REDLION™

DA70D Intelligent Edge Controller With Scalable Inputs/Outputs

Installation Guide

- Protocol conversion feature converts numerous protocols simultaneously
- Modular design supports up to three communications sleds and up to 10 PID control or I/O modules
- Advanced web server with Javascript, Bootstrap, CSS and HTML5 support delivers operations visibility anywhere
- Real-time data, event and security logging to microSD card or via ftp with cryptographic signature support
- Industrial construction for reliable operation
- Wide operating temperature range

c(UL)us LISTED
IND.CONT. EQ.
E317425

FOR USE IN HAZARDOUS LOCATIONS:
Class I, Division 2, Groups A, B, C, and D
T4

CE ⟨Ex⟩

II 3 G Ex ec IIC T4 Gc
DEMKO 20 ATEX 2268X
IECEx UL 20.0007X

GENERAL DESCRIPTION

The modular 3-sled design of the DA70D allows for up to three communications sleds to be added as connectivity requirements change or new standards emerge. Rugged, field-installable PID control and I/O modules ensure a solution that adapts to meet almost any industrial application need.

CONTROLLER PACKAGE CHECKLIST

This product package should contain the items listed below. This list does not include any sleds that may have been ordered. If any items are missing or damaged, contact Red Lion immediately.
- DIN Rail Mount DA70D Controller
- Pre-installed Sled Carriage
- Dust Cover
- Installation Guide

SAFETY SUMMARY

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

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

⚠ WARNING - EXPLOSION HAZARD. NOT HOT SWAPPABLE. DO NOT REMOVE OR REPLACE WHILE CIRCUIT IS LIVE UNLESS THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.

AVERTISSEMENT - RISQUE D'EXPLOSION. NON ÉCHANGEABLE À CHAUD. NE PAS RETIRER OU REMPLACER SOUS TENSION SAUF SI LA ZONE EST EXEMPTE DE CONCENTRATIONS INFLAMMABLES.

⚠ CAUTION: Risk of Danger
Read complete instructions prior to installation and operation of the unit.
ATTENTION : Risque de danger
Lire les instructions complètes avant l'installation et l'utilisation de l'appareil.

⚠ WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2
AVERTISSEMENT - DANGER D'EXPLOSION - LE REMPLACEMENT DE COMPOSANTS PEUT NUIRE L'APTITUDE À LA CLASSE I, DIVISION 2

⚠ This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only.
Cet équipement est adapté à une utilisation dans des endroits de classe I, Division 2, Groupes A, B, C, D, ou dans des endroits non dangereux seulement.

SPECIFICATIONS

1. **POWER REQUIREMENTS**:
The DA70D Controller must use a Class 2 circuit according to National Electrical Code (NEC), NFPA-70 or Canadian Electrical Code (CEC), Part I, C22.1 or a Limited Power Supply (LPS) according to IEC 60950-1 or Limited-energy circuit according to IEC 61010-1.
Power connection via removable three position terminal block.
Supply Voltage: 12 to 24 VDC +/- 15%, Class 2 source

INPUT VOLTAGE	12 V	24 V
Typical Power DA70D Controller only	4 W	4.5 W
Max Power DA70D Controller only	4.5 W	5 W
Available Power for Modules (Maximum of 10 modules)	43 W	45 W
Max Power DA70D Controller, with Sleds & USB	16 W	17 W
Max Power DA70D Controller with full accessories	59 W	62 W

2. **BATTERY**: 3 V Lithium coin cell. Typical lifetime of 5 years, at nominal usage. To maintain UL rating, replacement battery must be: Red Lion CRA000 BT3V0 00000, Rayovac BR1225X-BA or Panasonic BR1225A/BN.

3. **MEMORY**:
   On Board User Memory: 1 GB of non-volatile Flash memory.
   Memory Card: microSD slot accepts Class 5 or better microSD cards up to 256 GB capacity. FAT32, industrial grade.

