

Professional NMEA 0183 Multiplexer Install/User Manual

For all variants:
PRO-MUX-1-R
PRO-MUX-1-S

Issue 1.0



Important Notices

The device to which this manual relates complies with the Electromagnetic Compatibility requirements according to EN60945. The unit should always be used in conjunction with appropriately approved, shielded cable and connectors as per NMEA 0400 to ensure compliance. A declaration of conformity is available for download at www.actisense.com.

If the device to which this manual relates is to be installed within five metres of a compass, please refer to the 'Compass Safe Distance' section in the 'Technical Specifications' table.

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Technical Accuracy

To the best of our knowledge the information contained in this document was correct at the time it was produced. Active Research Ltd cannot accept liability for any inaccuracies or omissions.

The products described in this manual and the specifications thereof may be changed without prior notice. Active Research Ltd cannot accept any liability for differences between the product and this document. To check for updated information and specifications please check www.actisense.com.

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Product Registration

Please register your product via the online form at actisense.com/product-registration/.

Your product package includes a unit serial number. The serial number is six digits long and can be found below the barcode on the label. Your registration will assist Actisense Support to link your product to your details, simplifying any future assistance you may require.

Product Guarantee

All Actisense products are provided with a 3 year guarantee as standard. To activate the 5-year guarantee offered with this product please complete product registration either online (See 'Product Registration' section above) or by completing and returning the warranty card supplied in the box with the product.

If you suspect that the unit is faulty please refer to the Troubleshooting Section of the User Manual before contacting support.

It is a requirement of the guarantee that all installations of electronic equipment follow the NMEA 0400 specification. Any connection to a battery or power supply must meet the mandatory essential safety requirements that may be imposed by local regulatory agencies.

Actisense products are intended for use in a marine environment, primarily for below deck use. If a product is to be used in a more severe environment, such use may be considered misuse under the Active Research Ltd guarantee.

Product Disposal

Please dispose of this product in accordance with the WEEE Directive. The product should be taken to a registered establishment for the disposal of electronic equipment.

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Installation Warnings

All warnings and notices must be followed to ensure the correct operation of the PRO-MUX-1. Incorrect installation may invalidate the guarantee.

It is highly recommended that all of the installation instructions are read before commencing the installation. There are important warnings and notes throughout the manual that should be considered before the installation is attempted.

Warning 1: Accuracy

The Actisense PRO-MUX-1 is designed to accurately transfer data from input to output. When the PRO-MUX-1 is in a Basic Mode no data integrity checking is performed, therefore any incomplete, inaccurate or corrupt data received on a PRO-MUX-1 input will be duplicated to the PRO-MUX-1 outputs. In contrast, PRO-MUX-1 Smart Modes do use the sentence checksum (if available) to remove incomplete and corrupted data, however, the accuracy of the data fields in a valid sentence still remains the responsibility of the NMEA Talker that generated the data.

Warning 2: Installation and Operation

This product must be installed and operated in accordance with the instructions provided. Failure to do so could result in personal injury, damage to your boat and/or poor product performance.

Warning 3: Installation Code of Practice

When wiring the power supply to the PRO-MUX-1 ensure the isolation switch is off. Wiring the PRO-MUX-1 while the connection is live may damage the PRO-MUX-1 and is in breach of the guarantee. Any connection to a battery or power supply must meet the mandatory essential safety requirements that may be imposed by local regulatory agencies.

All wiring should be in accordance with the requirements of the NMEA 0400 installation specification.

Warning 4: Mounting Requirements

Select a flat location to mount the PRO-MUX-1. Mounting on a contoured surface may cause damage to the case. Do not mount the PRO-MUX-1 while the device is powered, or the cable harness is connected. Note that the connectors are pluggable for easy disconnection when mounting or removing the PRO-MUX-1.

Software Updates

The PRO-MUX-1 units have built-in firmware which is held in flash memory, allowing quick and easy upgrades using the latest Actisense Toolkit. It is highly recommended that the firmware is kept up to date in the PRO-MUX-1.

The firmware version installed in the PRO-MUX-1 can be viewed on the web based Configuration Tool 'Home' page, in the 'Main Application' section. Details of the latest PRO-MUX-1 firmware version released can be viewed on the Actisense website.

PRO-MUX-1 Intro & Features

The Actisense® Professional NMEA 0183 Multiplexer (PRO-MUX-1) is a robust and highly flexible platform that cures many interconnectivity headaches.

The PRO-MUX-1 is reliable, robust and provides industry leading isolation on all inputs and outputs as standard, so that connected devices safely avoid hazardous ground loops, the number 1 cause of product failure in NMEA 0183 networks.

