

Programmable Voltage Sensing Relay

INSTALLATION & OPERATION MANUAL

Thank you for choosing an interVOLT product ...

interVOLT is a trademarked brand of specialised electronic power conversion products produced by Amelec Australia Pty Ltd. Commencing in 2000 and establishing our first product in the market in 2001, interVOLT are renowned for our high quality voltage converters, power conditioners and battery equalizers.

We are now pleased to introduce a truly unique and innovative product, our new PSR Programmable Sensing Relay. The PSR is a first in many ways and more details of this can be found on the OVERVIEW pages in this manual.

In short the PSR is a solid state electronic relay, fully programmable by the user or installer and suitable for a myriad of applications. The solid state construction is achieved by using Hi-Rel Mosfet technology now becoming increasingly popular in automotive electronic engineering design.

This cutting edge technology allows interVOLT's PSR to replace similar electro-mechanical devices which have moving parts and therefore subject to wear and tear, resulting in short life and premature failure. As mentioned, the PSR provides the installer or user with the ability to program various settings and functions. This is a feature previously unseen in similar voltage sensing relays and sets interVOLT well and truly apart from the competition.

As with all interVOLT products the PSR is designed for demanding applications in marine, coach, bus, RV, mining, agricultural and alternative energy applications just to name a few. The applications include but are not limited to combining, isolation and emergency paralleling of batteries, low or high voltage disconnecting of heavy loads.

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PSR PROGRAMMABLE SENSING RELAY

The new interVOLT PSR is as unique as it is attractive. It incorporates a myriad of features and benefits not previously available in similar electro-mechanical devices, several of which are highlighted as follows:

- Completely solid state, no moving parts to wear or fail
- Available in 12 or 24 VDC at 150 Amps continuous rating
- Fully programmable interface for voltage and time delay
- User configurable for normally open or closed switching
- Load contacts are bi-directional and not polarity conscious
- Switched circuit cannot backfeed due to isolated design
- Complete DC-DC isolation between control and load circuits
- Clear LED display and indicators for ease of operation
- Alarm output for remote monitoring of voltage condition
- Electronics are enclosed in dust and water proof housing
- Compact design can be mounted in any position to suit
- Over temperature protected with thermal shutdown
- High quality assembly featuring marine grade hardware
- Conformally coated circuit boards for additional protection
- Separate connection for emergency override or control
- 24 months warranty (subject to specific terms and conditions)

This manual contains comprehensive information on the installation, set-up and use of the all new PSR Programmable Sensing Relay and is applicable to this model only. Whilst every care has been taken in the preparation of this manual, Amelec Australia Pty Ltd offers no guarantee, express or implied, and accepts no liability for any inaccuracies, errors or omissions in its content. Specifications are subject to change without notice.

The interVOLT PSR is primarily developed for the safe and reliable switching of heavy loads (up to 150 Amps continuous) in any 12 or 24VDC application (model dependent). When applied and installed correctly, the solid state design will ensure years of reliable service. The advantage of being able to program the voltage and time delay limits along with the state (normally open or closed) of the switching terminals allows the PSR to be used for a multitude of applications including but not limited to those listed below. This manual outlines the most common applications for the PSR including wiring diagrams in each instance. Listed below are a number of examples where the PSR can be utilised. Each example is accompanied by an explanation and circuit diagram on the appropriate page.

- Combining of battery banks for charging from a single source.
Page 16
- A low voltage disconnect for loads up to 150 Amps continuous.
Page 20
- Automatic paralleling of batteries for emergency supply.
Page 24
- Automatic load switching using the control terminals for sensing.
Page 28
- As a heavy duty relay for switching loads up to 150 Amps.
Page 32

Please see the Installation section for the correct location and mounting procedure prior to commencing any wiring.

This manual provides detailed information on the application, installation and operation of the new interVOLT PSR Series Voltage Sensing Relays. We have summarised the key reference pages below.

- Selection:** The PSR's are voltage specific and are available in two versions for 12VDC or 24VDC applications. See page 34 for specifications.
- Overview:** Review the layout of the PSR before attempting any wiring connections. The operator interface is activated after the control (sense) wires are connected and the PSR is powered up. The load terminals need not be connected for the operator interface to function. Refer to pages 5-9 for details.
- Operation:** Familiarise yourself with the various functions of the PSR on pages 5-7 as follows:
 - Relay STATE – normally open or normally closed depending on application;
 - Voltage limit settings – for controlling UPPER, LOWER and ALARM setpoints;
 - Time delay settings – for controlling UPPER, LOWER and ALARM setpoints;
 - RESET mode – for reloading all factory default settings.
 - Manual override control – activate or deactivate the circuit in an emergency by manually bypassing the programmed settings.
- Installation:** Prior to mounting the PSR, assess the environmental conditions and determine the best location. Refer to page 10 for further information.
- Wiring:** Check the load rating of the application and consider voltage drop. Ensure correct fuses and wire conductor sizes are utilised. Refer to pages 10-12 for detailed instructions.
- Programming:** If you wish to change the factory default settings, you will need to follow the set-up procedures detailed on pages 13-15.