4. **COMMUNICATION CAPABILITIES**:
   USB Device Port: Isolated USB 2.0 full speed, type B connection. USB DEVICE PORT IS FOR SYSTEM SET-UP AND DIAGNOSTICS AND IS NOT INTENDED FOR PERMANENT CONNECTION.
   USB Host Port: Complies with Universal Serial Bus Specification Rev 2.0. Supports data transfers at high speed and full speed with over current protection (0.5 A max).
   Ethernet Ports: Two 10/100 Base TX RJ-45 Ports, auto MDI/MDI-X.
   Isolation from Ethernet network to controller: 1500 Vrms
   Serial Ports: Three serial ports with individual port isolation available in these two configurations:

DA70D0F	2 - RS-232 ports (RJ12 connectors) 1 - RS-485/422 port (RJ45 connector)
DA70D0G	1 - RS-232 port (RJ12 connector) 2 - RS-485/422 ports (RJ45 connectors)

5. **ENVIRONMENTAL CONDITIONS**:
   Operating Temperature Range: -40 to 75 °C
   Storage Temperature Range: -40 to 85 °C
   Operating and Storage Humidity: 0 to 85% max. RH non-condensing
   Vibration to IEC 60068-2-6: Operational 5-500 Hz, 2 g
   Shock to IEC 60068-2-27: Operational 15 g
   Altitude: Up to 2000 meters
   Installation Category II, Pollution Degree 2 as defined in IEC/EN 60664-1.

6. **CERTIFICATIONS AND COMPLIANCES**:
   CE Approved
     EN 61326-1 Immunity to Industrial Locations
     Emission CISPR 11 Class A
     IEC/EN 61010-1
     RoHS Compliant
   ATEX Approved
     ⬡ II 3 G Ex ec IIC T4 Gc
     DEMKO 20 ATEX 2268X
   IECEx Approved
     IECEx UL 20.0007X
   UL Hazardous: File # E317425
   Rugged IP30 enclosure

7. **CONNECTIONS**:
   Power Connection: Three-pin top mounted connector
     Wire Strip Length: 0.3" (7.5 mm)
     Wire Gauge Capacity: 12 to 24 AWG (3.31 to 0.20 mm^2) copper wire only
     Torque: 4.4-5.3 inch-lbs (0.5-0.6 N-m)
   Module Connection: 8 pin connectors
     Wire Strip Length: 0.3" (7.5 mm)
     Wire Gauge Capacity: 14 to 24 AWG (2.08 to 0.20 mm^2) copper wire only
     Torque: 2 inch-lbs (0.23 N-m)

8. **CONSTRUCTION**: Metal and plastic enclosure with IP30 rating. For use only in an approved enclosure.

9. **MOUNTING REQUIREMENTS**: Mounts onto standard DIN style top hat (T) profile mounting rails according to EN50022 – 35 x 7.5 mm and 35 x 15 mm.

10. **WEIGHT**: 2 lb 2.5 oz (978.05 g)

DIMENSIONS In Inches (mm)

Modules sold separately.
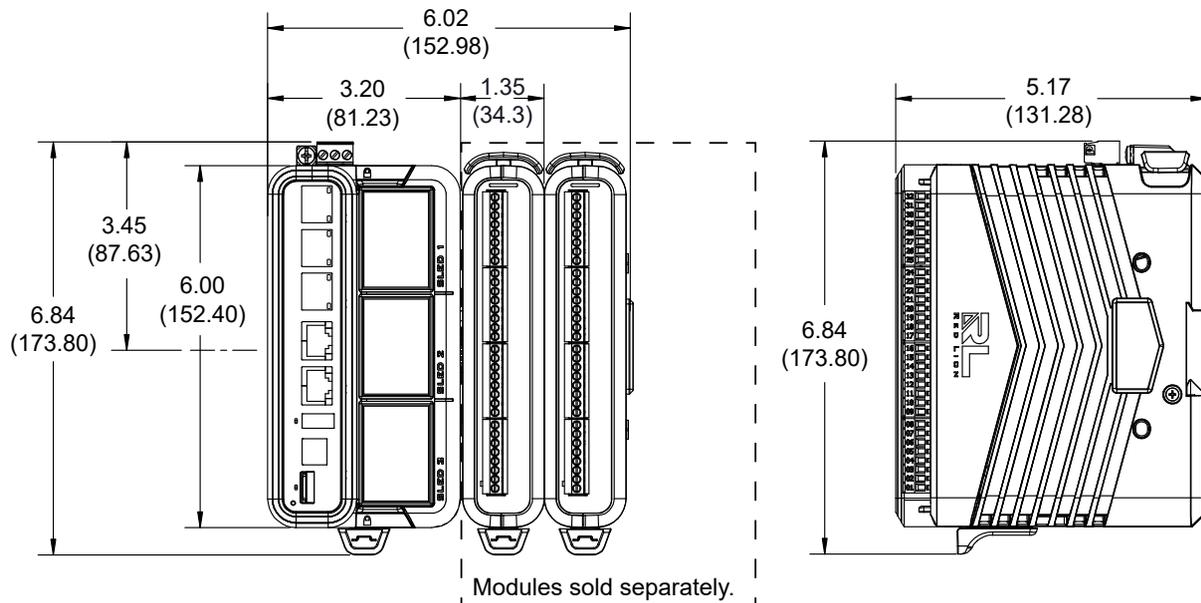
EMC INSTALLATION GUIDELINES