The eight NMEA 0183 inputs can be routed to any of the six NMEA 0183 outputs, providing a highly customisable network. A bi-directional serial port and an Ethernet port allow for simple configuration and diagnostics using Actisense software.

The configuration tool is accessible via any popular web browser (using the Ethernet port) so there are no PC operating system compatibility issues to contend with. Using the web based configuration tool will allow the user to finely tune the exact data available on each output. The default setup is for all data to go to all outputs.

2-part pluggable connectors on the PRO-MUX-1 (screw or screwless terminals available) mean that new devices can easily be installed without the need to remove the PRO-MUX-1 from its mounted location. A professional DIN rail mounting mechanism keeps the PRO-MUX-1 secure in high vibration environments. Helpful LEDs indicate power, data in, data out and the alarm status to aid diagnostics.

- Ethernet port – for configuration, diagnostics and sharing NMEA 0183 data
- 8 OPTO-Isolated NMEA 0183 inputs
- 6 ISO-Drive NMEA 0183 outputs
- Advanced Data Filtering/Routing
- Configurable Input and output baud rates
- Serial port – for configuration, diagnostics or as an additional NMEA 0183 input/output.
- Free firmware updates make the device future-proof
- Alarm output relay (N/O and N/C contacts available)
- Mode inputs to provide manual selection of operational mode
- Diagnostic LEDs on all inputs and outputs
- Alarm status LED
- Mode LED
- Bi-colour status LED
- DIN rail or Panel mountable
- Pluggable connectors for quick and easy installation

Before getting started

The wire colours used in this manual are in accordance with the NMEA 0183 specification (v.4.10, June 2014) and are for illustration purposes only. Please ensure you check the wiring colours in the installation instructions for the devices you wish to interface to the PRO-MUX-1.

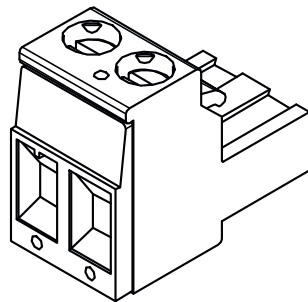
Terminals

The PRO-MUX-1 comes with two main choices for its 2-way and 3-way connectors: 'screw' (-R) or 'screwless' (-S).

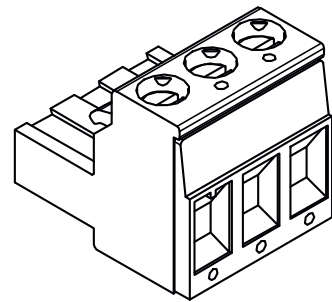
PRO-MUX-1 connectors are pluggable, meaning they can be easily removed for quick and simple wire installation without the need to unmount the PRO-MUX-1 from its installed location.

Screw Connector

2-way:



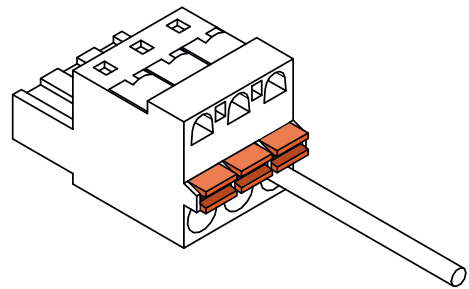
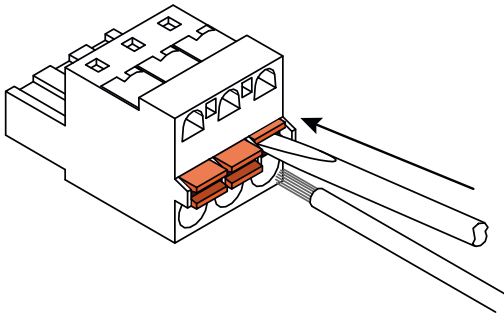
3-way:



Screwless Connector

Open the clamp inside the screwless connector by pressing down on the orange button with a small (2mm) flat headed screwdriver. This will allow the wire to be inserted. For best connections do not twist the wire strands.

Release the orange button to lower the clamp on to the wire strands for a secure termination.



