

# ***gBOX***

***Ethernet to GPI Interface***






***Users Manual***



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*gBOX User's Manual, Second Edition  
Part Number 932126*

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# Introduction

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The gBOX is a general purpose interface box that converts up to 48 GPI (General Purpose Interface) inputs and outputs to 100/10baseT Ethernet or a serial interface. Up to 8 gBOXes may be slaved off a master gBOX to convert up to a total of 432 GPI inputs and outputs.

The gBOX communicates over standard TCP/IP which allows it be used with any host computer running any operating system that uses TCP/IP protocol. The gBOX can also be connected to other gBOXes to allow longer runs than traditional GPI cables. Since the gBOX uses TCP/IP, traffic can be routed over internal LANs, wireless LANs, MANs, WANs and even over the public Internet.

Unit configuration is accomplished using the rear panel DIP switches.

When the gBOX is outfitted with an Ethernet Interface (JLCooper p/n 920394) the unit functions as either a server or client. When configured as a server, it passively waits for client devices to connect to it. The device can be a computer or another gBOX configured as a client. When the gBOX is configured as a client, it will actively attempt to connect to the server gBOX. Once this is accomplished, the either gBOX will pass data received in the serial or GPI ports to the remote gBOX. If there is no data received in the gBOX, the gBOX will not send any TCP packets.

# Setup

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## ***Unpacking***

The gBOX package will contain the following items:

- gBOX
- Power Supply
- This Users Manual
- Four rubber feet

## ***Connections***

The gBOX connections are straightforward:

1. Plug the power supply into the gBOX.
2. Install an Ethernet or serial interface into the interface slot.
3. Connect Ethernet cable or serial cable to unit.
4. Connect GPI cables into GPI ports.

<b>Pin</b>	<b>Function</b>
1	Ground
2	GPI 1
3	GPI 2
4	GPI 3
5	GPI 4
6	GPI 5
7	GPI 6
8	GPI 7
9	GPI 8
10	GPI 9
11	GPI 10
12	GPI 11
13	GPI 12
14	GPI 13
15	GPI 14
16	GPI 15
17	GPI 16
18	GPI 17
19	GPI 18
20	GPI 19
21	GPI 20
22	GPI 21
23	GPI 22
24	GPI 23
25	GPI 24

<b>Pin</b>	<b>Function</b>
1	Ground
2	GPI 25
3	GPI 26
4	GPI 27
5	GPI 28
6	GPI 29
7	GPI 30
8	GPI 31
9	GPI 32
10	GPI 33
11	GPI 34
12	GPI 35
13	GPI 36
14	GPI 37
15	GPI 38
16	GPI 39
17	GPI 40
18	GPI 41
19	GPI 42
20	GPI 43
21	GPI 44
22	GPI 45
23	GPI 46
24	GPI 47
25	GPI 48

**gBOX Master GPI In/Out Pinout**

# Configuration

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## ***Operating Modes***

### **Ethernet**

When the gBOX has an Ethernet Interface installed, it has two distinct modes of operation that are set by the rear panel DIP switches. The modes are:

- Server
- Client

The DIP switches are read only at power on so the gBOX must be power cycled for the changes to take effect.

### **Serial**

When the gBOX has a serial Interface installed, it has just one distinct mode of operation. This is GPI to serial conversion.

### **Expander**

When the gBOX has an Ethernet or serial interface installed, it is a master unit, which communicates directly with another master unit or a host computer.

When the gBOX does not have an interface installed, it becomes an Expander gBOX. An Expander gBOX adds 48 additional GPI Inputs and Outputs to a Master gBOX. An Expander gBOX connects to a Master gBOX using an Expander cable plugged into one of the Expander ports on the rear panel. Up to 8 Expander gBOXes can be added to a master gBOX.

# Ethernet Interface

When MCS-Ethernet Interface is installed, the rear panel DIP switches on the left side set the IP Address and behavior of the gBOX.

The rear panel DIP switches on the right side are currently not used and are ignored.

