

FLASHCUT CNC

CONTROL MADE SIMPLE

USB Signal Generator Hardware Guide



Midwest Office

444 Lake Cook Road, Suite 22
Deerfield, IL 60015

Phone (847) 940-9305 ♦ Fax (847) 940-9315

www.flashcutcnc.com

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Getting Started

About This Manual

CNC is a unique application involving hardware and software. We recommend that you read all of these instructions before using the product.



Since automated machining is potentially dangerous, please take the time to completely read through this manual and the software User's Guide to understand the operation of the electronics, software and machine before cutting a part.

Turning Off the Controller



Always turn off the CNC Controller when it is not in use.

Safety and Usage Guidelines



When running an automated machine tool, safety is of the utmost importance. For proper and safe use of the CNC program and your CNC machine, the following safety guidelines must be followed:

- 1. Never let the machine tool run unattended.**
- 2. Require any person in the same room as a running machine tool to wear safety goggles and to stay a safe distance from the machine.**
- 3. Allow only trained operators to run the machine tool. Any operator must have:**
 - Knowledge of machine tool operation.**
 - Knowledge of personal computer operation.**
 - Knowledge of Microsoft Windows.**
 - Good common sense.**
- 4. Place safety guards around the machine to prevent injury from flying objects. It is highly recommended that you build a safety shield around the entire tool envelope.**
- 5. Never place any part of your body within the tool envelope while the machine is online, since unexpected machine movement can occur at any time.**
- 6. Always keep the tool envelope tidy and free of any loose objects.**
- 7. Be on alert for computer crashes at all times.**

WPI, Inc. is not responsible for the safe installation and use of this product. You and only you are responsible for the safety of yourself and others during the operation of your CNC machine tool. We supply this product but have no control over how it is installed or used. Always be careful!

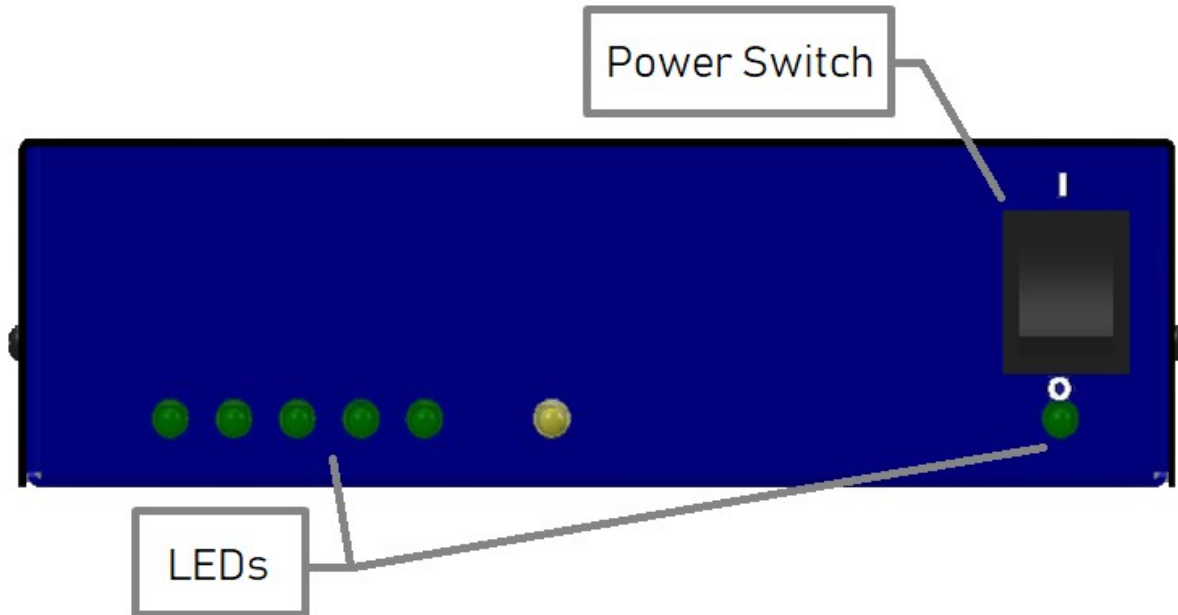
WPI, Inc. or its affiliates are not responsible for damage to any equipment or workpiece resulting from use of this product.

If you do not understand and agree with all of the above safety guidelines, do not use this product.

USB Signal Generator

Front Panel

The front panel provides the main power switch and diagnostic LEDs.

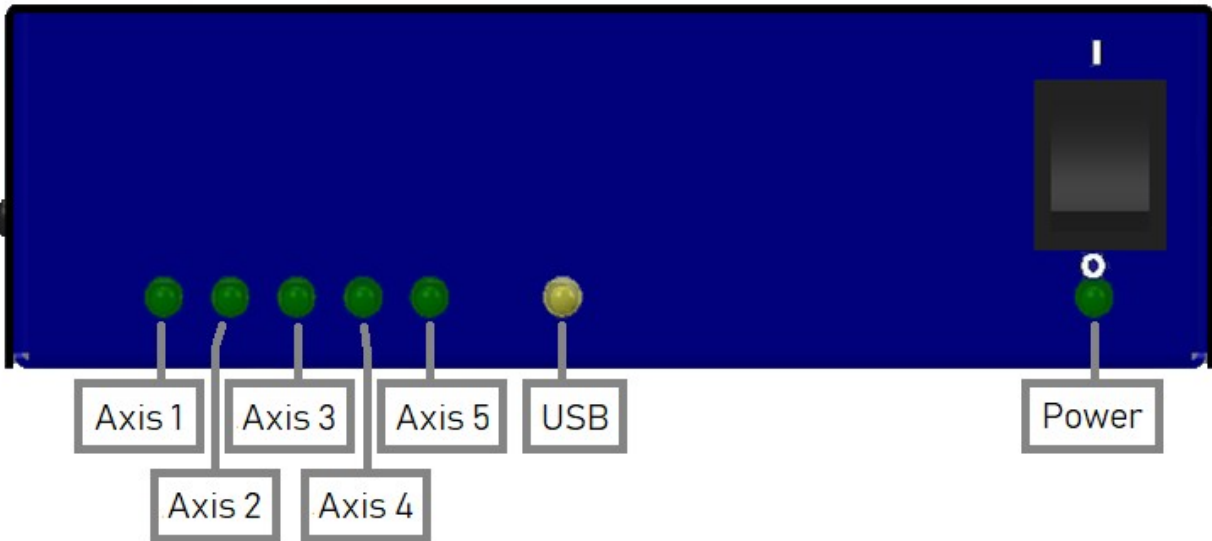


Power Switch

The power switch turns the unit on and off. If there is ever a communications error while running the system, it may be necessary to turn the switch off, wait 10 seconds and turn it back on to reset the internal microprocessor.

LEDs

The front panel LEDs can be used as a diagnostic tool to know the state of the system.