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

1. A unit should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded cables for all Signal and Control inputs. The shield connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
    a. Connect the shield to earth ground (protective earth) at one end where the unit is mounted.
    b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is over 1 MHz.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors, feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run through metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter. Also, Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. Long cable runs are more susceptible to EMI pickup than short cable runs.
5. In extremely high EMI environments, the use of external EMI suppression devices such as Ferrite Suppression Cores for signal and control cables is effective. The following EMI suppression devices (or equivalent) are recommended:
Fair-Rite part number 0443167251 (Red Lion #FCOR0000)
Line Filters for input power cables:
    Schaffner # FN2010-1/07 (Red Lion #LFIL0000)
6. To protect relay contacts that control inductive loads and to minimize radiated and conducted noise (EMI), some type of contact protection network is normally installed across the load, the contacts or both. The most effective location is across the load.
    a. Using a snubber, which is a resistor-capacitor (RC) network or metal oxide varistor (MOV) across an AC inductive load is very effective at reducing EMI and increasing relay contact life.
    b. If a DC inductive load (such as a DC relay coil) is controlled by a transistor switch, care must be taken not to exceed the breakdown voltage of the transistor when the load is switched. One of the most effective ways is to place a diode across the inductive load. Most Red Lion products with solid state outputs have internal zener diode protection. However external diode protection at the load is always a good design practice to limit EMI. Although the use of a snubber or varistor could be used.
        Red Lion part numbers: Snubber: SNUB0000
   Varistor: ILS11500 or ILS23000
7. Care should be taken when connecting input and output devices to the instrument. When a separate input and output common is provided, they should not be mixed. Therefore a sensor common should NOT be connected to an output common. This would cause EMI on the sensitive input common, which could affect the instrument's operation.

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

INSTALLATION

Controller DIN Rail Mounting

The DIN rail should be mounted horizontally so that the unit's ventilation holes are vertical in relation to installation 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. A minimum 3.2 mm distance shall be maintained between the hazardous live parts of the equipment and accessible parts of the fire/electrical enclosure. For environments with vibration or impacts, DIN rail clamps are recommended.

DIN RAIL LOCK LATCH
Unlock ◄──────► Lock
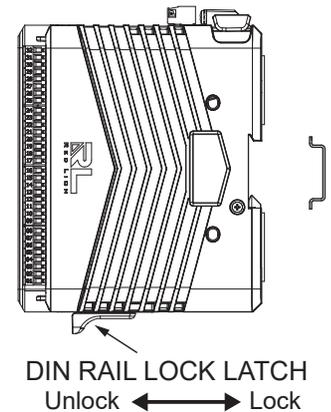
For hazardous location installation, the following shall be taken into consideration:
— The equipment shall only be used in an area of at least pollution degree 2, as defined in EN/IEC 60664-1.
— The equipment shall be installed in an enclosure that provides a minimum ingress protection of IP54 in accordance with EN/IEC 60079-0. The enclosure shall be accessible only with the use of a tool.
— Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value at the supply terminals to the equipment.

Recommended DIN Rail Mounting Steps:

1. Ensure the DIN rail lock latch is in the outward most position (unlocked). Hook the top back of the DA70D DIN rail clip on the unit over the DIN rail.
2. Push the bottom of the unit towards the DIN rail until the unit is flush with the rail.
3. Push the DIN rail lock latch to the latched (in) position.

