Sixnet® Series VersaTRAK mIPm Industrial RTU

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Preface

Disclaimer

This user manual provides an overview of installation, maintenance and operation of the Sixnet® Series VersaTRAK mIPm Industrial RTU equipment. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls, Inc. is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

Users of this document are urged to heed warnings and cautions used throughout the document.

Compliance Information

It is recommended that the owner of this equipment determine and ensure conformance with any specific and applicable local regulations.

Part 15 of the Federal Communications Commission (FCC) - A Rules: Interference

Every effort has been made to ensure that this equipment is designed to comply with the limits for a Class A digital device, as described in the FCC Rules.

This product complies with Part 15 of the FCC-A Rules.

Operation is subject to the following conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Industry Canada

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions; (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe A répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

Environmental Impact Statement

Red Lion equipment contains no hazardous materials as defined by the United States Environmental Protection Agency (USEPA). Red Lion recommends that all failed product be returned to Red Lion for failure analysis and proper disposal.

Toxic Emissions

Red Lion equipment releases no toxic emissions.

Trademark Acknowledgments

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- Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and/or other countries.
- Ethernet is a registered trademark of Xerox Corporation.
- Tera Term is a registered trademark of T. Teranishi.

All other marks are the property of their respective owners.

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at

http://www.redlion.net/support/documentation.

Additional Product Information

Additional product information can be obtained by contacting the local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Warnings and Cautions

Warnings apply to situations where personal injury or death may result.

Cautions apply to where reduced function or damage to equipment may result.

These products should not be used 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 consequential equipment or personnel safety. In particular, Red Lion disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in any application.

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.

Ces produits ne doivent pas être utilisés pour remplacer le verrouillage de sécurité approprié. Aucun dispositif basé sur un logiciel (ou tout autre dispositif à l'état solide) devraient jamais être conçus pour être responsable de l'entretien de l'équipement consécutifs ou la sécurité du personnel. En particulier, Red Lion décline toute responsabilité pour les dommages, directs ou indirects, résultant de l'utilisation de cet équipement dans n'importe quelle application.

Tout courant, câblage entrée et sortie (I / O) doit être conforme aux méthodes de câblage à la Classe I, Division 2 et conformément à l'autorité compétente.

General Safety Cautions and Warnings

CAUTION: If the Sixnet series equipment is used in the manner not specified by Red Lion, the protection provided by the equipment may be impaired.

ATTENTION: Si l' Sixnet série équipement est utilisé d'une manière non spécifiée par Red Lion, la protection fournie par l'équipement peut être compromise.

CAUTION: Do not perform any services on the unit unless qualified to do so. Do not substitute unauthorized parts or make unauthorized modifications to the unit.

ATTENTION: Ne pas effectuer de services sur l'appareil s'il n'est pas qualifié pour le faire. Ne pas substituer pièces non autorisées ou de modifications non autorisées de l'appareil.

CAUTION: Do not operate the equipment in a manner not specified by this manual.

ATTENTION: Ne pas faire fonctionner l'équipement d'une manière non spécifiée par ce manuel.

WARNING: Install only in accordance with Local and National Codes of authorities having jurisdiction.

ALERTE: Installer uniquement, conformément aux codes locaux et nationaux des autorités ayant compétence.

Electrical Safety Warnings

WARNING: Do not work on equipment or cables during periods of lightning activity.

ALERTE: Ne pas travailler sur le matériel ou les câbles pendant les périodes d'activité de la foudre.

WARNING: Properly ground the unit before connecting anything else to the unit. Units not properly grounded may result in a safety risk and could be hazardous and may void the warranty. See the grounding technique section of this Hardware Guide for proper ways to ground the unit.

ALERTE: Correctement à la terre de l'unité avant tout raccordement à l'unité. Unités pas correctement mise à la terre peut entraîner un risque de sécurité et pourraient être dangereux et peut annuler la garantie. Voir la section technique de mise à la terre de ce mode d'emploi des moyens appropriés à la masse de l'appareil.

WARNING: Do not operate the unit with the end plates removed, as this could create a shock or fire hazard.

ALERTE: Ne pas faire fonctionner l'unité avec les plaques d'extrémité retiré, ce qui pourrait créer une décharge électrique ou un incendie.

CAUTION: Observe proper DC Voltage polarity when installing power input cables. Reversing voltage polarity can cause permanent damage to the unit and voids the warranty.

ATTENTION: Respecter la polarité correcte de tension DC lors de l'installation des câbles d'alimentation d'entrée. Inversion de polarité de tension peut causer des dommages permanents à l'appareil et annule la garantie.

Environmental Safety Cautions and Warnings

CAUTION: This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

ATTENTION: Cet équipement est adapté pour une utilisation dans la classe I, Division 2, Groupes A, B, C et D ou non dangereux endroits seulement.

WARNING: Explosion Hazard – Substitution of components may impair suitability for Class I, Division 2.

ALERTE: Risque d'explosion - Remplacement d'un composant peut empêcher la conformité de Classe I, Division 2.

WARNING: Explosion Hazard - When in hazardous locations, disconnect power before replacing or wiring modules.

ALERTE: Risque d'explosion - Ne débranchez pas l'équipement à moins que l'alimentation ait été coupée ou que l'environnement est connu pour être non dangereux.

WARNING: Explosion Hazard – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous.

ALERTE: Risque d'explosion - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux.

Safety Information

Environmental

Pollution degree: 2 (Per IEC 61010-1)

Electrical

Properly ground the unit before connecting anything else to it. If the equipment is used in a manner "not" specified by Red Lion, the protection provided by the equipment may be impaired.

Overvoltage category: II (Per IEC 61010-1)

Safety Standards

This unit meets the standards listed below, plus others.

Note: Some ratings may be pending on newer models. Contact Red Lion for the latest information.

Electrical safety:
CE per Low Voltage Directive and IEC 61010-1
UL recognition per UL508
CSA per C22.2/142

Markings:

Direct Current: 10-30 VDC (minimum/maximum)

Protective Conductor Terminal

See warnings below.
Install the controller in accordance with local and national electrical codes.
Lightning Danger: Do not work on equipment during periods of lightning activity.
Do not connect a telephone line into one of the Ethernet RJ45 connectors.

EMC (emissions and immunity):
CE per the EMC directive, EN 55022 or EN 61000-6-2/4

FCC part 15 and ICES 003; Class A. See FCC statement on previous page.

Marine, maritime and offshore:
These devices, when installed in an appropriately IP rated enclosure, comply with the ABS standards which are similar to DNV No. 2.4 and equivalent to Lloyds. See warning below.

For marine and maritime compliance, do not install this product within 5 meters of a standard or a steering magnetic compass.

WEEE compliance:
These devices comply with the WEEE directive. Do not throw away these devices in the standard trash. Contact Red Lion regarding proper disposal.

RoHS compliance:
These devices comply with the RoHS directive and are consider lead and other hazardous substance free.

Hazardous Locations:
UL per ISA12.12.01 (Class I, Div. 2), Groups A,B,C,D (UL File # 317425)
CSA per C22.2/213 (Class 1, Div. 2), Groups A,B,C,D (cUL File # E317425)

ATEX per IEC 60079-0 and IEC 60079-7, Zone 2

Chapter 1 Overview

Introduction

The products covered by this manual are designed for use in industrial control and data acquisition systems. Refer to the Red Lion Electronic catalog and the individual data sheets for complete features and benefits. This user manual covers the aspects of hardware installation and maintenance for the VT-mIPm. For software features and capabilities, please refer to the electronic help system in the Sixnet® I/O Tool Kit software.

A typical Red Lion station consists of an AC to DC power supply, a Red Lion controller or RTU, and I/O modules. The VT-mIPm can interface with I/O modules via Ethernet (EtherTRAK®-2), or RS485 (EtherTRAK-2). Just about any combination of these components along with third party hardware and software can be used to make a system.

Contents of Package

The shipping package should contain the items listed below in undamaged condition. If the package contents are damaged, contact your carrier and file a damage claim with them.

- 1 VT-mIPm-248-D or VT-mIPm-138-D unit
- 1 RJ45-DB9-KIT which includes 2 unwired adapters and 1 RJ45-DB9F-IPM
- 1 Quick Start Guide Getting Started Installing Red Lion Hardware

Getting Started with Red Lion Hardware

Following these steps will make installation and start-up of your unit easier

1. **Mount the Hardware:** Refer to "DIN Rail and Panel Mounting" for information on installing the Red Lion Hardware.
2. **Communication Wiring to I/O Modules is needed:** Make the necessary communication connections to any EtherTRAK-2 I/O modules and Ethernet switch. Refer to the I/O wiring section for information on how to wire the fault relay to the VT-mIPm.
3. **Connect Power and I/O Wiring to the Modules:** Connect AC power to the Red Lion or user supplied power supply. Make DC power connections from the power supply to the Red Lion components. Make field wiring connections to the Sixnet I/O modules and any peripheral equipment. Refer to the appropriate user manuals for I/O connection details. Refer to the I/O wiring section for information on how to wire the 6HBWDOG1 when using the fail-safe device.
4. **Install Communication Cabling:** The unit covered by this manual comes with communication accessories. Snap the prewired RJ45 to DB9 adapter to the RJ45 patch cord (not supplied). Connect this cable between one of the serial RS232 ports (RJ45 connector) on your VersaTRAK mIPm RTU/Controller and a serial RS232 port (DB9 connector) on your PC. (refer to "Communication Ports")
5. **Fabricate and install RS232 and RS485 cables as needed to connect to other devices.** If you are using Ethernet units, install the correct cabling and peripherals. Refer to the documentation for your Ethernet communication devices for details. Refer to communication wiring section for pinouts of ports and cables to Red Lion devices.
6. **Install I/O Wiring:** Refer to the I/O Wiring section for guidance on how to wire the I/O to instruments.
7. **Apply Power:** Power up the Red Lion component and related peripherals. Observe the status LED on each unit. Typically, a solid ON indicates proper operation. A blinking LED may indicate that the unit needs to be configured. Refer to the appropriate Red Lion manual for details. (refer to "Power and Status LED"). When using the 6HBWDOG1 it is usually best to start by using bypass mode by clicking the bypass button.
8. **Configure Using the Sixnet I/O Tool Kit:** Use the Sixnet I/O Tool Kit to create a hardware configuration for each Red Lion station. Use RS232 or Ethernet to communicate to the RTU/Controller via the Tool Kit. The default station number (slave address) used for Sixnet UDR and Modbus Protocols is one. The default IP address of network 1 is 10.1.0.1. Refer to the electronic help in the I/O Tool Kit for details.
9. **Test the Hardware:** Use the Test I/O window in the I/O Tool Kit program to verify proper I/O operation of all Red Lion stations. Refer to the I/O Tool Kit electronic help system.
10. **Configure Your PC Software to Communicate with the Red Lion Station(s):** Refer to the software documentation.
11. **If You Have Difficulty:** If you experience startup trouble, visit our Knowledge Base for some troubleshooting tips. If you still need assistance, please contact Red Lion Technical Support.