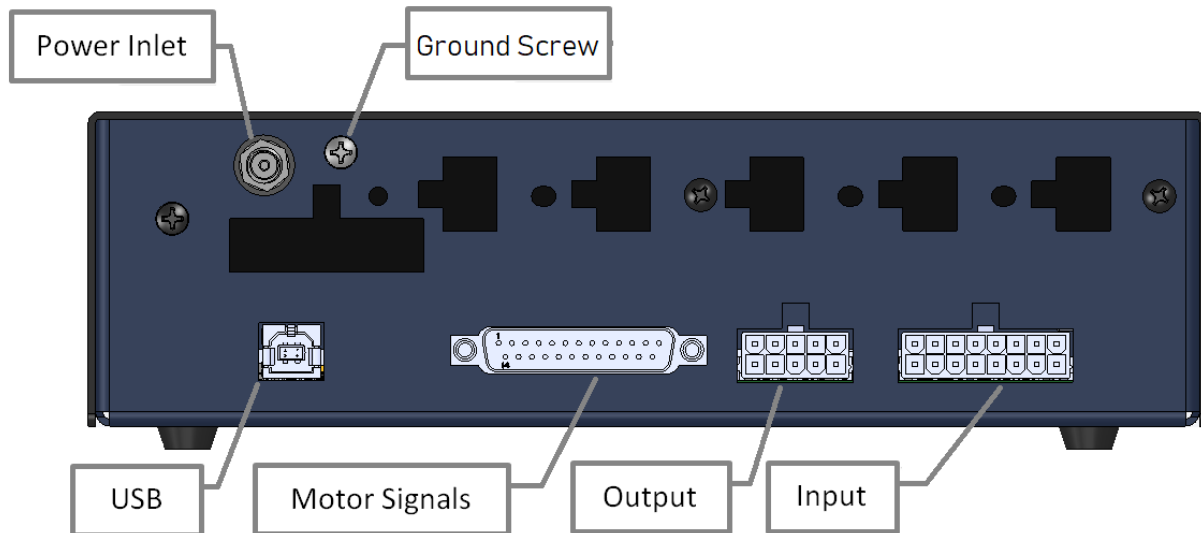
The five LEDs grouped on the left indicate the motion on axes 1-5. The brightness of the LED is based on the step rate of the axis. The faster an axis is moving, the brighter the axis LED will be. The axis LEDs are numbered 1-5 going left to right.

The amber LED indicates that the controller has a physical connection to the USB port on the PC. This is not an indication that the controller is connected through the software.

The LED to the right is the power/diagnostic LED. This LED is used to indicate that the unit is powered on.

Rear Panel

The rear panel of the CNC controller provides a connection point for main power, ground and all control signals used in the CNC system.



Power Inlet

The power inlet is a receptacle for supplying power to the controller. The unit is shipped with an external DC power supply unit (PSU). This PSU has extra protection against the electrical demand to drive motors. If the controller is powered by a third-party PSU, damage may occur. Please contact the Support Team for information on an approved replacement.

<i>Model Number</i>	<i>Voltage (VDC)</i>	<i>Amperage (A)</i>
501A Signal Generator	9	1.67
5501-#-050-M	42.5	5

Motor Signals

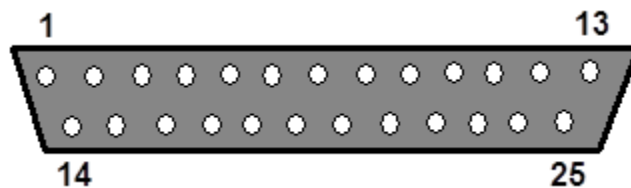
The Motor Signals connector uses a DB-25 connector to send step and direction signals from the Signal Generator to an external drive box.

The Motor Signals connector also provides a connection point to inputs 1-8 and outputs 1 & 2. Inputs 1-8 are the same signals found on the Input connector. Output 1 & 2 are the same outputs found on the output connector.

The Motor Signals connector can be used to tap into the internal +5V power supply as well as provide an externally isolated power supply for the inputs. Refer to the signal generator section of this hardware guide for further information on input voltage compatibility.

The voltage levels for each Output, Step, Direction and Enable signals are all 5V logic.

DB-25 Connector for Motor Signals			
Pin No.	Signal	Pin No.	Signal
1	OUTPUT 1	14	ENABLE ALL
2	OUTPUT 2	15	INPUT 1
3	STEP AXIS 5	16	INPUT 2
4	DIRECTION AXIS 5	17	INPUT 3
5	INPUT 5	18	INPUT 4
6	INPUT 6	19	DIRECTION AXIS 4
7	INPUT 7	20	DIRECTION AXIS 3
8	INPUT 8	21	DIRECTION AXIS 2
9	DIRECTION AXIS 1	22	INTERNAL VCC +5V
10	STEP AXIS 4	23	OPT. VCC (INPUT)
11	STEP AXIS 3	24	INTERNAL GND
12	STEP AXIS 2	25	OPT. GND (INPUT)
13	STEP AXIS 1		



USB

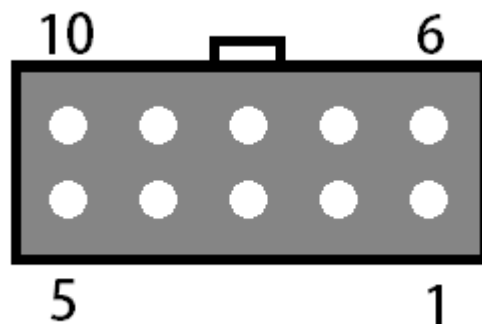
The USB connector is used for communication with the USB port on the host PC. Use a USB-A to B cable with a maximum length of 3 meters to make the connection. Plug the cable directly into PC, as opposed to a USB repeater or a hub. If the software loses communication with the Signal Generator, electrical noise may be the cause. To reduce electrical noise problems, use a shorter USB cable or attach one or more ferrite chokes to the USB cable. Toroid-shaped chokes are more effective than snap-on cylindrical chokes. If you need more than 3m of USB cable length, use an active extension cable.

For the most robust USB connection, make sure the controller is communicating with the PC in Full-Speed mode rather than Hi-Speed mode. This setting can be found in the configuration dialog of your CNC software and will not decrease performance compared to Hi-Speed.

Outputs

This connector is for up to eight output lines. The Output ports cannot drive a 24V external system unless it accepts TTL/CMOS levels. They are all driven by HCT family logic. Output logic high is normally 5V and can be as low as 3.9V at full load. Output logic low is normally 0V and can be as high as 0.3V at full load. Each of these signals can provide up to 20mA of current. Information about the mating connector can be found in the Signal Generator section.

