MSXB 060/061 Accessory Board Manual

Analog Input Expansion Board

Version 1.00

Microstar Laboratories, Inc.

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Part Number MSXB060M100

Contents

MSXB 060/MSXB 061: Analog Input Expansion Board

The Microstar Laboratories Analog Input Expansion Board, part number MSXB 060, multiplexes 32 differential analog inputs into a Data Acquisition Processor. Up to eight Analog Input Expansion Boards can be connected to a Data Acquisition Processor, providing 256 differential analog inputs.

The advanced model of MSXB 060 is MSXB 061. Each MSXB 061 has 64 differential analog inputs. The MSXB 061 backplane and single-board enclosure models include a main board and an adapter board. The main board is similar to MSXB 060 except that it accepts 32 more differential analog inputs from the adapter board. The adapter board is a small board installed on the main board to provide 32 more differential analog inputs. Up to four MSXB061 boards can be connected to a Data Acquisition Processor, providing 256 differential analog inputs.

The MSXB 060 Analog Input Expansion Board features high-speed, fault-protected inputs multiplexer chips and programmable logic device controls.

The MSXB 060 has a filter on each input channel. All differential input signal pairs are shielded with case ground and all output signal pairs are shielded with analog sense ground. The isolation between signal pairs gives a good shielding against electromagnetic noise caused by other analog and digital wires on the board.

Basic Models

Microstar Laboratories has several models of MSXB 060 and MSXB 061 available. MSXB 060 board is compatible with the Standard Data Acquisition Processor backplane system and optionally can be installed in a stand-alone or single-board external enclosure configuration. MSXB 060 boards mount directly in a standard Microstar Laboratories industrial enclosure fitted with a 68-line analog backplane.

Table 1 shows all current MSXB 060 and MSXB 061 board models. Other models may be available. Contact your Microstar Laboratories representative for information about all available models.

Table 1. MSXB 060 and MSXB 061 Basic Models

Product Name	DAP Connection
MSXB060-01-E2R	backplane
MSXB060-01-A2R	shielded right angle single-board enclosure
MSXB060-02-A2Z	shielded right angle stand-alone
MSXB061-01-E2S	backplane
MSXB061-01-A2S	shielded right angle single-board enclosure
MSXB061-02-A2Z	shielded right angle stand-alone

Installation

The backplane models with DAP connection E2 connect to the Data Acquisition Processor by installing into any available slot in the analog backplane mounted in an industrial enclosure.

When installing the MSXB 060 or MSXB 061 board, push the board firmly into the slot and make sure the board is securely connected to the backplane.

The stand-alone models and single-board enclosure models with DAP connection A2 connect to the Data Acquisition Processor by means of the MSCBL040-01 or MSCBL041-01 cables.
  • MSCBL 040-01 is a 68-line round shielded cable, which can use with EMC-compliant systems.
  • MSCBL 041-01 is a 68-line flat ribbon cable, which cannot use with EMC-compliant systems.
  • These 68-line cables connect the analog I/O connector of a Data Acquisition Processor to connector `J1` of the MSXB 060 board.

Warning: Never connect or disconnect the Analog Input Expansion Board from the analog backplane or the Data Acquisition Processor while power is applied to any of them.

Hardware Configuration

The following diagram shows the layout of Analog Input Expansion Board:
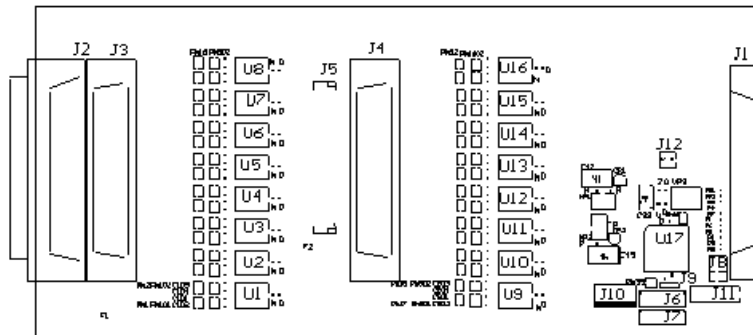
Figure 1. MSXB 060 Connector Locations

The Analog Input Expansion Board has a header J9 that connects to the PLD chip. Header J9 allows to select between the 32 differential analog inputs configuration and the 64 differential analog inputs configuration by setting the jumper resistor on J9 to pin 1-2 and pin 2-3 respectively. The pin 3 of J9 is closer to header J11.