Recommended DIN Rail Removal Steps:

1. Move the DIN rail lock latch to the unlatched (out) position.
2. Unhook the top of the unit and remove it from the DIN rail.
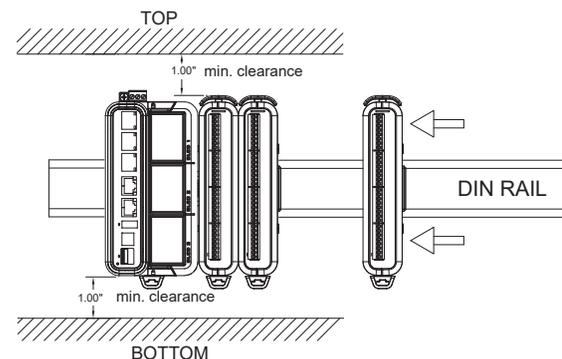
MODULE INSTALLATION
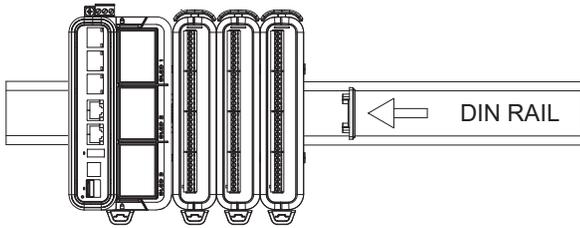

Figure 1 - Attach modules to Controller on DIN Rail
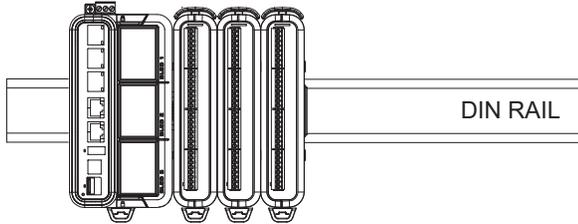
Figure 2 - Attach dust cap to last module

Figure 3 - Module Installation is complete.

SLED INSTALLATION

> ⚠ **CAUTION**: Follow standard ESD precautionary procedures.
>
> **ATTENTION**: Suivez les procédures de précaution standard de décharge électrostatique.

1. Prior to installing the Sled(s) for your DA70D Controller application, ensure that the Controller is not receiving power.
2. Remove the carriage from the Controller case by releasing the two retaining latches and pulling straight out from Controller.
3. Remove blank panel from the carriage slot of the target sled installation location.
4. Install sled by aligning the two sled mounting hole fasteners, with the controller mounting posts. Be sure locating holes on bottom side of sled align with the locating pins on the carriage, and the sled sits flush against the carriage.
5. Hand tighten the sled captive fasteners, or use a screwdriver if necessary.
6. Repeat the above steps for any additional sleds.
7. Carefully align the carriage with Controller base and press carriage into the controller.

> ⚠ **CAUTION**: Failure to properly align the carriage can result in damage to the Sled connector pins.
>
> **ATTENTION:** Si le chariot n'est pas correctement aligné, les broches du connecteur du chariot risquent d'être endommagées.

8. Close the retaining latches to ensure the carriage is fully seated into the Controller case.

POWER SUPPLY REQUIREMENTS

The DA70D Controller requires a 12-24 VDC power supply. Your unit may draw considerably less than the maximum rated power depending upon the configuration and features being used. As additional sleds and/or modules are used, your unit will draw increasing amounts of power. Items that could cause increases in current are modules, microSD card, communications sleds, and other features programmed through software.

To ensure you do not exceed the capacity of your DA70D Controller host power supply, calculate the total power consumption required for all planned accessories. Each module's maximum power consumption is listed in the Specifications of their Product Bulletin. The total power available for modules is listed in the specifications of the DA70D Controller host.

It is very important that the power supply meets the following requirements and 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 Controller. Ideally, the shortest length possible should be used.
 – The wire used to connect the Controller power supply should be at least 22-gauge wire. If a longer cable run is used, a heavier gauge wire should be used. The routing of the cable should be kept away from large capacitors, inverters, and other devices which may generate significant electrical noise.
 – Use a power supply with an NEC Class 2 or Limited Power Source (LPS) and SELV (safety extra-low voltage) rating. This type of power supply provides isolation to accessible circuits from hazardous voltage levels generated by a mains power supply due to single faults. 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.
 – Peak efficiency (DA70D) occurs at the low side of the voltage range (approx. 12 V), recommended for high temperature applications.

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

WIRING

All power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction.

> ⚠ CAUTION: Only UL listed wiring with temperature ratings greater than 90 °C permitted for Class I, Division 2, Zone 2 and ATEX/IECex installations.
>
> ATTENTION: Seul le câblage homologué UL avec des températures nominales supérieures à 90°C est autorisé pour les installations de classe I, Division 2 , zone 2 et ATEX/IECex.

