MAC 6000 Stand Alone Shutter Controller Manual

Ludl Electronic Products, Ltd.
p/n: 90M043

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Preface

Summary

This user guide introduces you to the LEP MAC6000 Shutter Controller. It will orient you to the many features and how to configure your system.

Copyright

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Safety Information

This manual contains sections on setting up the controller and installing mechanical systems. Where applicable throughout this manual, cautions and warnings are used to draw your attention to safety precautions that should be taken.

Customer Service

If service should be required, contact your equipment dealer or Ludl Electronic Products, 171 Brady Avenue, Hawthorne, NY 10532-2201 (888) 769-6111. By email or through our website: www.ludl.com, sales@ludl.com or support@ludl.com

Responsibilities

Users and service personnel should be aware of possible hazards associated with any mechanical system. Safety awareness and training should be provided.

Product Compliance

Listings and Conformance Data

The MAC 6000 system is ETL listed #3153061NYM and tested to the following standards:

<u>EU Low Voltage Directive – Safety</u>
CENELEC EN 61010-1
Issued:2001/03/01 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1: General Requirements -Construction Review, Testing and Report Issuance
* ETL listing - if performed concurrently with EN 61010-1
* cETL - Canada - if performed concurrently with UL 61010-1

<u>CE EMC Directive:</u>
BSI BS EN 61326-1 (RF Emissions and Immunity),
BSI BS EN 61000-4-2 *Issue:1995/09/15 Electromagnetic Compatibility (EMC) Part 4: Testing and Measurement Techniques Section 4.2: Electrostatic Discharge Immunity Test - Basic EMC Publication IEC 1000-4-2: 1995 -*
CENELEC EN61000-4-3
Issued:2002/04/01 Electromagnetic Compatibility (EMC) Part 4-3:Testing and Measurement Techniques - Radiated, Radio-Frequency, Electromagnetic Field Immunity Test IEC 61000-4-3: 2002 -
CENELEC EN61000-4-4
Issue:1995/01/01 Electromagnetic Compatibility (EMC) Part 4: Testing and Measurement Techniques Section 4: Elec. Fast Transient/Burs Immunity Test Basic EMC Publication (IEC 1000-4-4 : 1995) -
CENELEC EN61000-4-5
Issue:1995/01/01 Electromagnetic Compatibility (EMC) Part 4: Testing and Measurement Techniques Section 5: Surge Immunity Test (IEC1000-4-5 : 1995) -
CENELEC EN61000-4-6
Issue:1996/07/01 Electromagnetic Compatibility (EMC) Part 4: Testing and Measurement Techniques Section 6: Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields IEC 1000-4-6: 1996 –
CENELEC EN61000-4-8
Issue:1993/01/01 Electromagnetic Compatibility (EMC) Part 4: Testing and Measurement Techniques Section 8: Power Frequency Magnetic Field Immunity Test - Basic EMC Publication (IEC 1000-4-8 :1993) –
CENELEC EN61000-4-11
Issue:1994/01/01 Electromagnetic Compatibility (EMC) Part 4: Testing and Measurement Techniques Section 11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests (IEC1000-4-11:1994) -
CENELEC EN61000-3-3
Issue:1995/01/01 A1(2001) (EMC) Part 3: Limits Section 3: Limitation of Voltage Fluctuations and Flicker in Low-Voltage Supply Systems for Equipment with Rated Current Less Than or Equal to 16 A -
* Flicker - applicable only if rated below 16amps per phase

The system is also CE compliant and has been tested extensively for compliance with international standards for mechanical and electrical safety as well as emission and susceptibility to EMI (electro-magnetic interference). To maintain compliance with these standards use only LEP supplied components.

MAC 6000 Shutter Controller System

The purpose of this manual is to describe the system and outline the configuration options. It should be used in conjunction with the LEP Interface BASIC Interpreter manual and the LEP MAC6000 Command Manual

Introduction
The MAC 6000 shutter controller system is the 2nd generation stand alone shutter controller from LEP.   Intended for microscope and laser automation systems, the system has flexible communication ports and supports LEP's shutters as well Uniblitz shutters.   System configuration is simplified and is more flexible than the previous 1st generation of the LEP shutter controller. By eliminating the external switches for LEP/ Uniblitz shutters and 25mm/35mm shutters, all shutters are now driven with the same electronic hardware characteristics.

