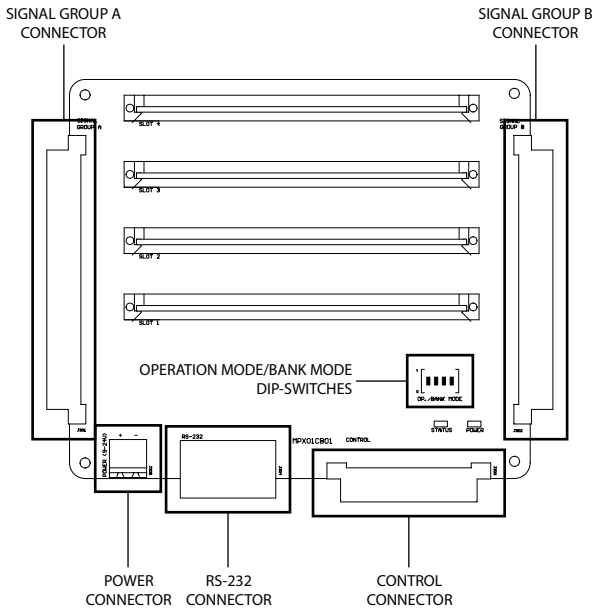


MPX160A User's Manual

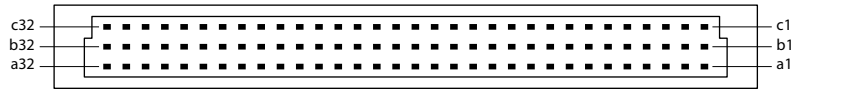
MPX160A is a signal demultiplexer for device in-system programming/testing. It allows the ISP connection coming from a programmer/tester to be switched to one of the available output channels (up to 32). In this way, a single programmer/tester can easily handle multiple device programming, whether on a single board or distributed across multiple boards in a panel assembly.

Connectors and Controls



SIGNAL GROUP CONNECTORS PINOUT

(96 way, DIN 41612, reverse, pitch = 2.54mm, female)

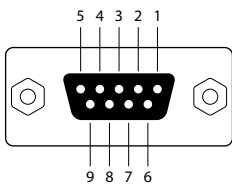


Note: SIGNAL GROUP A and SIGNAL GROUP B connectors have the same pinout. In the table below, the -X suffix stands for -A for signals in the SIGNAL GROUP A connector, and for -B for signals in the SIGNAL GROUP B connector.