CONNECTING TO EARTH GROUND

Each DA70D has a chassis ground terminal on the top of the unit. Your unit should be connected to earth ground. Steps should be taken beyond connecting to earth ground to eliminate the buildup of electrostatic charges.

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

[1] USB's shield may be connected to earth ground at the host. USB's shield in turn may also be connected to signal common.

FACTORY RESET BUTTON

The factory reset button located in the lower left area of the front of the unit can be used to access the system console. Refer to software manual for access procedure and available options.
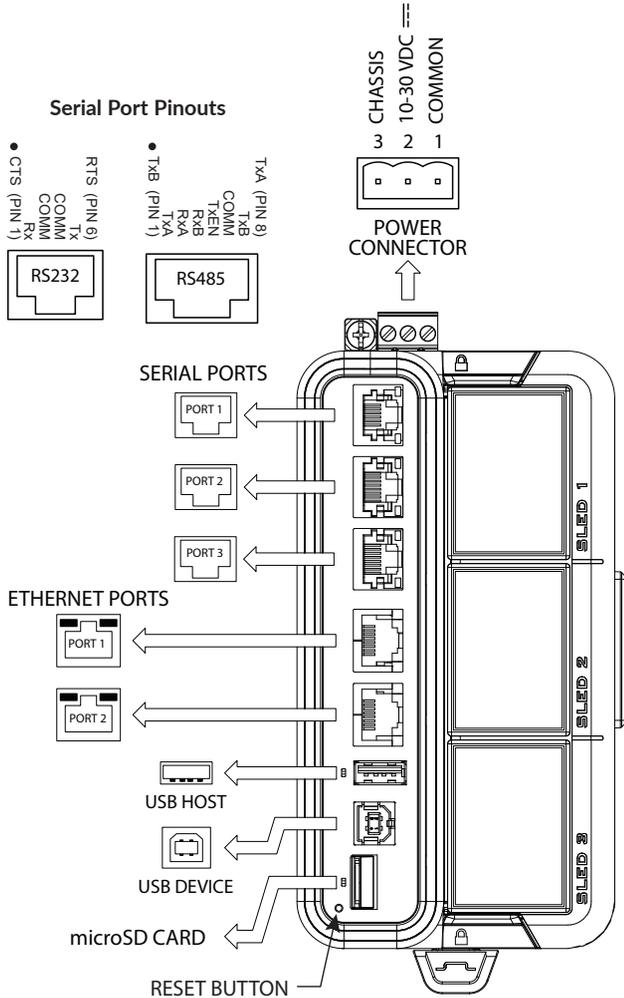
CONFIGURING A DA70D

The DA70D is configured using Crimson® 3.1 software. Crimson is available as a no charge download from Red Lion's website. Crimson updates for new features and drivers are posted

on the website as they become available. By configuring the DA70D using the latest Crimson version, you are assured that your unit has the most up to date feature set. Crimson software can configure the DA70D through the Serial programming port, USB device port, Ethernet ports or microSD card.

The microSD card can be used to program a DA70D by placing an image file on the microSD card. The card is then inserted into the target DA70D and powered. Refer to the Crimson 3.1 User Manual for more information on the proper names and locations of this file.

DA70D PORT PINOUTS

Serial Port Pinouts

SERIAL PORTS

PORT 1
PORT 2
PORT 3

ETHERNET PORTS

PORT 1
PORT 2

USB HOST
USB DEVICE
microSD CARD
RESET BUTTON

POWER CONNECTOR

DA70D CELLULAR CONNECTIVITY

Cellular connectivity is achieved using the DA 4G LTE - CAT4 Modem Sled. It is recommended that the Cellular Sled be installed into sled slot 1, the topmost sled slot in the carriage of the Controller. Refer to the documentation shipped with your DA 4G LTE - CAT4 Sled.

> ⚠ Do not connect or disconnect cables while power is applied unless area is known to be non-hazardous. Not hot swappable.

