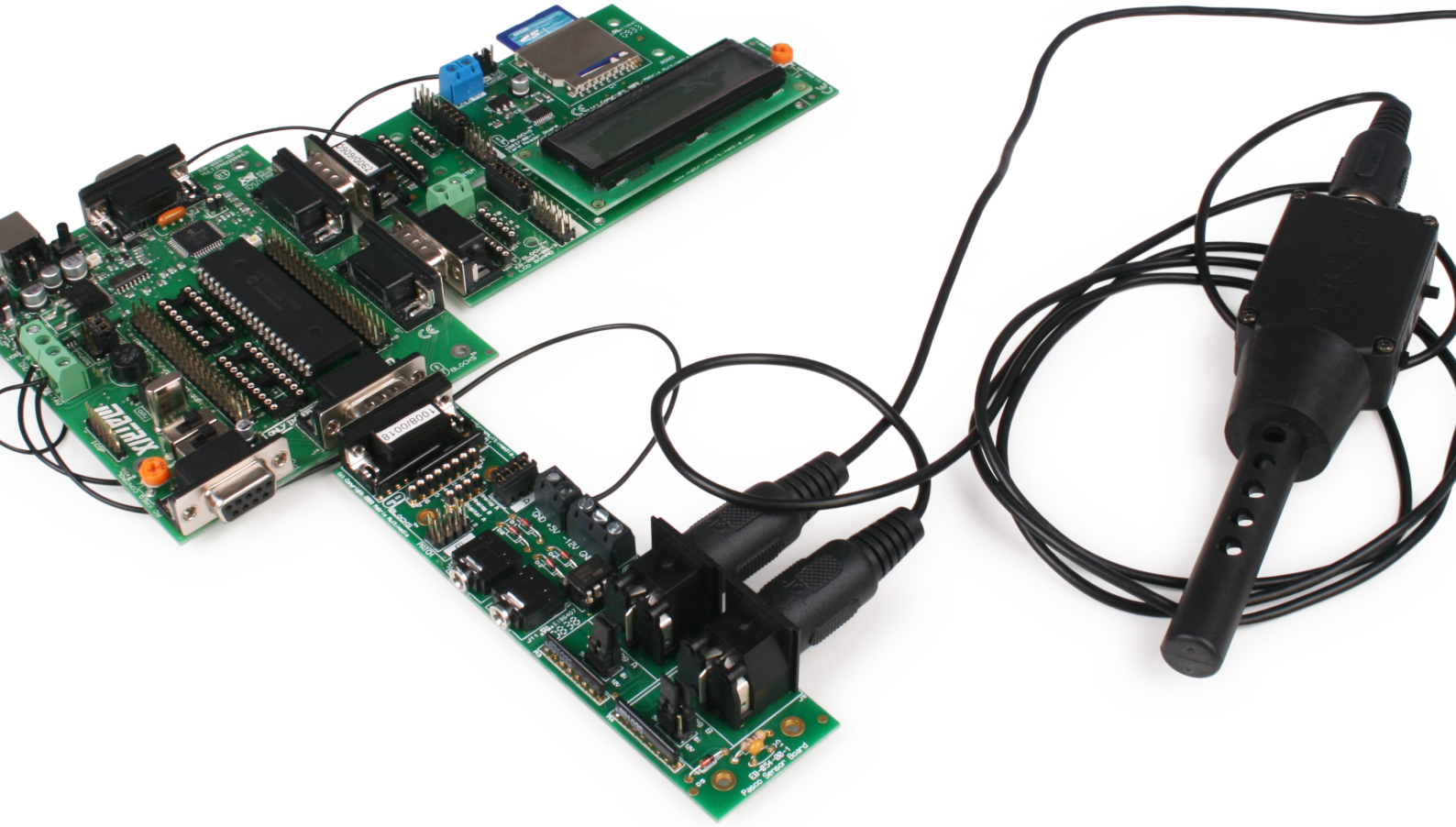
MATRIX

eBLOCKS®

PASCO sensor board

Contents



About this document

This document concerns the EB018 E-blocks CAN bus board.

1. Trademarks and copyright

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2. Disclaimer

The information provided within this document is correct at the time of going to press. Matrix TSL reserves the right to change specifications from time to time.

