MODELS CSMSTRSX AND CSMSTRGT – ENHANCED MODULAR CONTROLLER SERIES MASTER

- PROVIDES ENHANCED FEATURES FOR DATA ACQUISITION OR MULTI-ZONE PID CONTROL APPLICATIONS
- WEBSERVER PROVIDES WORLDWIDE ACCESS TO DATA LOGS AND VIRTUAL HMI
- VIRTUAL HMI OFFERS BUILT-IN PC-BASED SCADA FUNCTIONALITY
- PERFORMS HIERARCHICAL CONTROL OF OTHER MODULES IN THE MODULAR CONTROLLER SERIES
- STORES MODULE CONFIGURATION INFORMATION, AND AUTOMATICALLY REPROGRAMS REPLACED MODULES
- EXTENSIVE BUILT-IN DRIVER LIST ALLOWS EASY DATA MAPPING TO PLCs, PCs, AND SCADA SYSTEMS
- INDEPENDENT SERIAL PORTS PROVIDE VIRTUALLY UNLIMITED INTEGRATION METHODS
- 10 BASE-T/100 BASE-TX ETHERNET CONNECTION PROVIDES NETWORKING CAPABILITY
- SUPPORTS UP TO 16 MODULAR CONTROLLER SERIES MODULES
- COMPACTFLASH® SLOT ALLOWS PROCESS DATA TO BE LOGGED DIRECTLY TO CSV FILES

GENERAL DESCRIPTION
The Model CSMSTR is a communications and control platform designed for use with Modular Controller Series slave modules. The CSMSTR uses a proprietary high speed serial protocol to communicate, via backplane connection, with up to 16 slave modules. Through the same connection, the Master also provides power to the modules.

When powered up, the CSMSTR automatically identifies and addresses connected slave modules. By storing the configuration information of all of the modules, the CSMSTR is able to automatically configure modules if they are replaced.

The Master provides high-speed RS232/422/485 communication ports and an Ethernet port for connection to PCs, PLCs, and SCADA systems. An extensive list of master and slave protocol drivers are available to allow the CSMSTR to share and exchange variable data with external devices. The 10 Base-T/100 Base-TX Ethernet port can also be used to connect and share data with other devices at high speeds. The virtual HMI feature allows you to create and control an HMI from any networked PC. An onboard CompactFlash slot provides storage for the Master’s built-in data logger.

The design of the Modular Controller Series high density packaging and DIN rail mounting saves time and panel space. The controller snaps easily onto standard top hat (T) profile DIN rail.

SOFTWARE
The CSMSTR is programmed with Crimson 2.0 software for Windows® 2000 or later platforms. The software is an easy to use, graphical interface which provides a means of communication configuration, as well as commissioning and calibration of new systems.

CONTENTS OF PACKAGE
- CS Master
- Termination Plug
- Terminal Block for connecting power.

SAFETY SUMMARY
All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the controller to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the controller. An independent and redundant temperature limit indicator with alarm outputs is strongly recommended.

CompactFlash is a registered trademark of CompactFlash Association.
ORDERING INFORMATION

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Module</td>
<td>CSMSTR1</td>
<td>Modular Controller Master, Comms, Ethernet</td>
<td>CSMSTRV2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modular Controller Master with multiple protocol converter, data logger, web server with Virtual HMI up to QVGA (320 x 240) size and expansion slot.</td>
<td>CSMSTRSX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modular Controller Master with multiple protocol converter, data logger, web server with Virtual HMI up to VGA (640 x 480) size and expansion slot with increased SDRAM.</td>
<td>CSMSTRGT</td>
</tr>
<tr>
<td>Communications Cables (10 feet)</td>
<td>CBL</td>
<td>RS232 Programming Cable</td>
<td>CBLPRG00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>USB Cable</td>
<td>CBLUSB00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communications Cables1</td>
<td>CBLxxxxxx</td>
</tr>
<tr>
<td>Software</td>
<td>SFCRM2</td>
<td>Crimson 2.0, Modular Controller Manual, and Download Cable</td>
<td>SFCRM2MC</td>
</tr>
<tr>
<td>Power Supply</td>
<td>PSDR2</td>
<td>DIN Rail Mounted Power Supply</td>
<td>PSDRxxxxx</td>
</tr>
<tr>
<td>Accessories</td>
<td>XCCN</td>
<td>CANopen option card for Modular Controller or Data Station Plus</td>
<td>XCCN0000</td>
</tr>
<tr>
<td></td>
<td>XCDN</td>
<td>DeviceNet option card for Modular Controller or Data Station Plus</td>
<td>XCDN0000</td>
</tr>
<tr>
<td></td>
<td>XCPB</td>
<td>PROFIBUS option card for Modular Controller or Data Station Plus</td>
<td>XCPBDP00</td>
</tr>
<tr>
<td></td>
<td>XCRS</td>
<td>RS232/485 option card for Modular Controller or Data Station Plus</td>
<td>XCRS0000</td>
</tr>
<tr>
<td></td>
<td>G3CF1</td>
<td>CompactFlash Card 3</td>
<td>G3CFxxx</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rail Stops (Qty 2)</td>
<td>RSRTSP00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Base</td>
<td>CSBASE00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Termination Plug</td>
<td>CSTERM00</td>
</tr>
</tbody>
</table>

1 Visit www.redlion.net for a complete list of PID modules, data acquisition modules, communications drivers and cables.
2 Use this part number to purchase Crimson on CD with a printed Modular Controller Manual, USB cable, and RS-232 cable.
3 Otherwise, download free of charge from www.redlion.net.
4 Industrial grade two million write cycles.
HARDWARE

INSTALLATION

DIN rail should be mounted horizontally so that the unit’s ventilation holes are vertical in relation to cabinet orientation. A minimum clearance of 1 inch (25.4 mm) should be maintained above and below the unit in order to ensure proper thermal regulation.

Figure 1 - Attach CSMSTR Master To DIN Rail
Figure 2 - Attach Slave Bases To DIN Rail
Figure 3 - Attach Termination Plug*
Figure 4 - Installation Complete

COMPACTFLASH® CARD

CompactFlash socket is a Type II socket that can accept either Type I or II cards. Use cards with a minimum of 4 Mbytes and a maximum of 2 Gbytes with the Master’s CompactFlash socket. Cards are available at most computer and office supply retailers. CompactFlash can be used for configuration transfers, data logging, and trending.

Information stored on a CompactFlash card can be read by a card reader attached to a PC. This information is stored in IBM (Windows®) PC compatible FAT16 file format.

Note: Do not remove or insert the CompactFlash card while power is applied.

POWER SUPPLY REQUIREMENTS

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:

– The power supply must be mounted close to the unit, with usually not more than 6 feet (1.8 m) of cable between the supply and the master. Ideally, the shortest length possible should be used.

– The wire used to connect the master’s power supply should be at least 22-gage wire. 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 a Class 2 or SELV rating is to be used. A Class 2 or SELV 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.

Visit www.redlion.net for a complete list of our PSDR Series of Class 2 power supplies.

NOTE

For reliable operation in all of our products, Red Lion recommends the use of SanDisk®, SimpleTech, and SMART® brands of CompactFlash cards. Industrial grade versions that provide up to two million write/erase cycles minimum are available from Red Lion.
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. To reduce the chance of noise spikes entering the unit via the power lines, connections should be made to a clean source. Connecting to circuits that also power loads such as contactors, relays, motors, solenoids etc. should be avoided.

2. The unit should be mounted in a metal enclosure, which is properly connected to protective earth.

3. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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.
   c. Connect the shield to common of the master and leave the other end of the shield unconnected and insulated from earth ground.

4. 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.

5. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.

6. In extremely high EMI environments, the use of external EMI suppression devices is effective. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite part number 0443167251 (RLC part number FCOR0000)
     - TDK part number ZCAT3035-1330A
     - Steward part number 28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner part number FN610-1/07 (RLC part number LFIL0000)
     - Schaffner part number FN670-1.8/07
     - Corcom part number 1 VR3

Visit RLC’s web site at www.redlion.net for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.
COMMUNICATION PORTS

RS232/PG

WARNING: Do NOT use a standard DH-485 cable to connect this port to Allen Bradley equipment.

PORT 3 - ETHERNET CONNECTION

* Use appropriate communications cable. See Ordering Information for descriptions of the available cables.
CONFIGURING A MASTER

The Master is configured using Crimson 2.0 software. Crimson 2.0 is available as a free download from Red Lion’s website, or it can be ordered on CD. Updates to Crimson 2.0 for new features and drivers are posted on the website as they become available. By configuring the Master using the latest version of Crimson 2.0, you are assured that your unit has the most up to date feature set. Crimson 2.0 software can configure the Master through the RS232/PG port, USB/PG port, Ethernet or CompactFlash. The USB/PG port is connected using a standard USB cable with a Type B connector.

The driver needed to use the USB port will be installed with Crimson 2.0. The RS232/PG port uses a programming cable made by Red Lion to connect to the DB9 COM port of your computer. If making your own cable, refer to the “Master Port Pin Outs” for wiring information.

The CompactFlash can be used to program a Master by placing a configuration file and firmware on the CompactFlash card. The card is then inserted into the target Master and powered. Refer to the Crimson 2.0 literature for more information on the proper names and locations of the files.

CABLES AND DRIVERS

Red Lion has a wide range of cables and drivers for use with many different communication types. A list of these drivers and cables along with pin outs is available from Red Lion’s website. New cables and drivers are added on a regular basis. If making your own cable, refer to the “Master Port Pin Outs” for wiring information.

USB, DATA TRANSFERS FROM THE COMPACTFLASH CARD

In order to transfer data from the CompactFlash card via the USB port, a driver must be installed on your computer. This driver is installed with Crimson 2.0 and is located in the folder C:\Program Files\Red Lion Controls\Crimson 2.0\Device\ after Crimson 2.0 is installed. This may have already been accomplished if your Master was configured using the USB port.

Once the driver is installed, connect the Master to your PC with a USB cable, and follow “Mounting the CompactFlash” instructions in the Crimson 2.0 user manual.

Note that using the USB port for frequent data transfers is not recommended. For frequent data transfers it is recommended that the Ethernet connection be used. Through the Ethernet connection a web page can be set up to view logged data. Refer to the Crimson 2.0 manual for details.

COMMUNICATING WITH THE MASTER

For example, when wiring to a hub or switch use a straight-through cable, but when connecting to another NIC use a crossover cable.

The Crimson 2.0 manual contains additional information on Ethernet communications.

RS232 PORTS

The Master has two RS232 ports. There is the RS232/PG port and the COMMS port. Although only one of these ports can be used for programming, both ports can be used for communications with a PLC. The RS232/PG port can be used for either master or slave protocols.

RS422/485 PORT

The Master has one RS422/485 port. This port can be configured to act as either RS422 or RS485.

DH485 COMMUNICATIONS

The Master’s RS422/485 COMMS port can also be used for Allen Bradley DH485 communications.

WARNING: DO NOT use a standard DH485 cable to connect this port to Allen Bradley equipment. A cable and wiring diagram are available from Red Lion.
LEDS

STS – STATUS LED

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

Startup Routine

<table>
<thead>
<tr>
<th>INDICATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapidly Flashing</td>
<td>Master is currently running the boot loader and/or being flash upgraded by Crimson.</td>
</tr>
<tr>
<td>Steady</td>
<td>Master is operating properly.</td>
</tr>
</tbody>
</table>

Error States

<table>
<thead>
<tr>
<th>LED</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 blink, pause, repeat</td>
<td>One or more slave modules are missing from the system. Master and installed modules will perform normally in this state.</td>
</tr>
<tr>
<td>2 blinks, pause, repeat</td>
<td>Missing configuration, or configuration being updated by Crimson.</td>
</tr>
<tr>
<td>3 blinks, pause, repeat</td>
<td>Quantity of module bases does not match configuration file. Master will not communicate with the modules until the error is corrected.</td>
</tr>
<tr>
<td>4 blinks, pause, repeat</td>
<td>Termination plug not installed, or one or more bases are malfunctioning. Master will not communicate with the modules until the plug is reinstalled, and power is cycled.</td>
</tr>
</tbody>
</table>

CF LED

<table>
<thead>
<tr>
<th>LED</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>No CompactFlash Card is present.</td>
</tr>
<tr>
<td>Steady</td>
<td>Valid CompactFlash card is present.</td>
</tr>
<tr>
<td>Flashing Rapidly</td>
<td>CompactFlash card is being checked.</td>
</tr>
<tr>
<td>Flickering</td>
<td>Unit is writing to the CompactFlash, either because it is storing data, or because the PC connected via the USB port has locked the drive.</td>
</tr>
<tr>
<td>Flashing Slowly</td>
<td>Incorrectly formatted CompactFlash card present.</td>
</tr>
</tbody>
</table>

Note: LEDs are not available on the Programming Port: RS232/PG.

