provided through User's Terminal Blocks or Expansion connectors. Once the RF sections have been configured, the error output signal is available for the loop-filter. For instance, the SK433 *PI2D Compensator* was designed to process the error signal delivered by the SK301. Because 3rd party loop-filters may not feature DC-offset voltage compensation of the error signal, this functionality has been included in the SK301. Small DC-offset voltages can be thus added to the error output signal to slightly change the locking-point. Additional DC-gain is also provided to increase the gain from the beat-note input to the error output. Filter sections can be configured to remove unwanted high-frequency contents from the error signal spectrum.

1.8.8 Monitoring Output Selection

The signal routed to the monitoring output (**MONO**) is selected *via* the `MONS` remote command. The error signal and its filtered versions can be thus selected as output signal. Because the last amplifier stage of the monitoring output introduces about $15\,\mathrm{nV}/\sqrt{\mathrm{Hz}}$ of additional noise, the **ERRO** output should be used instead for low-noise measurements of the error signal. The output voltages of the power detectors measuring the levels at the mixer RF- and LO-input ports can be also routed to the monitoring output. In this case, the output voltage, expressed in mV, is either $V_{\mathrm{MONO}} = 36.8 \times P_{\mathrm{RF}} + 450.8$ or $V_{\mathrm{MONO}} = 36.8 \times P_{\mathrm{LO}} + 570.4$, for power levels expressed in dBm. Since these numerical values have been calculated for an operation at 30 MHz, slight deviations can be encountered at higher frequencies.

1.8.9 Restoring the Default Configuration

To reset the SK301 module 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 Description of Operation

This chapter provides the user with a number of additional details of the operation of the SK301 *RF Demodulator* module.

2.1 Expansion Connectors

The SK301 module provides the user with two expansion connectors for mounting an additional board (see Fig.4). Indeed, specific functionalities can be obtained by mounting a dedicated board on these connectors. This feature can be useful for customization purposes. The expansion connectors' pins are identified on the *Functional Block Diagram* using the **EXP** label. Analog signals and power supplies of the SK301 are routed to the Analog I/O Expansion connector while their digital counterparts are available through the Digital I/O connector. Some pins are reserved for programming the microcontroller and should not be used. Refer to the Section 1.5 for information on which pins are actually used in the SK301.

CAUTION – *Because the power lines are fed from the internal module circuitry and not directly from the backplane, only low-consumption circuits should be powered from the expansion connectors. Contact us prior using this functionality.*

The parts used for the expansion connectors are compatible with the standard 2x20-pin PC/104 non-stackthrough J2-connector, *e.g.* M20-6112045 from Harwin.

2.2 Shared Backplane Lines

Some lines of the backplane are dedicated for sharing analog and digital signals between modules. They correspond to the AIO, PWR-AIO, DIO and PWR-DIO lines listed in the generic pin assignments. This functionality can be useful for customizing a system where the number of front-panel connections has to be reduced by using these backplane lines instead. Refer to the Section 1.4.4 for information on which SK301's signals can be routed to the shared lines of the backplane.

CAUTION – *The SK301 has no internal protection against short-circuits on the shared lines. Contact us before using this functionality.*

2.3 User Terminals Blocks

The SK301 is primary designed to be assembled into a platform. Some pins of the mating connector are not connected to the bus, they are instead directly routed to 16 terminal blocks located at the rear-side of the backplane. This arrangement provides the user with specific wiring schemes. Indeed, acting as many independent connectors, the user terminal blocks can be used to wire some SK301's signals regardless of the backplane operation.
The SK301's signals routed to the user terminal blocks are identified on the *Functional Block Diagram* using **UTB** labels. See Figure 3 for their generic pin assignments and Section 1.4.5 for information about which signals of the SK301 are routed to the the terminal blocks.

CAUTION – *By design, an SK301 module can be plugged anywhere into the platform since there is no assigned slot. The only reserved location (the rightmost slot) is dedicated to the master module, which is in fact a part*

of the platform. Therefore, using the user terminal blocks functionality of a specific slot will, in practice, assign the module to this slot. Contact us before using this functionality.

3 Remote Operation

This chapter describes how to operate the SK301 *RF Demodulator* over the host interface.

3.1 Commands

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

3.2 Status Model

The *Status Model Diagram* of the SK301's is available online at the product page. The *Programming Guide* also provides the user with detailed information about the Status registers.

4 Accessories and Related Products

This chapter describes related products and accessories that are available for use with the SK301 *RF Demodulator*. These optional parts must be ordered separately.

