

Model GMPID - Graphite® PID Module Installation Guide



- Dedicated single and dual PID modules for the Graphite products
- Fully isolated design provides reliable operation
- PID control with reduced overshoot
- Universal inputs accept TC, RTD, 0-10 V and 0/4-20 mA signals
- On demand auto-tuning of PID settings
- DC analog output (optional, GMP1 only)
- Heater current input (optional) ensures detection of heater circuit failure
- Configured using Crimson® software (version 3.0 or later)

UL LISTED FOR USE IN HAZARDOUS LOCATIONS:
IND. CONT. EQ. E317425
Class I, Division 2, Groups A, B, C, and D
T4

For Model No. GMP1SA00, GMP1SM00, GMP2S000, and GMP2SM00 Only

UL US LISTED
IND. CONT. EQ. E302106



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
UL23UKEX2879X

For Model No. GMP1SA00, GMP1SM00, GMP2S000, and GMP2SM00 Only

GENERAL DESCRIPTION

The Model GMPID series modules are full featured PID controllers designed for use with the Graphite® products. The GMP1 is a single loop controller, while the GMP2 is a dual loop controller. The design of the system provides a true modular PID control platform for multi-zone control applications. The modules can accept a wide range of thermocouple, RTD, 0-10 V, 0/4-20 mA signals. With multiple discrete outputs, plus an optional analog output (GMP1 only), the GMPID modules can perform virtually any combination of time-proportioning or linear control for heat, cool, or heat/cool applications. The discrete outputs may also be assigned to one of seven internal soft alarms. The GMP1's optional linear output can be assigned to transmit virtually any internal variable.

The modules connect and communicate via proprietary USB connection to the various Graphite host devices. The Graphite host devices, equipped with serial ports as well as an Ethernet port(s), allows the system to share data with PCs, PLCs, and SCADA systems. The maximum number of modules varies for each Graphite host device, see specific models for details.

Once programmed, the module will continue to operate/control independent of the Graphite host device as long as power is applied. Remove power from the host device before installing or replacing any modules.

The GMPID modules are available with various discrete output combinations, including relays, and open drain MOSFETs. For applications requiring large loads to be controlled, several DIN rail mount relays are available.

The modules can operate in On/Off, P, PI, or PID control mode, and use an on-demand Auto-Tune that establishes the tuning constants. The PID constants may be fine-tuned through the serial or Ethernet interface. The modules employ a unique overshoot suppression feature, which allows the quickest response without excessive overshoot. The modules can also be operated in manual mode, providing the operator with direct control of the output.

CONFIGURATION

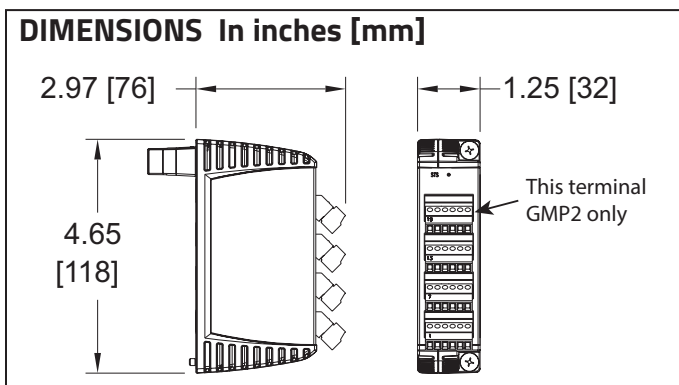
The Graphite is configured with Windows® compatible Crimson® software. The software is an easy to use, graphical interface which provides a means of configuration and commissioning of new systems, as well as routine module re-calibration.

ALARMS

Each loop within the modules has seven internal "soft" alarms, which can be assigned to trigger any output. This includes four process alarms, two heater current, and one input fault alarm.

ANALOG OUTPUT OPTION (GMP1 ONLY)

The optional DC Analog Output (10 V or 20 mA) can be independently configured and scaled for control or re-transmission purposes.



