HIWIN MIKROSYSTEM CORP.

LMDX User Guide

Version 1.0
Jan. 2005

ABOUT THIS MANUAL

Scope

This manual describes the hardware of Hiwin's LMDX driver.

Related Documentation

Users can also refer to other related manuals below.

- DspHost2 Operation Manual.pdf
- LMDX Command and Parameter Manual.pdf
- LMSP Troubleshoot.pdf

Comments

If you have any comments on this manual, *HIWIN* engineers are always there to serve you. We can be reached as shown below.

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Document Validity

The information in this document is subject to change without notice.

TABLE OF CONTENTS

Revision History

Release	Date	Applies to	Comments
1.0	7. Jan. 2005	LMDX firmware 040809	Initial publication

1. INTRODUCTION

This manual is prepared for HIWIN LMDX users to drive linear servo planar motor. It leads the users through proper installation and setup of a LMDX. It is assumed that users have fundamental knowledge of basic electronics, computers, motion control card, and so on. It is recommended that users go through the manual before taking any action.

This manual consists of the following sections: Section 2 describes basic operational theory. Section 3 gives the specifications of LMDX system and dimensions. Section 4 is about wiring. This is to introduce all connector and pin assignment and interface to help users in wiring.

Motor

An LMSP motor has one planar stator with tooth structure, and one planar forcer with position sensors. Forcer is supported by air bearing. Air is supplied to forcer, so that the air gap between stator is kept to serve as guide between stator and forcer. There are 4 electromagnetic modules in an LMSP forcer where 2 modules for one direction, and 2 for the other direction. Each module is driven by 2-phase currents, i.e., phase A and phase B, to produce a reluctance force to move the forcer to an equilibrium point. 3 precision position sensors are used to inform the driver the updated position, 1 in updating direction Y, and 2 in updating direction X. The 2 sensors for X(X1 and X2) are arranged symmetrically to the center, so the yaw error can be detected in addition to position. Each encoder sends differential signals in sin and cos.

Amplifier

The LMDX driver contains DSP board, UC48 ADC board, 4 PU2 amplifiers, IDP4 pulse input, and DXIO board. The 4 PU2 amplifiers output max. 3A to 4 force modules in the forcer. IDP4 receives STEP/DIR pulses from motion controller or PLC. DXIO board is I/O board. It also outputs IN-POS, Servo Ready, ALARM. It inputs HOME and RESET etc.

Mains input voltage is 95~125V for LMDX1 and 200~240V for LMDX2.

DspHost

Setup and tuning is easy using DspHost. DspHost communicates with LMDX driver via RS-232 cable. Initialization could be done easily by DspHost. Parameter could be saved to hard disk in files and retrieved later.

Data capturing helps user to tune the servo gains and see internal signals for best operation. Compensation values could be easily handled via this user's interface.

2. OPERATIONAL THEORY

2.1 Alignment

In LMSP series motors, there are teeth or grids on the surface of stator (platen). There are also teeth structure on force modules and sensors in forcer, therefore motor must align with grids before servo control (Servo on). This is an important step before servo control.

2.2 Operating Mode

Monitor mode

This is for CPU to update firmware.

Stand–alone mode

With help of high speed DSP, Hiwin′s LMDX series driver is capable of path planning. Without motion control card, it is possible to issue motion commands through RS-232.

Pulses mode

Motion controller or PLC's sends pulses to driver. Pulses correspond to position commands. When driver receives a pulse, motor would move a specified distance accordingly. Motion controller is responsible for path generation. In acceleration phase, frequency of sending pulses becomes higher. In constant speed phase, frequency remains the same.

Servo off mode

This is different from closed loop mode. In this mode, users can't move motor through motion command or sending pulses because of no current outputs. So the motor is free.