USER COMMUNICATION PORTS - TX/ RX LEDS

<table>
<thead>
<tr>
<th>LED</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GREEN</td>
<td>Transmitting</td>
</tr>
<tr>
<td>RED</td>
<td>Receiving</td>
</tr>
</tbody>
</table>

ETHERNET LEDS

<table>
<thead>
<tr>
<th>LED</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>YELLOW (Solid)</td>
<td>Link Established</td>
</tr>
<tr>
<td>YELLOW (Flashing)</td>
<td>Network Activity</td>
</tr>
<tr>
<td>GREEN</td>
<td>10 BASE-T Communications</td>
</tr>
<tr>
<td>AMBER</td>
<td>100 BASE-TX Communications</td>
</tr>
</tbody>
</table>

1. Do not turn off power to the unit while this light is flickering. The unit writes data in two minute intervals. Later Microsoft operating systems will not lock the drive unless they need to write data; Windows 98 may lock the drive any time it is mounted, thereby interfering with logging. Refer to "Mounting the CompactFlash" in the Crimson 2.0 User Manual.
LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company’s liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company’s option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODELS CSMSTRLE – ENHANCED MODULAR CONTROLLER SERIES MASTER

- ADDS MULTIPLE PROTOCOL CONVERSION FUNCTIONALITY TO DATA ACQUISITION AND MULTI-ZONE PID CONTROL APPLICATIONS
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- SUPPORTS UP TO 16 MODULAR CONTROLLER SERIES MODULES
- SUPPORTS UP TO NINE PROTOCOLS SIMULTANEOUSLY (with expansion card)

GENERAL DESCRIPTION

The Model CSMSTRLE is a communications and control platform designed for use with Modular Controller Series slave modules. The CSMSTR uses a proprietary high speed serial protocol to communicate, via backplane connection, with up to 16 slave modules. Through the same connection, the Master also provides power to the modules.

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DIAMETERS 1 in inches (mm)

3.09 (78.5)
4.15 (105.4)
5.30 (134.7)

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

CompactFlash is a registered trademark of CompactFlash Association.
PART NUMBER: PSDRXXXX

5. Industrial grade two million write cycles.

4. Use this part number to purchase Crimson on CD with a printed Modular Controller Manual, USB cable, and RS-232 cable.

3. The module's with analog input and/or output signals may have their signals deviate during disturbance but self-recover when the disturbance is removed.

2. Criterion B: Temporary loss of performance from which the unit self-recoverers.


SAFETY
UL Listed, File #E302106, UL508, CSA 22.2 No. 14-M05
LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.

ELECTROMAGNETIC COMPATIBILITY

Immunity to Industrial Locations:
- Electrostatic discharge EN 61000-4-2
  - Criterion B
    - 4 kV contact discharge
    - 8 kV air discharge
  - Criterion B'
    - 10 V/m
  
- Fast transients (burst) EN 61000-4-4
  - Criterion B
    - 2 kV
    - I/O signal 1 kV
  
- Surge EN 61000-4-5
  - Criterion B
    - power
    - 1kV L-L, 2 kV L-G
  
- RF conducted interference EN 61000-4-6
  - Criterion A
    - 3 V/rms

Emissions:
- Emissions EN 55011
  - Class A

Notes:
2. Criterion B: Temporary loss of performance from which the unit self-recoverers.
3. The module's with analog input and/or output signals may have their signals deviate during disturbance but self-recover when the disturbance is removed.

WEIGHT: 15.1 oz (456.4 g)
HARDWARE
INSTALLATION

DIN rail should be mounted horizontally so that the unit’s ventilation holes are vertical in relation to cabinet orientation. A minimum clearance of 1 inch (25.4 mm) should be maintained above and below the unit in order to ensure proper thermal regulation.

Figure 1 - Attach CSMSTRLE Master To DIN Rail

Figure 2 - Attach Slave Bases To DIN Rail

Figure 3 - Attach Termination Plug*
* Supplied with CSMSTRLE Master Module.

Figure 4 - Installation Complete

COMPACTFLASH® CARD

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3. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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.
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WIRING
POWER CONNECTION

PROGRAMMING PORTS

RS232/PG
USB/PG
ETHERNET

CBLPROC0
OR
CBLUSB00
OR
Ethernet (Crossover)
COMMUNICATION PORTS

RS232/PG

WARNING: Do NOT use a standard DH-485 cable to connect this port to Allen Bradley equipment.

RS232

* Use appropriate communications cable. See Ordering Information for descriptions of the available cables.

RS485

PORT 3 - ETHERNET CONNECTION

Standard Ethernet cable
COMMunicating with the Master

Configuring a Master

The Master is configured using Crimson® 2.0 software. Crimson 2.0 is available as a free download from Red Lion’s website, or it can be ordered on CD. Updates to Crimson 2.0 for new features and drivers are posted on the website as they become available. By configuring the Master using the latest version of Crimson 2.0, you are assured that your unit has the most up to date feature set. Crimson 2.0 software can configure the Master through the RS232/PG port, USB/PG port, Ethernet or CompactFlash. The USB/PG port is connected using a standard USB cable with a Type B connector.

The driver needed to use the USB port will be installed with Crimson 2.0. The RS232/PG port uses a programming cable made by Red Lion to connect to the DB9 COM port of your computer. If making your own cable, refer to the “Master Port Pin Outs” for wiring information.

The CompactFlash can be used to program a Master by placing a configuration file and firmware on the CompactFlash card. The card is then inserted into the target Master and powered. Refer to the Crimson 2.0 literature for more information on the proper names and locations of the files.

Cables and Drivers

Red Lion has a wide range of cables and drivers for use with many different communication types. A list of these drivers and cables along with pin outs is available from Red Lion’s website. New cables and drivers are added on a regular basis. If making your own cable, refer to the “Master Port Pin Outs” for wiring information.

Usb, Data Transfers From the Compactflash Card

In order to transfer data from the CompactFlash card via the USB port, a driver must be installed on your computer. This driver is installed with Crimson 2.0 and is located in the folder C:\Program Files\Red Lion Controls\Crimson 2.0\Device after Crimson 2.0 is installed. This may have already been accomplished if your Master was configured using the USB port.

Once the driver is installed, connect the Master to your PC with a USB cable, and follow “Mounting the CompactFlash” instructions in the Crimson 2.0 user manual.

Note: The USB port is for system set-up and diagnostics and is not intended for permanent connection.

Ethernet Communications

Ethernet communications can be established at either 10 BASE-T or 100 BASE-TX. The Master’s RJ45 jack is wired as a NIC (Network Interface Card). For example, when wiring to a hub or switch use a straight-through cable, but when connecting to another NIC use a crossover cable.

The Crimson 2.0 manual contains additional information on Ethernet communications.

Troubleshooting

If for any reason you have trouble operating, connecting, or simply have questions concerning your new Master, contact Red Lion’s technical support. For contact information, refer to the back page of this bulletin for phone and fax numbers.

EMAIL: techsupport@redlion.net
Web Site: http://www.redlion.net

RS232 Ports

The Master has two RS232 ports. There is the RS232/PG port and the COMMS port. Although only one of these ports can be used for programming, both ports can be used for communications with a PLC. The RS232/PG port can be used for either master or slave protocols.

RS422/485 Port

The Master has one RS422/485 port. This port can be configured to act as either RS422 or RS485.

RS422/485 4-Wire Connections

RS485 2-Wire Connections

Note: All Red Lion devices connect A to A and B to B, except for Paradigm devices. Refer to www.redlion.net for additional information.

DH485 Communications

The Master’s RS422/485 COMMS port can also be used for Allen Bradley DH485 communications.

Warning: Do not use a standard DH485 cable to connect this port to Allen Bradley equipment. A cable and wiring diagram are available from Red Lion.
LEDS

STS - STATUS LED

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

Startup Routine

<table>
<thead>
<tr>
<th>INDICATION</th>
<th>LED</th>
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</thead>
<tbody>
<tr>
<td>Rapidly Flashing</td>
<td>Master is currently running the boot loader and/or being flash upgraded by Crimson.</td>
</tr>
<tr>
<td>Steady</td>
<td>Master is operating properly.</td>
</tr>
</tbody>
</table>

Error States

<table>
<thead>
<tr>
<th>LED</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 blink, pause, repeat</td>
<td>One or more slave modules are missing from the system. Master and installed modules will perform normally in this state.</td>
</tr>
<tr>
<td>2 blinks, pause, repeat</td>
<td>Missing configuration, or configuration being updated by Crimson.</td>
</tr>
<tr>
<td>3 blinks, pause, repeat</td>
<td>Quantity of module bases does not match configuration file. Master will not communicate with the modules until the error is corrected.</td>
</tr>
<tr>
<td>4 blinks, pause, repeat</td>
<td>Termination plug not installed, or one or more bases are malfunctioning. Master will not communicate with the modules until the plug is reinstalled, and power is cycled.</td>
</tr>
</tbody>
</table>

CF LED

<table>
<thead>
<tr>
<th>LED</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>No CompactFlash Card is present.</td>
</tr>
<tr>
<td>Steady</td>
<td>Valid CompactFlash card is present.</td>
</tr>
<tr>
<td>Flashing Rapidly</td>
<td>CompactFlash card is being checked.</td>
</tr>
<tr>
<td>Flickering</td>
<td>Unit is writing to the CompactFlash, either because it is storing data, or because the PC connected via the USB port has locked the drive.</td>
</tr>
<tr>
<td>Flashing Slowly</td>
<td>Incorrectly formatted CompactFlash card present.</td>
</tr>
</tbody>
</table>

1. Do not turn off power to the unit while this light is flickering. The unit writes data in two minute intervals. Later Microsoft operating systems will not lock the drive unless they need to write data; Windows 98 may lock the drive any time it is mounted, thereby interfering with logging. Refer to “Mounting the CompactFlash” in the Crimson 2.0 User Manual.

USER COMMUNICATION PORTS - TX/ RX LEDS

<table>
<thead>
<tr>
<th>LED</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GREEN</td>
<td>Transmitting</td>
</tr>
<tr>
<td>RED</td>
<td>Receiving</td>
</tr>
</tbody>
</table>

Note: LEDs are not available on the Programming Port: RS232/PG.

ETHERNET LEDS

<table>
<thead>
<tr>
<th>LED</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>YELLOW (Solid)</td>
<td>Link Established</td>
</tr>
<tr>
<td>YELLOW (Flashing)</td>
<td>Network Activity</td>
</tr>
<tr>
<td>GREEN</td>
<td>10 BASE-T Communications</td>
</tr>
<tr>
<td>AMBER</td>
<td>100 BASE-TX Communications</td>
</tr>
</tbody>
</table>

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company’s liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company’s option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
GENERAL DESCRIPTION

The Model CSMSTRV2 is a communications and control platform designed for use with Modular Controller Series slave modules. The CSMSTRV2 uses a proprietary high speed serial protocol to communicate, via backplane connection, with up to 16 slave modules. Through the same connection, the Master also provides power to the modules.

When powered up, the CSMSTRV2 automatically identifies and addresses connected slave modules. By storing the configuration information of all of the modules, the CSMSTRV2 is able to automatically configure modules if they are replaced.

The Master provides high-speed RS232/422/485 communication ports and an Ethernet port for connection to PCs, PLCs, and SCADA systems. An extensive list of master and slave protocol drivers are available to allow the CSMSTRV2 to share and exchange variable data with external devices. The 10 Base-T/100 Base-TX Ethernet port can also be used to connect and share data with other devices at high speeds.

The CSMSTRV2 was designed as a direct replacement for the original CSMSTRSE. This new model provides benefits such as support via Crimson® 2.0 software, which allows configuration files to be uploaded. To save programming time, files originally created in Crimson 1.0 (.cdb files) may be imported into Crimson 2.0.

The design of the Modular Controller Series high density packaging and DIN rail mounting saves time and panel space. The controller snaps easily onto standard top hat (T) profile DIN rail.

SOFTWARE

The CSMSTRV2 is programmed with Crimson® 2.0 software for Windows® 2000 or later platforms. The software is an easy to use, graphical interface which provides a means of communication configuration, as well as commissioning and calibration of new systems.

CONTENTS OF PACKAGE

- CS Master
- Termination Plug
- Terminal Block for connecting power.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the controller to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the controller. An independent and redundant temperature limit indicator with alarm outputs is strongly recommended.
**SPECIFICATIONS**

1. **POWER:** 24 VDC ± 10%
   - 400 mA min. (1 module)
   - 3 Amps max. (16 modules)
   - Must use Class 2 or SELV rated power supply.

2. **COMMUNICATIONS:**
   - USB/PG Port: Adheres to USB specification 1.1. Device only using Type B connection.
   - Serial Ports: Format and Baud Rates for each port are individually software programmable up to 115,200 baud.
   - COMMS Ports: RS422/485 port via RJ45, and RS232 port via RJ12
   - DH485 TXEN: Transmit enable; open collector, V_{OH} = 15 VDC, V_{OL} = 0.5 V @ 25 mA max.