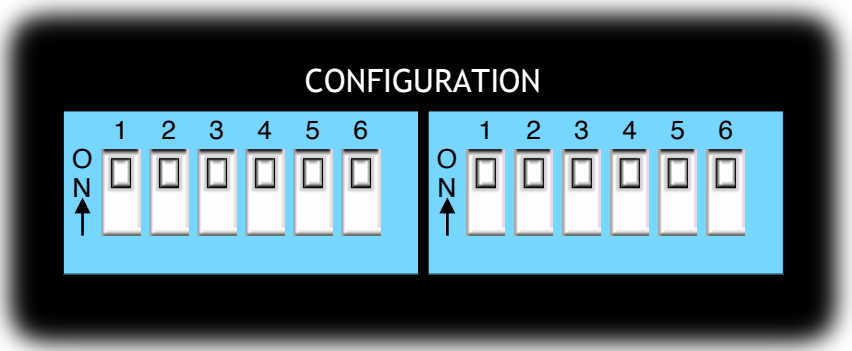


Figure 1

## Mode Selection

When DIP switch 5 on the left side is in the Off position, the gBOX behaves as a server. That is, the gBOX waits for a device such as a host computer or client gBOX to establish a connection to it. Conversely, when DIP switch 5 is in the On position, the gBOX behaves as a client. That is, the gBOX attempts to connect to a server device such as a server gBOX to establish a connection to it.

SW5	Mode
Off	Server
On	Client

Mode Selection of gBOX



## Server Mode

In the Server Mode of operation, DIP Switches 1, 2, 3 and 4 on the left side set the IP address of the gBOX. The units IP address is set according to the table below.

SW1	SW2	SW3	SW4	
Off	Off	Off	Off	192.168.254.102
On	Off	Off	Off	192.168.254.104
Off	On	Off	Off	192.168.254.106
On	On	Off	Off	192.168.254.108
Off	Off	On	Off	192.168.254.110
On	Off	On	Off	192.168.254.112
Off	On	On	Off	192.168.254.114
On	On	On	Off	192.168.254.116
Off	Off	Off	On	10.0.0.128
On	Off	Off	On	10.0.0.130
Off	On	Off	On	10.0.0.132
On	On	Off	On	172.16.0.128
Off	Off	On	On	172.16.0.130
On	Off	On	On	Not used
Off	On	On	On	Not used
On	On	On	On	User Setting

**Left DIP Switch Settings**

Note: The gBOX listens on TCP port 23.

## Client Mode

In the Client Mode of operation, DIP Switches 1, 2, 3 and 4 on the left side set the IP address of the gBOX. The units IP address is set according to the table below.

SW1	SW2	SW3	SW4	
Off	Off	Off	Off	192.168.254.103
On	Off	Off	Off	192.168.254.105
Off	On	Off	Off	192.168.254.107
On	On	Off	Off	192.168.254.109
Off	Off	On	Off	192.168.254.111
On	Off	On	Off	192.168.254.113
Off	On	On	Off	192.168.254.115
On	On	On	Off	192.168.254.117
Off	Off	Off	On	10.0.0.129
On	Off	Off	On	10.0.0.131
Off	On	Off	On	10.0.0.133
On	On	Off	On	172.16.0.129
Off	Off	On	On	172.16.0.131
On	Off	On	On	Not used
Off	On	On	On	Not used
On	On	On	On	User Setting

**Left DIP Switch Settings**

Note: The gBOX attempts to connect to TCP port 23 on the server.

## Serial Interface

When the 920465 Standard RS-422 Interface Card or 920466 Standard RS-232 Interface Card is installed, the rear panel DIP switches on the left side set the serial port parity. The bitrate of the gBOX is fixed at 38400 bits/sec.

SW1	SW2	
On	x	No Parity
Off	Off	Odd Parity
Off	On	Even Parity

x = Don't Care

### Serial Port Parity Settings

## Expander

The gBOX can be daisy chained to allow one Ethernet or Serial connection to accommodate up to 432 GPI Inputs and Outputs. When the rear panel slot is vacant, the gBOX assumes it is an expander unit and uses the rear panel DIP switches 1, 2 and 3 on the left side to set the expander ID. The expander ID as defined in the table below.

SW1	SW2	SW3	
Off	Off	Off	Expander #1 (GPI 49-96)
On	Off	Off	Expander #2 (GPI 97-144)
Off	On	Off	Expander #3 (GPI 145-192)
On	On	Off	Expander #4 (GPI 193-240)
Off	Off	On	Expander #5 (GPI 241-288)
On	Off	On	Expander #6 (GPI 289-336)
Off	On	On	Expander #7 (GPI 337-384)
On	On	On	Expander #8 (GPI 385-432)

### gBOX Expander Unit Definition

## **gBOX Security**

The gBOX contains a basic security mechanism that prevents unintended hosts or gBOXes from passing data through a secured gBOX. A gBOX can be protected with password that is set with the configuration utility. The password is stored in nonvolatile memory and, is read upon power up.