The shutter controller allows independent control over four different shutters. The shutters can be controlled in three manners front panel switches, software control, and SYNC connector option.

Located on the front of the controller are four toggle switches used to open/close each shutter. Each shutter port has a corresponding LED indicator light denoting when the shutter is open (light on) or closed (light off).

Utilizing LEP's unique shutter design a life expectancy of 50 million cycles is expected. The shutter open/close characteristics can also be programmed, but are factory set for optimal performance at 18ms for an open and close.

Architecture
Each MAC 6000 Shutter Controller incorporates the main power supply base module a RS-232/USB Interface and Shutter Controller Module.

Explanation of Symbols used in this Manual:

WARNING: - Refers to a hazardous condition explained later in this manual.

PINCH POINT: - Refers to locations where user should use caution to avoid personal injury

Input Power Requirement and Ratings

The MAC 6000 controller automatically switches to accommodate any of the international supply voltages. Simply connect the proper line cord to the rear-panel receptacle and switch it on. Allowable range is 90-260 Volts AC, 50-60 Hz. Internal fusing is 3.15 Amp, time delay. Rated input power is 120 Watts maximum.

Fuses

⚠️**WARNING: Main voltage is present inside this controller.**

The MAC 6000 has a single fuse integrated into the switching power supply within the base module. This is not a user serviceable component. In the unlikely event of a switching power supply failure, the base module would need to be serviced by LEP.

Fuses used in shutter module
Warning – All replaceable fuses must be replaced with same type as given in following table. Individual modules are safety fused as follows:

PN:	Module Name	Fuse qty	Fuse type	Location	Fuse Mfr.	Function
996068	Shutter Controller Module	4	452 001.MRL	F1, F3, F4, F5	Littlefuse Nano series 1Amp	Shutter drive protection

Mounting considerations:
This system is intended for indoor/laboratory use in a dry environment.
The controller, as provided, is for tabletop use. It must be placed such that there is at least 2" of clearance on sides and rear for unrestricted cooling airflow. If mounted within a cabinet, ambient air available for cooling controller should be below 25°C.

⚠️ If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Line Cord

The line cord connection is a standard IEC receptacle. The MAC 6000 switches automatically to accommodate any standard international line voltage and frequency.

Host Computer Interface

Every MAC 6000 shutter controller system is supplied with a standard RS232 and USB cable, which interconnects from the rear panel of the controller to an available host computer.

The RS-232 / USB interface provides a means for the host computer to communicate with the MAC 6000 system.. The interface supports several modes of communication: ASCII and binary modes (backward compatible for with MAC 5000 and earlier systems) plus new CAN format (both in ASCII and Binary formats). The ASCII mode processes recognizable commands such as OPEN S and CLOSE S. The binary mode provides a lower level of communication providing higher throughput and universal adaptability. The CAN commands are the native command formats used in MAC6000 and should be used when writing new applications. All other formats are interpreted to CAN commands internally.

RS232

The standard RS-232 port supports baud rates up to 57.6k., which can be changed via software commands.

RS232 Commands:
```
BAUD [port] [baud rate] - Reads or Sets the baud rate
PARITY [Port] [Parity] - Reads or Sets the parity (N=None, O=Odd, E=Even)
```

Baud Rate	2400
	4800
	9600 (default)
	19200
	28800
	38400
	57600
Parity	Odd
	Even
	None (default)

The RS232 cable (p/n: 73A00031) is can be connected from the 9-pin female connector, labeled RS232, to the host serial port. No hardware handshaking is provided.

