REM Technology Inc.

REMVue®

Reciprocating Equipment Manager

Operations Manual

AIR / FUEL RATIO AND GOVERNOR CONTROL
REMVue® – 500 IPM CONTROLLER
OPERATIONS MANUAL

Version 1a
February 13, 2004

INSTALLATION AND HAZARDOUS AREA WARNINGS

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, REM Technology Inc. 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.

Notes: *All information in this document applies to REM Vue®–500 IPm controller and I/O, except where otherwise noted. Refer to the REM Vue®–500 I/O Tool Kit software on-line help system for detailed product specifications and configuration settings.*

REM *Vue*® is a registered trademark owned by REM Technology Inc.

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REMVue® – 500 IPM CONTROLLER OPERATIONS MANUAL

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REM*Vue*® – 500 IPM CONTROLLER OPERATIONS MANUAL

1. OVERVIEW

1.1 Introduction

The products covered by this manually are designed for use in industrial control and data acquisition systems. Refer to the REM*Vue*® Catalog and the individual data sheets for complete features and benefits. This user manual covers the aspects of hardware installation and maintenance.

A typical REM*Vue*® panel consists of a DC power supply; a REM*Vue*® controller and modular I/O modules.

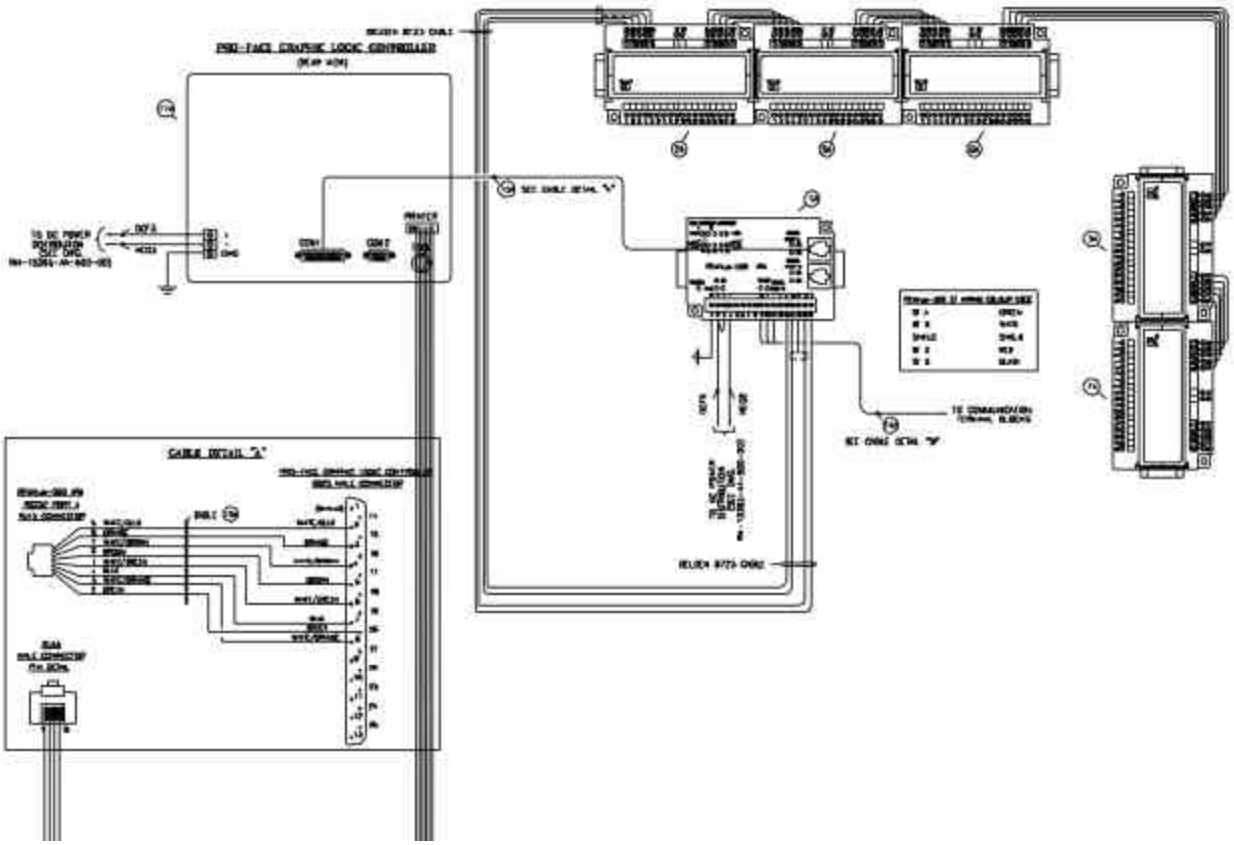


Figure 1 REM*Vue*® Panel

1.2 Getting Started with REMVue® Hardware

Following these steps will make installation and start-up easier.