When password protection is enabled, the sending gBOX embeds the password in the transmitted IP packet. At the remote end, the receiving gBOX must have password protection enabled AND have a matching password.

The DIP switches are read only at power on so the gBOX must be power cycled for any changes to take effect.

This security mechanism is only used in gBOX Server and gBOX Client modes. SW6 should be set to the off position when used in the GPI to Serial and GPI to Ethernet modes.

SW6	
On	Disable password protection
Off	Enable password protection

### **Security Configuration**

The effect of SW6 takes place immediately.

*Note: If a gBOX has password protection is disabled; it will ignore the password and act on any packets sent to it.*

# Technical Reference

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## ***Electrical Connections***

### **Ethernet**

This gBOX port is just like Ethernet ports on a computer, to connect it to a hub, switch or router, use a straight through cable. To connect it to another gBOX or computer, use a crossover cable. The gBOX supports IEEE 802.3u clause 28 Auto-Negotiation that automatically senses the Ethernet port speed & duplex operation and chooses the highest performance settings.

In addition, four LEDs on the front panel that indicate various operating conditions of the Ethernet port. These LEDs are:

- Link
- 100BaseT activity
- 10BaseT activity
- Collision

**Serial**

When the 920466 Standard RS-232 Interface Card or the 920465 Standard RS-422 Interface Card is installed the unit is a simple GPI to serial converter. The pinout of the serial interface is detailed in the table below.

Interface	RS-232C	RS-422A "Mach"	RS-422A "Host"
Pin 1	not used	not used	not used
Pin 2	Transmit	Receive A	Transmit A
Pin 3	Receive	Transmit B	Receive B
Pin 4	not used	Ground	Ground
Pin 5	Ground	not used	not used
Pin 6	not used	Ground	Ground
Pin 7	not used	Receive B	Transmit B
Pin 8	not used	Transmit A	Receive A
Pin 9	not used	not used	not used

**Serial Port Pinout**

Serial port communications occurs with the following parameters:

- Bit rate: 38400 bits/sec
- Start bits: 1
- Data bits: 8
- Stop bits: 1

The parity of the serial port can be set on the leftmost set of DIP switches on the rear panel. The parity is set using the following table.

Switch 1	Switch 2	Parity
Down	Down	Odd
Down	Up	Even
Up	x	None

**Serial Port Parity Selection**

*X= Don't Care*

## GPI Port Pinouts

The GPI ports on the rear of the gBOX are 25 pin D-sub connectors. The GPI In connector has 24 TTL/CMOS compatible inputs with internal pull-ups to +5 volts. The GPI Out connector has 24 TTL/CMOS compatible outputs. On both connectors, pin 1 is the ground reference and pins 2-25 are the GPI signals.

When gBOXes connected together in a client/server manner establish a connection, both client and server gBOXes will send the state of its GPI In ports to each other so it can be shown on the GPI Out port on the remote gBOX. After that, changes to a GPI In port will cause a gBOX to send a GPI message to the remote gBOX. Additionally, the gBOXes will send a GPI message every 5 seconds to keep the connection alive and to refresh the state of the GPI outputs.

A packet is sent whenever a change to the GPI In is sensed. At present, it is sampled about every 20 milliseconds.

MSB				LSB				
Byte1	Pin 9	Pin 8	Pin 7	Pin 6	Pin 5	Pin 4	Pin 3	Pin 2
Byte2	Pin 17	Pin 16	Pin 15	Pin 14	Pin 13	Pin 12	Pin 11	Pin 10
Byte3	Pin 25	Pin 24	Pin 23	Pin 22	Pin 21	Pin 20	Pin 19	Pin 18

**gBOX GPI 1-24 In/Out Pinouts**

MSB				LSB				
Byte4	Pin 9	Pin 8	Pin 7	Pin 6	Pin 5	Pin 4	Pin 3	Pin 2
Byte5	Pin 17	Pin 16	Pin 15	Pin 14	Pin 13	Pin 12	Pin 11	Pin 10
Byte6	Pin 25	Pin 24	Pin 23	Pin 22	Pin 21	Pin 20	Pin 19	Pin 18

**gBOX GPI 25-48 In/Out Pinouts**

Pin 1 is ground.

