Protege DIN Rail 4 Channel Analog Output Expander

Installation Manual

Last Published: 31-May-21 12:09 PM

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Introduction

The Protege DIN Rail 4 Channel Analog Output Expander extends the Protege system by providing 4 highly configurable industrial instrumentation compatible analog outputs that allow the interface of any 0-10V actuator or controllable device.

Flexible module network architecture allows large numbers of modules to be connected to the RS-485 module network. Up to 250 modules can be connected to the Protege system in any combination to the network, over a distance of up to 900M (3000ft). Further span can be achieved with the use of a network repeater module.

The current features of the analog expander include:

- 4 independent analog output channels
- High resolution ultra fast 12 Bit DAC
- Individual channel restore options
- 12VDC pass-through and 24VDC internally generated supply outputs for sensors
- Industry standard DIN rail mounting
- Online and remote upgradeable firmware
- Secure encrypted RS-485 module communications

Installation Requirements

This equipment is to be installed in accordance with:

- The product installation instructions
- AS/NZS 2201.1 Intruder Alarm Systems
- The Local Authority Having Jurisdiction (AHJ)

Grounding Requirements

An effectively grounded product is one that is intentionally connected to earth ground through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent elevated voltages which may result in undue hazard to connected equipment or to persons.

Grounding of the Protege system is done for three basic reasons:

1. Safety
2. Component protection
3. Noise reduction

Safety Grounding

The object of safety grounding is to ensure that all metalwork is at the same ground (or earth) potential. Impedance between the Protege system and the building scheme ground must conform to the requirements of national and local industrial safety regulations or electrical codes. These will vary based on country, type of distribution system and other factors. The integrity of all ground connections should be checked periodically.

General safety dictates that all metal parts are connected to earth with separate copper wire or wires of the appropriate gauge.

Earth Ground Connection

The DIN rail enclosure and the DIN rail modules must be grounded to a suitable single-point earth ground connection in the installation. A minimum 14AWG solid copper wire (or thicker, in accordance with local authorities) shall be used from the Protege system's earth connection points.

The DIN rail enclosure includes an earth ground single-point link connection via the metallic enclosure. This single-point link is the Protege system's earth ground. All modules that have earth ground connections and that are installed in the same enclosure shall be connected to this single point. A single-point earth ground connection avoids the creation of ground loops in the system and provides a single reference point to earth ground.

DIN Rail Ground Connections (one or more cabinets installed in the same room)
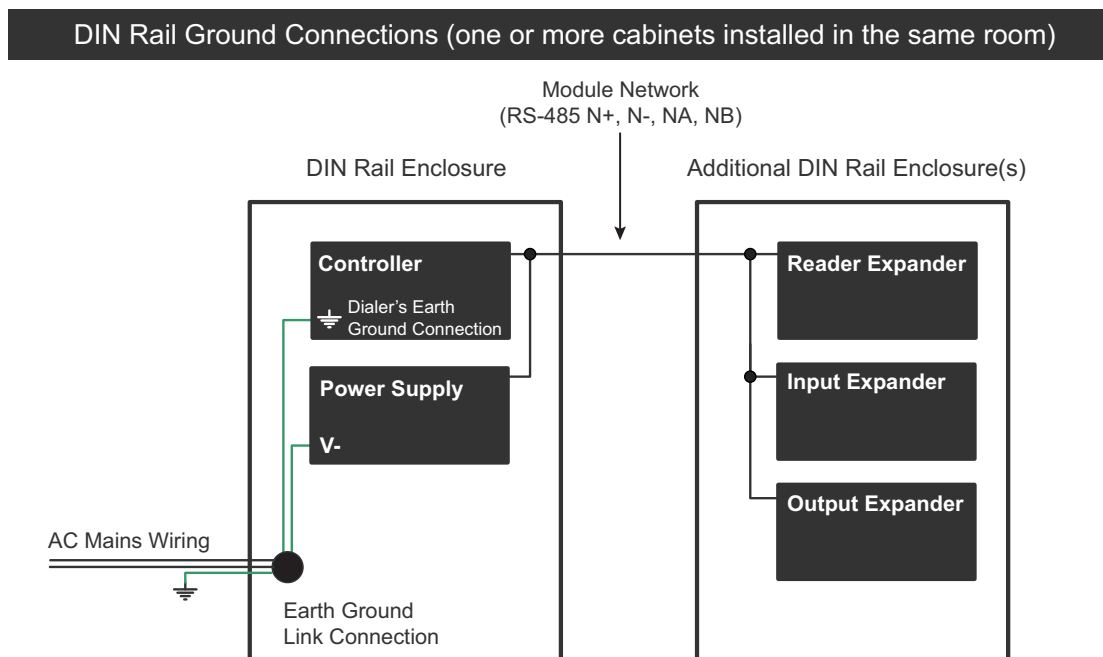
DIN Rail Ground Connections (multiple cabinets in different rooms, sectors, or buildings)