Software Tools

Red Lion supplies the “mission-oriented” tools you need for every step of your project from the initial specification, through startup, and years of trouble free operation. Refer to the online help in the Sixnet I/O Tool Kit for complete details.

Sixnet® I/O Tool Kit

The Sixnet I/O Tool Kit is a configuration, calibration and maintenance tool for Red Lion hardware. Use the I/O Tool Kit to configure I/O features, perform channel-by-channel calibrations in meaningful engineering units, and perform live diagnostics at each station. Refer to the electronic help for details.

Here are the optional Feature Sets for the Sixnet I/O Tool Kit:

- **Basic (free):** Basic configuration of RTU and I/O modules. All that is needed to use the Red Lion Workbench.
- **SCS (Scalable Control System) features:** Includes importing, tag exporting, I/O transfers and advanced load options. The SCS option is required to develop ISaGRAF programs, using the ISaGRAF Workbench.
- **Data logging:** Includes Sixlog data logging including automatic host and client transfers.
- **IPm® Advanced feature:** Gain access to LINUX-visible features in VersaTrak mIPm RTU/Controller, including file loading and advanced diagnostics. A library of functions to access the IPm I/O registers and other services is supplied with this enhanced license.

Red Lion Workbench

The Red Lion Workbench allows you to write IEC 61131 Control Programs for a Red Lion VersaTRAK mIPm RTU/Controller. Five IEC 61131 languages are supported (FBD, LD, ST, SFC, IL). The Straton Workbench may be downloaded from www.redlion.net. Within the Electronic help are extensive help topics and several tutorials.

To take advantage of the full feature set of Red Lion Workbench Workbench it is best to configure the project with one tag database. See the difference between one tag database and a two tag database see the technical note - Red Lion Workbench vs Tool Kit and Red Lion Workbench – Red Lion Support.

ISaGRAF

The ISaGRAF Workbench allows you to write an IEC 61131 control program for a Red Lion VersaTRAK mIPm RTU/Controller. All 5 of the IEC 61131 languages are supported, including Ladder Logic and Function Blocks.

Chapter 2 Assembly and Installation

DIN Rail and Panel Mounting

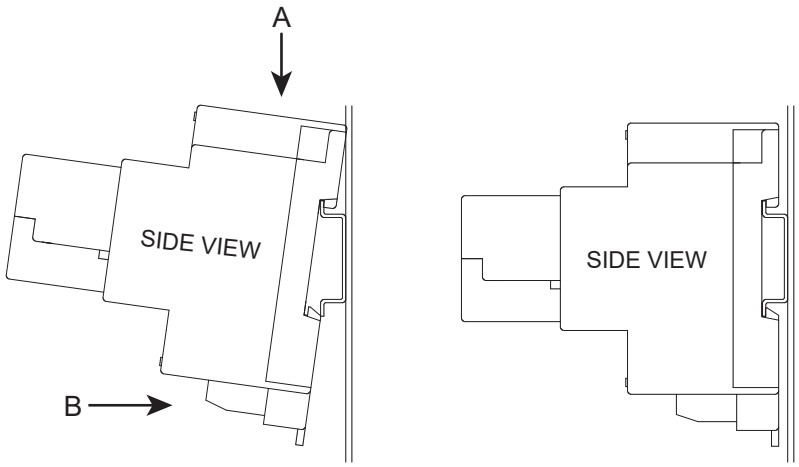
The VT-mIPm units can be snapped onto a standard DIN rail (EN50022). The VT-mIPm units can be panel mounted using the mounting holes as shown below. Use #8 screws to hold the VT-mIPm to the Panel.

Refer to the drawings below to properly mount the VT-mIPm unit.

Note: Allow enough room to route Ethernet copper or fiber optic cables.

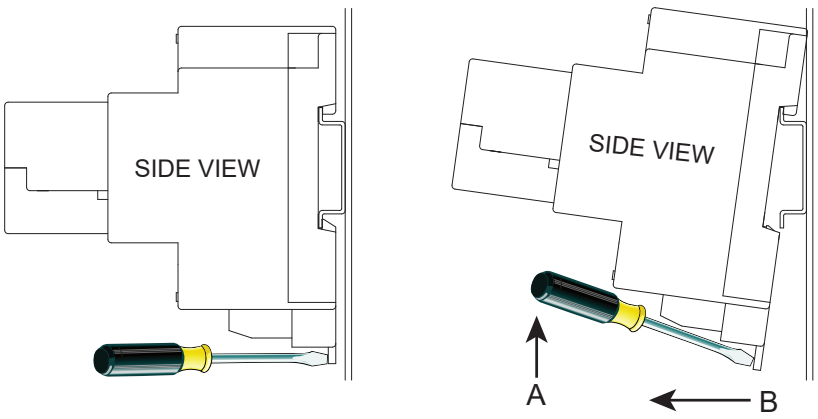
Mounting on DIN Rail

1. Place top DIN rail mounting tabs.
2. Push down until clip attaches to DIN rail.



Removing from DIN Rail

1. Place screw driver in DIN rail locking tab. Use screw driver to pry down on DIN rail tab to pull clip down.
2. Pull VT-MIPM off of DIN rail.



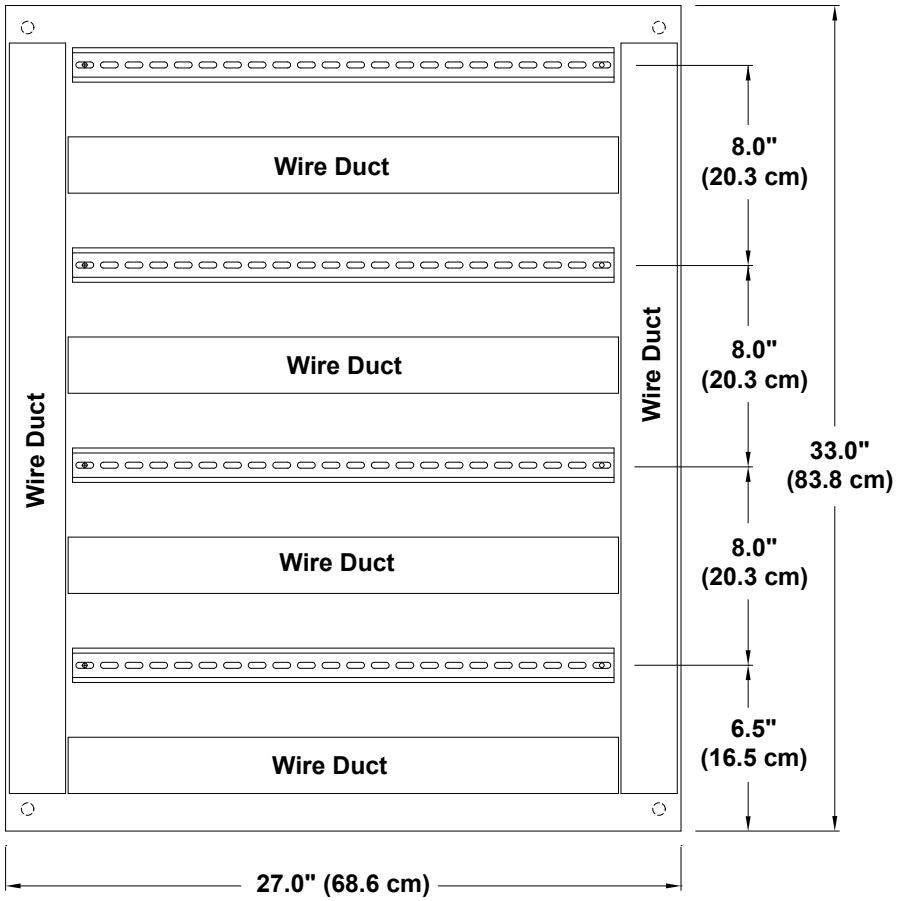
Panel Assembly

Most Red Lion components snap onto DIN rail strips fastened to a sub panel. The figure below shows a sample panel with DIN rail strips and wire duct attached. Recommended DIN rail spacing is 8 inches. This spacing allows room for wire duct to be installed without obstructing field wiring installation.

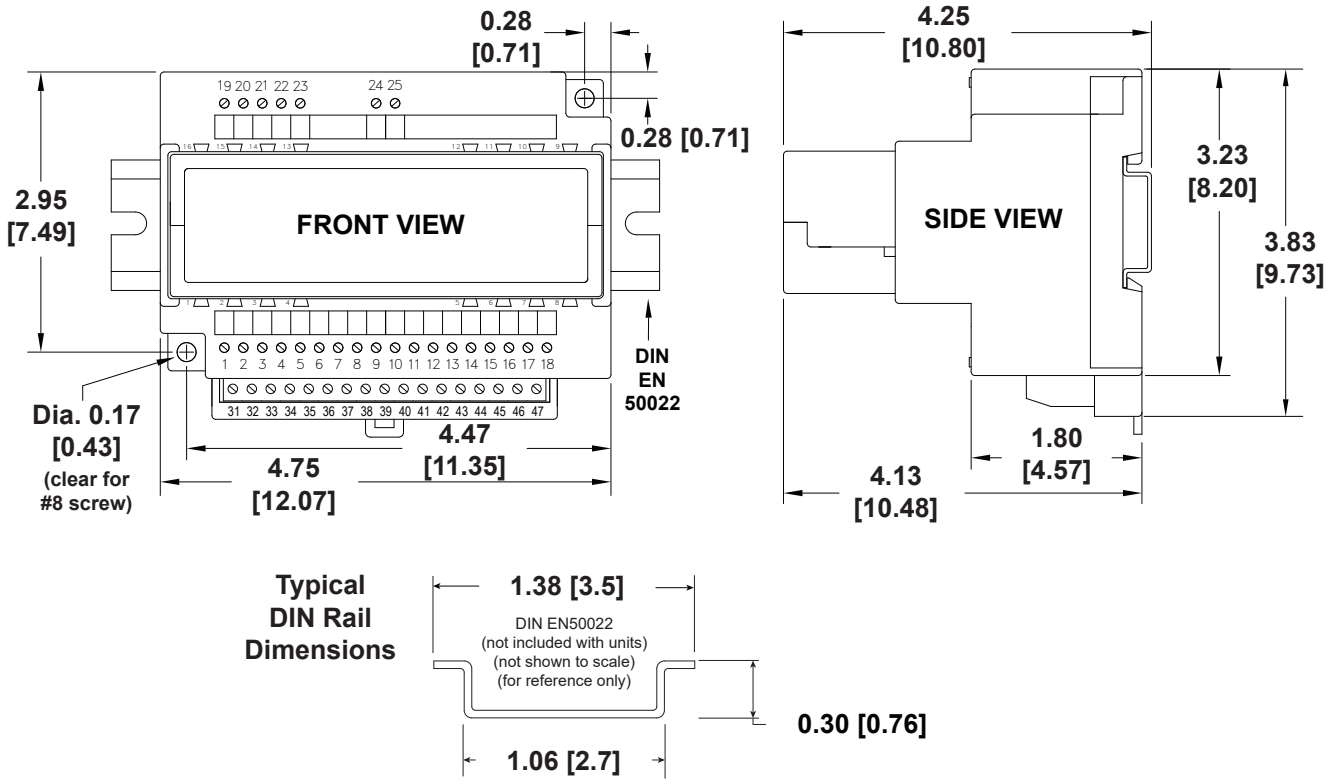
The Red Lion components are typically installed against one another, but space may be left between modules to accommodate other DIN rail mounted components such as terminal blocks and fuse holders. End clamps are recommended to restrict side-to-side movement. The sample layout below shows the physical dimensions of the VT-mIPm.