Connections

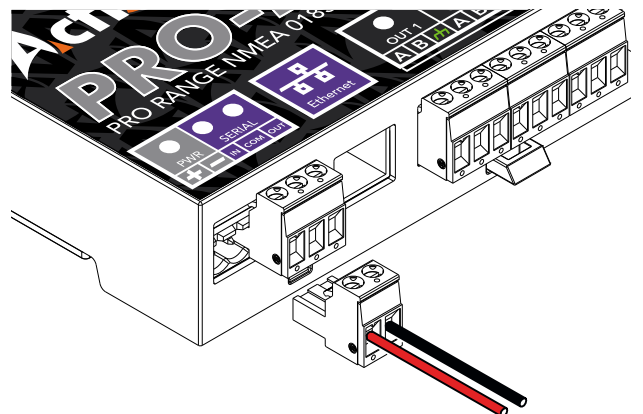
Power Supply

The PRO-MUX-1 requires a power source providing between 10 and 35 Volts DC.

The PRO-MUX-1 '+' terminal should be connected to the vessel power supply '+' terminal via the correctly rated fuse (in accordance with NMEA 0400).

The PRO-MUX-1 '-' terminal should be connected to the vessels DC ground plate.

The input supply connection has continuous reverse polarity and ESD protection.



Professional NMEA 0183 Intelligent Multiplexer - PRO-MUX-1

NMEA 0183 Talker and Listener Designations

The NMEA have updated the NMEA 0183 specification to ensure a consistent naming convention is used for labelling ports. The designation follows the same rules as used for Rx and Tx labelling but uses Talker and Listener instead. The input / receiving (Rx) port will be labelled as a 'Listener' port. The output / transmitting (Tx) port will be labelled as a 'Talker' port. When a port is labelled 'Listener' it is an input and when it is labelled 'Talker' it is an output.

Connecting to NMEA Devices

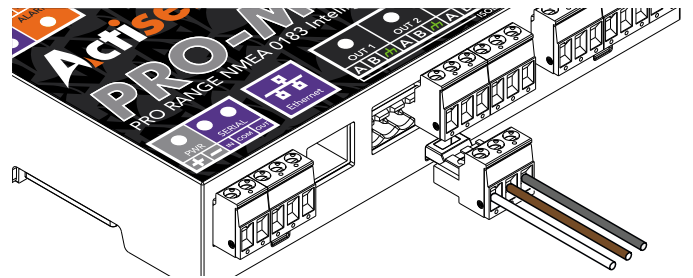
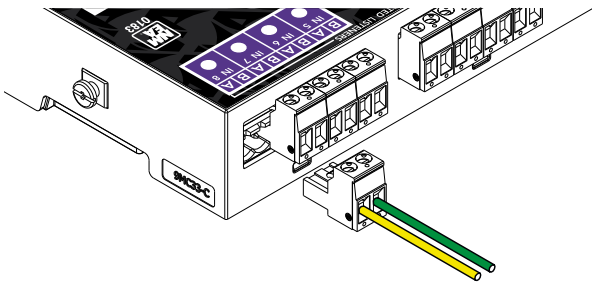
The 'A/+' and 'B/-' of the NMEA 0183 device should be matched to the 'A' and 'B' on the PRO-MUX-1. If the NMEA 0183 device has a ground (GND) wire (and no 'B/-' wire), simply connect this to 'B' on the PRO-MUX-1.

OPTO Inputs

Connect the NMEA 0183 Talker to the PRO-MUX-1 Listener terminals as shown in the diagram.

ISO-Drive Outputs

Connect the NMEA 0183 Listener to the PRO-MUX-1 Talker terminals as shown in the diagram. Connect the shield/drain wire of each Listener to the \hbar terminal.

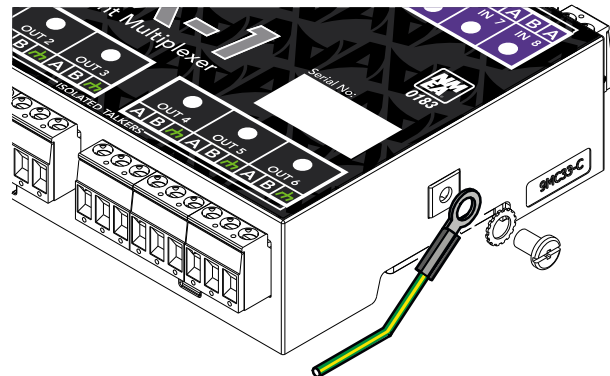
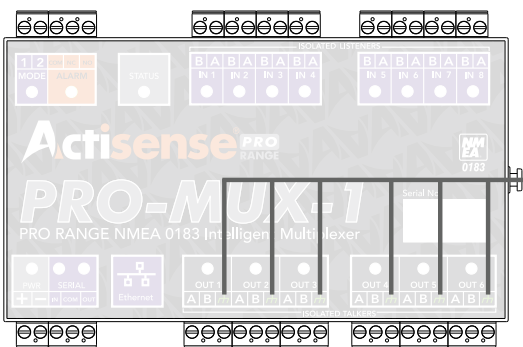


RF Ground Connection

The shield from each Listener should be connected to the \hbar terminal on the PRO-MUX-1 'Isolated Talkers' ports.