Pin	Signal	Description	Pin	Signal	Description	Pin	Signal	Description
a1	IN-D0-X	Input signal D0 (Digital)	b1	OUT-SG06-D2-X	Output Signal Group 6, D2	c1	OUT-SG12-PO-X	Output Signal Group 12, PO
a2	IN-D1-X	Input signal D1 (Digital)	b2	OUT-SG06-A0-X	Output Signal Group 6, A0	c2	OUT-SG13-DO-X	Output Signal Group 13, DO
a3	IN-D2-X	Input signal D2 (Digital)	b3	OUT-SG06-PO-X	Output Signal Group 6, PO	c3	OUT-SG13-D1-X	Output Signal Group 13, D1
a4	IN-A0-X	Input signal A0 (Analog)	b4	OUT-SG07-DO-X	Output Signal Group 7, DO	c4	OUT-SG13-D2-X	Output Signal Group 13, D2
a5	IN-PO-X	Input signal P0 (Power)	b5	OUT-SG07-D1-X	Output Signal Group 7, D1	c5	OUT-SG13-PO-X	Output Signal Group 13, PO
a6	OUT-SG01-DO-X	Output Signal Group 1, DO	b6	OUT-SG07-D2-X	Output Signal Group 7, D2	c6	OUT-SG13-DO-X	Output Signal Group 13, DO
a7	OUT-SG01-D1-X	Output Signal Group 1, D1	b7	OUT-SG07-A0-X	Output Signal Group 7, A0	c7	OUT-SG14-DO-X	Output Signal Group 14, DO
a8	OUT-SG01-D2-X	Output Signal Group 1, D2	b8	OUT-SG07-PO-X	Output Signal Group 7, PO	c8	OUT-SG14-D1-X	Output Signal Group 14, D1
a9	OUT-SG01-A0-X	Output Signal Group 1, A0	b9	OUT-SG08-DO-X	Output Signal Group 8, DO	c9	OUT-SG14-D2-X	Output Signal Group 14, D2
a10	OUT-SG01-PO-X	Output Signal Group 1, PO	b10	OUT-SG08-D1-X	Output Signal Group 8, D1	c10	OUT-SG14-A0-X	Output Signal Group 14, A0
a11	OUT-SG02-DO-X	Output Signal Group 2, DO	b11	OUT-SG08-D2-X	Output Signal Group 8, D2	c11	OUT-SG14-PO-X	Output Signal Group 14, PO
a12	OUT-SG02-D1-X	Output Signal Group 2, D1	b12	OUT-SG08-A0-X	Output Signal Group 8, A0	c12	OUT-SG15-DO-X	Output Signal Group 15, DO
a13	OUT-SG02-D2-X	Output Signal Group 2, D2	b13	OUT-SG08-PO-X	Output Signal Group 8, PO	c13	OUT-SG15-D1-X	Output Signal Group 15, D1
a14	OUT-SG02-A0-X	Output Signal Group 2, A0	b14	OUT-SG09-DO-X	Output Signal Group 9, DO	c14	OUT-SG15-D2-X	Output Signal Group 15, D2
a15	OUT-SG02-PO-X	Output Signal Group 2, PO	b15	OUT-SG09-D1-X	Output Signal Group 9, D1	c15	OUT-SG15-A0-X	Output Signal Group 15, A0
a16	OUT-SG03-DO-X	Output Signal Group 3, DO	b16	OUT-SG09-D2-X	Output Signal Group 9, D2	c16	OUT-SG15-PO-X	Output Signal Group 15, PO
a17	OUT-SG03-D1-X	Output Signal Group 3, D1	b17	OUT-SG09-A0-X	Output Signal Group 9, A0	c17	OUT-SG16-DO-X	Output Signal Group 16, DO
a18	OUT-SG03-D2-X	Output Signal Group 3, D2	b18	OUT-SG09-PO-X	Output Signal Group 9, PO	c18	OUT-SG16-D1-X	Output Signal Group 16, D1
a19	OUT-SG03-A0-X	Output Signal Group 3, A0	b19	OUT-SG10-DO-X	Output Signal Group 10, DO	c19	OUT-SG16-D2-X	Output Signal Group 16, D2
a20	OUT-SG03-PO-X	Output Signal Group 3, PO	b20	OUT-SG10-D1-X	Output Signal Group 10, D1	c20	OUT-SG16-A0-X	Output Signal Group 16, A0
a21	OUT-SG04-DO-X	Output Signal Group 4, DO	b21	OUT-SG10-D2-X	Output Signal Group 10, D2	c21	OUT-SG16-PO-X	Output Signal Group 16, PO
a22	OUT-SG04-D1-X	Output Signal Group 4, D1	b22	OUT-SG10-A0-X	Output Signal Group 10, A0	c22	-	Reserved
a23	OUT-SG04-D2-X	Output Signal Group 4, D2	b23	OUT-SG10-PO-X	Output Signal Group 10, PO	c23	-	Reserved
a24	OUT-SG04-A0-X	Output Signal Group 4, A0	b24	OUT-SG11-DO-X	Output Signal Group 11, DO	c24	GND	Ground
a25	OUT-SG04-PO-X	Output Signal Group 4, PO	b25	OUT-SG11-D1-X	Output Signal Group 11, D1	c25	GND	Ground
a26	OUT-SG05-DO-X	Output Signal Group 5, DO	b26	OUT-SG11-D2-X	Output Signal Group 11, D2	c26	GND	Ground
a27	OUT-SG05-D1-X	Output Signal Group 5, D1	b27	OUT-SG11-A0-X	Output Signal Group 11, A0	c27	GND	Ground
a28	OUT-SG05-D2-X	Output Signal Group 5, D2	b28	OUT-SG11-PO-X	Output Signal Group 11, PO	c28	GND	Ground
a29	OUT-SG05-A0-X	Output Signal Group 5, A0	b29	OUT-SG12-DO-X	Output Signal Group 12, DO	c29	GND	Ground
a30	OUT-SG05-PO-X	Output Signal Group 5, PO	b30	OUT-SG12-D1-X	Output Signal Group 12, D1	c30	GND	Ground
a31	OUT-SG06-DO-X	Output Signal Group 6, DO	b31	OUT-SG12-D2-X	Output Signal Group 12, D2	c31	GND	Ground
a32	OUT-SG06-D1-X	Output Signal Group 6, D1	b32	OUT-SG12-A0-X	Output Signal Group 12, A0	c32	GND	Ground

RS-232 CONNECTOR PINOUT

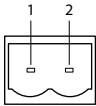
(9 way, D-Sub, female)