Red Lion components can be installed in any orientation and order on your panel.

Sample Layout for a 36" x 30" Enclosure



VersaTRAK mIPm RTU Dimensions In inches [cm]



Chapter 3 Power and I/O Wiring

Power Requirements

The Red Lion VersaTRAK mIPm RTU accepts 24 VDC power from a Red Lion power supply or from a user DC power source of 10 to 30 VDC.

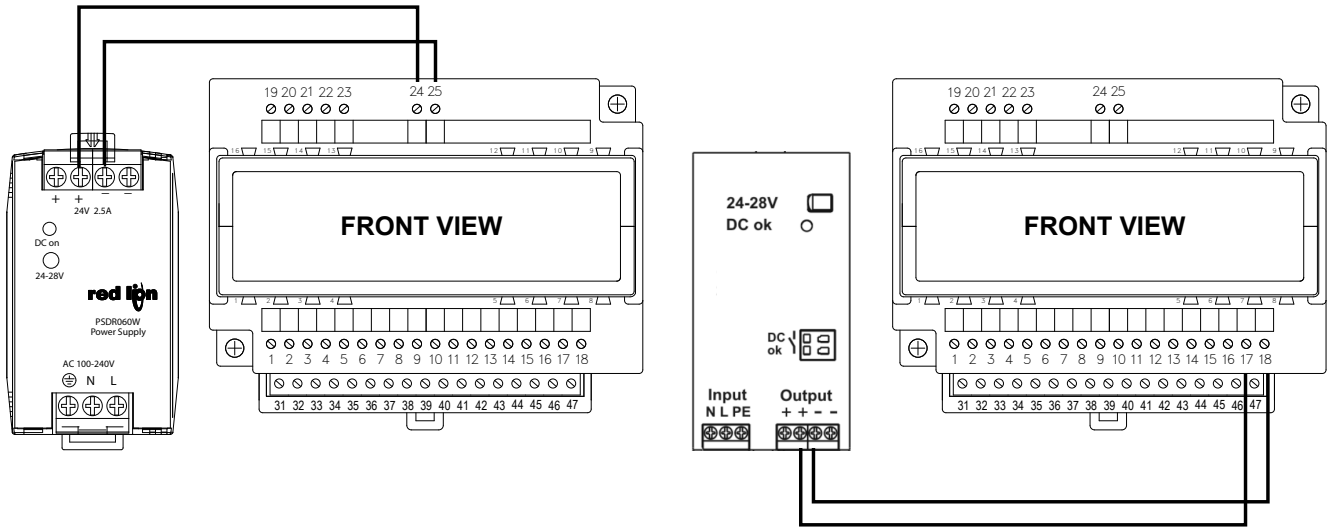
To calculate the current requirements, add the wattage required for the VT-mIPm and other modules in use. Then divide the total wattage by the DC power source voltage. Then add any current needed for user instrumentation loops.

All Red Lion units and user instrumentation loops may be powered from a single DC source.

Red Lion Power Supplies

The Red Lion Power Supplies below provide several current options. Connect + (DC +) from to the power supply to + (SCW 24, 17) on the VT-mIPm and – (DC -) on the power supply to – (SCW 25, 18) on the VT-mIPm.

- PSDR030W – 1.25 A @ 24VDC
- PSDR060W – 2.9 A @ 24VDC
- PSDR095W – 3.9 A @ 24VDC
- NTPS-24-1-3 – 1.3 A @ 24VDC
- NTPS-24-10 – 10 A @ 24VDC
- NTPS-24-20 – 20 A @ 24VDC
- NTPS-24-3 – 3 A @ 24VDC
- NTPS-24-5 – 5 A @ 24VDC



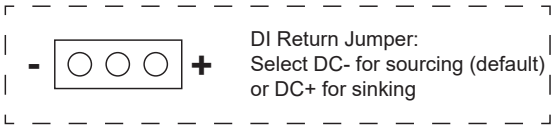
On-board I/O Overview

The VT-mIPm comes with integrated discrete and analog I/O on board. Wiring for the available on-board I/O should be made based on the wiring diagram shown in the figure below. A hardware summary for each of the available I/O is described below. Further details on the features available when using the on-board I/O can be found in the electronic help system in the Sixnet® I/O Tool Kit.

Discrete Inputs

There are twelve discrete inputs in all models of the VT-mIPm. These inputs may be wired for sourcing or sinking by selecting the proper DI return jumper position in the base. An input count feature uses analog input registers to accumulate the positive transitions of each input.

To access the jumper unplug the VT-mIPm logic module from the base and open the base door.



Positive DC voltage must be applied to an input to indicate an ON condition. All channels are referenced to a common return or supply, which is connected to the negative side (ground) or positive side (DC+) of the DC power source. One wire from each sourcing field input should be bussed together and connected to terminal 17 (DC +). One wire from each sinking field input should be bussed together and connected to terminal 18 (DC GND). Refer to the wiring diagram. Set the DI return jumper inside the wiring base to match the wiring configuration of the inputs (sinking or sourcing).

Discrete Outputs

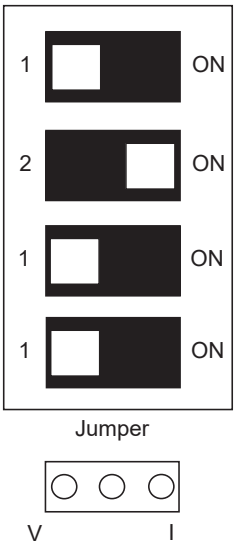
Depending on your model of the VT-mIPm, there are either four or eight discrete outputs integrated into the unit. The discrete output channels each provide up to 1 Amp DC to power motor contactors, valves, and other loads. A single terminal is provided for each output channel. All outputs are powered from the DC power terminal. All channels are referenced to a common return, which is connected to the negative side (ground) of the DC power source.

Analog Inputs

There are either six or eight 4-20 mA analog inputs on your VT-mIPm. These inputs provide 16 bits of resolution for precision analog measurements.

A single input terminal is provided for each measurement channel. Care must be taken to externally provide a suitable instrumentation ground for these single ended input circuits.

Each analog channel has built in current protection circuitry, such that each channel open circuits before any circuit damage will occur. Each channel has a DIP switch and jumper to configure the Analog Input range. The DIP switch and jumper must match the software configuration settings. See the diagram and instructions below.



Turn on only one switch per channel (0-2 V all OFF). 4-20 mA is default.

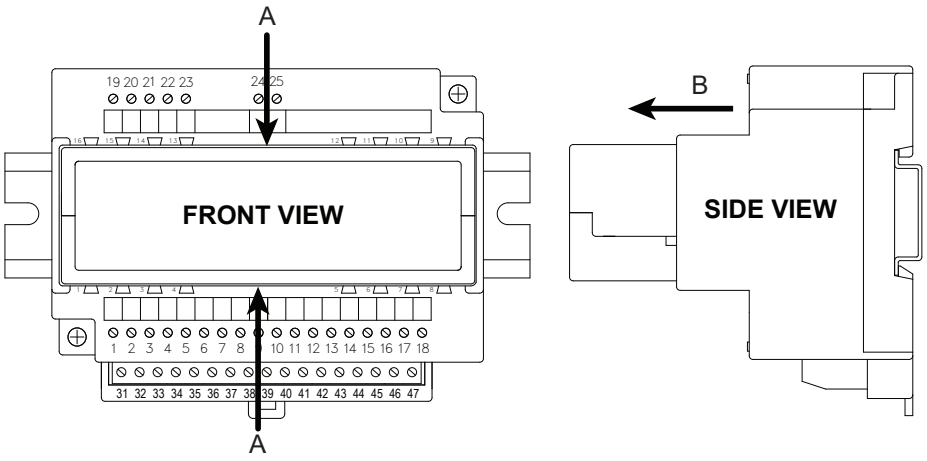
Match jumper to the DIP setting (V) or (I). (I) is Default.