All \hbar terminals are connected internally and form a common bonding point at the RF ground stud.

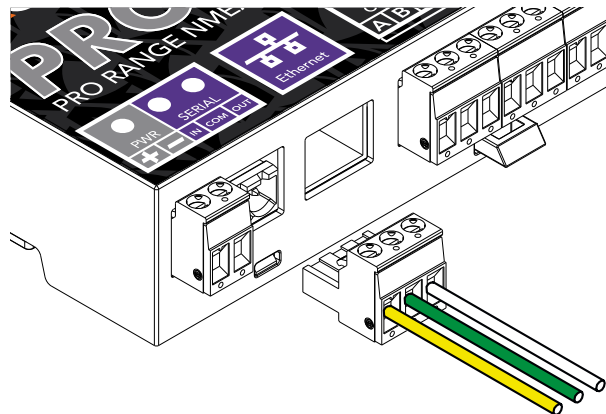
The RF ground stud should be connected to the vessels RF ground plate using a minimum conductor size of 8 AWG (10mm²) in accordance with NMEA 0400, (in version 3.1, this is in section 3.2).



Serial

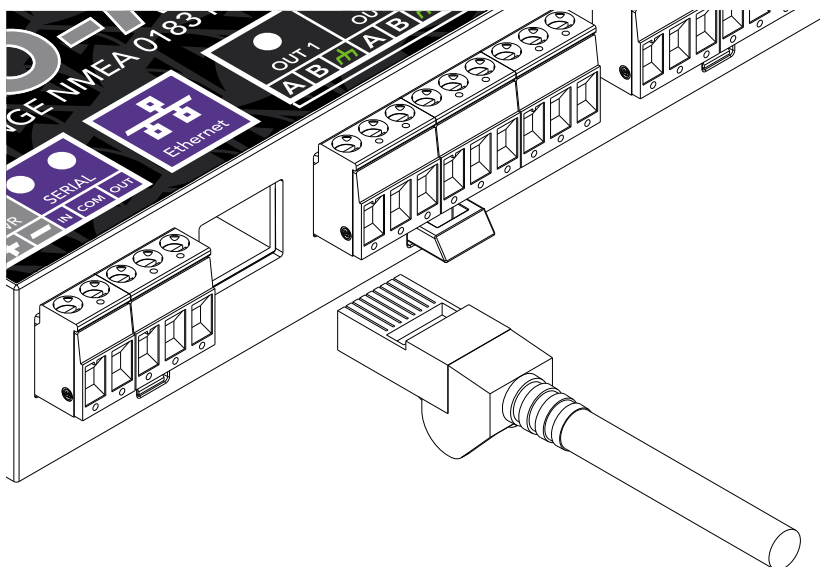
The connections for a standard RS232 cable are:

NDC-5 Label	Serial IN	Serial COM	Serial OUT
Connects to DB9 Serial Port	Pin 3 / TXD	Pin 5 / GND	Pin 2 / RXD



Ethernet

Either a standard Ethernet patch or crossover cable with an RJ45 plug can be used for a direct connection to a PC/laptop, or the PRO-MUX-1 can be connected to an Ethernet network switch. Insert the RJ45 plug in to the PRO-MUX-1 'Ethernet' terminal until a click is heard. To remove the RJ45 plug, push down on the locking clip and pull the cable away from the 'Ethernet' terminal.



Alarm

Connect to an Alarm input, indicator or monitoring equipment as required.