66-DE-09P
MALE

LEP CONTROLLER SIDE

66-DE-09S
FEMALE

COMPUTER SIDE
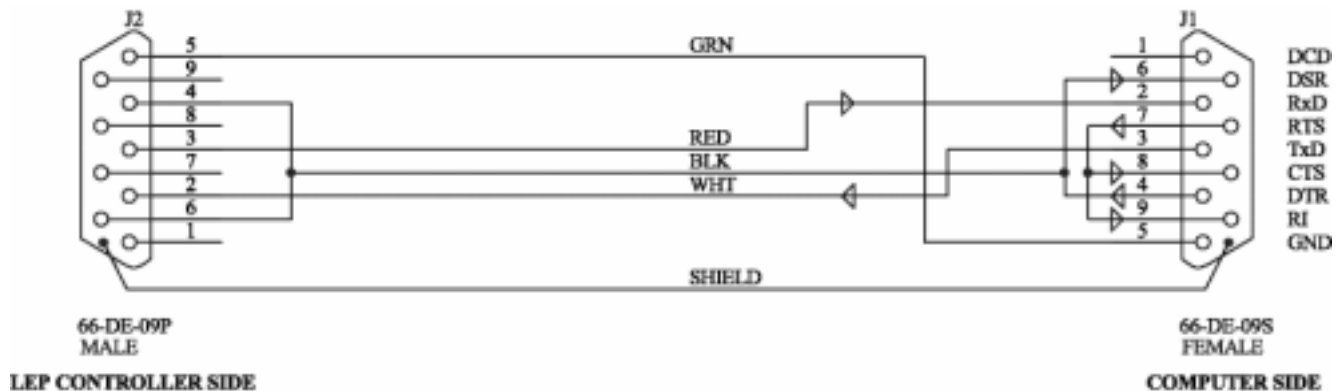
USB
The USB interface complies with the USB standard 2.0.

