Hardware Installation Manual

SMC6480, SMC6490 and PMC6496

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HWMN-SMC6-R20120417

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Change Log

Revision Date	Changes	Version
2011-4-17	Origin Create	HWMN-SMC6-R20120417

Safety Items

Read this manual carefully before trying to install the motion controller into your system. The person who setups the controller should have a better understanding on electronics and mechanics. Contact Leadshine technical guys when you have questions on this document.

Before running execute motion program, make sure the axes will not impact anything. It is recommended to uncouple the motor from the load before you are familiar with Leashine motion controller. Otherwise, unexpected damage to the machine may occur.

Ensure that the power supply voltage dose not exceed the controller's input range. Double check the connections and make sure the power lead polarity is correct.

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Chapter 1 Family Overview

1.1 Introduction

Leadshine SMC6000 is 10/100M Ethernet-based general purpose motion controller. It provides 1 to 4 axes motion control to stepper/servo motors for various operations. It can work in standalone mode without PC or work as a slaver in an Ethernet network. The controller number in the network has no limitation.

Leadshine SMC6000 uses embedded microprocessor and FPGA to implement algorithm for multi-axes interpolation, pulse generation, acceleration/deceleration control and processing of digital input/output in the hardware level, offering high speed, high precision and stable features to motion control. It can output maximum 5MHz pulse and supports up to 4-axes linear interpolation, any 2-axes circulation interpolation, continuous interpolation and S-curve velocity profile. Programming of motion program is simple and it supports many language including Leadshine BASIC, G-Code, Visual Basic and Visual C++. What's more, Leadshine SMC6000 integrates isolated I/O, D/A output, PWM output, encoder counter and manual input in one single package.

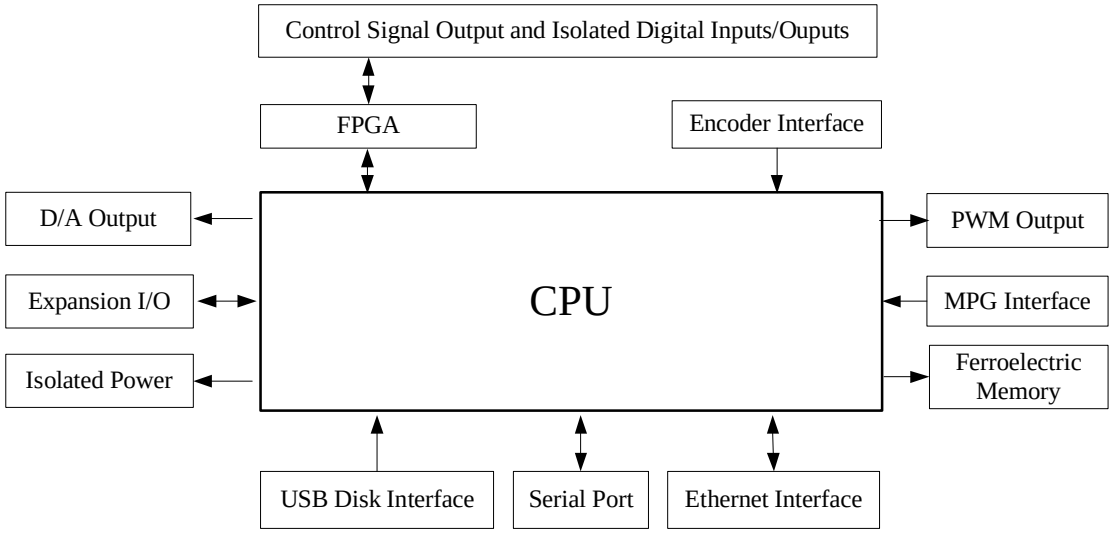

Figure 1-1: Controller Architecture

The serial port COM1/COM2 and the RJ45 Ethernet port can be used for motion control or uploading/downloading configuration data. Programming or configuration to SMC6000 requires only one PC with Ethernet interface or serial port. Leadshine SMC6000 provides optional touch screen for easy operation in the field. Its built-in ferroelectric memory can be used to store the dynamic motion parameter during execution of motion program. You can restore these parameters in case of unexpected power-off.

1.2 Product Covered

This manual tries to specify the functionality, structure, connector pin assignment and connections of Leadshine SMC6480, SMC6490 and PMC6496. Table 1-1 illustrates the key features of Leadhine SMC600.

Table 1-1 SMC6000 Motion Controller Specifications

	SMC6480	SMC6490	PMC6496
Number of Controllable Axes	4	4	4
Pulse Output Frequency(MAX)	5.0MHz	5.0MHz	5.0MHz
Position Range	-2,147,483,647 to +2,147,483,648 (32 BIT)		
Interpolation Cycle	300 us	300 us	300 us
General Purpose Digital Inputs	24 inputs include 8 isolated inputs and 16 non-isolated inputs		
General Purpose Digital Outputs	32 inputs include 16 isolated inputs and 16 non-isolated inputs		
D/A Outputs	2 Channels, 0.07~4.45V, 8 bit	-	-
Encoder Counter	-	4 Channels, Max 4 MHz bandwidth, 32 bit counter	
Manual Pulse Input		1 Channel, Max 1MHz bandwidth	
PWM Output	2 Channels, Max 1MHz bandwidth, duty-cycle 0~100%, 32-bit resolution		
Flash Memory	32M Bytes	32M Bytes	8M Bytes
Ferroelectric Memory	-	32K Byte Optional	32K Bytes
Network Interface	10M/100M Ethernet		
Serial Port	RS-232, 2 D-Shell 9-pin connector		
USB Disk Interface	USB 1.1, 12Mbytes / s		
External Power Supply	24VDC, 1100mA		
Operating Temperature	0~50℃	0~50℃	0~50℃
Storage Temperature	-20~80℃	-20~80℃	-20~80℃
Size	208mm*116mm*42mm	186mm*147mm*42mm	
Programming	G Code, BASIC, VB/VC library		

1.3 Applications

- Electronic assembly and measurement equipments
- Semiconductor and LCD manufacturing & measurement equipments
- Laser cutting/engraving/marking equipments
- Vision & measurement automation equipments
- Biotech sampling and handing devices
- Robotics
- Special CNC machines
- Other automation system using stepper and servo

1.4 Order Information

Table 1-2 Order Information

Part Number	Description
SMC6480	Motion Controller SMC6480, BASIC
SMC6480G	Motion Controller SMC6480, G-Code
SMC6490-FM	Motion Controller SMC6490, BASIC, Ferroelectric Memory
SMC6490	Motion Controller SMC6490, BASIC
SMC6490-FM	Motion Controller SMC6490, G-Code, Ferroelectric Memory
SMC6490G	Motion Controller, SMC6490, G-Code
PMC6496	Motion Controller, PMC6496

Table 1-3 Accessories Information

Part Number	Description
CALBE37-DP-20	Cable for expansion I/O terminal board ACC37-7480, 37pin, 2000mm
ACC37-7480	Terminal board ACC37-7480 for expansion I/O, isolated amplifier
TK6070iH	Touch screen, 7 inch screen

Chapter 2 Controller Interface and Pin Assignment

2.1 Controller Interface

2.1.1. SMC6480 Interface

Leadshine SMC6480 has one control signal connector J21, one isolated I/O connector J11, one D/A output connector, two serial port connector COM1&COM2, one non-isolated expansion I/O connector, one power-up level setting switch for digital output 1-24, one RJ45 connector for Ethernet communication, one USB port for USB disk and one power supply connector., as shown in figure 2-1.

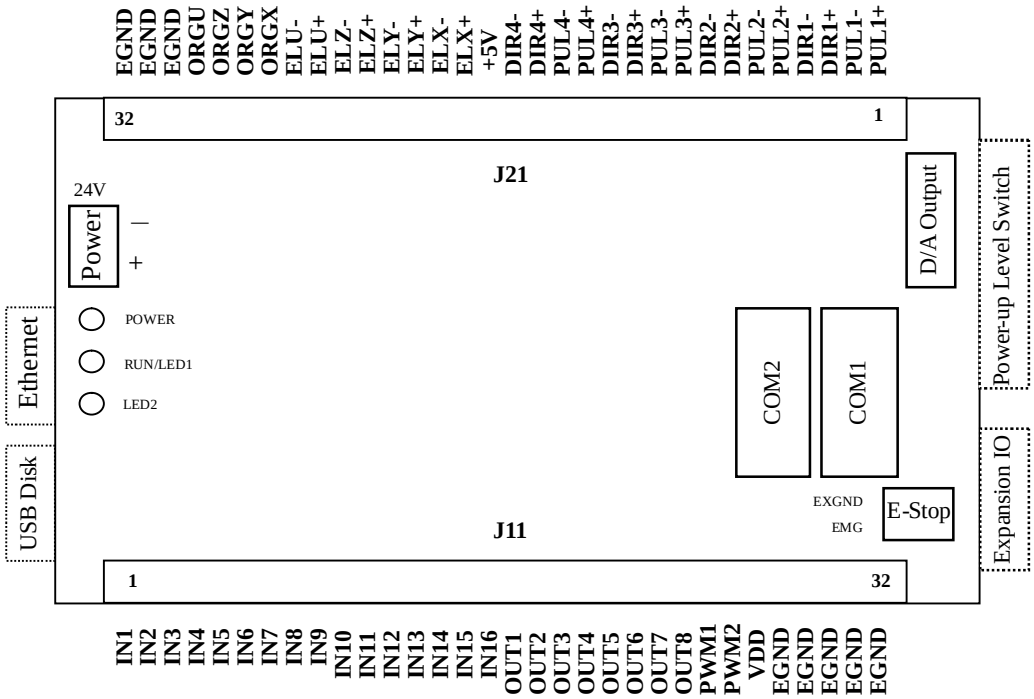

Figure 2-1: SMC6480 Interface

2.1.2. SMC6490 and PMC6496 Interface

Leadshine SMC6490/PMC6496 has one control signal connector J21, one isolated I/O connector J11, two serial port connector COM1&COM2, one manual pulse connector, one non-isolated expansion I/O connector, one encoder connector, one power-up level setting switch for digital output 1-24, one RJ45 connector for Ethernet communication, one USB port for USB disk and one power supply connector., as shown in figure 2-2.