Mounting the PRO-MUX-1

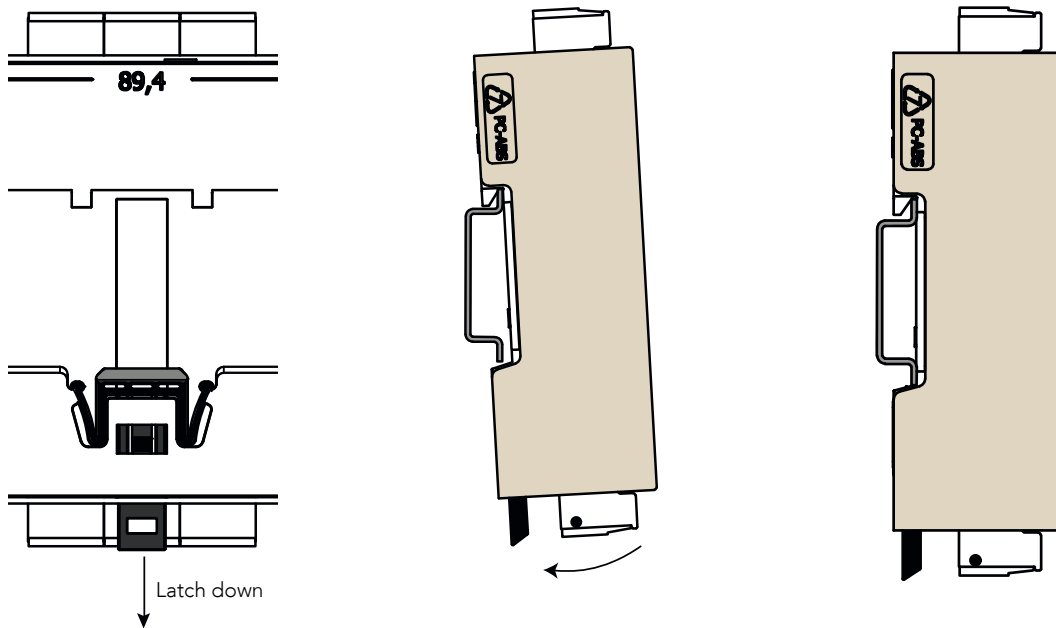
DIN Rail Mounting

Install the DIN rail in the desired location.

Fully retract the black securing latch in to the down position.

Attach the PRO-MUX-1 to the DIN rail as shown in the diagrams below.

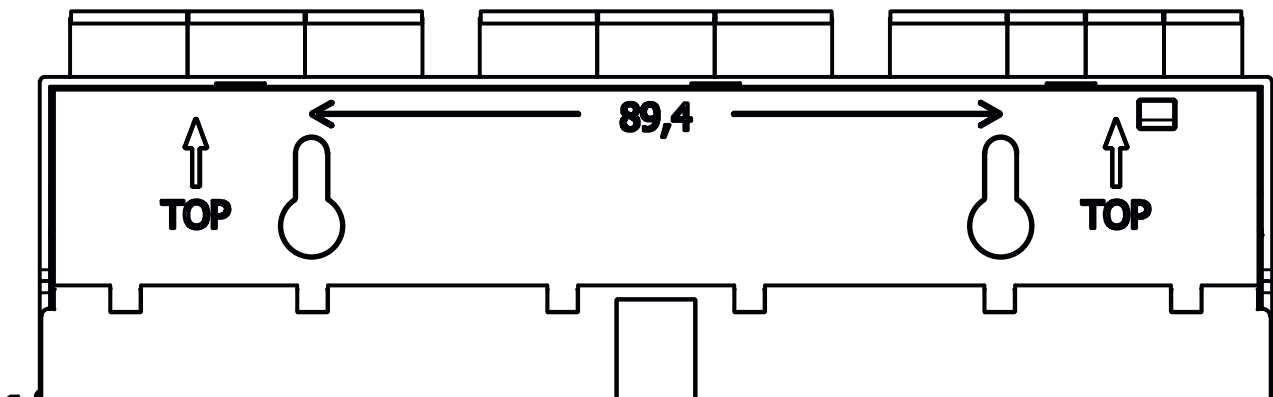
Ensure the PRO-MUX-1 sits flush against the DIN rail, then push the securing latch back in to position to hold the PRO-MUX-1 in place.



Bulkhead Mounting

Actisense recommends the PRO-MUX-1 is installed using the DIN rail supplied for the most secure installation. However, the PRO-MUX-1 can be secured to a bulkhead using the two screw catches on the reverse of the PRO-MUX-1 shown in the diagram below.

Two screws must be used 89.4mm apart and horizontally aligned.



Web Browser Configuration Tool

The Configuration Tool for the PRO-MUX-1 is built-in and can be accessed via the Ethernet connection. As the Configuration Tool is web based it is compatible with all popular web browsers and Operating Systems.

An internet connection is not required to access the Configuration Tool.

The default page displayed is the PRO-MUX-1 Configuration Tool 'Home' page. We strongly suggest bookmarking the 'Home' page in your web browser to allow quick and easy future access.

To access any of the PRO-MUX-1 setup pages, the user is required to log-in. This prevents unauthorised user access from modifying the PRO-MUX-1 configuration. The factory default log-in is "admin" for username and "admin" for password.

All modifications to the PRO-MUX-1 settings, including any user defined 'User Modes' are automatically saved inside the PRO-MUX-1.