3. Testing this product

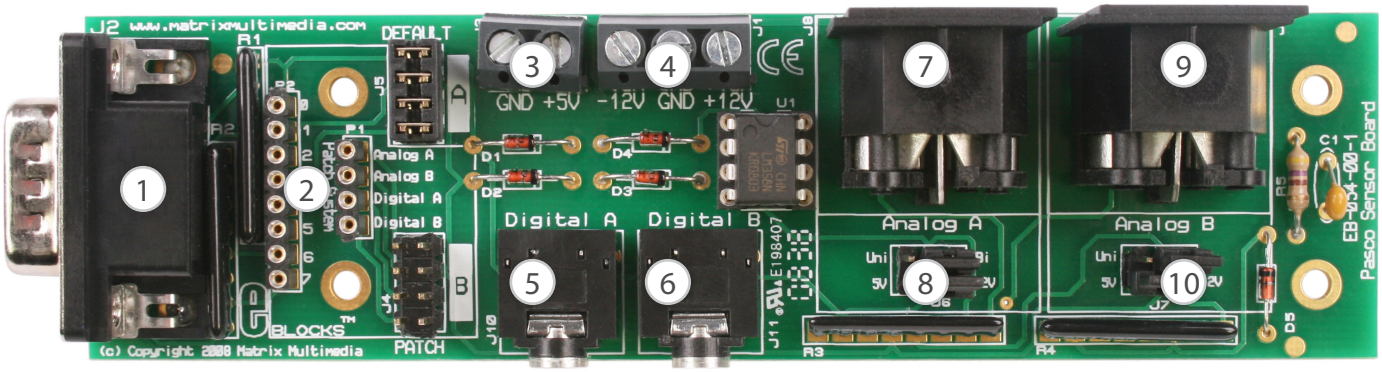
It is advisable to test the product upon receiving it to ensure it works correctly. Matrix provides test procedures for all E-blocks, which can be found in the Support section of the website.

4. Product support

If you require support for this product then please visit the Matrix website, which contains many learning resources for the E-blocks series. On our website you will find:

- How to get started with E-blocks - if you are new to E-blocks and wish to learn how to use them from the beginning there are resources available to help.
- Relevant software and hardware that allow you to use your E-blocks product better.
- Example files and programs.
- Ways to get technical support for your product, either via the forums or by contacting us directly.

Board layout



1. 9-way downstream D-type connector
2. Patch system
3. +5V power supply terminals
4. +/-12V power supply terminals
5. Digital A connector
6. Digital B connector
7. Analog A connector
8. Analog A range selection jumpers
9. Analog B connector
10. Analog B range selection jumpers

1. Analog channel jumper settings

Each analog channel has two sets of signal range selection jumpers.

Jumper	Description
5V / 12V	Select 5V or 12V signal range
Uni / Bi	12V Unipolar (0V to +12V) or 12V Bipolar (-12V to +12V) signal range Set to Uni when the 5V option is selected

5V / 12V Jumper	Uni / Bi Jumper	Input range
12V	Uni	0V to +10V
12V	Bi	-10V to+10V
5V	Uni	0V to +5V
5V	Bi	Not used

General guide for analog sensor jumper settings.