   **Note:** For additional information on the communications or signal common and connections to earth ground please see the “Connecting to Earth Ground” in the section “Installing and Powering the CSMSTRSX.”

3. **ETHERNET PORT:**
   - RJ45 jack is wired as a NIC (Network Interface Card).

4. **LEDs:**
   - STS – Status LED indicates condition of master.
   - TX/RX – Transmit/Receive LEDs show serial activity.
   - Ethernet – Link and activity LEDs.

5. **MEMORY:**
   - On-board User Memory: 4 Mbytes of non-volatile Flash memory.
   - On-board SDRAM: 2 Mbytes

6. **ENVIRONMENTAL CONDITIONS:**
   - Operating Temperature Range: 0 to 50°C
   - Storage Temperature Range: -30 to +70°C
   - Operating and Storage Humidity: 80% max relative humidity, non-condensing, from 0 to 50°C
   - Vibration According to IEC 68-2-6: 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2 g’s.
   - Shock According to IEC 68-2-27: Operational 25 g, 11 msec in 3 directions.
   - Altitude: Up to 2000 meters

7. **CONSTRUCTION:**
   - Case body is burgundy high impact plastic and stainless steel. Installation Category I, Pollution Degree 2.

8. **POWER CONNECTION:**
   - Wiring: 3 V/rms
   - Electrostatic discharge: EN 61000-4-2 Criterion B
   - Fast transients (burst): EN 61000-4-4 Criterion B
   - Surge: EN 61000-4-5 Criterion B
   - Immunity to RF conducted interference: EN 61000-4-6 Criterion A

9. **ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Module</td>
<td>CSMSTRV2</td>
<td>Modular Controller Master, Comms, Ethernet</td>
<td></td>
</tr>
<tr>
<td>Communications</td>
<td>CBL</td>
<td>RS232 Programming Cable</td>
<td>CBLPROG0</td>
</tr>
<tr>
<td>Cables (10 feet)</td>
<td>USB</td>
<td>Cable</td>
<td>CBLUSB00</td>
</tr>
<tr>
<td>Software</td>
<td>SFCRM2MC</td>
<td>Crimson® 2.0, Modular Controller Manual, and Download Cable</td>
<td>SFCRM2M</td>
</tr>
<tr>
<td>Power Supply</td>
<td>G3CF</td>
<td>CompactFlash Card</td>
<td>G3CFxxxx</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
<td>Rail Stops (Qty 2)</td>
<td>RSRSTP00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Base</td>
<td>CSBASE00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Termination Plug</td>
<td>CSTERM00</td>
</tr>
</tbody>
</table>

**Notes:**

1 Visit www.redlion.net for a complete list of PID modules, data acquisition modules, communications drivers and cables.

The CSMSTRV2 was designed as a direct replacement for the original CSMSTRSE. This new model provides benefits such as support via Crimson® 2.0 software that allows configuration files to be uploaded. To save programming time, files originally created in Crimson 1.0 (.cdb files) may be imported into Crimson 2.0.

2 Use this part number to purchase Crimson on CD with a printed Modular Controller Manual, USB cable, and RS-232 cable. Otherwise, download free of charge from www.redlion.net.

3 Industrial grade two million write cycles.
HARDWARE INSTALLATION

DIN rail should be mounted horizontally so that the unit’s ventilation holes are vertical in relation to cabinet orientation. A minimum clearance of 1 inch (25.4 mm) should be maintained above and below the unit in order to ensure proper thermal regulation.

Figure 1 - Attach CSMSTR Master To DIN Rail

Figure 2 - Attach Slave Bases To DIN Rail

Figure 3 - Attach Termination Plug*

Figure 4 - Installation Complete

POWER SUPPLY REQUIREMENTS

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:

– The power supply must be mounted close to the unit, with usually not more than 6 feet (1.8 m) of cable between the supply and the master. Ideally, the shortest length possible should be used.
– The wire used to connect the master’s power supply should be at least 22-gage wire. 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 a Class 2 or SELV rating is to be used. A Class 2 or SELV 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.

Visit www.redlion.net for a complete list of our PSDR Series of Class 2 power supplies.
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. To reduce the chance of noise spikes entering the unit via the power lines, connections should be made to a clean source. Connecting to circuits that also power loads such as contactors, relays, motors, solenoids etc. should be avoided.
2. The unit should be mounted in a metal enclosure, which is properly connected to protective earth.
3. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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.
   c. Connect the shield to common of the master and leave the other end of the shield unconnected and insulated from earth ground.
4. 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.
5. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
6. In extremely high EMI environments, the use of external EMI suppression devices is effective. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite part number 0443167251 (RLC part number FCOR0000)
     - TDK part number ZCAT3035-1330A
     - Steward part number 28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner part number FN610-1/07 (RLC part number LFIL0000)
     - Schaffner part number FN670-1.8/07
     - Corcom part number 1 VR3
   - Visit RLC’s web site at www.redlion.net for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.

WIRING

POWER CONNECTION

PROGRAMMING PORTS

RS232/PG

USB/PG

ETHERNET

Ethernet (Crossover)
**COMMUNICATION PORTS**

**RS232/PG**

* Use appropriate communications cable. See Ordering Information for descriptions of the available cables.

**WARNING:** Do NOT use a standard DH-485 cable to connect this port to Allen Bradley equipment.

---

**PORT 3 - ETHERNET CONNECTION**

**RS232**

**RS485**

**Standard Ethernet cable**

* Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
CONFIGURING A MASTER

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The driver needed to use the USB port will be installed with Crimson 2.0. The RS232/PG port uses a programming cable made by Red Lion to connect to the DB9 COM port of your computer. If making your own cable, refer to the “Master Port Pin Outs” for wiring information.

CABLES AND DRIVERS

Red Lion has a wide range of cables and drivers for use with many different communication types. A list of these drivers and cables along with pin outs is available from Red Lion’s website. New cables and drivers are added on a regular basis. If making your own cable, refer to the “Master Port Pin Outs” for wiring information.

Note: The USB port is for system set-up and diagnostics and is not intended for permanent connection.

ETHERNET COMMUNICATIONS

Ethernet communications can be established at either 10 BASE-T or 100 BASE-TX. The Master’s RJ45 jack is wired as a NIC (Network Interface Card). For example, when wiring to a hub or switch use a straight-through cable, but when connecting to another NIC use a crossover cable.

The Crimson 2.0 manual contains additional information on Ethernet communications.

Communicating with the Master

RS232 PORTS

The Master has two RS232 ports. There is the RS232/PG port and the COMMS port. Although only one of these ports can be used for programming, both ports can be used for communications with a PLC. The RS232/PG port can be used for either master or slave protocols.

RS422/485 PORT

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Cables and drivers

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The Crimson 2.0 manual contains additional information on Ethernet communications.

DH485 COMMUNICATIONS

The Master’s RS422/485 COMMS port can also be used for Allen Bradley DH485 communications.

WARNING: DO NOT use a standard DH485 cable to connect this port to Allen Bradley equipment. A cable and wiring diagram are available from Red Lion.
LEDS

STS - STATUS LED
The green Status LED provides information regarding the state of the Master, as well as the rest of the system. This includes indication of the various stages of the start-up routine (power-up), and any errors that may occur.

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<td>Missing configuration, or configuration being updated by Crimson.</td>
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<td>Quantity of module bases does not match configuration file. Master will not communicate with the modules until the error is corrected.</td>
</tr>
<tr>
<td>4 blinks, pause, repeat</td>
<td>Termination plug not installed, or one or more bases are malfunctioning. Master will not communicate with the modules until the plug is reinstalled, and power is cycled.</td>
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</table>

ETHERNET LEDS

<table>
<thead>
<tr>
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<th>INDICATION</th>
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<tbody>
<tr>
<td>YELLOW (Solid)</td>
<td>Link Established</td>
</tr>
<tr>
<td>YELLOW (Flashing)</td>
<td>Network Activity</td>
</tr>
<tr>
<td>GREEN</td>
<td>10 BASE-T Communications</td>
</tr>
<tr>
<td>AMBER</td>
<td>100 BASE-TX Communications</td>
</tr>
</tbody>
</table>

Note: LEDs are not available on the Programming Port: RS232/PG.
The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company’s liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company’s option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODEL CSPID – MODULAR CONTROLLER SERIES PID MODULES

- DEDICATED SINGLE AND DUAL PID MODULES FOR THE MODULAR CONTROLLER SERIES
- HOT-SWAPPABLE REPLACEMENT REDUCES DOWNTIME
- AUTO ADDRESSING MINIMIZES CONFIGURATION TIME
- FULLY ISOLATED DESIGN PROVIDES RELIABLE OPERATION
- PID CONTROL WITH REDUCED OVERSHTH
- 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, CSPID1 ONLY)
- HEATER CURRENT INPUT (OPTIONAL) ENSURES DETECTION OF HEATER CIRCUIT FAILURE
- WINDOWS® CONFIGURATION SOFTWARE

GENERAL DESCRIPTION

The Model CSPID series modules are full featured PID controllers designed for use with the Modular Controller Series. The CSPID1 is a single loop controller, while the CSPID2 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 (CSPID1 only), the CSPID 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 CSPID1’s optional linear output can be assigned to transmit virtually any internal variable.

The CSPID modules connect and communicate via a backplane connection to the CSMSTR Modular Controller Series Master. The CSMSTR, equipped with serial ports as well as an Ethernet port, allows the system to share data with PCs, PLCs, and SCADA systems. The Master supports any combination of up to 16 CS Series modules.

The CSPID modules are available with various discrete output combinations, including relays, open drain MOSFETs, and triac outputs. 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.

Internal power management circuits allow the modules to be replaced while power is applied, which reduces downtime in the event of a relay failure. All configuration information is stored locally within each module, as well as in the Master, so replacement modules do not need to be configured.

The Modular Controller Series’ high density packaging and DIN rail mounting saves time and panel space. The backplane connection provides power and communication to the module and snaps easily onto standard top hat (T) profile DIN rail.

CONFIGURATION

The Modular Controller Series is configured with Windows® compatible Crimson® software. The software is an easy to use, graphical interface which provides a means of communication configuration, as well as commissioning and calibration of new systems.

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 (CSPID1 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 option provides immediate warning of a circuit short or open, instead of waiting for a high or low temperature shutdown alarm.

DIMENSIONS 1 in inches (mm)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>126.5</td>
</tr>
<tr>
<td>Width</td>
<td>105.9</td>
</tr>
<tr>
<td>Depth</td>
<td>31.5</td>
</tr>
</tbody>
</table>

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

CAUTION: Risk of electric shock.

Tel +1 (717) 767-6511
Fax +1 (717) 764-0839
www.redlion.net

Bulletin No. CSPID1-F
Drawing No. LP0542
Released 03/09

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
SAFETY SUMMARY
All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the controller to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the controller. An independent and redundant temperature limit indicator with alarm outputs is strongly recommended.

SPECIFICATIONS

1. POWER: Derived from system backplane. (CSPID1 draws 150 mA max. load on power input of MASTER. CSPID2 draws 125 mA max). Modules may be hot-swapped (Replaced while powered up).

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. MASTER also stores the parameters in order to reprogram modules that are replaced.

4. INPUT:
   - GENERAL:
     - Sample Time: 67 msec (15 Hz)
     - Common Mode Rejection: >110 dB, 50/60 Hz
     - Normal Mode Rejection: >40 dB, 50/60 Hz
     - Temperature Coefficient: ±0.01%/°C
     - Step Response Time: 200 msec typ., 250 msec max

   - THERMOCOUPLE INPUTS:
     - Types: T, E, J, K, R, S, B, N, C
     - Input Impedance: 20 MΩ
     - Lead Resistance Effect: 0.25 µV/°Ω
     - Cold Junction Compensation: Less than ±1°C typical (±1.5°C max) over 0 to 50 °C ambient temperature
     - Resolution: 0.1°

   - RTD INPUTS:
     - Type: 2 or 3 wire
     - Excitation: 150 µA
     - Lead Resistance: 15 Ω Max
     - Resolution: 1 or 0.1°

   - PROCESS INPUT:

<table>
<thead>
<tr>
<th>INPUT RANGE</th>
<th>ACCURACY (18 TO 28 °C)</th>
<th>IMPEDANCE</th>
<th>MAX CONTINUOUS OVERLOAD</th>
<th>RESOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 V</td>
<td>0.1% span</td>
<td>1 M Ohm</td>
<td>50 V</td>
<td>16 bit</td>
</tr>
<tr>
<td>20 mA</td>
<td>0.1% span</td>
<td>10 Ohm</td>
<td>100 mA</td>
<td>16 bit</td>
</tr>
</tbody>
</table>

5. 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.