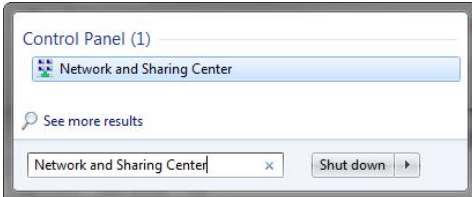
Standard Ethernet networks

If the PRO-MUX-1 is connected to an Ethernet network containing both DHCP and DNS servers, launch any popular web browser and enter 'http://promux-xxxxxx' into the address bar (replacing 'xxxxxx' with the actual product's serial number). It is important to include the 'http://' section of this address. If it is missing, the browser will conduct a web search.

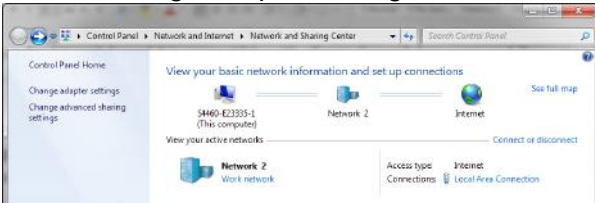
Direct connections or basic Ethernet networks

If the PRO-MUX-1 is connected directly to a PC (or the Ethernet network does not have a DHCP server), the PRO-MUX-1 will communicate using auto-IP by default. The auto-IP process can take up to 60 seconds to complete. The PC's "Local Area Connection" must also be setup to use auto-IP in order to communicate on this network most PCs are set to do this by default. If needed, instructions for how to do this using Windows 7 are detailed below (other Windows Operating Systems will be similar). Administrator privileges are required to carry out these instructions in full:

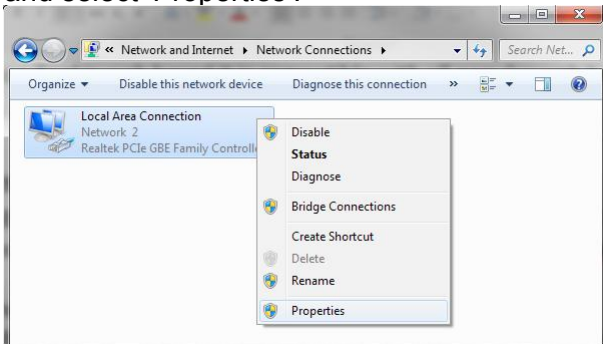
1. Launch the 'Start' menu and type 'Network and Sharing Center' in the search bar. Select 'Network and Sharing Center'.



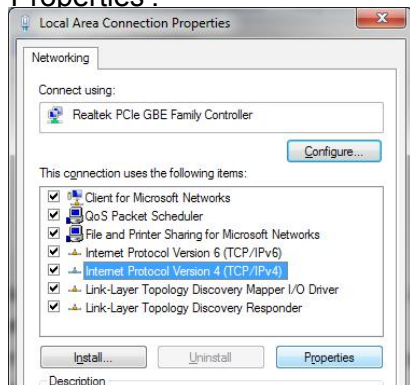
2. In the 'Network and Sharing Center' window, select 'Change adapter settings'.



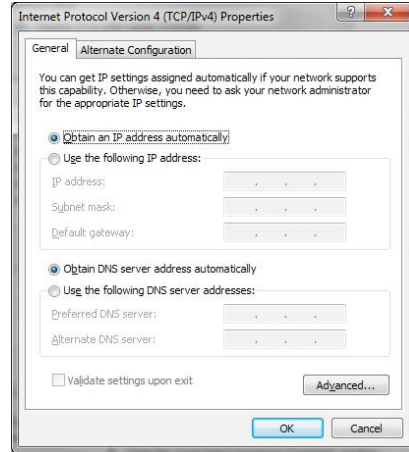
3. Right click on 'Local Area Connection' and select 'Properties'.



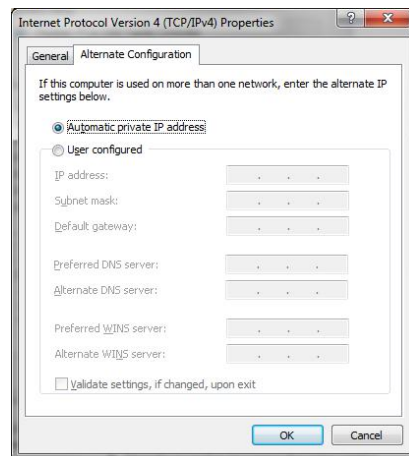
4. Select 'Internet Protocol Version 4 (TCP/IPv4)' but DO NOT untick the box. Then Select 'Properties'.