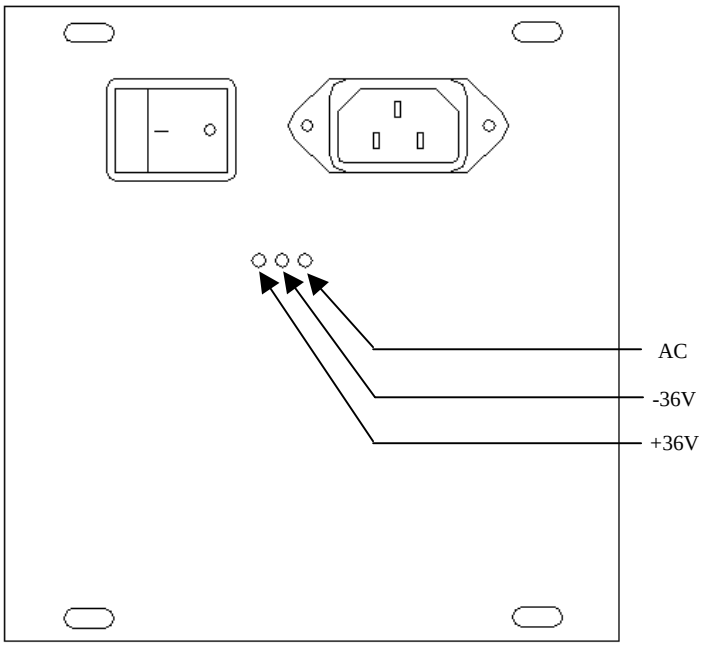
Open loop mode

Position feedback is not used in open loop. It is similar to HIWIN LMPP motor in this mode. X and Y axis are driven separately. LMSP becomes stepping motor.

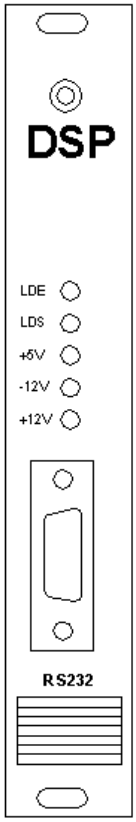
2.3 Status Indicator

Power Status Indicator

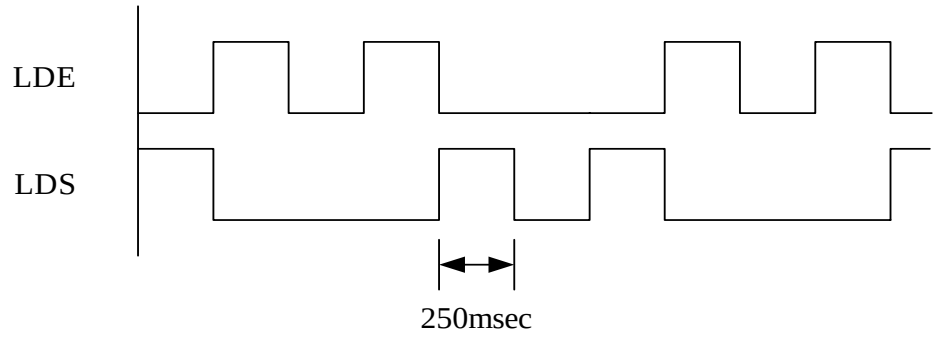
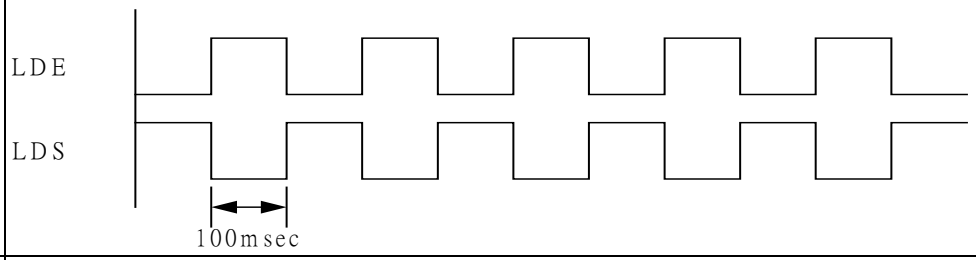
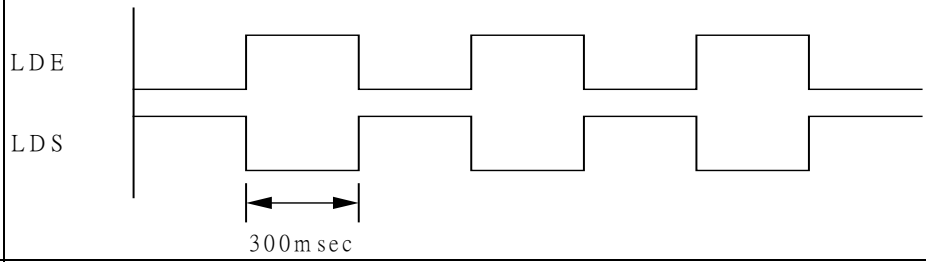
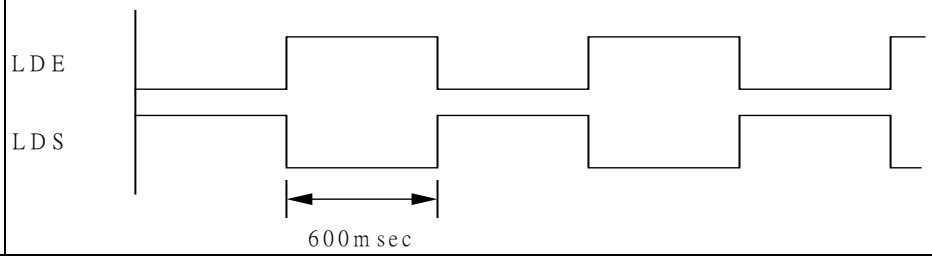
There are three LEDs including +36V and -36V and AC input on the front panel. They show whether the internal DC power is OK. If yes, the LEDs light green. Locations are shown below.