Module Network (RS-485 N+, N-, NA and NB)

DIN Rail Enclosure

Controller

Dialer's Earth
Ground Connection

Power Supply

V-

Earth Ground
Link Connection

Sector or Building #1

DIN Rail Enclosure

Reader Expander

Input Expander

Output Expander

Sector or Building #2

DIN Rail Enclosure

Input Expander

Input Expander

Input Expander

Sector or Building #3
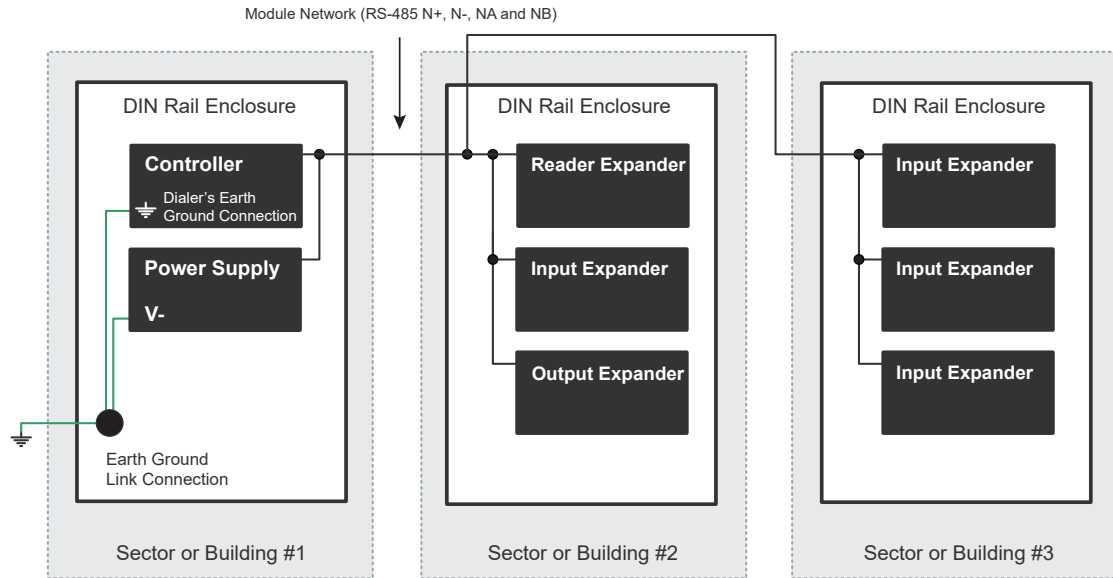
Note that the DIN rail enclosure earth terminal is connected to the power supply V- terminal.

There must be only **one** single earth grounding point per system.

Mounting

Protege DIN rail modules are designed to mount on standard DIN rail either in dedicated DIN cabinets or on generic DIN rail mounting strip.

When installing a DIN rail module, ensure that there is adequate clearance around all sides of the device and that air flow to the vents of the unit is not restricted. It is recommended that you install the module in a location that will facilitate easy access for wiring. It is also recommended that the module is installed in an electrical room, communication equipment room, secure cabinet, or in an accessible area of the ceiling.

1. Position the DIN rail module with the labeling in the correct orientation.
2. Hook the mounting tabs (opposite the tab clip) under the edge of the DIN rail.
3. Push the DIN rail module against the mount until the tab clips over the rail.