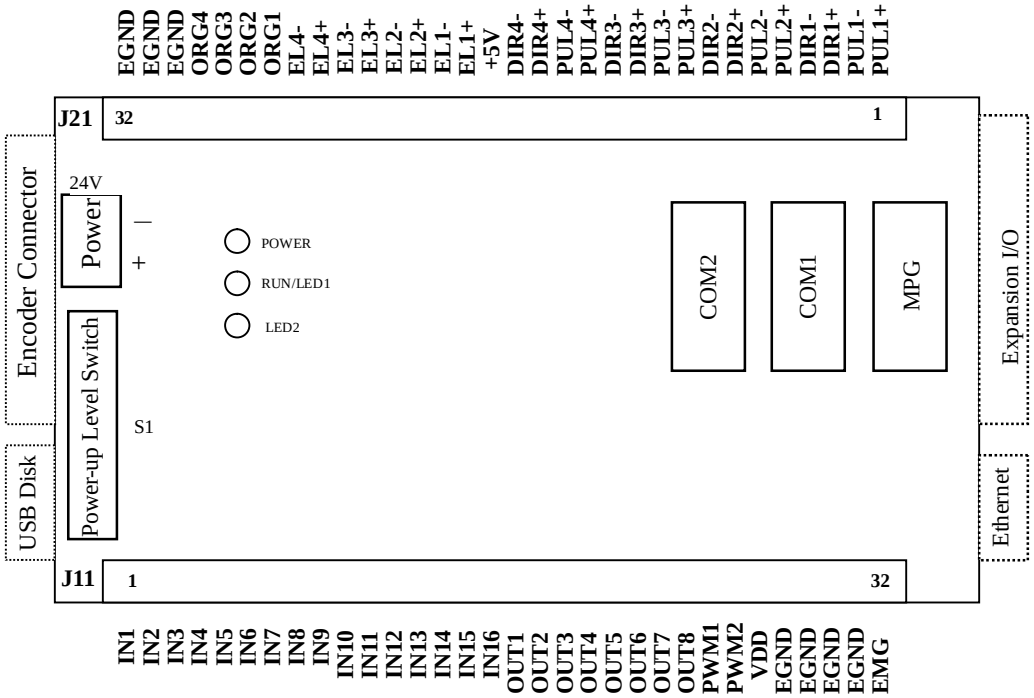

Figure 2-2: SMC6490/PMC6496 Interface

2.1.3. Wiring Notes

1) Make sure supply voltage is 24VDC and connecting polarity is correct.

2) Use normal RJ45 cable for network connections via Router or HUB. If it is direct connection to PC, exchanges transmit and receive wire for one of the RJ45 connectors in the cable.

3) Please study the pin assignment and interface circuit of each connector in this manual carefully. Make sure you understand them before trying to connect them.

2.2 Pin Assignment

2.1.1. Power Connector

The SMC6000 needs only one 24VDC regulated power supply for normal operation. Recommended power supply current rating is 1100Amp. .

Table 2-1 Power Connector Pin Assignment (SMC6480, SMC6490 and PMC6496)

Power Connector Pin Assignment (SMC6480, SMC6490 and PMC6496)			
Pin	**Name**	**I/O**	**Description**
1	**24V +**	**I**	Power Supply Input (Positive), 24VDC.
2	**24V -**	**I**	Power Ground (Negative)

2.1.2. Control Signal Connector J21

Control signal connector provides pulse and direction outputs for position and velocity control. End limit and origin input are assigned in this connector. See table 2-2 for the detail.

Table 2-2 Control signal connector J21 pin assignment (SMC6480, SMC6490 and PMC6496)

Control Signal Connector Pin Assignment (SMC6480, SMC6490 and PMC6496)							
Pin	**Signal**	**I/O**	**Description**	**Pin**	**Signal**	**I/O**	**Description**
1	PUL1+	O	Axis 1 Pulse +	17	+5V	O	+5V Power
2	PUL1-	O	Axis 1 Pulse -	18	ELx+	I	Axis 1 End Limit+, reference to EXGND
3	DIR1+	O	Axis 1 Direction +	19	ELx-	I	Axis 1 End Limit-, reference to EXGND
4	DIR1-	O	Axis 1 Direction -	20	Ely+	I	Axis 2 End Limit+, reference to EXGND
5	PUL2+	O	Axis 2 Pulse +	21	Ely-	I	Axis 2 End Limit-, reference to EXGND
6	PUL2-	O	Axis 2 Pulse -	22	ELz+	I	Axis 3 End Limit+, reference to EXGND
7	DIR2+	O	Axis 2 Direction +	23	ELz-	I	Axis 3 End Limit-, reference to EXGND
8	DIR2-	O	Axis 2 Direction -	24	Elu+	I	Axis 4 End Limit+, reference to EXGND
9	PUL3+	O	Axis 3 Pulse +	25	Elu-	I	Axis 4 End Limit-, reference to EXGND
10	PUL3-	O	Axis 3 Pulse -	26	ORGx	I	Axis 1 Origin Input
11	DIR3+	O	Axis 3 Direction +	27	ORGy	I	Axis 2 Origin Input
12	DIR3-	O	Axis 3 Direction -	28	ORGz	I	Axis 3 Origin Input
13	PUL4+	O	Axis 4 Pulse +	29	ORGu	I	Axis 4 Origin Input
14	PUL4-	O	Axis 4 Pulse -	30	EXGND	GND	Power Ground
15	DIR4+	O	Axis 3 Direction +	31	EXGND	GND	Power Ground
16	DIR4-	O	Axis 3 Direction -	32	EXGND	GND	Power Ground

2.1.3. I/O Connector J11

I/O connector J11 provides 16 isolated general purpose digital inputs and 8 isolated general purpose digital outputs. All digital inputs in this connector can be configured as dedicated or special purpose inputs. See table 2-3 for more detail.

Table 2-3 I/O Connector J11 pin assignment (SMC6480, SMC6490 and PMC6496)

I/O Connector J11 Pin Assignment(SMC6480, SMC6490 and PMC6496)			
Pin	**Name**	**I/O**	**Description**
1	IN1	I*	Isolated General-purpose Digital input 1 / Run
2	IN2	I*	Isolated General-purpose Digital input 2 / Pause
3	IN3	I*	Isolated General-purpose Digital input 3 / Stop
4	IN4	I*	Isolated General-purpose Digital input 4 / Home
5	IN5	I*	Isolated General-purpose Digital input 5 / X++ (JOG Axis 1 in positive direction)
6	IN6	I*	Isolated General-purpose Digital input 6 / X-- (JOG Axis 1 in negative direction)
7	IN7	I*	Isolated General-purpose Digital input 7 / Y++((JOG Axis 2 in positive direction)
8	IN8	I*	Isolated General-purpose Digital input 8 / Y-- (JOG Axis 2 in negative direction)

9	IN9	I*	Isolated General-purpose Digital input 9 / Z++(JOG Axis3 in positive direction)
10	IN10	I*	Isolated General-purpose Digital input 10 / Z--(JOG Axis 3 in negative direction)
11	IN11	I*	Isolated General-purpose Digital input 11 / U++(JOG Axis 4 in positive direction)
12	IN12	I*	Isolated General-purpose Digital input 12 / U--(JOG Axis 4 in negative direction)
13	IN13/INP1	I*	Isolated General-purpose Digital input 13 / Axis 1 In-position Signal Input
14	IN14/INP2	I*	Isolated General-purpose Digital input 14 / Axis 2 In-position Signal Input
15	IN15/INP3	I*	Isolated General-purpose Digital input 15 / Axis 3 In-position Signal Input
16	IN16/INP4	I*	Isolated General-purpose Digital input 16 / Axis 4 In-position Signal Input
17	OUT1	O	Isolated General-purpose Digital output 1
18	OUT2	O	Isolated General-purpose Digital output 2
19	OUT3	O	Isolated General-purpose Digital output 3
20	OUT4	O	Isolated General-purpose Digital output 4
21	OUT5	O	Isolated General-purpose Digital output 5
22	OUT6	O	Isolated General-purpose Digital output 6
23	OUT7	O	Isolated General-purpose Digital output 7
24	OUT8	O	Isolated General-purpose Digital output 8
25	PWM1	O	Isolated PWM output 1
26	PWM2	O	Isolated PWM output 2
27	VDD	O	5V Power Output
28	EXGND	GND	External Power Ground
29	EXGND	GND	External Power Ground
30	EXGND	GND	External Power Ground
31	EXGND	GND	External Power Ground
32	EXGND	GND	External Power Ground (SMC6480)
32	EMG	I	Emergency Stop (SMC6490, PMC6496)

Note: These inputs with asterisk (I) can be configured as special purpose input.