1. ***Mount the Hardware***

   If you purchased a complete panel system, the complete enclosure is ready for installation. If you purchased individual components, refer to the following sections of this or the appropriate user manuals for information on installing them into an enclosure.

2. ***Install ST-BUS or Communication Wiring to I/O Modules***

   Make ST-BUS wiring connections to any REMVue® I/O module. Refer to a following section for ST-BUS wiring guidelines.

3. ***Connect Power and I/O Wiring to the Modules***

   Connect power to the REMVue® or user-supplied DC power supply. Make DC power connections from the power supply to the REMVue® components. Make field wiring connections to the REMVue® I/O modules and any peripheral equipment. Refer to the appropriate user manuals for I/O connection details.

4. ***Install Communication Cabling***

   The units covered by this manual come with communication accessories. Snap the pre-wired 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 controller and a serial RS232 port (*DB9 connector*) on your PC.

   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.

5. ***Apply Power***

   Power up the REMVue® components 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 REMVue® user manual for details.

6. ***Configure Using the REMVue® I/O Tool Kit***

   Refer to the steps on the next page to create a hardware configuration for each REMVue® station. Refer to the on-line help in the I/O Tool Kit for details.

7. ***Test the Hardware***

   Use the Test I/O window in the I/O Tool Kit program to verify proper I/O operation of all REMVue® stations. Refer to the I/O Tool Kit on-line help system.

8. *Configure Your PC Software to Communicate with the REMVue® Station(s)*

Refer to the documentation for your software.

9. *If You Have Difficulty*

If you experience startup trouble, refer to a following page in this document for some trouble-shooting tips or phone RTI Technical Support for help.

2. ASSEMBLY AND INSTALLATION

2.1 REMVue® Panel Assembly

Most REMVue® components snap onto DIN rail strips fastened to a sub panel. Figure 2 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 REMVue® 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. Figure 3 shows the physical dimensions of the units covered by this manual.

REMVue® components can be installed in any orientation and order on your panel.