DELAY. The contacts of the PSR are switched at user pre-set (or factory default) voltage limits. In addition timing can be introduced to delay the switching once the pre-set voltage limits have been reached. The delay is displayed in seconds and can be adjusted in 1 second increments up to 250 seconds. The TIME DELAY functions can be defined as follows:

- UPPER TIME DELAY** – this is the delay in seconds between the actual upper voltage limit being reached and activated. This is useful to prevent cyclic switching when the voltage reaches the switching cusp. For example, when used as a battery combiner a time delay can be used to prevent constant switching of the contacts when the voltage is hovering at the limit.
- LOWER TIME DELAY** – this is the delay in seconds between the actual lower voltage limit being reached and activated. This is useful to prevent cyclic switching when the voltage reaches the switching threshold. For example, when used as a battery combiner a time delay can be used to prevent constant switching of the contacts when the voltage is hovering at the limit.
- ALARM TIME DELAY** – this is the delay in seconds between the actual alarm voltage limit being reached and activated. This is useful to prevent nuisance switching when the voltage reaches the switching threshold. For example, when used as a battery combiner a time delay can be used to prevent nuisance switching of the alarm when the engine is cranking and the voltage dips momentarily below the alarm setpoint.

STATE. This function enables the installer to change the relay contact state (load switching terminals) from normally open (N/O) to normally closed (N/C). The default state is normally open and is the most common state.

Primary Functions

The interVOLT PSR is a user programmable voltage sense relay. The relay is programmable in terms of voltage sensing, time delay and contact state which are defined below.

VOLTAGE. The PSR can be programmed to activate the load switching terminals at a desired voltage. An alarm voltage can also be set to output a separate signal to trigger a remote audio/visual warning device. The voltage is sensed by the control terminals (marked + and – on the terminal strip). The control terminals are accurately measuring the input voltage independent of the switching terminals for more precise sensing. The voltage is displayed to one decimal place with an accuracy of $\pm 1\%$. The VOLTAGE LIMIT functions can be defined as follows:

- UPPER VOLTAGE LIMIT** – this is the higher of any two voltages that the PSR can be set to activate the load switching terminals when the voltage is reached. For example, when used as a battery combiner this would be the 'combine' voltage which closes the contacts.
- LOWER VOLTAGE LIMIT** – this is the lower of any two voltages that the PSR can be set to activate the load switching terminals when the voltage is reached. For example, when used as a battery combiner this would be the 'release' voltage which opens the contacts.
- ALARM VOLTAGE LIMIT** – this is a setting for any desired voltage which will trigger the alarm signal and activate any audio/visual warning device (of maximum 200mA). For example when used as a battery combiner this would be the minimum voltage considered suitable to enable starting an engine from the sense battery.

Normally closed state can be used under certain conditions, such as failsafe switching when used as a load switching relay for example. The state is displayed as either **n-c** or **n-o** depending on the selection.

RESET. The PSR is factory programmed with defaults for the aforementioned settings (refer to page 14-15 for details). Should it be necessary to reinstate the factory default setpoints it is a simple process to do so. Please refer to page 14 for details on using the RESET function.

Other Functions

Manual Override Control. In addition to the aforementioned the PSR has an override function which, when wired to a separate control switch, allows the operator to remotely override the relay in an emergency. For example, if the PSR is being used to combine batteries, the remote function can be used in an emergency to override all the programmed settings and bring the secondary battery online in the event the primary battery is drained and/or fails.

Automatic Status Display. The PSR will automatically display the status when the setpoints are activated. In the factory default state of normally open (**n-o**) the PSR will display the symbol **On** when the Upper Voltage Limit is reached and the symbol **OFF** when the Lower Voltage Limit is reached. In normally closed state (**n-c**) these will be reversed.

Manual Status Display. At any time the status can be manually checked by momentarily pushing either up or down control button. This will display either the **On** or **OFF** symbol depending on the condition.

Layout

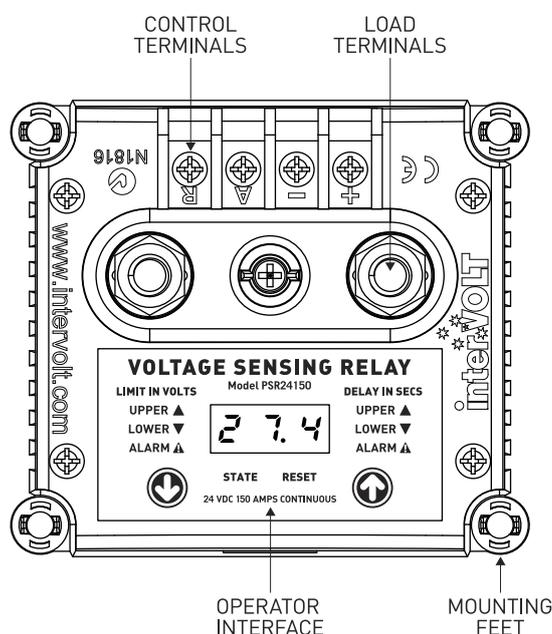
Load Terminals. These are the two large terminals (studs) which are switching the heavy load connected to the PSR. They are unidirectional (not line or load conscious) but must be the same polarity. These contacts can be normally open or normally closed by choice. They are fitted with M8 nuts and spring washers and must be correctly terminated. An example of the correct method of termination is depicted on page 12.

Control Terminals. These are the four small terminals located behind the contact terminals. They are fitted with M3 x 6mm cross recessed screws. The terminals are marked as follows:

- +** Positive input for voltage sensing
- Negative input for voltage sensing
- A** Positive output for alarm trigger
- R** Positive input for remote override

Please observe polarity when connecting the control terminals. Failure to observe correct polarity will result in damage to the control circuit of the PSR and will void warranty. These terminals must be correctly terminated. An example of the correct method of termination is depicted on page 12.

