



INTERSTACKS

Analog Input



Analog In - Looking into back

1	2	3	4	5	6	7	8	DC Out	GND
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The Analog input block has eight input channels, each individually configurable for 0-20mA, 0-10V, 0-5V, 0-2.5V, 0-1.28V, -10 to +10V, -5 to +5V, -2.5 to +2.5V, -1.28 to +1.28V, and -0.64 to +0.64V.

When using a sensor, the sensor power must often be provided separately. The GND for the sensor power supply should be connected to the Analog Input GND (terminal 10).

Contact your Interstacks support engineer or email info@interstacks.com with any questions.



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Digital Input



Digital In - Looking into back

1	Gnd 1	2	Gnd 2	3	Gnd 3	4	Gnd 4	DC Out	GND
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The Digital Input block supports four opto-isolated digital inputs (0 to 30V). Each input has its own isolated ground reference.

Contact your Interstacks support engineer or email info@interstacks.com with any questions.



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I/O Expander

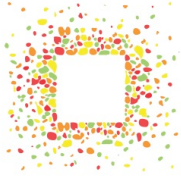


I/O Expander - Looking into back

1	2	3	4	5	6	7	8	DC Out	GND
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Connect dry contact switch inputs (or NPN, or OC open collector sensor outputs). This block also supports eight 3.3V digital outputs that can drive an external relay board. The digital inputs must be dry contact switch closures or 5V DC maximum. Other hardware blocks such as the Digital In and Analog In Universal block support other voltage ranges. There is a ten screw terminal connector for connecting wires to the block. The connector block can also output 3.3V or 5V for powering an external device.

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Dual UART Serial



Dual UART Serial - Looking into back

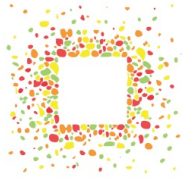
UART1 TX	UART1 RCV	I2C SCL	I2C SDA	UART2 TX	UART2 RCV			DC Out	GND
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Connect external sensors, small character displays, GPS receivers, SmartShunts, and many other peripherals. This block supports two UART (3.3V (5v tolerant)), and one I2C, serial data interface ports. There is a ten wire screw terminal connector for connecting wires to the block.

The dual UART serial block can communicate via all its serial connections simultaneously. Python programming inside the stack can be used to parse and send messages in various formats.

DC Out is 3.3V if property V is 1 (default). 5V if property V is 0. Can supply 400 mA.

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Serial



Serial - Looking into back

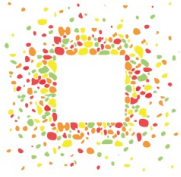
UART TX	UART RCV	I2C SCL	I2C SDA	SPI TX	SPI RCV	SPI CS	SPI CLK	DC Out	GND
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Connect external sensors, small character displays, GPS receivers, Smartshunts, multi-RGB LED chains and many other peripherals. This block supports UART (3.3V), I2C, and SPI serial interface protocols. There is a ten wire screw terminal connector for connecting wires to the block.

There are a very large number of external devices that can be connected to the Interstacks Serial block using one of the three standard serial protocols. The serial block can communicate using all three types of serial connections simultaneously. Python programming inside the stack can be used to parse and send messages in various formats.

DC Out is 3.3V if property V is 1 (default). 5V if property V is 0. Can supply 400 mA.

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RS-485

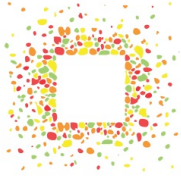


RS-485 - Looking into back

1	2	3	4	5	6	A/-	B/+	NC	GND
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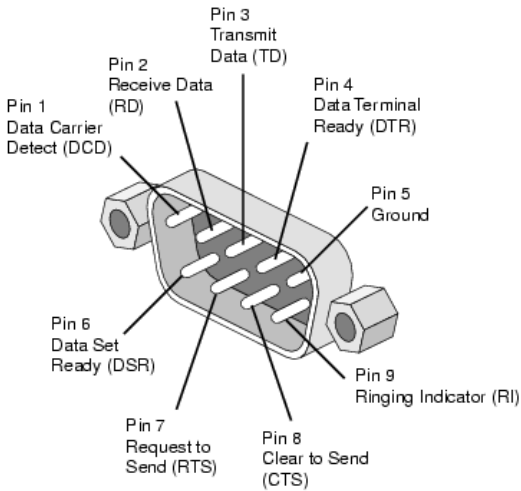
Connect your stack to a RS-485, multi-drop serial network. Set your baud rate (speed) and whether you want a network termination resistor via software inside the stack. There are many message protocols that run on RS-485 networks, for example MODBUS-ASCII, MODBUS RTU, DMX512, and proprietary machine specific formats. Python programming inside the stack can be used to parse and send messages in various formats.