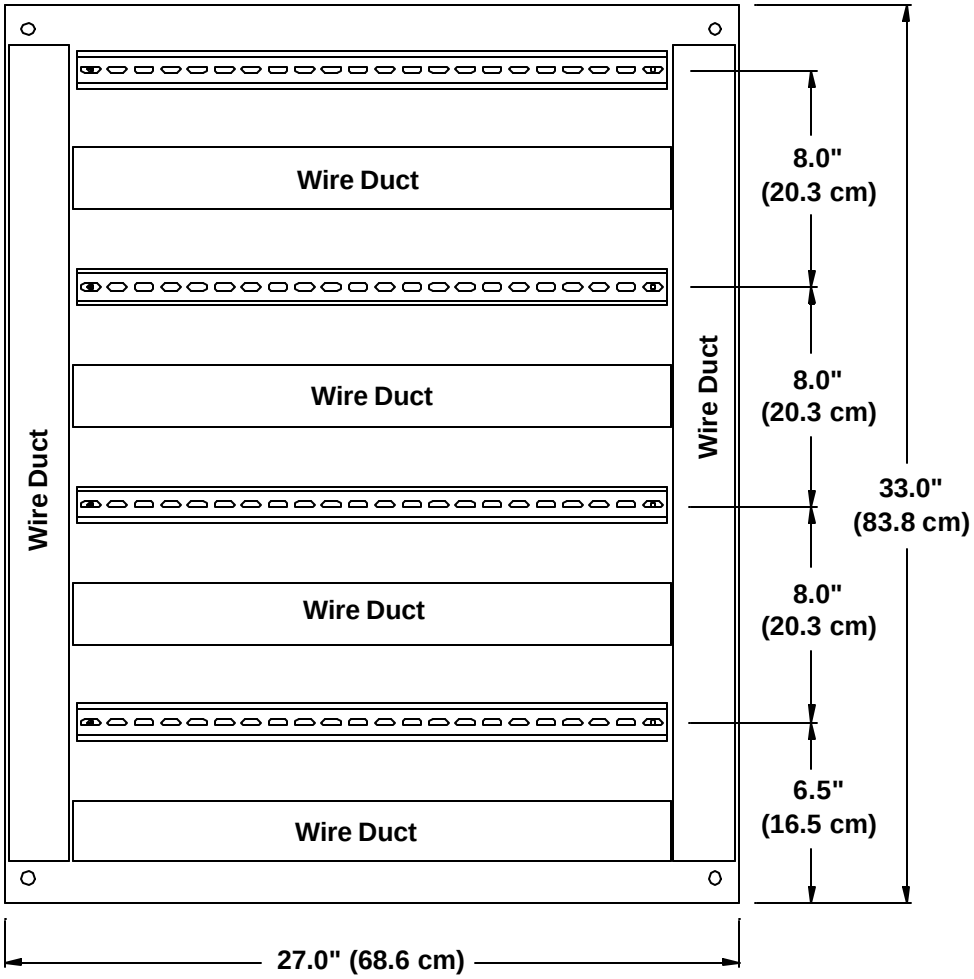


Figure 2 Sample Layout for a 36" ´ 30" Enclosure

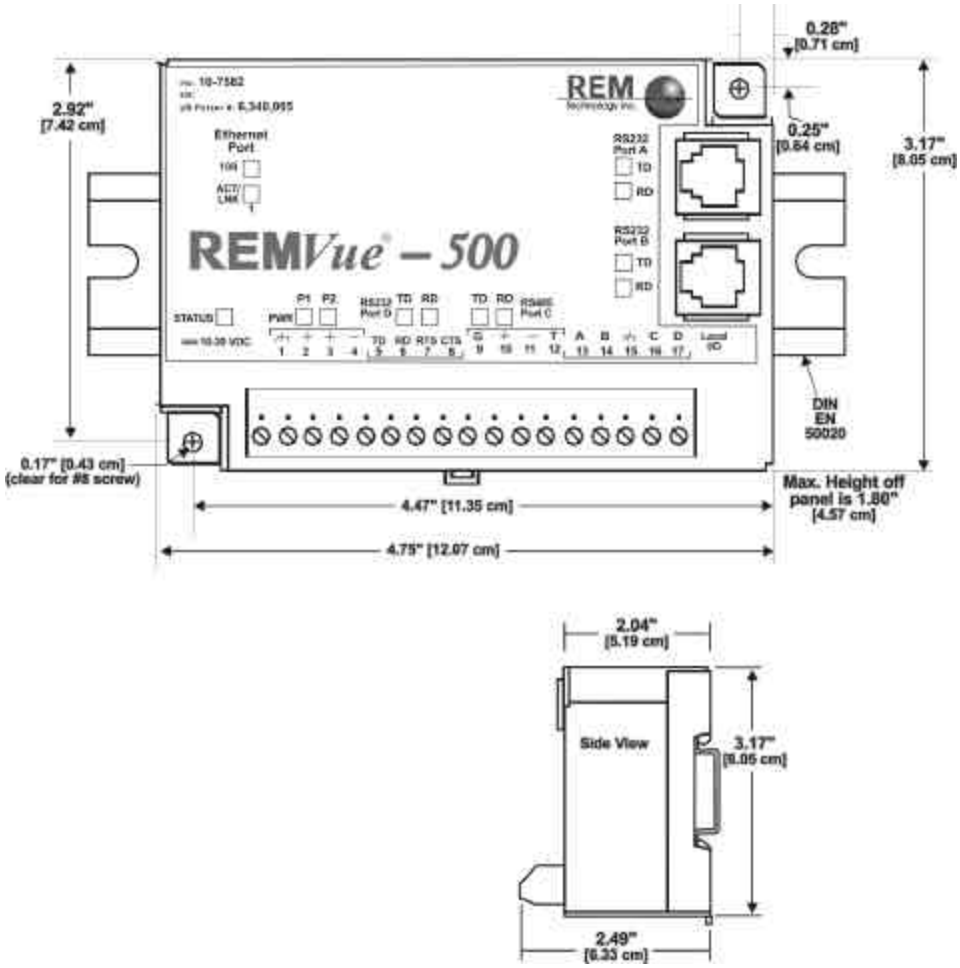


Figure 3 REMVue® Controller Dimensions

3. POWER AND ST-BUS WIRING

3.1 Power Requirements

REMVue® IPm controllers accept 24 VDC power from a user DC power source of **10 to 30 VDC**.