5. Under the 'General' tab heading, ensure 'Obtain an IP address automatically' and 'Obtain DNS server address automatically' are selected.



6. Under the 'Alternate Configuration' tab heading, ensure 'Automatic private IP address' is selected.



7. Accept these changes by selecting 'OK'.
8. Close the 'Local Area Connection Properties' window.

Now that the PC and PRO-MUX-1 are using the same IP address range, launch any popular web browser and enter 'http://promux-xxxxxx' in to the address bar (replacing 'xxxxxx' with the product's serial number).

Troubleshooting Guide

First level PRO-MUX-1 diagnostics / fault finding can be performed by observing the LED behavior.

The normal behavior of the PRO-MUX-1 LEDs is described on the next page. If the LEDs are not behaving as expected, this will indicate a fault in either the device connected to the PRO-MUX-1, the wiring/connections, or the PRO-MUX-1 itself.

Some common check to perform on all terminals of the PRO-BUF-1 if the correct LED behaviour is not displayed:

- Connectors are fully inserted
- All pins of the connector are in the correct location (not half in the neighboring connection)
- Wires are terminated firmly and correctly (check polarity)

LED	Colour	State	Description	User action
PWR	Blue	Pulsing	Indicates presence of power	None required
IN (INCLUDING 'SERIAL IN')	Green	Flashing	Data available on input indicated by LED.	No action required
	-	Off	No data available on this input or autobaud detection in progress (up to 20 seconds)	Check if connected Talker is sending data. If it is, review configuration.
OUT (INCLUDING 'SERIAL OUT')	Orange	Flashing/ solid	Flashes at a rate determined by baud rate and data length. If available bandwidth is nearly full, LED may appear solid instead of flashing	None required
STATUS	Red	Flashing / solid	Buffer Full – Overload condition, sentences are being dropped.	Use a web browser to review configuration and correct overload condition.
	Yellow	Flashing / solid	Warning, buffer is filling. Duplicate deletion is managing to maintain output capacity by deleting older copies of sentences	Review configuration to understand the required rates of sentences which is acceptable to any connected device
	Green	Flashing / solid	Normal operation. No data issues.	No action required
	-	Off	No data passing through outputs. Either no input data, or if IN LED is active it means all data is blocked.	Check if the connected Talker is sending data. If it is, review configuration.
Ethernet	Green	Flashing	Data activity on the Ethernet port	No action required
	Yellow	On	Indicates line speed at 100Mbps	No action required
		Off	Indicates line speed at 10Mbps	
-	Off	No data available	Check that the Ethernet network is operational.	
ALARM	Red	On	Indicates alarm conditions have been met.	Review status page in browser to understand alarm source.
MODE	Green	Pulsing / Flashing	Pulsing - User defined mode selected, Flashing - Pre-defined operating mode selected according to mode pins. Number of flashes = operating mode number	No action required
PWR and STATUS (Combined)	Power = blue Status = red	Power = on (solid) Status = on (solid)	Critical HW Error Both Power & Status LEDs are solid	Return to manufacturer if this persists after a power reset

Technical Support and the Returns Procedure

All installation instructions and any warnings contained in this manual must be followed before contacting Actisense technical support. If the troubleshooting guide did not help resolve the problem and an error persists, please contact Actisense Technical Support to help trace the issue before considering the return of the product.

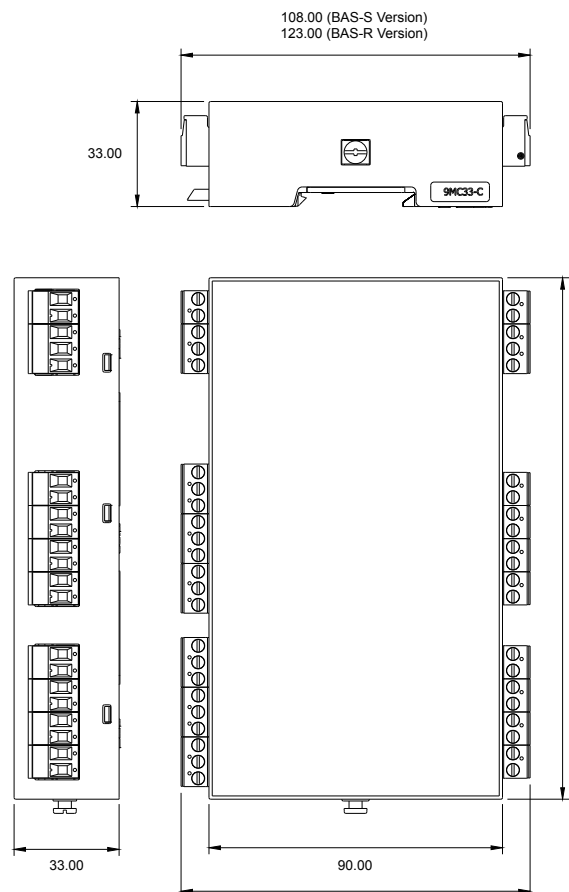
If the Actisense support engineer concludes that the PRO-MUX-1 unit should be returned to Actisense, a 'Return Merchandise Authorisation' (RMA) number will be issued by the support engineer.

