

FCC Interference Statement

This equipment has been tested and found to comply with the limits for a Class A Digital Device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against interference if installed and operated properly in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not properly installed and used in accordance with the instructions in this manual, may cause harmful interference in which case the user will be required to correct the interference at his own expense.

Any changes or modifications to the equipment by the user not expressly approved by grantee or the manufacturer could void the users authority to operate such equipment.

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How To Use This User Guide

This user guide is designed to help you install, develop, and maintain your system. Each chapter begins with a list of specific objectives that should be met after you have read the chapter. This section is intended to help you find and use the information in this user guide.

Assumptions

This user guide assumes that you have the skills or fundamental understanding of the following information.

- Basic electronics concepts (voltage, switches, current, etc.)
- Basic motion control concepts (torque, velocity, distance, force, etc.)

With this basic level of understanding, you will be able to effectively use this user guide to install, develop, and maintain your system.

Contents of This Manual

This user guide contains the following information.

**Chapter 1:
Introduction**

This chapter provides a description of the product and a brief account of its specific features.

**Chapter 2:
Getting Started**

This chapter contains a detailed list of items you should have received with your LN Drive shipment. It will help you to become familiar with the system and ensure that each component functions properly.

**Chapter 3:
Installation**

This chapter provides instructions for you to properly mount the system and make all electrical connections. Upon completion of this chapter, your system should be completely installed and ready to perform basic operations.

**Chapter 4:
Hardware
Reference**

This chapter contains information on system specifications (dimensions and performance). It may be used as a quick-reference tool for proper switch settings and connections.

**Chapter 5:
Troubleshooting**

This chapter contains information on identifying and resolving system problems.

**Installation
Process
Overview**

To ensure trouble-free operation, pay special attention to the environment in which the LN Drive equipment will operate, the layout and mounting, and the wiring and grounding practices used. These recommendations are intended to help you easily and safely integrate LN Drive equipment into your manufacturing facility. Industrial environments often contain conditions that may adversely affect solid state equipment. Electrical noise or atmospheric contamination, may also affect the LN Drive System.

**Developing Your
Application**

Before you attempt to develop and implement your application, there are several issues that you should consider and address.

- ① Recognize and clarify the requirements of your application. Clearly define what you expect the system to do.
- ② Assess your resources and limitations. This will help you find the most efficient and effective means of developing and implementing your application.
- ③ Follow the guidelines and instructions outlined in this user guide. Do not skip any steps or procedures. Proper installation and implementation can only be ensured if all procedures are completed in the proper sequence.

**Installation
Preparation**

Before you attempt to install this product, you should complete the following steps:

- ① Review this entire user guide. Become familiar with the user guide's contents so that you can quickly find the information you need.
- ② Develop a basic understanding of all system components, their functions, and interrelationships.
- ③ Complete the basic system configuration and wiring instructions (in a simulated environment, not a permanent installation) provided in *Chapter 2, Getting Started*.
- ④ Perform as many basic functions as you can with the preliminary configuration. You can only perform this task if you have reviewed the entire user guide. You should try to simulate the task(s) that you expect to perform when you permanently install your application (however, do not attach a load at this time). This will give you a realistic preview of what to expect from the complete configuration.
- ⑤ After you have tested all of the system's functions and used or become familiar with all of the system's features, carefully read *Chapter 3, Installation*.
- ⑥ After you have read Chapter 3 and clearly understand what must be done to properly install the system, you should begin the installation process. Do not deviate from the sequence or installation methods provided.
- ⑦ Before you begin to customize your system, check all of the system functions and features to ensure that you have completed the installation process correctly.

The successful completion of these steps will prevent subsequent performance problems and allow you to isolate and resolve any potential system difficulties before they affect your system's operation.

Conventions

To help you understand and use this user guide effectively, the conventions used throughout this user guide are explained in this section.

**Warnings &
Cautions**

Warning and caution notes alert you to possible dangers that may occur if you do not follow instructions correctly. Situations that may cause bodily injury are presented as warnings. Situations that may cause system damage are presented as cautions. These notes will appear in bold face and the word warning or caution will be centered and in all capital letters. Refer to the examples shown below.

WARNING

Do not touch the motor immediately after it has been in use for an extended period of time. The motor may be hot.

CAUTION

System damage will occur if you power up the system improperly.