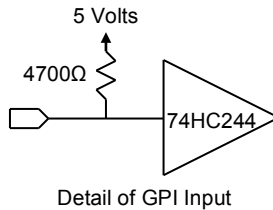


## GPI Port Circuitry Details

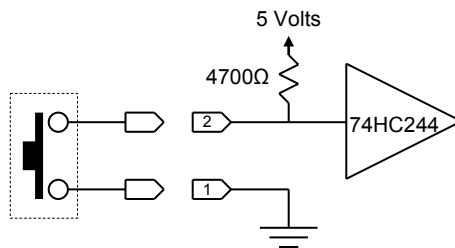
The gBOX GPI input and output circuits are detailed in the following section.

The inputs of the gBOX GPI ports are CMOS inputs. The input circuitry has a 4700 ohm pullup resistor to +5 volts as referenced to pin 1 of the GPI Input Port.

*Note: Because the inputs are CMOS, the input voltage MUST be limited to voltage levels between 0 and 5 volts. If this is not possible, consider using the gBOX I/O.*

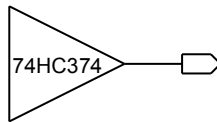


The internal pullup resistor insures that the input pin is set to a known state. The default state of the GPI Inputs is +5 volts or a logic state of '1' in the GPI message bitmap. The internal pullup resistor also allows a simple switch or 'dry contact' to be connected between a GPI Input pin and ground as shown in the example below.



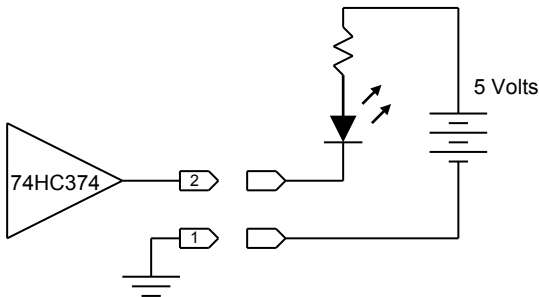
The outputs of the gBOX GPI ports are also CMOS. The output signal is referenced to pin 1 of the GPI Output Port. The GPI Outputs are rated to +/- 6mA. If this is not sufficient for your application, consider using the eBOX I/O.

*Note: Because the inputs are CMOS, the output voltage MUST be limited to voltage levels between 0 and 5 volts. This can occur if driving a circuit that is powered by a voltage higher than 5 volts. If this is not possible, consider using the gBOX I/O.*

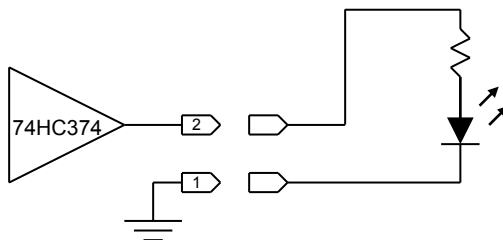


Detail of GPI Output

The example circuits below shows a GPI Output driving an LED.