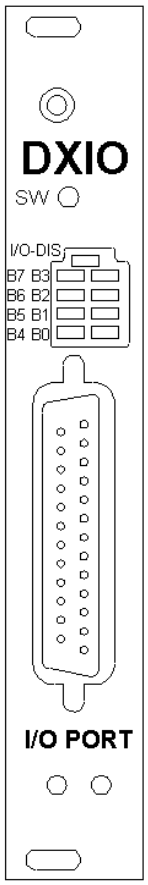
DSP Status Indicator



The DSP's status indicator are divided into two parts. One part is power supply including ±12V and +5V for DSP. The other includes two LEDs shown below. LDE is red. LDS is orange. There are three ways of blinking. Each blinking means a different motion mode or monitor mode. About motion modes, please refer to command 'FX' of "LMDX Command and parameter manual.pdf "

DSP Status Indicator	
Monitor Mode	
Motion mode	Diagram for blinking code
Servo off	
Closed Loop	
Open Loop	

DXIO Status Indicator



LEDs of DXIO card show LMDX input/output statuses. SW is a switch. It switches between input/output statuses. If I/O-DIS light, the status is input. Otherwise, it is output. The status is output when driver power on. So they can help users to see current status. Each LED is described below.

Outputs		
LED NO.	Description	Signal
B0	None	
B1	None	
B2	Alarm	OT3-C
B3	Servo Ready (SVON)	OT4-C
B4	None	
B5	In-Position	OT6-C
Inputs		
B0	Execute Homing	I1+
B1	None	
B2	None	

B3	None	
B4	None	
B5	None	
B6	None	
B7	Reset Driver	I8+

3. SPECIFICATION

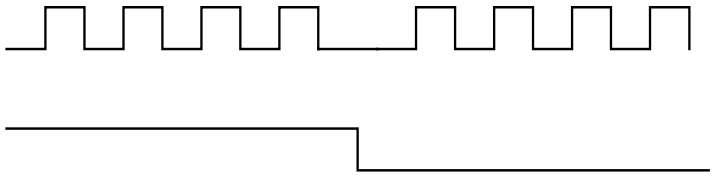
3.1 Power Supply

Model	LMDX1	LMDX2
Main Voltage	100 to 120V AC ±10%, single-phase	200 to 240V AC ±10%, single-phase
Fuse (AC Input)	250V, 6.3A, Time-Lag Glass Tube	
Fuse (DC Output)	250V, 10A	

3.2 Power output

Model	PU2
Max.Current	3A
Fuse	250V, 6.3A, Time-Lag Glass Tube

3.3 Pulse Command Input

	Positive Direction	Negative Direction
Step Direction		

3.4 Digital Inputs/Outputs

	Inputs	Outputs
Channels	8(2 dedicated)	6(3 dedicated)
Functon	I1 : Home I8 : Reset	OT3-C : Alarm OT4-C : Servo Ready(SVON) OT6-C : In-Position