10-Pin Mini-Fit Jr. Connector for Outputs			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	OUTPUT 1	6	OUTPUT 2
2	OUTPUT 3	7	OUTPUT 4
3	OUTPUT 5	8	OUTPUT 6
4	OUTPUT 7	9	OUTPUT 8
5	+5V	10	GND

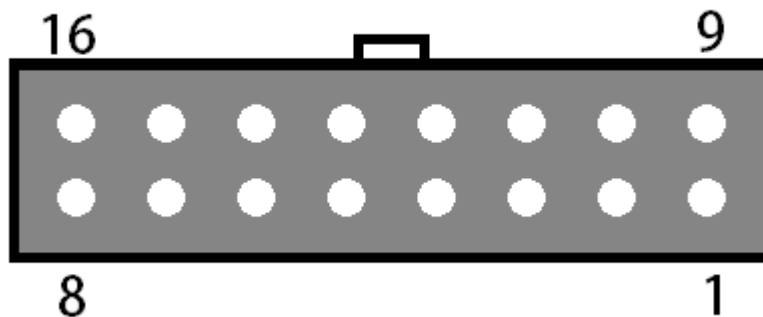


Inputs

The input connector provides a connection point for up to eight input lines. The most common use of the input lines is for limit or safety switches. These lines are all TTL and CMOS compatible, optically-isolated inputs. When a switch is open, its input signal is high (5VDC). When the switch is closed, the input signal is grounded low (0VDC). If you need more than eight input lines, an I/O expansion board is available.

The input circuit can be configured to be compatible with higher voltages and optical isolation. NPN type proximity sensors are compatible with the input lines, but may require a different voltage to power. For configuration and mating connector information, refer to the Signal Generator section of this manual.

16-Pin Mini-Fit Jr. Connector for Inputs			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	OPT. GND	9	INPUT 1
2	OPT. GND	10	INPUT 2
3	OPT. GND	11	INPUT 3
4	OPT. GND	12	INPUT 4
5	OPT. GND	13	INPUT 5
6	OPT. GND	14	INPUT 6
7	OPT. GND	15	INPUT 7
8	OPT. GND	16	INPUT 8



Signal Generator

LEDs

The Signal Generator has seven LED indicators on-board to show different states of the system.

Power-On Sequence

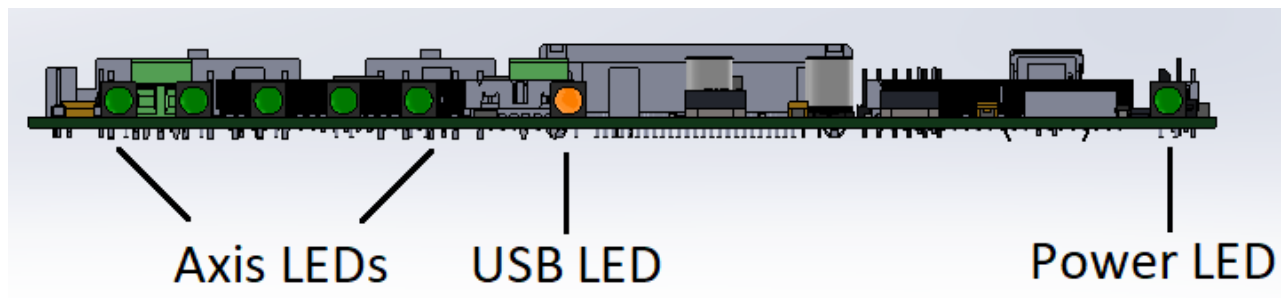
When power is first applied to the Signal Generator, the seven LED indicators go through a start-up sequence to indicate that the firmware is in a healthy state. First, all LEDs blink once. Then, each LED blinks once in order from Axis 1 to Power.

After the light sequence is complete, Axis 1-5 LEDs will remain off and the Power LED will be on. The USB LED will be on if a USB cable is connected between the controller and PC, otherwise the USB LED will be off.

If the LEDs do not sequence on power-up as described, either there is no power to the Signal Generator or the firmware on the controller has become corrupted and the controller will need to be repaired.

During Operation

Each Axis LED will pulse when its corresponding axis is commanded to move. This causes the LED to appear to increase in brightness as the commanded motion becomes faster.



Inputs

Inputs 1-8 are all optically isolated to provide a measure of protection from overvoltage and transient voltages. The inputs' reference voltage can be supplied by the Signal Generator's internal logic power or by an external voltage wired to the Signal Generator's TB40.

Internal Power

This option works well for most applications but negates some of the signal isolation. When JP84 shorts pins 1 and 2, OPT VCC gets its power from the internal 5V power source. When JP85 shorts pins 1 and 2, OPT GND is directly connected to the internal GND.

External Isolated Power

For the best noise immunity, connect an external 5V-24V power supply using one of the following methods. This is the default configuration. Ensure that all of your input devices are compatible with the supplied voltage. When JP84 shorts pins 2 and 3, OPT VCC gets its power from the TB-VCC. When JP85 shorts pins 2 and 3, OPT GND is directly connected to the TB-GND.

Choose only one of the following methods to supply power:

- Connect a power source to the TB-40 screw terminal.
- Connect a power source through pins 23 & 25 of the DB-25 connector.

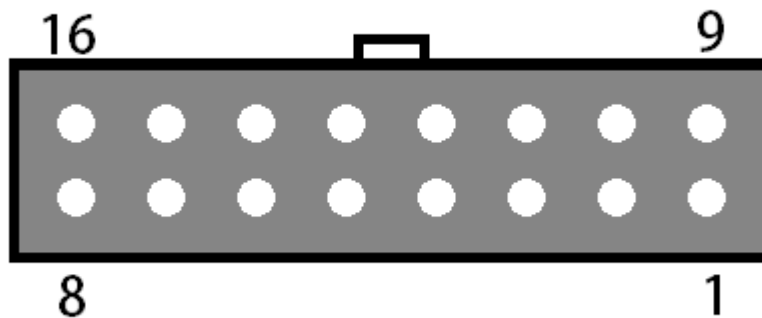


If you are providing an external voltage through pins 23 & 25 of the DB-25 Motor Signals connector or via TB-40, then you must have both JP84 & JP85 jumpers on pins 2 & 3. OTHERWISE, SEVERE DAMAGE COULD RESULT.

The input line settings can be individually changed between normally closed (N.C.) or normally open (N.O.) input lines using the software config. Please refer to the software User’s Guide under “Input Line Settings” for further information. In the software, the Input Line Status dialog displays "OPEN" for a high-level input voltage, or open switch, and "CLOSED" for a low-level input voltage or closed switch. Each of these inputs are also accessible on the Motor Signals connector. These are the same—electrically—between this location and the Motor Signals connector.

The receptacle that plugs into this connector is a Mini-Fit Jr. Series 16 pin receptacle (Molex part number 39-01-2160), with female pins (Molex part number 39-00-0039 or 39-00-0047 for 22 gauge or thinner wires). The Molex 63819-0901 crimp tool is recommended for installing the pins. Kits containing connectors and pins are available through us or at an electronics distributor.