6. ISOLATION LEVEL: 500 Vrms @ 50/60 Hz for 1 minute between the following:
   - OP1
   - OP2
   - OP3
   - OP4
   - Linear Output (CSPID1 only)
   - Signal Inputs and HCM
   - CS Master Power Supply Input

7. COMMUNICATIONS: Provided by the CS Master

8. A/D CONVERTER: 16 bit resolution

9. DISCRETE OUTPUTS:
   - CSPID1: Outputs 1 and 2 available as Solid State NFET, Form A relay or Triac. Output 3 is a Form C relay.
   - CSPID2: Outputs 1 through 4 available as Form A relay, Solid State NFET, or Triac.

   - 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
     - 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)
     - 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.)

   - Triac: (CSPID1TA only)
     - Type: Optically isolated, zero-crossing detection
     - Rating: 120 VAC, Min: 20 VAC
     - Max Load Current: 1.0 A across Operating Temperature Range
     - Min Load Current: 5 mA
     - Offstate Leakage Current: 1 mA Max
     - Operating Frequency: 20 to 400 Hz
     - Protection: Internal Transient Suppression, Fused

   - Triac: (CSPID2T0 and CSPID2TM only)
     - Type: Optically isolated, zero-crossing detection
     - Rating: 120 VAC, Min: 20 VAC
     - Max Load Current: 0.5A @ 25°C, 0.4A @ 50°C
     - Min Load Current: 5 mA
     - Offstate Leakage Current: 1 mA Max
     - Operating Frequency: 20 to 500 Hz
     - Protection: Internal Transient Suppression, Fused

10. CONTROL MODES:
    - Control: On/Off, P, PI, or PID
    - Output: Time proportioning or linear (CSPID1 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
11. 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

12. ANALOG DC OUTPUT (optional, CSPID1 only):
   Selectable/programmable for 0-10 VDC, 0-20 mA, or 4-20 mA
   Resolution:
   Voltage: 500 µV
   Current: 1 µA
   Accuracy:
   0.1% of full scale (18 to 28 °C)
   0.2% of full scale (0 to 50 °C)
   Update Time: 0.0 to 60.0 sec
   Compliance (for current output only): 500 Ω max.
   Minimum load (voltage output only): 10 KΩ min.
   Outputs are independently jumper 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.

13. HEATER CURRENT MONITOR INPUT (optional):
   Type: Single phase, full wave monitoring of load currents
   Input: 100 mA max. input for use with external current transformers
   Input Resistance: 5 Ω
   Accuracy: ±3.0% full scale, 5 to 100% of range
   Frequency: 50 to 400 Hz
   Minimum output on time for break alarm: 350 msec

14. ENVIRONMENTAL CONDITIONS:
   Operating Temperature Range: 0 to +50 °C
   Storage Temperature Range: -40 to +85 °C
   Operating and Storage Humidity: 85% max relative humidity, non-condensing, from 0 to +50°C
   Vibration According to IEC 68-2-6: 10 to 150 Hz, 0.075 mm amplitude in X, Y, Z direction 1 g.
   Shock According to IEC 68-2-27: Operational 25 g (10g relay), 11 msec in 3 directions.
   Altitude: Up to 2000 meters

15. CERTIFICATIONS AND COMPLIANCES:
   SAFETY
   UL Listed, File # E302106, UL508, CSA C22.2 No. 14-M05
   LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
   IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
   ELECTROMAGNETIC COMPATIBILITY
   Immunity to Industrial Locations:
   Electrostatic discharge EN 61000-4-2 Criterion B
   4 kV contact discharge 8 kV air discharge
   Electromagnetic RF fields EN 61000-4-3 Criterion B
   Fast transients (burst) EN 61000-4-4 Criterion B
   Surge EN 61000-4-5 Criterion B
   1 kV L-G, 2 kV L-G
   RF conducted interference EN 61000-4-6 Criterion A
   Emissions EN 55011 Class A
   Notes:
   2. Criterion B: Temporary loss of performance from which the unit self-recover.
   3. The module’s analog input and/or output signals may deviate during disturbance but self-recover when disturbance is removed.
   4. Power supplied from backplane via Master Module.

16. CONSTRUCTION: Case body is burgundy high impact plastic. Installation Category I, Pollution Degree 2.

17. CONNECTIONS: Removable wire clamp screw terminal blocks.
   Wire Gage: 28-16 AWG terminal gage wire
   Torque: 1.96-2.23 inch/lbs (0.22-0.25 N-m)

18. MOUNTING: Snaps on to standard DIN style top hat (T) profile mounting rails according to EN50022 -35 x 7.5 and -35 x 15.

19. WEIGHT: CSPID1: 7 oz (198.4 g)
    CSPID2: 7 oz (198.4 g)

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**BLOCK DIAGRAM**

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**Emissions EN 55011 Class A**

Notes:
2. Criterion B: Temporary loss of performance from which the unit self-recover.
3. The module’s analog input and/or output signals may deviate during disturbance but self-recover when disturbance is removed.
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19. WEIGHT: CSPID1: 7 oz (198.4 g)
    CSPID2: 7 oz (198.4 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.
   a. The mounting clip that connects to the DIN rail should have the DIN rail connected to protective earth.

2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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.
   c. Connect the shield to common of the module and leave the other end of the shield unconnected and insulated from earth ground.

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. Therefore, keep cable runs as short as possible.

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 (RLC part number FCOR0000)
   - TDK part number ZCAT3035-1330A
   - Steward part number 28B2029-0A0

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 RLC 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.

7. Also 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 effect the instruments, operation.

Visit RLC’s web site at www.redlion.net for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.

HARDWARE

CSPID1 ONLY
ANALOG OUTPUT OPTION

Select either Voltage or Current output by placing the output jumpers in the appropriate location. The output jumpers are located on the side of the CSPID1 module.

Voltage
Current

CSPID2 ONLY
INPUT JUMPERS

Select the desired input type for each channel by positioning the jumper appropriately. For thermocouple inputs, the jumper position can be ignored.

INSTALLATION

SEPARATE BASE FROM MODULE
ATTACH THE MODULE BASE TO THE DIN RAIL
ATTACH MODULE TO BASE

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
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. 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.

CSPID1 Input Connections

- **RTD**: 0-10 V, 4-20 mA
- **Voltage**: 0-10 V, 4-20 mA
- **Thermocouple and Millivolt**: 0-10 V, 4-20 mA

CSPID2 Input Connections

- **RTD**: 0-10 V, 4-20 mA
- **Voltage**: 0-10 V, 4-20 mA
- **Thermocouple and Millivolt**: 0-10 V, 4-20 mA

Heater Current Monitor

- **Heater Circuit**: Opt +, Opt -
- **Opt2**: Opt +, Opt -
- **Opt2 (OPT)**: Opt +, Opt -

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
CSPID1 OUTPUT CONNECTIONS

Outputs 1 and 2 - Relay Version

Outputs 1 and 2 - Triac Version

Outputs 1 and 2 - Solid State Version

Analog Output

Output 3

CSPID2 OUTPUT CONNECTIONS

Outputs 1- 4 - Relay Version

Outputs 1- 4 - Solid State Version

Outputs 1- 4 - Triac Version
LEDS

STS - STATUS LED

The Status LED is a dual color 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

<table>
<thead>
<tr>
<th>LED Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapidly Flashing Red</td>
<td>Module is currently running the boot loader and/or being flash upgraded by Crimson. This occurs for four seconds during a power up.</td>
</tr>
<tr>
<td>Steady Red</td>
<td>Module switching to configuration.</td>
</tr>
<tr>
<td>Green</td>
<td>Module performing normally.</td>
</tr>
</tbody>
</table>

FIRMWARE UPGRADE

The module’s firmware is stored in flash memory to prevent software/hardware conflicts, and so that software features may be added in the future.

During a download, Crimson compares its own library of firmware files with those stored in the Master module. If they do not match, Crimson will download the necessary files. The Master then checks to make sure that the I/O modules contain the same firmware. If they contain a different revision, the Master will automatically copy those files into the module’s flash memory. During this process, the module LEDs will flash rapidly, starting with the top row, and progressing through the remaining rows until the process is complete.

Error States

<table>
<thead>
<tr>
<th>LED Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Red</td>
<td>Module not controlling, and not communicating.</td>
</tr>
<tr>
<td>Green/Pulsing Red</td>
<td>Module is controlling properly, but has lost communication with the Master.</td>
</tr>
</tbody>
</table>

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.

*CSPID2 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.

CONFIGURATION

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

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Module</td>
<td>CSMSTR</td>
<td>Modular Controller Master, Multi Comms ports and Ethernet</td>
<td>CSMSTRv2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modular Controller Master with multiple protocol converter, Ethernet and expansion slot</td>
<td>CSMSTRLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modular Controller Master with multiple protocol converter, data logger, web server with Virtual HMI up to Q/VGA (320 x 240) size and expansion slot</td>
<td>CSMSTRSX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modular Controller Master with multiple protocol converter, data logger, web server with Virtual HMI up to VGA (640 x 480) size and expansion slot with increased SDRAM</td>
<td>CSMSTRGT</td>
</tr>
<tr>
<td>CSPID1</td>
<td></td>
<td>Single Loop Module, Relay Outputs</td>
<td>CSPID1R0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Loop Module, Relay Outputs, Analog Output</td>
<td>CSPID1RA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Loop Module, Relay Outputs, Heater Current Input</td>
<td>CSPID1RM</td>
</tr>
<tr>
<td></td>
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<td>Single Loop Module, Solid State Outputs</td>
<td>CSPID1SO</td>
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<td>Single Loop Module, Solid State Outputs, Analog Output</td>
<td>CSPID1SA</td>
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<td>Single Loop Module, Solid State Outputs, Heater Current Input</td>
<td>CSPID1SM</td>
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<td>Single Loop Module, Triac Outputs, Analog Output</td>
<td>CSPID1TA</td>
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<td>CSPID2</td>
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<td>Dual Loop Module, Relay Outputs</td>
<td>CSPID2R0</td>
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<td></td>
<td></td>
<td>Dual Loop Module, Relay Outputs, Heater Current Input</td>
<td>CSPID2RM</td>
</tr>
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<td></td>
<td></td>
<td>Dual Loop Module, Solid State Outputs</td>
<td>CSPID2SO</td>
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<td>Dual Loop Module, Solid State Outputs, Heater Current Input</td>
<td>CSPID2SM</td>
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<td></td>
<td>Dual Loop Module, Triac Outputs</td>
<td>CSPID2T0</td>
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<td></td>
<td></td>
<td>Dual Loop Module, Triac Outputs, Heater Current Input</td>
<td>CSPID2TM</td>
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<tr>
<td>Communications Cables (10 feet)</td>
<td>CBL</td>
<td>Programming Cable for CS, G3, &amp; Paradigm Series</td>
<td>CBLPRG0</td>
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<td></td>
<td></td>
<td>Communications Cables</td>
<td>CBLxxxxx</td>
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<tr>
<td>Software</td>
<td></td>
<td>Crimson® Programming Software</td>
<td>SFCRM</td>
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<td></td>
<td></td>
<td>Crimson® Programming Software, Manual, and Download Cable</td>
<td>SFCRK</td>
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<tr>
<td>Accessories</td>
<td></td>
<td>Rail Stops (Qty 2)</td>
<td>RSRTSP00</td>
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<tr>
<td></td>
<td></td>
<td>Replacement Base</td>
<td>CSBASE00</td>
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<tr>
<td></td>
<td></td>
<td>Replacement Termination Plug</td>
<td>CSTERM00</td>
</tr>
</tbody>
</table>

1 Visit www.redlion.net for a complete list of PID modules, data acquisition modules, communications drivers and cables.

2 Free at www.redlion.net

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company’s liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company’s option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODEL CSOUT - MODULAR CONTROLLER SERIES
4-CHANNEL ANALOG OUTPUT MODULE

- HIGH DENSITY ANALOG OUTPUT MODULE FOR THE MODULAR CONTROLLER SERIES
- AVAILABLE OUTPUTS INCLUDE 0 to 5 VDC, 0 to 10 VDC, ±10 VDC, AND 0/4-20 mA DC
- OUTPUTS ARE ISOLATED FROM EACH OTHER AND FROM THE BACKPLANE
- OUTPUTS ARE SOFTWARE CONFIGURED AND FULLY SCALABLE
- AUTO ADDRESSING MINIMIZES CONFIGURATION TIME
- CAN BE USED IN CONJUNCTION WITH ANY CS SERIES MODULES

GENERAL DESCRIPTION

The model CSOUT is an analog output module designed for use with the Modular Controller Series. The module provides four isolated outputs that are independently programmable for output ranges of 0-5V, 0-10V, ±10V, 0-20mA, or 4-20mA. Internal scaling is provided to accommodate virtually any application.

The modules connect and communicate via a backplane connection to the CSMSTR Modular Controller Series Master. The CSMSTR, equipped with serial ports as well as an Ethernet port, allows the system to share data with PCs, PLCs, and SCADA systems. The Master supports up to 16 CS Series modules (refer to the "Power" specifications).

Internal power management circuits allow the modules to be replaced while power is applied, which reduces downtime. All configuration information is stored locally within each module, as well as in the Master, so replacement modules do not need to be configured.