Pin	Signal	Description
1	N.C.	Not connected
2	TX	RS-232 TX
3	RX	RS-232 RX
4	N.C.	Not connected
5	GND	Ground
6	N.C.	Not connected
7	N.C.	Not connected
8	N.C.	Not connected
9	N.C.	Not connected

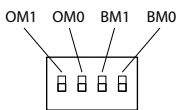
POWER CONNECTOR PINOUT

(Terminal block, pitch = 5.08mm, male)



Pin	Signal	Description
1	PWR	9-24V DC
2	GND	Ground

OPERATION MODE/BANK MODE DIP-SWITCHES

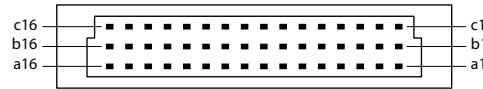


OM1	OM0	Configuration
0	0	Address mode
0	1	Sequencer mode
1	X	Serial mode

BM1	BM0	Configuration
0	0	Dual 5x16 mode
0	1	Single 5x32 mode
1	X	Single 10x16 mode

CONTROL CONNECTOR PINOUT

(48 way, DIN 41612, reverse, pitch = 2.54mm, female)



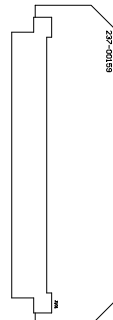
Pin	Signal	Description	Pin	Signal	Description	Pin	Signal	Description
a1	SEL0-A	Demux A Selection 0	b1	3V3	3.3V output, 100-mA fuse protected	c1	GND	Ground
a2	SEL1-A	Demux A Selection 1	b2	3V3	3.3V output, 100-mA fuse protected	c2	GND	Ground
a3	SEL2-A	Demux A Selection 2	b3	3V3	3.3V output, 100-mA fuse protected	c3	GND	Ground
a4	SEL3-A	Demux A Selection 3	b4	3V3	3.3V output, 100-mA fuse protected	c4	GND	Ground
a5	SEL4	Demux A/B Selection 4	b5	3V3	3.3V output, 100-mA fuse protected	c5	GND	Ground
a6	ENA-A	Demux A Enable	b6	3V3	3.3V output, 100-mA fuse protected	c6	GND	Ground
a7	SEL0-B	Demux B Selection 0	b7	3V3	3.3V output, 100-mA fuse protected	c7	GND	Ground
a8	SEL1-B	Demux B Selection 1	b8	3V3	3.3V output, 100-mA fuse protected	c8	GND	Ground
a9	SEL2-B	Demux B Selection 2	b9	3V3	3.3V output, 100-mA fuse protected	c9	GND	Ground
a10	SEL3-B	Demux B Selection 3	b10	3V3	3.3V output, 100-mA fuse protected	c10	GND	Ground
a11	ENA-B	Demux B Enable	b11	3V3	3.3V output, 100-mA fuse protected	c11	GND	Ground
a12	GND	Ground	b12	3V3	3.3V output, 100-mA fuse protected	c12	GND	Ground
a13	GND	Ground	b13	3V3	3.3V output, 100-mA fuse protected	c13	GND	Ground
a14	GND	Ground	b14	3V3	3.3V output, 100-mA fuse protected	c14	GND	Ground
a15	GND	Ground	b15	3V3	3.3V output, 100-mA fuse protected	c15	GND	Ground
a16	GND	Ground	b16	3V3	3.3V output, 100-mA fuse protected	c16	GND	Ground

Diagnostic Self-Test and Errors

A diagnostic self-test is performed automatically every time MPX160A is powered. However, the provided Test Plug can be used to perform an in-depth diagnostic self-test. Just connect the Test Plug to the SIGNAL GROUP A connector and wait until the test is automatically performed. At the end of the test procedure, the STATUS LED will blink once to signal a successful test, or twice to signal a failure. Repeat the process with the SIGNAL GROUP B connector.

The table below lists all possible STATUS LED blink modes, that may signal an error also outside the diagnostic self-test procedure.

