red lion®

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MODEL CSDIO - MODULAR CONTROLLER
SERIES DIGITAL MODULE

c**UL**us LISTED
IND. CONT. EQ.
34AD

- ADDS REMOTE I/O CAPABILITY TO THE MODULAR CONTROLLER SERIES
- EIGHT INPUT, SIX OUTPUT DIGITAL MODULE
- INPUTS ISOLATED FROM OUTPUTS
- INPUTS INDEPENDENTLY SWITCH SELECTABLE FOR SINK OR SOURCE SIGNALS
- INPUTS INDEPENDENTLY CONFIGURABLE FOR HIGH OR LOW ACTIVE STATE
- INPUTS INDEPENDENTLY SWITCH SELECTABLE FOR HIGH OR LOW FREQUENCY SIGNALS
- RELAY OR NFET OUTPUT MODELS AVAILABLE

c**UL**us
LISTED
IND.CONT. EQ.
3PWL

FOR USE IN HAZARDOUS LOCATIONS:
Class I, Division 2, Groups A, B, C, and D

For Model No. CSDIO14S Only

ABS TYPE APPROVED PRODUCT

CE

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.
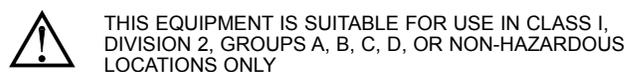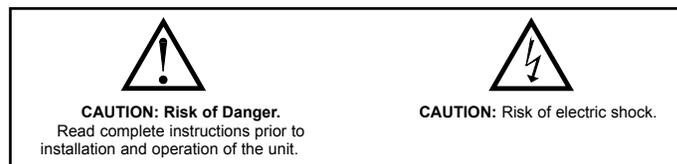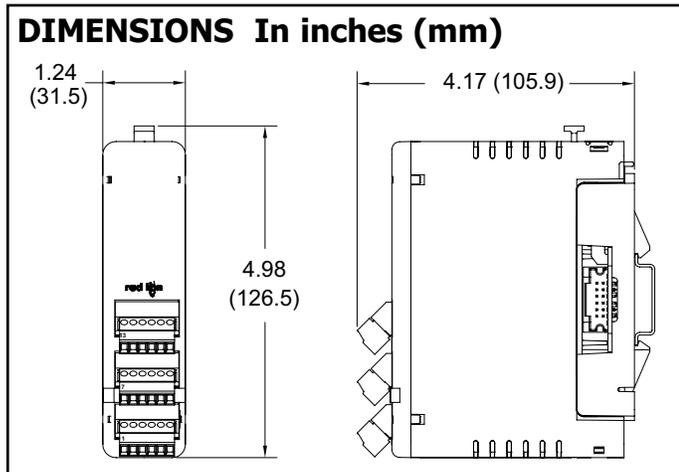
CONFIGURATION

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.
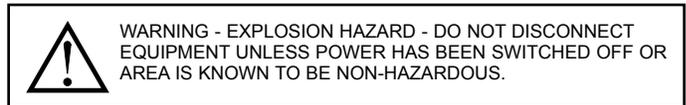
Do not use the module to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the module.
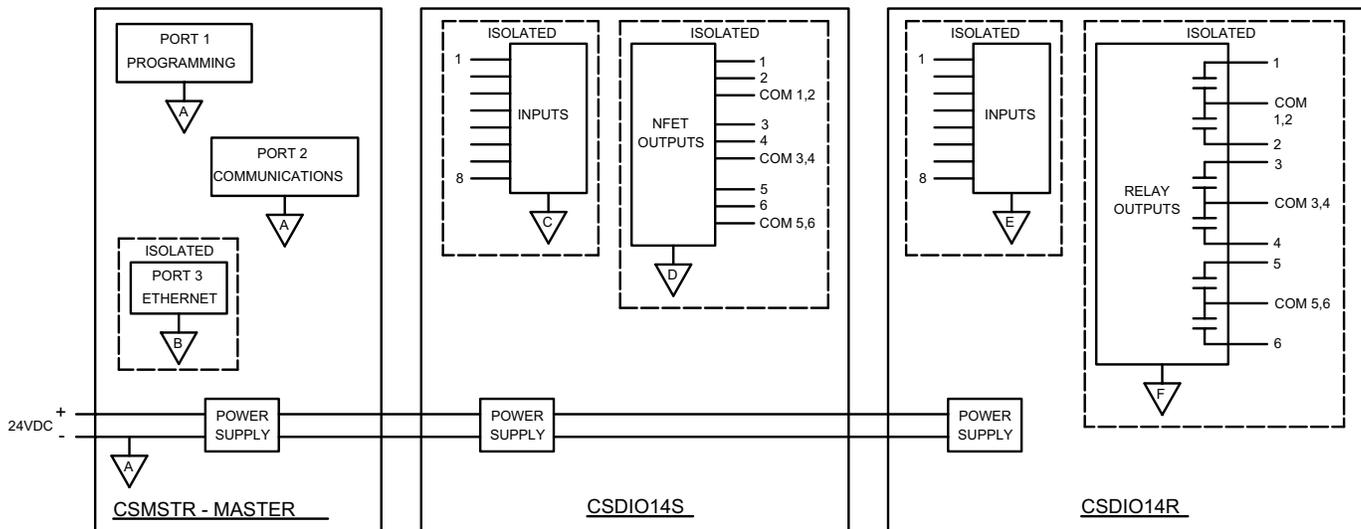
⚠ **CAUTION: Risk of Danger.** Read complete instructions prior to installation and operation of the unit.