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RS-232



The RS-232 block has a male DB-9 connector. There are many message protocols that run on RS-232, most are machine specific. Python programming inside the stack can be used to parse and send messages in various formats. The software also sets communication settings like baud rate.

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I/O pH-ORP



I/O pH-ORP - Looking into back

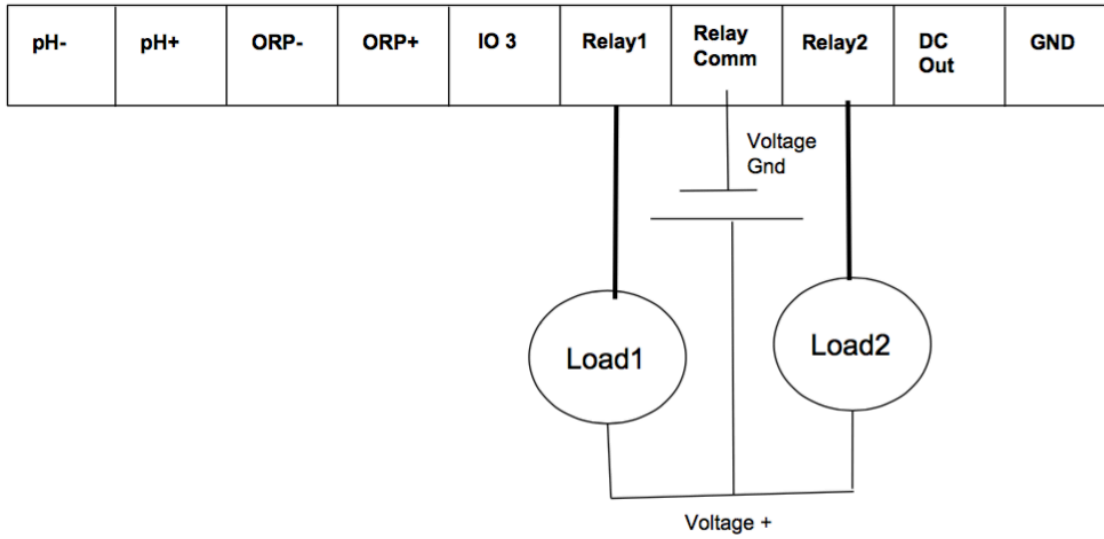
pH-	pH+	ORP-	ORP+	IO 3	Relay1	Relay Comm	Relay2	DC Out	GND
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The I/O pH ORP block supports connecting pH and ORP electrode sensors for measuring water quality. It also has a general I/O pin that can be used for a digital or analog (3.3V) connection and two switched relay outputs that have a common terminal.

pH and ORP sensors are often used to measure water quality. They are passive electrodes that require special signal conditioning electronics. They are connected to the pH-, pH+, ORP-, and ORP+ screw terminals on the back of the module. They will output analog values between 0 and about 670 over their full range. You can calibrate the sensors using standard test solutions. A lower pH will be a higher number, higher pH a lower number. Neutral pH will output approximately 330. ORP oxidation range will be a higher number and ORP reduction will be a lower number (than neutral 330). Note that the typical lifetime of sensor probes is 12 - 18 months and they need to be stored in solution. Please read your sensor probe documentation for more information.

Relay Outputs

When using the relay outputs, connect the ground for the power supply powering your loads (solenoids, valves, etc) to the Relay Common terminal. Connect one end of your loads to the positive voltage of your power supply and the other end of your loads to the Relay 1 and Relay 2 terminals. The relay outputs are rated at 0 - 60 V DC max and 700 mA current max. If you need to switch higher voltages or AC power, you can connect inexpensive external relay adapters to the Interstacks I/O Expander block.



Python programming inside the stack can be used to implement many custom applications.

Contact your Interstacks support engineer or email info@interstacks.com with any questions.



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Barcode



The Interstacks Barcode hardware block lets you connect a USB Barcode scanner to your stack. There are many vendors that sell Barcode scanners with a USB host connector. Simply plug the Barcode scanner into the USB Host connector on the back of the Interstacks Barcode hardware block. When a barcode is scanned, its value will be output as a character string from the Barcode block. Python programming inside the stack can be used to read the barcode string and use it for any application.

Contact your Interstacks support engineer or email info@interstacks.com with any questions.