3.5 Mechanical and Environmental

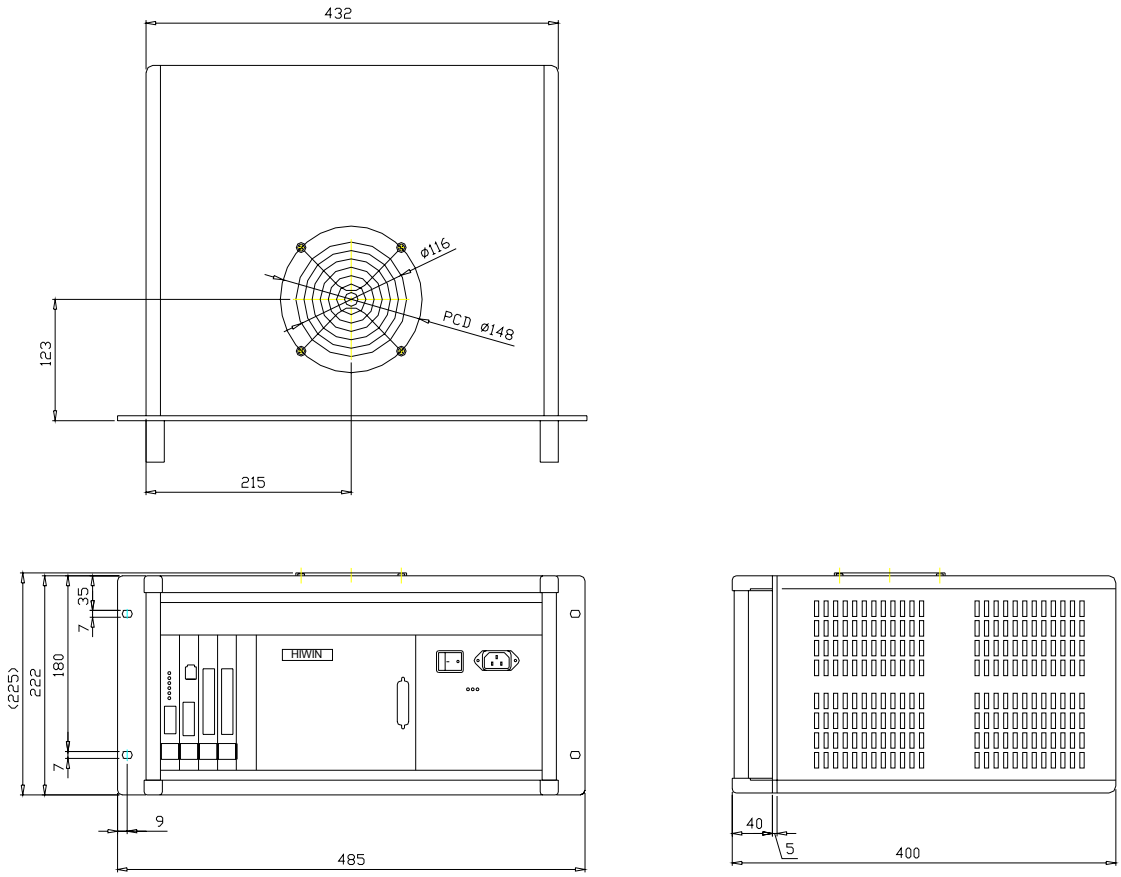
Weight	13.3Kg
Operating Temperature	Max.50^0C