4.1 Optional Module Adapters

Like all SK-Series modular instruments, the SK301 module is primary designed to be assembled into a platform. But stand-alone operation of the SK301 *RF Demodulator* is also possible (see section 1.7.2). In this case, the user has to wire all required power supplies and remote control lines to the DIN41612 connector. In order to help the user in this operation, *Signals and Systems for Physics* provides several module adapters, namely the SKN10 and SKN11. For instance, the SKN10 *Module Adapter* features a mating DIN41612 connector, an USB-to-UART bridge and several spring clamp terminals blocks. Refer to the adapters' pages online for detailed information.

5 Figures

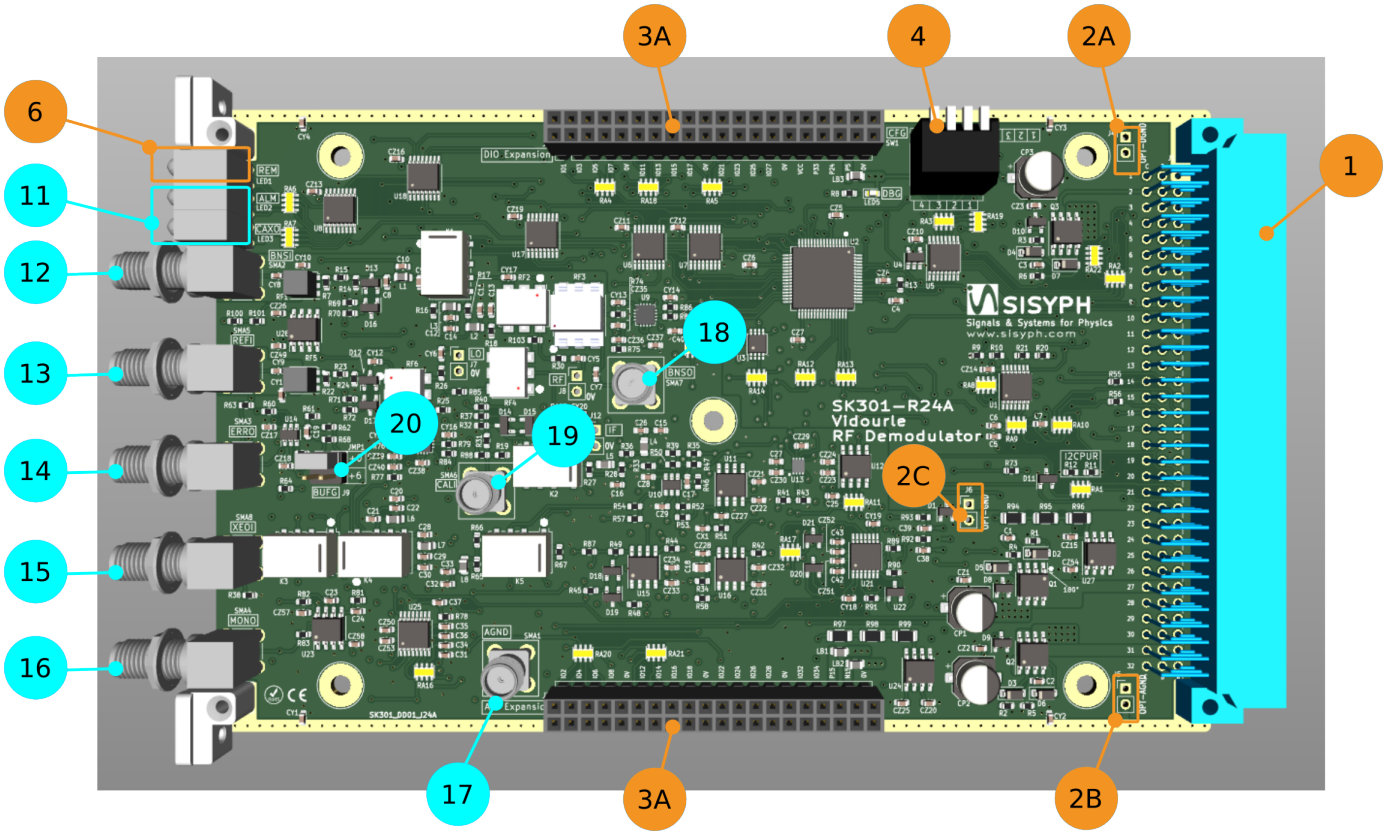


Figure 1: View of the SK301's top side. The module is shown without its front-panel. Circled numbers refer to features detailed in the Section 1. While the orange colored numbers denote generic parts of the SK-Series modules, their blue-color counterparts refer to specific features of the SK301.