The Modular Controller Series’ high density packaging and DIN rail mounting saves time and panel space. The backplane connection provides power and communication to the module and snaps easily onto standard top hat (T) profile DIN rail.

CONFIGURATION

The Modular Controller Series is configured with Windows® compatible Crimson™ software. The software is an easy to use, graphical interface that provides a means of communication configuration, as well as commissioning and calibration of new systems.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the module to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the module.

DIMENSIONS In inches (mm)

1.24 (31.5)
4.98 (126.5)
4.17 (105.9)
SPECIFICATIONS

1. **POWER**: Derived from system backplane. (CSOUT draws 180 mA max. load on power input of MASTER). Modules may be hot-swapped (replaced while powered up).

2. **LEDs**:
   - **STS**: Status LED shows module condition.
   - **ALM**: Alarm LED is lit when an internal alarm condition exists.

3. **MEMORY**: Non-volatile memory retains all programmable parameters. MASTER also stores the parameters in order to reprogram modules that are replaced.

4. **COMMUNICATIONS**: Provided by the CS Master

5. **OUTPUTS**:
   - Channels: 4 independent outputs
   - **Response Time**: 25 msec max. to within 99% of final value
   - **Output Range**: software selectable

<table>
<thead>
<tr>
<th>OUTPUT RANGE</th>
<th>ACCURACY *</th>
<th>ACCURACY *</th>
<th>COMPLIANCE</th>
<th>RESOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 5 VDC</td>
<td>0.2% of span</td>
<td>0.4% of span</td>
<td>10K Ω min.</td>
<td>1/30,000</td>
</tr>
<tr>
<td>0 to 10 VDC</td>
<td>0.1% of span</td>
<td>0.2% of span</td>
<td>10K Ω min.</td>
<td>1/60,000</td>
</tr>
<tr>
<td>-10 to +10 VDC</td>
<td>0.1% of span</td>
<td>0.2% of span</td>
<td>10K Ω min.</td>
<td>1/60,000</td>
</tr>
<tr>
<td>0 to 20 mA</td>
<td>0.1% of span</td>
<td>0.2% of span</td>
<td>500 Ω max.</td>
<td>1/48,000</td>
</tr>
<tr>
<td>4 to 20 mA</td>
<td>0.1% of span</td>
<td>0.2% of span</td>
<td>500 Ω max.</td>
<td>1/48,000</td>
</tr>
</tbody>
</table>

* The accuracy is specified after 20 minutes warmup; in a non-condensing environment; and includes linearity errors.

6. **ISOLATION LEVEL**: The outputs are isolated from each other, and are isolated from the power supply. 500 V @ 50/60 Hz for 1 minute between any of the outputs and the CS Master power supply input.

7. **ENVIRONMENTAL CONDITIONS**:
   - **Operating Temperature Range**: 0 to +50°C
   - **Storage Temperature Range**: -40 to +85°C
   - **Operating and Storage Humidity**: 85% max relative humidity, non-condensing, from 0 to +50°C
   - **Vibration According to IEC 68-2-6**: 10 to 150 Hz, 0.075 mm amplitude in X, Y, Z direction 1 g.
   - **Shock According to IEC 68-2-27**: Operational 25 g, 11 msec in 3 directions.
   - **Altitude**: Up to 2000 meters

8. **CERTIFICATIONS AND COMPLIANCES**:

   **SAFETY**
   - UL Listed, File # E302106, UL508, CSA C22.2 No. 14-M05
   - LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
   - IEC 60100-1, EN 60100-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.

   **ELECTROMAGNETIC COMPATIBILITY**
   - Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

   **Immunity**:
   - Electrostatic discharge EN 61000-4-2 Criterion B
   - 4 kV contact discharge
   - 8 kV air discharge
   - Electromagnetic RF fields EN 61000-4-3 Criterion A
   - 10 V/m
   - Fast transients (burst) EN 61000-4-4 Criterion A
   - 2 kV power
   - 1 kV signal
   - Surge EN 61000-4-5 Criterion A
   - 1 kV L-L, 2 kV L-N-E power
   - RF conducted interference EN 61000-4-6 Criterion A
   - 3 V/rms

   **Emissions**:
   - Emissions EN 55011 Class A

   **Notes**:
   - 2. Criterion B: Temporary loss of performance from which the unit self-recovers.
   - 3. Power supplied from back plane via Master Module.

9. **CONSTRUCTION**: Case body is burgundy high impact plastic. Installation Category I, Pollution Degree 2.

10. **CONNECTIONS**: Removable wire clamp screw terminal blocks.
    - Wire Gage: 28-16 AWG terminal gage wire
    - Torque: 1.96-2.23 inch/lbs (0.22-0.25 N-m)

11. **WEIGHT**: 7 oz (198.4 g)

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**BLOCK DIAGRAM**

[Diagram showing block diagram with specified connections and outputs]
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 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.
   a. The mounting clip that connects to the DIN rail should have the DIN rail connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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.
   c. Connect the shield to common of the module and leave the other end of the shield unconnected and insulated from earth ground.
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. Therefore, keep cable runs as short as possible.

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 (RLC part number FCOR0000)
   - TDK part number ZCAT3035-1330A
   - Steward part number 28B2029-0A0
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 RLC 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.
   - RLC part numbers: Snubber SNUB0000
   - Varistor ILS11500 or ILS23000
   Note: Reference manufacturer's instructions when installing any EMI suppression device.
7. Also, 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 effect the instrument’s operation.

Visit RLC’s web site at www.redlion.net for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.

HARDWARE INSTALLATION

SEPARATE BASE FROM MODULE

ATTACH THE MODULE BASE TO THE DIN RAIL

ATTACH MODULE TO BASE

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. 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.
LEDS

STS – STATUS LED
The Status LED is a dual color 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

<table>
<thead>
<tr>
<th>LED State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapidly Flashing Red</td>
<td>Module is currently running the boot loader and/or being flash upgraded by Crimson. This occurs for four seconds during a power up.</td>
</tr>
<tr>
<td>Steady Red</td>
<td>Module switching to configuration.</td>
</tr>
<tr>
<td>Green</td>
<td>Module performing normally.</td>
</tr>
</tbody>
</table>

Error States

<table>
<thead>
<tr>
<th>LED State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Red</td>
<td>Module not controlling, and not communicating.</td>
</tr>
<tr>
<td>Green/Pulsing Red</td>
<td>Module is controlling properly, but has lost communication with the Master.</td>
</tr>
</tbody>
</table>

ALM – ALARM LED
The Alarm LED indicates the presence of a fault condition.

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

During a download, Crimson compares its own library of firmware files with those stored in the Master module. If they do not match, Crimson will download the necessary files. The Master then checks to make sure that the I/O modules contain the same firmware. If they contain a different revision, the Master will automatically copy those files into the module’s flash memory. During this process, the module LEDs will flash rapidly, starting with the top row, and progressing through the remaining rows until the process is complete.

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

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Module</td>
<td>CSMSTR</td>
<td>Modular Controller Master, Multi Comms ports and Ethernet</td>
<td>CSMSTRV2</td>
</tr>
<tr>
<td></td>
<td>CSMSTR</td>
<td>Modular Controller Master with multiple protocol converter, data logger, web server with Virtual HMI up to QVGA (320 x 240) size and expansion slot.</td>
<td>CSMSTRSX</td>
</tr>
<tr>
<td></td>
<td>CSMSTR</td>
<td>Modular Controller Master with multiple protocol converter, data logger, web server with Virtual HMI up to VGA (640 x 480) size and expansion slot with increased SDRAM</td>
<td>CSMSTRGT8</td>
</tr>
<tr>
<td>Analog Output Module</td>
<td>CSOUT1</td>
<td>4-Channel Analog Output Module</td>
<td>CSOUT400</td>
</tr>
<tr>
<td>Communication Cables (10 feet)</td>
<td>CBL</td>
<td>Programming Cable for CS, G3, &amp; Paradigm Series</td>
<td>CBLPROG0</td>
</tr>
<tr>
<td></td>
<td>CBL</td>
<td>Communications Cables</td>
<td>CBLxxxxx</td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td>Crimson Programming Software</td>
<td>SFCRM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crimson Programming Software, Manual, and Download Cable</td>
<td>SFCRK</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
<td>Rail Stops (Qty 2)</td>
<td>RSRSTP00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Base</td>
<td>CSBASE00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Termination Plug</td>
<td>CSTERM00</td>
</tr>
</tbody>
</table>

1 Visit www.redlion.net for a complete list of PID modules, data acquisition modules, communications drivers and cables.
2 Free at www.redlion.net

LIMITED WARRANTY
The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company’s liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company’s option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products. The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter. No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.

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www.stevenengineering.com

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
MODEL CSDIO - MODULAR CONTROLLER SERIES DIGITAL MODULE

GENERAL DESCRIPTION

The Model CSDIO series modules are digital I/O modules designed for use with the Modular Controller Series. The CSDIO14 offers eight inputs and six outputs that can be used to monitor contact or sensor inputs and actuate relays, solenoids, PLC inputs, etc.

The inputs accept standard DC inputs or contact closures, and are configured for Sink/Source signals via external switches. Additionally, each input has a switch selectable input filter that can be used to prevent contact bounce. Each input may also be software configured as a high-active or low-active input.

The modules are available with relay or NFET outputs that are capable of switching up to one amp each (NFET DC only). For applications requiring large loads to be controlled, several DIN rail mount relays are available.

The CSDIO modules connect and communicate via a backplane connection to the CSMSTR Modular Controller Series Master. The CSMSTR, equipped with serial ports as well as an Ethernet port, allows the system to share data with PCs, PLCs, and SCADA systems. The Master supports any combination of up to 16 CS Series modules.

Internal power management circuits allow the modules to be replaced while power is applied, which reduces downtime in the event of a relay failure. All configuration information is stored locally within each module, as well as in the Master, so replacement modules do not need to be configured. The Modular Controller Series’ high density packaging and DIN rail mounting saves time and panel space. The backplane connection provides power and communication to the module and snaps easily onto standard top hat (T) profile DIN rail.

CONFIGURATION

The Modular Controller Series is configured with Windows® compatible Crimson™ software. The software is an easy to use, graphical interface that provides a means of communication configuration, as well as commissioning and calibration of new systems.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the module to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the module.

DIMENSIONS In inches (mm)

1.24 (31.5)
4.98 (126.5)
4.17 (105.9)
GENERAL SPECIFICATIONS
1. **POWER**: Derived from system backplane. (CSDIO draws 170 mA max. load on power input of MASTER). Modules may be hot-swapped (replaced while powered up).
2. **LEDs**: 
   - STS - Status LED shows module condition. 
   - IN1-IN8 - LEDs are lit when associated input is active. 
   - OP1-OP6 - LEDs are lit when associated output is active. 
   - ALM - Alarm LED is lit when an internal alarm condition exists.
3. **MEMORY**: Non-volatile memory retains all programmable parameters. MASTER also stores the parameters in order to reprogram modules that are replaced.
4. **INPUTS**: DIP switch selectable for sink or source 
   - Maximum voltage: +30 VDC, reverse polarity protected 
   - Off Voltage: < 1.2 Volts 
   - On Voltage: > 3.8 Volts 
   - Input Impedance: Source Mode 10K ohms; Sink Mode 20K ohms 
   - Input Frequency*: Filter switch on: 50 Hz 
   - Filter switch off: 300 Hz 
   - * Actual usable frequency limited by communication to external device.
5. **OUTPUTS**: Outputs available as FORM-A relay or Solid State NFET. 
   - **Form A Relay Output**: 
     - Type: N.O. 
     - The following pairs of relays share the common terminal: 1&2, 3&4, 5&6 
     - Current Rating by pair: 3 Amps @ 30 VDC / 125 VAC resistive 
     - 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.) 
   - **Solid State Output**: 
     - Type: Switched DC, N Channel open drain MOSFET 
     - Contact Rating: 1 ADC max 
     - VDS ON: < 0.2 V @ 1 A 
     - VDS MAX: 30 VDC 
     - Offstate Leakage Current: 0.5 µA max
6. **LOGIC (BOOLEAN) MODE**: 
   - Count Frequency: 200 Hz/input when input is directly connected (soft-wired) to the counter. 
   - Logic Propagation Delay: 400 msecs. max. 
   - Timer Accuracy: 0.2% 
7. **ISOLATION LEVEL**: 500 Vrms @ 50/60 Hz for 1 minute between the following: 
   - Inputs 
   - Outputs 
   - CS Master Power Supply Input
8. **COMMUNICATIONS**: Provided by the CS Master
9. **ENVIRONMENTAL CONDITIONS**: 
   - Operating Temperature Range: 0 to +50°C 
   - Storage Temperature Range: -40 to +85°C 
   - Operating and Storage Humidity: 85% max relative humidity, non-condensing, from 0 to +50°C 
   - Vibration According to IEC 68-2-6: 10 to 150 Hz, 0.075 mm amplitude in X, Y, Z direction 1 g. 
   - Shock According to IEC 68-2-27: Operational 25 g (10g relay), 11 msec in 3 directions. 
   - Altitude: Up to 2000 meters
10. **CERTIFICATIONS AND COMPLIANCES**: 
    - **SAFETY**: 
      - UL Listed, File # E302106, UL508, CSA C22.2 No. 14-M05 
      - LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1. 
    - **ELECTROMAGNETIC COMPATIBILITY**: 
      - Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use. 
      - **Immunity**: 
        - Electrostatic discharge EN 61000-4-2 Criterion B 
        - Electromagnetic RF fields EN 61000-4-3 Criterion A 
        - Fast transients (burst) EN 61000-4-4 Criterion A 
        - Surge EN 61000-4-5 Criterion A 
        - RF conducted interference EN 61000-4-6 Criterion A 
      - **Emissions**: 
        - Emissions EN 55011 Class A 
    - Notes: 
      - 2. Criterion B: Temporary loss of performance from which the unit self-recoveres. 
      - 3. Power supplied from back plane via Master Module. 
11. **CONSTRUCTION**: Case body is burgundy high impact plastic. Installation Category I, Pollution Degree 2. 
12. **CONNECTIONS**: Removable wire clamp screw terminal blocks. 
    - Wire Gage: 28-16 AWG terminal gage wire 
    - Torque: 1.96-2.23 inch/lbs (0.22-0.25 N-m) 
13. **MOUNTING**: Snaps on to standard DIN style top hat (T) profile mounting rails according to EN50022 -35 x 7.5 and -35 x 15. 
14. **WEIGHT**: 6.6 oz (187.1 g)