3.6 Serial Interface

Channels	1
Type	RS-232
Baud Rate	9,600

Data Bits	8
Parity	Odd
Stop Bits	2

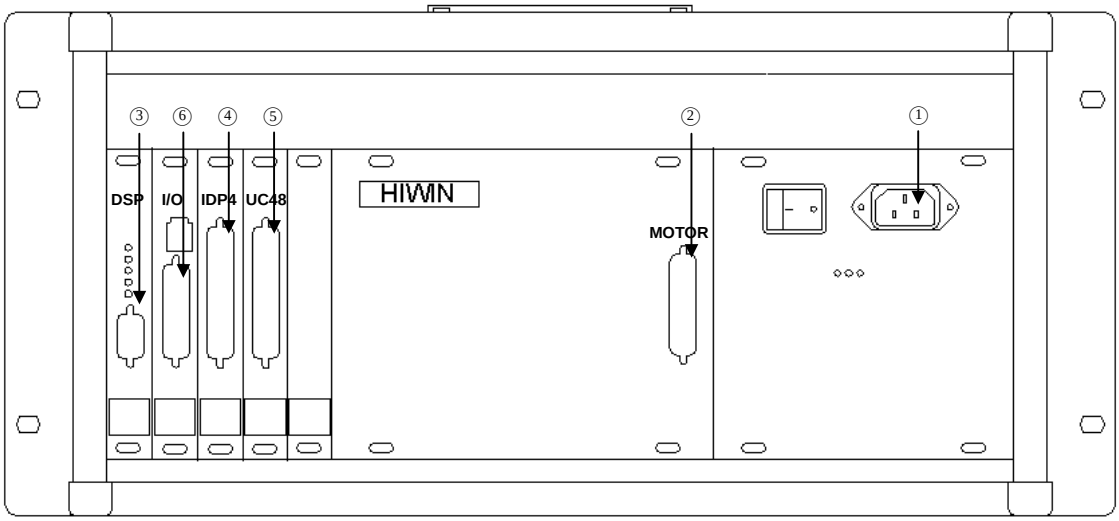
3.7 Dimensions



4. WIRING

4.1 Connector Locations

Connector locations are shown below.



① AC Mains

② Motor

③ RS-232 Serial Communication

④ Pulse

⑤ Position Feedback

⑥ DXIO

4.2 AC Mains

Mating connector

Description	EN 60320C13

Hiwin Part #	Driver End	Power Outlet
LMACP20B	Plug EN 60320C13	Plug NEMA 5-15P, 100~120V
LMACP20F		Plug CEE (7)VII, 200~240V
LMACP20G		Flying leads, 100~240V

Pin Assignment

Not Available

Wiring Diagram

Not Available

4.3 Motor

Mating Connector

Description	D-sub 25-pin(Female)

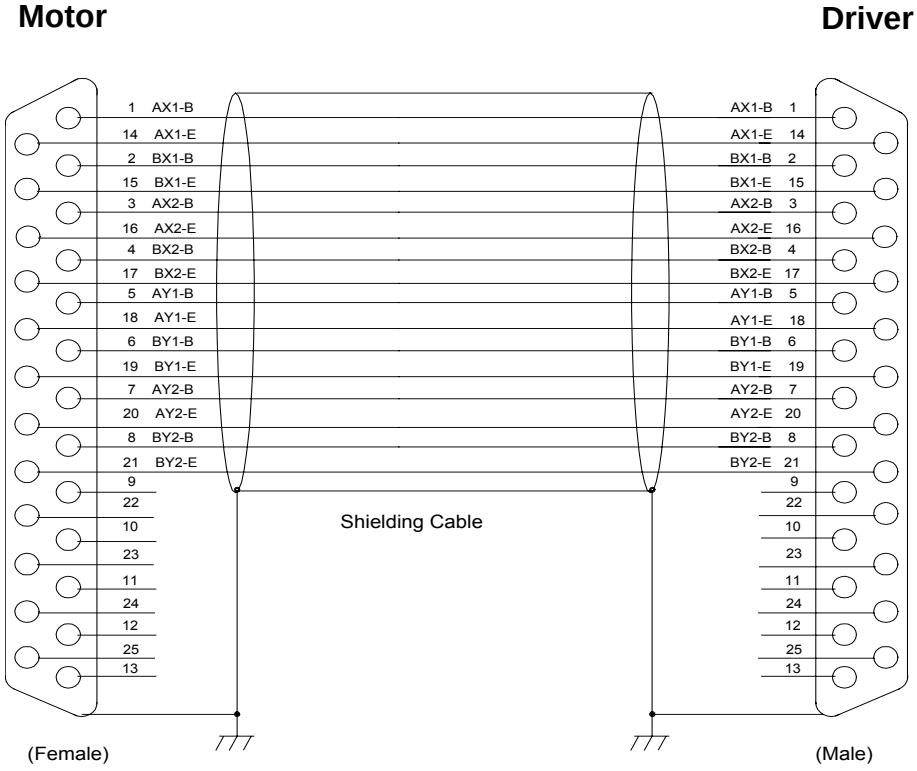
Hiwin Part #	Driver End	Motor End
LMACD20D	D-sub 25-pin(Male)	D-sub 25-pin(Female)