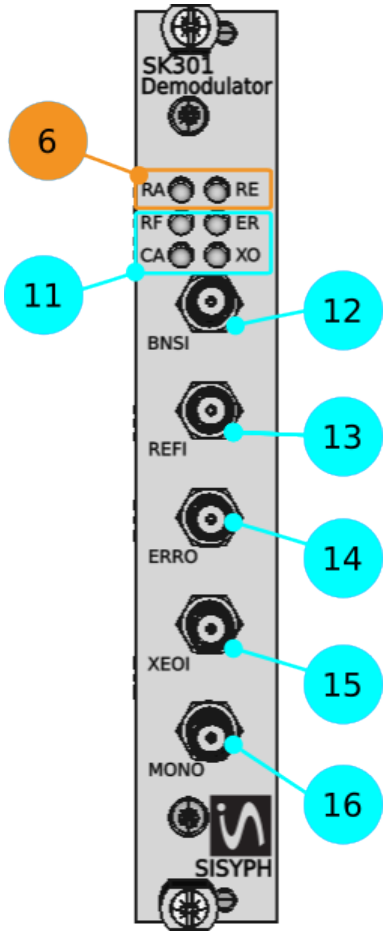


Figure 2: The SK301's front view. Circled numbers refer to features detailed in the Section 1. While the orange colored numbers denote generic characteristics shared by all SK-Series modules, their blue-color counterparts refer to specific features of the SK301.

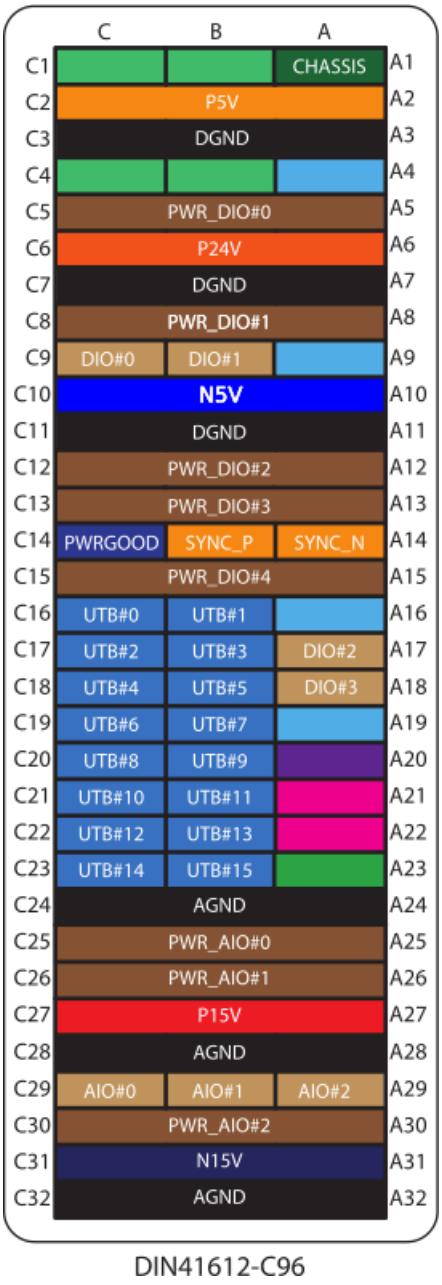


Figure 3: Generic pin assignments of the DIN41612 connector. The DIN41612-96C connector carries all the power and communication lines to the module. Additional lines are provided for i) sharing signals with other slave modules plugged on the same backplane, ii) reception of the 10-MHz synchronization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

