

Graphite® Expansion Racks Installation Guide



- Easy to add I/O capability with Graphite plug-in modules
- Configured using Crimson® 3 software
- Aluminum case construction for both the expansion rack and the I/O modules

UL US FOR USE IN HAZARDOUS LOCATIONS:
 Class I, Division 2, Groups A, B, C, and D
LISTED
 IND.CONT. EQ.
 E302106
 E317425



UK CA **CE** **Ex** II 3 G Ex nA IIC T4 Gc
 -40°C ≤ T_{AMB} ≤ 75°C
 DEMKO 14 ATEX 1387X
 IECEx UL 15.0035X
 UL22UKEX2574X

GENERAL DESCRIPTION

Each expansion rack can support up to 3 Graphite modules, and up to 4 racks can be bolted together, to provide up to 12 Graphite modules per expansion rack system. The expansion racks connect and communicate via proprietary USB connection to the various Graphite host devices, via standard USB A/B cable. The GEXRACK1 USB base rack provides the interface to the Graphite host, and up to 3 GEXRACK2 3-Port expansion racks can be attached to the USB base rack. The backplane connection between expansion racks provides power and communications for the downstream racks and modules. The GEXRACK1 also offers a filtered power supply for both the rack and the Graphite host device which can be used when installing in electrically noisy environments.

The Graphite host devices, equipped with serial ports as well as Ethernet port(s), allows the system to share data with PCs, PLCs, and SCADA systems.

The expansion racks snap easily onto standard top hat (T) profile DIN rail, or can be bolted directly to the panel in high vibration environments.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in this document or on equipment must be observed to ensure personal safety and to prevent damage to either the device or equipment connected to it.

Do not use these products to replace proper safety interlocking. No software-based device (or any other solid-state device) should ever be designed to be responsible for the maintenance of personnel safety or consequential equipment not equipped with safeguards. Red Lion disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in a manner not specified.

 **CAUTION: Risk of Danger.**
 Read complete instructions prior to installation and operation of the unit.

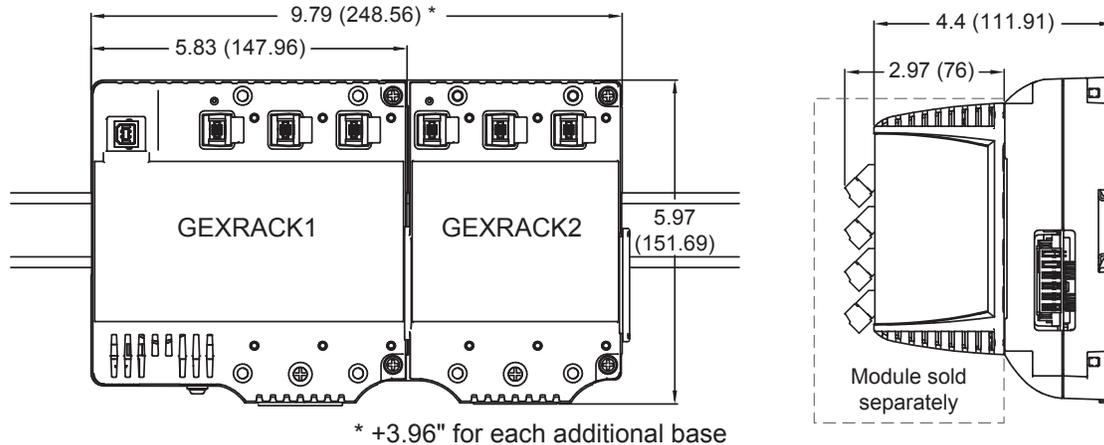
 **WARNING - EXPLOSION HAZARD -** Do not disconnect equipment unless power has been switched off or area is known to be non-hazardous.

 **WARNING - EXPLOSION HAZARD -** Substitution of components may impair suitability for Class I, Division 2

CONTENTS OF PACKAGE

GEXRACK1	GERRACK2
- Base	- Base
- (2) 3-position terminal blocks (Power supply filter)	- (3) module port covers
- (3) module port covers	- Downstream port cover
- Downstream port cover	- User Bulletin
- User Bulletin	

DIMENSIONS In inches (mm)



SPECIFICATIONS

1. POWER: +10 to 30 VDC

Must use a Class 2 circuit according to National Electrical Code (NEC), NFPA-70 or Canadian Electrical Code (CEC), Part I, C22.1 or a Limited Power Supply (LPS) according to IEC/EN 60950-1 or Limited-energy circuit according to IEC/EN 61010-1.

