MSXB 027 Accessory Board Manual

5B Analog Isolation Board

Version 1.50

Microstar Laboratories, Inc.

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Part Number MSXB027M150

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MSXB 027: 5B Analog Isolation Board

The Microstar Laboratories 5B Analog Isolation Board, part number MSXB 027, provides an isolated analog interface to all a-Series Data Acquisition Processors. Isolation protects the Data Acquisition Processor from high voltages and provides the independence from ground that some applications require.

The 5B Analog Isolation Board is compatible with all 5B isolated signal conditioning modules. These modules are available from Microstar Laboratories and other sources.

5B-series isolated signal conditioning modules provide an isolated analog interface. Each 5B Analog Isolation Board supports any combination of eight input and output modules.

The number of input channels can be expanded to 512 by using multiple boards. The 5B Analog Isolation Board uses the same input expansion addressing scheme as the Analog Input Expansion Board, and may be used in conjunction with the Analog Input Expansion Board.

The 5B Analog Isolation Board is available in different models that allow various system configurations. Contact your Microstar Laboratories supplier for more information about available options.

Hardware Configuration

The 5B Analog Isolation Board connects to the Data Acquisition Processor using cable MSCBL 040-01 or MSCBL 041-01. These 68-line cables connect the analog I/O connector of a Data Acquisition Processor to connector `J1` of the 5B Analog Isolation Board. Additional boards are added to the system by using a daisy-chain version of the MSCBL 041.

All outputs from the eight channels on the 5B Analog Isolation Board connect to the lower-eight analog single-ended inputs of connector `J1`. Connector `J1` has the same pin-out as the analog I/O connector of the Data Acquisition Processor, which is shown in the Data Acquisition Processor hardware documentation.

Besides the analog I/O connector, `J1`, there are provisions for three other connections, ten configuration headers, and field termination points. The location of these components is marked in the following diagram. All diagrams show the jumpers in the same orientation as in this figure.

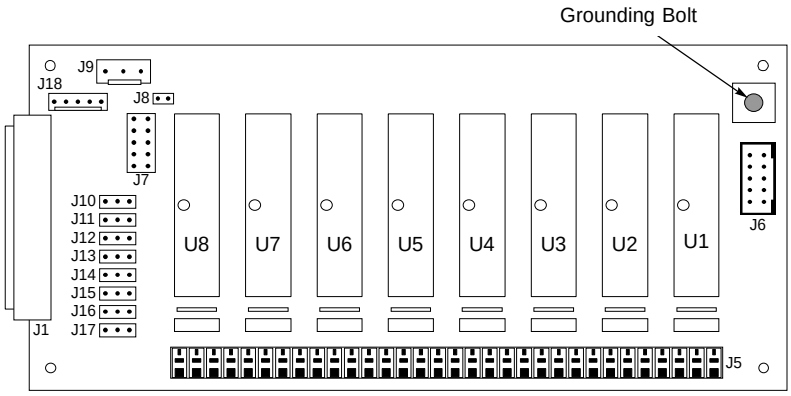


Figure 1: MSXB 027 Jumper Locations

Input-Channel Address Range Selection

The address space of 512 input channels is divided into thirty-two ranges of sixteen channels each. Because a single board can supply eight inputs at most, each range of sixteen channels is further divided into a low-order half and a high-order half. `J7` determines one of the thirty-two channel ranges provided by the board. Within that range, the channels are individually configured for the low- or high-order half of the range by headers `J10` through `J17`.

Selection of the input address range is made by placing shunts on header `J7`. Shunts are placed horizontally, connecting like numbers. Each jumper setting on connector `J7` selects an address range of 16 input channels.

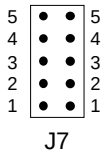


Figure 2. Input Address Range Selection Header

Pin 1 of connector `J7` is closest to the bottom edge of the board. The input range is selected according to the following table:

Table 1. Input Range Selection

Low Order Input Range	Jumper Setting	High Order Input Range
S0 - S7	1, 2, 3, 4, 5	S8 - S15
S16 - S23	1, 2, 3, 4,	S24 - S31
S32 - S39	1, 2, 3, 5	S40 - S47
S48 - S55	1, 2, 3	S56 - S63
S64 - S71	1, 2, 4, 5	S72 - S79
S80 - S87	1, 2, 4	S88 - S95
S96 - S103	1, 2, 5	S104 - S111
S112 - S119	1, 2,	S120 - S127
S128 - S135	1, 3, 4, 5	S136 - S143
S144 - S151	1, 3, 4	S152 - S159
S160 - S167	1, 3, 5	S168 - S175
S176 - S183	1, 3	S184 - S191
S192 - S199	1, 4, 5	S200 - S207
S208 - S215	1, 4	S216 - S223