16-Pin Mini-Fit Jr. Connector for Inputs			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	OPT. GND	9	INPUT 1
2	OPT. GND	10	INPUT 2
3	OPT. GND	11	INPUT 3
4	OPT. GND	12	INPUT 4
5	OPT. GND	13	INPUT 5
6	OPT. GND	14	INPUT 6
7	OPT. GND	15	INPUT 7
8	OPT. GND	16	INPUT 8



Outputs

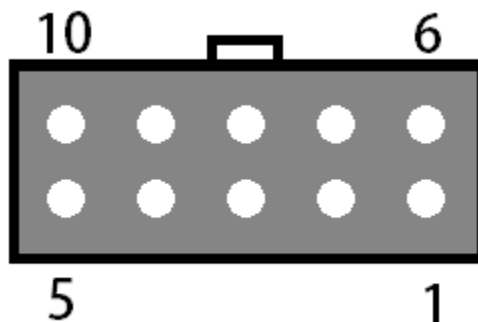
This connector is for up to eight output lines. These lines are all compatible with TTL/CMOS level outputs. The Output ports cannot drive a 24V external system unless it accepts TTL/CMOS levels. They are all driven by HCT family logic. Output logic high is normally 5V and can be as low as 3.9V at full load. Output logic low is normally 0V and can be as high as 0.3V at full load. Each of these signals can provide up to 20mA of current.

Two additional pins on this connector are provided for your output lines: ground and +5V. These are connected to GND and +5V and are not optically isolated. This 5V circuit can source up to 100 mA. Any larger current demand requires a larger power source.

The output lines are all initialized to low (0V) when you turn on the Signal Generator. Output lines 1 and 2 are also connected through pins 1 and 2, respectively, of the Motor Signal connector. These are the same—electrically—between this location and the Motor Signals connector.

The receptacle that plugs into this connector is a Mini-Fit Jr. Series 10 pin receptacle (Molex part number 39-01-2100), with female pins (Molex part number 39-00-0039 or 39-00-0047 for 22 gauge or thinner wires). The Molex 63819-0901 crimp tool is recommended for installing the pins. Kits containing connectors and pins are available through us or at an electronics distributor.

10-Pin Mini-Fit Jr. Connector for Outputs			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	OUTPUT 1	6	OUTPUT 2
2	OUTPUT 3	7	OUTPUT 4
3	OUTPUT 5	8	OUTPUT 6
4	OUTPUT 7	9	OUTPUT 8
5	+5V	10	GND



Motor Signals

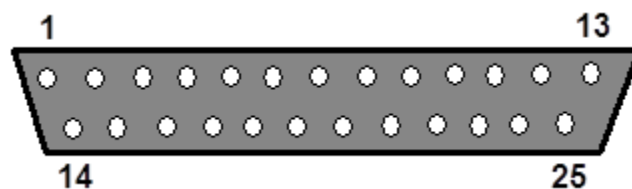
The Motor Signals connector uses a DB-25 connector to send step and direction signals from the Signal Generator to an external drive box.

The Motor Signals connector also provides a connection point to inputs 1-8 and outputs 1 & 2. Inputs 1-8 are the same signals found on the Input connector. Output 1 & 2 are the same outputs found on the output connector.

The Motor Signals connector can be used to tap into the internal VCC +5V power supply on the signal generator as well as provide an externally isolated power supply for the inputs. Refer to the signal generator section of this hardware guide for further information on input voltage compatibility.

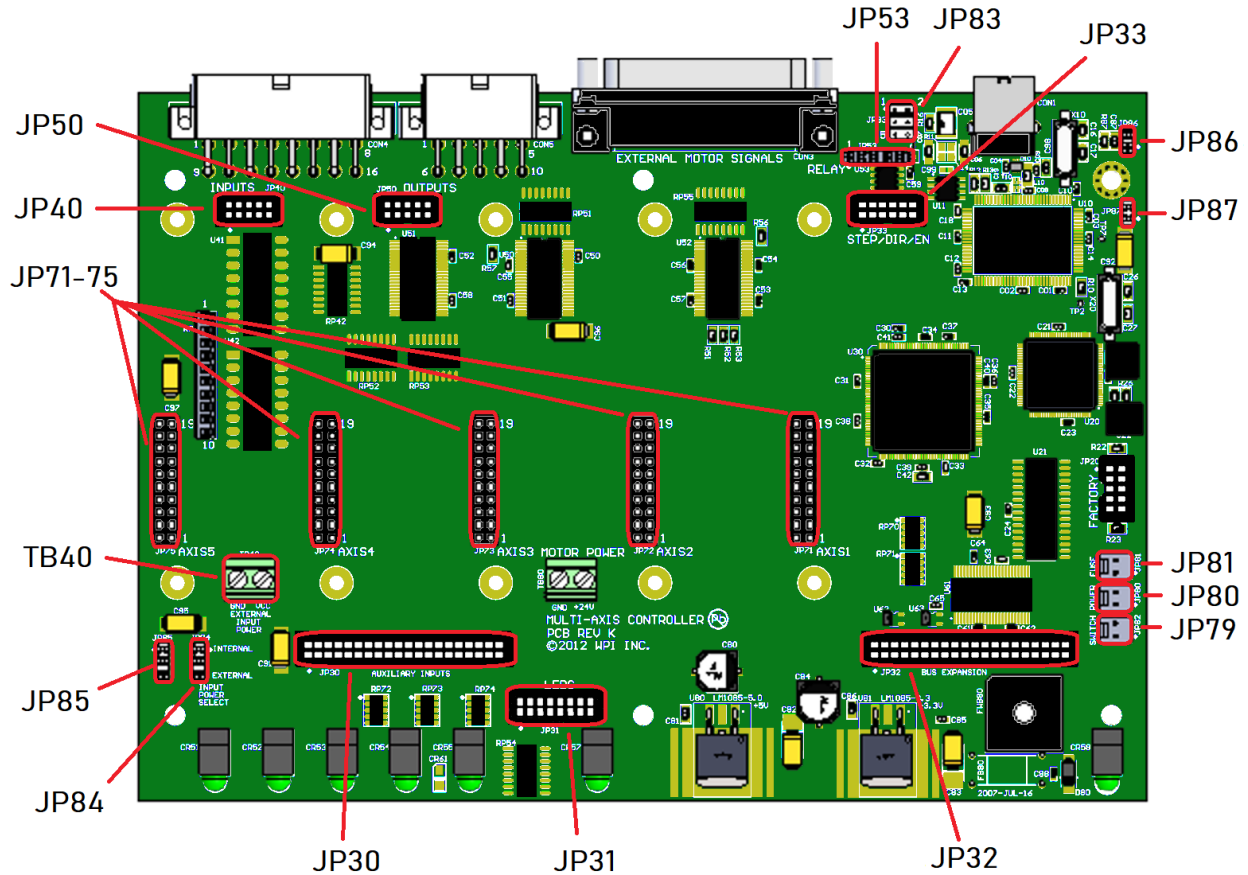
The voltage levels for each Output, Step, Direction and Enable signals are all 5V logic.