Operator Interface. The operator interface consists of the switches and displays used to control and monitor the PSR functions. The control consists of two buttons marked with up and down arrows. They are used for scroll, adjust and save operations. The 3 digit LED display is used in conjunction with the control buttons to adjust the voltage, delay, state and reset functions of the PSR. These functions are also displayed as text icons and are illuminated when scrolling through the program settings. See over for illustration.



NOTICE!

The PSR must be properly installed in order to comply with environmental operating considerations and the manufacturer's warranty terms and conditions.

The PSR is constructed from marine grade materials and the electronics are enclosed in a sealed housing (IP67) however it should, wherever possible, be installed in a protected environment. Due to the external termination the PSR is NOT designed to be installed in a location where water can 'short' between the terminals.

LOCATION

Select a suitable location where the PSR can be mounted. Ensure there is adequate ventilation to the heatsink ribs and that the location is free from excessive vibration and heat. Although sealed for protection from the ingress of dust and moisture the PSR should not be mounted in a wet environment.

ORIENTATION

The PSR can be mounted in any position vertically or horizontally due to the solid state design. The PSR should be installed on a hard flat surface – do not install on an upholstered or insulated surface. Ensure at least 50mm of clearance all around from other equipment.

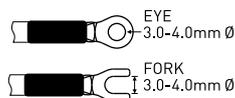
MOUNTING

The PSR should be installed with appropriate fasteners ensuring all anchor holes are utilised. The mounting hole diameter is 5mm and it is recommended that a fastener with a diameter (major thread) of no less than 3.5mm be used. Do not over tighten.

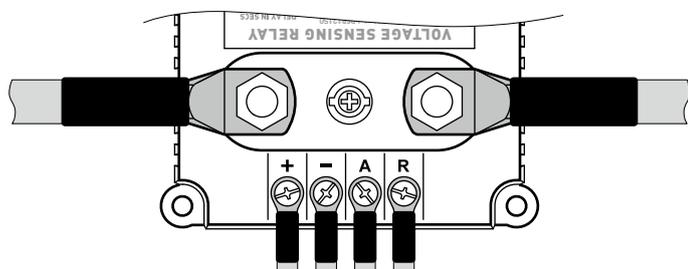
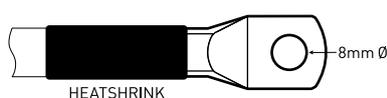
The load switching terminals (M8 stud) and pin drive nut are tin plated copper for excellent conductivity. The pin-drive nut should **NEVER** be removed. It is recommended that proper tinned drawn-copper cable lugs are used for termination.

All cable lugs must be properly terminated using appropriate tooling in order to prevent poor contact which can result in overheating of the stud. An example of the correct method of termination is depicted below.

CRIMP TERMINALS FOR CONTROL TERMINATION



COPPER LUG FOR LOAD TERMINATION



can again be pressed to save the setting (if you do not push the two control buttons to save the setting, it will be saved automatically after 10 seconds at which point the display will disappear). The [UPPER ▲] will stop flashing and remain steady. The new setting has now been saved.

To move through to the next icon press either the up or down control button and scroll to the next icon [LOWER ▼] which will illuminate and concurrently show the factory default setting (voltage or time) in the LED display. Again, if you wish to change the factory default press the two control buttons on the operator interface simultaneously and the selected icon [LOWER ▼] will begin to flash. Use either the up or down control button to adjust the figure to the desired setpoint. Again, press the two buttons simultaneously to save the setting or just leave and it will save automatically after 10 seconds. Repeat the aforementioned step for each voltage or time setting you wish to program.

To change the contact state of the relay use the up or down control buttons to scroll through the various settings until [STATE] is illuminated. The LED display will show the factory default setting of n-o for normally open. Press the two control buttons on the operator interface simultaneously and [STATE] will begin to flash. Once flashing use either the up or down control button to change the display to n-c for normally closed. Again, press the two buttons simultaneously to save the setting or just leave and it will save automatically after 10 seconds.

If you wish to reset the factory defaults at any time scroll through the various settings until [RESET] is illuminated. The LED display will show a default of 4-n. Press the two control buttons on the operator interface simultaneously and the RESET icon [RESET] will begin to flash.

WIRING

In order to ensure safety, good performance and long life the PSR should be wired according to the method detailed overleaf. Please refer pages 16-33 for schematics of the various wiring circuits available.

IMPORTANT! Ensure adequately rated cables are used for the maximum load connected to the PSR. If uncertain, consult your cable supplier quoting the continuous rating of the load and the length of cable on both input and output switching terminals. There is a voltage drop and cable size calculator on the interVOLT website at www.intervolt.com. Undersizing the cable will result in poor performance, over heating, a reduction in longevity and may jeopardise your warranty in the event of a failure.

Disconnect the battery supply at the source before attempting any connection to the control or switching terminals of the PSR.

Install an appropriately rated circuit breaker or fuse as the load protection for the supply cable to the PSR. The circuit breaker or fuse should be rated according to the load and should be no greater than the cross sectional rating of the cable being used. The maximum fuse rating should not exceed 150 Amps.

Connect all wiring to the PSR control (M3 screw) terminals ensuring correct polarity. Failure to observe correct polarity will result in damage to the control circuit of the PSR. In the event the PSR is incorrectly reverse polarity connected, the unit must be returned to vendor for servicing.