**Related
Publications**

Current Parker Compumotor Motion Control Catalog

Chapter 1. Introduction

Chapter Objective The information in this chapter will enable you to:

- Understand the product's basic functions and features

Product Description

The LN Drive is a linear, microstepping amplifier. The FCC Class A approved LN Drive, was designed specifically for applications where EMI (Electromagnetic Interference) must be kept to an absolute minimum.

The LN Drive is capable of driving two phase permanent magnet hybrid rotary and linear motors. The LN Drive has sixteen motor resolutions that extend from 200 to 101,600 steps per revolution, as well as eight different waveforms. These features give the user excellent capabilities to control motor smoothness and accuracy.

The LN Drive has additional user features which allow the user to select between 115/230VAC, eliminating the need for a transformer. The Autostandby feature allows the drive to automatically switch to 50% of the preset current, allowing the motor and drive to cool when not in use. the unique Autotest feature allows the user to quickly determine that all connections and settings have been properly made.

Features

The LN Drive requires no external power supply, it uses 115/230VAC for its power inputs. Compumotor motors are two-phase hybrid motors (permanent magnet type). Four, six, or eight lead motors may be used, with the internal phases connected for either parallel or series operation, provided the motor's inductance does not drop below 5 mH. *For best performance, motor inductance should be above 5 mH, but motor with inductance ratings as low as 0.5 mH may be used.* The LN Drive also provides the following features:

- Microprocessor controlled microstepping provides smooth operation over a wide range of speeds
- FCC approved linear amplifier, produces virtually no conducted or radiated EMI
- Full short circuit protection for phase-to-phase and phase-to-ground short circuits
- Overtemperature and undervoltage protection
- Uses low-inductance motors for improved high-speed performance (17, 23, 34 frame size motors available with torques from **15-150** oz-in)
- LED status indicator: power, undervoltage, overtemperature (latched), motor fault (latched)
- Motor connector interlock to prevent connector damage
- Optically coupled step, direction, and shutdown are compatible with all Compumotor indexers (25-pin D connector)
- A fault output signals other equipment if a fault occurs
- 90-135VAC/185-275VAC, 50/60Hz power input, switch selectable
- 16 DIP switch selectable motor resolutions are available (200 - 101,600 steps/rev)
- Operates linear motor forcers
- 2 mHz step input

Chapter 2. Getting Started

Chapter Objectives

The information in this chapter will enable you to:

- Verify that each component of your system has been delivered safely
- Become familiar with the system components and their interrelationships
- Ensure that each component functions properly by bench testing

What You Should Have

Inspect the LN Drive upon receipt for obvious damage to its shipping container. Report any such damage to the shipping company. Parker Compumotor cannot be held responsible for damage incurred in shipment. The following items should be present and in good condition.

Part	Part Number
Power Cable	44-000054-01
LN Drive	LN-Drive
LN Drive User Guide	88-011931-01
Motor	Variety of sizes available*

*Refer to Table 2-2 for specific motor sizes

Table 2-1. Ship Kit List

Quick Test

This section will show you how to set the DIP switches and wire the unit quickly to ensure that your system is operating properly. Detailed installation instructions are provided in *Chapter 3, Installation*. You will need the following tools to complete these steps:

- A phillips head screw driver (to make the connections)
- A flat screw driver (to adjust the DIP switches)

WARNING

Do not apply power to the system until this entire chapter has been read.