DB-25 Connector for Motor Signals			
Pin No.	Signal	Pin No.	Signal
1	OUTPUT 1	14	ENABLE ALL
2	OUTPUT 2	15	INPUT 1
3	STEP AXIS 5	16	INPUT 2
4	DIRECTION AXIS 5	17	INPUT 3
5	INPUT 5	18	INPUT 4
6	INPUT 6	19	DIRECTION AXIS 4
7	INPUT 7	20	DIRECTION AXIS 3
8	INPUT 8	21	DIRECTION AXIS 2
9	DIRECTION AXIS 1	22	INTERNAL VCC +5V
10	STEP AXIS 4	23	OPT. VCC (INPUT)
11	STEP AXIS 3	24	INTERNAL GND
12	STEP AXIS 2	25	OPT. GND (INPUT)
13	STEP AXIS 1		



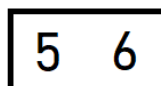
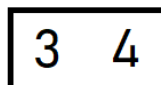
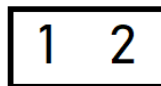
Jumper Settings

Pin 1 of each jumper can be identified by a small, white dot printed on the PCB. A complete description of all jumpers and pin assignments can be found in the Wiring Appendix.



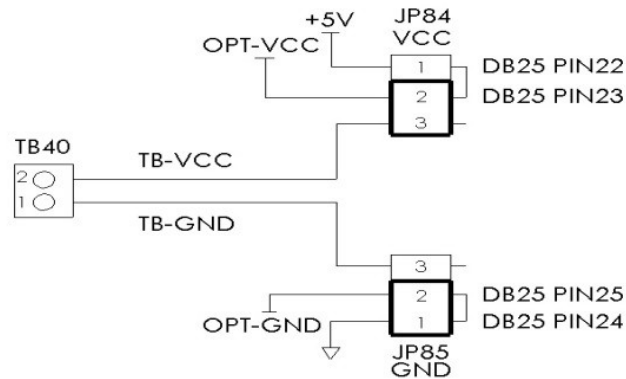
JP83 – DB to USB Ground

This connects the DB-25 ground to the USB ground. By default pins 1 & 2, 3 & 4, and 5 & 6 are jumped as pairs. In order to isolate only the USB shield, only jump pins 3 and 5 and remove JP86. To isolate only the chassis, jump pins 1 & 2, 3 & 5 and 4 & 6 and remove JP86 and JP87. For further information, please see the USB Communications Troubleshooting Guide.



JP84/JP85 – Input Power Select

These two jumpers enable you to choose between the internal power of the Signal Generator and isolated power from an external source. Both jumpers must be set on the same pair of pins (either both must be on pins 1 & 2 or both must be on pins 2 & 3). See the Input section of this guide for further details.



JP86 – USB to Chassis Ground

This jumper connects the USB shield to the chassis ground of the Signal Generator when jumped. In order to isolate the USB shield remove this jumper and make sure only pins 3 and 5 are jumped on JP83. In order to isolate the DB-25 the USB shields, remove this jumper. In order to isolate the DB-25 shield, the USB shield and the chassis remove this jumper as well as JP87.

JP87 – Internal Signal to Chassis Ground

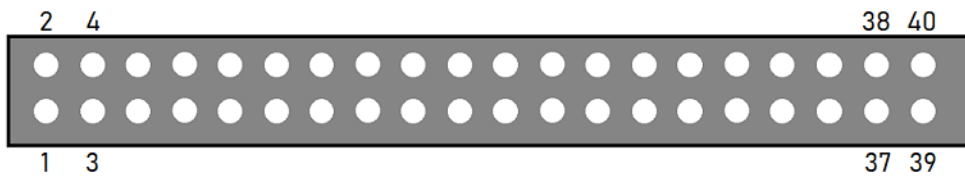
This jumper connects the internal signal ground to the chassis ground of the Signal Generator when jumped. In order to isolate the chassis ground, remove this jumper in addition to JP86 and jump pin 3 and 5, and 4 and 6 on JP83. In order to isolate the DB-25 shield, the USB shield and the chassis, remove this jumper as well as JP86.

Internal Connections

JP30 – Auxiliary Input

This header contains the input signals from the Signal Generator for optional I/O Expansion. Connections should be made with approved peripherals, otherwise damage may occur.

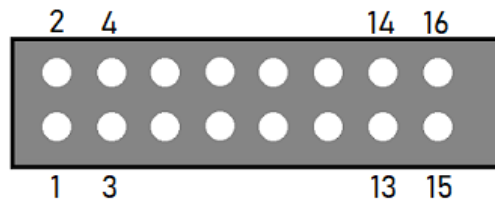
JP30 – Auxiliary Input			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	+3.3V	21	GPI-24
2	+3.3V	22	GPI-9
3	GPI-32	23	GPI-23
4	GPI-1	24	GPI-10
5	GPI-31	25	GPI-22
6	GPI-2	26	GPI-11
7	GPI-30	27	GPI-21
8	GPI-3	28	GPI-12
9	GPI-29	29	GPI-20
10	GPI-4	30	GPI-13
11	GPI-28	31	GPI-19
12	GPI-5	32	GPI-14
13	GPI-27	33	GPI-18
14	GPI-6	34	GPI-15
15	GPI-26	35	GPI-17
16	GPI-7	36	GPI-16
17	GPI-25	37	+3.3V
18	GPI-8	38	+3.3V
19	GND	39	GND
20	GND	40	GND



JP31 – Status LEDs

This is for connecting wired LEDs from a custom chassis to the 501A LED signals.

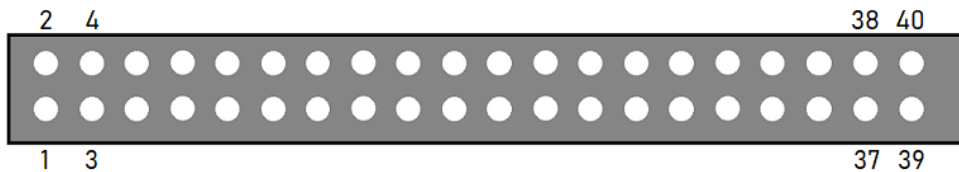
JP31 – Status LEDs			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	+5V	9	LED-DIR4
2	N/C	10	LED-STEP4
3	LED-DIR1	11	LED-DIR5
4	LED-STEP1	12	LED-STEP5
5	LED-DIR2	13	LED-AUX
6	LED-STEP2	14	LED-USB
7	LED-DIR3	15	GND
8	LED-STEP3	16	LED-PWR



JP32 – Bus Expansion

This header contains signal and address lines for an optional I/O Expansion board. Connections should be made with approved peripherals, otherwise damage may occur.

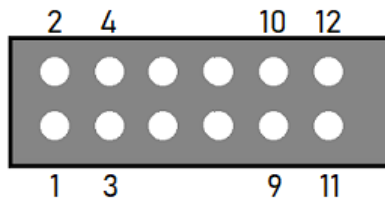
JP32 – Bus Expansion			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	+3.3V	21	DATA1
2	GND	22	DATA2
3	CS6	23	DATA3
4	STATUS6	24	DATA4
5	TXD2	25	DATA8
6	FAULT6	26	DATA7
7	RXD2	27	DATA6
8	AUX1-STB	28	DATA5
9	OUT-ENA	29	+7V
10	AUX2-STB	30	+7V
11	OUT2-STB	31	SPHOME
12	OUT1-STB	32	ENC CLK
13	OUT4-STB	33	+3.3V
14	OUT3-STB	34	ENC DIR
15	+5V	35	AGND
16	+5V	36	AV+
17	GND	37	DAC2
18	GND	38	DAC1
19	A0	39	ADC1
20	A1	40	AGND



JP33 – Step and Direction

This header contains each step and direction signal for all five axes of motion as well as the global enable signal and the common ground reference.