2.1.4. Expansion I/O Connector

Expansion I/O provides you with additional 16 non-isolated general purse digital inputs and 16 non-isolated general purpose digital outputs. Some digital inputs in this connector can be configured as dedicated or special purpose inputs. See table 2-4 for more detail.

Table 2-4 Expansion I/O Connector Pin Assignment (SMC6480, SMC6490 and PMC6496)

Expansion I/O Connector Pin Assignment (SMC6480, SMC6490 and PMC6496)			
Pin	**Name**	**I/O**	**Description**
1	IN17	I	Non-isolated General-purpose Digital input 17
2	IN18	I	Non-isolated General-purpose Digital input 18
3	IN19	I	Non-isolated General-purpose Digital input 19
4	IN20	I	Non-isolated General-purpose Digital input 20

5	IN21/ALM1	I*	Non-isolated General-purpose Digital input 21 / Axis 1 Alarm Signal Input
6	IN22/ALM2	I*	Non-isolated General-purpose Digital input 22 / Axis 2 Alarm Signal Input
7	IN23/ALM3	I*	Non-isolated General-purpose Digital input 23 / Axis 3 Alarm Signal Input
8	IN24/ALM4	I*	Non-isolated General-purpose Digital input 24 / Axis 4 Alarm Signal Input
9	IN25	I*	Non-isolated General-purpose Digital input 25 / Active Level configured by bit0 of S1
10	IN26	I*	Non-isolated General-purpose Digital input 26 / Active Level configured by bit0 of S1
11	IN27	I*	Non-isolated General-purpose Digital input 27 / Active Level configured by bit0 of S1
12	IN28	I*	Non-isolated General-purpose Digital input 28 / Active Level configured by bit0 of S1
13	IN29	I*	Non-isolated General-purpose Digital input 29 / Active Level configured by bit1 of S1
14	IN30	I*	Non-isolated General-purpose Digital input 30 / Active Level configured by bit1 of S1
15	IN31	I*	Non-isolated General-purpose Digital input 31 / Active Level configured by bit1 of S1
16	IN32	I*	Non-isolated General-purpose Digital input 32 / Active Level configured by bit1 of S1
17	VCC3.3	O	3.3V Power Output
18	VCC3.3	O	3.3V Power Output
19	GND	GND	5V/3.3V Power Ground
20	GND	GND	5V/3.3V Power Ground
21	OUT9	GND	Non-isolated General-purpose Output 9
22	OUT10	O	Non-isolated General-purpose Output 10
23	OUT11	O	Non-isolated General-purpose Output 11
24	OUT12	O	Non-isolated General-purpose Output 12
25	OUT13	O	Non-isolated General-purpose Output 13
26	OUT14	O	Non-isolated General-purpose Output 14
27	OUT15	O	Non-isolated General-purpose Output 15
28	OUT16	O	Non-isolated General-purpose Output 16
29	OUT17	O	Non-isolated General-purpose Output 17
30	OUT18	O	Non-isolated General-purpose Output 18
31	OUT19	O	Non-isolated General-purpose Output 19
32	OUT20	O	Non-isolated General-purpose Output 20
33	OUT21	O	Non-isolated General-purpose Output 21
34	OUT22	O	Non-isolated General-purpose Output 22
35	OUT23	O	Non-isolated General-purpose Output 23
36	OUT24	O	Non-isolated General-purpose Output 24
37	GND	GND	5V/3.3V Power Ground

Note: These inputs with asterisk (I) can be configured as special purpose inputs.

2.1.5. Serial Port COM1

COM1 is a D shell 9 pin male connector which has the transmitting and the receive pin for RS232 communication. This port is used for configuration and uploading/downloading motion program. See table 2-5 for the detail.

Table 2-5 Serial port COM1 pin assignment (SMC6480, SMC6490 and PMC6496)

Serial Port COM1 Pin Assignment (SMC6480, SMC6490 and PMC6496)			
Pin	**Name**	**I/O**	**Description**
1	NC	N/A	Not connected
2	RXD0	I	RS232 receive
3	TXD0	O	RS232 transmit
4	NC	N/A	Not connected
5	EXGND	GND	External power ground
6	NC	N/A	Not connected
7	NC	N/A	Not connected
8	NC	N/A	Not connected
9	NC	N/A	Not connected

2.1.6. Serial Port COM2

COM2 is a D shell 9 pin female connector which has the transmitting and the receive pin for RS232 communication. This port is used for controller configuration or downloading/downloading motion program. See table 2-6 for the detail.

Table 2-6 Serial port COM2 Pin assignment (SMC6480, SMC6490 and PMC6496)

Serial Port COM2 Pin Assignment (SMC6480, SMC6490 and PMC6496)			
Pin	**Name**	**I/O**	**Description**
1	NC	N/A	Not connected
2	RXD0	I	RS232 receive
3	TXD0	O	RS232 transmit
4	NC	N/A	Not connected
5	EXGND	GND	External power ground
6	NC	N/A	Not connected
7	NC	N/A	Not connected
8	NC	N/A	Not connected
9	NC	N/A	Not connected

2.1.7. Power-up level DIP Switch Function

There is a 4 bit DIP switch for setting of power-up level for digital outputs 1-24. See table 2-7 for the detail.

Table 2-7 DIP Switch Function (SMC6480, SMC6490 and PMC6496)

Power-up Level DIP Switch Function (SMC6480, SMC6490 and PMC6496)		
SWITCH	**ON/OFF**	**Description**
1	ON	Power-up level of digital outputs 17-24 is 0
	OFF	Power-up level of digital outputs 17-24 is 1
2	ON	Power-up level of digital outputs 9-16 is 0
	OFF	Power-up level of digital outputs 9-16 is 1
3	ON	Power-up level of digital outputs 5-8 is 0
	OFF	Power-up level of digital outputs 5-8 is 1
4	ON	Power-up level of digital outputs 1-4 is 0
	OFF	Power-up level of digital outputs 1-4 is 1

2.1.8. E-Stop Connector (SMC6480)

When the E-Stop input is activated, all the axes will stop and no pulse output. See table 2-8 for the pin assignment. Figure 3-5 illustrates how to connect an E-step switch to the controller.

Table 2-8 E-Stop Connector Pin Assignment (SMC6480)

E-Stop Connector Pin Assignment (SMC6480)			
Pin	**Name**	**I/O**	**Description**
1	EMG	I	E-stop Input
2	EXGND	GND	External power ground.

2.1.9. D/A Output Connector (SMC6480)

The D/A output is reference to AGND. Its swing rang is from 0.07-4.45V. The output circuit is shown in figure 3-18. See the pin assignment in table 2-9.

Table2-9 D/A Output Connector Pin Assignment (SMC6480)

D/A Output Connector Pin Assignment			
Pin	Name	I/O	Description
1	Analog A	O	D/A output channel A
2	Analog B	O	D/A output channel B
3	AGND	GND	D/A output ground
4	AGND	GND	D/A output ground

2.1.10. Encoder Connector(SMC6490 and PMC6496)

The encoder input can be used for pulse counting of position feedback. There are up to 4 channel AB phase and Z index inputs with latched signal for capture of position. All of the inputs are TTL compatible

Table2-10 Encoder Connector Pin Assignment (SMC6490 and PMC6496)

Encoder Connector Pin Assignment (SMC6490 and PMC6496)							
Pin	Name	I/O	Description	**Pin**	Name	I/O	Description
1	5V	O	+5V Power Output	**20**	GND	GND	5V Power Ground
2	GND	GND	5V Power Ground	**21**	EA2+	I	Axis 2 Encoder Phase A +
3	EA1+	I	Axis 1 Encoder Phase A +	**22**	EA2-	I	Axis 2 Encoder Phase A -
4	EA1-	I	Axis 1 Encoder Phase A -	**23**	EB2+	I	Axis 2 Encoder Phase B +
5	EB1+	I	Axis 1 Encoder Phase B +	**24**	EB2-	I	Axis 2 Encoder Phase B -
6	EB1-	I	Axis 1Encoder Phase B -	**25**	EZ2+	I	Axis 2 Encoder Index Z +
7	EZ1+	I	Axis 1 Encoder Index Z +	**26**	EZ2-	I	Axis 2 Encoder Index Z -
8	EZ1-	I	Axis 1 Encoder Index Z -	**27**	LTC2+	I	Axis 2 Latch Signal Input +
9	LTC1-	I	Axis 1 Latch Signal Input +	**28**	LTC2-	I	Axis 2 Latch Signal Input -
10	5V	O	+5V Power Output	**29**	GND	GND	5V Power Ground
11	GND	GND	5V Power Ground	**30**	EA4+	I	Axis 4 Encoder Phase A +
12	EA3+	I	Axis 3 Encoder Phase A +	**31**	EA4-	I	Axis 4 Encoder Phase A -
13	EA3-	I	Axis 3 Encoder Phase A -	**32**	EB4+	I	Axis 4 Encoder Phase B +
14	EB3+	I	Axis 3 Encoder Phase B +	**33**	EB4-	I	Axis 4 Encoder Phase B -
15	EB3-	I	Axis 3 Encoder Phase B -	**34**	LTC1+	I	Axis 1 Latch Signal Input +
16	EZ3+	I	Axis 3 Encoder Index Z +	**35**	EZ4-	I	Axis 4 Encoder Index Z -
17	EZ3-	I	Axis 3 Encoder Index Z -	**36**	NC	N/A	Not Connected
18	EZ4+	I	Axis 4 Encoder Index Z +	**37**	NC	N/A	Not Connected
19	5V	O	+5V Power Output				

2.1.11. Manual Pulse Connector (SMC6490 and PMC6496)

Manual pulse from the MPG can be used to joy the axes during processing. Leadshine SMC6400B accepts AB phase input signals. That is, A phase is lead or lag B phase by 90 degree and it represents the move direction. The pulse frequency can be multiplied by 10 times or 100 times. You need to select which axis to be operated by pulling the SEL pin to ground before sending the pulse. See table 2-11 for the pin assignments.