ETHERNET COMMUNICATIONS

Ethernet communications can be established at either 10 BASE-T or 100 BASE-TX. The DA70D's RJ45 jacks are 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. Refer to the Crimson 3.1 User Manual and Red Lion's website for additional information on Ethernet communications.

| LED COLOR(S)	MEANING
YELLOW solid	Link established.
YELLOW flashing	Data being transferred.
GREEN (OFF)	10 BASE-T Communications
GREEN (ON)	100 BASE-TX Communications

RS232 PORT(S)

The DA70D has one or two RS232 serial ports depending on unit configuration that can be used for either programming or for communications. The RS232 port can be used for master or slave protocols. The serial port has a pair of LEDs to indicate transmit and receive activity. The pinout is shown to the right.

DA70D RS232 to a PC			
DA70D : RJ12		PC : DB9	
Pin #	Name	Pin #	Name
4	COMM	1	DCD
5	Tx	2	Rx
2	Rx	3	Tx
	N/C	4	DTR
3	COMM	5	GND
	N/C	6	DSR
1	CTS	7	RTS
6	RTS	8	CTS
	N/C	9	RI

RS485/422 COMMS PORT(S)

The DA70D has one or two RS485 ports depending on unit configuration. These ports can be used for RS485 or RS422 communication. The comms port has a pair of LEDs to indicate transmit and receive activity.
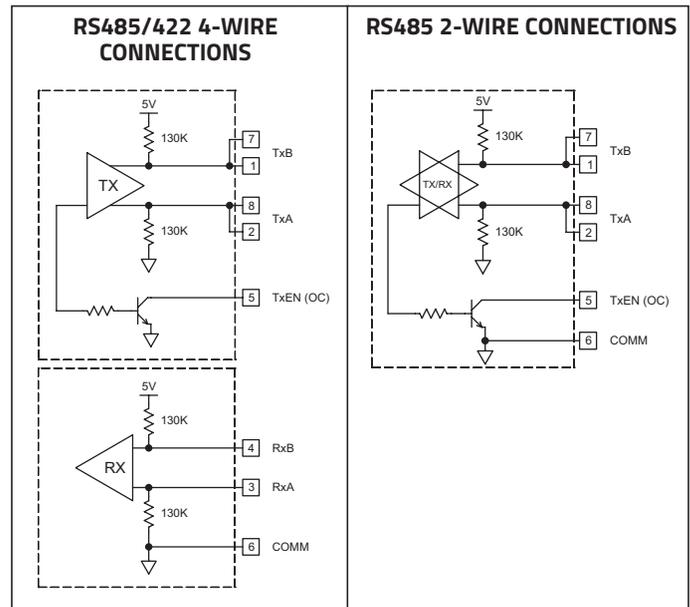
Note: All Red Lion devices connect A to A and B to B. Refer to www.redlion.net for additional information.

Examples of RS485 2-Wire Connections

DA70D to Red Lion RJ11			
DA70D : RJ45		RLC : RJ11	
Pin #	Name	Pin #	Name
5	TxEN	2	TxEN
6	COMM	3	COMM
1	TxB	5	B-
2	TxA	4	A+

DA70D to Modular Controller			
DA70D		Modular Controller	
Pin #	Name	Pin #	Name
1, 4	TxB	1, 4	TxB
4, 1	RxB	4, 1	RxB
2, 3	TxA	2, 3	TxA
3, 2	RxA	3, 2	RxA
5	TxEN	5	TxEN
6	COMM	6	COMM
7	TxB	7	TxB
8	TxA	8	TxA

DH485 COMMUNICATIONS

The DA70D's RS485/422 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 at www.redlion.net/cables-drivers.

STATUS RING LED

LED COLOR	LED STATE	MEANING
Green	Solid	Controller is configured and running
Blue	Rapid Flashing	Bootloader is Active
Blue	Slow Flashing	Invalid File System
Red	Solid	Active Auto Alarm
Red	Flashing	Active Manual Alarm

## USB, DATA TRANSFERS FROM THE microSD CARD

WARNING - Do not connect or disconnect cables while power is applied unless area is known to be non-hazardous. Not hot swappable. USB port is for system set-up and diagnostics and is not intended for permanent connection.

In order to transfer data from the microSD card via the USB port, a driver must be installed on your computer. This driver is installed with Crimson and is located in the folder C:\Program Files\Red Lion Controls\Crimson 3.1\Device\ after Crimson is installed. This may have already been accomplished if your DA70D was configured using the USB port.

Once the driver is installed, connect the DA70D to your PC with a USB cable, and follow "Mounting the microSD" instructions in the Crimson 3.1 User Manual.