Pin Assignment

Function	Signal	Pin
Phase A- output of X1 Amplifier	AX1-E	14
Phase B- output of X1 Amplifier	BX1-E	15
Phase A- output of X2 Amplifier	AX2-E	16
Phase B- output of X2 Amplifier	BX2-E	17
Phase A- output of Y1 Amplifier	AY1-E	18
Phase B- output of Y1 Amplifier	BY1-E	19
Phase A- output of Y2 Amplifier	AY2-E	20
Phase B- output of Y2 Amplifier	BY2-E	21
		22
		23
		24
		25

Pin	Signal	Function
1	AX1-B	Phase A+ output of X1 Amplifier
2	BX1-B	Phase B+ output of X1 Amplifier
3	AX2-B	Phase A+ output of X2 Amplifier
4	BX2-B	Phase B+ output of X2 Amplifier
5	AY1-B	Phase A+ output of Y1 Amplifier
6	BY1-B	Phase B+ output of Y1 Amplifier
7	AY2-B	Phase A+ output of Y2 Amplifier
8	BY2-B	Phase B+ output of Y2 Amplifier
9		
10		
11		
12		
13		

Wiring Diagram



4.4 RS-232 Serial Communication

Mating connector

Description	D-sub 9-pin(Male)

Hiwin Part #	Driver End	COM Port of PC
LMACR20A	D-sub 9-pin(Female)	D-sub 9-pin(Female)

Pin Assignment

Function	Signal	Pin
Connect with Pin4		6
	RTS	7
	CTS	8
		9

Pin	Signal	Function
1		
2	RxD	
3	TxD	
4		Connect with Pin6
5	GND	

Wiring Diagram

Not Available

4.5 Pulse

Mating connector

Description	D-sub 25-pin(Male)

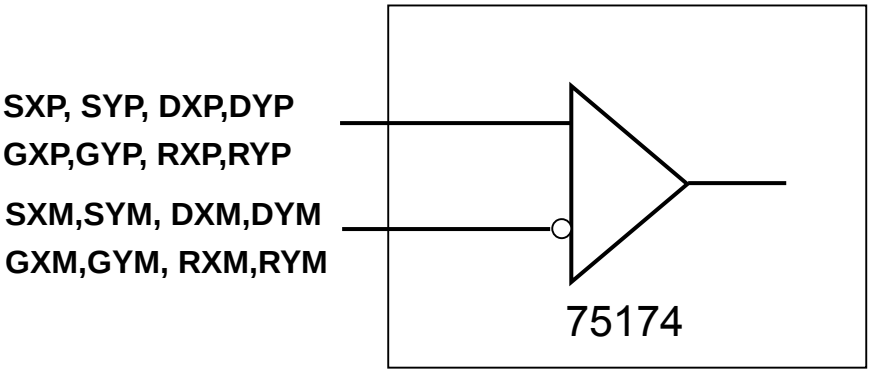
Hiwin Part #	Driver End	Motion Controller End
LMACK20H	D-sub 37-pin(Female)	Flying leads

Pin Assignment

Function	Wire Color	Signal	Pin
			20
			21
			22
			23
Reset Y-	Blue/2 Red dots	RYM	24
Reset X-	Pink/1 Red dot	RXM	25
			26
			27
			28
			29
			30
			31
Ready Y-	Pink/2 Red dots	GYM	32
DIR Y-	Green/1 Red dot	DYM	33
STEP Y-	Gray/2 Red dots	SYM	34
Ready X-	Yellow/1 Red dot	GXM	35
DIR X-	Yellow/2 Red dots	DXM	36
STEP X-	Gray/1 Red dot	SXM	37