A USB 2.0 Type A/B cable (p/n: 73A00056) can be connected from the USB port, labeled USB, on the rear of the controller to the host computer USB port. Provided on the MAC6000 Application CD (p/n: 99P015) are the necessary USB drivers.
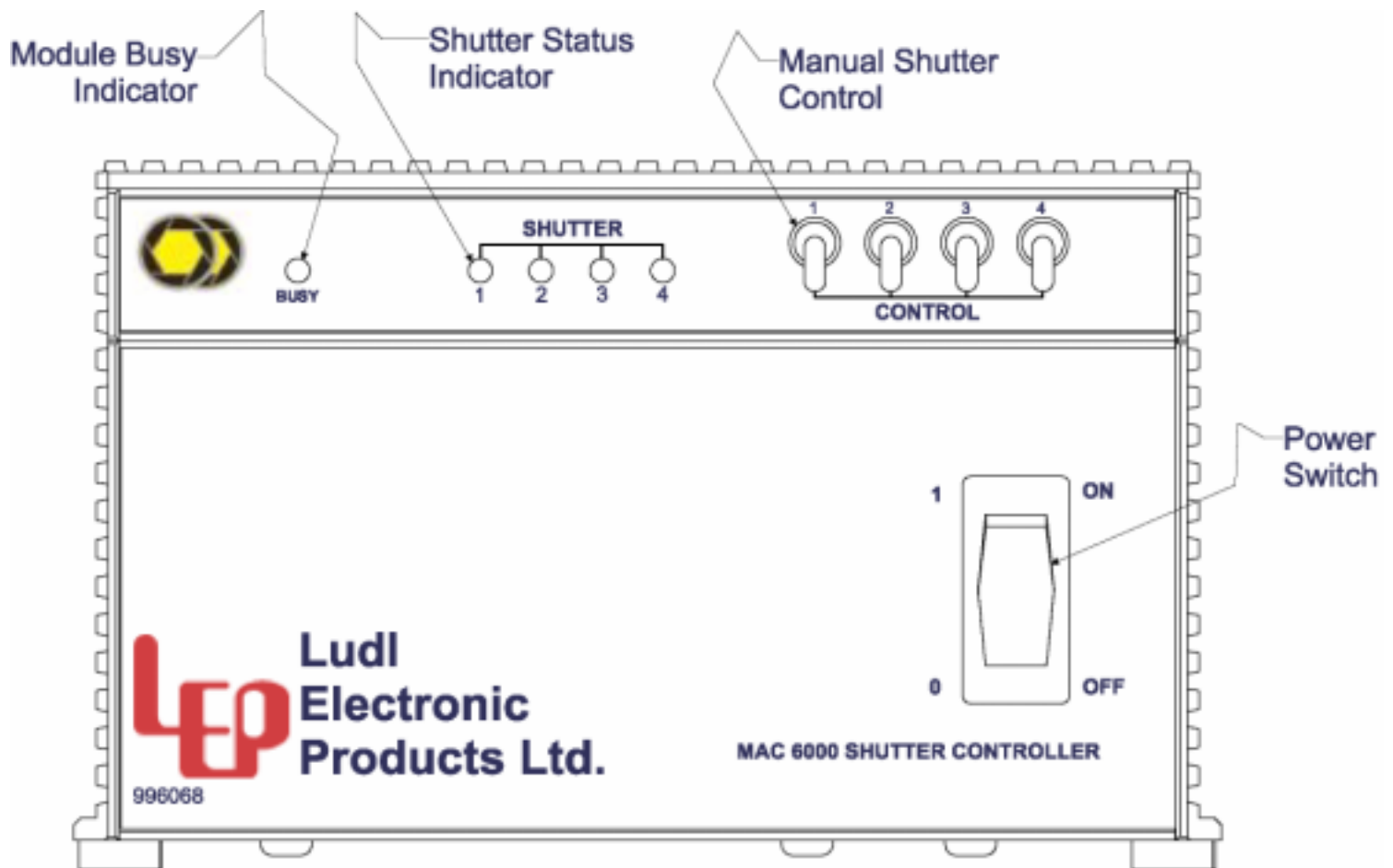
Shutter Address
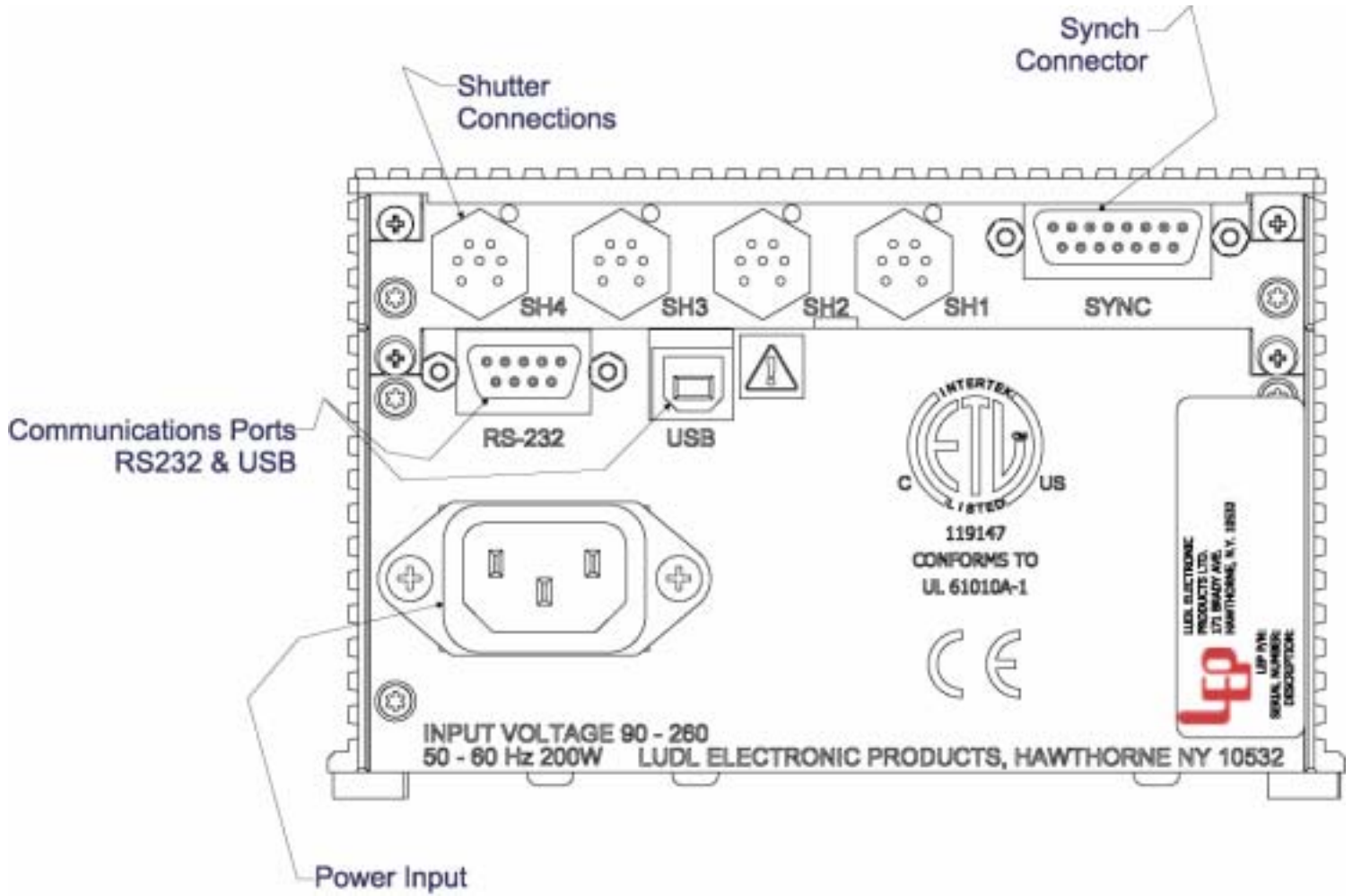The MAC 6000 stand alone controller has two unique addresses (17 & 18)

