

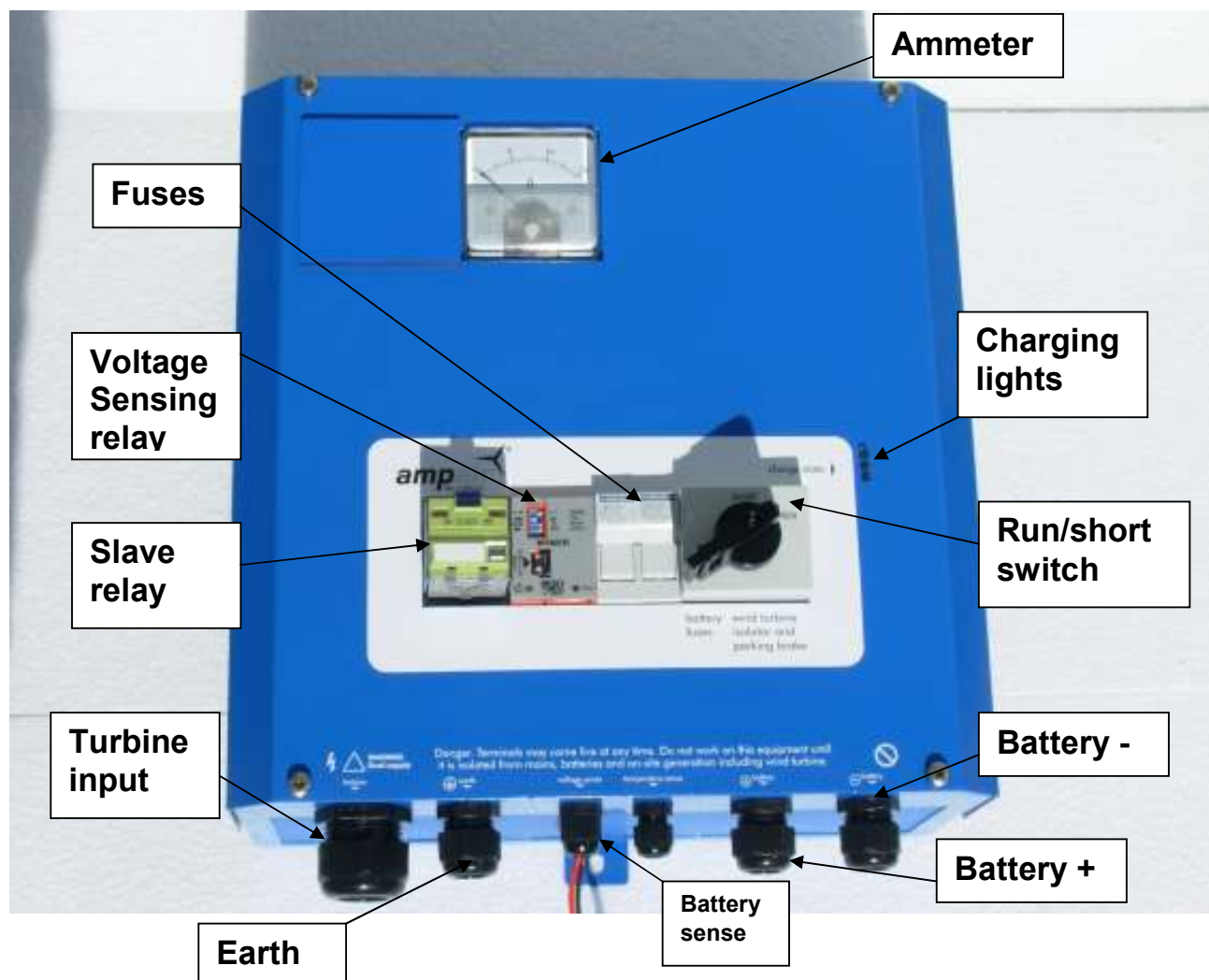
## Ampair Regulator Instructions: Model TS-600-48