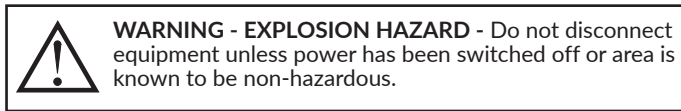
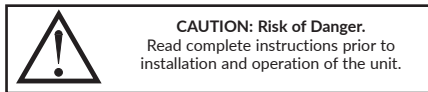
HEATER CURRENT MONITOR OPTION

The optional Heater Current Monitor input is useful for early warning of heater degradation, or heater circuit failure. The input connects to a current transformer with an output of 100 mA AC to ensure that proper heater current is present when the control output is on, and that little or no current is present when the output is off. This provides immediate warning of a circuit short or open, instead of waiting for a high or low temperature shutdown alarm.

SAFETY SUMMARY

All safety related regulations, local codes as well as 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 consistent with these specifications.



SPECIFICATIONS

1. POWER: Power will be supplied by the Graphite host device. Some modules, depending on usage may consume high levels of power. This may limit the total number of modules that can be installed on a single Graphite host. Check the Graphite module and Graphite host data sheets for specific usage and power requirements.

GMPID1 Max Power: 3.3 W

GMPID2 Max Power: 2.7 W

2. LEDs*:

STS - Status LED shows module condition

OP1, OP2, OP3, OP4 - Indicate status of outputs 1, 2, 3, and 4
ALM, or AL1 and AL2 - Alarm LEDs are lit during any internal alarm condition

* Default configuration.

3. MEMORY: Non-volatile memory retains all programmable parameters.

4. INPUT:

GENERAL:

Sample Time: 50 msec (20 Hz)

Common Mode Rejection: >110 dB, 50/60 Hz

Normal Mode Rejection: >50 dB, 50/60 Hz

Temperature Coefficient: 0.01%/°C

Step Response Time: 100 msec typ., 200 msec max

THERMOCOUPLE INPUTS:

Types: T, E, J, K, R, S, B, N, C

Input Impedance: 20 M Ω

Lead Resistance Effect: 0.25 μV/Ω

Cold Junction Compensation: Less than ±1°C typical

(±1.5°C max) over -40 to 75 °C ambient temperature

Resolution: 0.1°

TYPE	MEASUREMENT RANGE	WIRE COLOR	
		ANSI	BS 1843
T	-200 to +400°C -328 to +752°F	(+) Blue (-) Red	(+) White (-) Blue
E	-200 to +730°C -328 to +1346°F	(+) Violet (-) Red	(+) Brown (-) Blue
J	-200 to +760°C -328 to +1400°F	(+) White (-) Red	(+) Yellow (-) Blue
K	-200 to +1350°C -328 to +2462°F	(+) Yellow (-) Red	(+) Brown (-) Blue
R	0 to +1768°C +32 to +3214°F	No Standard	(+) White (-) Blue
S	0 to +1768°C +32 to +3214°F	No Standard	(+) White (-) Blue
B	+149 to +1820°C +300 to +3308°F	No Standard	No Standard
N	-200 to +1300°C -328 to +2372°F	(+) Orange (-) Red	(+) Orange (-) Blue
C	0 to +2315°C +32 to +4199°F	No Standard	No Standard
W5/W6			
mV	0 mV to 50 mV	N/A	N/A

RTD INPUTS:

Type: 2 or 3 wire

Excitation: 150 μA

Lead Resistance: 15 Ω Max

Resolution: 1 or 0.1°

TYPE	INPUT TYPE	RANGE
385	100 Ω platinum, Alpha = .00385	-200 to +600°C -328 to +1100°F
392	100 Ω platinum, Alpha = .003919	-200 to +600°C -328 to +1100°F
672	120 Ω nickel, Alpha = .00672	-80 to +215°C -112 to +419°F

PROCESS INPUT:

INPUT RANGE	ACCURACY	IMPEDANCE	MAX CONTINUOUS OVERLOAD	RESOLUTION
10 V	0.1% span	1 M Ohm	50 V	16 bit
20 mA	0.1% span	10 Ohm	100 mA	16 bit

5. PROBE BREAK RESPONSE: Upscale drive, Input Fault Alarm bit set high, ALx LED illuminates.

6. TEMPERATURE INDICATION ACCURACY: ± (0.3% of span, +1°C). Includes NIST conformity, cold junction effect, A/D conversion errors, temperature coefficient and linearization conformity at 23 °C after 20 minute warm up.