⚠ **CAUTION:** Risk of electric shock.

⚠ WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2

⚠ THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D, OR NON-HAZARDOUS LOCATIONS ONLY

DIMENSIONS In inches (mm)

1.24 (31.5)

4.17 (105.9)

4.98 (126.5)

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 useable 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 to IEC 68-2-6: Operational 10 to 150 Hz, 1 g.
    Shock to IEC 68-2-27: Operational 25 g (10 g relay).
    Altitude: Up to 2000 meters
10. **CERTIFICATIONS AND COMPLIANCES**:
    SAFETY
    Check each module's specifications to determine system compliance.
    CE Approved
        EN 61326-1 Immunity to Industrial Locations
        Emission CISPR 11 Class A
    Safety requirements for electrical equipment for measurement, control, and laboratory use:
        EN 61010-1: General Requirements
        EN 61010-2-030: Particular Requirements for Testing and Measuring Circuits
        EN 61010-2-201: Particular Requirements for Control Equipment
    RoHS Compliant
    UL Listed: File #E302106
    UL Hazardous (CSDIO14S only): File #E317425
    ABS Certificate #09-HS426719-B-4-PDA
11. **CONSTRUCTION**: Case body is burgundy high impact plastic. For indoor use only. Installation Category II, 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)

| ⚠ | WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR AREA IS KNOWN TO BE NON-HAZARDOUS. |

BLOCK DIAGRAM

EMC INSTALLATION GUIDELINES

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

1. A unit should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded cables for all Signal and Control inputs. The shield connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield to earth ground (protective earth) at one end where the unit is mounted.
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is over 1 MHz.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors, feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run through metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter. Also, Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. Long cable runs are more susceptible to EMI pickup than short cable runs.
5. In extremely high EMI environments, the use of external EMI suppression devices such as Ferrite Suppression Cores for signal and control cables is effective. The following EMI suppression devices (or equivalent) are recommended:
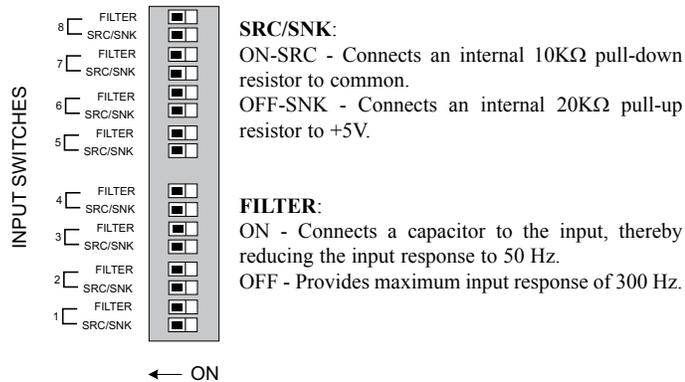   Fair-Rite part number 0443167251 (RLC part number FCOR0000)
   Line Filters for input power cables:
   Schaffner # FN2010-1/07 (Red Lion Controls # LFIL0000)

6. To protect relay contacts that control inductive loads and to minimize radiated and conducted noise (EMI), some type of contact protection network is normally installed across the load, the contacts or both. The most effective location is across the load.
   a. Using a snubber, which is a resistor-capacitor (RC) network or metal oxide varistor (MOV) across an AC inductive load is very effective at reducing EMI and increasing relay contact life.
   b. If a DC inductive load (such as a DC relay coil) is controlled by a transistor switch, care must be taken not to exceed the breakdown voltage of the transistor when the load is switched. One of the most effective ways is to place a diode across the inductive load. Most 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
7. Care should be taken when connecting input and output devices to the instrument. When a separate input and output common is provided, they should not be mixed. Therefore a sensor common should NOT be connected to an output common. This would cause EMI on the sensitive input common, which could affect the instrument's operation.

Visit RLC's web site at http://www.redlion.net/emi for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.
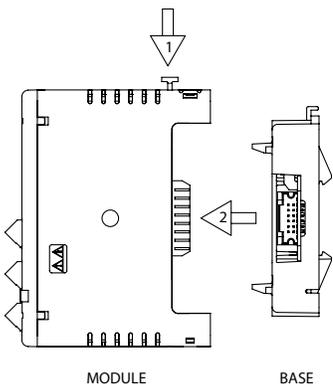
HARDWARE
INPUT SWITCHES

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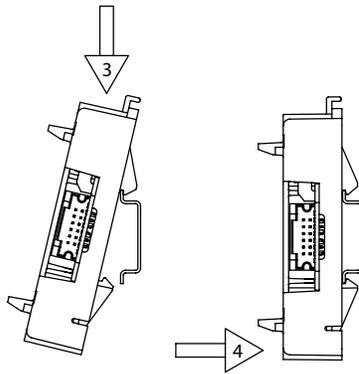

SRC/SNK:

ON-SRC - Connects an internal 10KΩ pull-down resistor to common.