Do not connect the GND to EXGND See chapter 2.3 for more information.

Table 2-11 Manual Pulse Connector Pin Assignment (SMC6490 and PMC6496)

Manual Pulse Input Connector Pin Assignment (SMC6490 and PMC6496)							
Pin	**Name**	**I/O**	**Description**	**Pin**	**Name**	**I/O**	**Description**
1	PA	I	Manual pulse input phase A	**9**	GND	GND	Internal 5V Power Ground
2	PB	I	Manual pulse input phase B	**10**	GND	GND	Internal 5V Power Ground

3	X10	I	10× Pulse Frequency, active Low.	**11**	SELy	I	Select Axis Y, active low.
4	X100	I	100× Pulse Frequency, active low.	**12**	SELz	I	Select Axis Z, active low.
5	SELx	I	Select Axis X, active low.	**13**	SELu	I	Select Axis U, active low.
6	GND	GND	Internal 5V Power Ground	**14**	+5V	O	Internal +5V power output f
7	GND	GND	Internal 5V Power Ground	**15**	+5V	O	Internal +5V power output
8	GND	GND	Internal 5V Power Ground				

Note: The Manual Pulse Input of SMC6490/PMC6496 is non-isolated but the inside circuit is powered by internal isolated power supply..

2.3 Isolated and Non-isolated Power Output

There are many power supply voltages output from SMC6000 controller. Figure 2-3 illustrate the relationship between them.

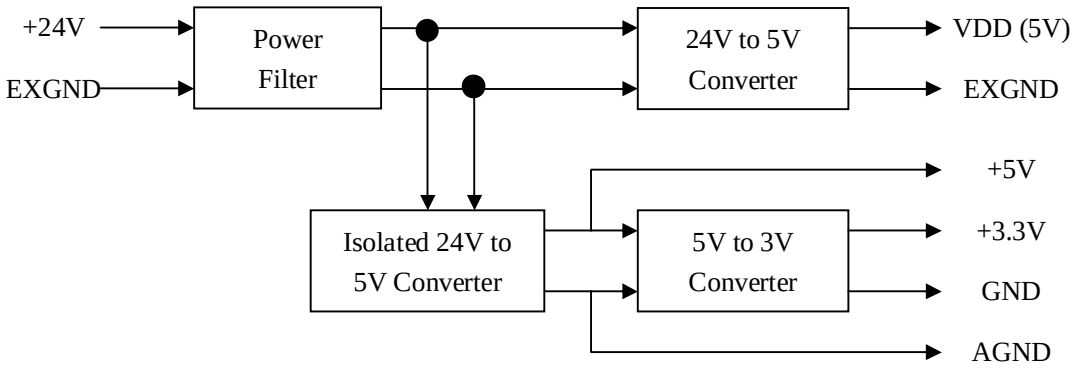

Figure 2-3: SMC6000 isolated and non-isolated power output

In figure 2-3, the 24V external power is converted into VDD (5V) directly. The +5V and +3.3V are completely isolated from the external power to ensure the internal circuit work independently. The AGND is reference of the D/A output and the +3.3V is used in the expansion I/O outputs. The VDD (5V) can be used for peripheral equipment and its return ground is common with EXGND.

Note: 1) Never connect AGND or GND to EXGND. Otherwise the electronic interference will coupled into the internal circuit.

2) Instead of 24V, the VDD output is 5V which is different from the other Leadshine controllers.

2.4 USB Disk Interface

Leadshine SMC6000 uses USB1.1 standard for the USB disk and can support any 2G or 4G USB disk in the market. MAX transmission speed is 12Mb/s.

Chapter 3 Interface Circuit

3.1 Control Signal Output

Leadshine SMC6000 can control 4 axes stepper/servo motor at the same time. By default, the control signal PUL and DIR of each axis represents pulse and direction signal. They can be configured as CW/CCW signal in the demo software. See more information in SMC6000's software manual.

The control signal output circuit and its connection to a differential input stepper drive is shown in figure 3-1. If the stepper drive is single-ended input, connect it as figure 3-2. Negative output and +5V are used in the single-ended connections. Please note that the PUL and DIR can only sink/source maximal 20mA which should be enough for the opto-coupler.

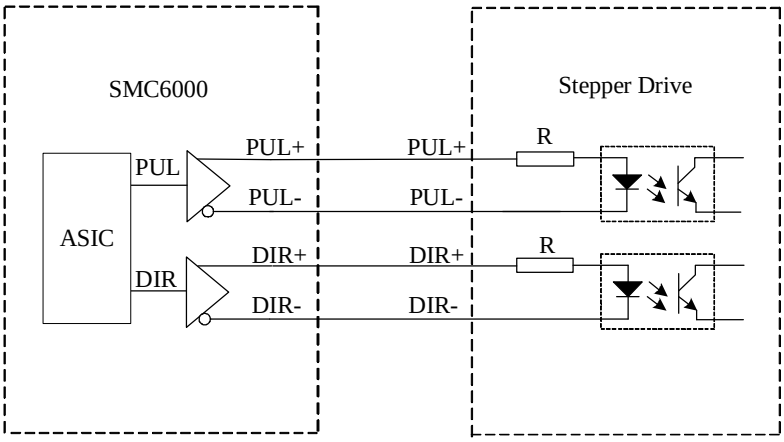

Figure 3-1: Differential Output of Control Signal PUL and DIR

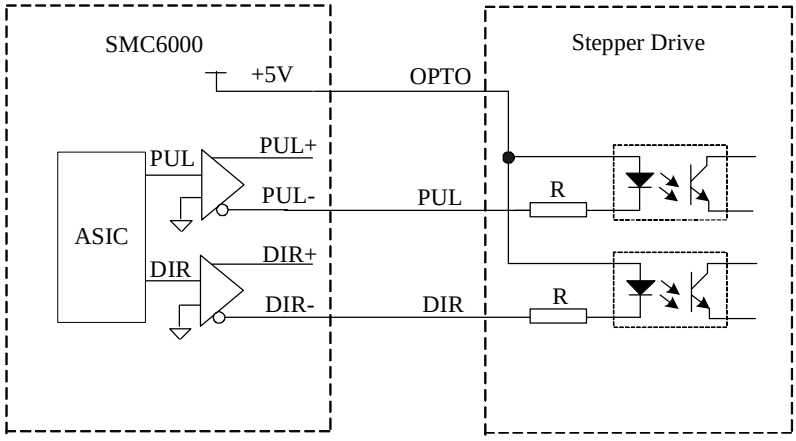

Figure 3-2: Single-ended Output of Control Signal PUL and DIR

3.2 Origin Input ORG

ORG signal is used to detect the mechanical home/origin position in a machine. SMC6000's ORG input circuit is shown in figure 3-3. The built-in opto-coupler and low-pass filter prevent electronic interference from coupling into the motion controller thus increase system reliability. See table 2-2 for pin assignment of ORG signal in the

connector.

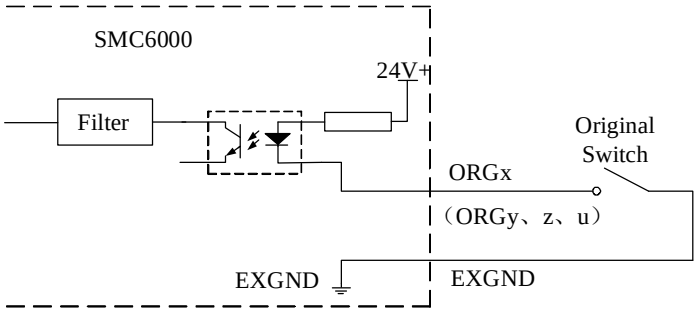

Figure 3-3: Origin Signal ORG Input Circuit

3.3 End Limit input EL

EL is used to limit axis move range and protect the machine. When it is activated, the pulse output will be output immediately. EL+ can be used in CW direction and EL- can be used in CCW direction. The input circuit of EL is shown in figure 3-4.

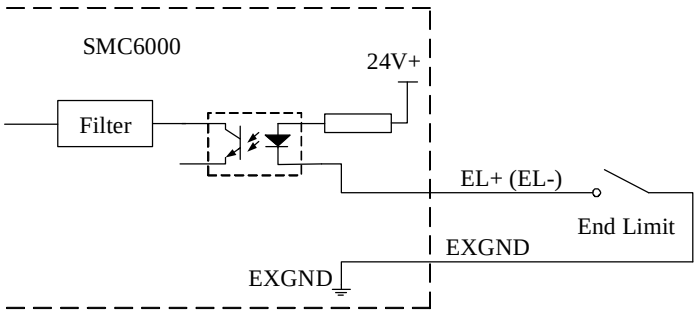

Figure 3-4: End Limit Signal EL Input Circuit

The active level of EL can be configured in the Demo software. Set EL be active low if the end limit switch is normal open and when it turns on, EL will be activated and the moving axis stops immediately. Otherwise, set EL be active high if the end limit switch is normal close, and when it turns off, EL is activated and the moving axis stops immediately.