S224 - S231	1, 5	S232 - S239
S240 - S247	1	S248 - S255
S256 - S263	2, 3, 4, 5	S264 - S271
S272 - S279	2, 3, 4	S280 - S287
S288 - S295	2, 3, 5	S296 - S303
S304 - S311	2, 3	S312 - S319
S320 - S327	2, 4, 5	S328 - S335
S336 - S343	2, 4	S344 - S351
S352 - S359	2, 5	S360 - S367
S368 - S375	2	S376 - S383
S384 - S391	3, 4, 5	S392 - S399
S400 - S407	3, 4	S408 - S415
S416 - S423	3, 5	S424 - S431
S432 - S439	3	S440 - S447
S448 - S455	4, 5	S456 - S463
S464 - S471	4	S472 - S479
S480 - S487	5	S488 - S495
S496 - S503	none	S504 - S511

Headers J10 through J17 select the low- or high-order half of the sixteen channel address range determined by J7. This scheme allows for maximum expandability and a high degree of flexibility. As shipped from the factory, shunts join pins 1 and 2 of J10 through J17. Together with the default setting of J7, they configure the MSXB 027 for the low-order end of the first channel range, S0 through S7. Pin 1 of these headers is situated closest to J1.

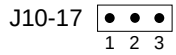


Figure 3. High/Low-Order Range Selection Headers

Placing the shunts on pins 2 and 3 of J10 through J17 configures the board for channels S8 through S15, the high-order end of the default range. You can disconnect the Data Acquisition Processor from an individual 5B module by removing the shunt from the associated header. Although inadvisable, you can also mix-and-match shunts on J10 through J17, setting some channels to the high-order section of a range and others to the low-order section. However, this practice may result in confusion and can easily lead to address conflicts, as discussed below.

Table 2. Shunt Settings for Low-Order & High-Order Range Settings

5B	Pins

Header	Module	1-2	2-3
J10	U1	S0	S8
J11	U2	S1	S9
J12	U3	S2	S10
J13	U4	S3	S11
J14	U5	S4	S12
J15	U6	S5	S13
J16	U7	S6	S14
J17	U8	S7	S15

Two 5B Analog Isolation Boards may share the same input address range, permitting all 16 signals in a given range to be utilized. To do this, simply configure their `J7` headers identically, as is shown on boards "A" and "B" in the figure, below. When ranges are shared, however, address conflicts can arise where two input modules try to drive the same signal line. This is best avoided by ensuring that one board is configured exclusively for the low-order range using `J10` through `J17` and the other is configured for the high-order range, as shown in the following diagram.

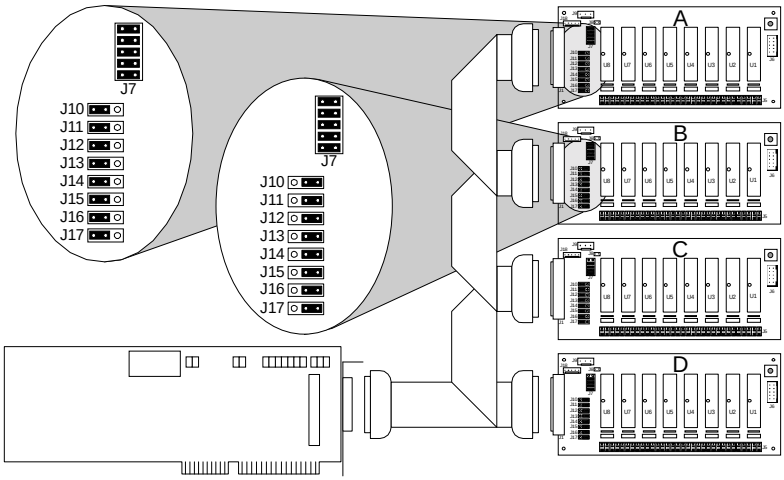


Figure 4. Example of Expansion Settings.

From the address range table, we see that `J7` configures boards A and B to share input channels `S0` through `S15`. Board A will drive `S0` through `S7` since all `J10` through `J17` shunts are placed on pins 1 and 2. Board B will drive `S8` through `S15` since its `J10` through `J17` shunts are on

pins 2 and 3. If boards C or D employ 5B input modules, they must use a configuration for J7 different from that used on boards A and B; otherwise address conflicts will result. A thirty-two input channel system may be obtained by configuring J7 on C and D with shunts only on pin-pairs 1 through 4 so that the two boards share the range S16 through S31.

Configuring Outputs

The MSXB 027 supports up to eight output modules. However, there are only 6 independent sources for driving output modules. Each of the two DAC outputs from connector J1 is connected to a pair of the module output channels. DAC0 connects to channels 4 and 5 (U5 and U6, respectively) while DAC1 connects to channels 6 and 7 (U7 and U8, respectively).