Set Up

Once the control (sense) wires are connected the PSR is ready to be programmed if necessary. Keep in mind the factory default settings may suit your application and there may be no requirement to adjust them. The factory default settings are as follows:

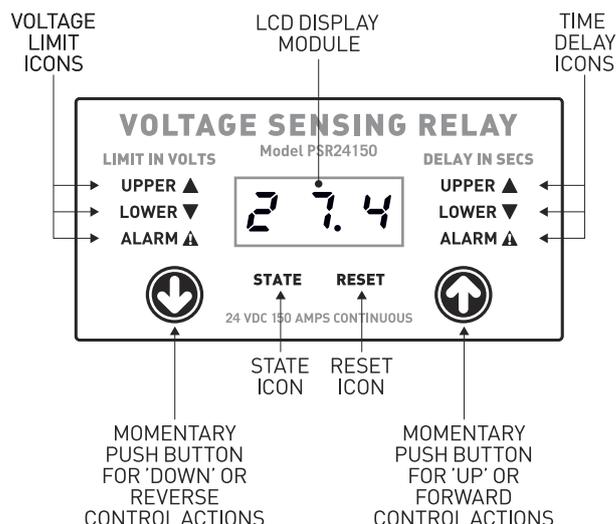
| | PSR12150 for 12VDC | PSR24150 for 24VDC |
|---------------------|---------------------|--------------------|
| Upper Voltage Limit | 13.7 Volts | 27.4 Volts |
| Upper Time Delay | 5 Seconds | |
| Lower Voltage Limit | 12.8 Volts | 25.6 Volts |
| Lower Time Delay | 5 Seconds | |
| Alarm Voltage Limit | 12.0 Volts | 24.0 Volts |
| Alarm Time Delay | 10 Seconds | |
| State of Contacts | Normally Open (n-o) | |

If you wish to adjust the settings please use the following procedure:

Press the two control buttons on the operator interface simultaneously. The LED display will indicate a series of scrolling bar segments for a few seconds as it initialises (performing internal system check). Once initialised the display will show the factory default Upper Voltage Limit of 13.7 for a 12VDC system or 27.4 for a 24VDC system and the UPPER icon [UPPER ▲] will be illuminated.

If you wish to change the default setting, press the two control buttons again simultaneously and release after the [UPPER ▲] starts to flash. Once flashing use either the up or down control button to adjust the setting in 0.1V increments to reach the desired setpoint. Once selected both buttons

Once flashing use either the up or down control button to change the display to YES (to reset) or no (not to reset). Again, press the two buttons simultaneously to save the setting or just leave and it will save automatically after 10 seconds. If YES is selected all factory default settings will be instituted.



BATTERY COMBINER FOR CHARGING

FIGURE I

One of the primary applications for the PSR is its suitability for combining dual batteries for charging from a single source whilst still maintaining isolation between the batteries. A typical application for this is where there is a requirement to charge two batteries (or banks of batteries) and there is only one charging source available. As it is not good practice to parallel charge two batteries the option of installing an automatic device such as the PSR to both control and isolate the batteries is a desirable alternative to other charging methods. Case example as follows:

Scenario: A vessel is equipped with two banks of 12V batteries, a main starting bank and a house bank. The only charging source is a single alternator on the main engine which is generally under utilised due to minimal cycling of the starting bank. The owner would also like to charge the house bank from the alternator without fear of discharging the starting bank in the event the house battery is inadvertently discharged.

Resolution: The PSR can be programmed to direct the charging source to the house battery via the starting battery while still maintaining complete isolation when not activated. This will ensure the correct maintenance of the auxiliary battery and at the same time prevents the auxiliary battery from discharging or 'draining' the starting battery.

IMPORTANT! The PSR must be set to **normally open (n-o)** when used in this application (n-c is factory default).

When used as a battery combiner the PSR can be user programmed with the following settings:

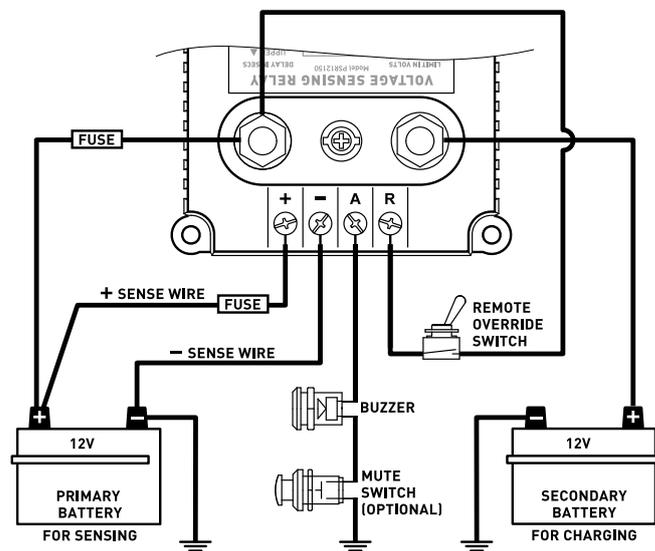
- **Upper Voltage Limit** – this is the setpoint you will program as the 'combine' voltage i.e. when the starting battery reaches this setting the relay will close and automatically connect the house battery for charging. The default setting is 13.7 Volts for a 12V system but this voltage can be programmed to the desired setting.
- **Upper Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the 'combine' function. This setpoint provides a delay between the time the upper voltage limit is reached and when it is activated. This is useful to prevent cyclic switching when the voltage is at the switching threshold.
- **Lower Voltage Limit** – this is the setpoint you will program as the 'release' voltage i.e. when starting battery reaches this setting the relay will open and automatically disconnect the house battery from charging. The default setting is 12.8 Volts for a 12V system but this voltage can be programmed to the desired setting.
- **Lower Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the 'release' function. This setpoint provides a delay between the time the lower voltage limit is reached and when it is activated. This is useful to prevent cyclic switching when the voltage is at the switching threshold.