Removal

A Protege DIN rail module can be removed from the DIN rail mount using the following steps:

1. Insert a flat blade screwdriver into the hole in the module tab clip.
2. Lever the tab outwards and rotate the unit off the DIN rail mount.

DC Power & Encrypted Module Network

The expander incorporates encrypted RS-485 communications technology, and both module and network power are supplied by the N+ and N- terminals.

Network communications input from the Controller or previous module
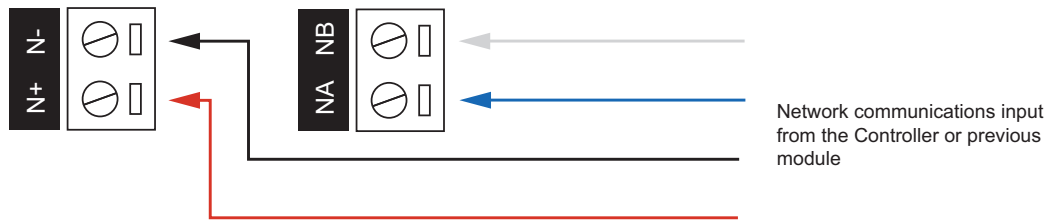
Connection of the communications and DC supply should be performed according to the diagram shown above. It is important that the N+ network communications power be 12VDC supplied from an independent battery backed power supply unit capable of supplying the required voltage to all devices on the RS-485 network.

Warning:

- The 12V N+ and N- communication input must be supplied from only **one** point. Connections from more than one 12V supply may cause failure or damage to the unit or the device supplying network power.
- The 330 ohm EOL (End of Line) resistor provided in the accessory bag **must** be inserted between the NA and NB terminals of the **first** and **last** modules on the RS-485 network. These are the modules physically located at the ends of the RS-485 network cabling.

End of Line Resistors:

First Module on RS-485 Network
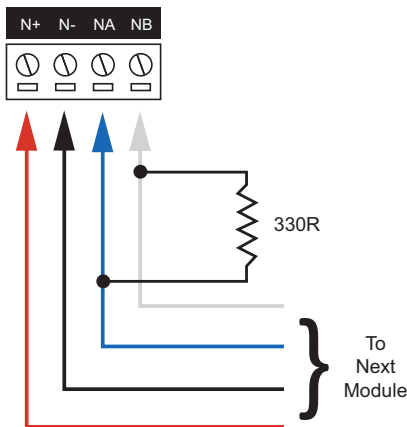
Last Module on RS-485 Network
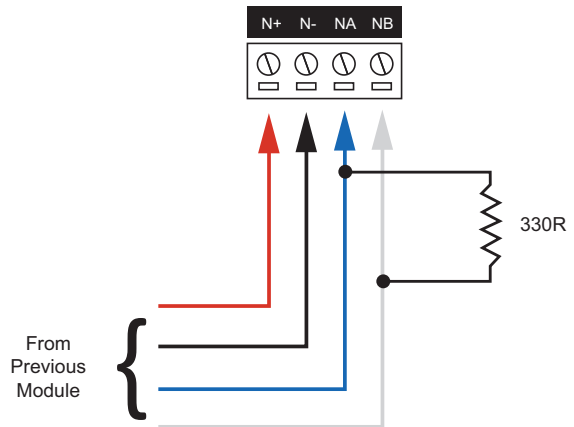
Sensor Interface

The analog expander allows the control of four separate analog output channels which can be used to interface with any industrial automation actuator that accepts an input of 0-10V output.

There are common requirements when wiring actuation devices that accept a signal from the analog expander outputs that must be observed to ensure the highest possible performance is achieved

- All cables should be high quality overall screened instrumentation rated cable with the screen earthed at **one** end only.
- Signal cables should be laid a minimum distance of 300mm from any source of interference including power cables, high current conductors, switchgear, or any forms of electrical noise.
- For two-wire sensor loops we recommend Austral standard cable B5102ES. For three-wire loops we recommend Austral standard cable B5103ES.
- It is recommended that you do not ground any current loop output, and use of a power supply that does not require a ground connection is recommended.
- If possible, signal-carrying cable that is exposed to harsh environments should include extra precaution against lightning strikes.

We recommend operating the module and associated sensors using a non-grounded power supply unit. Before removing ground connections for power supplies ensure that local regulations for the region allow this connection.