Power connection via removable three position terminal block.

Available Power For Modules: 13 W per 3-port rack; 52 W total for expansion rack system (up to 12 modules).

Available Power For Host: 60 W.

2. ENVIRONMENTAL CONDITIONS:

Operating Temperature Range: -40 to 75 °C T_{AMB}, or lowest range among equipment used in your Graphite system. Consult the user manual or www.redlion.net/OpTemp for further details.

Storage Temperature Range: -40 to 85 °C T_{AMB}

Panel Mount Vibration to IEC 68-2-6: Operational 5-500 Hz, 4 g

Panel Mount Shock to IEC 68-2-27: Operational 40 g (10 g, modules w/relays)

* DIN Rail Mount Vibration to IEC 68-2-6: Operational 5-500 Hz, 2 g

* DIN Rail Mount Shock to IEC 68-2-27: Operational 15 g (10 g, modules w/relays)

* DIN latch CAM must be in latched position.

Requires DIN Rail type: DIN 1010, DIN 1065, or DIN 3065.

Operating and Storage Humidity: 80% max. relative humidity, non-condensing

Altitude: Up to 2000 meters

Installation Category II, Pollution Degree 2 as defined in IEC/EN 60664-1.

3. CERTIFICATIONS AND COMPLIANCES:

CE Approved

EN 61326-1 Immunity to Industrial Locations

IEC/EN 61010-1

RoHS Compliant

ATEX Approved

Ⓜ II 3 G Ex nA IIC T4 Gc

DEMKO 14 ATEX 1387X

EN 60079-0, -15

IECEX Approved

Ex nA IIC T4 Gc

IECEX UL 15.0035X

IEC 60079-0, -15

UKEX Approved

UL22UKEX2574X

UL Listed: File #E302106

UL Hazardous: File #E317425

IP20 Enclosure rating

ABS Type Approval for Shipboard Applications

4. MOUNTING REQUIREMENTS: Panel mount, or standard top hat (T) profile DIN rail mount. Panel mount hardware is not provided. The units can accept #5 to #10 (M3 to M4). 1.5" (38 mm) minimum length, depending on panel thickness. Washers and lock-washer recommended.

Torque screws 96 to 128 ozf-in (0.68 to 0.90 Nm).

5. CONNECTIONS: High compression cage-clamp terminal block

Wire Strip Length: 0.3" (7.5 mm)

Wire Gauge Capacity: One 14 AWG (1.63 mm) solid, two 18

AWG (1.02 mm) or four 20 AWG (0.81 mm)

6. CONSTRUCTION: Case body is all metal construction.

7. WEIGHT:

GEXRACK1, USB 3-Port Base Rack: 1.78 lb. (795.2 g)

GEXRACK2, 3-Port Expansion Rack: 1.33 lb. (596.4 g)

EMC INSTALLATION GUIDELINES

Although Red Lion Controls products are designed with a high degree of immunity to Electromagnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into a unit may be different for various installations. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed are some EMI guidelines for a successful installation in an industrial environment.

1. A unit should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded cables for all Signal and Control inputs. The shield connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
 - a. Connect the shield to earth ground (protective earth) at one end where the unit is mounted.
 - b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is over 1 MHz.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors, feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run through metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter. Also, Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. Long cable runs are more susceptible to EMI pickup than short cable runs.
5. In extremely high EMI environments, the use of external EMI

suppression devices such as Ferrite Suppression Cores for signal and control cables is effective. The following EMI suppression devices (or equivalent) are recommended:
 Fair-Rite part number 0443167251 (Red Lion #FCOR0000)
 Line Filters for input power cables:

Schaffner # FN2010-1/07 (Red Lion #LFIL0000)

6. To protect relay contacts that control inductive loads and to minimize radiated and conducted noise (EMI), some type of contact protection network is normally installed across the load, the contacts or both. The most effective location is across the load.
 - a. Using a snubber, which is a resistor-capacitor (RC) network or metal oxide varistor (MOV) across an AC inductive load is very effective at reducing EMI and increasing relay contact life.
 - b. If a DC inductive load (such as a DC relay coil) is controlled by a transistor switch, care must be taken not to exceed the breakdown voltage of the transistor when the load is switched. One of the most effective ways is to place a diode across the inductive load. Most Red Lion products with solid state outputs have internal zener diode protection. However external diode protection at the load is always a good design practice to limit EMI. Although the use of a snubber or varistor could be used.