- **Alarm Voltage Limit** – this is the setpoint you will program as the low voltage warning limit for your main or starting battery. In the event this battery is discharged for whatever reason a signal can be output to a remote alarm (audible, visual or both) to alert the operator. The default setting is 12.0 Volts for a 12V system but this voltage can be programmed to the desired setting.
- **Alarm Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the alarm function. This setpoint provides a delay between the time the alarm voltage limit is reached and when it is activated. This is useful to prevent nuisance alarm warnings when the voltage dips below the desired level, when cranking the engine for example.

Note:

In addition to the aforementioned functions, the PSR has several other features which can be utilised to aid and assist the user and/or installer. These features include Manual Override Control, Automatic Status Display, and Manual Status Display. Please refer to page 7 for details.

FIGURE I



LOW VOLTAGE DISCONNECT

FIGURE II

Another specialised application for the PSR is its use as a low voltage disconnect to prevent inadvertent discharge of battery banks. The PSR can be connected in series with the load and programmed with any desired voltage (with time delay) in order to open the load contacts when the battery is discharged. Additionally, it can be programmed with a higher voltage limit to re-connect the load automatically but only when the battery is charged to suitable voltage. Case example as follows:

Scenario: A vessel is fitted with a bow thruster which is serviced by a house bank of 24V batteries. To prevent complete discharge of the batteries when the thruster is being used, the owner wishes to automatically disconnect the bow thruster at a desired voltage in order to preserve the batteries for other uses.

Resolution: The PSR can be programmed to disconnect the bow thruster automatically when the voltage drops to a preset level. Additionally, a time delay can be set to prevent the bow thruster from shutting down on start up when the voltage dips temporarily due to the inrush current.

IMPORTANT! The PSR must be set to **normally open (n-o)** when used in this application (n-c is factory default).

When used as a low voltage disconnect the PSR can be user programmed with the following settings:

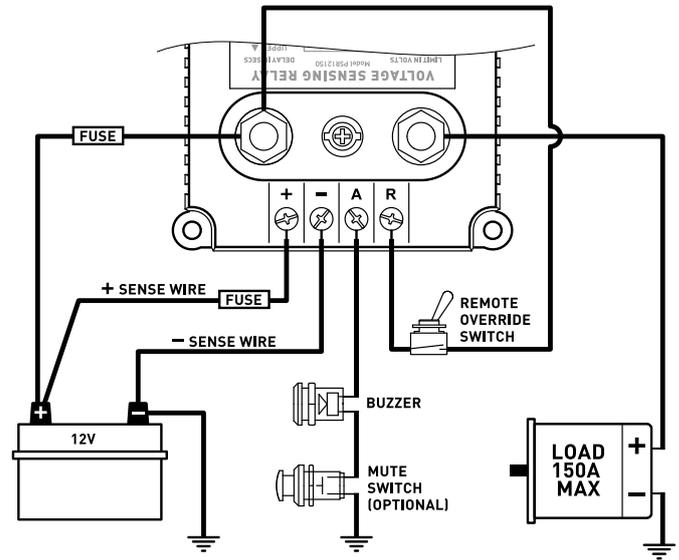
- **Upper Voltage Limit** – this is the setpoint you will program as the 're-connect' voltage for the load i.e. when the battery reaches this setting the relay will close and automatically connect the load on the output. This setpoint could be set 1.0V higher than the disconnect voltage as a 'hysteresis' thus ensuring the battery has reached a suitably charged level before re-connecting. Assuming a 24VDC system, this voltage could be set anywhere from 27.0 Volts to 28.0 Volts as an example.
- **Upper Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the 're-connect' function. This setpoint provides a delay between the time the upper voltage limit is reached and when it is activated. This is useful to allow for the desired voltage to be stabilised for any given time period before reconnecting the load. In a typical application this setting would be set to around 10 seconds.
- **Lower Voltage Limit** – This is the setpoint you will program as the 'disconnect' voltage i.e. when the battery reaches this setting the relay will open and automatically disconnect the load on the output. This setpoint is dependent upon the particular application, type of battery and charging regime. The installer would need to determine the appropriate setting after researching this information. Assuming a 24VDC system, this voltage could typically be set anywhere from 24.0 Volts to 26.0 Volts as an example.

- **Lower Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the 'disconnect' function. This setpoint provides a delay between the time the lower voltage limit is reached and when it is activated. This is useful to prevent cyclic switching and allows for voltage transients and dips to be taken into consideration.
- **Alarm Voltage Limit** – this is the setpoint you will program as the low voltage warning limit for the battery. In the event this battery is discharged for whatever reason a signal can be output to a remote alarm (audible, visual or both) to alert the operator. Assuming a 24VDC system this could be set to 24.0 Volts as a typical example.
- **Alarm Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the alarm function. This setpoint provides a delay between the time the alarm voltage limit is reached and when it is activated. This is useful to prevent nuisance alarm warnings when the voltage dips below the desired level, when cranking the engine for example.