7. ISOLATION LEVEL: 500 Vrms @ 50/60 Hz for 1 minute between the following:

OP1

OP2

OP3

OP4

Linear Output (GMP1 only)

Signal Input 1 and HCM

Signal Input 2 and HCM (GMP2 only)

Power Supply Input

8. COMMUNICATIONS: Provided by the Graphite host device

9. A/D CONVERTER: 16 bit resolution

10. DISCRETE OUTPUTS:

GMP1: Outputs 1 and 2 available as Solid State NFET or Form A relay. Output 3 is an SSR NFET or Form C relay.

GMP2: Outputs 1 through 4 available as Form A relay or Solid State NFET.

Solid State Output:

Type: Switched DC, N Channel open drain MOSFET

Current Rating: 1 A max

VDS ON: 0.3 V @ 1 A

VDS MAX: 30 VDC

Offstate Leakage Current: 0.5 mA max

Form A Relay Output:

Type: N.O.

Current Rating: 3 Amps @ 125 VAC or 30 VDC (resistive load)
1/10 HP @ 125 VAC

Life Expectancy: 200,000 cycles at maximum load rating.
(Decreasing load, increasing cycle time, and use of surge suppression such as RC snubbers increases life expectancy.)

Form C Relay Output:

Type: SPDT

Current Rating: 5 Amps @ 125 VAC or 28 VDC (resistive load)
1/8 HP @ 125 VAC

Life Expectancy: 100,000 cycles at maximum load rating.
(Decreasing load, increasing cycle time, and use of surge suppression such as RC snubbers increases life expectancy.)

11. CONTROL MODES:

Control: On/Off, P, PI, or PID

Output: Time proportioning or linear (GMP1 only)

Cycle Time: Programmable from 0.0 to 60.0 sec

Auto-Tune: When selected, sets proportional band, integral time, derivative time values, and output dampening time

Probe Break Action: Programmable response

Sensor Fail Response: Upscale

12. ALARMS:

Modes:

Manual

Absolute High Acting

Absolute Low Acting

Deviation High Acting

Deviation Low Acting

Inside Band Acting

Outside Band Acting

Reset Action: Programmable; automatic or latched

Standby Mode: Programmable; enable or disable

Hysteresis: Programmable

Sensor Fail Response: Upscale

13. ANALOG DC OUTPUT (optional, GMP1 only):

Selectable/programmable for 0-10 VDC, 0-20 mA, or 4-20 mA

Resolution:

Voltage: 500 μ V

Current: 1 μ A

Accuracy:

0.1% of full scale (18 to 28 °C)

0.2% of full scale (-40 to 75 °C)

Update Time: 0.0 to 60.0 sec

Compliance (for current output only): 500 Ω max.

Minimum load (voltage output only): 10 K Ω min.

Outputs are software selectable for either 10 V or 20 mA. The output range may be field calibrated to yield approximate 10% overrange and a small underrange (negative) signal.

14. HEATER CURRENT MONITOR INPUT (optional):

Type: 300 V max, 50 A max. Single phase, full wave monitoring of load currents

Input: 100 mA max. input for use with external current transformers

Input Resistance: 5 Ω

Accuracy: \pm 3.0% full scale, 5 to 100% of range

Frequency: 50 to 400 Hz

Minimum output on time for break alarm: 350 msec

Note: To ensure isolation to SELV circuits, use a UL Listed current transformer.

15. ENVIRONMENTAL CONDITIONS:

Operating Temperature Range:

GMP1RA00, GMP1RM00, GMP2R000, and GMP2RM00:

-40 to 70 °C T_{AMB}

GMP1SA00, GMP1SM00, GMP2S000, and GMP2SM00:

-40 to 75 °C T_{AMB}

Operating temperature is limited to 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}

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

Operating and Storage Humidity: 0 to 85% max. Relative humidity, non-condensing.