Analog Outputs

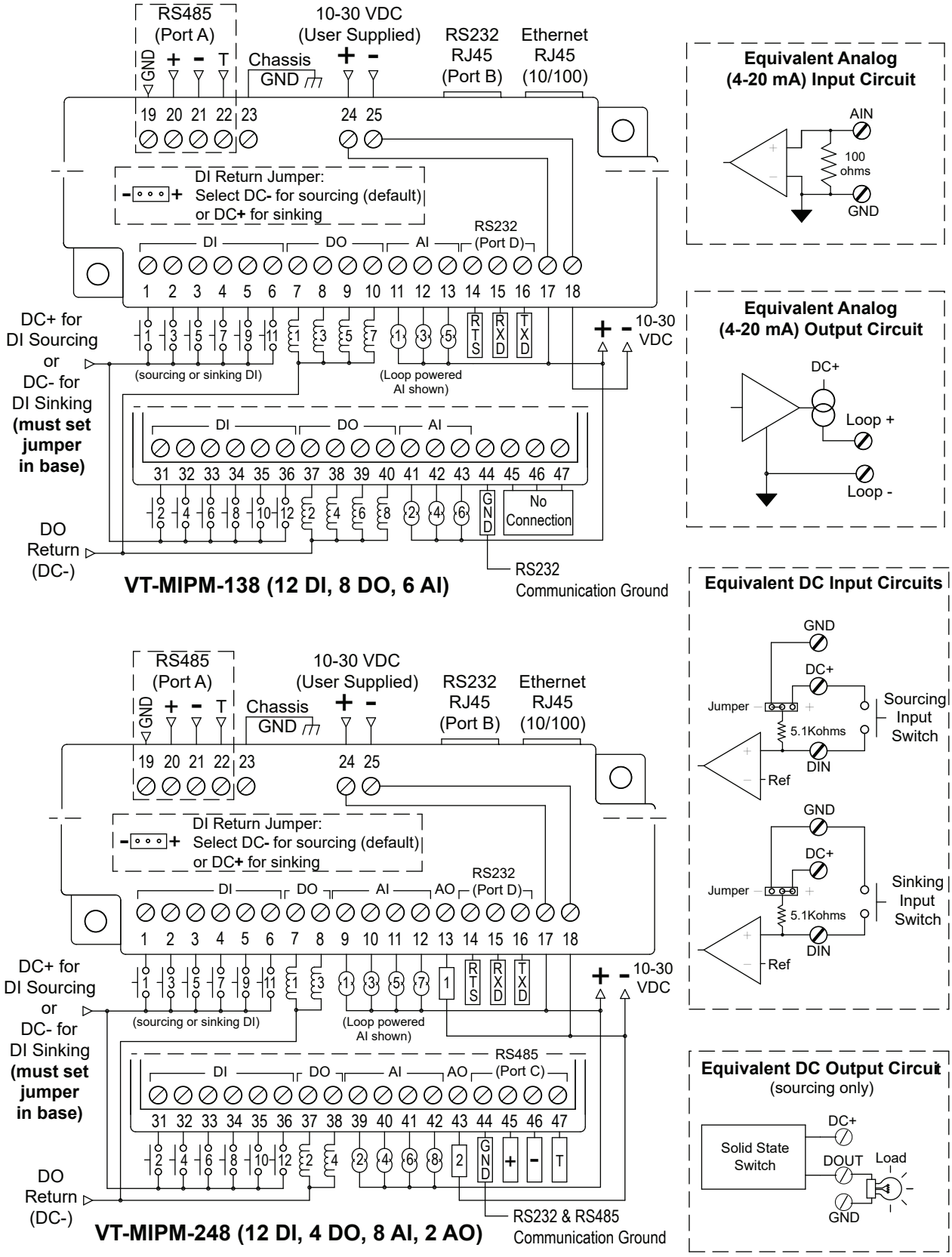
The VersaTRAK mIPm model VT-mIPm-248 has two 4-20 mA analog output channels, providing 16 bits of resolution at each channel. A single terminal is provided for each output channel. Care must be taken to externally provide a suitable instrumentation ground for these output circuits.

Access Jumpers and DIP Switches in the Wiring Base

To access the jumpers and DIP switch settings in the VT-mIPm wiring base please turn off power to the VT-mIPm. Unplug the logic module from the wiring base by firmly pressing in on the plastic “PRESS” tabs on the top and bottom (as pictured below). Pull the module from the base.



I/O Wiring Diagram



I/O Wiring with Red Lion Devices

Below are examples of how other Red Lion devices can be wired to the VT-mIPm.

6HBWDOG1 -Watchdog Module

The 6HBWDOG1 watchdog module is a hardware-based (no software) watchdog module to fail safe in case of hardware failure or maintenance. Using the 6HBWDOG1 with the VT-mIPm is completely optional and depends on the needs of the application. The 6HBWDOG1 monitors a hardware heartbeat signal from a DO channel. If that heartbeat stops the state on the relay will change which can control power to the VT-mIPm. The VT-mIPm can be connected to the 6HBWDOG1 in a number of ways. Below are two options.

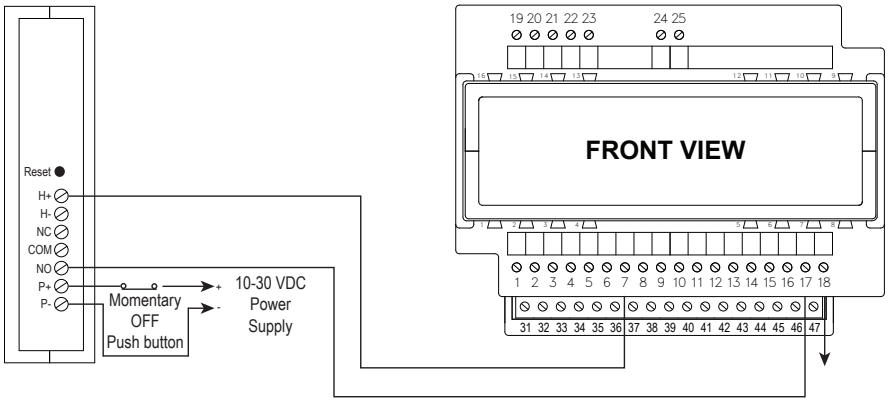
The boot time of a VT-mIPm is about 1 minute. Boot delay and Heartbeat timeout are configured with dip switches using a multiplier Boot delay is recommended at 80 seconds (Time = ↓↑ or 10s; Multiplier = ↑↑ or 8) or 50 seconds (Time = ↑↑ or 25s; Multiplier = ↑↓ or 2) will work in most cases.

Configuring a heartbeat should be programmed in the VT-mIPm should be programmed using Red Lion Workbench or ISaGRAF IEC 61131-3 programming software. Below is an example of the line of code that can be used to create a heartbeat. In the example below the Blink block is used with a time input of 500ms and with an output configured to the first DO channel on the VT-mIPm.

Note: The time input of the “Blink” block, cycle time of the program and heartbeat timeout on the 6HBWDOG1 should all be considered.

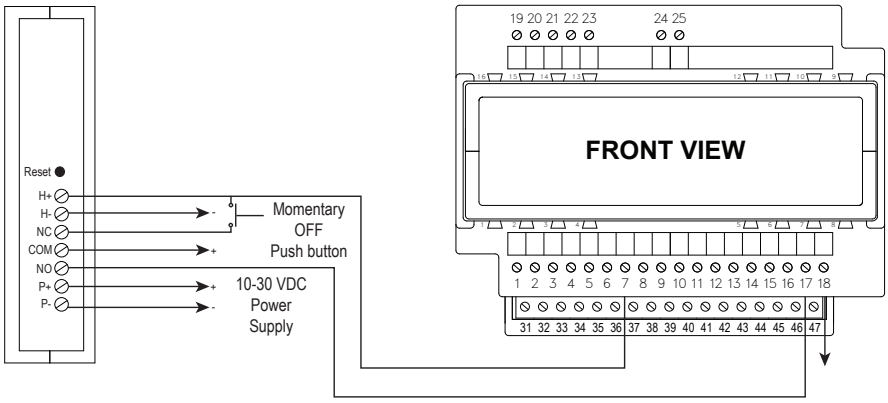
6HBWDOG1 with Heartbeat Timeout Under 80s

In some applications detecting with heartbeat under the VT-mIPm boot time is required. Heartbeat timeout can be set to 1 second (Time = ↓↓ or 1s; Multiplier = ↓↓ or 1) or longer. In this case when a timeout is triggered to the power on the 6HBWDOG1 can be cycled or the “Reset” button on the face of the 6HBWDOG1 can be depressed to trigger the boot delay. In the example below a momentary off button is shown to reset the 6HBWDOG1.



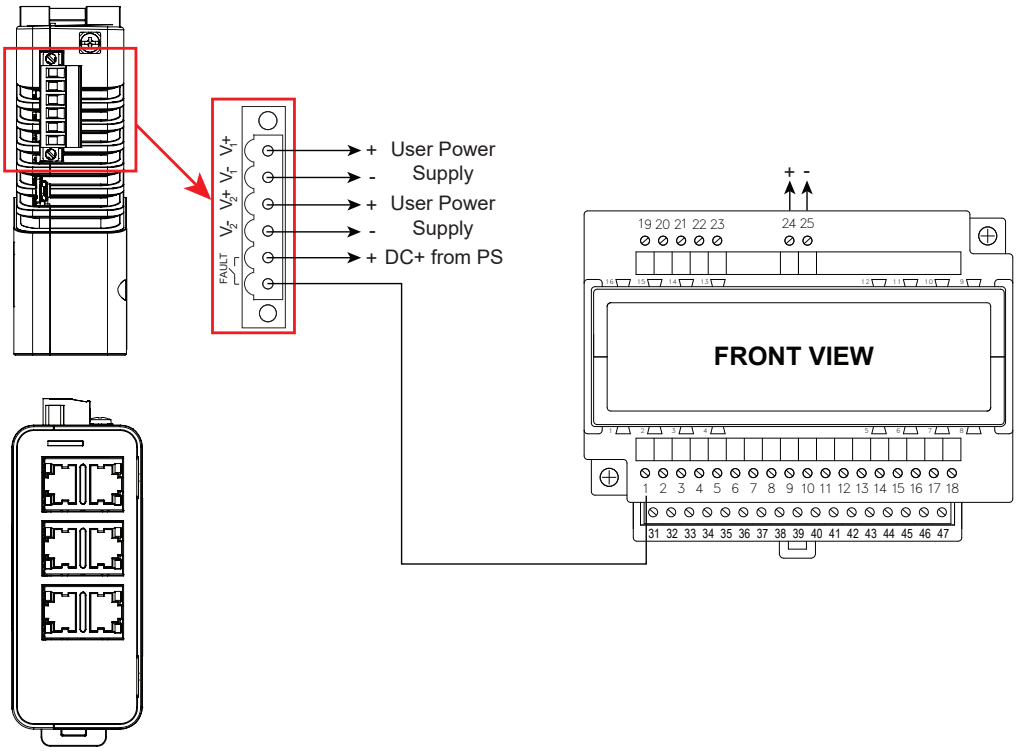
6HBWDOG1 with heartbeat timeout and boot delay set to 80s or greater

In some applications heartbeat timeout and boot delay can be set to 80s or greater (Time = ↓↑ or 10s; Multiplier = ↑↑ or 8). In this case when a timeout is triggered to the power on the 6HBWDOG1 can be cycled or the Reset button on the face of the 6HBWDOG1 can be depressed to trigger the boot delay. Alternatively, any change of state on the heartbeat input (H+ and H-) of the 6HBWDOG1 will trigger a reset of the heartbeat timeout. When the 6HBWDOG1 is in a failure state (heartbeat timeout has elapsed) the relay will short the "COM" to "NC." Therefore, a momentary ON button can be connected from "NC" to "H +" to trigger a reset of the heartbeat timeout.