High Level Module IDs:

Address	Module Type	High Level ID	Description
17	FWSHC	S(1)	Shutter 1 & 2
18	FWSHC	S2	Shutter 3 & 4

Front Panel Controls

Rear Panel Connections

Shutter Connections

Synch Connector

SH4   SH3   SH2   SH1   SYNC

Communications Ports
RS232 & USB

RS-232   USB

INTERTEK
ETL
C   US
LISTED
119147
CONFORMS TO
UL 61010A-1

CE

LUDL ELECTRONIC
PRODUCTS LTD.
171 BRADY AVE.
HAWTHORNE, N.Y. 10532

LEP P/N
SERIAL NUMBER
DESCRIPTION

INPUT VOLTAGE 90 – 260
50 – 60 Hz 200W   LUDL ELECTRONIC PRODUCTS, HAWTHORNE NY 10532

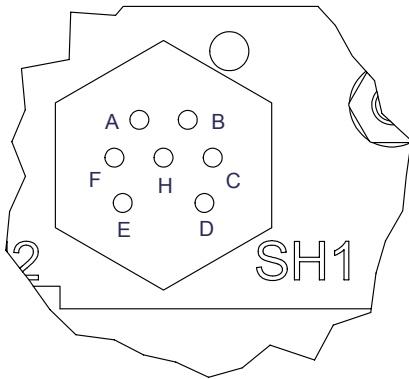Power Input

Rear Panel Pin Out

Independent synchronization for hardware triggering can be utilized by using the DB15 SYNC connector located on the back panel of the controller. The diagram below shows the pin out of the sync connector.