3.2 Current Requirements

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

3.3 DC Power Wiring

All REMVue® units and user instrumentation loops may be powered from a single DC source. Refer to Figure 4 for typical DC power connections. The user DC power source must be between 10 to 30 volts.

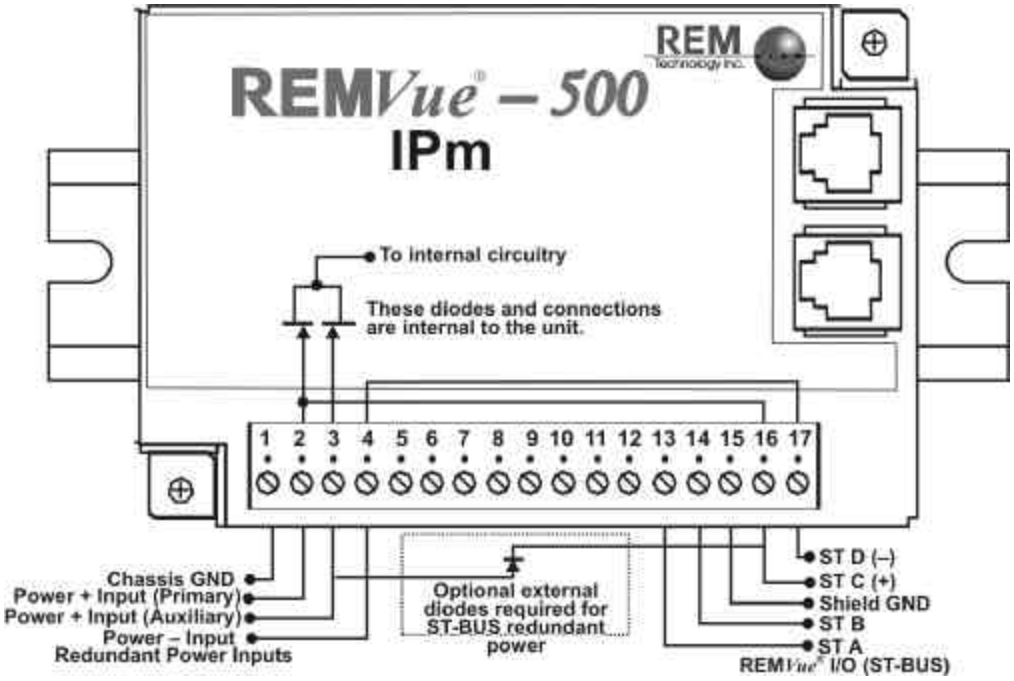


Figure 4 REMVue® Power Connections

3.4 Redundant Power Inputs

The REM Vue® controller has a redundant power + input terminal. (*There is one common power — terminal.*) This allows you to connect two separate power supplies. If one fails then the other will take over powering your hardware.

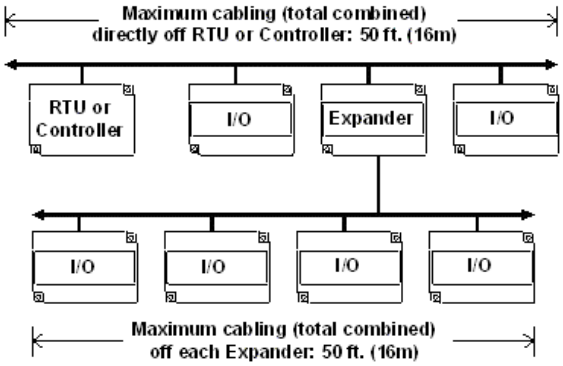
Notes: *In the REM Vue® – 500 controller, the ST C (+) and ST D (-) of the ST-BUS are internally connected to only the primary power input (terminals 2 and 4). Therefore, when running on only auxiliary power (terminals 3 and 4) then there will be no power on terminals 16 and 17 (ST C and ST D). If redundant power is desired for the ST-BUS it is recommended that the auxiliary power + be connected to terminal 16 through an external diode. The diode should be appropriately sized (current rating) for the number of I/O modules being powered (see Figure 4).*

3.5 ST-Bus Wiring Guidelines

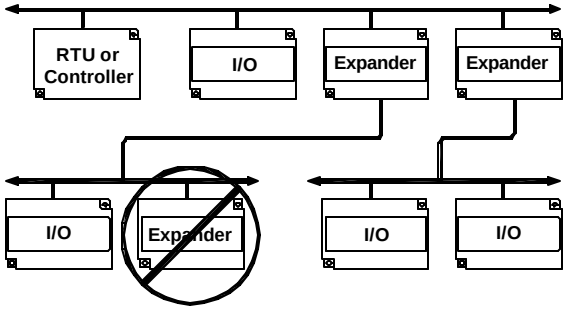
ST-Bus wiring connects the REM Vue® I/O modules to the controller. Follow the upcoming guidelines for reliable performance.