3.4 E-Stop Input EMG

In order to protect operator and equipment in case of emergency, Leadshine SMC6000 provides emergency stop input EMG to stop the all axes immediately when EMG is activated. The EMG input circuit is shown in figure 3-5. See table 2-8 for the pin assignment of EMG for SMC6480 or table 2-3 for SMC6490/PMC6496.

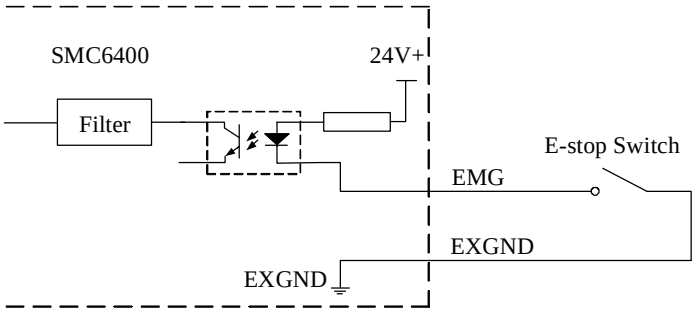

Figure 3-5: Emergency Stop Signal EMG Input Circuit

3.5 General Purpose Digital Input

Leadhine SMC6000 motion controller has 16 isolated and 16 non-isolated general purpose digital inputs which can be connected to switch, sensor or output signals form other controller.

3.5.1. Isolated General Purpose Digital Inputs

The input circuit is shown in figure 3-6. See table 2-3 for pin assignment of isolated general purpose inputs.

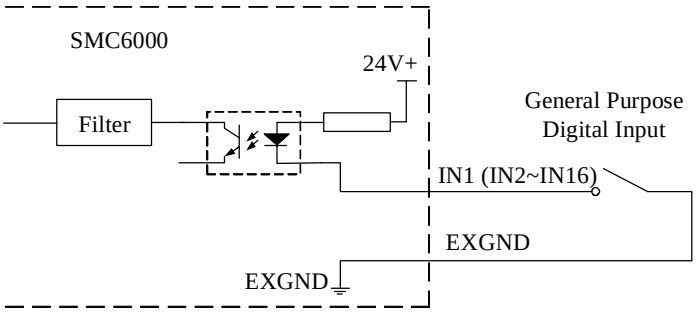

Figure 3-6: Isolated General Purpose Digital Input Circuit

3.5.2. Non-isolated General Purpose Digital Inputs

The non-isolated general purpose digital inputs are assigned in the expansion I/O connector and it is required to add isolated device for those inputs when connected to peripheral equipment. Leadshine also provides optional terminal board ACC37-7480 to user. Electronic noise will couple into the internal circuit and the controller will not function ok when there is no isolation applied to these inputs. Figure 3-7 illustrates the non-isolated input circuit.

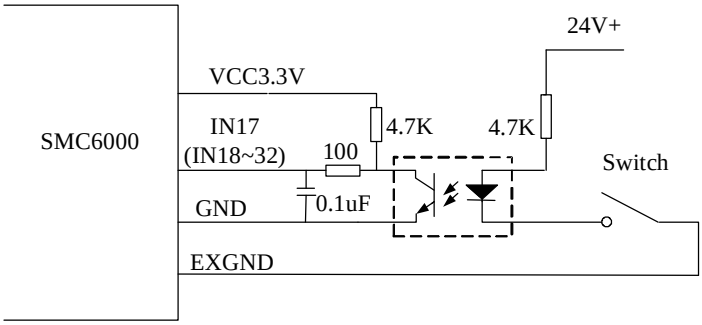

Figure 3-7: Non-isolated General Purpose Digital Input Circuit

3.6 General Purpose Digital Output

Leadshine SMC6000 provides 8 isolated and 16 non-isolated general purpose digital outputs.

3.6.1. Isolated General Purpose Digital Outputs

The isolated general purpose outputs adopt OC (open collector) output circuit. Digital output OUT1 and OUT2 use MOSFET and they can withstand up to 1A current for relay. See figure 3-8 for interface circuit of OUT1 and OUT2. Digital output OUT3~OUT8 adopts ULN2803 and the output current is limit to 60mA. See figure 3-9 for interface circuit of digital output OUT3-OUT8. The pin assignments of isolated digital outputs are shown in table 2-3.

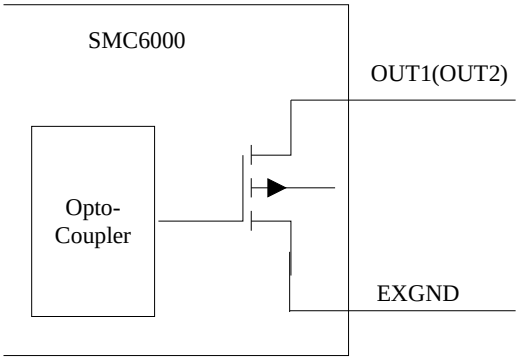

Figure 3-8: 1Amp isolated General Purpose Digital Output OUT1 and OUT2

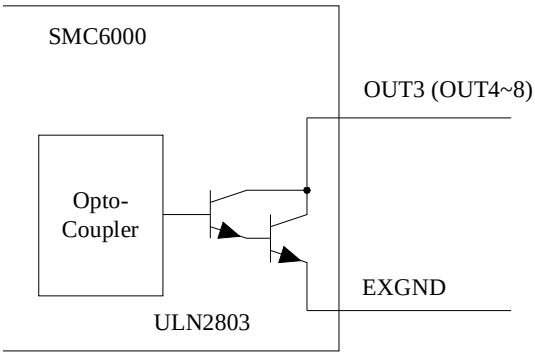

Figure 3-9: 60mA isolated General Purpose Digital Output OUT3-OUT8

Typical connections of general purpose digital outputs to different components are shown as follows:

1) Connections to LED

When connected the digital output to a LED, series a resistor between the power input and the LED to limit the current to approx 10mA. The resistance is depending on the external power voltage. For example, 2K series resistor is suitable for 24VDC power input. See figure 3-10 for how to connect the LED and series resistor.

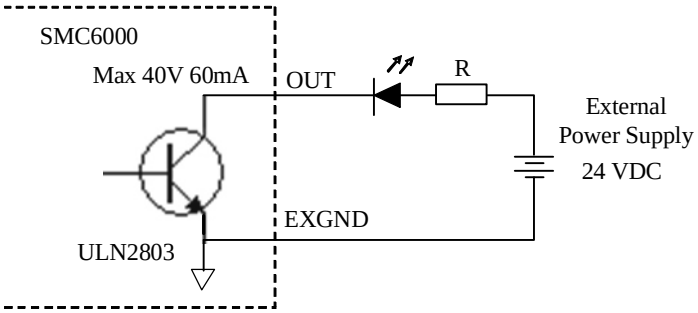

Figure 3-10: Connect Digital Output to LED

2) Connections to a Lamp

Use a warm-up resistor R for the connected lamp in order to increase lamp's life-time. Determine the resistor by the following rule: when the digital output is high level, this resistor should not turn on the lamp.

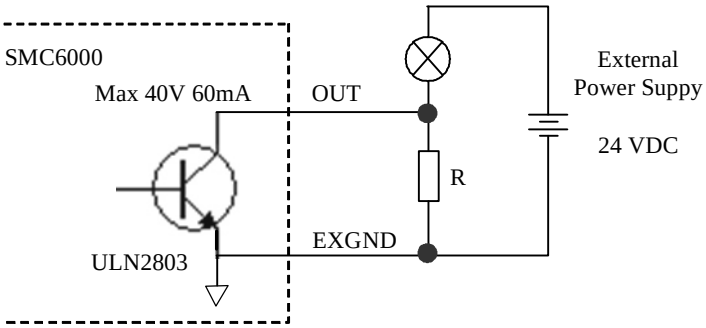

Figure 3-11: Connect Digital Output to Lamp

2) Connections to a Relay

The mechanical relay is inductance type load. If a mechanical relay is used, a diode must be paralleled to it to by pass the inductance voltage generated when it is switched off. See figure 3-12 for the connections. The series resistor is used to limit current to 60mA, in order to protect the output circuit of SMC6000.

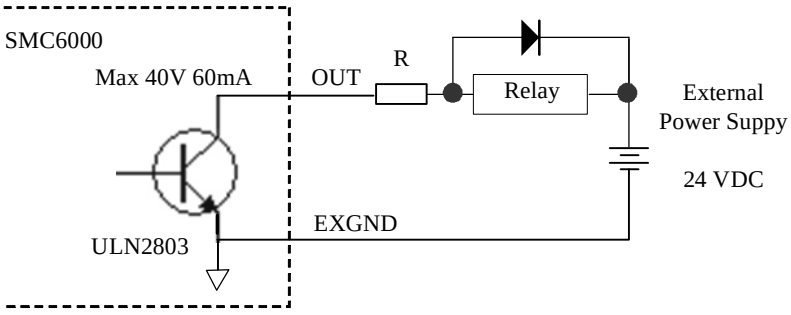

Figure 3-12: Connect Digital Output to Relay

Caution

Note: 1) A diode must be paralleled to the relay to by pass inductive voltage. Connect a series resistor between the digital output and the relay if the drive current is great than 60mA. Otherwise the digital output will be risk of damage.