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**BLOCK DIAGRAM**

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
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.
   a. The mounting clip that connects to the DIN rail should have the DIN rail connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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.
   c. Connect the shield to common of the module and leave the other end of the shield unconnected and insulated from earth ground.
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. Therefore, keep cable runs as short as possible.

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 (RLC part number FCOR0000)
   - TDK part number ZCAT3035-1330A
   - Steward part number 28B2029-0A0

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 RLC 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.

   RLC part numbers: Snubber SNUB0000
   - Varistor ILS11500 or ILS23000

   Note: Reference manufacturer's instructions when installing any EMI suppression device.

7. Also, 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 effect the instrument’s operation.

Visit RLC’s web site at www.redlion.net for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.

HARDWARE

INPUT SWITCHES

Each input is independently configurable for sinking or sourcing signals. A filter capacitor is also selectable for avoiding contact bounce.

<table>
<thead>
<tr>
<th>FILTER</th>
<th>SRC/SNK:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ON-SRC - Connects an internal 10KΩ pull-down resistor to common.</td>
</tr>
<tr>
<td>2</td>
<td>OFF-SNK - Connects an internal 20KΩ pull-up resistor to +5V.</td>
</tr>
</tbody>
</table>

FILTER:
- ON - Connects a capacitor to the input, thereby reducing the input response to 50 Hz.
- OFF - Provides maximum input response of 300 Hz.
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. 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.

INPUT CONNECTIONS

<table>
<thead>
<tr>
<th>IN</th>
<th>IN</th>
<th>IN</th>
<th>IN</th>
<th>IN</th>
<th>IN</th>
<th>IN</th>
<th>IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td></td>
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Sinking Input

<table>
<thead>
<tr>
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<th>IN</th>
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</tr>
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<tbody>
<tr>
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<td>11</td>
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<td>COM, IN</td>
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Sourcing Input

<table>
<thead>
<tr>
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Output Connections

<table>
<thead>
<tr>
<th>OUT</th>
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<tbody>
<tr>
<td>7</td>
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Relay Version

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<tr>
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<tr>
<td>COM, IN</td>
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<td>7</td>
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</tbody>
</table>

Solid State NFET Version

<table>
<thead>
<tr>
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<tbody>
<tr>
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<td>COM, IN</td>
<td>10</td>
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<td>COM, IN</td>
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<td>7</td>
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</tbody>
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<td>9</td>
</tr>
<tr>
<td>COM, IN</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>
**LEDS**

**STS – STATUS LED**

The Status LED is a dual color 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

<table>
<thead>
<tr>
<th>LED State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapidly Flashing Red</td>
<td>Module is currently running the boot loader and/or being flash upgraded by Crimson. This occurs for four seconds during a power up.</td>
</tr>
<tr>
<td>Steady Red</td>
<td>Module switching to configuration.</td>
</tr>
<tr>
<td>Green</td>
<td>Module performing normally.</td>
</tr>
</tbody>
</table>

### Error States

<table>
<thead>
<tr>
<th>LED State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Red</td>
<td>Module not controlling, and not communicating.</td>
</tr>
<tr>
<td>Green/Pulsing Red</td>
<td>Module is controlling properly, but has lost communication with the Master.</td>
</tr>
</tbody>
</table>

**ALM – ALARM LED**

The Alarm LED indicates the presence of a fault condition.

**FIRMWARE UPGRADE**

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

During a download, Crimson compares its own library of firmware files with those stored in the Master module. If they do not match, Crimson will download the necessary files. The Master then checks to make sure that the I/O modules contain the same firmware. If they contain a different revision, the Master will automatically copy those files into the module’s flash memory. During this process, the module LEDs will flash rapidly, starting with the top row, and progressing through the remaining rows until the process is complete.

**CONFIGURATION**

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

---

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Module</td>
<td>CSMSTR</td>
<td>Modular Controller Master, Multi Comms ports and Ethernet</td>
<td>CSMSTRV2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modular Controller Master with multiple protocol converter, data logger, web server with Virtual HMI up to QVGA (320 x 240) size and expansion slot.</td>
<td>CSMSTRSX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modular Controller Master with multiple protocol converter, data logger, web server with Virtual HMI up to VGA (640 x 480) size and expansion slot with increased SDRAM</td>
<td>CSMSTRGT</td>
</tr>
<tr>
<td>Digital Modules</td>
<td>CSDI014₁</td>
<td>Eight Inputs, Six Relay Outputs</td>
<td>CSDI014R</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eight Inputs, Six Solid State Outputs</td>
<td>CSDI014S</td>
</tr>
<tr>
<td>Communication Cables (10 feet)</td>
<td>CBL</td>
<td>Programming Cable for CS, G3, &amp; Paradigm Series</td>
<td>CBLPROG0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communications Cables¹</td>
<td>CBLxxxxx</td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td>Crimson Programming Software²</td>
<td>SFCRM</td>
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<tr>
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<td></td>
<td>Crimson Programming Software Manual, and Download Cable</td>
<td>SFCRK</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
<td>Rail Stops (Qty 2)</td>
<td>RSRSTP00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Base</td>
<td>CSBASE00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Termination Plug</td>
<td>CSTERM00</td>
</tr>
</tbody>
</table>

¹ Visit www.redlion.net for a complete list of PID modules, data acquisition modules, communications drivers and cables.
² Free at www.redlion.net

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
LIMITED WARRANTY
The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company’s liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company’s option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODEL CSSG1—MODULAR CONTROLLER SERIES STRAIN GAGE MODULE

- STRAIN GAGE MODULE FOR THE MODULAR CONTROLLER SERIES
- HOT-SWAPPABLE REPLACEMENT REDUCES DOWNTIME
- AUTO ADDRESSING MINIMIZES CONFIGURATION TIME
- PID CONTROL WITH REDUCED OVERSHOOT
- LOAD CELL, PRESSURE AND TORQUE BRIDGE INPUTS
- SOFTWARE SELECTABLE LOW LEVEL INPUTS (20 mV, 33 mV or 200 mV FULL SCALE)
- SOFTWARE SELECTABLE 5 VDC or 10 VDC BRIDGE EXCITATION
- DIGITAL TARE (re-zero), BATCH TOTALIZER, AND PEAK/VALLEY (max/min) RECORDING
- ON DEMAND AUTO-TUNING OF PID SETTINGS
- DC ANALOG OUTPUT
- WINDOWS® CONFIGURATION SOFTWARE

GENERAL DESCRIPTION
The Model CSSG is a full featured single loop PID controller designed for use with the Modular Controller Series. The module accepts low level signals from a variety of bridge-type transducers, such as load cells, pressure transducers, torque transducers, etc. An optional second signal input is available, providing math capabilities between the two input channels (average, differential, etc.). Each input channel provides a software selectable 5 V or 10 V stable bridge excitation voltage, capable of driving up to four 350 Ω bridges (combined total per module). The inputs are software selectable for ±20 mV, ±33 mV, or ±200 mV full scale. With solid state or relay outputs, plus an analog output, the CSSG module can perform virtually any combination of time-proportioning or linear control. The discrete outputs may also be assigned to one of seven internal soft alarms; and the linear output can be assigned to transmit virtually any internal variable. In addition, digital tare (re-zero), batch totalizer, and peak/valley (max/min) are provided.

The modules connect and communicate via a backplane connection to the CSMSTR Master module. The Master, equipped with serial ports as well as an Ethernet port, allows the system to share data with PCs, PLCs, and SCADA systems. The Master supports up to 16 CS Series modules (when using CSSG modules, refer to “Power” specifications).

The CSSG modules are available with relays, or open drain MOSFET outputs. 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.

Internal power management circuits allow the modules to be replaced while power is applied, which reduces downtime in the event of a relay failure. All configuration information is stored locally within each module, as well as in the Master, so replacement modules do not need to be configured.

The Modular Controller Series’ high density packaging and DIN rail mounting saves time and panel space. The backplane connection provides power and communication to the module and snaps easily onto standard top hat (T) profile DIN rail.

CONFIGURATION
The Modular Controller Series 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.

SAFETY SUMMARY
All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the controller to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the controller.
**SPECIFICATIONS**

1. **POWER**: Derived from system backplane. 250 mA max. load on power input of MASTER. Module may be hot-swapped (replaced while powered up). Modules per Master: A single Master can support up to 11 CSSG1 modules combined with any 5 other module types. For applications that require more than 11 CSSG1 modules, please contact technical support.

2. **LEDs**:
   - STS - Status LED shows module condition.
   - OP1, OP2, OP3 - Indicate status of outputs 1, 2, and 3
   - ALM - Alarm LED is lit during an internal alarm condition.
   * Default configuration.

3. **MEMORY**: Non-volatile memory retains all programmable parameters. The MASTER also stores the parameters in order to reprogram any modules that are replaced.

4. **INPUTS**:

<table>
<thead>
<tr>
<th>SOFTWARE SELECTABLE INPUT RANGE</th>
<th>ACCURACY * 18 TO 28°C 10 TO 75% RH</th>
<th>ACCURACY * 0 TO 50°C 0 TO 85% RH</th>
</tr>
</thead>
<tbody>
<tr>
<td>±200.0 mVDC</td>
<td>0.02% of reading +3 µV</td>
<td>0.07% of reading +4 µV</td>
</tr>
<tr>
<td>±33.0 mVDC</td>
<td>0.02% of reading +5 µV</td>
<td>0.07% of reading +7 µV</td>
</tr>
<tr>
<td>±200.00 mVDC</td>
<td>0.02% of reading +30 µV</td>
<td>0.07% of reading +40 µV</td>
</tr>
</tbody>
</table>

* After 20 minute warm-up. Accuracy over the 0 to 50°C range includes the temperature coefficient.

- Connection Type:
  - 4-wire bridge (differential)
  - 2-wire (single-ended)
- Sample Time: 67 msec (15 readings per second)
- Common Mode Range (with respect to input common): 0 to ±5 VDC
- Common Mode Rejection: > 100 dB, DC to 120 Hz
- Temperature Coefficient (ratio metric): 20 ppm°C max.
- Step Response Time: 200 msec max. to within 99% of final process value
- Input Impedance: 100 MΩ
- Max Continuous Overload: 30 V
- PV Range: -30,000 to 30,000
- Effective Resolution: 16-bit

5. **BRIDGE EXCITATIONS**:
   - Software selectable:
     - 5 VDC, ±2%, 65 mA max.
     - 10 VDC, ±2%, 125 mA max. combined (excitation 1 plus excitation 2).
   - Temperature coefficient (ratio metric): 20 ppm°C max.
   - Max. four 350Ω bridges per module.

6. **ISOLATION LEVEL**: 500 Vrms @ 50/60 Hz for 1 minute between the following:
   - OP1 *
   - OP2 *
   - OP3

- Linear Output Signal Inputs (the 2 input channels are not isolated from each other)
- CS Master Power Supply Input
  * Outputs OP1 and OP2 of SSR model are not isolated from each other

7. **COMMUNICATIONS**: Provided by the CS Master.

8. **DISCRETE OUTPUTS**:
   - Outputs 1 and 2 are available as Solid State NFET, or Form A relay. Output 3 is a Form C relay.
   - 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
       - 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.)