Altitude: Up to 2000 meters

16. CERTIFICATIONS AND COMPLIANCES:

CE Approved

EN 61326-1 Immunity to Industrial Locations

IEC/EN 61010-1

RoHS Compliant

ATEX/UKEX Approved (GMP1SA00, GMP1SM00,

GMP2S000, and GMP2SM00 only)

Ⓜ II 3 G Ex nA IIC T4 Gc

DEMKO 14 ATEX 1387X

EN 60079-0, -11, -15 -31

UL23UKEX2879X

IECEx Approved (GMP1SA00, GMP1SM00, GMP2S000, and GMP2SM00 only)

Ex nA IIC T4 Gc

IECEx UL 15.0035X

IEC 60079-0, -11, -15 -31

India PESO Approved:

A/P/HQ/MH/104/7441 (P549599)

UL Listed: File #E302106

UL Hazardous: File #E317425 (GMP1SA00, GMP1SM00, GMP2S000, and GMP2SM00 only)

ABS Type Approval for Shipboard Applications

17. CONSTRUCTION:

Case body is all metal construction.

18. CONNECTIONS:

Removable wire clamp screw terminal blocks.

Wire Gage: 28-16 AWG (0.32 mm - 1.29 mm) terminal gage wire

Torque: 1.95-2.21 inch-lbs (0.22-0.25 N-m)

19. MOUNTING:

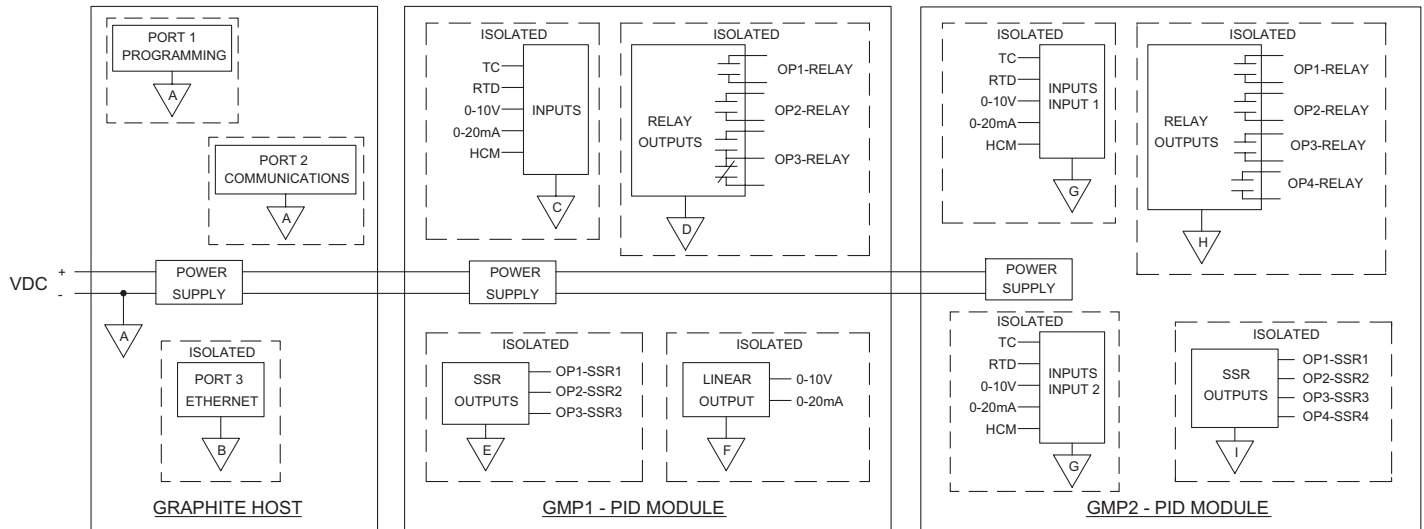
Screws to host.

20. WEIGHT:

GMP1: 8 oz (224 g)

GMP2: 8 oz (224 g)

