

LNII Series Motor and Drives

Operator's Manual
PN 04-01805 B

PRECISION MOTION CONTROLS

2530 Berryessa Rd. #209
San Jose, CA 95132

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LNII Manual

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INTRODUCTION

Description

The LNII Drive is a microstepping drive with a linear amplifier for the output stage. It is intended for stepping motor applications where motor vibration must be minimized and EMI noise can't be tolerated. The LNII drive eliminates EMI generated noise in the steady state condition and minimizes EMI noise while running. The drives dual voltage supply design, allows this unit to have speed vs torque curves superior to most pulsewidth modulated drives; while minimizing the stress on the power amplifier. Extremely smooth movement is provided with a microstepping resolution of up to 51200 steps/revolution; this makes this product suitable in applications with precision equipment where vibration must be minimized.

The LNII Drive can be bought with a wide range of motors, with torque ranging from 60 to 600 in-oz. The drive has two dip switches for easy access to current selection, step size, auto-shutdown, 3rd harmonic correction, and a test mode. Each function is described in detail further on in the manual.

A standard 25 pin D connector with step, direction, and remote disable inputs make this drive easy to interface with existing indexers on the market. The remote disable input removes power from the drive so that the motor can be turned by hand. This may also be used as a safety limit since it overrides any of the other drive signals.

The Two fault indicators indicate various motor conditions. LED1 on means that a over-current, over-temperature, or low-voltage condition has occurred; this is a fatal error and power must be turned off and then back on for the drive to continue operation. LED 2 on indicates that current is not on the motor (ie the shut down signal is active).

A optional RS232 connection on the 25 pin "D" connector makes it possibly to accept simple commands for special application. Consult the factory if you would need this feature.

Features

The LNII is a high performance linear Microstepping drive designed for low noise applications. The systems dual supply allows cool operation at idle and low speed operation yet still enables the drive to obtain high speeds.

* Wave shape correction of 3%, 6% third harmonic distortion

* 115/220 VAC line voltage operation

- * Auto-standby reduces motor current to 1/2 after 2 seconds if no input is received.
- * 2 Mhz step input rate (0.25 usec min width high or low)
- * 8 selectable step sizes
- * Short circuit current protection
- * Low voltage sense

Warranty

PMC's linear drives have a one year warranty against manufacturing defects from the date of purchase. If your unit should ever fail, and you wish to send it back for repairs; you should do the following:

1. Get the serial number from the defective unit.
2. Check purchase date to see if the unit is under warranty. If not, obtain a purchase order number for repair costs.
3. Call Precision Motion Controls for a return authorization (408) 298-0898.
4. Ship to :

Precision Motion Controls
2530 Berryessa Rd. #209
San Jose, CA. 95132

Attention RMA # _____

INSTALLATION

Unpacking

When unpacking your unit verify that the unit was not damaged during shipping. Report any damage found to the shipper. Check the box contents against the packing slip. The box will contain the driver, an AC line cord and manual. If a complete system was bought a motor will also be included.

Connect the motor to the driver box and then plug in the AC line cord. Feel the shaft of the motor and verify that the motor is producing torque. If you are able to move the motor shaft the motor does not have torque; unplug the line cord. Check if any of the motor wires have come out of the connector or if the fuse is blown. Contact the factory for a return authorization if the above checks prove negative. IF the above test works turn off the drive and put the unit into the test mode by placing dip-switch 2 position 7 to the on position. Plug the AC cord in; the motor will rotate at about 0.5 rev/second in the counter clockwise direction.

CAUTION, always disconnect the AC power prior to connecting or disconnecting the motor to the drive.

Mounting

The LN Drive comes with built in mounting brackets to facilitate mounting. The unit may be mounted in any direction. Our built-in fan eliminates the need for the user to be concerned about cooling. It is recommend that 3 inches be allowed above the box for air flow into the system. See appendix B for a detailed drawing of the driver box and motors.