Note:

In addition to the aforementioned functions, the PSR has several other features which can be utilised to aid and assist the user and/or installer. These features include Manual Override Control, Automatic Status Display, and Manual Status Display. Please refer to page 7 for details.

FIGURE II



AUTOMATIC PARALLELING OF BATTERIES

FIGURE III

The PSR can also be used as a paralleling switch for multiple battery banks. The advantage with this particular application is that the PSR can be utilised as an automatic load connect switch. The PSR is programmed with the desired voltage and delay limits to connect a second battery to the primary battery when required. For example a starting battery can be connected via the PSR to any secondary battery (of the same voltage) to automatically provide assistance to the starting battery in an emergency or as a back-up. Case example as follows:

Scenario: A vessel is fitted with a 12V starting battery bank. In addition there is an onboard generating set which is also fitted with a 12V starting battery. The genset battery is independent and is separately charged from another source. The owner of the vessel would like to use the genset battery as a back-up to the main battery in an emergency situation.

Resolution: It is possible, using the PSR, to utilise the genset battery as an emergency back-up to assist the main starting battery by paralleling both batteries automatically. In automatic mode the PSR is programmed with voltage and delay setpoints to allow the second battery to connect when required and disconnect when the primary battery voltage returns to normal. The PSR can also be used as a manual parallel switch when used as a conventional relay (refer page 32).

IMPORTANT! The PSR must be set to **normally closed (n-c)** when used in this application (**n-a** is factory default).

When used for automatic paralleling of batteries the PSR can be user programmed with the following settings:

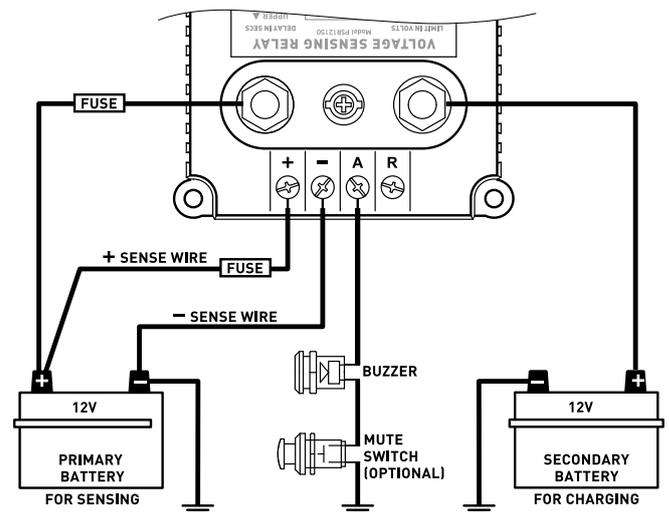
- **Upper Voltage Limit** – this is the setpoint you will program as the 'disconnect' voltage to isolate the second battery after the primary battery again reaches a suitably charged level. Assuming a 12VDC system, this voltage could be set anywhere from 13.5 Volts to 15.0 Volts as an example.
- **Upper Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the 'disconnect' function. This setpoint provides a delay between the time the upper voltage limit is reached and when it is activated. This is useful to allow for the desired voltage of the primary battery to be stabilised before disconnecting the secondary battery. In a typical application this setting would be set to around 10 seconds.
- **Lower Voltage Limit** – this is the setpoint you will program as the 'connect' or paralleling voltage for the load i.e. when the battery reaches the desired voltage the relay will activate and close the load contacts thus connecting the two batteries. Assuming a 12VDC system, this voltage could be set anywhere from 12.0 Volts to 13.5 Volts as an example.
- **Lower Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the 'parallel' function. This setpoint provides a delay between the time the lower voltage limit is reached and when it is activated. As an example this setting could be adjusted to 5 seconds which would allow for momentary voltage dips and transients before activating the connect function.

- **Alarm Voltage Limit** – this is the setpoint you will program as the low voltage warning limit for the battery. In the event this battery is discharged for whatever reason a signal can be output to a remote alarm (audible, visual or both) to alert the operator. Assuming a 12VDC system this could be set to 12.0 Volts as a typical example.
- **Alarm Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the alarm function. This setpoint provides a delay between the time the alarm voltage limit is reached and when it is activated. This is useful to prevent nuisance alarm warnings when the voltage dips below the desired level, when cranking the engine for example.

Note:

In addition to the aforementioned functions, the PSR has several other features which can be utilised to aid and assist the user and/or installer. These features include Manual Override Control, Automatic Status Display, and Manual Status Display. Please refer to page 7 for details.

FIGURE III



AUTOMATIC LOAD SWITCHING

FIGURE IV

The PSR is ideally suited to automatic load switching (up to 150 Amps) by using the control terminals for sensing a desired voltage range. This function is particularly useful in remote, often unmanned installations, where there is a requirement to automatically switch heavy loads on and off as required at the same time protecting equipment from collateral damage such as undervoltage or overvoltage situations. Case example as follows:

Scenario: In a remote solar powered application a submersible 24V DC water pump is used to draw water from a bore which is then pumped some distance into a large storage tank. The pump is driven from a bank of batteries and is controlled by an automatic float switch in the storage tank. In this instance the pump is not protected from under voltage should the battery bank drain.