NT-5000 Alarm Relay Wiring

In most applications a switch will be used to connect the VT-mIPm to the Ethernet Network. NT5000 switches are a great fit for this purpose. In addition to managed switch features like VLAN, RSTP, N-Ring™ (fast healing switch) the NT5000 has alarming features that can trigger an alarm relay that can be detected by the VT-mIPm. Alarms in the switch can be triggered by port link, port usage, power inputs, N-Ring faults. The example below shows how to connect the relay to a discrete input on the VT-mIPm.

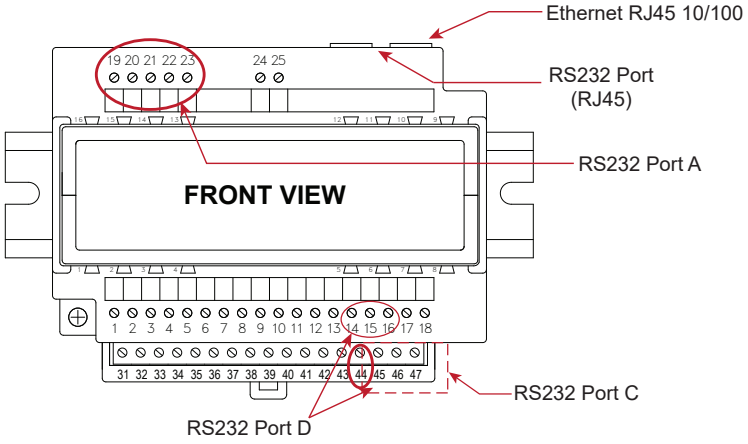


Chapter 4 Communications Connections

Communication Ports

The VT-mIPm-XXX has two available port combinations, depending on the model number. See the chart and diagram below for port population and location.

PRODUCT	RS485 PORT A	RS232 PORT B	RS485 PORT C	RS232 PORT D	ETHERNET PORT
VT-mIPm-138-D	✓	✓	×	✓	✓
VT-mIPm-248-D	✓	✓	✓	✓	✓



RS232 Port B	Ethernet RJ45	RS485 Port C
1. RI/DSR in	1. TX+	SCW 44: GND
2. DCD in	2. TX-	SCW 45: +
3. DTR out	3. RX+	SCW 46: -
4. GND	6. RX-	SCW 47: T
5. RXD in		
6. TXD out		
7. CTS out		
8. RTS out		

(EIA/TIA-561)	RS485 Port A	RS232 Port D
	SCW 19: GND	SCW 14: RTS
	SCW 20: +	SCW 15: RXD
	SCW 21: -	SCW 16: TXD
	SCW 22: T	SCW 44: GND

RS485 Ports A & C

Depending on the model of VersaTRAK mIPm, there are either one or two RS485 ports available on the unit. The RS485 port establishes a (2-wire, half duplex only) connection to Red Lion's EtherTRAK®-2 I/O modules or other equipment. Four terminals (for signal GND, 485+, 485-, & termination) are provided for each available RS485 interface. Generally, you connect + to + and – to – between units. However, since there is no standard for RS485 terminal designations you may need to connect + to – and – to + in some cases. No damage will result if you connect incorrectly. It is highly recommended that you tie the signal ground to an appropriate ground (if available) between all RS485 units. Make sure to use a good quality communication cable with three conductors (twisted is preferred) plus a shield. To prevent ground loops, the shield should be connected to chassis ground on only one end of any cable run.

Note: If you have existing wiring that has only two conductors and a shield, you can use the shield to connect the signal grounds between stations. This is not optimal (especially for long cable runs) but should work in most situations.

RS485 Termination

The VersaTRAK mIPm has RS485 termination components (150 ohm resistor and a 0.01 µF capacitor connected in series) already inside for each RS485 port. To terminate your RS485 network just tie the "T" terminal to the RS485 '–' terminal. Make sure to use the same type and size conductor as used already for your RS485 '–' connection. It is recommended that both end stations of your RS485 network be terminated. Avoid terminating more than two stations. Refer to the EtherTRAK-2 User Manual on how to terminate a EtherTRAK-2 I/O Module. For 3rd party devices, please refer to their user manual for termination instructions.

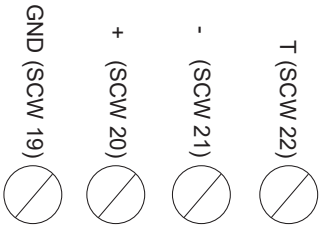
Bias Resistors

On a RS485 2-wire network, a pair of bias resistors (1K ohm typically) acting upon the transmit/receive wires may be required. If bias resistors are not present, the receive inputs on some RS485 devices may react to noise on the floating wires. The bias resistors will force the transmit/receive wires to a known (non-floating) state when none of the RS485 devices are transmitting data. Some RS485 devices have bias resistors built-in, and are enabled through DIP-switch or jumper settings. Make sure there is only one pair of bias resistors acting upon the network.

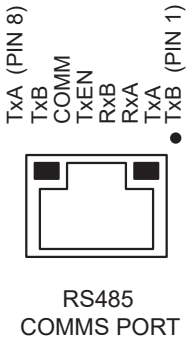
Note: If your RS485 network is made up exclusively of Red Lion devices then these bias resistors are not necessary.

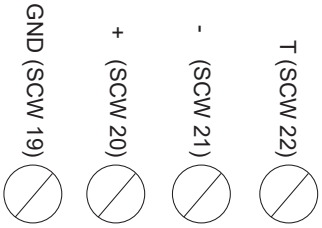
Wiring to other Red Lion devices

Below is a list of cable wiring to connect to compatible Red Lion devices.

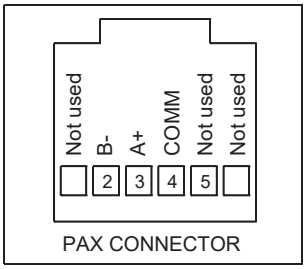


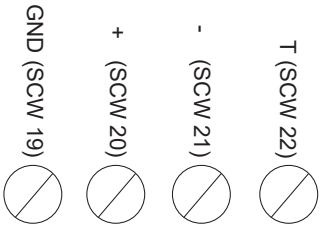
VT-mIPm-XXX-D		DA10/DA30/DA50/DA70 GRAPHITE CR1000/CR3000	
RS485 Port A SCW 19 to 22		**RS485 RJ45**	
GND	19	6	COMM
+	20	1	TXB
-	21	2	TXA
T	22	-	NC



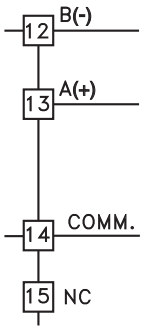


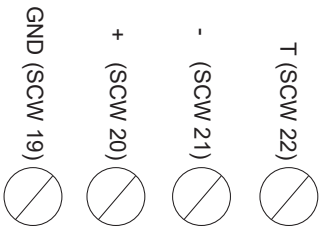
VT-mIPm-XXX-D		PAX AND PAX2 PANEL METER WITH PAXCDC1C COMMUNICATIONS CARD	
RS485 Port A SCW 19 to 22		**RS485 RJ11**	
GND	19	4	COMMON
+	20	3	A(+)
-	21	2	B(-)
T	22	5	NC



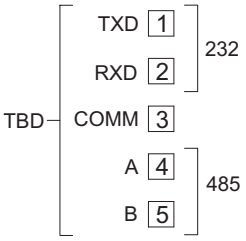


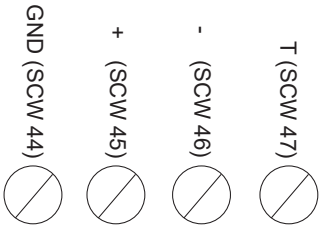
VT-mIPm-XXX-D		PAX AND PAX2 PANEL METER WITH PAXCDC10 COMMUNICATIONS CARD	
RS485 Port A SCW 19 to 22		**RS485 SCW 12 to 15**	
GND	19	14	COMMON
+	20	13	A(+)
-	21	12	B(-)
T	22	15	NC



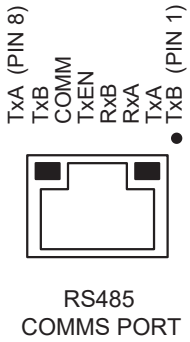


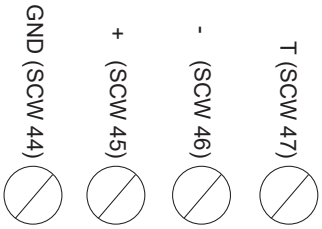
VT-mIPm-XXX-D		LD - LARGE DISPLAY	
RS485 Port A SCW 19 to 22		RS485 SCW 3 to 5	
GND	19	3	COMM
+	20	4	A
-	21	5	B
T	22	-	NC



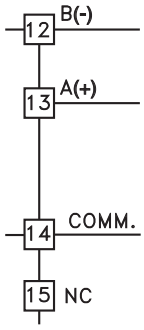


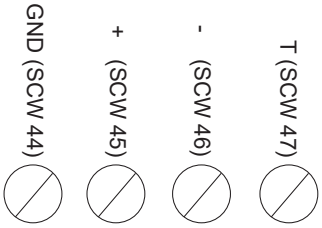
VT-mIPm-XXX-D		DA10/DA30/DA50/DA70 GRAPHITE CR1000/CR3000	
RS485 Port C SCW 44 to 47		RS485 RJ45	
GND	44	6	COMM
+	45	1	TXB
-	46	2	TXA
T	47	-	NC



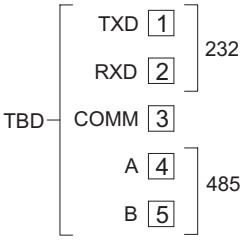


VT-mIPm-XXX-D		PAX AND PAX2 PANEL METER WITH PAXCDC10 COMMUNICATIONS CARD	
RS485 Port C SCW 44 to 47		RS485 SCW 12 to 15	
GND	44	14	COMMON
+	45	13	A(+)
-	46	12	B(-)
T	47	15	NC





VT-mIPm-XXX-D		LD - LARGE DISPLAY	
RS485 Port C SCW 44 to 47		RS485 SCW 3 to 5	
GND	44	3	COMM
+	45	4	A
-	46	5	B
T	47	-	NC



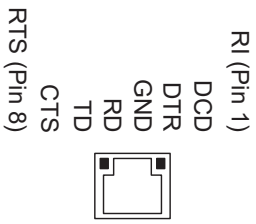
RS232 Port B

An RJ45 female connector is provided for this port. The pin-outs follow the EIA/TIA-561 standard (See the table below). A pre-wired DB9F to RJ45F adapter (RJ45-DB9F-IPM) is included with these units (see below for adapter wiring pin-out). To connect to other RS232 devices with the RJ45-DB9F-IPM adapter along with a RJ45 male to RJ45 male straight-thru wired patch cable (not included) to make a connection between the RJ45-DB9F-IPM adapter to the PC, USB to RS232 adapter or other DTE device. This port can be used for communication of field devices and to reset/load firmware with a RS232 connection and Ethernet connection.