3.6.2. Non-isolated General Purpose Digital Outputs

Non-isolated general purpose digital outputs are assigned in the expansion I/O connector. Additional isolated circuit should be used when connect them to peripheral equipment. You can also use Leadshine terminal board ACC37-7480 which offers isolation and anti-interference capacity. Typical connection of non-isolated digital output is shown in figure 3-13. See the pin assignment of non-isolated digital outputs in table 2-4.

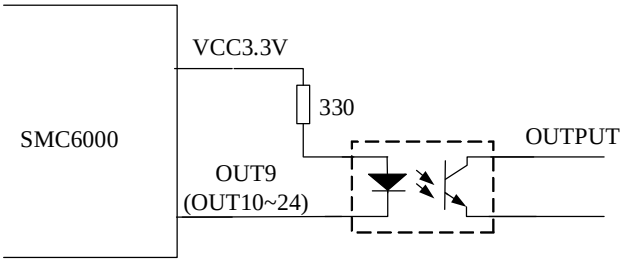

Figure 3-13: Connect Digital Output to Relay

3.7 Expansion I/O Terminal Board ACC37-7480

For your convenience Leadshine provides terminal board ACC37-7480 for expansion I/O connections. This terminal board offers isolation and current amplification to the expansion I/O. Figure 3-14 gives the pin out and mechanical specification of ACC37-7480.

Caution

Note: The ACC37-7480 requires power supply to make it work. Please connect 24VDC to connector J1 of ACC37-7480.

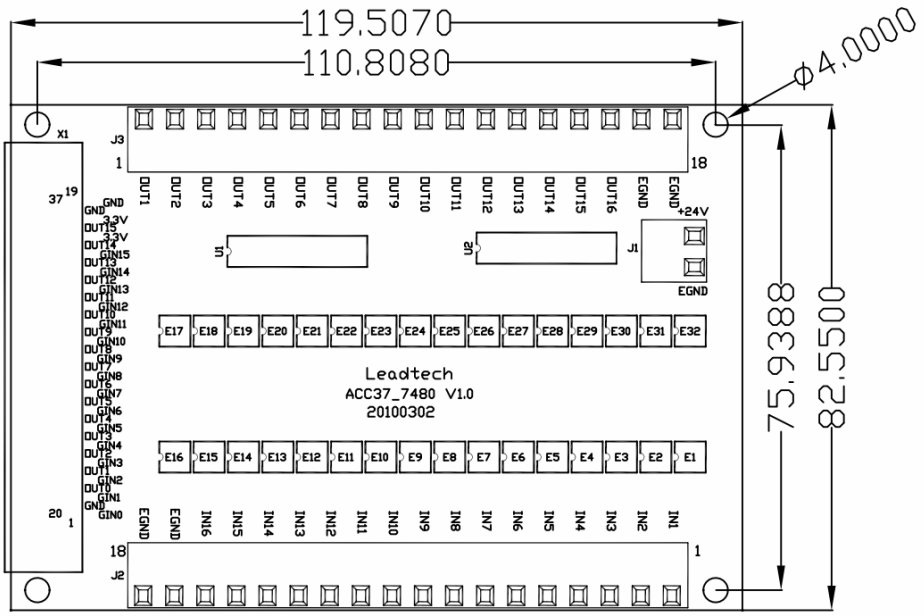

Figure 3-14: Terminal Board ACC37-7480

The expansion I/O of Leadshine SMC6000 is connected to connector X1 of terminal board ACC37-7480 through a cable with DB37 connector. The connector J2 pin assignment of ACC37-7480 is shown in table 3-1. The connector J3 pin assignment of ACC37-7480 is shown in table 3-2. The interface circuit of those inputs and outputs in ACC37-7480 are shown in figure 3-15 and figure 3-16, respectively.

Table 3-1 Terminal Board ACC37-7480 General Purpose Input Connector J2 Pin Assignment

Terminal Board ACC37-7480 Connector J2 Pin Assignment			
Pin	**Name**	**I/O**	**Description**
1	IN1	I	Expansion General-purpose Digital Input 17
2	IN2	I	Expansion General -purpose Digital input 18
3	IN3	I	Expansion General-purpose Digital Input 19
4	IN4	I	Expansion General-purpose Digital Input 20
5	IN5	I	Expansion General-purpose Digital Input 21
6	IN6	I	Expansion General-purpose Digital Input 22
7	IN7	I	Expansion General-purpose Digital Input 23
8	IN8	I	Expansion General-purpose Digital Input 24
9	IN9	I	Expansion General-purpose Digital Input 25
10	IN10	I	Expansion General-purpose Digital Input 26
11	IN11	I	Expansion General-purpose Digital Input 27
12	IN12	I	Expansion General-purpose Digital Input 28
13	IN13	I	Expansion General-purpose Digital Input 29
14	IN14	I	Expansion General-purpose Digital Input 30
15	IN15	I	Expansion General-purpose Digital Input 31
16	IN16	I	Expansion General-purpose Digital Input 32
17	EGND	GND	External Power Ground
18	EGND	GND	External Power Ground

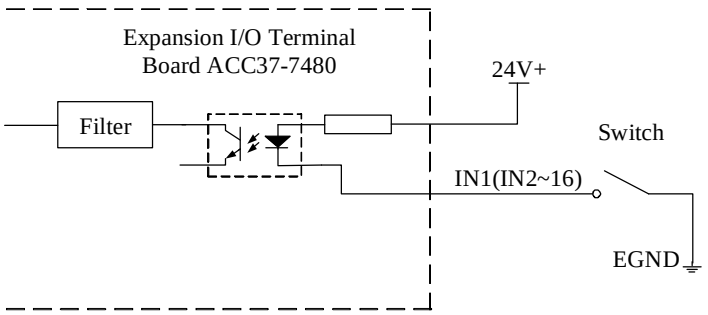

Figure 3-15: Interface circuit of IN1~IN16 in terminal board ACC37-7480

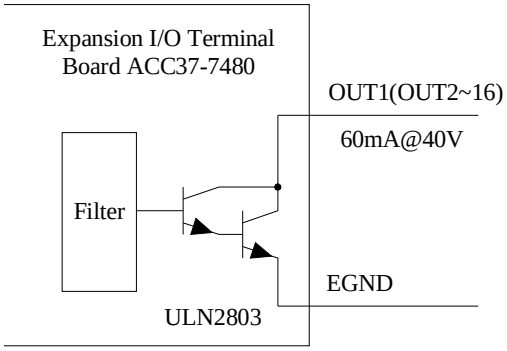

Figure 3-16: Interface circuit of OUT9-OUT24 in terminal board ACC37-7480

Table 3-2 Terminal Board ACC37-7480 General Purpose Outputs Connector J2 Pin Assignment

Pin Assignment of Connector J3 in Terminal Board ACC37-7480			
1	OUT1	O	Expansion General-purpose Digital Output 9
2	OUT2	O	Expansion General-purpose Digital Output 10
3	OUT3	O	Expansion General-purpose Digital Output 11
4	OUT4	O	Expansion General-purpose Digital Output 12
5	OUT5	O	Expansion General-purpose Digital Output 13
6	OUT6	O	Expansion General-purpose Digital Output 14
7	OUT7	O	Expansion General-purpose Digital Output 15
8	OUT8	O	Expansion General-purpose Digital Output 16
9	OUT9	O	Expansion General-purpose Digital Output 17
10	OUT10	O	Expansion General-purpose Digital Output 18
11	OUT11	O	Expansion General-purpose Digital Output 19
12	OUT12	GND	Expansion General-purpose Digital Output 20
13	OUT13	GND	Expansion General-purpose Digital Output 21
14	OUT14	GND	Expansion General-purpose Digital Output 22
15	OUT15	GND	Expansion General-purpose Digital Output 23
16	OUT16	GND	Expansion General-purpose Digital Output 24
17	EGND	GND	External Power Ground
18	EGND	GND	External Power Ground

3.8 PWM Output

Leadshine SMC6000 provides two channels, 32bit PWM outputs with isolation. Its interface circuit is shown in figure 3-17.

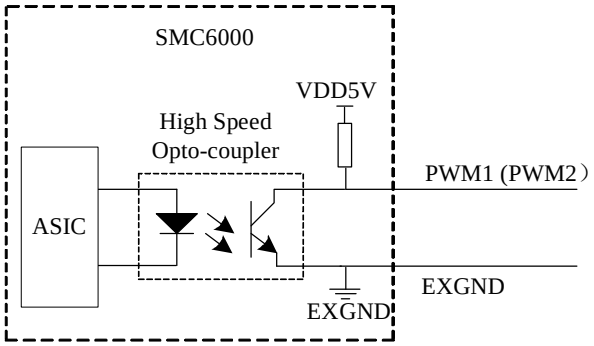

Figure 3-17: Interface circuit of PWM output

3.9 D/A Output

Leadshine SMC6480 provides 2 channel 8 bit D/A output with a voltage follower. Because the operational amplifier is powered by a single 5VDC, the D/A output is between 0.07V and 4.45V. Figure 3-18 is the interface circuit of D/A output. If 0V output is required, contact Leadshine to modify the SMC6480 for 0~2.5V D/A output.