9. **CONTROL MODES**:
   - Control: On/Off, P, PI, or PID
   - Output: Time proportioning or linear
   - 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

10. **ALARMS**:
    - Modes:
      - Manual
      - Absolute High Acting
      - Deviation High Acting
      - Inside Band Acting
    - Reset Action: Programmable; automatic or latched
    - Standby Mode: Programmable; enable or disable
    - Hysteresis: Programmable

11. **ANALOG DC OUTPUT**: Jumper Selectable/programmable for 0-10 VDC, 0-20 mA, or 4-20 mA
    - Resolution:
      - Voltage: 500 µV
      - Current: 1 µA
    - Accuracy:
      - 0.1% of full scale (18 to 28°C)
      - 0.2% of full scale (0 to 50°C)
    - Update Time: 0.0 to 60.0 sec
    - Compliance (for current output only): 500 Ω max.
    - Minimum load (voltage output only): 10 KΩ min.
    - Output is independently jumper 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.

12. **ENVIRONMENTAL CONDITIONS**:
    - Operating Temperature Range: 0 to +50°C
    - Storage Temperature Range: -40 to +85°C
    - Operating and Storage Humidity: 85% max relative humidity, non-condensing, from 0 to +50°C
    - Vibration According to IEC 68-2-6: 10 to 150 Hz, 0.075 mm amplitude in X, Y, Z direction 1 g.
    - Shock According to IEC 68-2-27: Operational 25 g (10g relay), 11 msc in 3 directions.
    - Altitude: Up to 2000 meters

13. **CERTIFICATIONS AND COMPLIANCES**:
    - Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

14. **SAFETY**
    - Electrostatic discharge: EN 61000-4-2
    - Criterion A: 4 kV contact discharge
    - Criterion B: 8 kV air discharge
    - Electromagnetic RF fields: EN 61000-4-3
    - Criterion B: 10 V/m
    - Fast transients (burst): EN 61000-4-4
    - Criterion A: 2 kV power
    - Surge: EN 61000-4-5
    - Criterion B: 1 kV L-L
    - 2 kV L&N-E power
    - RF conducted interference: EN 61000-4-6
    - Criterion A: 3 V/rms

**ELECTROMAGNETIC COMPATIBILITY**

**Immunity to Industrial Locations**:

- Electrostatic discharge: EN 61000-4-2
  - Criterion A
  - 4 kV contact discharge
  - 8 kV air discharge
- Electromagnetic RF fields: EN 61000-4-3
  - Criterion B
  - 10 V/m
- Fast transients (burst): EN 61000-4-4
  - Criterion A
  - 2 kV power
- Surge: EN 61000-4-5
  - Criterion B
  - 1 kV L-L
- 2 kV L&N-E power
- RF conducted interference: EN 61000-4-6
  - Criterion A
  - 3 V/rms

**Emissions**

<table>
<thead>
<tr>
<th>Emissions</th>
<th>EN 55011</th>
<th>Class A</th>
</tr>
</thead>
</table>

**Notes**:

1. **Criterion A**: Normal operation within specified limits.
2. **Criterion B**: Temporary loss of performance from which the unit self-recoveries.
3. **Power supplied from backplane via Master Module**

14. **CONSTRUCTION**: Case body is burgundy high impact plastic. Installation Category I, Pollution Degree 2.

15. **CONNECTIONS**: Removable wire clamp screw terminal blocks.

- Wire Gage: 28-16 AWG terminal gage wire
- Torque: 1.96-2.23 inch/lbs (0.22-0.25 N-m)

16. **MOUNTING**: Snaps on to standard DIN style top hat (T) profile mounting rails according to EN50022 -35 x 7.5 and -35 x 15.

17. **WEIGHT**: 7 oz (198.4 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.
   a. The mounting clip that connects to the DIN rail should have the DIN rail connected to protective earth.

2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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.
   c. Connect the shield to common of the module and leave the other end of the shield unconnected and insulated from earth ground.

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. Therefore, keep cable runs as short as possible.

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 (RLC part number FCOR0000)
   - TDK part number ZCAT3035-1330A
   - Steward part number 28B2029-0A0

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 RLC 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.

   RLC part numbers: Snubber SNUB0000
   - Varistor ILS11500 or ILS23000
   
   Note: Reference manufacturer's instructions when installing any EMI suppression device.

7. Also 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 instruments, operation.

Visit RLC’s web site at www.redlion.net for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.
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. 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.

HARDWARE

ANALOG OUTPUT OPTION
Select either Voltage or Current output by placing the output jumpers in the appropriate location. The output jumpers are located on the side of the CSSG1 module.

INSTALLATION

SEPARATE BASE FROM MODULE
ATTACH THE MODULE BASE TO THE DIN RAIL
ATTACH MODULE TO BASE
INPUT CONNECTIONS

2-Wire Single Ended Input

4-Wire Bridge Input

6-Wire Bridge Input

BRIDGE COMPLETION RESISTORS
For single strain gage applications, bridge completion resistors must be employed externally to the module. Only use metal film resistors with a low temperature coefficient of resistance.
Load cells and pressure transducers are normally implemented as full resistance bridges and do not require bridge completion resistors.

OUTPUT CONNECTIONS

Outputs 1 and 2 - Relay Version

Outputs 1 and 2 - Solid State Version

Output 3

Analog Output
LEDS

STS – STATUS LED
The Status LED is a dual color 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.

<table>
<thead>
<tr>
<th>Startup Routine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapidly Flashing Red</td>
</tr>
<tr>
<td>Steady Red</td>
</tr>
<tr>
<td>Green</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Red</td>
</tr>
<tr>
<td>Green/Pulsing Red</td>
</tr>
</tbody>
</table>

OP1, OP2, OP3, – OUTPUT STATUS LED
The OP1, OP2, and OP3 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.

ALM – ALARM LED
The Alarm LED is factory configured to indicate the presence of an alarm. Whenever one of the seven alarms is active, the LED turns on. This LED may be remapped to various other module properties.

FIRMWARE UPGRADE
The module’s firmware is stored in flash memory to prevent software/hardware conflicts, and so that software features may be added in the future.
During a download, Crimson compares its own library of firmware files with those stored in the Master module. If they do not match, Crimson will download the necessary files. The Master then checks to make sure that the I/O modules contain the same firmware. If they contain a different revision, the Master will automatically copy those files into the module’s flash memory. During this process, the module LEDs will flash rapidly, starting with the top row, and progressing through the remaining rows until the process is complete.

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

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Module</td>
<td>CSMSTR</td>
<td>Modular Controller Master, Multi Comms ports and Ethernet</td>
<td>CSMSTRV2</td>
</tr>
<tr>
<td>Strain Gage Control Modules</td>
<td>CSSG1</td>
<td>Single Loop, One SG Input, Relay Outputs, Analog Out</td>
<td>CSSG10RA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Loop, One SG Input, Solid State Outputs, Analog Out</td>
<td>CSSG10SA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Loop, Two SG Inputs, Relay Outputs, Analog Out</td>
<td>CSSG11RA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Loop, Two SG Inputs, Solid State Outputs, Analog Out</td>
<td>CSSG11SA</td>
</tr>
<tr>
<td>Communications Cables (10 feet)</td>
<td>CBL</td>
<td>Programming Cable for CS, G3, &amp; Paradigm Series</td>
<td>CBLPROG0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communications Cables 1</td>
<td>CBLxxxxx</td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td>Crimson Programming Software</td>
<td>SFCRM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crimson Programming Software, Manual, and Download Cable</td>
<td>SFCRK</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
<td>Rail Stops (Qty 2)</td>
<td>RSRSTP00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Base</td>
<td>CSBASE00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Termination Plug</td>
<td>CSTERM00</td>
</tr>
</tbody>
</table>

1 Visit www.redlion.net for a complete list of PID modules, data acquisition modules, communications drivers and cables.
2 Free at www.redlion.net

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company’s liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company’s option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

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DEDICATED HIGH DENSITY INPUT MODULES FOR THE MODULAR CONTROLLER SERIES

MODELS AVAILABLE TO ACCEPT ±10 V, 0/4-20 mA, THERMOCOUPLE AND RTD INPUTS

±10 V AND 0/4-20 mA INPUT VERSIONS FULLY SCALABLE

±10 V AND 0/4-20 mA INPUT VERSIONS AVAILABLE WITH 100 POINT LINEARIZATION

UNUSED INPUTS CAN BE DISABLED TO INCREASE OVERALL READING RATE

IDEAL FOR DATA-ACQUISITION APPLICATIONS

AUTO ADDRESSING MINIMIZES CONFIGURATION TIME

CAN BE USED IN CONJUNCTION WITH ANY CS SERIES MODULES

GENERAL DESCRIPTION

The Model CSTC, CSRTD, CSINI, and CSINV are 16-bit analog input modules designed for use with the Modular Controller Series. These modules provide a means of high-density signal measurement for data-acquisition applications. The CSTC module accepts a wide range of thermocouple types, while the CSRTD accepts various RTD inputs. The CSINI and CSINV accept 0/4-20 mA and ±10 V process signals, respectively.

The modules connect and communicate via a backplane connection to the CSMSTR Modular Controller Series Master. The CSMSTR, equipped with serial ports as well as an Ethernet port, allows the system to share data with PCs, PLCs, and SCADA systems. The Master supports any combination of up to 16 CS series modules, allowing a total of 128 signals to be monitored via a single Master.

Internal power management circuits allow the modules to be replaced while power is applied, which reduces downtime. All configuration information is stored locally within the module, as well as in the Master, so replacement modules do not need to be configured.

The Modular Controller Series’ high density packaging and DIN rail mounting saves time and panel space. The backplane connection provides power and communication to the module and snaps easily onto standard top hat (T) profile DIN rail.

CONFIGURATION

The Modular Controller Series 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.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the module to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the module. An independent and redundant temperature limit indicator with alarm outputs is strongly recommended.

GENERAL SPECIFICATIONS

1. POWER: Derived from system backplane. (75 mA load on power input of MASTER). Module may be hot-swapped (replaced while powered up).

2. LEDs:
   - STS - Status LED shows module condition.
   - ALM - Alarm LED is lit during any internal alarm condition.

3. MEMORY: Non-volatile memory retains all programmable parameters. MASTER also stores the parameters in order to reprogram modules that are replaced.

4. ISOLATION LEVEL: 500 Vrms @ 50/60 Hz for 1 minute between the Signal Inputs and the CS Master Power Supply Input.

5. COMMUNICATIONS: Provided by the CS Master
GENERAL SPECIFICATIONS (CONT'D)

6. CERTIFICATIONS AND COMPLIANCES:

SAFETY
UL Listed, File # E302106, UL508, CSA C22.2 No. 14-M05
LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment
for measurement, control, and laboratory use, Part 1.

ELECTROMAGNETIC COMPATIBILITY
Emissions and Immunity to EN 61326: Electrical Equipment for
Measurement, Control and Laboratory use.

Immunity to Industrial Locations:
Electrostatic discharge EN 61000-4-2
Electromagnetic RF fields EN 61000-4-3
Fast transients (burst) EN 61000-4-4
Surge EN 61000-4-5
RF conducted interference EN 61000-4-6

Emissions:
Environments EN 55011
Class A

CSTC8 SPECIFICATIONS

12. INPUTS:
Channels: 8 single-ended
Effective Resolution: Full 16-bit
Sample Time: 50 msec - 400 msec, depending on number of enabled inputs.

<table>
<thead>
<tr>
<th>ENABLED INPUTS</th>
<th>SCAN TIME (READING RATE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50 msec (20 Hz)</td>
</tr>
<tr>
<td>2</td>
<td>100 msec (10 Hz)</td>
</tr>
<tr>
<td>3</td>
<td>150 msec (6.7 Hz)</td>
</tr>
<tr>
<td>4</td>
<td>200 msec (5 Hz)</td>
</tr>
<tr>
<td>5</td>
<td>250 msec (4 Hz)</td>
</tr>
<tr>
<td>6</td>
<td>300 msec (3.3 Hz)</td>
</tr>
<tr>
<td>7</td>
<td>350 msec (2.9 Hz)</td>
</tr>
<tr>
<td>8</td>
<td>400 msec (2.5 Hz)</td>
</tr>
</tbody>
</table>

Common Mode Rejection: >110 dB, 50/60 Hz
Normal Mode Rejection: >90 dB, 50/60 Hz
Temperature Coefficient: 0.01%/°C
Step Response Time: One scan time (to within 99% of final value)
Types: T, E, J, K, R, S, B, N, C
Slope & Offset: Provides sensor error correction
Input Impedance: 20 MΩ
Lead Resistance Effect: 0.25 µV/°C
Cold Junction Compensation: Less than ±1°C typical (±1.5°C max) over 0 to
50 °C ambient temperature

CSRTD6 SPECIFICATIONS

15. RTD INPUTS:
Channels: 6 single-ended
Effective Resolution: Full 16-bit
Sample Time: 67 msec - 400 msec, depending on enabled inputs.