Blinks	Description
1	Test successful
2	Test failure
3	Startup self-test error
4	Internal communication error
5	Unknown error



Absolute Maximum Ratings

Parameter	Value
Input voltage on lines SEL[3..0]-A, SEL4, ENA-A, SEL[3..0]-B, ENA-B	-2V to +9V
Source current on line 3V3	+100mA
Input voltage on lines IN-D[2..0]-A, IN-D[2..0]-B, OUT-SG[16..1]-D[2..0]-A, OUT-SG[16..1]-D[2..0]-B	-1V to +7V
Input voltage on lines IN-A0-A, IN-A0-B, OUT-SG[16..1]-A0-A, OUT-SG[16..1]-A0-B	-1V to +16.8V
Input voltage on lines IN-PO-A, IN-PO-B, OUT-SG[16..1]-PO-A, OUT-SG[16..1]-PO-B	-42V to +42V
Current on lines IN-D[2..0]-A, IN-A0-A, IN-D[2..0]-B, IN-A0-B, OUT-SG[16..1]-D[2..0]-A, OUT-SG[16..1]-D[2..0]-B, OUT-SG[16..1]-A0-B	±50mA
Switching/carry current on lines IN-PO-A, IN-PO-B, OUT-SG[16..1]-PO-A, OUT-SG[16..1]-PO-B	±500mA
Supply voltage on line PWR	-20V to +24V
Power consumption on line PWR	1A

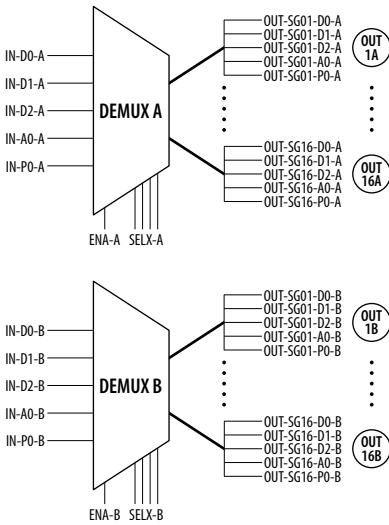
Operating Ratings

Parameter	Value
V _{IL} (input low voltage) on lines SEL[3..0]-A, SEL4, ENA-A, SEL[3..0]-B, ENA-B	0V to +1.155V
V _{IH} (input high voltage) on lines SEL[3..0]-A, SEL4, ENA-A, SEL[3..0]-B, ENA-B	+2.31V to +5.5V
Analog signal range on lines IN-D[2..0]-A, IN-D[2..0]-B, OUT-SG[16..1]-D[2..0]-A, OUT-SG[16..1]-D[2..0]-B	0V to +5.5V
Analog signal range on lines IN-A0-A, IN-A0-B, OUT-SG[16..1]-A0-A, OUT-SG[16..1]-A0-B	0V to +15.5V
Analog signal range on lines IN-PO-A, IN-PO-B, OUT-SG[16..1]-PO-A, OUT-SG[16..1]-PO-B	0V to +24V
Continuous current on lines IN-D[2..0]-A, IN-D[2..0]-B, OUT-SG[16..1]-D[2..0]-A, OUT-SG[16..1]-D[2..0]-B	±30mA
Continuous current on lines IN-A0-A, IN-A0-B, OUT-SG[16..1]-A0-A, OUT-SG[16..1]-A0-B	±40mA
Continuous current on lines IN-PO-A, IN-PO-B, OUT-SG[16..1]-PO-A, OUT-SG[16..1]-PO-B	±500mA
Overall stand-by power consumption	200mA

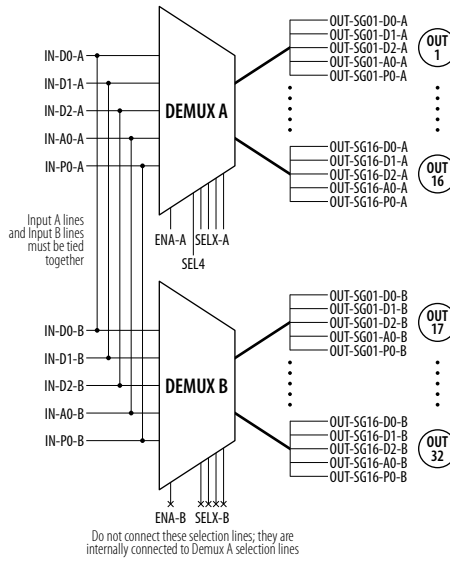
Bank Modes

Output Groups are logical sets of one or two Signal Groups, and are enclosed in circles.