Connector J6 allows four DAC outputs from an Analog Output Expansion Board to be connected to the 5B Analog Isolation Board. Cable MSCBL 014 connects the Analog Output Expansion Board's DAC output connector to connector J6 of MSXB 027.

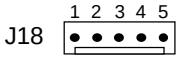
The four DAC outputs from the Analog Output Expansion Board connect to channels 0, 1, 2, and 3 (U1, U2, U3 and U4). Up to 66 output channels can be used by daisy-chaining 16 5B Analog Isolation Boards and 16 Analog Output Expansion Boards. 64 output channels would then be from the Analog Output Expansion Boards, and two channels would be from the Data Acquisition Processor.

Unlike input channels, which are enabled only when the DAP samples a channel within the address range selected by J7, output modules are always enabled and always driving their field-side interface. The only configuration choice lies in selecting the output module's location on the board, and thereby its source. Care must be taken in system design to ensure that output module sources provide appropriate values at all times when the MSXB 027 is powered on.

For an output module, the configuration of its respective J10 through J17 header is meaningless. To reduce overall system capacitance and to improve settling times, Microstar Laboratories recommends that shunts be removed from the J10 through J17 headers that correspond to output modules. The module-to-header correspondence is described in Table 2, "Shunt Settings for Low-Order & High-Order Range Settings."

Supplying I/O Trigger and Clock Signals

J18 supplies a means of connecting trigger and clock signals for controlling input and output operations on a Data Acquisition Processor. Additional information about hardware clocking and triggering may be found in the Clocks and Triggers chapter of the Data Acquisition Processor manual. J18 is a five pin connector, Molex part number 22-23-2051 and mates with Molex part 22-01-3057. Pin 1 of J18 is closest to the left edge of the board. The following table gives the pin map of these inputs to the Data Acquisition Processor.



Pin	Signal
1	Ground
2	External Input Trigger
3	External Input Clock
4	External Output Trigger
5	External Output Clock

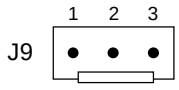
Figure 5. Triggering and Clocking Connector

External Power

The 5B Analog Isolation Board alone, without any modules installed, typically requires 30mA. Most 5B modules typically require 30mA each. Please refer to the manufacturer's specifications for power consumption of a specific 5B module. The total power consumption of all expansion boards must not exceed the availability of the Data Acquisition Processor. Please refer to the hardware documentation of the Data Acquisition Processor for more specific power availability information. If the total power consumption of the exceeds the power availability of the Data Acquisition Processor, then external power must be used.

The 5B Analog Isolation Board allows an external 5-volt power supply to be connected through connector `J9`. Connector `J9` is a male Molex connector part number 26-60-4030 and mates with the Molex connector part number 09-50-3031. A mating connector is included with the Microstar Laboratories cable kit MSCBL 035-01K.

Pin 1 is closest to connector `J18`.



Pin	Signal
1	+5 volts
2	Ground
3	Not Connected

Figure 6. External Power Connector

When an external +5 Volts power supply is connected to the board, both shunts on jumper headers `J50` and `J51` must be removed. Jumper headers `J50` and `J51` are located near connector `J9` on the top left corner of the board. Removing all the shunts from `J50` and `J51` disconnects the Data Acquisition Processor's +5V power supply from the board's +5V power supply.

Warning: When using an external power supply, both shunts on `J50` and `J51` must be removed. Otherwise the external power supply or the host PC power supply could be damaged.

Field Side Interface

Signals are connected to the input/output channels by means of the termination connector J5. Each channel has four terminations, which are labeled: -EX, LO, HI, and +EX. The LO and HI terminals are the differential inputs or outputs. The -EX and +EX terminals are the excitation voltage supplies provided by certain modules, such as strain gauge modules.

Current Input Resistor

Shunt resistor sockets are provided for measuring input current. A 20-ohm precision shunt resistor is provided with each 5B current input module.

Caution: If high voltages are connected to the 5B Analog Isolation Board, extreme caution should be used to prevent electric shock. Always disconnect all high voltages before handling the 5B Analog Isolation Board. Mount the 5B Analog Isolation Board so that it cannot come into contact with conductive materials.

Overvoltage Protection

The 5B modules provide protection from overvoltages. A typical 5B module provides 240V rms continuous input protection on any of the field side inputs. It also provides 1500V rms common mode input to output isolation. The user should check the specifications of the particular 5B module being used. If there is a danger of exceeding the module's isolation voltage limit, the grounding bolt near connector J6 should be connected to ground with a large diameter wire that is as short as possible. In the event of module failure, the grounding bolt is used to divert potentially large currents which could damage the Data Acquisition Processor.

Cold Junction Compensation Option

A 5B Analog Isolation Board is available with cold junction compensation (CJC) installed. The 5B37 and 5B47 thermocouple modules require a temperature sensor for cold junction compensation

(CJC). The CJC circuit does not affect other types of modules that don't require CJC.