<table>
<thead>
<tr>
<th>ENABLED INPUTS</th>
<th>SCAN TIME (READING RATE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>67 msec (14.9 Hz)</td>
</tr>
<tr>
<td>2</td>
<td>133 msec (7.5 Hz)</td>
</tr>
<tr>
<td>3</td>
<td>200 msec (5 Hz)</td>
</tr>
<tr>
<td>4</td>
<td>267 msec (3.8 Hz)</td>
</tr>
<tr>
<td>5</td>
<td>333 msec (3 Hz)</td>
</tr>
<tr>
<td>6</td>
<td>400 msec (2.5 Hz)</td>
</tr>
</tbody>
</table>

Common Mode Rejection: >110 dB, 50/60 Hz
Normal Mode Rejection: >90 dB, 50/60 Hz
Temperature Coefficient: 0.01%/°C
Step Response Time: One scan time (to within 99% of final value)
Type: 2 or 3 wire
Excitation: 150 µA

Notes:
2. Criterion B: Temporary loss of performance from which the unit self-
recoveres.
3. Power supplied from backplane via Master Module.
4. CSRTD600

7. ENVIRONMENTAL CONDITIONS:
Operating Temperature Range: 0 to +50°C
Storage Temperature Range: -40 to +85°C
Operating and Storage Humidity: 85% max relative humidity, non-
condensing, from 0 to +50°C
Vibration According to IEC 68-2-6: 10 to 150 Hz, 0.075 mm amplitude in
X, Y, Z direction 1 g.
Shock According to IEC 68-2-27: Operational 25 g, 11 msec in 3 directions.
Altitude: Up to 2000 meters
8. CONSTRUCTION: Case body is burgundy high impact plastic. Installation
Category I, Pollution Degree 2.
9. CONNECTIONS: Removable wire clamp screw terminal blocks
Wire Gage: 28-16 AWG terminal gage wire
Torque: 1.96-2.23 inch/lbs (0.22-0.25 N-m)
10. MOUNTING: Snaps on to standard DIN style top hat (T) profile mounting
rails according to EN50022 -35 x 7.5 and -35 x 15.
11. WEIGHT: 6 oz (170.1 g)

12. WIRE COLOR

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MEASUREMENT RANGE</th>
<th>ANSI</th>
<th>BS 1843</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>-200 to +400°C</td>
<td>(+) Blue</td>
<td>(+) White</td>
</tr>
<tr>
<td></td>
<td>-328 to +752°F</td>
<td>(-) Red</td>
<td>(-) Blue</td>
</tr>
<tr>
<td>E</td>
<td>-200 to +730°C</td>
<td>(+) Violet</td>
<td>(+) Brown</td>
</tr>
<tr>
<td></td>
<td>-328 to +1348°F</td>
<td>(+) White</td>
<td>(+) Blue</td>
</tr>
<tr>
<td>J</td>
<td>-200 to +760°C</td>
<td>(+) White</td>
<td>(+) Yellow</td>
</tr>
<tr>
<td></td>
<td>-328 to +1400°F</td>
<td>(-) Red</td>
<td>(-) Brown</td>
</tr>
<tr>
<td>K</td>
<td>-200 to +1250°C</td>
<td>(+) Yellow</td>
<td>(+) Brown</td>
</tr>
<tr>
<td></td>
<td>-328 to +2282°F</td>
<td>(-) Red</td>
<td>(-) Blue</td>
</tr>
<tr>
<td>R</td>
<td>0 to +1768°C</td>
<td>No Standard</td>
<td>(+) White</td>
</tr>
<tr>
<td></td>
<td>+32 to +3214°F</td>
<td>No Standard</td>
<td>(+) Blue</td>
</tr>
<tr>
<td>S</td>
<td>0 to +1768°C</td>
<td>No Standard</td>
<td>No Standard</td>
</tr>
<tr>
<td></td>
<td>+32 to +3214°F</td>
<td>No Standard</td>
<td>No Standard</td>
</tr>
<tr>
<td>B</td>
<td>+149 to +1820°C</td>
<td>No Standard</td>
<td>No Standard</td>
</tr>
<tr>
<td></td>
<td>+300 to +3308°F</td>
<td>No Standard</td>
<td>No Standard</td>
</tr>
<tr>
<td>N</td>
<td>-200 to +1300°C</td>
<td>(+) Orange</td>
<td>(+) Orange</td>
</tr>
<tr>
<td></td>
<td>-328 to +2372°F</td>
<td>(-) Red</td>
<td>(-) Blue</td>
</tr>
<tr>
<td>C</td>
<td>0 to +2315°C</td>
<td>No Standard</td>
<td>No Standard</td>
</tr>
<tr>
<td></td>
<td>+32 to +4199°F</td>
<td>No Standard</td>
<td>No Standard</td>
</tr>
</tbody>
</table>

13. TEMPERATURE INDICATION ACCURACY: ± (0.3% of span, +1°C).
Includes NIST conformity, cold junction affect, A/D conversion errors,
temperature coefficient and linearity conformity at 23°C after 20 minute warm
up.
14. PROBE BREAK RESPONSE: Upscale drive, Input Fault Alarm bit set high,
ALM LED illuminates.

15. RTD INPUTS:
Channels: 6 single-ended
Effective Resolution: Full 16-bit
Sample Time: 67 msec - 400 msec, depending on enabled inputs.

<table>
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<td>333 msec (3 Hz)</td>
</tr>
<tr>
<td>6</td>
<td>400 msec (2.5 Hz)</td>
</tr>
</tbody>
</table>

Common Mode Rejection: >110 dB, 50/60 Hz
Normal Mode Rejection: >90 dB, 50/60 Hz
Temperature Coefficient: 0.01%/°C
Step Response Time: One scan time (to within 99% of final value)
Type: 2 or 3 wire
Excitation: 150 µA

Lead Resistance: 15 Ω Max
Resolution: 0.1°
Slope & Offset: Provides sensor error correction

<table>
<thead>
<tr>
<th>TYPE</th>
<th>INPUT TYPE</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>385</td>
<td>100 Ω platinum, Alpha =.00385</td>
<td>-200 to +600°C</td>
</tr>
<tr>
<td>392</td>
<td>100 Ω platinum, Alpha =.003919</td>
<td>-200 to +600°C</td>
</tr>
<tr>
<td>672</td>
<td>120 Ω nickel, Alpha =.00672</td>
<td>-80 to +215°C</td>
</tr>
<tr>
<td>672</td>
<td>Linear resistance</td>
<td>0 Ω to 300 Ω</td>
</tr>
</tbody>
</table>

16. TEMPERATURE INDICATION ACCURACY: ± (0.1% of span) over 18
to 28°C environment, ± (0.2% of span) over 0 to 50°C environment.
Includes NIST conformity, A/D conversion errors, temperature coefficient and
linearity conformity at 23°C after 20 minute warm up.
17. PROBE BREAK RESPONSE: If channel is enabled: upscale drive, Input
Fault Alarm bit set high, ALM LED illuminates.

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**CSINV8 SPECIFICATIONS**

21. INPUTS:
- Channels: 8 single-ended
- Ranges: ±10 VDC or ±20 mA
- Effective Resolution: Full 16-bit
- Programmable Scaling: ±30,000
- Linearizer: 100 Points (CSINV8L0 only)
- Sample Time: 50 msec - 400 msec, depending on number of enabled inputs.

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</tbody>
</table>

Common Mode Rejection: >110 dB, 50/60 Hz
Normal Mode Rejection: >90 dB, 50/60 Hz
Step Response Time: One scan time (to within 99% of final value)
Input Impedance: 10 Ω
Max. Continuous Overload: 100 mA

20. INPUT FAULT RESPONSE: Upscale Drive, Input Fault Alarm bit set high, ALM LED illuminates below ±10.4 VDC.

**CSINI8 SPECIFICATIONS**

18. INPUTS:
- Channels: 8 single-ended
- Ranges: 0-20 mA or 4-20 mA
- Effective Resolution: Full 16-bit
- Programmable Scaling: ±30,000
- Linearizer: 100 Points (CSINI8L0 only)
- Sample Time: 50 msec - 400 msec, depending on number of enabled inputs.

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</tr>
</tbody>
</table>

Common Mode Rejection: >110 dB, 50/60 Hz
Normal Mode Rejection: >90 dB, 50/60 Hz
Step Response Time: One scan time (to within 99% of final value)
Input Impedance: 10 MΩ
Max. Continuous Overload: 100 mA

22. ACCURACY: ±0.1% of span

23. INPUT FAULT RESPONSE: Upscale Drive, Input Fault Alarm bit set high, ALM LED illuminates below ±10.4 VDC.
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.
   a. The mounting clip that connects to the DIN rail should have the DIN rail connected to protective earth.
   b. Connect the shield to common of the module and leave the other end of the shield unconnected and insulated from earth ground.
   c. 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.
   d. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.

2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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.
   c. Connect the shield to common of the module and leave the other end of the shield unconnected and insulated from earth ground.

3. The use of 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 (RLC part number FCOR0000)
   - TDK part number ZCAT305-1330A
   - Steward part number 28B2029-0A0

4. 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 RLC 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.

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 (RLC part number FCOR0000)
   - TDK part number ZCAT305-1330A
   - Steward part number 28B2029-0A0

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 RLC 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.

7. Also 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 effect the instrument’s operation.

Visit RLC’s web site at www.redlion.net for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.

HARDWARE INSTALLATION

SEPARATE BASE FROM MODULE

ATTACH THE MODULE BASE TO THE DIN RAIL

ATTACH MODULE TO BASE

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. 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.

Visit RLC’s web site at www.redlion.net for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.
**LEDs**

*STS – Status LED*

The Status LED is a dual color 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**

<table>
<thead>
<tr>
<th>Light</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapidly Flashing Red</td>
<td>Module is currently running the boot loader and/or being flash upgraded by Crimson. This occurs for four seconds during a power up.</td>
</tr>
<tr>
<td>Steady Red</td>
<td>Module switching to configuration.</td>
</tr>
<tr>
<td>Green</td>
<td>Module performing normally.</td>
</tr>
</tbody>
</table>

**Firmware Upgrade**

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

During a download, Crimson compares its own library of firmware files with those stored in the Master module. If they do not match, Crimson will download the necessary files. The Master then checks to make sure that the I/O modules contain the same firmware. If they contain a different revision, the Master will automatically copy those files into the module’s flash memory. During this process, the module LEDs will flash rapidly, starting with the top row, and progressing through the remaining rows until the process is complete.

**ALM – Alarm LED**

The Alarm LED indicates the presence of an input fault condition. When one or more Input Fault Alarm bits is high, the LED turns on. The alarms may be disabled for unused inputs.

**Error States**

<table>
<thead>
<tr>
<th>Light</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Red</td>
<td>Module not controlling, and not communicating.</td>
</tr>
<tr>
<td>Green/Pulsing Red</td>
<td>Module is controlling properly, but has lost communication with the Master.</td>
</tr>
</tbody>
</table>

**Configuration**

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

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Module</td>
<td>CSMSTR</td>
<td>Modular Controller Master, Multi Comms ports and Ethernet</td>
<td>CSMSTRV2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modular Controller Master with multiple protocol converter, data logger, web</td>
<td>CSMSTRSX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>server with Virtual HMI up to QVGA (320 x 240) size and expansion slot.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modular Controller Master with multiple protocol converter, data logger, web</td>
<td>CSMSTRGT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>server with Virtual HMI up to VGA (640 x 480) size and expansion slot with</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>increased SDRAM.</td>
<td></td>
</tr>
<tr>
<td>Input Modules</td>
<td>CSTC1</td>
<td>8 Channel Thermocouple Module</td>
<td>CSTC8000</td>
</tr>
<tr>
<td></td>
<td>CSINI</td>
<td>8 Channel 0(4)-20 mA Input Module</td>
<td>CSINI800</td>
</tr>
<tr>
<td></td>
<td>CSINV</td>
<td>8 Channel ±10 V Input Module</td>
<td>CSINV800</td>
</tr>
<tr>
<td></td>
<td>CSRTD</td>
<td>6 Channel RTD Module</td>
<td>CSRTD600</td>
</tr>
<tr>
<td>Communications Cables</td>
<td>CBL</td>
<td>Programming Cable for CS, G3, &amp; Paradigm Series</td>
<td>CBLPROG0</td>
</tr>
<tr>
<td>(10 feet)</td>
<td></td>
<td>Communications Cables1</td>
<td>CBLxxxxx</td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td>Crimson Programming Software2</td>
<td>SFCRM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crimson Programming Software, Manual, and Download Cable</td>
<td>SFCRK</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
<td>Rail Stops (Qty 2)</td>
<td>RSRSTP00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Base</td>
<td>CSBASE00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement Termination Plug</td>
<td>CSTERM00</td>
</tr>
</tbody>
</table>

1 Visit www.redlion.net for a complete list of PID modules, data acquisition modules, communications drivers and cables.
2 Free at www.redlion.net
LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company’s liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company’s option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

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