GPI Output Example #1 with LED



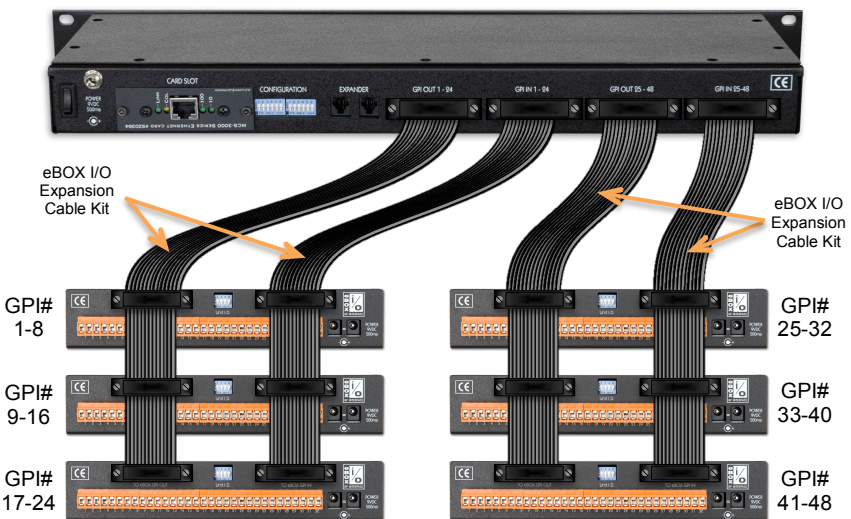
GPI Output Example #2 with LED

## Using with eBOX I/O

The gBOX GPI inputs and outputs are CMOS compatible circuits. The CMOS GPI inputs require that the input signals be 0 to 5 volts and referenced to ground. The CMOS GPI outputs can deliver 0 to 5 volts at up to +/- 6mA and referenced to ground.

In many cases, this will be compatible with your equipment. However, in some cases, there will be the end user equipment may not be compatible with 0 to 5 volt requirements of the gBOX GPI inputs and outputs. In this case, the eBOX I/O must be used. Each eBOX I/O buffers 8 inputs and 8 outputs. The inputs are buffered with an optoisolators while the outputs are buffered with a dry relay contact.

The eBOX I/O comes with a pair of cables that allow you to connect it to a single eBOX I/O to a gBOX. Up to six eBOX I/Os can be used with a single gBOX. To connect two or three eBOX I/Os to a single gBOX, you will need to order the optional eBOX I/O Expansion Cable Kit, JLC Cooper part number EBOX-I/O-EXPCAB. To connect four, five or six eBOX I/Os to a gBOX, you will need to order two optional eBOX I/O Expansion Cable Kits, JLC Cooper part number EBOX-I/O-EXPCAB. eBOX I/O Expansion Cable Kits



## Power

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The gBOX requires a 9 volt DC, center positive power supply capable of delivering at least 500 milliamps. The unit comes with a power supply appropriate for the country in which the unit was sold. If you need a power supply specific to your location, please contact your local distributor or JLCooper Electronics.

Location	JLCooper Part Number
North America	561026-4
Europe	561026-4

### Approved Power Supplies

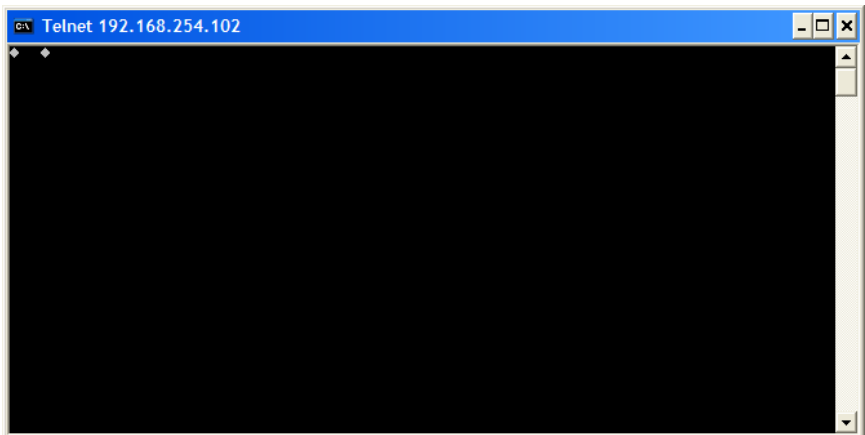
*Warning: Using a power supply other than the units specified in the above table can result in damage to the gBOX and/or other equipment, which is not covered by the JLCooper Factory Warranty.*

# Troubleshooting

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If for some reason the gBOX does not give you the expected results, take a moment to do some investigating. The most important concept is that you have your gBOX connected properly as outlined in *Installation and Use*. Take a moment to double check your setup.

- What is the state of the DIP switches?
- Do the 10 red LEDs flash alternately at power up?
- Do the Link and 100 (or 10) LEDs light up?
- In any mode, can you ping it (ping 192.168.254.102)?
- If you are using the password protection feature, is it enabled in both gBOXes?
- In normal client or server mode, can you communicate with it using the gBOX Configuration Utility?
- The ARP Cache in the host application may have the incorrect entry for the gBOX's IP address. Try clearing the ARP cache (arp -d in Windows).
- In normal server mode, if you telnet to the gBOX, do you see a short packet of unprintable characters every 5 seconds as shown in the screenshot below?



If you are using the gBOX Configuration Utility, be sure to reboot the gBOX for the settings to take effect

A common problem is forgetting to turn the power switch on or turning the unit on after the software application has launched.