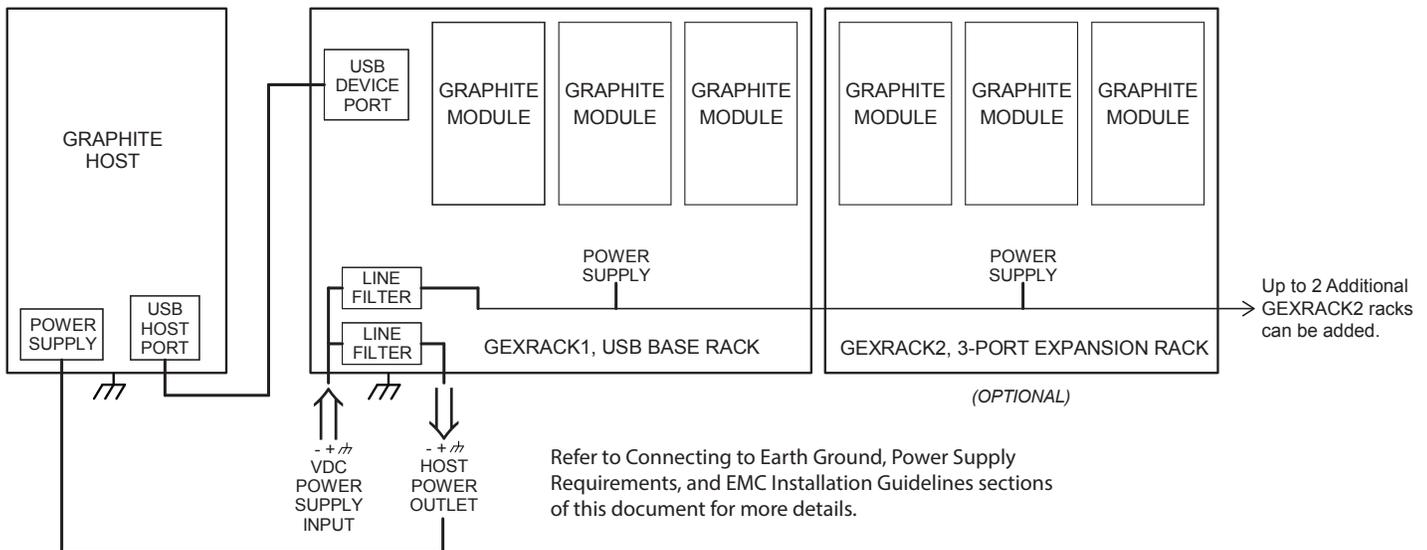
Red Lion part numbers: Snubber: SNUB0000

Varistor: ILS11500 or ILS23000

7. Care should be taken when connecting input and output devices to the instrument. When a separate input and output common is provided, they should not be mixed. Therefore a sensor common should NOT be connected to an output common. This would cause EMI on the sensitive input common, which could affect the instrument's operation.

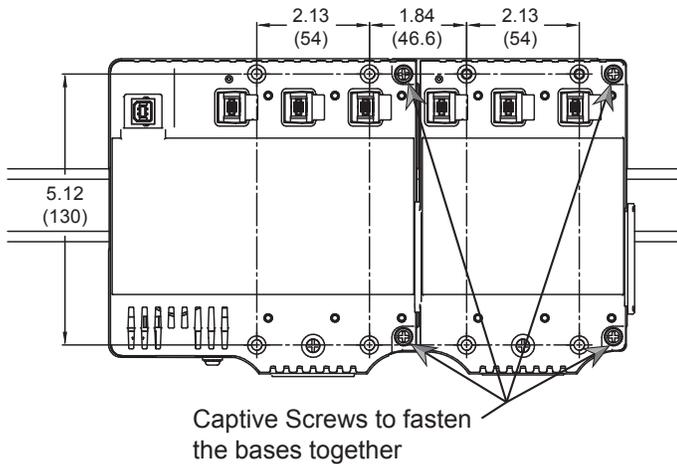
Visit <http://www.redlion.net/emi> for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion products.