Block Diagram



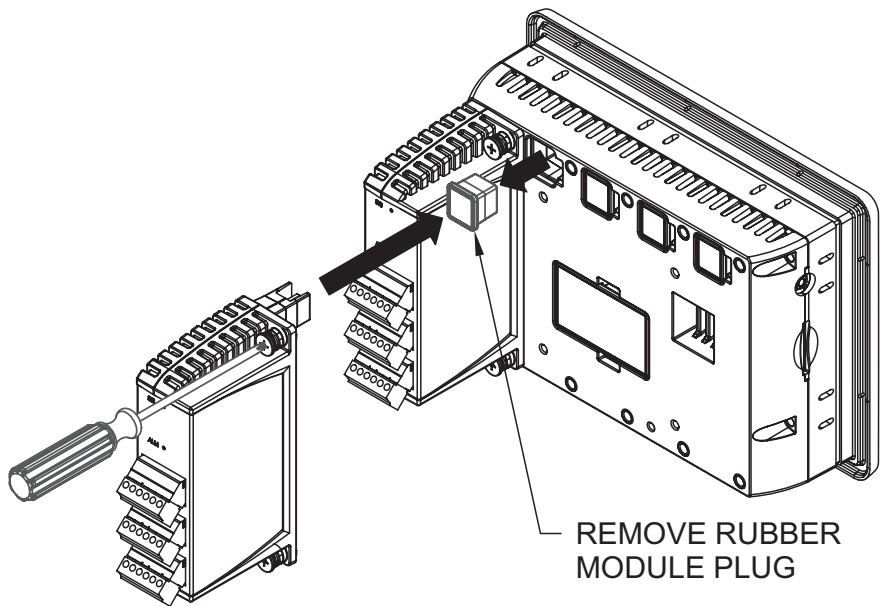
EMC INSTALLATION GUIDELINES

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

HARDWARE 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).

WARNING: Disconnect all power to the unit before installing or removing modules.

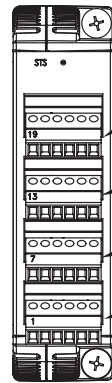


WIRING

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.

WARNING - EXPLOSION HAZARD -
Do not connect or disconnect cables while power is applied unless area is known to be non-hazardous.



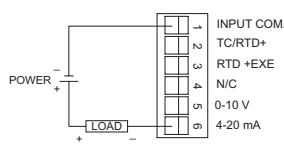
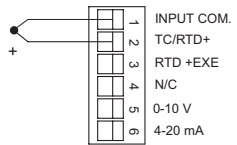
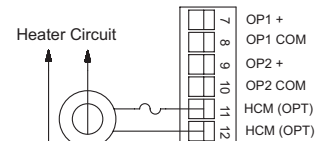
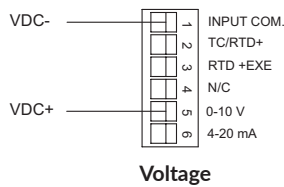
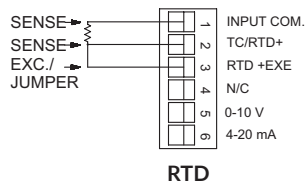
Terminals 19 to 24
(GMP2 Only)

Terminals 13 to 18

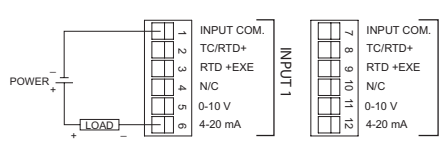
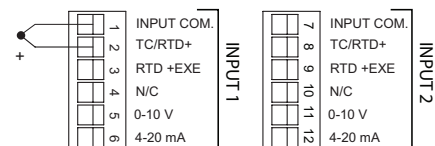
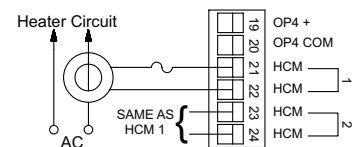
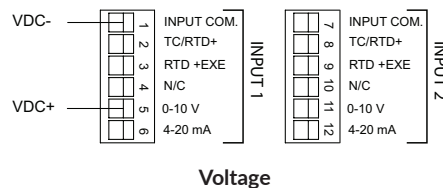
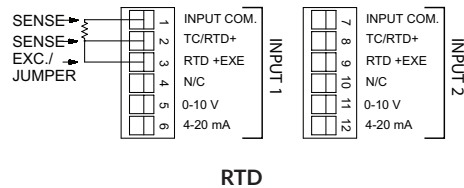
Terminals 7 to 12