3.5.1 ST-Bus Capability

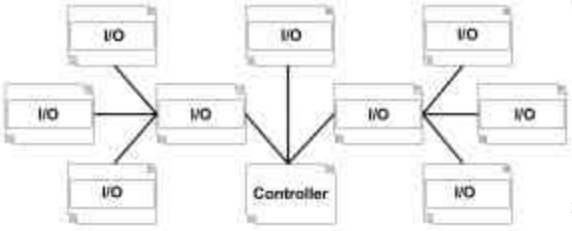
Max. modules controlled by one controller 128
Max. modules connected directly to controller..... 20 (*any mix*)
Max. modules connected to expander output ..... 20 (*any mix*)
Required cable type.....Any with 2 individually shielded pairs, 22AWG min.
Recommended cables.....Alpha 2466C, Belden 8723, Carol C1352
Max. cabling off each controller..... 50 ft. (16M)



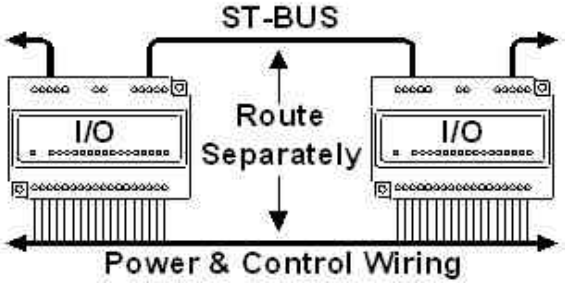
Connect up to 20 I/O modules or expanders directly to the controller with a maximum total cabling of 50 feet. Likewise, connect up to 20 I/O modules to each expander.



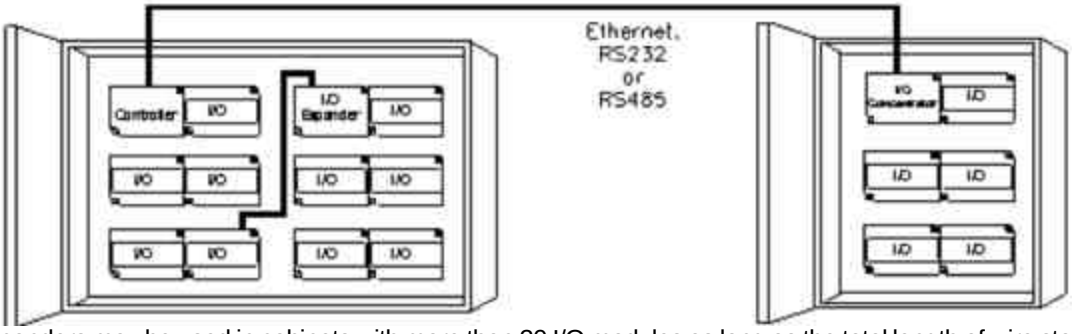
All expanders must be connected directly to the controller. (*Expanders cannot be cascaded in series.*)



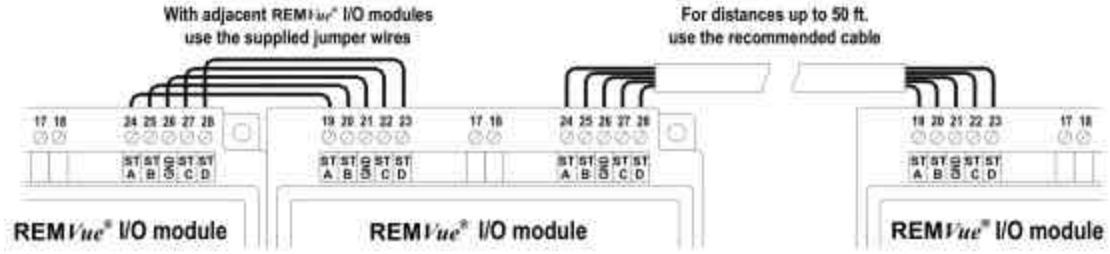
ST-Bus connections may form star configurations without any restrictions.



Route ST-Bus wiring away from power wiring and sources of electrical interference.