Block Diagram for Expansion Rack



EXPANSION RACK INSTALLATION PANEL MOUNTING INSTRUCTIONS

The expansion rack can be mounted on a DIN rail for normal environments, or bolted to a panel for high vibration environments. Refer to the diagram for the panel mount hole spacing.



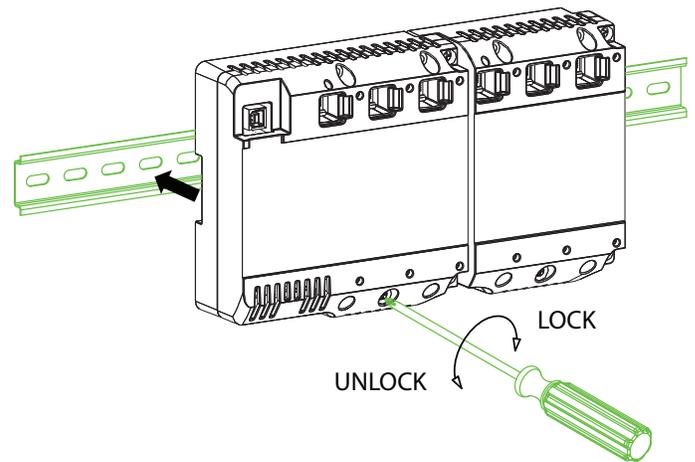
For hazardous location installation the following shall be taken into consideration:

- When used in a Zone 2 environment, the device shall be panel mounted in at least Zone 2 IECEx/ATEX-Certified tool accessible enclosure with a minimum ingress protection rating of at least IP54 as defined in IEC/EN 60529.
- Must be wired using Division 2 wiring methods as specified in article 501-4(b), 502-4(b), and 503-3(b) of the National Electric Code, NFPA 70 for installation within the United States, or as specified in section 19-152 of Canadian Electrical Code for installation in Canada.

DIN RAIL MOUNT AND CAM OPERATION

It is recommended that the expansion rack be DIN rail mounted only in low vibration environments. Refer to the Specifications section for details.

1. Using a screwdriver, push in and fully rotate the Cam counter-clockwise to push the DIN Clip downward against spring pressure locking it open
2. Place the base on the DIN rail. Place each additional base, and slide them together until the connectors engage. Then fasten the bases together with the two captive screws, located at each junction.
3. Using a screwdriver, push in and rotate the Cam 90 degrees clockwise to release the DIN clip to engage the DIN rail
4. Rotate the Cam an additional 90 degrees clockwise to lock the DIN clip in the closed position. The CAM must be in fully locked position to meet the vibration specification listed.



CONNECTING TO EARTH GROUND

The third pin of the power connector is chassis ground for the unit. Your unit should be connected to earth ground.

The chassis ground is not connected to signal common of the unit. Maintaining isolation between earth ground and signal common is not required to operate your unit. But, other equipment connected to this unit may require isolation between signal common and earth ground. *To maintain isolation between signal common and earth ground, care must be taken when connections are made to the unit.* For example, a power supply with isolation between its signal common and earth ground must be used. Also, plugging in a USB cable may connect signal common and earth ground.¹

¹ USB's shield may be connected to earth ground at the host.

USB's shield in turn may also be connected to signal common.

POWER SUPPLY REQUIREMENTS

The Graphite expansion rack requires a 10-30 VDC power supply. Your unit may draw considerably less than the maximum rated power depending upon the modules being used.

To ensure you do not exceed the capacity of your Graphite expansion rack power supply, calculate the total power consumption required for all of your planned modules. Each module's maximum power consumption is listed in the Specifications of their respective Product Bulletin. The total

power available for modules is listed in the Graphite Expansion Rack Specifications.