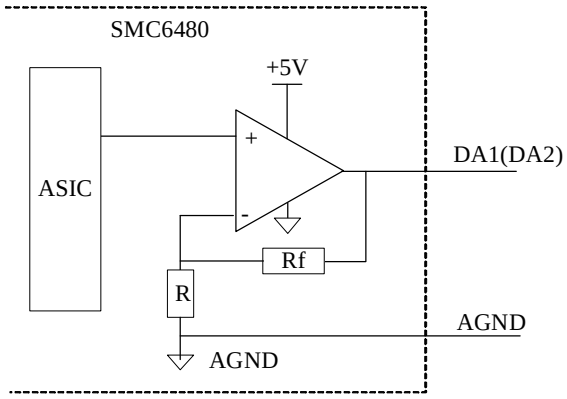

Figure 3-18: Interface circuit of D/A output

3.10 Encoder Input EA, EB and EZ

Leadshine SMC6490/PMC6496 accepts differential encoder input which includes channel A signal EA, channel B signal EB and Z index signal EZ. EA and EB are used for pulses counting. EZ can be taken as index signal. See figure 3-17.

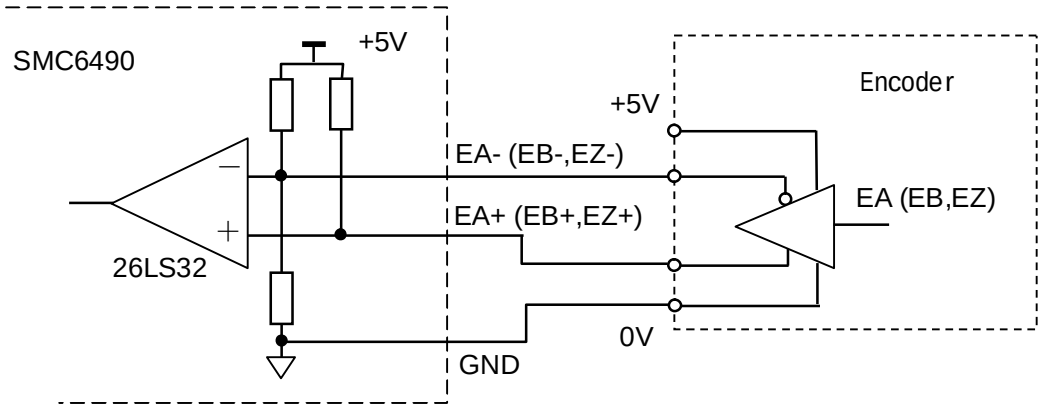

Figure 3-18: Interface circuit of encoder input

If the encoder output is single-ended like PNP, NPN or OC(open collector), connect the signals to the EA+, EB+ , EZ+ and leave the EA-, EB-, EZ- unconnected.

Caution

Note: 1) High level input of EA+, EA-, EB+, EZ+ and EZ- should be greater than 3.5V and less than 5V. Low level input should be less than 0.5V. The encoder should offer 6mA current at the least for each channel.

2) Don’t forget to connect the encoder ground to the controller’s ground.

Chapter 4 Typical Connection

4.1 Stepper Drive Connection

4.1.1. Single-ended Stepper Drive Connection

The singled-ended input requires a common-anode input for the PUL and DIR signal. In such configuration, connect the +5V to the common terminal of PUL and DIR. The connection is shown in figure 4-1.

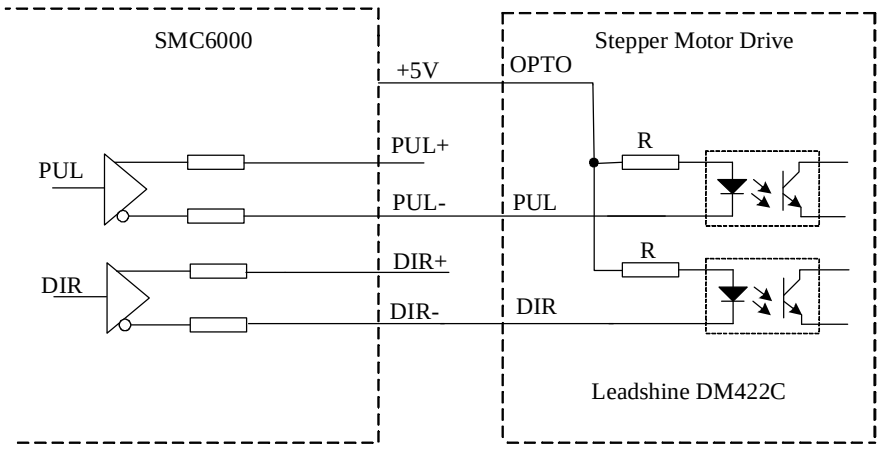

Figure 4-1: Connections to single-ended stepper motor drive

4.1.2. Differential Input Stepper Drive Connection

The connection is accordingly. See figure 4-2.

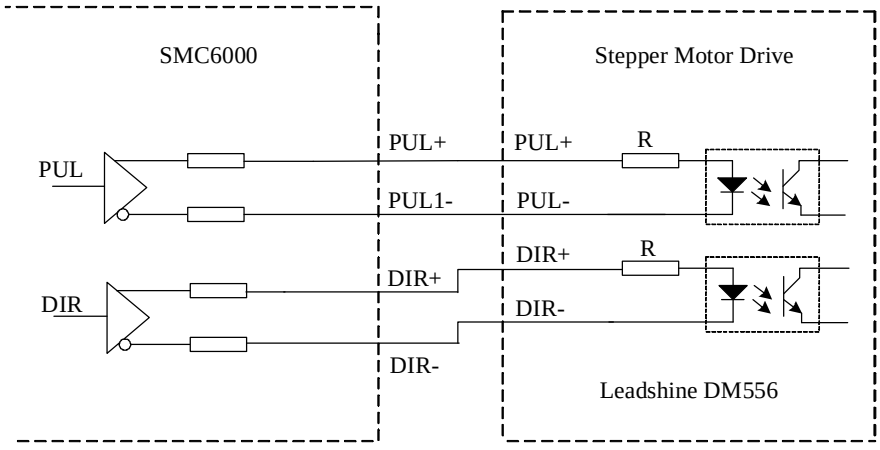

Figure 4-2: Differential input stepper motor drive connections

4.2 Servo Drive Connection

The connections to Panasonic servo motor drive is shown in figure 4-3.

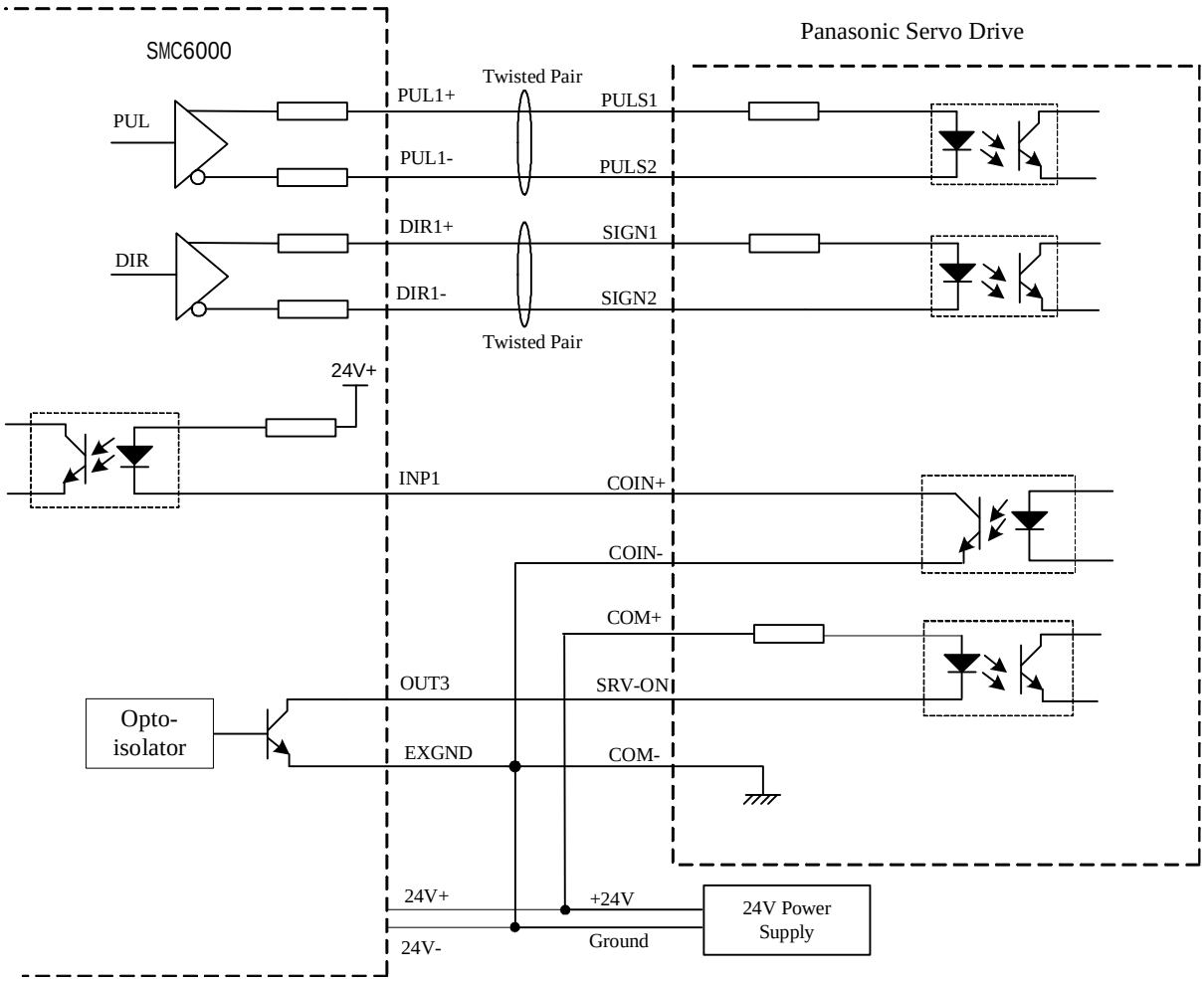

Figure 4-3: Connections to Panasonic AC servo motor drive

Note: Contact Leadshine at tech@leadshine.com if you have any questions or problems on the connection.