In addition, the JLCooper website ([www.jlcooper.com](http://www.jlcooper.com)) will contain up to date information on drivers, applications and troubleshooting.

If all else fails, you can contact the JLCooper Service Department at: [service@jlcooper.com](mailto:service@jlcooper.com).

## ***Care and Service***

If properly cared for, your gBOX should provide years of trouble free performance. While the gBOX is built in a rugged metal enclosure, please avoid dropping the gBOX.

Clean with a soft, damp cloth. Do not allow liquids, dust or other foreign matter to get inside the unit.

There are no user-serviceable parts in the gBOX. Please refer to the JLCooper Electronics Limited Factory Warranty on the last page for detailed warranty and service information.

# JLCooper Electronics Limited Warranty

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JLCooper Electronics ("JLCooper") warrants this product to be free of defects in materials or workmanship for a period of 12 months from the date of purchase. This warranty is non-transferable and the benefits apply only to the original owner. Proof of purchase in the form of an itemized sales receipt is required for warranty coverage. To receive service under warranty, it is recommended that customers first submit a support request at:

[http://jlcooper.com/\\_php/support\\_request.php](http://jlcooper.com/_php/support_request.php)

Customers can also email JLCooper factory service ([service@jlcooper.com](mailto:service@jlcooper.com)) or call 310-322-9990 to obtain service instructions. Details, including specific model, serial number, date and place of purchase and a complete description of the problem will be required. If it is determined that the product needs to be returned to the factory for service, a Return Form will need to be completed and an RMA number will be issued. Please do not return products without first receiving an RMA number.

Upon issuance of return authorization, the product should be packed in the original shipping materials and shipped prepaid and insured to: Service Department, JLCooper Electronics, 142 Arena Street, El Segundo, CA 90245. Please include the following: copy of the sales receipt, your name and address (no P.O. Boxes, please), a brief description of the problem, and any other related items discussed with the service department and considered necessary to evaluate the product or effect a repair. The return authorization number must be clearly written on the outside of the package.

JLCooper will at its option, without charge for parts or labor, either repair or replace the defective part(s) or unit. Carriage, insurance, customs duties, impounds, tariffs, taxes, surcharges, brokerage fees and other shipping costs are not covered by this warranty. JLCooper's normal repair turn around time at the factory is approximately 7 business days from receipt of product to return shipping. Your actual turn around time will also include return transit time.

Actual turn around time will vary depending upon many factors including the repeatability of the reported complaint, the availability of parts required for repair, the availability of related products needed to evaluate the product, etc. Priority services are available at additional cost. These should be discussed with the service technician at the time the return authorization is issued.

This warranty provides only the benefits specified and does not cover defects or repairs needed as result of acts beyond the control of JLCooper including but not limited to; abuse, failure to operate in accordance with the procedures outlined in this owner's manual; nor does it cover damage from accident, negligence, using incorrect power supply, modification, alteration, improper use, unauthorized servicing, tampering, ingress of foreign matter; nor for damage from natural or man-made events such as, but not limited to flooding, lightning, electrostatic discharge, tornadoes, earthquake, fire, etc.

THE DURATION OF ANY OTHER WARRANTIES, WHETHER IMPLIED OR EXPRESS, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTY OF MERCHANTABILITY, IS LIMITED TO THE DURATION OF THE EXPRESS WARRANTY HEREIN. JLCOOPER HEREBY EXCLUDES INCIDENTAL AND CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO: LOSS OF TIME, INCONVENIENCE, DELAY IN PERFORMANCE OF THIS WARRANTY, THE LOSS OF USE OF THE PRODUCT OR COMMERCIAL LOSS, AND FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY APPLICABLE TO THIS PRODUCT. JLCOOPER SHALL NOT BE LIABLE FOR DAMAGES OR LOSS RESULTING FROM THE NEGLIGENT OR INTENTIONAL ACTS OF THE SHIPPER OR HIS CONTRACT AFFILIATES. THE CUSTOMER SHOULD CONTACT THE SHIPPER FOR PROPER CLAIMS PROCEDURES IN THE EVENT OF DAMAGE OR LOSS RESULTING FROM SHIPMENT. THIS WARRANTY SHALL BE GOVERNED BY THE LAWS OF THE STATE OF CALIFORNIA.