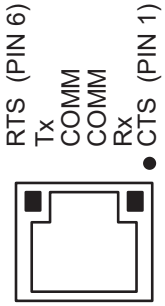
RED LION RJ45F PIN #, SIGNAL NAME	RJ45F TO DB9F ADAPTER WIRE COLOR	DB9 FEMALE CONNECTOR PIN #, SIGNAL NAME
1 RI/DSR in	Blue	4 DTR out
2 DCD in	Orange	N/C
3 DTR out	Black	6 DSR in
4 GND	Red	5 GND
5 RXD in	Green	3 TXD out
6 TXD out	Yellow	2 RXD in
7 CTS in	Brown	7 RTS out
8 RTS out	White	8 CTS in

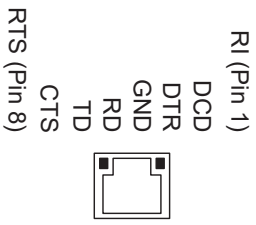
RS232 Port B Wiring

The RJ45 serial port connector bodies on Red Lion VT-mIPm-XXX-D products are not metallic. Therefore, shielded cables may be used to provide further protection by connecting the shield to the Chassis GND terminal (SCW 23). To prevent ground loops, the cable shield should be tied to the metal connector body at one end of the cable only. See below for cable wiring to compatible Red Lion devices.

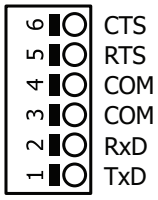


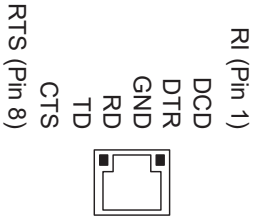
VT-mIPm-XXX-D		DA10/DA30/DA50/DA70 GRAPHITE CR1000/CR3000	
RS232 Port B RJ45		**RS232 RJ12**	
RI	1	-	NC
DCD	2	-	NC
DTR	3	-	NC
GND	4	3	SGG
RD	5	5	TX
TD	6	2	RX
CTS	7	6	RTS
RTS	8	1	CTS



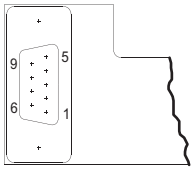


VT-mIPm-XXX-D		PM50	
RS232 Port B RJ45		**RS232 SCW 1 to 6**	
RI	1	-	NC
DCD	2	-	NC
DTR	3	-	NC
GND	4	3, 4	COM
RD	5	1	TX
TD	6	2	RX
CTS	7	5	RTS
RTS	8	6	CTS



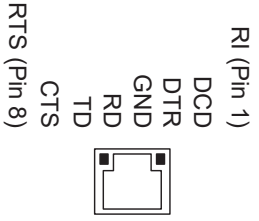


VT-mIPm-XXX-D		PM50	
RS232 Port B RJ45		**RS232 SCW 1 to 6**	
RI	1	-	NC
DCD	2	-	NC
DTR	3	-	NC
GND	4	3, 4	COM
RD	5	1	TX
TD	6	2	RX
CTS	7	5	RTS
RTS	8	6	CTS

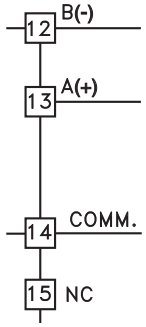


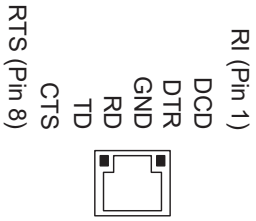
FEMALE

PIN 2 TXD
PIN 3 RXD
PIN 5 COMMON

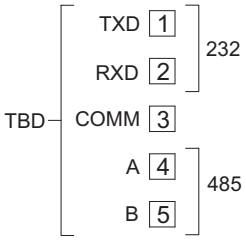


VT-mIPm-XXX-D		PAX AND PAX2 PANEL METER WITH PAXCDC2C COMMUNICATIONS CARD	
RS232 Port B RJ45		**RS232 SCW 12 to 15**	
RI	1	-	NC
DCD	2	-	NC
DTR	3	15	NC
GND	4	14	COMMON
RD	5	12	TX
TD	6	13	RX
CTS	7	-	NC
RTS	8	-	NC





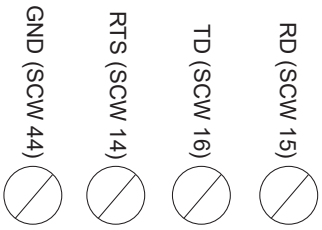
VT-mIPm-XXX-D		LD - LARGE DISPLAY	
RS232 Port B RJ45		RS232 SCW 1 to 3	
RI	1	-	NC
DCD	2	-	NC
DTR	3	-	NC
GND	4	3	COMMON
RD	5	1	TXD
TD	6	2	RXD
CTS	7	-	NC
RTS	8	-	NC



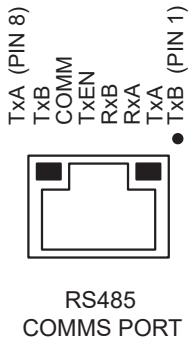
RS232 Port D

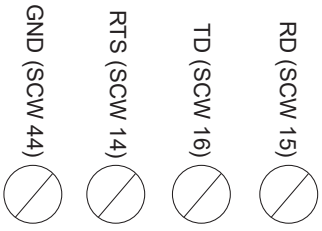
Port D is a four wire RS232 port. RTS, RXD, TXD and GND terminals are provided. (The CTS signal is not supported on this Port D.) Depending on your application, you may wish to wire the interface with a DB9 male or DB9 female connector. Figure 4-1 shows the pin-outs of male and female DB9 connectors. See diagrams below for guidance on connecting Port D to Red Lion devices.

Note: The 5th terminal is a communications ground and is shared by the adjacent RS485 Port C for the VT-mPm-248-D.

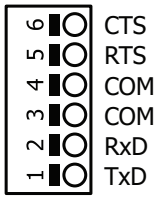


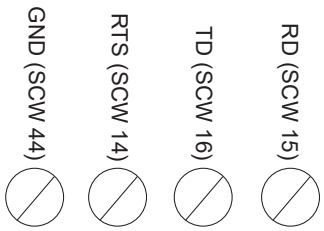
VT-mIPm-XXX-D		DA10/DA30/DA50/DA70 GRAPHITE CR1000/CR3000	
RS232 Port D SCW 44, 14 to 16		RS232 RJ12	
GND	44	3	SGG
RD	15	5	TX
TD	16	2	RX
NC	-	6	RTS
RTS	14	1	CTS



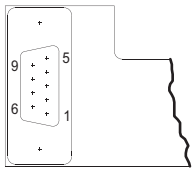


VT-mIPm-XXX-D		PM50	
RS232 Port D SCW 44, 14 to 16		RS232 SCW 1 to 6	
GND	44	3, 4	COM
RD	15	1	TX
TD	16	2	RX
NC	-	5	RTS
RTS	14	6	CTS



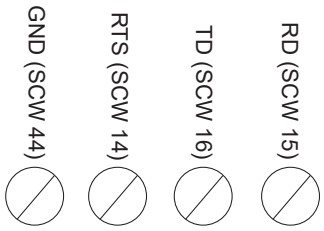


VT-mIPm-XXX-D		PAX AND PAX2 PANEL METER WITH PAXCDC20 COMMUNICATIONS CARD	
RS232 Port D SCW 44, 14 to 16		**RS232 DB9F**	
GND	44	5	COMMON
RD	15	2	TX
TD	16	3	RX
NC	-	-	NC
RTS	14	-	NC

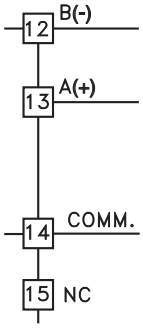


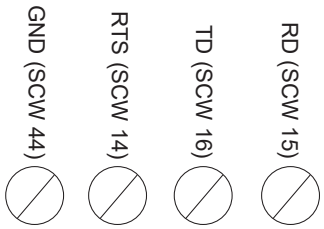
FEMALE

PIN 2 TXD
PIN 3 RXD
PIN 5 COMMON

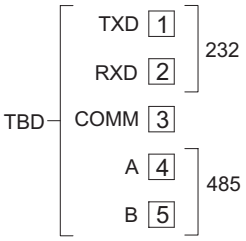


VT-mIPm-XXX-D		PAX AND PAX2 PANEL METER WITH PAXCDC2C COMMUNICATIONS CARD	
RS232 Port D SCW 44, 14 to 16		**RS232 SCW 12 to 15**	
GND	44	14	COMMON
RD	15	12	TX
TD	16	13	RX
NC	-	-	NC
RTS	14	-	NC



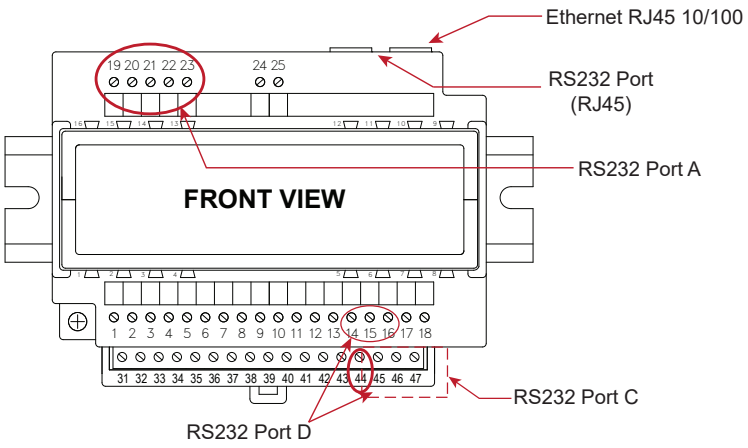


VT-mIPm-XXX-D		LD - LARGE DISPLAY	
RS232 Port D SCW 44, 14 to 16		**RS232 SCW 1 to 3**	
GND	44	3	COMMON
RD	15	1	TXD
TD	16	2	RXD
NC	-	-	NC
RTS	14	-	NC



Ethernet Port

This port is a 10/100BaseTX auto-detecting and auto-crossover Ethernet port. This means it will auto-detect the speed, and work with either a straight-thru or cross-wired Ethernet cable. A standard shielded RJ45 connector is provided. See the figures below for the pin-outs. This port has a fixed unique MAC address. The IP address can be set with the Sixnet® I/O Tool Kit software.