OFF-SNK - Connects an internal 20KΩ pull-up resistor to +5V.

FILTER:

ON - Connects a capacitor to the input, thereby reducing the input response to 50 Hz.

OFF - Provides maximum input response of 300 Hz.

HARDWARE INSTALLATION

SEPARATE BASE FROM MODULE

MODULE   BASE

ATTACH THE MODULE BASE TO THE DIN RAIL

ATTACH MODULE TO BASE

MODULE   BASE
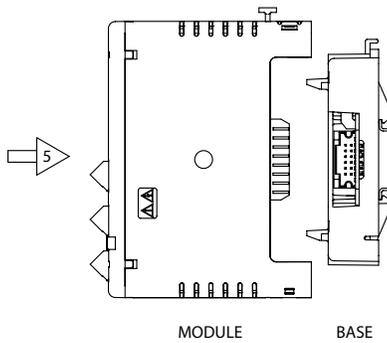

WIRING

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.

Terminals 13 to 18

Terminals 7 to 12

Terminals 1 to 6
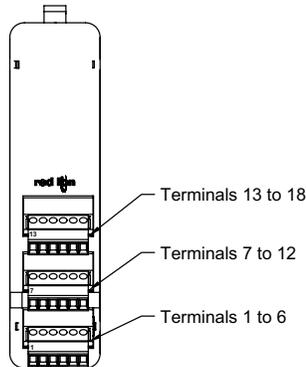
WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT WHILE CIRCUIT IS ALIVE UNLESS AREA IS KNOW TO BE NON-HAZARDOUS.

INPUT AND OUTPUT (I/O) WIRING MUST BE IN ACCORDANCE WITH CLASS I, DIV. 2 WIRING METHODS AND IN ACCORDANCE WITH THE AUTHORITY HAVING JURISDICTION.
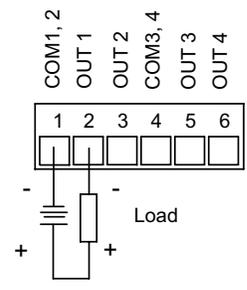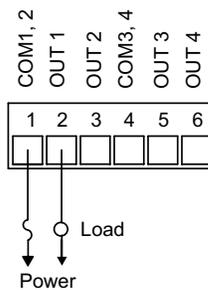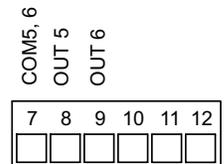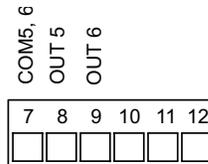

INPUT CONNECTIONS
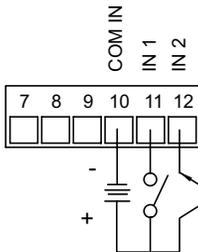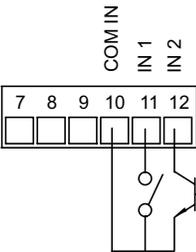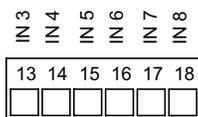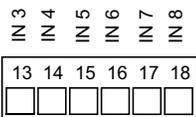
Sinking Input

Sourcing Input

OUTPUT CONNECTIONS

Relay Version

Solid State NFET 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

Rapidly Flashing Red	Module is currently running the boot loader and/or being flash upgraded by Crimson. This occurs for four seconds during a power up.
Steady Red	Module switching to configuration.
Green	Module performing normally.

Error States

Solid Red	Module not controlling, and not communicating.
Green/Pulsing Red	Module is controlling properly, but has lost communication with the Master.

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

TYPE	MODEL NO.	DESCRIPTION	PART NUMBER
Master Module	CSMSTR	Modular Controller Master, Multi Comms ports and Ethernet	CSMSTRV2
		Modular Controller Master with multiple protocol converter, data logger, web server with Virtual HMI up to QVGA (320 x 240) size and expansion slot.	CSMSTRSX
		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	CSMSTRGT
Digital Modules	CSDIO14[1]	Eight Inputs, Six Relay Outputs	CSDIO14R
		Eight Inputs, Six Solid State Outputs	CSDIO14S
Communication Cables (10 feet)	CBL	Programming Cable for CS, G3, & Paradigm Series	CBLPROG0
		Communications Cables[1]	CBLxxxxx
Software		Crimson® Programming Software[2]	SFCRM
		Crimson® Programming Software, Manual, and Download Cable	SFCRK
Accessories		Rail Stops (Qty 2)	RSRSTP00
		Replacement Base	CSBASE00
		Replacement Termination Plug	CSTERM00

Note: Certain modules are not suitable for use in Hazardous locations. Check each module's specifications prior to installation.

[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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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.