Cooling

The drive has a fan cooled enclosure; the surrounding temperature of the environment should not exceed 40 degrees centigrade. If the driver needs to be in a warmer environment, consult the factory for recommendations. The temperature of the transistor cases should not exceed 80 degrees centigrade.

Wiring

Motor Connections

The drive has three connectors on the box; a standard AC inlet, a 25 pin "D" connector for the indexer, and a 5 pin Phoenix connector for the motor.

IF a motor is purchased with the drive, the motor will have the connector attached to it; otherwise a connector with screw mountings will be supplied. The center pin of the connector is for connection of the motor cable shield. The center pin (shield) is connected to the motor case on PMC supplied motors. The system normally comes configured with the center pin jumped to motor ground and the supply floating. The motor connections are listed below.

Phoenix 5 pin connector

A+	(Red)
A-	(Black)
Shield	(earth gnd)
B+	(White)
B-	(Green)

An internal connector JP4 allows for optional connections of the shield and motor ground. Jumping JP4 connects motor shield to AC ground. Jumping JP5 connects the motor shield to motor ground on the board. Standard factory setting is for jumper JP5 is shorted.

Line Power

The drive has an AC line voltage (115 or 220 VAC) selection switch on the side of the unit. All units are shipped with the selection switch in the 115 line voltage position. The correct line cord is supplied for connection of 115 VAC power. Make sure that the unit is plugged into a wall socket with earth ground.

Indexer Connections

The STEP+, STEP-, DIRECTION+, and DIRECTION- signals are required for operation of the motor. These signals are photo-coupled to eliminate ground loops. The direction signal must not change 50 usec. prior to the step signal changing. A remote shutdown input is provided to remove power from the drive without removing AC power from the box.

If an over-current, under-voltage, or over-temperature condition is detected the photo-transistor across the Error+ and Error- output is turned on. If the ERROR signal is active, the drive's AC power needs to be recycled to reactivate the drive.

The Error condition is satisfied if the drive current exceeds 7 Amps, line voltage drops below 90 VAC, or if the internal temperature exceeds 50 degree C.

25 pin "D" connector

- 1 Step +
- 14 Step -
- 2 Direction +
- 15 Direction -
- 16 Shutdown +
- 17 Shutdown -
- 9 Fault + (collector)
- 21 Fault - (emitter)
- 11 RXD(option)
- 24 TXD(option)
- 12 RS232 ret

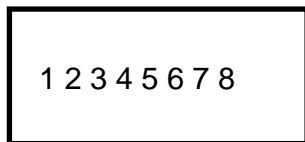
Switch Settings

Disconnect AC power from the unit prior to attempting to change any switch settings. The switch settings control the maximum winding current, step size of the motor\driver, 3rd harmonic correction, and test mode.

The two dip switches are accessible from the bottom of the box. The following diagrams and tables lists the dip switch settings for various motor currents and micro-stepping resolution. Resolutions not listed may be ordered as specials. Dip switch 2 is the one located nearest to the AC inlet

DIP SWITCH 2

ON



OFF

TABLE 1

Switch 2	1	2	3	4	5	6	7	8
PMC - 60 MTR	on	on	off	off	off	off	X	X
PMC - 90 MTR	on	on	off	off	off	off	X	X
PMC - 130 MTR	off	off	off	off	off	off	X	X
PMC - 160 MTR	on	off	off	off	off	off	X	X
PMC - 260 MTR	on	off	off	off	off	off	X	X
PMC - 320 MTR	on	off	off	off	off	off	X	X
PMC - 420 MTR	on	off	off	off	off	off	X	X
PMC - 600 MTR	on	on	on	off	off	off	X	X
Test Mode	X	X	X	X	X	X	on	X

The first 6 switches of dip switch 2 are the current settings and are approximately 40 ma per bit. The off position of the switch selects the current; switch 6 is the most significant bit. The PMC supplied motors run at approximately 2.25 amps/phase.

Test

This is a mode that is entered upon power up if switch 2-7 is in the on position. The motor will rotate in the CCW direction at 0.5 rev/sec . Power must be turned off and switch 2-7 put in the off position to leave this mode.