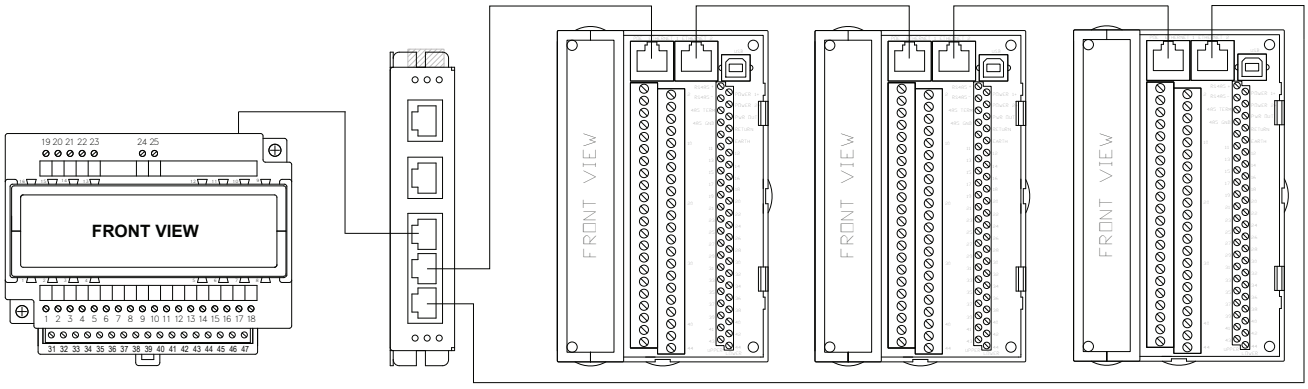
RS232 Port B	Ethernet RJ45	RS485 Port C
1. RI/DSR in	1. TX+	SCW 44: GND
2. DCD in	2. TX-	SCW 45: +
3. DTR out	3. RX+	SCW 46: -
4. GND	6. RX-	SCW 47: T
5. RXD in		
6. TXD out		
7. CTS out		
8. RTS out		
(EIA/TIA-561)	**RS485 Port A**	**RS232 Port D**
	SCW 19: GND	SCW 14: RTS
	SCW 20: +	SCW 15: RXD
	SCW 21: -	SCW 16: TXD
	SCW 22: T	SCW 44: GND

Network Topology

Connecting the EtherTRAK®-2 I/O modules to the VT-mIPm RTU is typically done with one or combination of one or more network topologies. These topologies are ring, passthru and star. They are defined below.

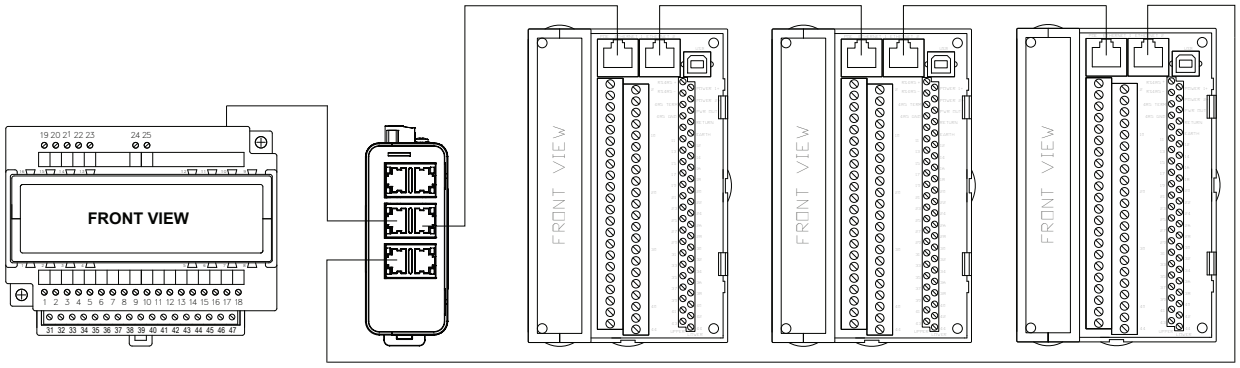
Real-Time Ring Topology

Connect a ring of I/O modules to the VT-mIPm RTU using a Red Lion Sixnet Monitored and Managed Series switches. The Ring network creates a reliable redundant ring capable of recovering very quickly (10ms per hop). The EtherTRAK-2 I/O modules must be in RING mode to use this network configuration.



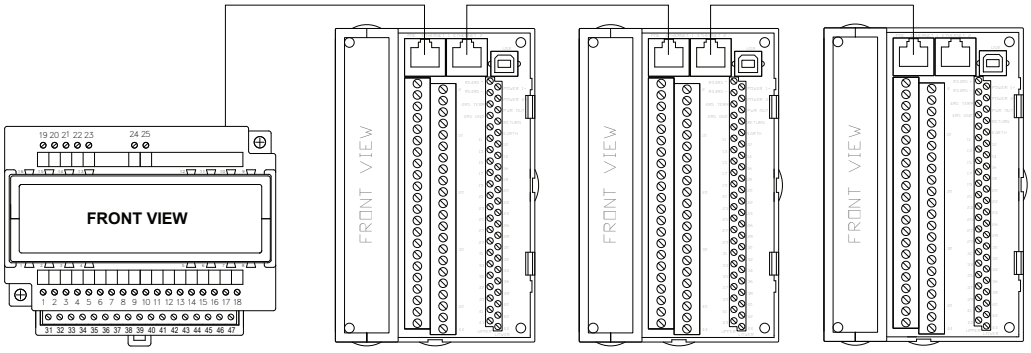
RSTP Ring Topology

Connect a ring of I/O modules to the VT-mIPm RTU using NT5000 series managed switches. The Ring network creates a reliable redundant ring capable of recovering quickly (2 to 3 seconds). By default NT5000 switches have RSTP enabled. The EtherTRAK®-2 I/O modules must be in PASSTHRU mode to use this network configuration.



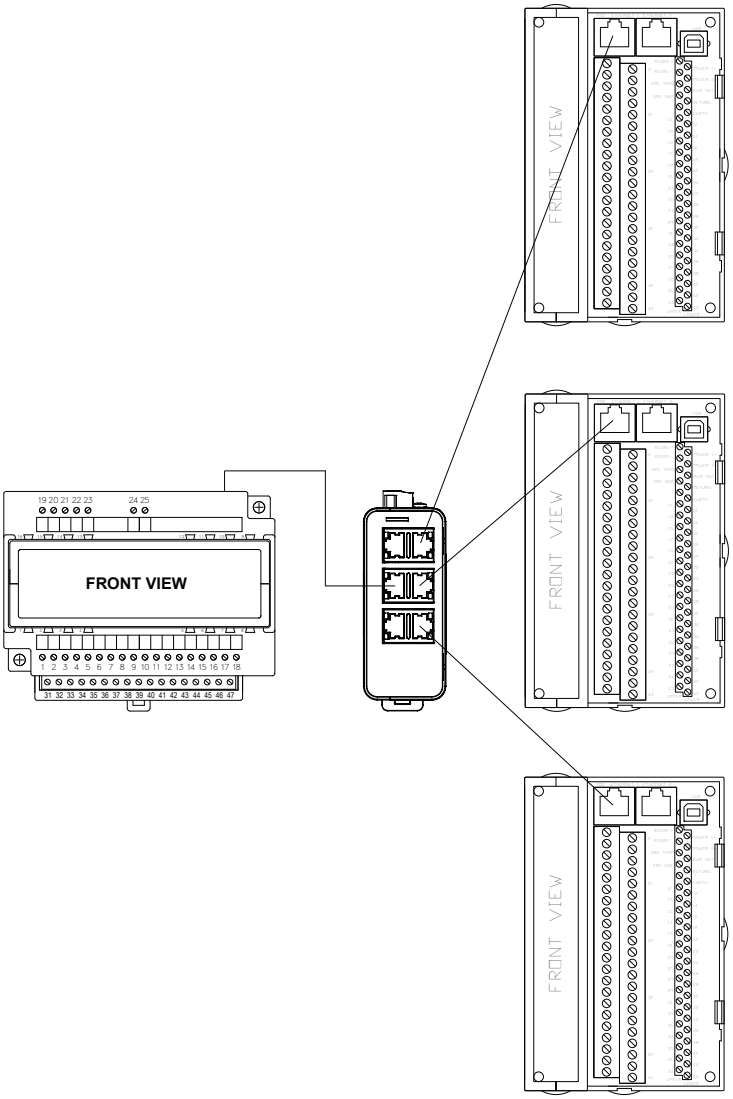
Passthru Topology

In this configuration no additional switches are needed. Simply daisy chain the EtherTRAK-2 I/O modules together and connect the first in the chain to the VT-mIPm RTU. Multiple chains may be connected to the Ethernet Port. The EtherTRAK-2 I/O modules must be in PASSTHRU mode to use this network configuration.



Star Topology

Using an external switch one device to each port. The EtherTRAK®-2 I/O modules must be in 2-Network or PASSTHRU mode to use this network configuration.



Recommended Switches

The VT-mIPm and EtherTRAK-2 I/O modules will work with all 802.3 switches. For applications using the Ring topology, Red Lion Sixnet Monitored and Managed switches are recommended.

- SL/SLX-6RS-X
- SL/SLX-XMS-X

For applications using other topologies NT5000 series switches are recommended.