Pin	Signal	Wire Color	Function
1	+5V	Blue/1 Black dot	Signal Supply
2			
3			
4			
5	RYP	Blue/2 Black dots	Reset Y+
6	RXP	Pink/1 Black dot	Reset X+
7			
8			
9			
10			
11			
12			
13	GYP	Pink/2 Black dots	Ready Y+
14	DYP	Green/1 Black dot	DIR Y+
15	SYP	Gray/2 Black dots	STEP Y+
16	GXP	Yellow/1 Black dot	Ready X+
17	DXP	Yellow/2 Black dots	DIR X+
18	SXP	Gray/1 Black dot	STEP X+
19	GND	Blue/1 Red dot	Signal GND

Wiring Diagram



4.6 Position Feedback

Mating Connector

Description	D-sub 37-pin(Female)

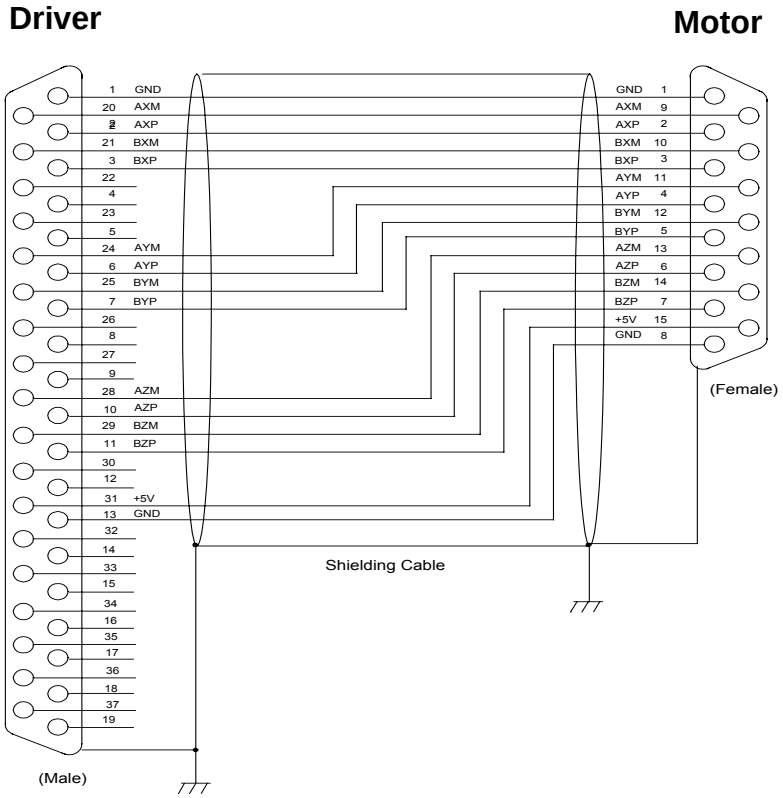
Hiwin Part #	Driver End	Motor End
LMACE20C	D-sub 37-pin(Male)	D-sub 15-pin(Female)

Pin Assignment

Function	Signal	Pin
Phase A- output of X1 Sensor	AXM	20
Phase B- output of X1 Sensor	BXM	21
		22
		23
Phase A- output of X2 Sensor	AYM	24
Phase B- output of X2 Sensor	BYM	25
		26
		27
Phase A- output of Y Sensor	AZM	28
Phase B- output of Y Sensor	BZM	29
		30
Signal Supply	+5V	31
		32
		33
		34
		35
		36
		37

Pin	Signal	Function
1	GND	Signal GND
2	AXP	Phase A+ output of X1 Sensor
3	BXP	Phase B+ output of X1 Sensor
4		
5		
6	AYP	Phase A+ output of X2 Sensor
7	BYP	Phase B+ output of X2 Sensor
8		
9		
10	AZP	Phase A+ output of Y Sensor
11	BZP	Phase B+ output of Y Sensor
12		
13	GND	Signal GND
14		
15		
16		
17		
18		
19		

Wiring Diagram



4.7 DXIO

Mating Connector

Description	D-sub 25-pin (Male)