Resolution: The PSR can be utilised to switch the pump via the float switch but only when the voltage is at the desired level. The automatic float switch is wired in series with the control terminals (positive or negative). The PSR is then programmed with the desired upper and lower voltage limits to disconnect the pump when the voltage drops below an acceptable limit and not reconnect it until the batteries are again charged to a suitable level.

IMPORTANT! The PSR must be set to **normally open (n-o)** when used in this application (**n-c** is factory default).

When used for automatic load switching the PSR can be user programmed with the following settings:

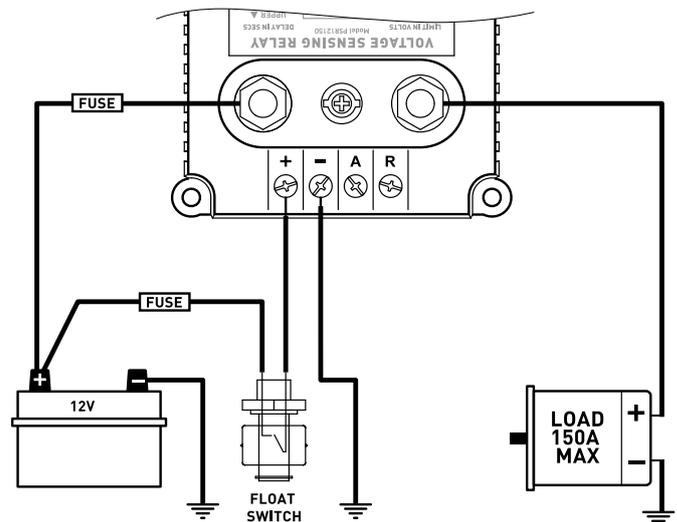
- **Upper Voltage Limit** – this is the setpoint you will program as the 're-connect' voltage to engage the pump when the desired level is reached. This setpoint could be set 1.0V higher than the disconnect voltage as a 'hysteresis' thus ensuring the battery has reached a suitably charged level before re-connecting. Assuming a 24VDC system, this voltage could be set anywhere from 25.0 Volts to 27.0 Volts as an example.
- **Upper Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the 're-connect' function. This setpoint provides a delay between the time the upper voltage limit is reached and when it is activated. This is useful to allow for the desired voltage to be stabilised for any given time period before reconnecting the load. In a typical application this setting would be set to around 10 seconds.
- **Lower Voltage Limit** – This is the setpoint you will program as the 'disconnect' voltage i.e. when the battery reaches this setting the relay will open and automatically disconnect the pump. This setpoint is dependent upon the particular application, type of battery and charging regime. The installer would need to determine the appropriate setting after researching this information. Again, assuming a 24VDC system, this voltage could typically be set anywhere from 23.0 Volts to 24.0 Volts as an example.

- **Lower Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the 'disconnect' function. This setpoint provides a delay between the time the lower voltage limit is reached and when it is activated. This is useful to prevent cyclic switching and allows for voltage transients and dips to be taken into consideration.
- **Alarm Voltage Limit** – this is the setpoint you will program as the low voltage warning limit for the battery. In the event this battery is discharged for whatever reason a signal can be output to a remote alarm (audible, visual or both) to alert the operator. Assuming a 24VDC system this could be set to 23.0 Volts as a typical example.
- **Alarm Time Delay** – this is the setpoint you will program as the time (in seconds) you wish to delay the alarm function. This setpoint provides a delay between the time the alarm voltage limit is reached and when it is activated. This is useful to prevent nuisance alarm warnings when the voltage dips below the desired level, when cranking the engine for example.

Note:

In addition to the aforementioned functions, the PSR has several other features which can be utilised to aid and assist the user and/or installer. These features include Manual Override Control, Automatic Status Display, and Manual Status Display. Please refer to page 7 for details.

FIGURE IV

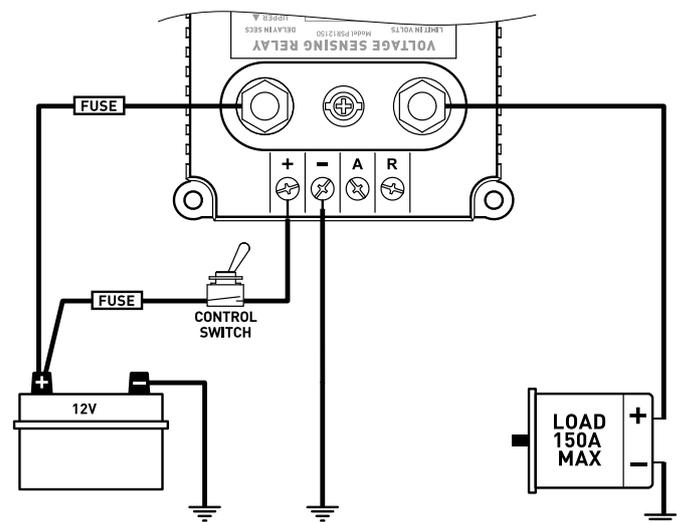


CONVENTIONAL HEAVY DUTY RELAY

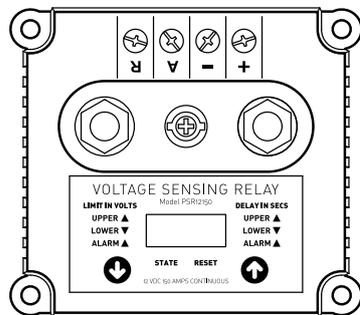
FIGURE V

The PSR can be used as a conventional, heavy duty relay for switching DC loads up to 150 Amps continuous. It has the added advantage of being programmable for either normally open (n-o) or normally closed (n-c) state. The control terminals are simply wired in series with the control device (switch or relay) and activated as required. In this instance the voltage limits and time delays can be programmed out of range of any activation setpoint i.e. so the limits do not have any influence over the control of the relay.