Chapter 5 Technical Specifications

Common VT-mIPm-XXX-D Specifications

PERFORMANCE SPECIFICATIONS
Industrial PowerPC 333MHz (32 bit data bus)
Operating system embedded open-source Linux
Dynamic memory (RAM) 512 MB for program execution, dynamic variables, dynamic file system, etc.
Program memory (Flash) 512 MB for Linux OS, program storage and file system
Retained memory (RAM) 8 MB (battery-backed) for datalogging and retained variables
Real-time clock battery-backed for time stamping and other operations
I/O Expansion RS-485 or Ethernet
Sixlog datalogging support
IEC 61131 programming, ISaGRAF for backward compatibility
High Level C programming
Battery life 10+ years
Real-time clock resolution 1ms
I/O Expansion EtherTRAK®-2 or E3 I/O Modules
WATCHDOG AND MONITORS
Communications watchdog. Settable timeout and output action (force off or freeze)
Heartbeat watchdog. Settable timeout & output action (force off or freeze)
SIXNET I/O TOOL KIT
Configuration software
Supports portable User Defined Function Blocks
Data types supported BOOL, DINT, REAL
Datalogging with Sixlog
Protocols Sixnet UDR and Modbus
I/O Transfers with configuration wizard
Windows 10, 11 64-bit and 32-bit
RED LION WORKBENCH (IEC 61131-3 PROGRAMMING AND CONFIGURATION)
Programming languages LD, FBD, SFC, Free Form SFC, ST and IL
Supports portable User Defined Function Blocks
Data types supported BOOL, BYTE, INT, DINT, DWORD, REAL, LREAL, TIME, STRING
Datalogging with datalogging blocks
Protocols Modbus TCP/IP Master and Slave, Distributed Protocol and Custom
I/O Transfers with fieldbus configration
Windows 10, 11 64-bit and 32-bit
ISaGRAF WORKBENCH (IEC 61131-3 PROGRAMMING ONLY) FOR COMPATIBILITY
Programming languages LD, FBD, SFC, ST and IL
Supports portable User Defined Function Blocks
Data types supported BOOL, DINT, REAL, TIME
Windows 7, 10 32-bit only

ENVIRONMENTAL AND COMPLIANCE
DIN rail or panel mount
Input power 10-30 VDC
Input current 100 mA @ 24 VDC (typical); 1 A per each discrete output (8 outputs maximum)
Temperature -40 to 70°C (-40 to 85°C storage)
Humidity 5% to 95% RH (non-condensing)
Flammability UL 94V-0 materials
Electrical safety UL 508, CSA C22.2/14; EN610101-1:2010: CE
EMI emissions FCC part 15, EN 61000-6-4:2007; EN 300 386 v1.5.1
EMC immunity EN 61000-6-2:2005
Vibration IEC 60068-2-6 Test Fc; 60870-2-2 Class Cm; IEC 60068-2-27
Hazardous locations ISA12.12.01, CSA C22.2/213, Class 1, Division 2 Groups A, B, C, D
ATEX (Zone 2) Ⓔx II 3 G Ex nA IIC T4A
ABS Type Approval 21-2078121-PDA
Size 4.75"L x 3.83"W x 4.13"H (12.07cm L x 9.73cm W x 10.48cm H)
ETHERNET PORT
10/100BASE-TX (Auto-Detecting)
RJ45 Connection (auto-crossover)
Protocols TCP/IP, ARP, UDP, ICMP, DHCP, Telnet, SSH, Modbus/TCP, Sixnet UDR, FTP

VT-mIPm-138-D Specifications

SERIAL PORTS
Up to 115,200 baud
RS485 Port A screws (485+, 485-, GND) 2-wire half-duplex
RS-232 Port B RJ45 (TD, RD, CTS, RTS, CD, DTR, DSR, GND)
RS-232 Port D Screws (TD, RD, GND)
Protocols Master and slave modes; Sixnet and Modbus RTU / ASCII; optional: Slave; DNP3, IEC60870-5-101/104. Others available as Linux applications
DISCRETE INPUTS
12 channels sourcing or sinking (jumper/software selectable)
Guaranteed ON voltage 9 VDC
Maximum voltage 30 VDC
Guaranteed OFF voltage 5.0 VDC and 1.5 mA DC
Input resistance and current 10K Ohms and 3 mA @ 24 VDC
Filtered ON/OFF delay 25 mS (20 Hz max. counting) for contact bounce filtering
Fast ON/OFF delay 4 mS (100 Hz max. counting)
Count rate (see above) (10 KHz on channel 1 only)
Counter modes pulse, rate and run time
Poll time (all channels) 5 mS to 20 mS configuration dependent
DISCRETE OUTPUTS
8 channels – sourcing 10-30 VDC
Min. and max. output load 1 mA to 1 Amp sourcing per channel
Max. OFF state leakage 0.05 mA
Inrush current 5 Amps (100 mS surge)
Typical ON characteristics 0.3 Ohms resistance and 0.3 VDC voltage drop @ 1A
Poll time (all channels) 5 mS to 20 mS configuration dependent
ANALOG INPUTS
6 channels – current or voltage selectable
Full scale range 4-20 mA
A/D and input resolution 16 bits (0.003%); 2 uA (current range)
Full scale accuracy +/-0.1% (@20°C) (factory calibration)
Span and offset temp. coeff. +/-50 ppm per °C
Input impedance 100 Ohm (current range), 80 K Ohm voltage
Current protection Self-resetting fuses (for 4-20 mA range)
DMRR 66 dB at 50/60 Hz (differential mode rejection)
CMRR (common mode rejection) Not applicable since analog inputs are single ended.
Fastest update time 50 mS (both channels) – configurable for longer integration times for better noise filtering

VT-mIPm-248-D Specifications

SERIAL PORTS
Up to 115,200 baud
RS485 Port A screws (485+, 485-, GND) 2-wire half-duplex
RS-232 Port B RJ45 (TD, RD, CTS, RTS, CD, DTR, DSR, GND)
RS-485 Port C (GND, 485+, 485-, T)
RS-232 Port D Screws (TD, RD, GND)
Protocols Master and slave modes; Sixnet and Modbus RTU / ASCII; optional: Slave; DNP3, IEC60870-5-101/104. Others available as Linux applications
DISCRETE INPUTS
12 channels sourcing or sinking (jumper/software selectable)
Guaranteed ON voltage 9 VDC
Maximum voltage 30 VDC
Guaranteed OFF voltage 5.0 VDC and 1.5 mA DC
Input resistance and current 10K Ohms and 3 mA @ 24 VDC
Filtered ON/OFF delay 25 mS (20 Hz max. counting) for contact bounce filtering
Fast ON/OFF delay 4 mS (100 Hz max. counting)
Count rate (see above) (10 KHz on channel 1 only)
Counter modes pulse, rate and run time
Poll time (all channels) 5 mS to 20 mS configuration dependent
DISCRETE OUTPUTS
4 channels – sourcing 10-30 VDC
Min. and max. output load 1 mA to 1 Amp sourcing per channel
Max. OFF state leakage 0.05 mA
Inrush current 5 Amps (100 mS surge)
Typical ON characteristics 0.3 Ohms resistance and 0.3 VDC voltage drop @ 1A
Poll time (all channels) 5 mS to 20 mS configuration dependent
ANALOG INPUTS
8 channels - Current or Voltage
Full scale range 4-20 mA , 0-5 VDC (jumper selectable)
A/D and input resolution 16 bits (0.003%); 2 uA (current range) or 0.5 mV (voltage range)
Full scale accuracy +/-0.1% (@20°C) (factory calibration)
Span and offset temp. coeff. +/-50 ppm per °C
Input impedance 100 Ohm (current range), 80 K Ohm voltage
Current protection Self-resetting fuses (for 4-20 mA range)
DMRR 66 dB at 50/60 Hz (differential mode rejection)
CMRR (common mode rejection) Not applicable since analog inputs are single ended.
Fastest update time 50 mS (both channels) – configurable for longer integration times for better noise filtering

ANALOG OUTPUTS
2 channels (4-20 mA)
A/D resolution 16 bits (0.003%)
Full scale accuracy +/-0.1% (@20°C)
Span and offset temp. coef. +/-50 ppm per °C
Input impedance 100 Ohm
Current protection Self-resetting fuses
DMRR (differential mode rejection) 66 dB at 50/60 Hz

Chapter 6 Maintenance Information

Local Diagnostics

Local diagnostics can be performed through any available port white the VT-mIPm is responding to messages from the other port. Diagnostic software, such as the Sixnet® I/O Toolkit, can be used to display the status of the I/O registers. Refer to the software's help system for details.

Power and Status LED

The "PWR" LED on the VT-mIPm indicates its operational and power status:

ON	The VT-mIPm is operating properly.
OFF	There is no power to the VT-mIPm or service is required. Contact Red Lion technical support.
FAST BLINK	This may occur when the VT-mIPm is being reset, or firmware is to be downloaded from the I/O Tool Kit software.
SLOW or PERIODIC BLINK	This indicates that the internal watchdog has detected a problem. Try clearing the memory and reloading the project from the I/O Tool Kit.

Controller or RTU Memory

The VT-mIPm has nonvolatile (battery-free) memory for storing configuration data from the I/O Toolkit utility. They also have battery-packed memory for storage of program variables and logged data. The battery is a rechargeable lithium cell that is kept fresh by the power circuitry in the VT-mIPm. The memory retention period for an unpowered VT-mIPm is at least 6 months at room temperature. The retention time will be shorter at higher temperatures. The life expectancy of the lithium battery is approximately 10 years or more.

Service and Support Information

Service Information

We sincerely hope that you never experience a problem with any of our products. If you do need service, call Red Lion at 1-877-432-9908 for Technical Support. A trained specialist will help you determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RO (Repair Order) can be obtained on the Red Lion website.

Red Lion tracks the flow of returned material with our RO system to ensure speedy service. You must include this RO number on the outside of the box so that your return can be processed immediately.

Be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RO form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Repairs are completed as soon as possible. If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:

Please fill in the following and keep this manual with your Red Lion system for future reference.

P.O. #: _____ Date Purchased: _____
Purchased From: _____
Serial Number: _____

Product Support

Technical Support:
Inside US: +1 (877) 432-9908
Outside US: +1 (717) 767-6511
Support: support.redlion.net
Hours: 8:00 am to 6:00 pm EST

Corporate Headquarters
Red Lion Controls
1750 5th Avenue
York, PA 17403
Website: www.redlion.net

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)**.

BY INSTALLING THIS PRODUCT, YOU AGREE TO THE TERMS OF THIS WARRANTY, AS WELL AS ALL OTHER DISCLAIMERS AND WARRANTIES IN THIS DOCUMENT.