Actuator 0-10V Interface

The analog expander allows the connection of voltage-based actuator devices that set the desired value or position based on the current consumption of the output from the expander.

In most cases these will accept a signal from 0-10V which is generated by the analog expander based on a digital value for the channel.

The following example shows the connection of a variable position actuator device that adjusts the vanes within an air conditioning duct based on the input voltage. In this example the device has been connected to Output 1 on the analog expander. It is possible to connect the actuator to any output available.
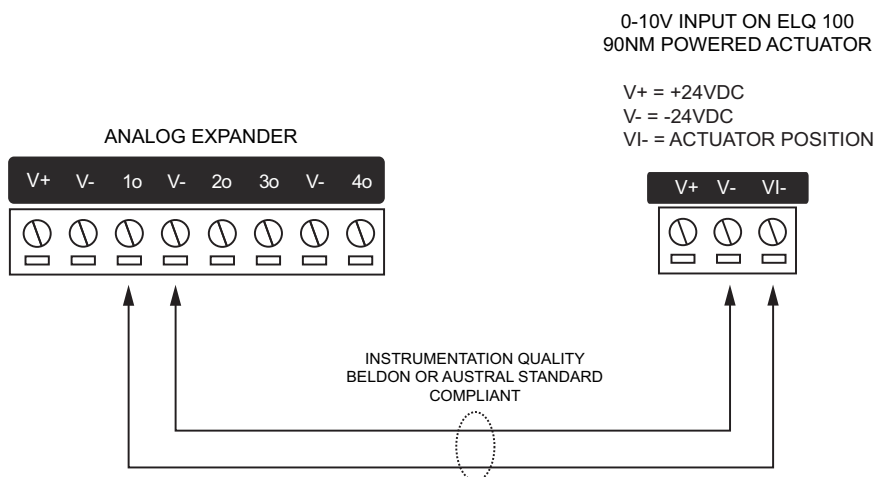
Warning: The shield wire on the sensor device connected to the input port should **not** be connected to any V-terminal. It should be connected to a suitable ground point at **one** end only. Do not join the shield and ground input wires at the sensor device. The shield should not be connected to any shield used for isolated communication. Always refer to the sensor manufacturer for detailed installation guidelines.

Inputs

The analog expander has no physical input connections. The analog expander monitors 8 trouble inputs used to report trouble conditions. A trouble input is in most cases not physically connected with an input in to the analog expander; rather it is related to a status condition within the system. For example, a module communication fault causes a trouble input to open as a result of the communication failure.

Trouble Inputs

Each analog expander can monitor up to 8 trouble inputs.

Trouble inputs are used to monitor the module status and in most cases are not physically connected to an external input.

The following table details the trouble inputs that are configured in the system and the trouble type and group that they activate.

Input Number	Description	Type	Group
AExxx:01	Reserved	None	None
AExxx:02	12VDC Pass-through Voltage Low	Power Fault	General
AExxx:03	24VDC Output Voltage Low	Power Fault	General
AExxx:04-07	Reserved	None	None
AExxx:08	Module Offline	Module Offline	System

Replace 'xxx' with the appropriate address of the module that you are programming.

Address Configuration

The module address is configured via programming and will require knowledge of the module serial number. The serial number can be found on the identification sticker on the product.

Refer to the Protege system controller installation manual for address programming details.

The controller has a set limit on the number of modules of each type that it can support. When adding and configuring modules always refer to the Maximum Module Addresses table in the controller installation manual.

LED Indicators

Protege DIN rail modules feature comprehensive diagnostic indicators that can aid the installer in diagnosing faults and conditions. In some cases an indicator may have multiple meanings depending on the status indicator display at the time.

Status Indicator

The status indicator displays the module status.

State	Description
Fast flash (green)	Module attempting registration with controller
Slow flash (green)	Module successfully registered with controller
Flashing (red)	Module communications activity

When the fault and status indicators are flashing alternately, the module is in identification mode, enabling the installer to easily identify the module in question. Upon either a module update or the identification time period expiring, the module will return to normal operation.

Fault Indicator

The fault indicator is lit any time the module is operating in non-standard mode. If the fault indicator is flashing, the module requires a firmware update or is in firmware update mode. When the fault indicator is on, the status indicator will flash an error code.