The RMA number must be clearly visible on both the external packaging and any documentation returned with the product. Any returns sent without an RMA Number will incur a delay in being processed and a possible charge. Any cables originally supplied with the product are to be included in the returned box.

Power Supply	
Input supply voltage	9 to 35 V DC
Input supply current	250mA max @ 12V DC (all outputs @ full drive into 100 ohm loads)
Input protection	Continuous reverse polarity, transient overvoltage and ESD protection
Power indicator	LED, Blue - indicates unit is functioning correctly
NMEA 0183 Port - Listener & Talker	
Number of Listener / input ports	8 isolated NMEA 0183 Listeners
Number of Talker / output ports	6 isolated NMEA 0183 Talkers
Compatibility	Fully NMEA 0183, RS422 & RS232 compatible. RS485 Listener compatible
Electrical isolation	2500 V input to ground, 1000 V output to ground using ISO-Drive™
Speed / baud rate	In1 to In4: up to 38400 bps In5 to In8: 4800 bps Out1: up to 115200 bps Out2 to Out6: up to 38400 bps
Talker output voltage drive	>= 2.1V (differential) into 100 ohm
Talker output current drive	20 mA maximum per output
Talker output protection	Short circuit and ESD
Listener input voltage tolerance	-15 V to +15 V continuous, -35 V to +35 V short term (< 1 second)
Listener input protection	Current limited, overdrive protection to 40 VDC and ESD protection
Listener data indicator	LED, Green (Flashes to indicate valid input)
Talker data indicator	LED, Orange (Flashes at data rate)
Status indicator	LED, Green / Yellow / Red to indicate status (see user manual)
Serial Port	
Number of input ports	1 isolated input
Number of output ports	1 isolated output
Compatibility	RS422 & RS232 compatible. RS485 Listener compatible
Electrical isolation	2500 V input to ground 1500 V output to ground using ISO-Drive™
Speed / baud rate	115200 bps
Output voltage drive	>= 2.1V (differential) into 100 ohm
Output current drive	20 mA max.
Output protection	Short circuit and ESD
Input voltage tolerance	-15 V to +15 V continuous, -35 V to +35 V short term (< 1 second)
Input protection	Current limited, overdrive protection to 40 VDC and ESD protection
Ethernet Port	
Host interface	10/100BaseT, automatic polarity detection
Supported protocols	TCP/IP for configuration and firmware updating TCP/IP and UDP for NMEA 0183 comms
Connector	RJ45
Electrical isolation	2kV
Indicators	Green - Link, Yellow - 100 Mbps

Mode Inputs	
Input voltage range	0 to 35V DC
Protection	Transient overvoltage and ESD protection
Alarm Output	
Contacts	Normally open and normally closed
Electrical isolation	1000V between power supply and contacts
Alarm indicator	LED, red indicates a valid alarm condition
Mechanical	
Housing material	Polycarbonate / ABS blend
Flame retardancy	UL94 - V0
Dimensions	See diagram below (165mm (L) x 108mm (W) x 33mm (H))
Weight	270g including all screw plugs & shield screw
Mounting	DIN rail mount (35mm top hat rail EN 50 022)
Compass safe distance	250mm
Wiring terminals	Pluggable 2/3 way screw or screwless connectors, 5mm pitch, 12 to 30 AWG
Approvals and Certifications	
EMC	IEC 60945 (sections 9 , 10 & 11)
CE	2014/30/EU
Environmental protection	IP43
Operating temperature	-15°C to +55°C
Storage temperature	-40°C to +85°C
Relative Humidity (RH)	0 - 80% RH
Guarantee	5 years

Product Dimensions.



Actisense[®]

21 Harwell Road
Poole
Dorset
UK, BH17 0GE

Tel: +44 (0)1202 746682
Email: support@actisense.com
Web: actisense.com



Product Code	Description
PRO-MUX-1-BAS-R	Standard configuration with pluggable screw terminals
PRO-MUX-1-BAS-S	Standard configuration with pluggable screwless terminals