Pasco sensor		5V / 12V jumper	Uni / Bi jumper	Conditioned output = input (approx.)		Notes
Acceleration	CI-6558	12V	Bi	1.25V = -5g	3.75V = +5g	
Barometer	CI-6531A	12V	Bi	1.25V = 24inHg	3.75V = 32inHg	
Carbon Dioxide	CI-6531A	12V	Uni	0V = 0ppm	5V = 10000ppm 5V = 100000ppm	(10K range) (100K range)
Charge	CI-6561	12V	Bi	0V = -10V	5V = +10V	
Colorimeter	CI-6747	5V	Uni	0V = 0%	4.5V = 100%	No PSU
Conductivity	CI-6729	12V	Uni	0V = 0mS	5V = 200mS 5V = 2000mS 5V = 20000mS	200 range 2K range 20K range
Current	CI-6556	12V	Bi	1.25V = -1.5A	3.75V = +1.5A	
Current, High	CI-6740	12V	Bi	0V = -10A	5V = +10A	
Dissolved oxygen	CI-6542	5V	Uni	0V = 0mg/L	5V = 13.5mg/L	No PSU
EKG	CI-6539A	5V	Uni	0V = 0mV	5V = 4mV	No PSU
Force	CI-6537	12V	Bi	0.5V = -50N	4.5V = +50N	
Force, Economy	CI-6746	12V	Bi	0V = -50N	5V = +50N	
Force Platform	CI-6461	12V	Uni	0V = -1N	5V = +4N	
Heart Rate	CI-6543B	5V	Uni	0V = 0V	5V = 5V	No PSU
Humidity, Relative	CI-6559	12V	Uni	0V = 5%	5V = 95%	
Ion-Selective Electrode Amplifier	CI-6738	12V	Bi	0V = -10V	5V = +10V	
Light	CI-6504A	5V	Uni	0V = 0% max	5V = 100% max	No PSU
Light, Broad Spectrum	CI-6630	5V	Uni	0V = 0% max	5V = 100% max	
Light, High-Sensitivity	CI-6604	5V	Uni	0V = 0% max	5V = 100% max	
Light, Infrared	CI-6628	5V	Uni	0V = 0% max	5V = 100% max	
Light, UVA	CI-9784	5V	Uni	0V = 0% max	5V = 100% max	
Magnetic Field	CI-6520A	12V	Bi	0V = -1000G 0V = -100G 0V = -10G	5V = +1000G 5V = +100G 5V = +10G	1X range 10X range 100X range
Oxygen Gas	CI-6562	12V	Uni	0V = 0%	5V = 100%	
pH	CI-6507A	5V	Uni	0V = 0pH	1.4V = 14pH	No PSU
Pressure Sensor-Absolute	CI-6532A	12V	Uni	0V = 0kPa	3.5V = 700kPa	
Pressure Sensor-Low	CI-6534A	12V	Uni	0V = 0Pa	5V = 10Pa	
Sound	CI-6506B	12V	Bi	0V = -10V	5V = +10V	
Temperature	CI-6605	12V	Uni	0V = -35°C	5V = +135°C	Non-linear
Temperature, RTD	CI-6525	12V	Bi	2V = -200°C	3V = +200°C	
Temperature, Type K	CI-6526	12V	Bi	2V = -200°C	3.5V = +400°C	
Thermistor	CI-6527A	12V	Bi	0V = 0ohm	5V = 360000ohm 5V = 36000ohm	100kohm 10kohm
Thermocline	CI-6731	5V 12V 12V	Uni Uni Uni	0V = 0°C 0V = 0m 0V = 0m	1V = 100°C 4.75V = 10m 4.85V = 10m	Temperature Fresh-water depth Salt-water depth
Voltage	CI-6503	12V	Bi	0V = -10V	5V = +10V	No PSU

Sensors labelled 'No PSU' allow the option of being operated without an external power supply. The supply voltages for these sensors can be obtained from the microcontroller programmer board.

Power connections			
Sensors marked 'No PSU' only		All sensors	
Sensor board	Programmer board	Sensor board	Power supply
+12V	+14V	+12V	External supply +12V
+5V	+V	+5V	Programmer board +V or external supply +5V
0V	No connection	0V	External supply 0V
-12V	No connection	-12V	External supply -12V

General information

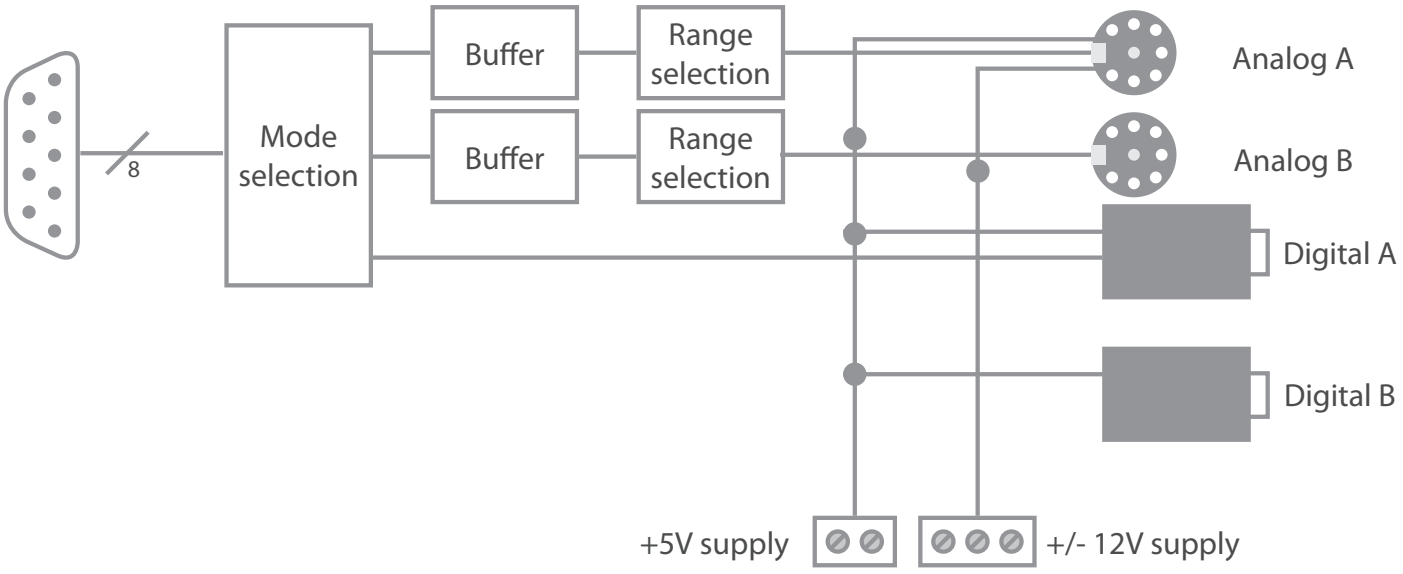
This E-block allows the PASCO® Scientific range of ScienceWorkshop sensors to be connected to a Matrix Technology Solutions programmer board.