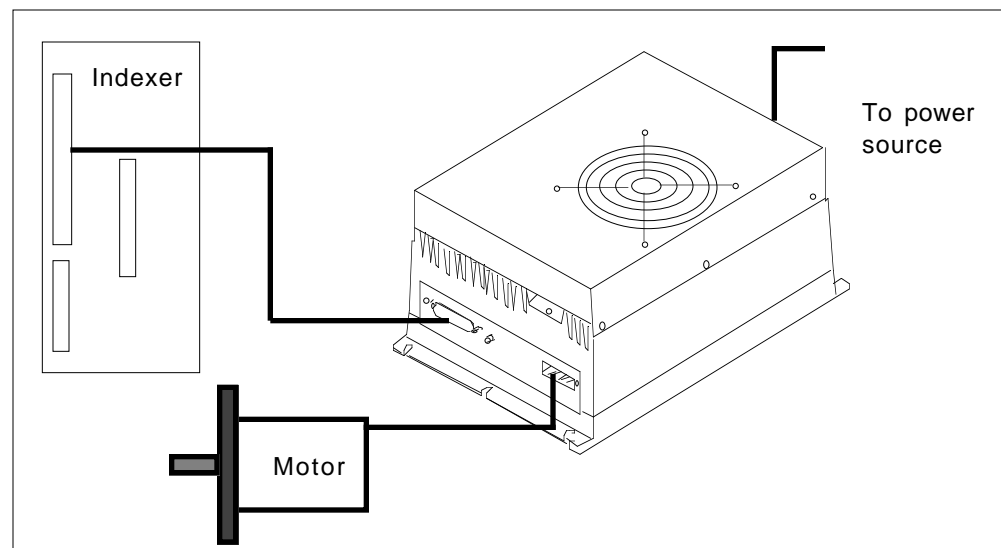


Figure 2-1. System Diagram

① Set DIP Switches

CAUTION

Never adjust the DIP switches with a pencil. Lead from the pencil may damage the drive.

The first thing that you must do is set the motor current on the LN Drive to match the motor that you are using. Use the directions below to set the DIP switches for your motor. (*To prevent damage to motors due to improper motor current settings, all LN Drives are shipped at the minimum motor current setting*).

The LN Drive has two sets of DIP switches. The first set of switches will be referred to as SW1 and the second set as SW2. The individual switch will be preceded by the # symbol. Hence, the third switch on SW1 will be referred to as SW1-#3, while the third switch on SW2 will be referred to as SW2-#3. Figure 2-2 shows the location of the LN Drive's DIP switches.

The LN Drive recognizes changes to its switch settings during power-up only.

CAUTION

The ergonomics of the DIP switches is physically reversed (upside down). The drive's installation label and all the tables in this user guide have been reversed, (8-1 instead of 1-8) to prevent installation errors.

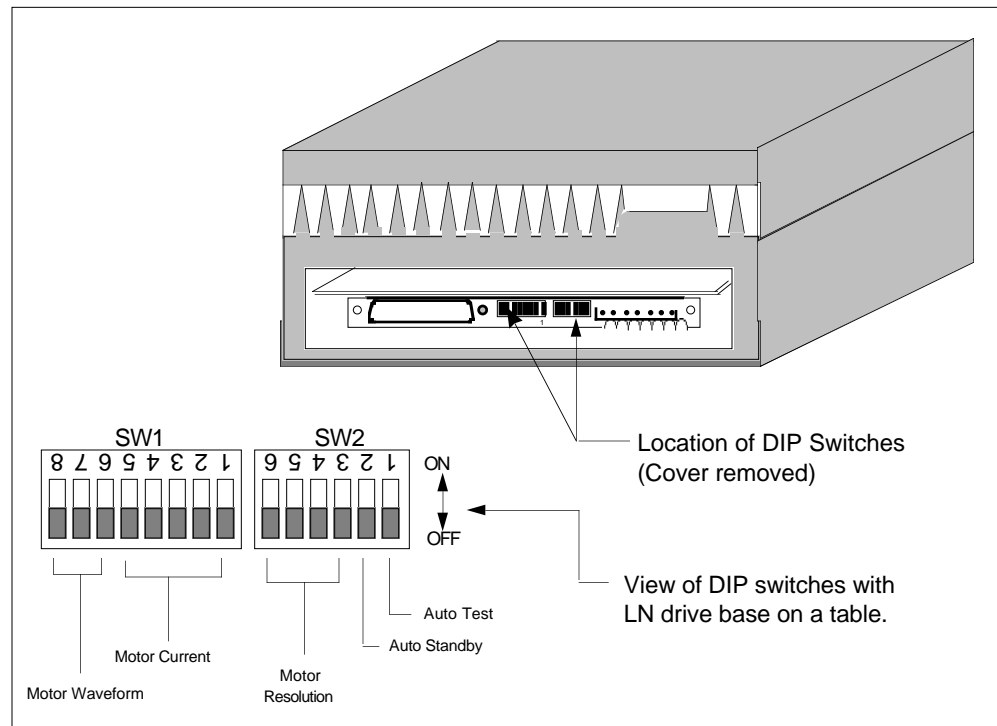


Figure 2-2. DIP Switch Locations

WARNING

Be sure that power is not applied to the unit.