Analog input signals should be within the operating range from –25 volts to +25 volts, relative to the ground of the MSXB 060 board. Input signals may be applied to the MSXB 060 board when the power is off.

Input signals are connected to the Analog Input Expansion Board through an HD-78 connector. Figure 2 shows the pin map of connector J2, each pin is labeled with the signal name:

J2

D31+	59		20	D15+
D31-	78		39	D15-
D30+	58		19	D14+
D30-	77		38	D14-
D29+	57		18	D13+
D29-	76		37	D13-
D28+	56		17	D12+
D28-	75		36	D12-
D27+	55		16	D11+
D27-	74		35	D11-
D26+	54		15	D10+
D26-	73		34	D10-
D25+	53		14	D9+
D25-	72		33	D9-
D24+	52		13	D8+
D24-	71		32	D8-
D23+	51		12	D7+
D23-	70		31	D7-
D22+	50		11	D6+
D22-	69		30	D6-
D21+	49		10	D5+
D21-	68		29	D5-
D20+	48		9	D4+
D20-	67		28	D4-
D19+	47		8	D3+
D19-	66		27	D3-
D18+	46		7	D2+
D18-	65		26	D2-
D17+	45		6	D1+
D17-	64		25	D1-
D16+	44		5	D0+
D16-	63		24	D0-
DAC1 RETURN	43		4	DAC0 RETURN
DAC1 OUT	62		23	DAC0 OUT
FusedAG0	42		3	
GND	61		22	GND
IXTIN	41		2	OXTIN
GND	60		21	GND
IXCIN	40		1	OXCIN

Figure 2. High density 78-pin connector J2

The high density 78-pin connector J2 or J3 of the MSXB 060 accepts
32 differential analog input signals. Signals may be connected to a
MSXB 060 using a custom Analog Termination Board or a cable kit,
part number MSCBL117-01K, that is available from Microstar
Laboratories.

The MSXB 060 and MSXB 061 boards are designed for measuring differential signals. Measurements of single-ended signals will not be accurate. Table 2 shows the correspondence between differential and single-ended inputs.

Table 2. Differential Input Connections

Single-Ended Input	Differential Input
S0, S1	D0-, D0+
S2, S3	D1-, D1+
S4, S5	D2-, D2+
S6, S7	D3-, D3+
S8, S9	D4-, D4+
S10, S11	D5-, D5+
S12, S13	D6-, D6+
S14, S15	D7-, D7+
S16, S17	D8-, D8+
S18, S19	D9-, D9+
S20, S21	D10-, D10+
S22, S23	D11-, D11+
S24, S25	D12-, D12+
S26, S27	D13-, D13+
S28, S29	D14-, D14+
S30, S31	D15-, D15+
S32, S33	D16-, D16+
S34, S35	D17-, D17+
S36, S37	D18-, D18+
S38, S39	D19-, D19+
S40, S41	D20-, D20+
S42, S43	D21-, D21+
S44, S45	D22-, D22+
S46, S47	D23-, D23+
S48, S49	D24-, D24+
S50, S51	D25-, D25+
S52, S53	D26-, D26+
S54, S55	D27-, D27+
S56, S57	D28-, D28+
S58, S59	D29-, D29+
S60, S61	D30-, D30+
S62, S63	D31-, D31+

Note: The input pin order on the J2 or J3 connector does not match the D0-D63 DAPL input pin order. The following tables show how the DAPL input signal pins map to Analog Input Expansion Board input pins.