The step sizes are set with dip-switch 1, positions 1 to 3. The selections are illustrated in the following table.

	Switch 1							
	1	2	3	4	5	6	7	8
Steps/rev								
50000	off	off	off	X	X	X	X	X
25000	on	off	off	X	X	X	X	X
10000	off	on	off	X	X	X	X	X
2000	on	on	off	X	X	X	X	X
51200	off	off	on	X	X	X	X	X
25600	on	off	on	X	X	X	X	X
6400	off	on	on	X	X	X	X	X
400	on	on	on	X	X	X	X	X
waveshape								
0%	X	X	X	on	on	on	X	X
+3%	X	X	X	off	on	on	X	X
-3%	X	X	X	on	off	on	X	X
+6%	X	X	X	off	off	on	X	X
-6%	X	X	X	on	on	off	X	X
autostandby	X	X	X	X	X	X	off	X
RS232	X	X	X	X	X	X	X	on

The user has the ability to select the motor current wave shape. This will help provide even steps and minimize motor vibrations for various motors. If you use motors that have a large detent torque compared to the motor torque you may need to select a wave form other than sine. The wave shape corrections are based on a percentage of third harmonic distortion.

Auto-Standby

In the auto-standby mode the drive reduces the current to 1/2 the rated current after approximately 2 seconds if no input pulses are received. This can be used to minimize motor heating and heat dissipation by the drive. This will have some effect on the motor position and should not be used if a slight change in your stop position cannot be tolerated. The position shift due to current reduction is about 5% of a motor cardinal step (8 usteps for a system with 50000 step resolution). This mode is activated by putting switch 1-7 in the off position.

RS232(option)

Enables RS232 port when SW1-8 is in the on position.

Electrical

Input Power: 90 to 132 VAC 50/60 Hz ,185 to 270 VAC 50/60 .switch selectable.

Fuse : 2 Amp (located on PC board by voltage select switch).

Output Power: 0 to 2.5 Amps at 40 VDC through an H bridge liner driver.

Motor Compatibility

Motor inductance - approximately 4 mh for a PMC supplied motor. The drive has no minimum inductance requirement however a motor inductance greater than 20 mh will degrade the top motor speed and may cause stability problems.

Indexer Inputs

Input signals: Step signals have a maximum of 2 MHz rate and a 250 nsec minimum width.

Direction signal applied at least 50 usec prior to a step pulse.

Shutdown requires 1 msec to respond (the application of this signal will cause the motor to lose sync if the step signal is applied at the same time).

Fault (error+, error-) is a npn transistor photo-coupled output. The transistor is on when an over-current, over-temperature or under-voltage condition is detected.

All input signal are optically isolated and have a 330 ohm current limiting resistor in series. A current of 8 to 15 ma should be applied to the opto-couplers. A driving source of 5 volts will meet this requirement.

The drive also has a RS232 input. These signals are not isolated from the driver unit. This is an option for OEM application to remotely change parameters. The shutdown input and fault output can be programmed for a different function for OEM customers. Consult factory if you have a need for this option.

PMC drives come pre tested and adjusted for the motor that is supplied with the unit. No further adjustments are necessary.

"DO Not" connect or disconnect the motor with power applied to the box.

Resonances

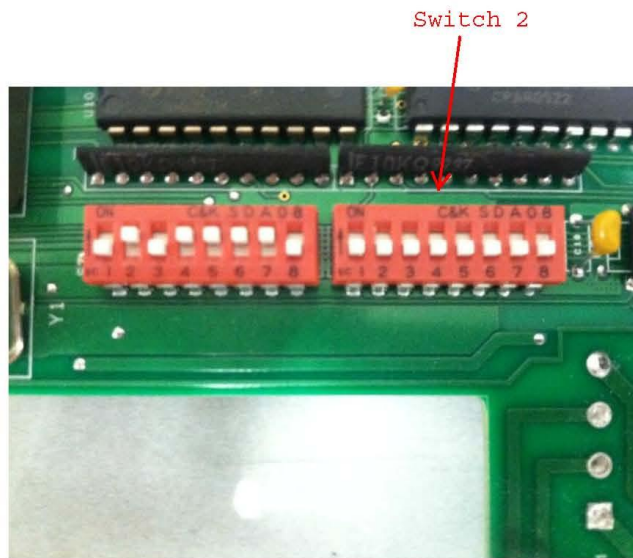
All stepper motor drives are subject to two oscillation regions; low speed (approximately 1 rev/sec) and mid range (approximately 10 to 15 rev/sec).