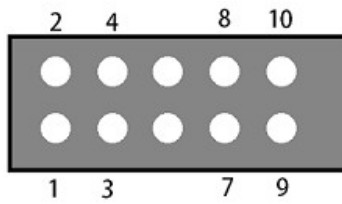
JP33 – Step and Direction			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	STEP5	7	STEP2
2	ENA	8	DIR3
3	STEP4	9	STEP1
4	DIR5	10	DIR2
5	STEP3	11	GND
6	DIR4	12	DIR1



JP40 – Input Aux

This header contains the same signals as the Mini-Fit Jr. Input Connector. It is provided to use an internal input connector or an external input connector on a custom chassis.

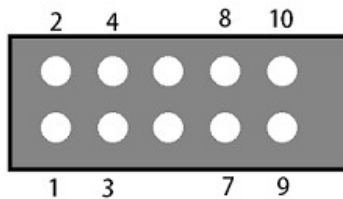
JP40 – Input Aux			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	GPI-2	6	GPI-5
2	GPI-1	7	GPI-8
3	GPI-4	8	GPI-7
4	GPI-3	9	OPT-GND
5	GPI-6	10	OPT-GND



JP50 – Output Aux

This contains the same signals as the Mini-Fit Jr. Output Connector. It is provided to use an internal output connector or an external output connector on a custom chassis.

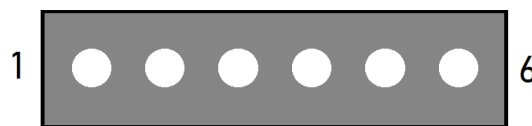
JP50 – Output Aux			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	GPO-2	6	GPO-5
2	GPO-1	7	GPO-8
3	GPO-4	8	GPO-7
4	GPO-3	9	GND
5	GPO-6	10	VCC



JP53 – Low-Side Relay

This header contains duplicate signals for Outputs 1&2 in order to drive an internal relay. (Either mounted here or on the power board, depending on configuration.) The clamps provide a reference voltage for use in signal isolation. The output low pins will sink current to drive devices.

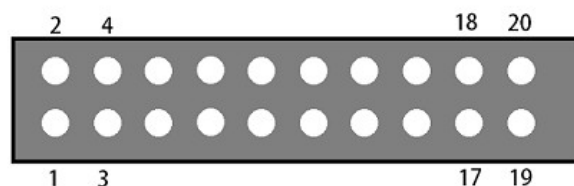
JP53 – Low-SideRelay			
<i>Pin No.</i>	<i>Signal</i>	<i>Pin No.</i>	<i>Signal</i>
1	+5V	4	GPO-1 LOW
2	GPO-2 CLAMP	5	GPO-1 CLAMP
3	GPO-2 LOW	6	GND



JP71-75 – Axis Plug-In Interfaces

There are five plug-in interfaces—one for each axis. They are used to add additional functions to the main signal generator board. Most typically, these provide signals to motor drives.

JP71-75 – Axis Plug-In Interfaces						
Pin No.	Function	JP71	JP72	JP73	JP74	JP75
1	HV-PWR	HV-PWR	HV-PWR	HV-PWR	HV-PWR	HV-PWR
2	HV-PWR	HV-PWR	HV-PWR	HV-PWR	HV-PWR	HV-PWR
3	Ground	GND	GND	GND	GND	GND
4	Ground	GND	GND	GND	GND	GND
5	RxD2	RxD2	RxD2	RxD2	RxD2	RxD2
6	Status	STATUS1	STATUS2	STATUS3	STATUS4	STATUS5
7	TxD2	TxD2	TxD2	TxD2	TxD2	TxD2
8	Fault Input	FAULT1	FAULT2	FAULT3	FAULT4	FAULT5
9	Input A	IN8	IN10	IN12	IN14	IN16
10	Direction	DR1	DR2	DR3	DR4	DR5
11	Input B	IN9	IN11	IN13	IN15	IN17
12	Step	ST1	ST2	ST3	ST4	ST5
13	SM0	SM0	SM0	SM0	SM0	SM0
14	SCOM	SCOM1	SCOM2	SCOM3	SCOM4	SCOM5
15	SM1	SM1	SM1	SM1	SM1	SM1
16	CS	CS1	CS2	CS3	CS4	CS5
17	Enable (Global)	ENA	ENA	ENA	ENA	ENA
18	+5V	+5V	+5V	+5V	+5V	+5V
19	Ground	GND	GND	GND	GND	GND
20	Ground	GND	GND	GND	GND	GND



JP80 – Rear Panel Power

Connect the main power here. It can be 8.5V – 16V DC.

JP81 – Rear Panel Fuse

This is for an optional power fuse. The unit is shipped with a shunt instead of a fuse. If you replace the shunt with a fuse, it should be rated to 1A slow-blow or time-delay.

JP82 – Front Panel Switch

If the power supplied to JP80 is not switched, you can connect the main power switch here.