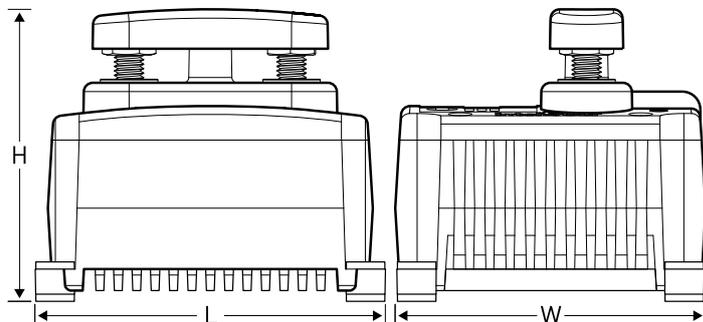
FIGURE V



| PSR Voltage Sensing Relay | PSR12150 | PSR24150 |
|--|--|----------------------|
| Application Voltage | 12VDC System | 24VDC System |
| Operating Voltage Sensing | 9VDC - 18VDC | 16VDC - 38VDC |
| Operating Voltage Switching | 33VDC Maximum | |
| Continuous Contact Rating | 150 A (rated @ 50°C) | 150 A (rated @ 40°C) |
| Momentary Contact Rating | 500 Amps DC for a period of 10 seconds @ 10% duty cycle (rated @ 40°C) | |
| Contact State | User selectable, normally open or closed | |
| Environmental protection | IP67 (internal components only) | |
| Electrical Protection | Thermal overload shutdown, automatic overload protection of sensing circuit. Low voltage disconnect. | |
| Standby Current Draw | Un-switched 10mA @ 13.5VDC and 23mA @ 27.0VDC | |
| Standby Current Draw | Switched 35mA @ 13.5VDC and 55mA @ 27.0VDC | |
| Operating Temperature | -25°C to +70°C (note continuous rating above) | |
| Alarm Output Signal | Equal to input voltage to 200mA maximum. | |
| Operating Humidity | Ideally should not exceed 95%. | |
| Enclosure Housing | E-coated A360 (ADC 3) die cast aluminium | |
| Enclosure Cover and Terminal Protector | Injection moulded electrical grade ABS/PC | |
| Load Terminals | Tin plated copper stud, stainless hardware. M8 | |
| Control Terminals | Tin plated brass contact, stainless hardware. M3 | |
| Dimensions | Footprint – 86mmW x 97mmL overall Profile – 81.5mmH overall (including terminal cover). | |
| Weight | 505 grams | |



| Reference | Dimension |
|-----------|-----------|
| L | 97mm |
| W | 86mm |
| H | 81.5mm |



interVOLT products are warranted for a period of 24 months against faulty materials and/or workmanship from date of purchase by the end user subject to proof of purchase. In the event proof of purchase is not provided, and at the discretion of the manufacturer, the warranty shall be 24 months from manufacturer's date of sale to the merchant from whom the product was purchased. interVOLT's 24 month warranty is subject to the following terms and conditions.

The goods must be installed and operated in accordance with the manufacturer's recommendations and instructions set out within this booklet.

In the event of a claim the goods are to be returned to the original point of purchase with a copy of the merchant invoice or the relevant merchant invoice number.

In the event of a claim any associated expenses including diagnosis, removal, and/or installation of the goods is the responsibility of the client including any freight costs.

The warranty shall be void where the goods have been used for a purpose for which they are not intended, or altered in any way that is detrimental, or opened or tampered with by an unauthorised party, or damaged by mechanical abuse, or contaminated by water or other substances, or damaged by incorrect application.

Save and except for the express warranty set out above and to the maximum extent permitted by law, all conditions and warranties which may at any time be implied by the common law, Trade Practices Act, Fair Trading Act or any other State or Federal Act are excluded. To the extent that these cannot be excluded and where the law permits, the manufacturer in respect of any such condition or warranty shall be limited at their option to the repair or the replacement of the goods or the supply of equivalent goods or refunding the cost of the goods.

Did you know?

- interVOLT power conversion products are proudly designed and developed in Australia for both domestic and international markets. All R&D is carried out at our premises in Perth, Western Australia and all IP is owned by our parent company Amelec Australia Pty Ltd.
- interVOLT products are designed to cope with the demands of the harshest applications and will operate in high temperature, high humidity environments. They are constructed of quality marine grade materials and when applied and installed correctly are designed to provide many years of continuous service.
- interVOLT's current range includes voltage converters, power conditioners, lighting dimmers and battery equalizers with a strong emphasis on quality, performance and value. We are committed to continual product development in the DC power conversion field.
- Intervolt products comply with both Australian and European Standards for Electro-Magnetic compatibility. They are supported by a 100% factory backed 24 month warranty against faulty components and/or workmanship (see warranty policy for comprehensive information).
- interVOLT is a registered trademark of Amelec Australia Pty Ltd an import, export, distribution and manufacturing company with a reputation for quality goods, superior service and competitive pricing.



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