Table 3. Differential Input Pin Mapping for MSXB 060 Boards

DAPL Input Pin	Connector	Connector Pin
D0	J2	5, 24
D1	J2	6, 25
D2	J2	7, 26
D3	J2	8, 27
D4	J2	9, 28
D5	J2	10, 29
D6	J2	11, 30
D7	J2	12, 31
D8	J2	13, 32
D9	J2	14, 33
D10	J2	15, 34
D11	J2	16, 35
D12	J2	17, 36
D13	J2	18, 37
D14	J2	19, 38
D15	J2	20, 39
D16	J2	44, 63
D17	J2	45, 64
D18	J2	46, 65
D19	J2	47, 66
D20	J2	48, 67
D21	J2	49, 68
D22	J2	50, 69
D23	J2	51, 70
D24	J2	52, 71
D25	J2	53, 72
D26	J2	54, 73
D27	J2	55, 74
D28	J2	56, 75
D29	J2	57, 76
D30	J2	58, 77
D31	J2	59, 78

Table 4. Differential Input Pin Mapping for MSXB 061 Boards

DAPL Input Pin	Connector	Connector Pin
D0	J2	5, 24
D1	J2	6, 25
D2	J2	7, 26
D3	J2	8, 27
D4	J2	9, 28
D5	J2	10, 29
D6	J2	11, 30
D7	J2	12, 31
D8	J2	13, 32
D9	J2	14, 33
D10	J2	15, 34
D11	J2	16, 35
D12	J2	17, 36
D13	J2	18, 37
D14	J2	19, 38
D15	J2	20, 39
D16	J2	44, 63
D17	J2	45, 64
D18	J2	46, 65
D19	J2	47, 66
D20	J2	48, 67
D21	J2	49, 68
D22	J2	50, 69
D23	J2	51, 70
D24	J2	52, 71
D25	J2	53, 72
D26	J2	54, 73
D27	J2	55, 74
D28	J2	56, 75
D29	J2	57, 76
D30	J2	58, 77
D31	J2	59, 78

Table 4. Differential Input Pin Mapping for MSXB 061 Boards, **continued**

DAPL Input Pin	Connector on the Adapter	Connector Pin
D32	J1	5, 24
D33	J1	6, 25
D34	J1	7, 26
D35	J1	8, 27
D36	J1	9, 28
D37	J1	10, 29
D38	J1	11, 30
D39	J1	12, 31
D40	J1	13, 32
D41	J1	14, 33
D42	J1	15, 34
D43	J1	16, 35
D44	J1	17, 36
D45	J1	18, 37
D46	J1	19, 38
D47	J1	20, 39
D48	J1	44, 63
D49	J1	45, 64
D50	J1	46, 65
D51	J1	47, 66
D52	J1	48, 67
D53	J1	49, 68
D54	J1	50, 69
D55	J1	51, 70
D56	J1	52, 71
D57	J1	53, 72
D58	J1	54, 73
D59	J1	55, 74
D60	J1	56, 75
D61	J1	57, 76
D62	J1	58, 77
D63	J1	59, 78

Input Range Selection

Up to eight MSXB 060 or four MSXB 061 boards can connect to a single DAP, providing 256 differential analog inputs. Each Analog Input Expansion Board must be configured to recognize a unique input address range. The jumper setting on header J8 selects the board address ranges:

Header J8 of   Header J8 of
MSXB 060 board   MSXB 061 board

```
 1    2    3            1    2
 ●    ●    ●            ●    ●

 ●    ●    ●            ●    ●
 1    2    3            1    2
   J8                     J8
```
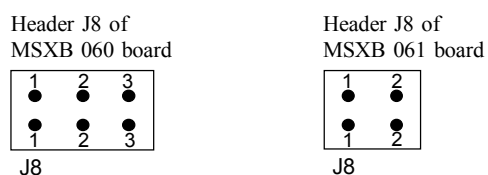
Figure 3. Input Range Selection Header

The pin 1 of connector J8 is closest to connectors J1 and J10. The input range for MSXB 060 boards is selected according to the following table:

Table 5. Input Range Configuration for MSXB 060 Boards

Single-Ended Input Range	Differential Input Range	Board Number	Jumpers
0 - 63	0 - 31	0	1, 2, 3
64 - 127	32 - 63	1	2, 3
128 - 191	64 - 95	2	1, 3
192 - 255	96 - 127	3	3
256 - 319	128 - 159	4	1, 2
320 - 383	160 - 191	5	2
384 - 447	192 - 223	6	1
448 - 511	224 - 255	7	none

The following table shows the input range for MSXB 061 boards:

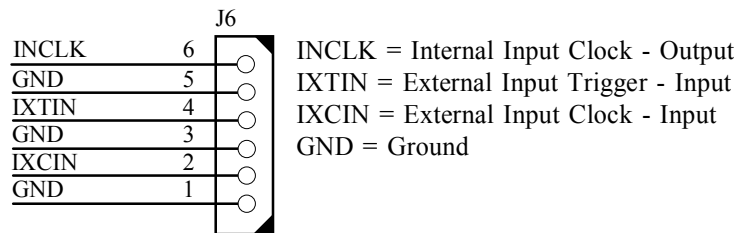*Table 6. Input Range Configuration for MSXB 061 boards*

Single-Ended Input Range	Differential Input Range	Board Number	Jumpers
0 - 127	0 - 63	0	1, 2
128 - 255	64 - 127	1	2
256 - 383	128 - 191	2	1
384 - 511	192 - 255	3	none

External Clocking and Triggering Connections

External clocking and triggering signals can be connected to the Analog Input Expansion Board to provide hardware triggering and clocking. See the Data Acquisition Processor manual for more information about hardware clocking and triggering.
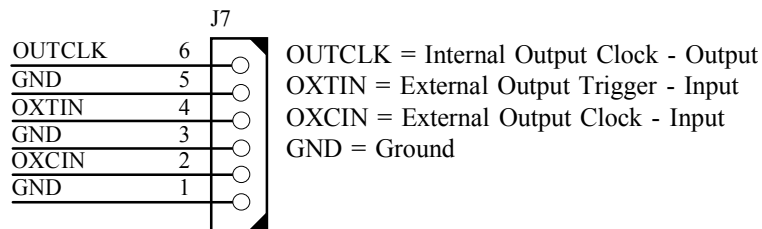
External signals connecting to `J6` and `J7` must be in the standard TTL range of 0 to +5 volts. The pins on `J6` and `J7` connect directly to the pins on a Data Acquisition Processor.

Input clocking and triggering signals can connect to `J6`. The pin 1 of connector `J6` is closer to connector `J1`. The pin numbering for connector `J6` is given in the following diagram:

J6

INCLK	6	INCLK = Internal Input Clock - Output
GND	5	IXTIN = External Input Trigger - Input
IXTIN	4	IXCIN = External Input Clock - Input
GND	3	GND = Ground
IXCIN	2	
GND	1	

Figure 4. Input Clocking and Triggering Header

Output clocking and triggering signals can connect to `J7`. The pin 1 of connector `J7` is closer to connector `J1`. The pin numbering for connector `J7` is given in the following diagram:

J7

OUTCLK	6	OUTCLK = Internal Output Clock - Output
GND	5	OXTIN = External Output Trigger - Input
OXTIN	4	OXCIN = External Output Clock - Input
GND	3	GND = Ground
OXCIN	2	
GND	1	

Figure 5. Output Clocking and Triggering Header

Sampling Speed with External Expansion

When sampling at high speeds using an MSXB 060, multiplexer settling time limits the sampling rate. Therefore, the settling time must be added to the settling time of the Data Acquisition Processor on-board analog circuits. Add 2 µs to the minimum sample rate of the Data Acquisition Processor.

Software Configuration

DAPL automatically generates expansion control signals, as specified by input procedure SET commands. For example, the following input procedure reads from expanded analog inputs:

```
RESET
IDEFINE A
    CHANNELS 5
    SET IPIPE0 D0
    SET IPIPE1 D15
    SET IPIPE2 D16
    SET IPIPE3 D20
    SET IPIPE4 D31 100
    TIME 10
    END
PDEFINE B
    BPRINT
    END
START
```