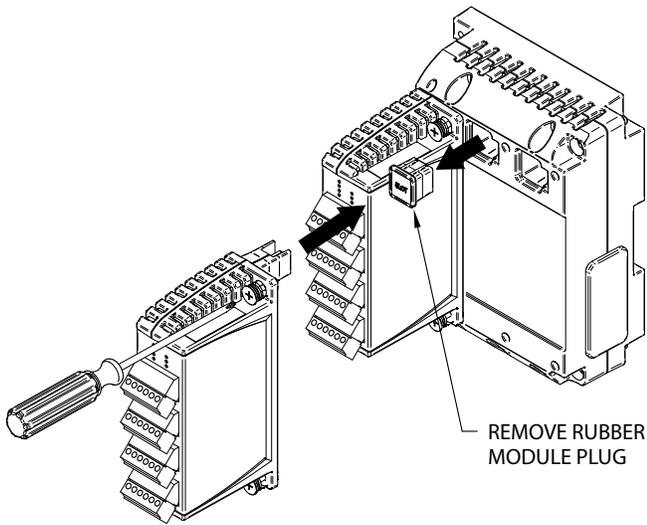
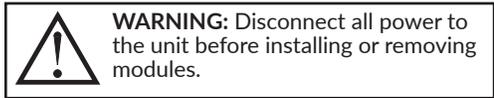
It is very important that the power supply is mounted correctly if the unit is to operate reliably. Please take care to observe the following points:

- Voltage range stated is at the power connector, not at the power source.
- Peak efficiency occurs at the low side of the voltage range (approximately 12 V), recommended for high temperature applications.
- The GEXRACK1 contains two built-in power supply line filters: one for the expansion rack system, and one for the Graphite host. The power supply is wired to the POWER INPUT CONNECTOR of the GEXRACK1, then the HOST POWER OUTPUT of the GEXRACK1 is wired to the Graphite host power input. This setup provides the best EMC performance.
- The power supply must be mounted close to the unit expansion rack, with usually not more than 6 feet (1.8 m) of cable between the supply and the expansion rack. Ideally, the shortest length possible should be used.
- Separate power supplies can be used for the Graphite host and the expansion rack system, but EMC performance will be reduced. Both the Graphite host and the expansion rack system must be properly connected to protective earth, as per the "CONNECTING TO EARTH GROUND" section.

- The wire used to connect the Graphite host's power supply should be at least 22-gage wire, suitably rated for the temperatures of the environment to which it is being installed. If a longer cable run is used, a heavier gage wire should be used. The routing of the cable should be kept away from large contactors, inverters, and other devices which may generate significant electrical noise.
- A power supply with an NEC Class 2 or Limited Power Source (LPS) and SELV rating is to be used. This type of power supply provides isolation to accessible circuits from hazardous voltage levels generated by a mains power supply due to single faults. SELV is an acronym for "safety extra-low voltage." Safety extra-low voltage circuits shall exhibit voltages safe to touch both under normal operating conditions and after a single fault, such as a breakdown of a layer of basic insulation or after the failure of a single component has occurred. A suitable disconnect device shall be provided by the end user.

MODULE INSTALLATION

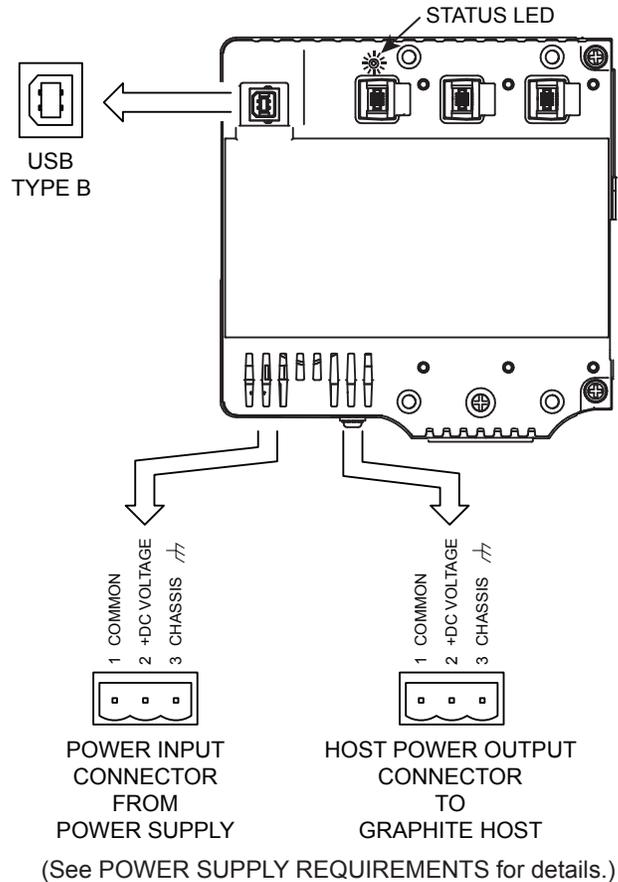
The physical order of all installed modules must match the modules order in Crimson. Torque screws to 6.0 pound-force inch [96 ounce-force inch] (0.68 Nm).