State	Description
Continuous slow flash (red)	Module is in boot mode awaiting firmware update
Constantly on (red)	Module is in error state and will flash an error code with the status indicator

Power Indicator

The power indicator is lit whenever the correct module input voltage is applied across the N+ and N- terminals.

State	Description
Constantly on (green)	Correct module input voltage applied
Constantly off	Incorrect module input voltage applied

Analog Output Status Indicators

Whenever an analog output channel on the analog expander is enabled the analog output status will be displayed on the front panel indicator (1-4) corresponding to the physical input number (ANALOG OUT 1-4). This allows easy walk test verification of analog outputs without the need to view the output channels from the keypad or Protege software.

State	Description
Constantly On (green)	Analog input is between **0-10V** (inclusive)

Error Code Indication

When the module attempts to register or communicate with the system controller a registration error can be generated indicating that it was not successful.

Error Code Display

The following table is only valid if the **fault** indicator is constantly on and the **status** indicator is flashing red.

If the fault indicator is flashing the module requires a firmware update or is currently in firmware update mode.

The status indicator will flash red with the error code number. The error code number is shown with a 250ms on and off period (duty cycle) with a delay of 1.5 seconds between each display cycle.

| Flash	Error Description
1	**Unknown Error Code** The error code returned by the system controller could not be understood by the module.
2	**Firmware Version** The firmware version on the module is not compatible with the system controller. To clear this error, update the module using the module update feature in the controller's web interface.
3	**Address Too High** The module address is above the maximum number available on the system controller. To clear this error change the address to one within the range set on the system controller, restart the module by disconnecting the power.
4	**Address In Use** The address is already in use by another module. To clear this error set the address to one that is not currently occupied. Use the view network status command to list the attached devices, or the network update command to refresh the registered device list.
5	**Controller Secured Registration Not Allowed** The controller is not accepting any module registrations. To allow module registrations use the network secure command to change the setting to not secured.
6	**Serial Number Fault** The serial number in the device is not valid. Return the unit to the distributor for replacement.
7	**Locked Device** The module or system controller is a locked device and cannot communicate on the network. Return the unit to the distributor for replacement.