INSTALL THE microSD CARD

Insert the microSD card into the slot on the front of the Controller with the card oriented as shown. The card is inserted properly when the card clicks into place in the card holder. To remove the microSD card, push in slightly on the card.
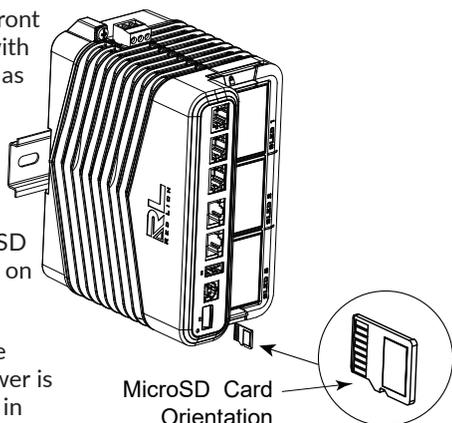
Note: Removal of the microSD while power is applied may result in corruption or loss of data.

MicroSD Card Orientation

## DA70D CONTROLLER BATTERY & TIME KEEPING

WARNING - Explosion Hazard - The area must be known to be non-hazardous before servicing/ replacing the unit and before installing or removing I/O wiring and battery. Not hot swappable.

A battery is used to keep time when the unit is without power. The battery of a DA70D Controller unit does not affect the unit's memory, all configurations and data is stored in non-volatile memory.

Changing the Battery

To change the battery of a DA70D Controller, first remove power to the unit. Insert a small screwdriver into the slot provided on the battery holder and pry the battery holder out of the unit. Remove the old battery from the holder and replace it with a new battery.

Note: Battery orientation MUST MATCH as shown.
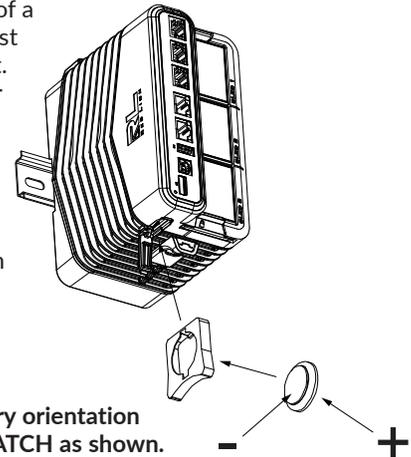
To maintain UL rating, battery must be replaced with one listed in the Specifications.

CAUTION: Lithium battery. Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

ATTENTION: Pile au lithium. Danger d'explosion si la batterie est mal remplacée. Remplacez-la uniquement par une pile du même type ou d'un type équivalent recommandé par le fabricant.

Please note that the old battery must be disposed of in a manner that complies with your local waste regulations. The battery must not be disposed of in fire, or in a manner whereby it may be damaged and its contents could come into contact with human skin.

Veuillez noter que la vieille pile doit être éliminée conformément à la réglementation locale en matière de déchets. La pile ne doit pas être jetée au feu, ni d'une manière qui pourrait l'endommager et son contenu pourrait entrer en contact avec la peau humaine.

RED LION CONTROLS TECHNICAL SUPPORT

If for any reason you have trouble operating, connecting, or simply have questions concerning your new DA70D Controller, contact Red Lion's technical support.

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

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

ORDERING INFORMATION

DESCRIPTION	PART NUMBER
DA70D Intelligent Edge Controller with 2 RS232 ports and 1 RS485 port	DA70D 0FNN NNNN 000
DA70D Intelligent Edge Controller with 1 RS232 port and 2 RS485 ports	DA70D 0GNN NNNN 000
4G LTE (CAT4) Cellular Sled for AMER (Verizon)	DA S00 CL9C4S VZ000
4G LTE (CAT4) Cellular Sled for EMEA, SAARC, APAC	DA S00 CL9C4S EU000
802.11n Wi-Fi Sled	DA S00 WF10N0 AM000
1 Port USB 2.0 Host Sled	DA S00 PN40U4 00000
Dual RS232 Ports Sled (Isolated)	DA S00 PN2221 IS000
Dual RS485 Ports Sled (Isolated)	DA S00 PN2442 IS000
Mixed RS232/RS485 Ports Sled (Isolated)	DA S00 PN2245 IS000

Spaces in listed part numbers are shown to improve readability, do not include when searching for or ordering these parts.

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

COPYRIGHT

LIMITED WARRANTY

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

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

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

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