WIRING

WIRING CONNECTIONS

All conductors should meet voltage and current ratings for each terminal. Also, cabling should conform to appropriate standards of good installation, local codes and regulations and be suitably rated for the temperatures of the environment to which it is being installed. When wiring the module, use the numbers on the label to identify the position number with the proper function. Strip the wire, leaving approximately 1/4" (6 mm) of bare wire exposed. Insert the wire into the terminal, and tighten.



CONFIGURATION

The Expansion Rack is configured with Windows® compatible Crimson® software. The software is an easy to use, graphical interface which provides a means of configuration and commissioning of new systems. Please see the Crimson manual for more details. Crimson software is available as a no charge download from Red Lion's website. The latest version of the software is always available from the website, and updating your copy is free.

COMMUNICATING WITH THE GRAPHITE HOST

Communication between the Graphite Host device and the Wide Expansion Rack is accomplished over USB communication. A standard USB 2.0 A/B cable can be used to connect the USB Host Port of the host, to the USB Device Port of the wide expansion rack. It is recommended to keep wiring distances as short as possible. One meter or less is preferable. Red Lion offers metal-armored, crush-proof cables for cabinet installations in several lengths. See Ordering information for available part numbers.

LEDs

USB HOST LEDs

COLOR	STATUS
OFF	Not operational
RED	Error
GREEN	Normal operation

EXPANSION RACK STATUS LEDs

The expansion rack status LED is a bi-color LED that provides information regarding the USB connection.

COLOR	STATUS
ORANGE	No USB connection with host
GREEN	USB connection established and performing normally

MODULE STATUS LEDs

Each module contains a status LED, refer to the respective Graphite module data sheets for details.

RED LION CONTROLS TECHNICAL SUPPORT

If for any reason you have trouble operating, connecting, or simply have questions concerning your new product, contact Red Lion's technical support.

Support: support.redlion.net
 Website: www.redlion.net
 Inside US: +1 (877) 432-9908
 Outside US: +1 (717) 767-6511

Red Lion Controls, Inc.
 35 Willow Springs Circle York, PA 17406

ORDERING INFORMATION

TYPE	DESCRIPTION	PART NUMBER
Expansion Base	Graphite USB 3-Port Base Rack	GEXRACK1
	Graphite 3-Port Expansion Rack	GEXRACK2
Accessories	USB Metal Armored, 0.5 Meter Cable	CBLUSBM0
	USB Metal Armored, 1 Meter Cable	CBLUSBM1
	USB Metal Armored, 2 Meter Cable	CBLUSBM2

A listing of the entire Graphite family of products and accessories can be found at www.redlion.net.

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(a) Red Lion Controls Inc. (the "Company") warrants that all Products shall be free from defects in material and workmanship under normal use for the period of time provided in "Statement of Warranty Periods" (available at www.redlion.net) current at the time of shipment of the Products (the "Warranty Period"). **EXCEPT FOR THE ABOVE-STATED WARRANTY, COMPANY MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE PRODUCTS, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Customer shall be responsible for determining that a Product is suitable for Customer's use and that such use complies with any applicable local, state or federal law.

(b) The Company shall not be liable for a breach of the warranty set forth in paragraph (a) if (i) the defect is a result of Customer's failure to store, install, commission or maintain the Product according to specifications; (ii) Customer alters or repairs such Product without the prior written consent of Company.

(c) Subject to paragraph (b), with respect to any such Product during the Warranty Period, Company shall, in its sole discretion, either (i) repair or replace the Product; or (ii) credit or refund the price of Product provided that, if Company so requests, Customer shall, at Company's expense, return such Product to Company.

(d) **THE REMEDIES SET FORTH IN PARAGRAPH (c) SHALL BE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND COMPANY'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN PARAGRAPH (a).**

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