Mechanical Diagram

The mechanical diagram shown below outlines the essential details needed to help ensure the correct installation of the analog expander.
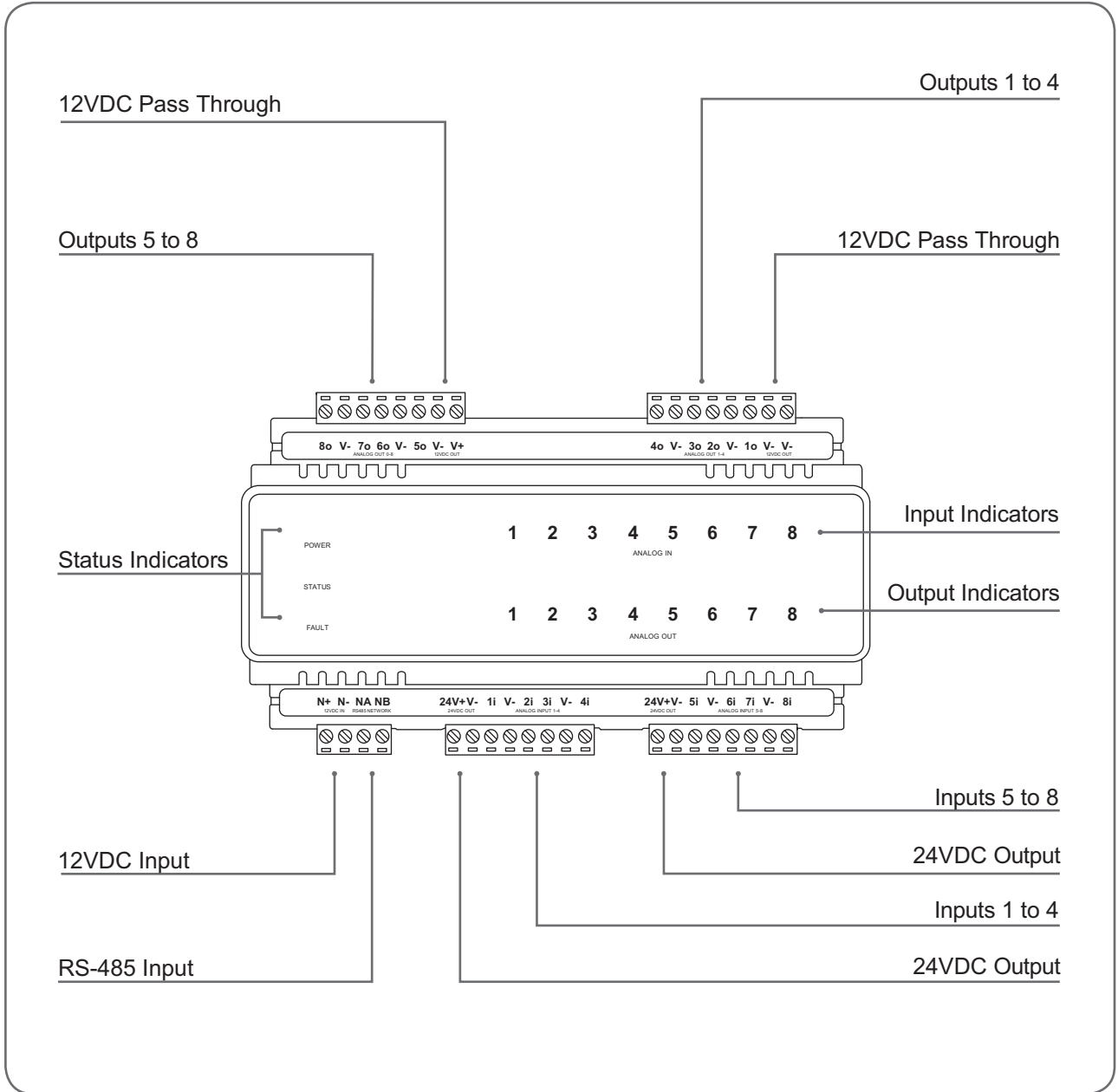
Mechanical Layout

The mechanical layout shown below outlines the essential details needed to help ensure correct installation and mounting. All measurements are shown in millimeters.
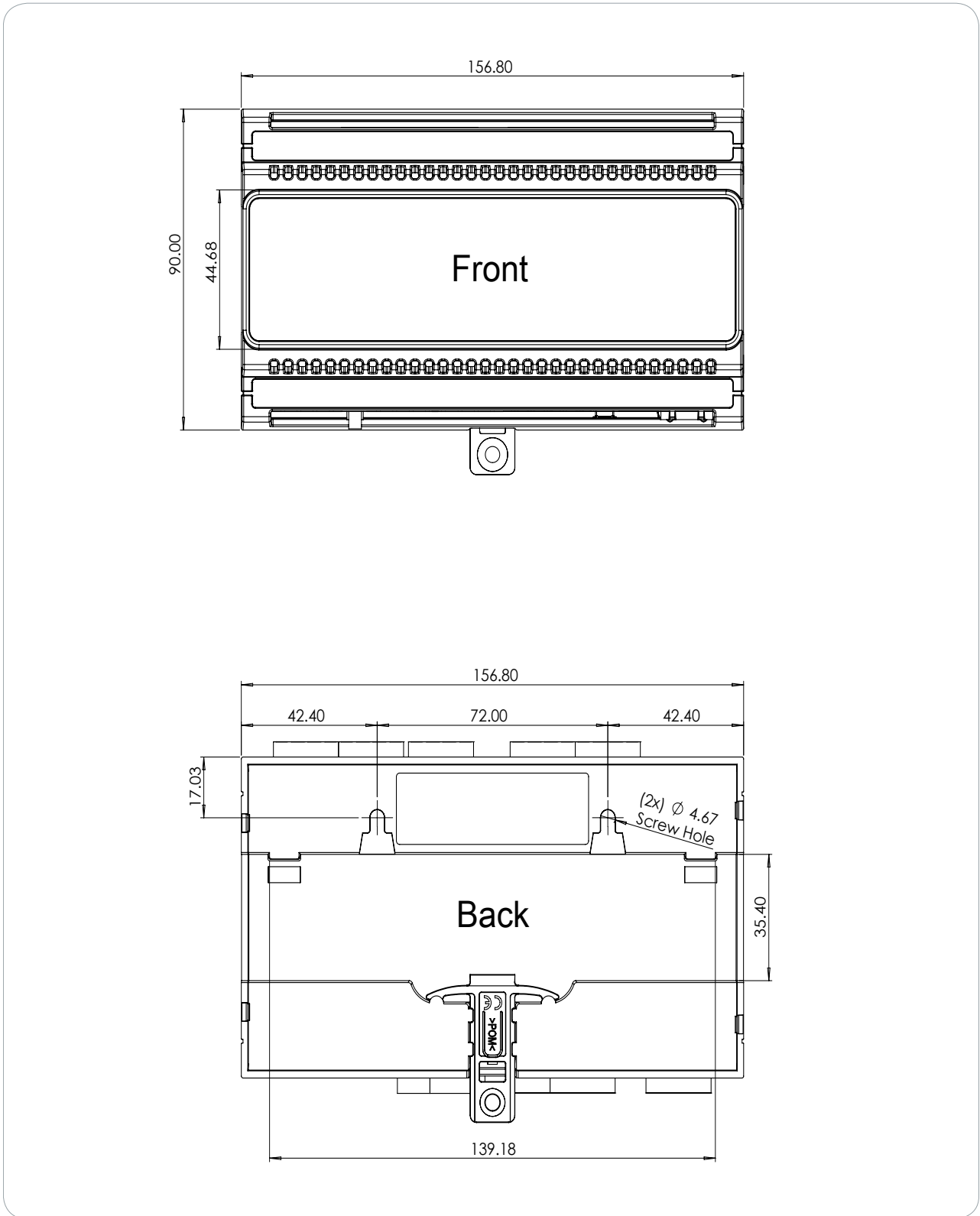
Technical Specifications