Expanders may be used in cabinets with more than 20 I/O modules as long as the total length of wire stays within the 50-foot limit. Extending ST-Bus wiring to additional cabinets is not recommended. Instead, use a gateway, RTU or I/O concentrator in each additional cabinet and run Ethernet, RS232 or RS485 wiring between the cabinets.



Use the supplied ST-Bus jumpers between adjacent **REMVue®** components. Otherwise, use the recommended cable.

4. COMMUNICATIONS

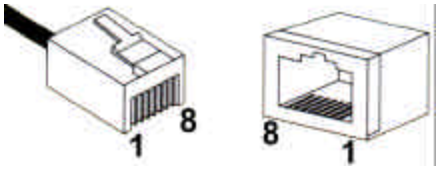
4.1 Communication Ports

The REMVue® controllers covered by this manual have various combinations of Ethernet and serial ports. See the chart below.

Product	RS232 Port A	RS232 Port B	RS485 Port C	RS232 Port D	Ethernet Port1	Ethernet Port 2	Built-In Switch
REMVue® – 500	×	×	×	×	×	—	—

4.1.1 RS232 Ports A and B

These ports are identical in connection and functionality. A RJ45 female connector is provided for each. The pin-outs follow the EIA/TIA-561standard (*see Figure 5*). A pre-wired DB9F to RJ45F adapter is included with these units. Use this adapter along with a RJ45 male to RJ45 male straight-thru wired patch cable (*not included*) to make a connection between a com port on your PC (*DB9 male*) and either Port A or B (*RJ45 female*). Refer to the REMVue® Catalog for more information on connecting to other equipment.



RJ45 Pin Locations
(For RS232 or Ethernet)

4.1.2 RS485 Port C

This port is found on all units. It provides a RS485 (*two-wire, half duplex only*) connection to other equipment. Four terminals (*for signal gnd, 485+, 485-, and termination*) are provided. 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.

Notes: *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

All these units have RS485 termination components (*150 ohm resistor and a 0.1 µF capacitor connected in series*) already inside. 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 used for your RS485 — connection. It is recommended that both end stations of your RS485 network be terminated. Avoid terminating more than two stations. For third party devices, please refer to their user manual for termination instructions.

Bias Resistors

On a RS485 two-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.

Notes: *If your RS485 network is made up exclusively of REM Vue® devices, these bias resistors are not necessary.*

4.1.3 RS232 Port D

Five screw terminals (*for TD, RD, RTS, CTS, and GND*) are provided to make your connections.

Notes: *The 5th terminal is signal ground and is shared by the adjacent RS485 Port C. Refer to Figure 5 for the exact connections.*

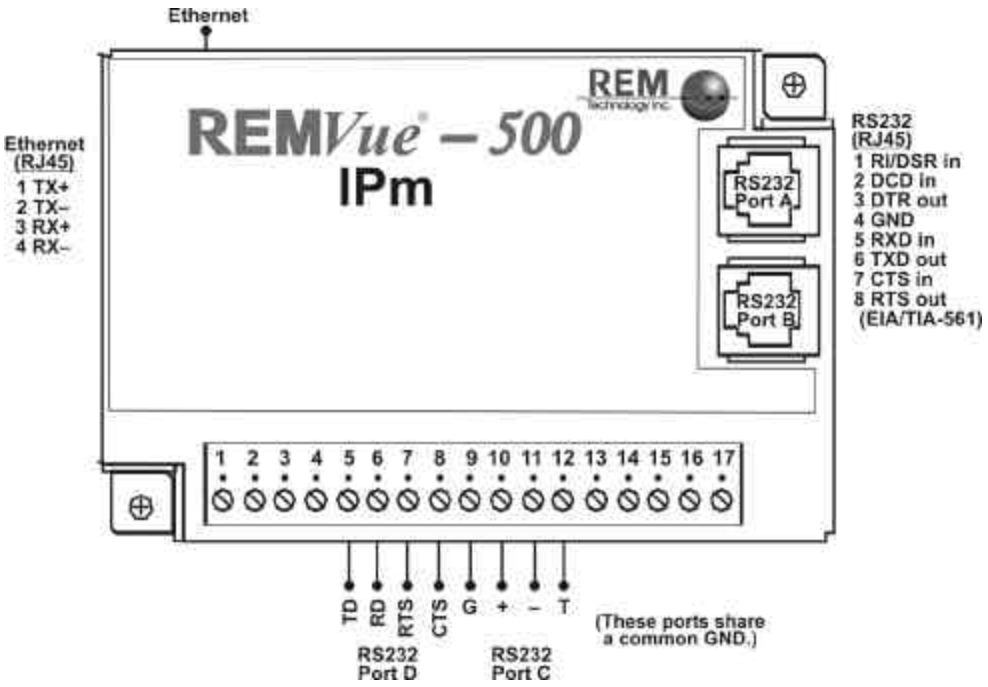


Figure 5 REM Vue® Communication Connections

4.1.4 Ethernet Port 1 (*Primary*)

It 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 REM Vue® I/O Tool Kit software. Refer to the on-line help for details.