SHUTTER CONNECTOR PINOUT	
PIN	FUNCTION
A	DIGITAL GND
B	SH1 OUT
C	
D	
E	POWER GND
F	RESERVED
H	

* All four shutter ports are wired the same.
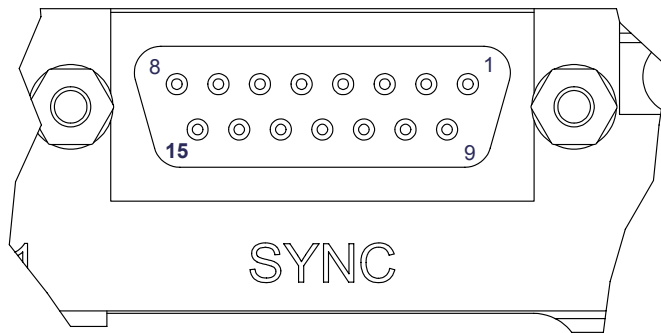
DB15 SYNC PINOUT	
PIN	FUNCTION
1	SYNC OUT 1
2	SYNC OUT 2
3	DIGITAL GND
4	SYNC OUT 3
5	SYNC OUT 4
6	SH1 IN
7	+5V EXT
8	SH1 IN/
9	SH2 IN
10	SH2 IN/
11	SH3 IN
12	SH3 IN/
13	SH4 IN
14	SH4 IN/
15	CLOSE ALL

System Setup

Cable connections are made to the rear of the controller unit. Attach cables from the shutters to the controller, as marked.

Mount shutters to the system as required.

 Users and/or service personnel must be properly trained in safe installation of electronic devices.

 PINCH POINT: - Please note any locations where user should use caution to avoid. Most commonly, inside the shutter aperture from the shutter blade.

Attach shutter cables as marked.

Attach one or more communication interface cables as required [RS-232, USB]
Default RS-232 communication is 9600, N, 8, 2

Attach power cord to mains power and turn on power switch on front panel.

When system is idle, the BUSY LED will blink every few seconds.

Basic operation can be verified by toggling the Manual Shutter Control switches. The shutters will open/close. The corresponding GREEN LED will show that the shutter is activated (open).

The LEP IDE software tool (or any suitable terminal emulator) can be used to verify communications. Once started, it will try to open the default serial port. If no communication is detected, communication setup from the pull-down menu should be run. Once communication is established, type VER*<enter> and a list of installed modules with their firmware version is listed to screen.
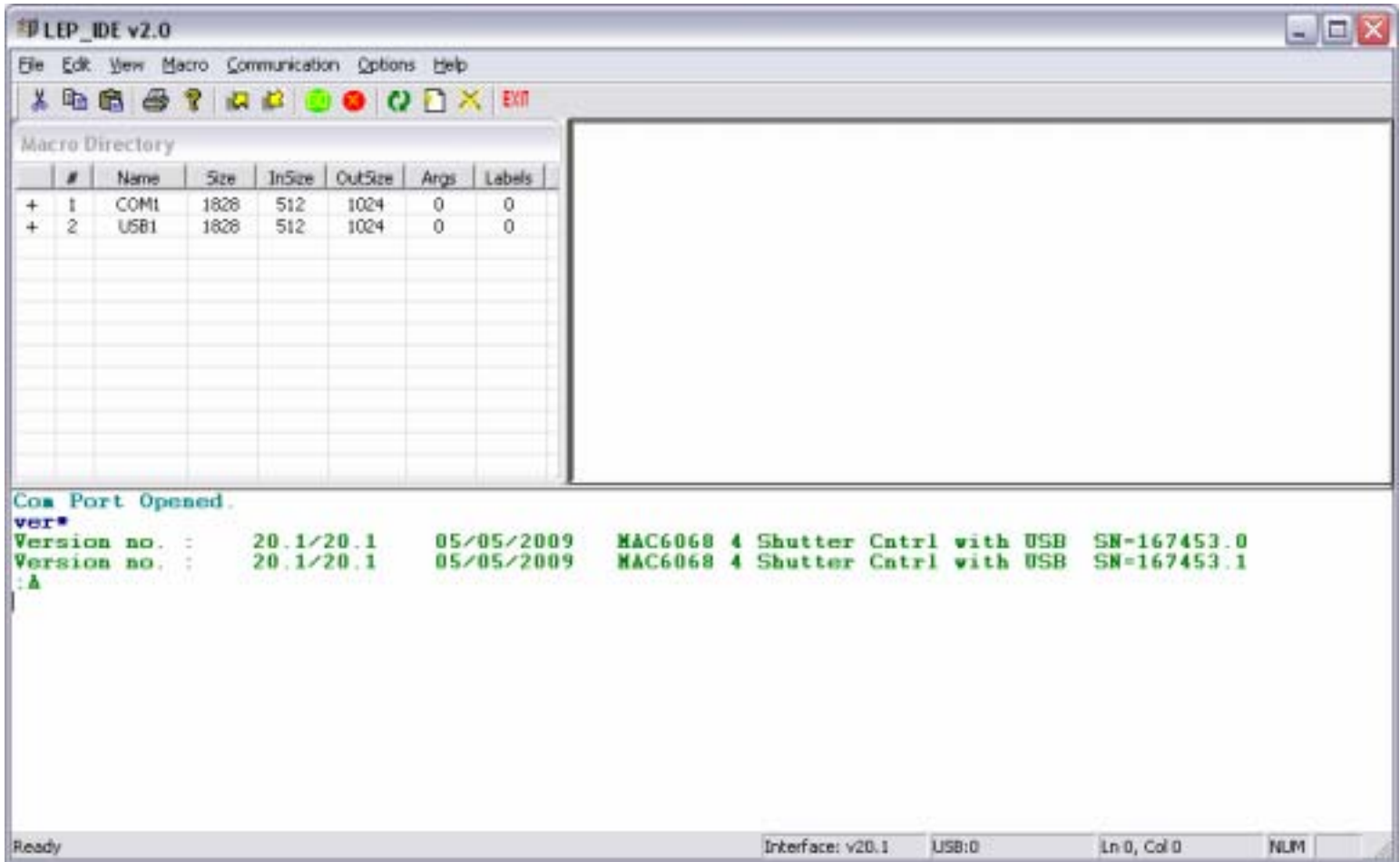
Warranty Information