The following specifications are important and vital to the correct operation of this product. Failure to adhere to the specifications will result in any warranty or guarantee that was provided becoming null and void.

Ordering Information	
PRT-DAC4-DIN	Protege DIN Rail 4 Channel Analog Output Expander
Power Supply	
DC Input Voltage	12VDC (+/-10%)
DC Output Voltage (DC IN Pass-Through)	12VDC 0.7A (Typical) Electronic Shutdown at 1.1A
DC Output Voltage (Internally Generated)	24VDC Electronic Shutdown at 200mA
Operating Current	80mA (Typical)
Low Voltage Cutout	8.7VDC
Low Voltage Restore	10.5VDC
Communication	
Communications	RS-485 Isolated Module Network
Inputs	
Analog Outputs	4 (4-20mA and 0-10V Input) 12 Bit Resolution (0-4095 Decimal) 5mA Capable Buffered Output (Minimum device impedance must be greater than 2000 Ohms)
Trouble Inputs	8
Dimensions	
Dimensions (L x W x H)	156.8 x 90 x 60mm (6.17 x 3.54 x 2.36")
Weight	270g (9.52oz)
Operating Conditions	
Operating Temperature	5˚- 55˚ Celsius (41˚ - 131˚ Fahrenheit)
Storage Temperature	-10˚- 85˚ Celsius (14˚ - 185˚ Fahrenheit)
Humidity	0%-85% (Non-Condensing)
Mean Time Between Failures (MTBF)	587,177 hours (calculated using RFD 2000 (UTE C 80-810) Standard)

It is important that the unit is installed in a dry cool location that is not affected by humidity. Do not locate the unit in air conditioning or a boiler room that can exceed the temperature or humidity specifications.

Integrated Control Technology continually strives to increase the performance of its products. As a result these specifications may change without notice. We recommend consulting our website (www.ict.co) for the latest documentation and product information.

Disclaimer and Warranty

Disclaimer: Whilst every effort has been made to ensure accuracy in the representation of this product, neither Integrated Control Technology Ltd nor its employees shall be liable under any circumstances to any party in respect of decisions or actions they may make as a result of using this information. In accordance with the ICT policy of enhanced development, design and specifications are subject to change without notice.

For warranty information, see our Standard Product Warranty.