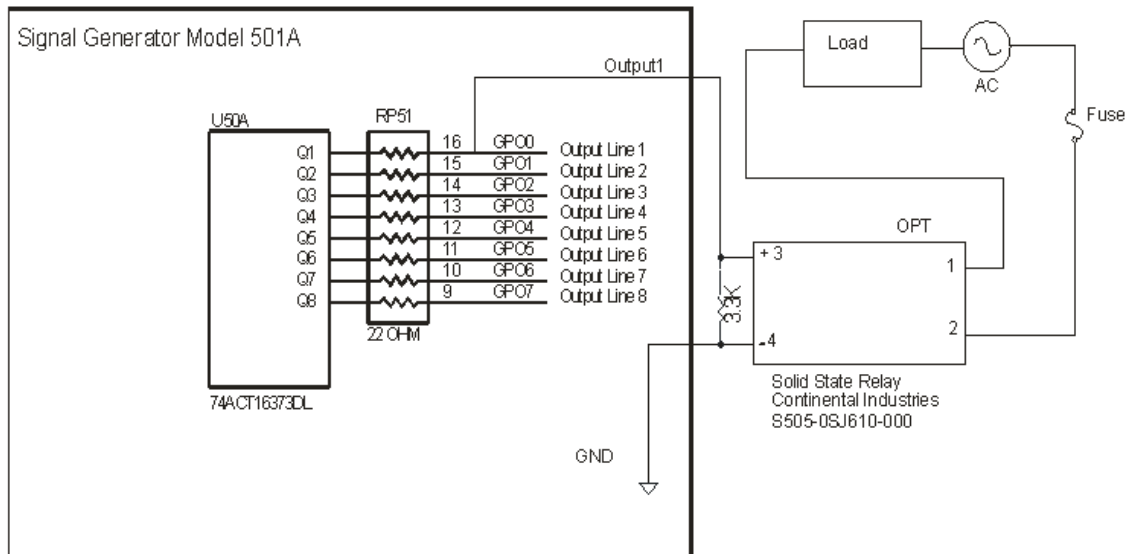
Wiring Appendix

Example Wiring

Typical Output Line Circuit

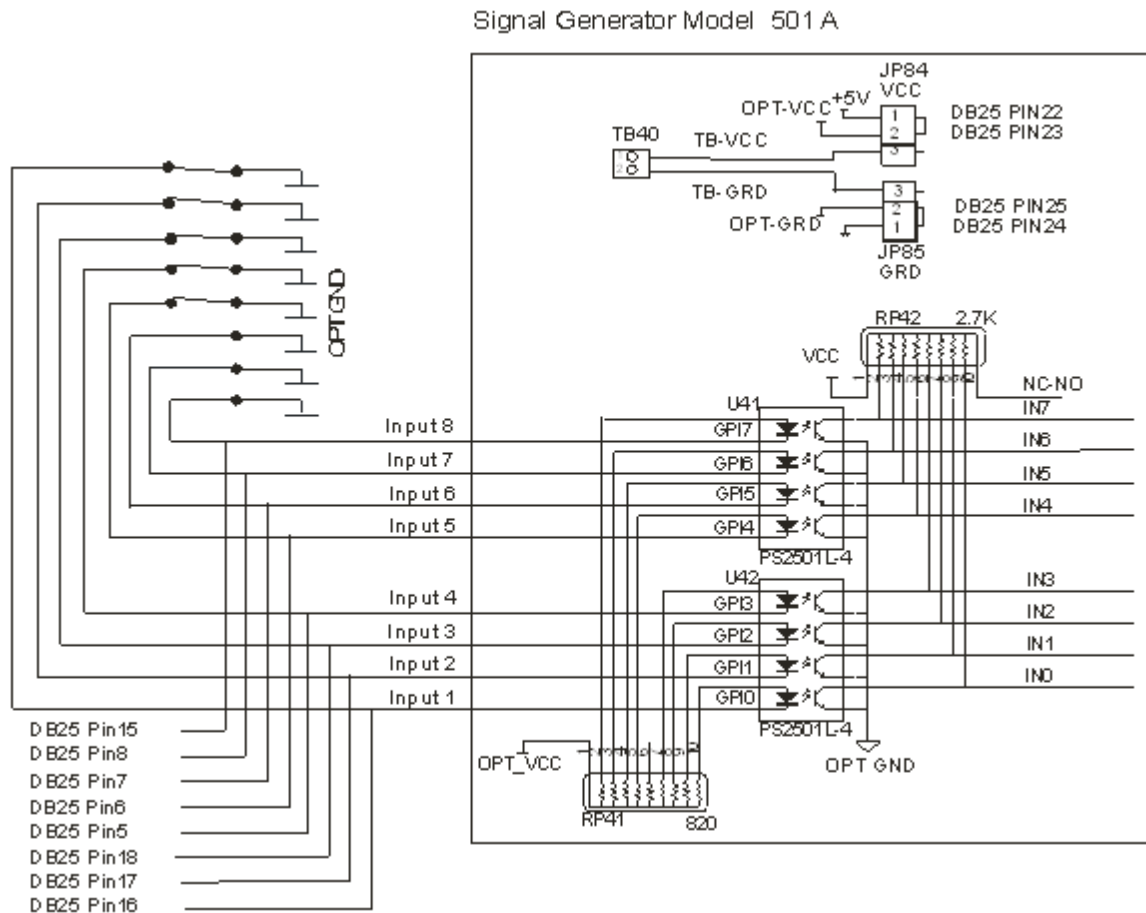
The schematic below shows a typical connection of one solid state relay controlled by output line 1 of the Signal Generator. A typical load could be a spindle, a vacuum, a laser, etc. In this example, the solid-state relay used is a Continental Industries model S505-0SJ610-000.

Each of the output signals has a 22-ohm resistor in series with their outputs. This is to reduce any “ringing” at the transient switching points. Ground and 5V are provided on this connector for your convenience. Our Spindle On/Off Relay Box is wired as shown in the below schematic.



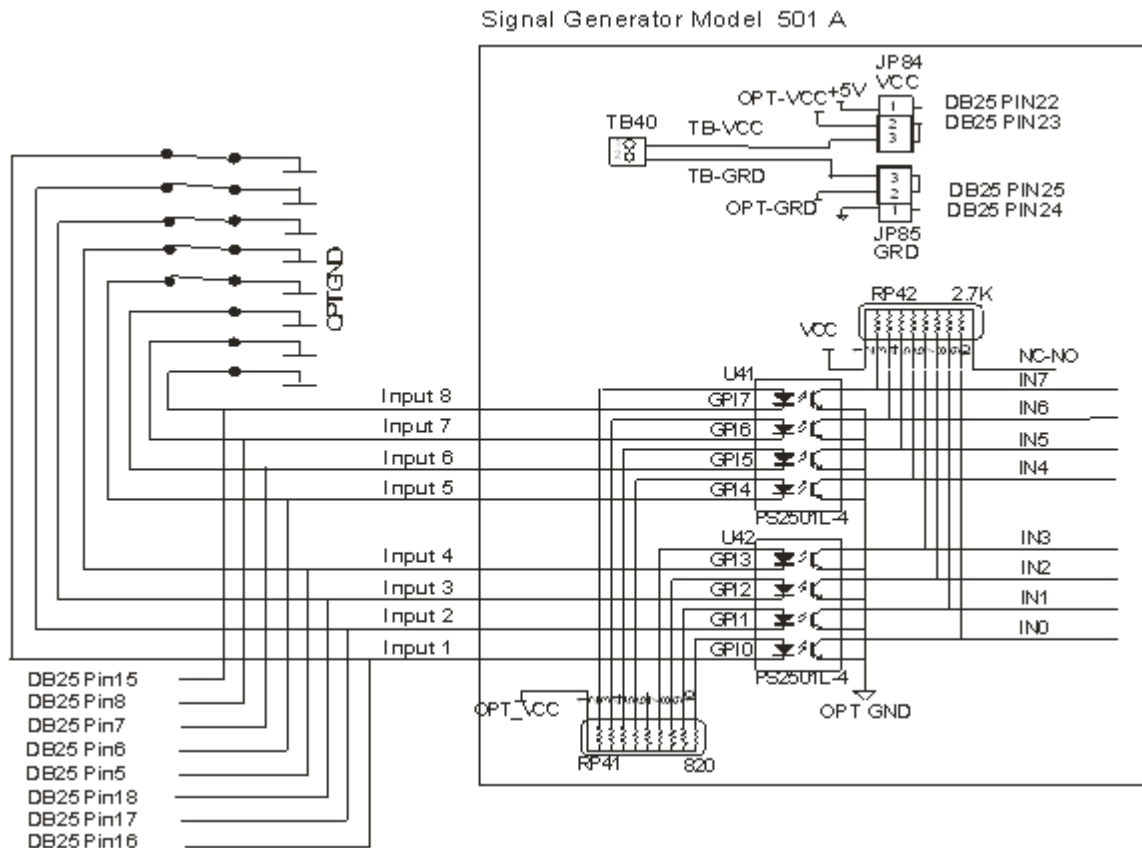
Typical Input Line Circuit – Internal Power

The following schematics show a typical connection of five normally closed switches. These switches are connected between input lines 1-5 and ground. Lines 6-8 are connected directly to ground with jumper wires. All external connections shown are made through the Input connector on the back of the Signal Generator. This resistor pack (RP 41) is socketed so that you can change the value if needed for your application.