Microstepping minimizes low speed oscillation. If your load has a high Q and resonates around 200 hz, adding extra inertia to the motor shaft may eliminate the problem. Changing the current wave shape may help tune the motor driver to your motor load combination.

PMC motors and drives have been matched to eliminate most mid-range instability problems.

LN2 DIP switch

Switch 1 is the one on the left hand side. It is used for waveshape selection and some RS232 features. Switch 2 is on the right hand side, used for current selection and test mode.



Drive Specifications

Performance (unloaded motor)

Repeatability: ± 5 arc-seconds (unidirectional)
 Accuracy: ± 5 arc-minutes (bidirectional)
 Step-to-Step Accuracy: ± 20 arc-seconds (unidirectional)

Inputs (optically isolated) 5 to 6.0 VDC, 20 ma.

Step : 250 nanosecond min.
 Direction: 100 usec setup and hold
 Shutdown: 10 msec min.

Output 25 Vdc, 5ma. max

Fault : optically isolated

Optional RS232

Environmental-Operating

Driver: 0 to 60 °C measured at the heat sink
 Motor: 110 °C measured at the motor case
 Ambient: 10 to 40 °C, 0 to 95% humidity,
 non-condensing

Environmental-Storage

Motor + Driver: -40 to +80 °C, 0 to 95% humidity,
 non-condensing

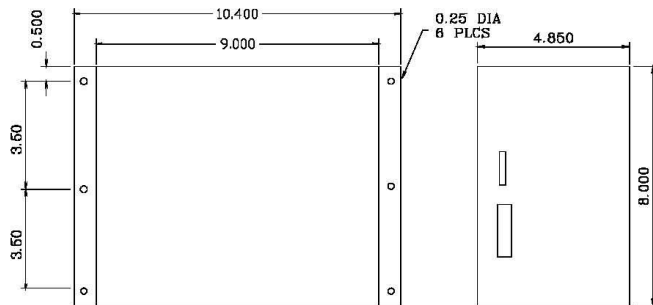
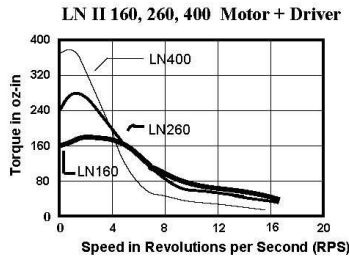
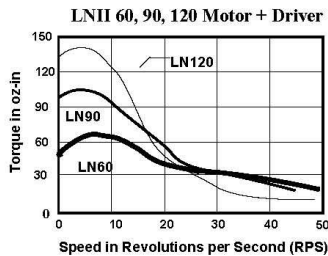
Power 95-130/185-270 VAC 50/60Hz, 1.2A

Weight 14 Lb.

Motor Specifications

Model	LNII-60	LNII-90	LNII-120	LNII-160	LNII-260	LNII-400
Static Torque (oz-in):	60	90	120	150	240	400
Motor size	23	23	23	34	34	34

Double shaft motors are standard add -s suffix for single shaft



Indexer connector:

25 pin D

1. Step+
2. Direction+
9. Fault+
11. Rx D
12. RS232 Ret
14. Step-
15. Direction-
16. Shutdown+
17. Shutdown-
21. Fault-
24. Tx D

Motor connector:

5 pin terminal block

1. A+
2. A-
3. Gnd
4. B+
5. B-

Precision Motion Controls

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