- ① Remove the panel that covers the DIP switches (refer to Figure 2-2).
- ② Set the motor current for your Compumotor motor using Table 2-2. SW1-#5 thru SW1-#1 **motor current** (refer to Figure 2-2 for the location of the SW1). Make the required adjustments to match the drive and motor types that you are using.

Table 2-2 shows motor current settings for series and parallel motor configurations. **Compumotor ships all LN Drive systems in series configurations.**

Motor Size	Drive Current	SW1-#5	SW1-#4	SW1-#3	SW1-#2	SW1-#1
LN43-34S	0.62	off	off	off	on	off
LN57-51S	1.17	off	off	off	off	on
LN57-83S	1.58	off	on	on	off	on
LN57-102S	1.78	on	off	off	on	on
LN83-62S	2.20	on	on	on	on	on

S: Series Configuration

Table 2-2. Setting Motor Current (Compumotor Motors)

If you are using a non-Compumotor motor, special precautions and instructions are required. Read the instructions in Chapter 3, Installation for non-Compumotor motors thoroughly before attempting to set the motor current or wire your motor.

- ③ To test the system, you will use the Automatic Test function. DIP switch SW2-#1 controls this function (refer to Figure 2-2 for the location of the SW2). Turn SW2-#1 on to enable the function. The Automatic Test function rotates the motor in an alternating move of slightly less than 6 revolutions at 1 rps.
- ④ After you have properly set motor current (SW1-#5 thru SW1-#1) and the Automatic Test function (SW2-#1), screw the plate that covers the DIP switches back onto the drive. **Do not change any other DIP switch settings.**
- ⑤ Replace the cover.

② Attaching the Motor

WARNING

POWER MUST BE OFF before cabling the drive. Lethal voltages are present inside the drive and on its screw terminals.

The LN Drive motor is pre-wired in series. Plug the pre-wired motor cable into the motor connector on the drive (refer to Figure 2-4). If you use a non-Compumotor motor, refer to *Chapter 3, Installation* for instructions on wiring the motor to the drive. **Do not connect the motor to the load at this time.**

③ Setting Voltage Select Switch

The LN Drive is capable of using either 115VAC or 230VAC. You must select the voltage prior to applying power to the drive. The default is 115VAC.

- ① Remove the clip and panel that cover the voltage select switch (Figure 2-3).
- ② Determine what supply voltage will be applied to the unit, 115 or 230VAC.
- ③ Set the voltage select switch to the position required.
- ④ Replace the switch cover and clip.

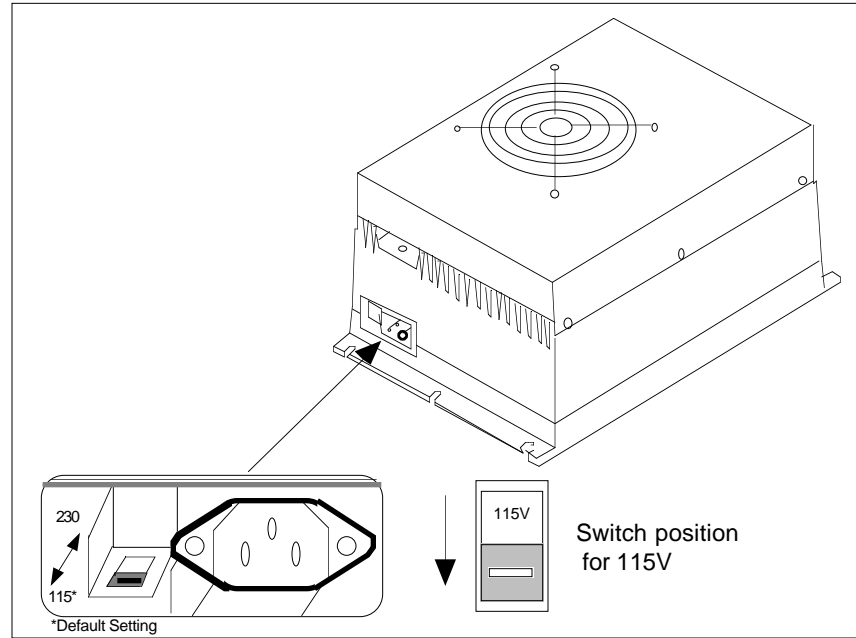


Figure 2-3. Voltage Select Switch Location

④ Applying Power

The power cable is provided. Complete the following steps to apply power.