Terminals 1 to 6

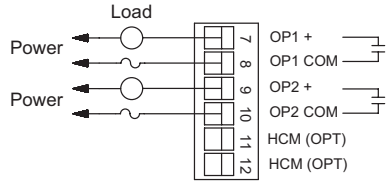
GMP1 Input Connections



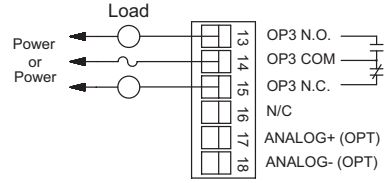
GMP2 Input Connections



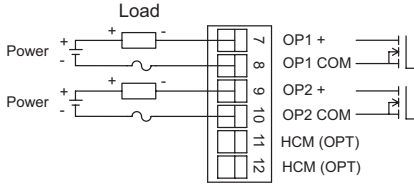
GMP1 Output Connections



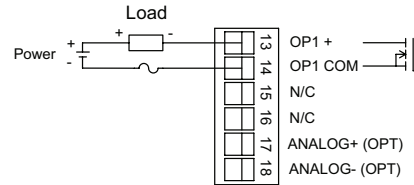
Outputs 1 and 2 - Relay Version



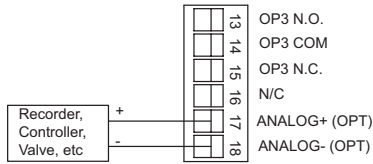
Output 3 - Relay Version



Outputs 1 and 2 - Solid State Version

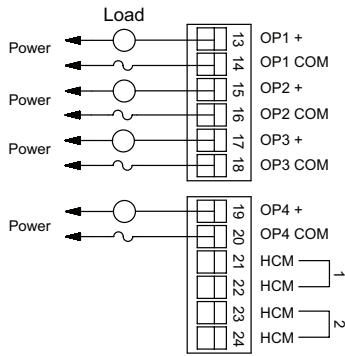


Output 3 - Solid State Version

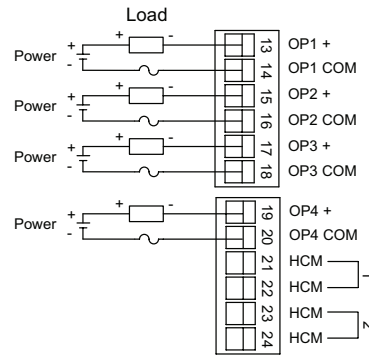


Analog Output

GMP2 Output Connections



Outputs 1- 4 - Relay Version



Outputs 1- 4 - Solid State Version

LEDs

STS – Status LED

The Status LED is a green LED that provides information regarding the state of the module. This includes indication of the various stages of the start-up routine (power-up), as well as any errors that may occur.

Startup Routine

LED	INDICATION
Off	Module is currently running the boot loader and/or being flash upgraded by Crimson.
Flashing Green	Module switching to configuration.
Green	Module performing normally.

Error States

LED	INDICATION
Flashing Green	Module is controlling properly, but has lost communication with the Host.

OP1, OP2, OP3, OP4* – Output Status LED

The OP1, OP2, OP3, and OP4* LEDs are factory configured to indicate the status of the outputs. The LEDs turn on when the output is active.

These LEDs may be remapped to various other module properties.

*GMP2 only

ALM or AL1 & AL2 – Alarm LED

The Alarm LEDs are factory configured to indicate the presence of an alarm. Whenever one of the seven alarms is active, the LED turns on.

These LEDs may be remapped to various other module properties.

FIRMWARE UPGRADE

The module's firmware is stored in flash memory so that software/hardware conflicts are avoided, and so features can be added in the future.

During a download, Crimson compares its own library of firmware files with those stored in the module. If they do not match, Crimson will download the necessary firmware.

CONFIGURATION

Programming is done via Crimson® software, a Windows® compatible configuration interface. Please see the Crimson manual for more information.

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
Input Modules	Graphite Module, Single PID, Relay and Analog Outputs ¹	GMP1RA00
	Graphite Module, Single PID, Relay and Heater Current Monitor ¹	GMP1RM00
	Graphite Module, Single PID, SSR and Analog Outputs	GMP1SA00
	Graphite Module, Single PID, SSR and Heater Current Monitor	GMP1SM00
	Graphite Module, Dual PID, Relay Outputs ¹	GMP2R000
	Graphite Module, Dual PID, Relay and Heater Current Monitor ¹	GMP2RM00
	Graphite Module, Dual PID, SSR Outputs	GMP2S000
	Graphite Module, Dual PID, SSR and Heater Current Monitor	GMP2SM00
Accessories	50 Amp Current Transformer (For Heater Current Models) UL Recognized component, Instrument Transformers, Inc. Part #2SFT500-0.1	CT005001

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

¹ Module is not suitable for use in hazardous locations.

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LIMITED WARRANTY

(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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