Typical Input Line Circuit – External Power

The input lines are all optically isolated. In this example, JP84 and JP85 are shorted using the internal power to source the external side of the optical couplers. However, for the best isolation, JP84 and JP85 should be open, and power should be provided through pins 23 and 25 of the DB25 Motor Signal connector. Input lines 1-4 and 5- 8 are internally connected to pins 15- 18 and 5-8 respectively of the DB25 Motor Signal connector.



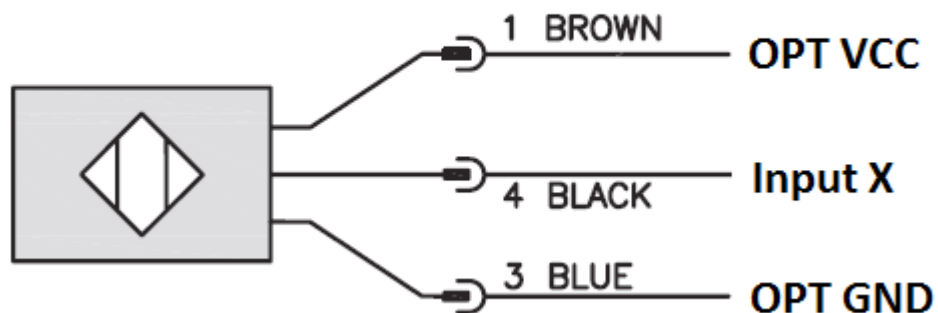
Note that the limit switch kit has the same wiring as shown in this example.

Proximity Sensors

When connecting a proximity type sensor, connect to the controller using the following diagram.

Please note only NPN type proximity sensors are compatible with the controller. Most sensors require the use of a higher, external voltage supply than the standard 5V to operate. Please see the information on Inputs in the Signal Generator section for more information on wiring OPT VCC.

NPN Proximity Sensor



Pin Location Index

Signal Locations

This table contains every instance of each signal in the system.

Signal Locations																			
	Signal Generator									Mini I/O	Ultra I/O								
Signal	CON5	CON4	CON3	JP30	JP40	JP50	JP53	JP33	JP71- JP75	P103	CON 1301	CON 1302	P1301 P1302	JP 1301	JP 1302	JP 301	JP 302	JP 303	
Input 1		9	15	4	2														49
Input 2		10	16	6	1														48
Input 3		11	17	8	4														47
Input 4		12	18	10	3														46
Input 5		13	5	12	6														45
Input 6		14	6	14	5														44
Input 7		15	7	16	8														43
Input 8		16	8	18	7														42
Input 9				22					JP71.9								47		
Input 10				24					JP71.11								46		
Input 11				26					JP72.9								45		
Input 12				28					JP72.11								44		
Input 13				30					JP73.9								43		
Input 14				32					JP73.11								42		
Input 15				34					JP74.9								41		
Input 16				36					JP74.11								40		
Input 17				35					JP75.9										41
Input 18				33					JP75.11										40
Input 19				31						10			P1.10						39
Input 20				29						12			P1.12						38
Input 21				27									P2.10					49	
Input 22				25									P2.12					48	
Input 23				23														47	
Input 24				21														46	
Input 25				17								9		2				45	
Input 26				15								10		1				44	
Input 27				13								11		4				43	
Input 28				11								12		3				42	
Input 29				9								13		6				41	
Input 30				7								14		5				40	
Input 31				5								15		8				39	
Input 32				3								16		7				38	

Signal Locations																		
	Signal Generator									Mini I/O	Ultra I/O							
Signal	CON5	CON4	CON3	JP30	JP40	JP50	JP53	JP33	JP71- JP75	P103	CON 1301	CON 1302	P1301 P1302	JP 1301	JP 1302	JP 301	JP 302	JP 303
Output 1	1		1			2	4			6&15			P1.6&15					37
Output 2	6		2			1	3			7&16			P1.7&16					36
Output 3	2					4							P2.6&15					35
Output 4	7					3							P2.7&16					34
Output 5	3					6												33
Output 6	8					5												32
Output 7	4					8												31
Output 8	9					7												30
Output 9																	39	
Output 10																	38	
Output 11																	37	
Output 12																	36	
Output 13																	35	
Output 14																	34	
Output 15																	33	
Output 16																	32	
Output 17																		29
Output 18																		28
Output 19																		27
Output 20																		26
Output 21																	37	
Output 22																	36	
Output 23																	35	
Output 24																	34	
Output 25													1		2		33	
Output 26													2		1		32	
Output 27													3		4		31	
Output 28													4		3		30	
Output 29													5		6		29	
Output 30													6		5		28	
Output 31													7		8		27	
Output 32													8		7		26	
Analog Input 1										18				P1.18		30		
Analog Input 2														P2.18		29		
Analog Output 1										17				P1.17		27		
Analog Output 2														P2.17		26		
PWM Output 1										14				P1.14		1		
PWM Output 2														P2.14		7		

Voltage/GND Locations

+5VDC

- Signal Generator
 - CON5.5
 - CON3.22
 - JP50.9
 - JP53.1
 - JP33.11
 - JP71-75.20
- Mini I/O
 - P103.13
- Ultra I/O
 - CON1302.9
 - P1301.13
 - P1302.13
 - JP1302.10

GND

- Signal Generator
 - CON5.10
 - CON3.24
 - JP30.19, 20, 39, 40
 - JP50.9
 - JP53.6
 - JP33.11
 - JP71-75.20
- Mini I/O
 - P103.4, 5, 8, 9
- Ultra I/O
 - CON1302.10
 - P1301.4, 5
 - P1302.1, 3, 4, 5
 - JP301.1, 2, 3, 4, 5, 6

OPT-VCC

- Signal Generator
 - CON3.23
- Ultra I/O
 - JP301.24, 48
 - JP302.25, 50
 - JP303.25, 50

OPT-GND

- Signal Generator
 - CON4.1, 2, 3, 4, 5, 6, 7, 8
 - CON3.25
 - JP40.9, 10
- Ultra I/O
 - CON1301.1, 2, 3, 4, 5, 6, 7, 8
 - JP301.16, 17, 18, 19, 20, 21, 22, 23, 24
 - JP302.13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24
 - JP303.13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24
 - JP1301.9, 10

Analog GND

- Ultra I/O
 - P1301.8, 9
 - P1302.8, 9
 - JP301.25, 28, 31

5-24VDC Clamp Voltage

- Signal Generator
 - JP53.2, 5
- Ultra I/O
 - JP301.8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24
 - JP302.1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25
 - JP303.1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