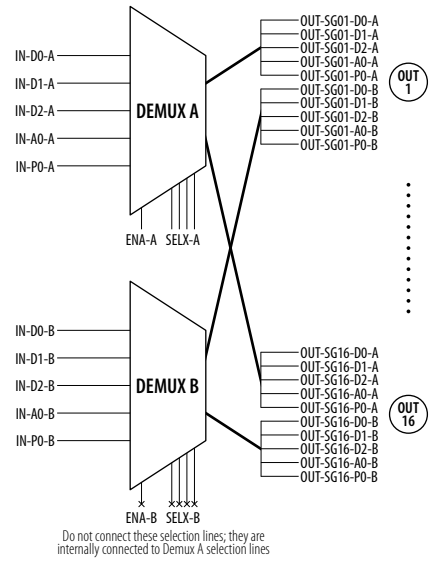
Dual 5x16 Mode



Single 5x32 Mode



Single 10x16 Mode



Operation Modes

Every time the DIP-switches change, the device resets to the default state, where no Output Group is selected. At most, only one Output Group is selected at any time. Enable lines are active high.

Address Mode

Selection lines (in the Control connector) are used to select the Output Group.
SELX-A, SEL4 (SEL4 is only used in Single 5x32 Bank Mode): 0-based Output Group lines.
ENA-A: Demux A enable.
SELX-B: 0-based Signal Group lines (only used in Dual 5x16 Bank Mode).
ENA-B: Demux B enable (only used in Dual 5x16 Bank Mode).

Sequencer Mode

Selection lines (in the Control connector) are used to sequentially select the Output Group.
Initially, no Output Group is selected. At the first strobe, the first Output Group is selected. Successive strobes select the next Output Group. When the last Output Group is reached, successive strobes have no effect.
SELO-A (Demux A strobe): a rising edge selects the next Output Group.
ENA-A (Demux A reset): resets to the default state, no Output Group selected.
SELO-B (Demux B strobe): a rising edge selects the next Output Group (only used in Dual 5x16 Bank Mode).
ENA-B (Demux B reset): resets to the default state, no Output Group selected (only used in Dual 5x16 Bank Mode).

Serial Mode

Signal Groups are selected via RS-232 commands. Selection lines are ignored.
Communication must be set to 9600 bps, no parity, 8 data bits, 1 stop bit.
Every command string must be followed by the return character (ASCII code 13, corresponding to the `\r` escape character in the C programming language); likewise, every command answer is terminated by the return character.
Each command returns either answer data or no answer data (see command reference). At the end of the answer (just before the return character), the `>` character is appended in case of success; in case of error, an error code is returned, followed by the `!` character (e.g. `$0001!`). See the table below for error codes.

Error Code	Description
\$0001	The MPXCLOSE or MPXOPEN command specifies an invalid Output Group
\$0002	Invalid command
\$0003	Invalid parameter
\$0004	Invalid Bank Mode
\$0005	Internal communication error
\$0006	Command could not be executed; MPX160A should be restarted

MPXPING

Description: Pings the device. Used to test the communication link
Parameters: None
Answer: **PONG**

MPXGETSTATUS

Description: Retrieves the current Operation Mode and Bank Mode as set by the DIP-switches
Parameters: None
Answer: **OM=<ADDRESS | SEQUENCER | SERIAL> BM=<DUAL 5x16 | SINGLE 5x32 | SINGLE 10x16>**

MPXCLOSE <Output Group>

Description: Selects an Output Group
Parameter (in Dual 5x16 Bank Mode): **1A to 16A, 1B to 16B**
Parameter (in Single 5x32 Bank Mode): **1 to 32**
Parameter (in Single 10x16 Bank Mode): **1 to 16**
Answer: None

MPXOPEN <Output Group>

Description: Deselects Output Groups
Parameters: **ALL** (available for all Bank Modes)
A or **B** (available for Dual 5x16 Bank Mode only)
Answer: None

MPXGETVER

Description: Retrieves the firmware version of MPX160A, including hardware model and firmware version of each of the four modules (or an error if a module information cannot be retrieved).
Parameters: None
Answer: **SW_VER=<Sw Version>**
MODULE=0 <HW_MOD=<Hw Model> HW_VER=<Hw Version> |<Error Code>
MODULE=1 <HW_MOD=<Hw Model> HW_VER=<Hw Version> |<Error Code>
MODULE=2 <HW_MOD=<Hw Model> HW_VER=<Hw Version> |<Error Code>
MODULE=3 <HW_MOD=<Hw Model> HW_VER=<Hw Version> |<Error Code>

MPXRESTART

Description: Resets the device.
Parameters: None
Answer: None



Important

SMH Technologies reserves the right to make improvements to MPX160A, its documentation and software routines, without notice. Information in this manual is intended to be accurate and reliable. However, SMH Technologies assumes no responsibility for its use; nor for any infringements of rights of third parties which may result from its use.

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