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USB Keyboard / Mouse



The Interstacks USB Keyboard/Mouse hardware block lets you connect a USB keyboard or mouse to your stack. It can also interface with many USB touch panels integrated into displays. Simply plug a USB Keyboard into the USB Host connector on the back of the block and type a key. A message with the character that was typed will be sent. It is also possible to do advanced keyboard, mouse, and touch panel event handling. Python programming inside the stack can be used to read the keyboard inputs and use them for any application.

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Infrared Receive/Transmit



IR Transmit

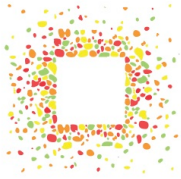
IR Recieve

The Interstacks Infrared Remote hardware block can receive and transmit infrared remote control codes. There are no infrared remote control standards. This means that the number of key codes numbers in the many thousands. Each device to be controlled from an infrared remote control uses its own unique codes. The “Key Code” output sends a five byte binary array when its receiver detects an infrared command. A typical message might be: Binary(“\x0c\xe0\xe0\xfe\xf5”). These are five (hexadecimal) binary bytes. By sending a similar five byte binary array to the “Character In” terminal, the Infrared Remote block will transmit the key code.

The Infrared Remote block has a built-in infrared receiver and transmitter behind the block's front label, in addition to connectors on its back for two external infrared transmitters and one external infrared receiver.

Python programming inside the stack can be used to read the received inputs and use them for any application.

Contact your Interstacks support engineer or email info@interstacks.com with any questions.



Motors



The Interstacks Motors hardware block enables you to connect four DC motors or two stepper motors (4V - 12V, 1 amp maximum). You can use motors in all kinds of mechatronic projects like robotics, small manufacturing motion platforms, and anything else that requires an actuator in the physical world. All motor power must be provided externally via a separate power supply. Typically 5 - 7V DC. DC (4 - 7V) motors and four wire DC (4v - 12v) stepper motors can be purchased from many sources e.g. Pololu. Python programming inside the stack can be used to control the attached motors.

If 'M' property is set to 0, specifying four DC motor functionality.

Motors connector - looking into back

DC4	DC4	DC3	DC3	DC2	DC2	DC1	DC1	DC Motor Power IN (5-7 V)	GND
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If 'M' property is set to 1, specifying two stepper motor functionality. (4v - 12v DC stepper motors. Four wire).

<u>STEP2</u> A	<u>STEP2</u> C	<u>STEP2</u> B	<u>STEP2</u> D	STEP1 A	STEP1 C	STEP1 B	STEP1 D	DC Motor Power IN (5-7 V)	GND
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(Four wire stepper motors often have the following color coded wiring that would correspond to the Motors block connector. Please check the spec sheet for your motor.)

BLACK	GREEN	RED	BLUE	BLACK	GREEN	RED	BLUE	DC Motor Power IN (5-7 V)	GND
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All motor power must be provided externally via a separate power supply. Typically 4.8-7V DC.

Contact your Interstacks support engineer or email info@interstacks.com with any questions.



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Servos



The Servos hardware block allows you to connect up to six DC (4.8 - 6 V) servo motors . All motor power must be provided externally via a separate power supply. Typically 5 - 7V DC. DC (4.8 - 6 V) servo motors can be purchased from many sources. See Adafruit, Sparkfun, Servocity and many others. Manufacturers include Futaba, Towerpro, and others. Servos can typically be positioned over 180 degrees only (half rotation). It is possible to also buy continuous rotation servo motors. Python programming inside the stack can be used to control the attached motors.

Servos connector - Looking into back

		S1	S2	S3	S4	S5	S6				
		V1	V2	V3	V4	V5	V6				
GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND

DC Motor Power IN (5-7 V)	GND
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All motor power must be provided externally via a separate power supply. Typically 4.8 - 6V DC. (see Adafruit, Sparkfun, Digikey)

Servo connector plugs in vertically. For many DC servos, the orange or white wire would go to the top pin e.g. S1

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Audio



Audio Out
(property X set to 1)

Mic In

The Interstacks Audio block can play musical notes via its built-in MIDI music synthesizer, play sound files, and generate digitized audio data. The block has a small speaker and microphone inside its plastic case, as well as connectors on the back for plugging in an external speaker or external microphone.

Simply send a character string, like 'cde', to the "Music Note" input terminal to hear three music notes. Try "CDEFG" to hear notes an octave higher. You can also send raw MIDI commands.

Python programming inside the stack can be used to control the audio hardware.

Contact your Interstacks support engineer or email info@interstacks.com with any questions.