- ① Plug the cable into the power connector on the drive (refer to Figure 2-4).
- ② Plug the other end of the cable into your voltage source. Observe that the fan is operating and the status LED is green. The motor should rotate CW and then CCW approximately 6 revolutions at 1 revolution per second (rps).
- ③ **To stop the motor, you must unplug the power cable from the power source.**

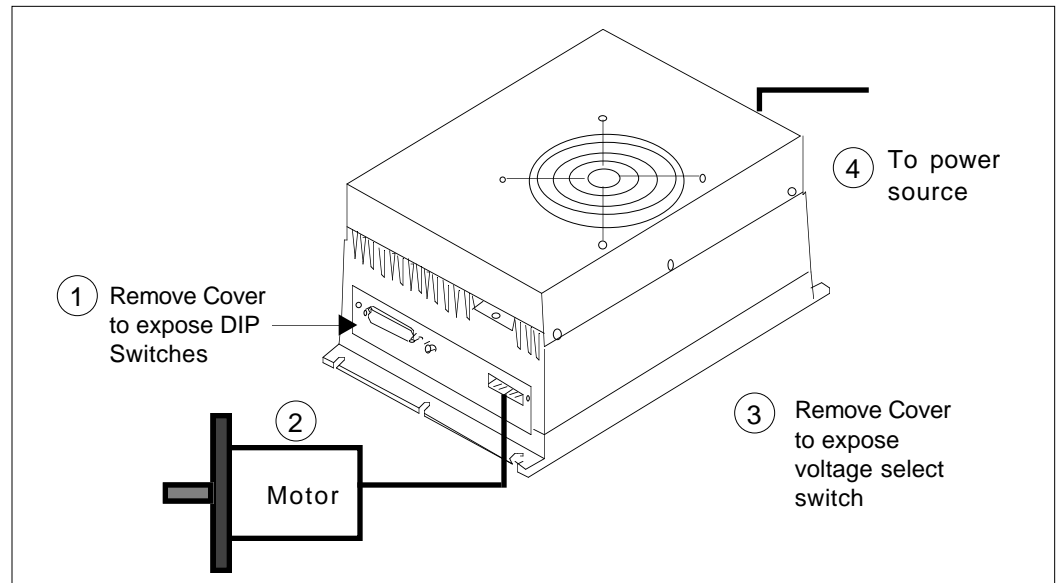


Figure 2-4. Test Configuration

The successful completion of this test indicates that the amplifier, motor, and microprocessor are operating properly. You can now test the indexer interface (Step, Direction, and Shutdown inputs). Be sure that power is not applied to the system when you begin. To perform this test, complete the following steps.

**⑤ Quick Test
with Indexer**

With no power applied to the drive, perform the following steps to test the indexer interface. *This test assumes that your indexer's motor resolution is set to 50,000 steps/rev. This is the default motor resolution setting for the LN Drive.*

- ① Remove the panel that covers the DIP switches. Turn DIP switch **SW2-#1 off** to disable the Automatic Test function. Ensure that switches **SW2-#3** through **SW2-#6** are off. **Do not change any other DIP switch settings.** Screw the panel back onto the drive.
- ② Connect your Compumotor indexer to the drive's 25-pin D indexer connector (refer to Figure 2-1). The appropriate cable is provided with the indexer.
- ③ Ensure that the pre-wired motor cable is connected (refer to Figure 2-1). Apply power to the drive and indexer.
- ④ Using the indexer, send step pulses to the drive that will rotate the motor one CW revolution (50,000 step pulses) at an acceleration of 1 rps^2 and a velocity of 1 rps (50,000 steps per second).
- ⑤ Using the indexer, send step pulses to the drive that will rotate the motor one CCW revolution at an acceleration of 1 rps^2 and a velocity of 1 rps (50,000 steps per second).
- ⑥ **Now you will test the Shutdown input. With no step pulses applied to the drive, activate the Shutdown input. Refer to your indexer's operations manual for instructions on activating the Shutdown input.**

By activating the Shutdown input, all current will be removed from the motor, and the status indicator should be red. You should be able to turn the motor shaft manually. Try to turn the shaft slowly. If you can turn it easily, the Shutdown input is working properly. If the shaft still has torque, check your wiring and try the test again.