The board provides two analog input channels and two bi-directional digital channels. Each analog provides two analog input channels and two bi-directional digital channels.ach analog channel includes a selection of signal conditioning options that can match an individual sensor output range to the input range of the microcontroller. The circuits are also protected against incorrect settings.

Power supples connected to board terminals are routed to the appropriate sensor connections.

1. Features

- 2 analog input channels with individually selectable input ranges of -10V to +10V, 0V to +10V, or 0V to +5V.
- Circuit and sensor protection against incorrect jumper settings.
- 2 bi-directional digital channels.
- Power supply connection and distribution.
- A patch system allowing any channel to be connected to any port pin.



Circuit description

The circuit consists of two bidirectional digital signal channels, two buffered analog input channels with selectable signal conditioning, power distribution, and programmer board connection options (see the circuit diagram on page 7).

1. Connectors

The 9-pin, D-type, downstream connector is used to connect the PASCO® sensor board to a port connector on a suitable microcontroller programmer board. The patch system determines which signal is connected to which port pin. The 'DEFAULT' connections (Option A) are:

Analog A	Pin 0
Analog B	Pin 1
Digital A	Pin 2
Digital B	Pin 4

The 'PATCH' connections (option B) allow individual signals to be connected to selected port pins via wire links. ***Note: Analog signals should be connected to port pins with an analog conversion capability.***

Analog signal connections are made via the two 8-pin DIN connectors. These connectors will supply power to

the sensors if the appropriate voltages are connected to the board's power supply input terminals.

Digital signal connections are made via the two 3.5mm stereo jack sockets. These connectors will provide a 5V power supply for the sensors if one is connected to the 5V power supply input terminals. Adapters are provided to convert the 6.35mm sensor jack plugs to 3.5mm.

Some sensors use both digital channels as inputs (e.g. Rotary Motion Sensor CI-6538), others use one channel as an input and one as an output (e.g. Motion Sensor II CI-6742).

2. Analog inputs

Both analog input channels are buffered by operational amplifiers. The analog inputs of a typical microcontroller will accept signals in the range 0V to 5V. The two stages of signal conditioning provided on the board allow the full range of sensor output signals to be matched to this requirement.

The Uni (unipolar) jumper option allows input signals to be fed directly to the amplifier inputs via single protection resistors and diodes.

The Bi (bipolar) jumper option connects the input signal via a potential divider referenced to 10V. This divides the input voltage by two and adds 5V. A -10V to +10V input signal will results in a 0V to +10V output. ***Note: In this configuration a 0V input signal will produce an output of 5V.***

The 5V jumper option allows the buffer amplifier output to be fed directly to the downstream connector via protection resistors and diodes.

The 12V jumper option connects the buffer amplifier output to the downstream connector via a potential divider that divides the output voltage by two. A 0V to 10V output signal will produce a 0V to 5V signal at the downstream connector.