4.3 Proximity Sensor Connection

Figure 4-4 illustrates the connection between Leadshine SMC6000 and proximity sensor. Here we take the OMRON TL-Q5MC2 as example.

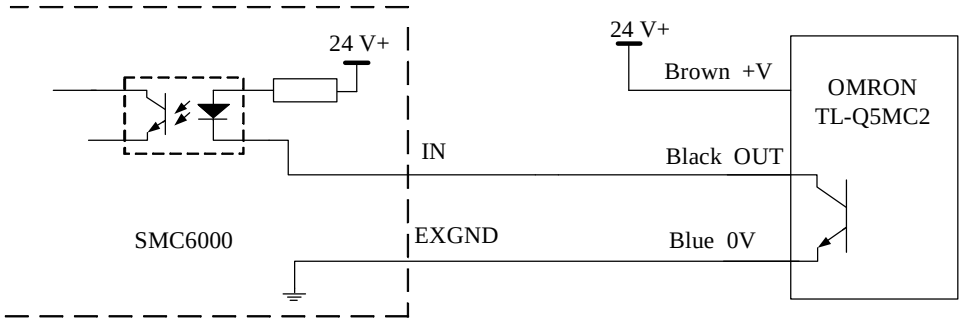

Figure 4-4: Connections to proximity sensor

4.4 Photoelectric Sensor Connection

Figure 4-4 illustrates the connection between Leadshine SMC6000 and proximity sensor. Here we take the RG150-8 as example.

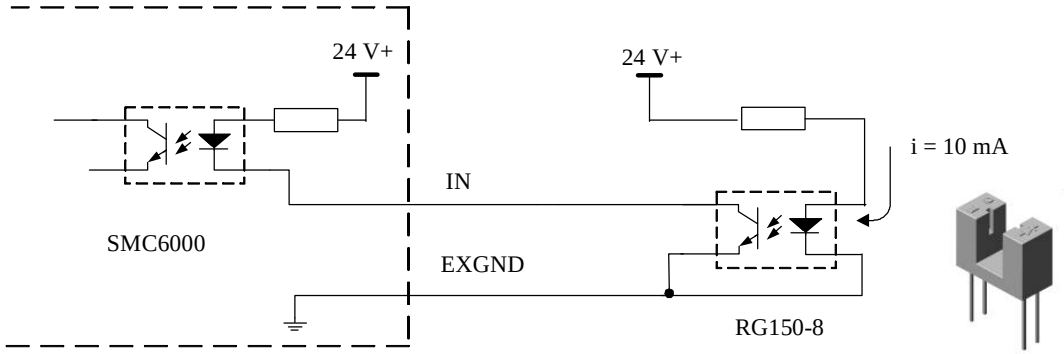

Figure 4-5: Connections to photoelectric sensor

4.5 Relay Connections

Figure 4-6 shows how to connect the SMC6000 to a mechanical relay. A diode must be parallel between the input coil of the relay to by pass the inductive voltage which may damage the output circuit of SMC6000.

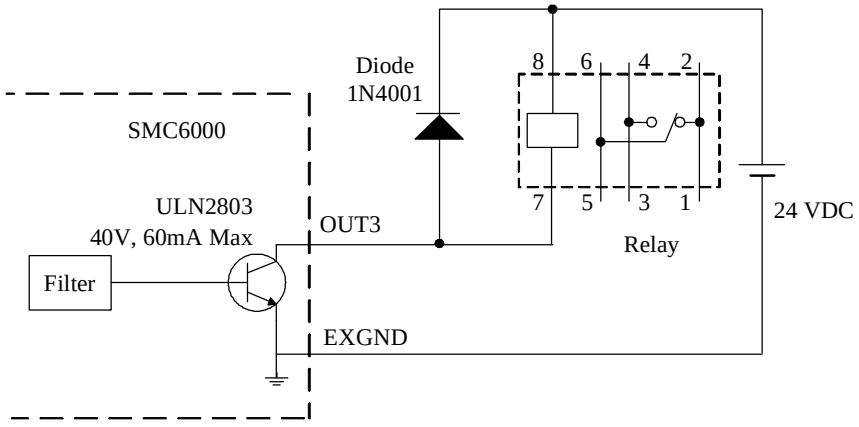

Figure 4-6: Connections to relay

4.6 Connection Troubleshooting

Symptom	Advise
Motor not move.	Please check whether the drive's command type is match to the controller's. You can use the demo software to test and observe the pulse count.
Controller can output pulse but motor not move	Check the connections between the drive and the motion controller. Make sure the drive has not alarm.
Motor can move but not position not correct	Check whether there is other interference source from large current/power equipment. Eliminate it by twisted pair and ground wiring. Sometimes the limit resistor between the motion controller and the drive is too big thus the signal current is too small.
Motor can be controlled but motor vibration or position overshoot is big.	Check the drive settings or whether the acceleration/deceleration time is too small.
Home position is not correct.	Check whether there is interference coupled into the encoder or origin signal. Make sure the shielding of the cable had been grounded.
End limit input not work	End limit sensor not work. End limit signal may be interfered.
Big voltage ripple on DA output	Check whether the DA output is reference to AGND.
Ethernet communication port not work	Check the Ethernet cable. Exchange the transmitting and receive wire when connected to a PC directly. Power-off before connecting the Ethernet cable to the controller.

Chapter 5 Mechanical Specifications

5.1 Mechanical Specification of SMC6480

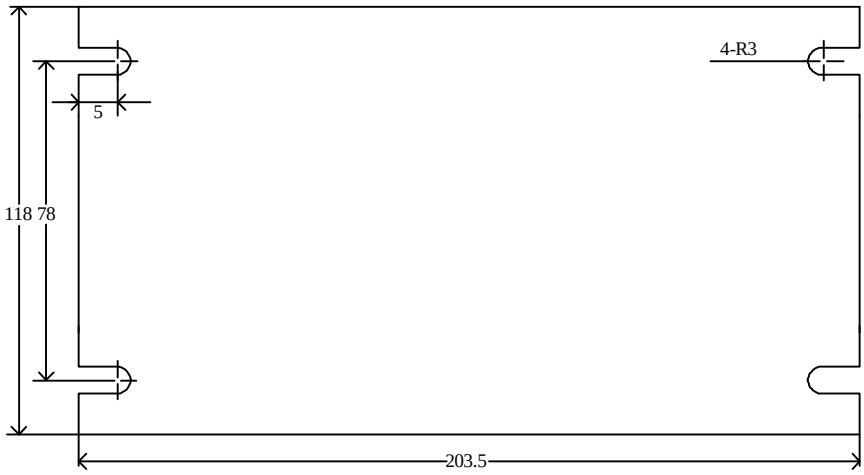

Figure 5-1: Mechanical Specification of SMC6480

5.1 Mechanical Specification of SMC6490 and SMC64596

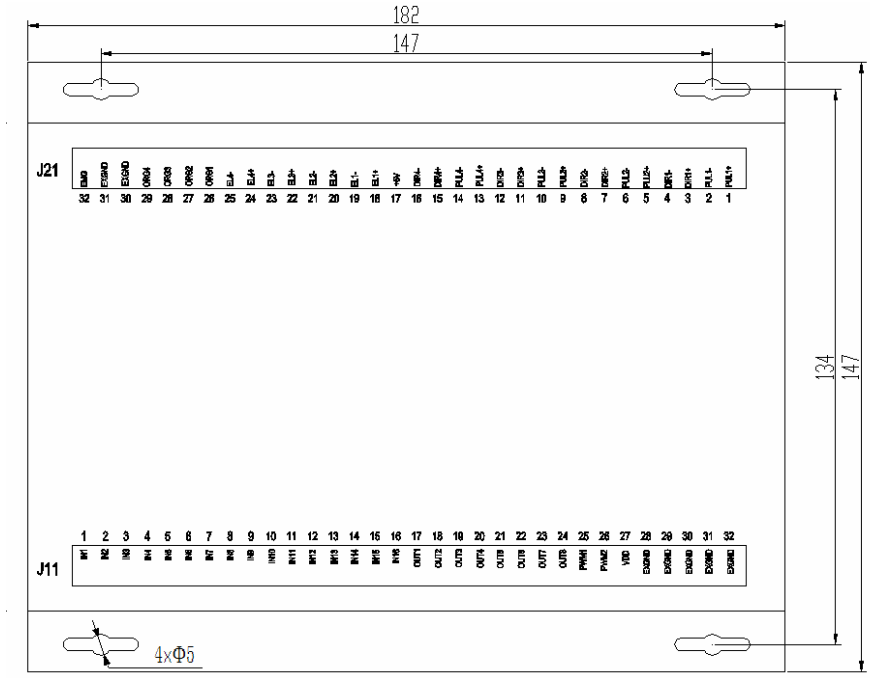

Figure 5-2: Mechanical Specification of SMC6490 and PMC6496

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