Pin Assignment

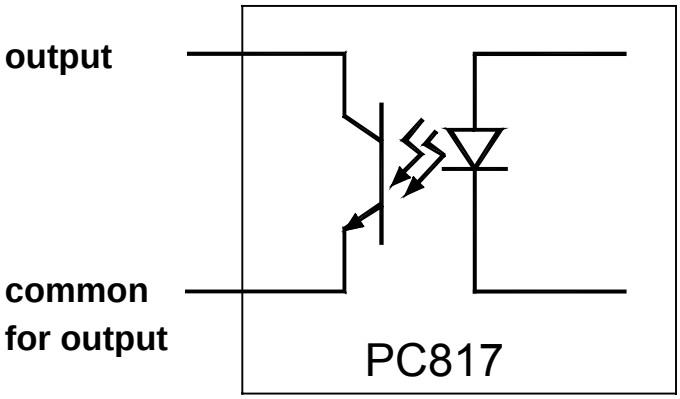
Function	Signal	Pin
HOME(-)	I1-	14
INPUT2(-)	I1-	15
INPUT3(-)	I1-	16
INPUT4(-)	I1-	17
INPUT5(-)	I1-	18
INPUT6(-)	I1-	19
INPUT7(-)	I1-	20
RESET(-)	I1-	21
OUTPUT5	OT5-C	22
In-Position	OT6-C	23
Common for Outputs	COM	24
Signal Gound	GND	25

Pin	Signal	Function
1	+5V	Signal Supply
2	I1+	Home(+)
3	I2+	INPUT2(+)
4	I3+	INPUT3(+)
5	I4+	INPUT4(+)
6	I5+	INPUT5(+)
7	I6+	INPUT6(+)
8	I7+	INPUT7(+)
9	I8+	RESET(+)
10	OT1-C	OUTPUT1
11	OT2-C	OUTPUT2
12	OT3-C	ALM
13	OT4-C	SVON

Pin 1 and Pin 25 should not be shorted. The +5V DC is only for 1A max. current.

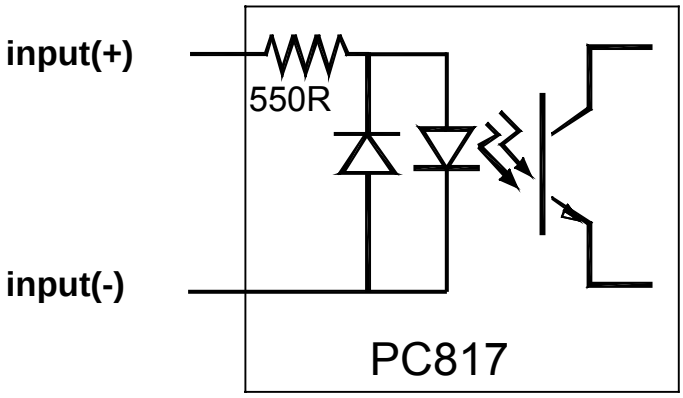
DXIO Interface Diagram

Outputs (30mA, 30V Max.)



output : OT1-C, OT2-C, OT3-C, OT4-C, OT5-C, OT6-C

Inputs (20mA Max.)



Input(+) : I1+, I2+, I3+, I4+, I5+, I6+, I7+, I8+
Input(-) : I1-, I2-, I3-, I4-, I5-, I6-, I7-, I8-

Appendix A : Accessory

AC Mains Cables

Hiwin Part#	Description		Length(m)
LMACP20B	Plug EN 60320C13	Plug NEMA 5-15P, 100~120V	2
LMACP20F		Plug CEE (7)VII, 200~240V	2
LMACP20G		Flying leads, 100~240V	2

Motor Cable

Hiwin Part#	Description		Length(m)
LMACD20D	D-sub 25-pin(Male)	D-sub 25-pin(Female)	2

RS-232 Cable

Hiwin Part#	Description		Length(m)
LMACR20A	D-sub 9-pin(Female)	D-sub 9-pin(Female)	2

Pulse Cable

Hiwin Part#	Description		Length(m)
LMACK20H	D-sub 37-pin(Female)	Flying leads	2

Position Feedback Cable

Hiwin Part#	Description		Length(m)
LMACE20C	D-sub 37-pin(Male)	D-sub 15-pin(Female)	2