5. TECHNICAL SPECIFICATIONS

Below are the technical specifications for the REMVue® IPm Controller.

General	Industrial PowerPC (32 bit data bus)
Compatibility with legacy VersaTRAK RTU and SixTRAK Programmable I/O Gateway	Fully (*except there is no on-board I/O*)
Operating system	Embedded LINUX
Unique station addresses (unit Ids)	16,000+ (REMVue®) or 247 (Modbus)
Dynamic memory (RAM) (*for program execution, dynamic variables, dynamic file system, etc.*)	32bit, 0 wait states 16 Megabytes
Program memory (Flash) (*for Linux OS, program storage, and file system*)	8 Megabytes
Datalogging memory (RAM) (*for datalogging and retained variables*)	Battery-backed – Rechargeable Lithium 512K bytes
Battery-backup time / life	1 year / 10+ years
Real-time clock resolution	10 mS
Real-time clock accuracy	+/-15 seconds per month
I/O expansion	SixTRAK, EtherTRAK, RemoteTRAK
Maximum local I/O (via ST-Bus port)	1,024 (128 SixTRAK modules) (*expander required after every 20 modules*)
Maximum distributed I/O (application dependent)	50,000+
Datalogging support	Yes – SIXNET Sixlog
Datalogging modes	Trending, alarm logging, sequence of events, event initiated, client transfers, and others
LINUX capabilities	Practically unlimited
Programming	High level C and others
Number of applications allowed	As many as there is memory for
Available FREE source code	Practically unlimited
IEC 61131 PLCopen programming	Yes – SIXNET ISaGRAF
Languages supported	Ladder logic, function chart, function block, instruction list, structured text, and flow chart
Number of programs allowed to be run in IPm at same time	2
Cycle time	10 mS minimum (*user settable*)
Communication capabilities	Master, slave, peer to peer, report on exception, store and forward and more
Communication media supported	Ethernet, telemetry, telephone (*dialup and leased line*), radio (*dumb and smart*), other wireless, fiber optic, short haul and more

Redundancy	Various levels supported
Redundant Ethernet links (ST-IPm only)	Yes – 2 unique MAC & IP addresses allow for 2 unique network connections
Redundant I/O modules	Yes – multiple modules can interface to the same I/O; an internal discrete bit reports on-line status of each module
Redundant controllers	Yes – automatic controller switch-over is supported (*user application programming required*)
Redundant power	Yes – automatic switch-over on failure
Backup RS485 communications	Yes – especially with EtherTRAK modules
Watchdogs and Monitors	**For run-time diagnostics**
CPU watchdog	CPU automatically resets if error is detected; status LED flashes error code
Communications watchdog	Settable timeout and output action (*force off or freeze*)
Heartbeat watchdog	Settable timeout & output action (force off or freeze)
Ethernet Port(s)	**10/100BaseTx (auto-detecting)**
Connection	RJ45 (*auto-crossover*)
Isolation	1,500 Volts RMS 1 minute (60 Hz.)
Message response time (typical)	5 mS
Diagnostic LEDs on each port	Indicates speed, link and activity
Protocols supported	TCP/IP, ARP, UDP, ICMP, DHCP, Modbus/TCP, SIXNET, and more
Independent networks	VT-IPm & ST-GT = 1 w/ unique MAC & IP address ST-IPm = 2 w/ unique MAC & IP addresses
Network port 1	1 shielded RJ45 connector
Integrated Ethernet switch features	Same as RTI's 10-7576
Serial Ports	**300 to 115,200 baud**
RS232 Port A	RJ45 (*TD, RD, CTS, RTS, CD, DTR, DSR/RI , GND*)
RS232 Port B	RJ45 (*TD, RD, CTS, RTS, CD, DTR, DSR/RI , GND*)
RS485 Port C	Screws (*GND, 485+, 485-, termination*) (*two-wire half-duplex*) (*GND common with port D*)
RS485 network	Up to 32 (full-load) stations
RS485 distance	Up to 0.5 miles (1 km)
RS232 Port D	Screws (*TD, RD, RTS, CTS, GND*)
Protocols (master & slave)	SIXNET & Modbus (RTU and ASCII); Many others available in LINUX
Diagnostic LEDs on each port	Transmit Data (TD) & Receive Data (RD)
Flow Control	Hardware, software, RTS-party (*for radios and RS485*)