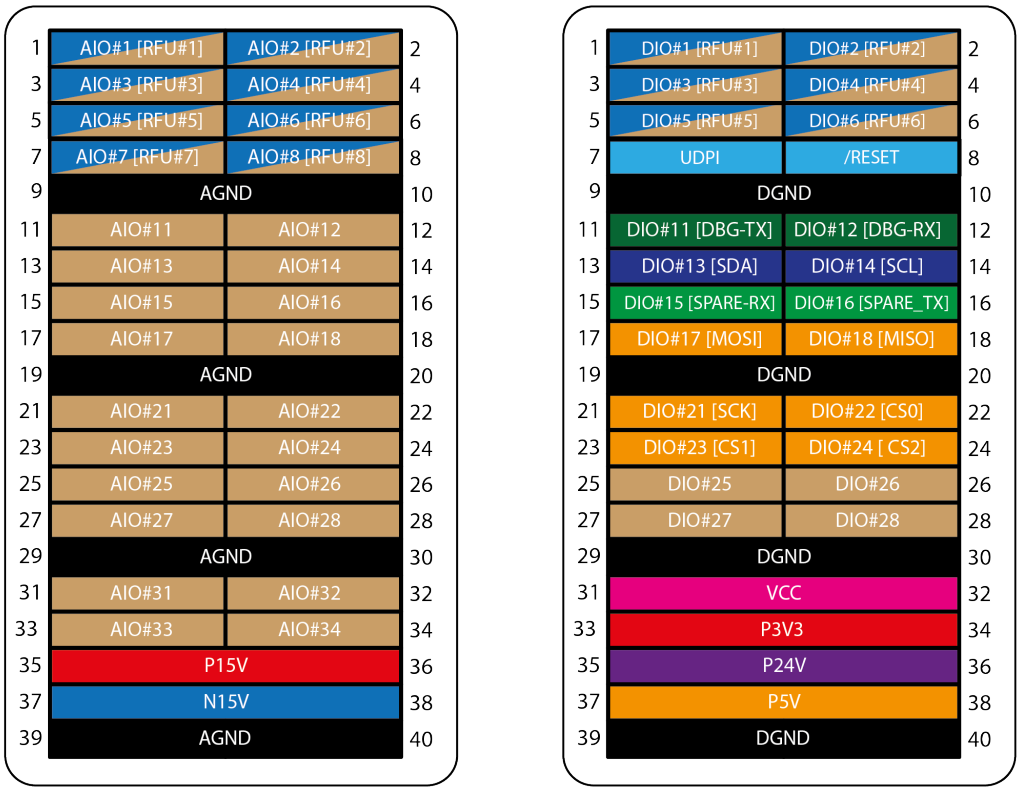


Figure 4: Generic pin assignments of the Expansion connectors. Analog power supplies and signals are routed to the AIO Expansion connector (left). Their digital counterparts are routed to the DIO Expansion connector (right). Refer to the Section 1.5 for information on the pin assignments used in SK301.

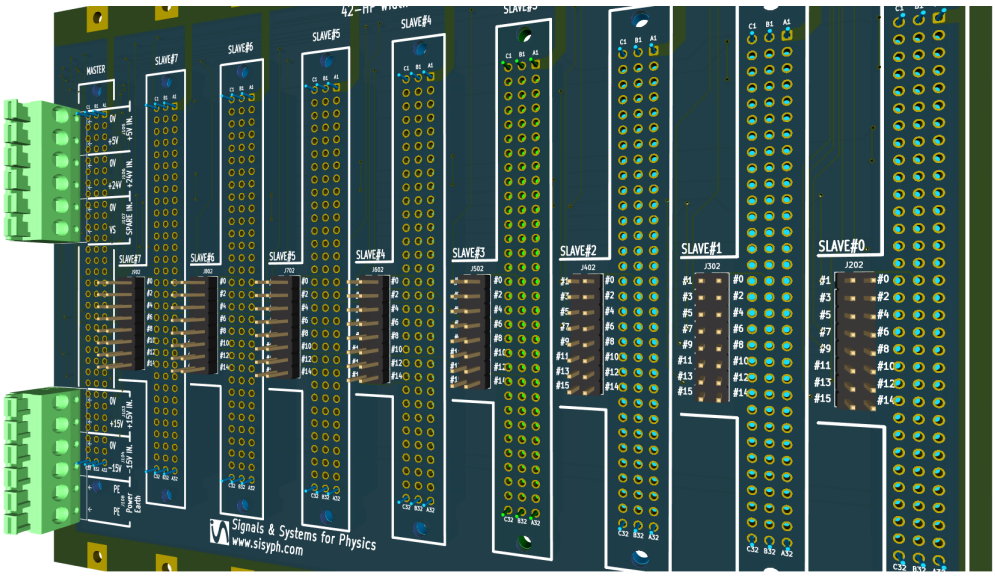


Figure 5: User's terminal blocks viewed from the rear of the backplane. Each slot of the SPK-Platform is associated with 16 independent terminals providing the user with specific wiring schemes. These connectors are accessible from the rear-side of the backplane. Note that if a 16-pin header has been used here as an exemplifying interface, the backplane is shipped without any populated parts to increase versatility.

6 Document Revision History

6.1 Version Number

This document is identified by SK301-SU02-P24A.

6.2 Revision History

P24A (2024-03-19)

Initial version.