3. Digital inputs/outputs

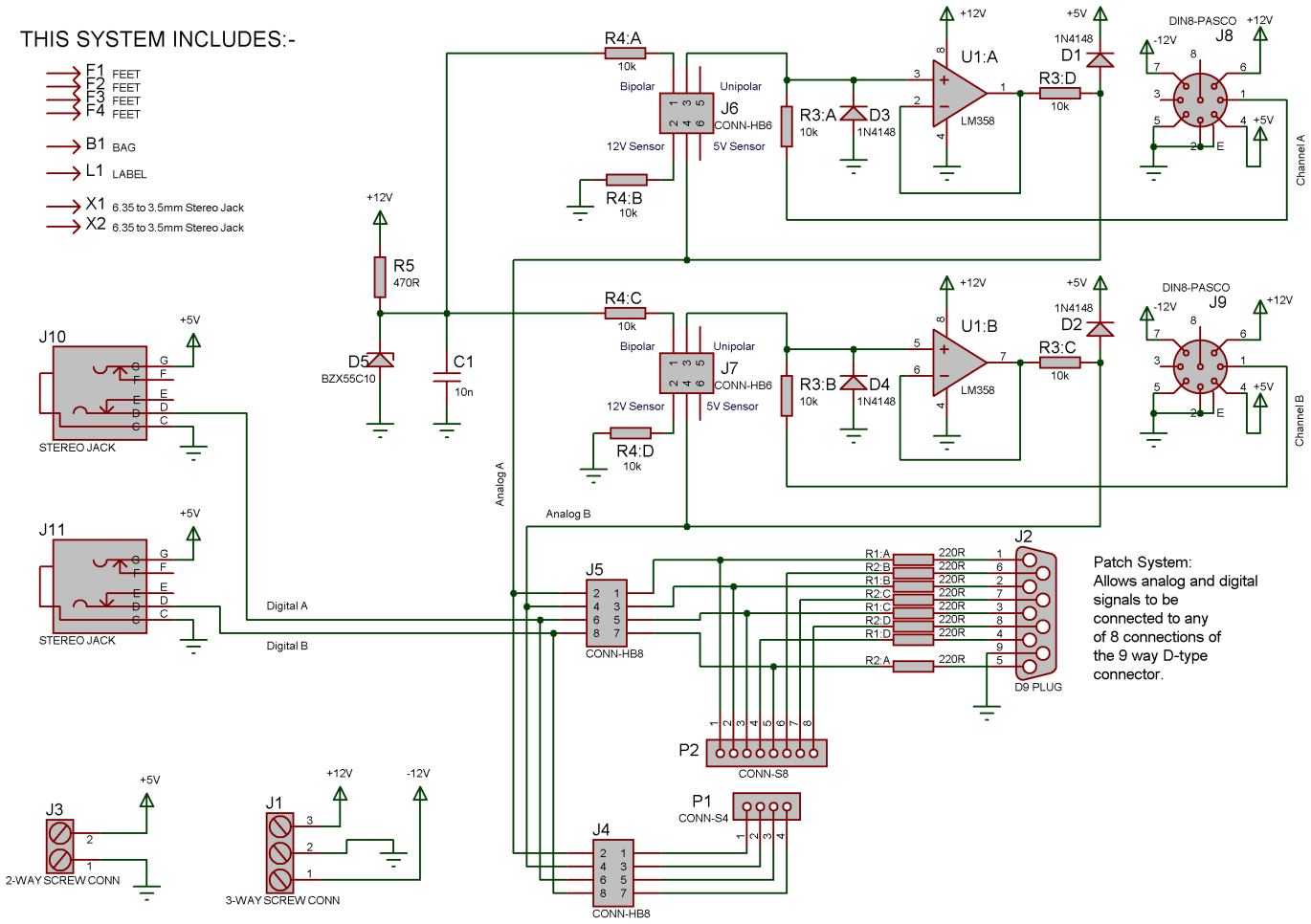
The digital inputs/outputs do not require any signal conditioning. A small resistor is provided in each signal line to protect against short-circuits.

4. 3.3V operation

This board is not suitable for 3.3V operation.

5V / 12V jumper	Uni / Bi jumper	Sensor signal ADC conversion (approx.)		
			8-bit	10-bit
12V	Uni	+10V	255	1023
		+5V	128	512
		0V	0	0
12V	Bi	+10V	255	1023
		0V	128	512
		-10V	0	0
5V	Uni	+5V	255	1023
		+2.5V	128	512
		0V	0	0

Circuit diagram



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