ST-BUS (local I/O) port	Full line of analog and discrete I/O
Modules	Up to 128 (including expanders)
I/O channels	Up to 1,024
Scan time	5 mS minimum (varies depending on quantity and type of I/O modules)
Benchmark 1: 48 discretes & 8 analog	10 mS
Benchmark 2: 512 discretes	30 mS
Benchmark 3: 128 analogs	40 mS
Benchmark 3: 512 discretes & 128 analogs	80 mS
Cable length	50 ft. (16 m.)
Wiring configurations	Daisy-chain or star
Cable type required	2 individually shielded pairs, 22 AWG min.
I/O Tool Kit Windows Software	**Level 1 provided free with all systems**
Operating systems	95, 98, ME, NT, 2000, and XP
Minimum system requirements	Pentium or equivalent, 32 Mb RAM, 100 Mb hard disk space
Option 1 (Basic)	Configuration, calibration, diagnostics, and limited exporting of I/O definitions.
Option 2 (SCS)	Full importing and exporting of I/O definitions, peer to peer I/O transfers, and the IOmap shared database.
Option 3 (Datalogging)	Datalogging capability and quick load feature "Load All".
Option 4 (LINUX)	LINUX functionality and support.
Option 5 (Web Server)	Web Server functionality and support.
Environmental	**DIN rail or flat panel mount**
Input voltage	10-30 VDC (integrated switching supply), (External AC/DC or DC/DC supplies optional)
Input power (@ 24 VDC unless otherwise noted) (±10%) Notes: *The power consumption variations mostly depend on the number of Ethernet and/or serial connections.*	2.4 W (110 mA) – typical *(no communications)* 2.7 W (112 mA) – typical *(serial communications only)* 3.1 W (128 mA) – typical *(all ports communicating)* (*rated current at max. voltage 30 VDC is 125 mA*)
Redundant power inputs	Yes with automatic switch over, diode protection, and internal voltage monitoring
Temperature	-40 to 70 °C (-40 to 85 °C storage)
Humidity	5% to 95% RH (*non-condensing*) (*optional conformal coating*)
Flammability	UL 94V-0 materials
Electrical Safety	UL 508, CSA C22.2/14; EN61010-1 (IEC1010); CE
EMI emissions	FCC part 15, ICES-003, Class A; EN55022; EN61326-1; CE
EMC immunity	EN61326-1 (EN61000-4-2,3,4,6); CE
Surge withstand	IEEE-472 (ANSI C37.90); EN61000-4-2, 4

Vibration	IEC68-2-6
Hazardous locations (Class 1, Div 2, Groups A, B, C, D)	UL 1604, CSA C22.2/213, Cenelec EN50021 Zone 2
Marine & Offshore	DNV (Det Norske Veritas)
Packaging	Alum. cover (*iridite finish*) on Lexan base
Mounting	DIN rail (EN50022) or direct to panel
Size	4.75"L × 3.25"W × 2.65"H *(121mm ´ 83mm ´ 67mm)*
Weight	0.730 Lbs.

6. MAINTENANCE INFORMATION

6.1 Local Diagnostics

Local diagnostics can be performed through any available port while the controller is responding to messages from the other port. Diagnostic software, such as the REMVue® I/O Tool Kit, can be used to display the status of the I/O registers. Refer to the software's on-line help for details.

6.2 Status LED

The "Status" LED on the controller or RTU indicates its operational status:

ON

The controller or RTU is operating properly.

OFF

There is no power to the controller or service is required. Contact REM Technology Inc. technical support.

FAST BLINK

This may occur when the controller is being reset, or firmware is to be downloaded from the I/O Tool Kit software.

SLOW or PERODIC 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.

6.3 Controller or RTU Memory

These REMVue® controllers have non-volatile (*battery-free*) memory for storing configuration data from the I/O Tool Kit utility.

They also have battery-backed 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 controller. The memory retention period for an unpowered controller or RTU is at least six 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.

6.4 Product Support

To obtain support for REMVue® products, call REM Technology Inc. and ask for Applications Engineering.

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