Warranty Time Period and Limitations
Ludl Electronic Products Ltd., hereafter referred to as **LEP,** warrants its products to be free from malfunctions and defects in both materials and workmanship for a period of one year from the date of original purchase.

Units returned to **LEP** that have been subject to abuse, misuse, damage or accident; have been connected, installed or adjusted contrary to the instructions furnished by **LEP** or repaired by unauthorized persons will not be covered by this warranty.

This warranty becomes null and void if you fail to pack equipment in a manner consistent with the original product packaging and damage occurs during product shipment.

LEP reserves the right to discontinue models; change specifications, price or design of this device at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser, his employees or agents.

LEP shall not be liable in any way for consequential damages resulting from use of this device.

This warranty is in lieu of all other representations or warranties expressed or implied and no agent or representative of **LEP** is authorized to assume any other obligation in connection with the sale and purchase of this device.

All instruments are delivered with serial tags located on the rear panel or bottom of the unit. These serial numbers are used to track the manufacturing date and the revision level. If this serial number is removed for any reason, the warranty is void.

Warranty Repair Coverage
LEP under this warranty is limited to repairing or replacing the defective device when returned to the factory, shipping charges prepaid, within one (1) year from date of original purchase. Such repair service will include all labor as well as any necessary adjustments and/or replacement parts. If replacement parts are used in making repairs, these parts may be remanufactured, and/or may contain remanufactured materials. If it is necessary to replace the entire system, it may be replaced with a remanufactured system.

Application Support
For application specific support, please contact your reseller, systems integrator, software manufacturer, or dealer directly. If additional technical support is required, your service provider should contact **LEP** with a detailed description of the problem, system configuration, and any available troubleshooting information.

How to Obtain Service

You may visit our web site at http://www.ludl.com; simply choose the appropriate contact group and we will promptly respond to your inquiry.

When returning any **LEP** equipment for repair you must first obtain an RMA (Return Merchandise Authorization) number from one of our Customer Service Representatives. The unit should be packed in its original packing materials and a detailed problem report should be enclosed. The accompanying paperwork should reference the RMA# and all items which were shipped to **LEP**.

Disclaimer

LEP Ltd. assumes no responsibility for damage of equipment or loss of information as a result of misuse of the contents in this manual. All information contained within is accurate at the time of printing.

NOTES

Ludl Electronic Products designs and manufactures a wide range of automation accessories for microscopes and instrumentation.

www.ludl.com

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