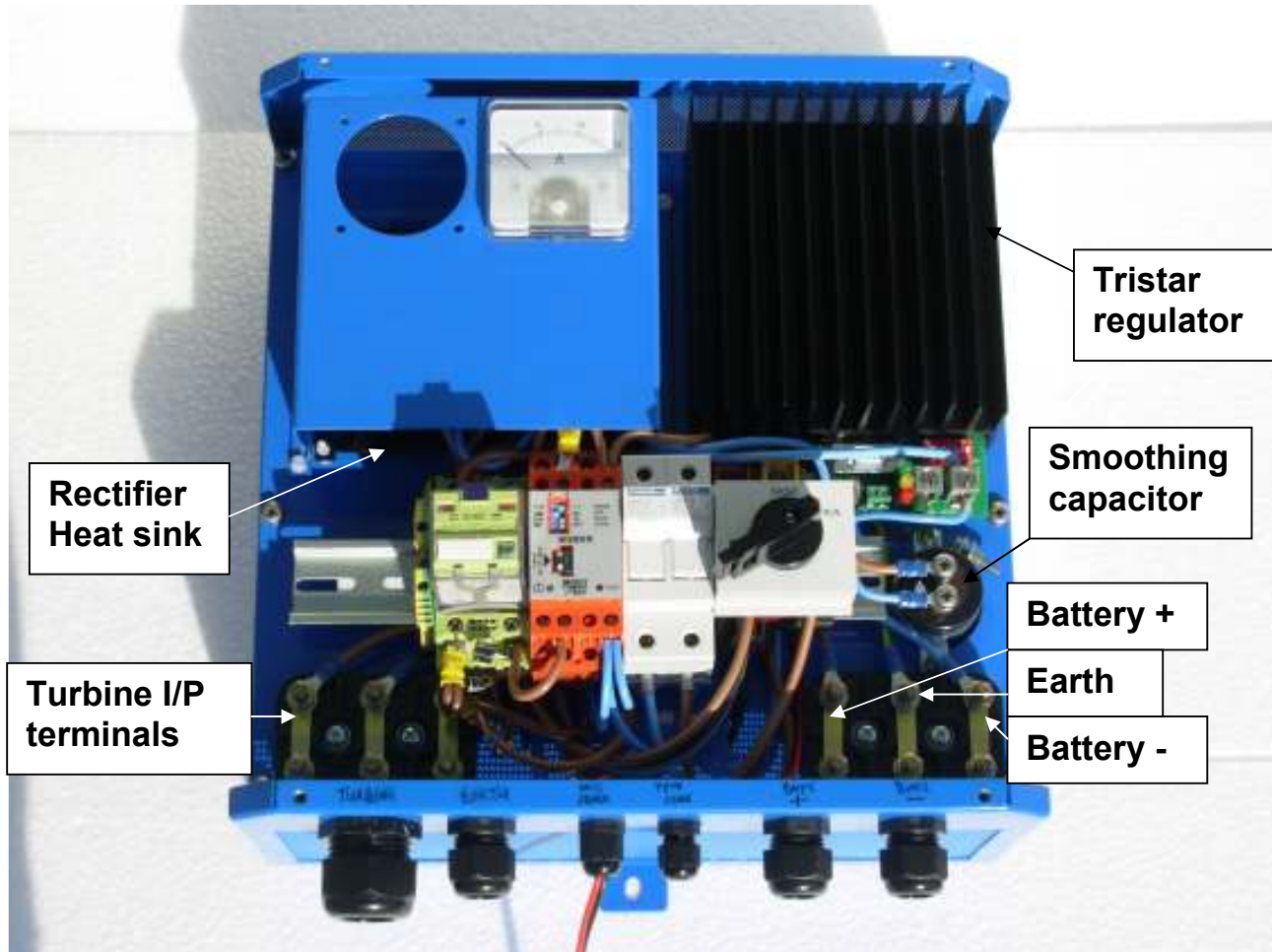
### Introduction

This regulator package is a single input channel and single output channel combination rectifier and regulator for use with the Ampair 600 wind turbine. It uses advanced three-stage pulse width modulated (PWM) charging with optional temperature compensation. The regulator package incorporates heat sinks, dump loads, run/short switch, ammeter, battery fuses and overvoltage protection relays. It is pre-wired in a steel cabinet suitable for wall mounting.

### Installation

Install the regulator in the cable run between the wind turbine and the battery. Ideally locate the regulator close to the batteries so that it is sensing the battery voltage and (if required) temperature. However the regulator should not be mounted inside an unventilated battery compartment. It should be mounted vertically so that the heat sinks operate correctly.





## Description

The package comprises:

1. Run / short switch
2. Three phase rectifier on a heat sink
3. Tristar TS-45 regulator with heat sink
4. Divert resistors
5. Fuses
6. Ammeter
7. Voltmeter is not fitted to the 48V version
8. Turbine terminals
9. Battery terminals
10. Sense leads
11. Voltage sensing relay
12. Slave relay.

### 1. Stop Switch

The run/short switch should always be switched to the SHORT position when any work is undertaken on the wind turbine in order to stop it from rotating at speed.

### 2. Three phase rectifier

This converts the 3 phase AC power from the wind turbine to DC for battery charging. It is pre-wired and no adjustment or maintenance is required. It is mounted on a heat sink.

### 3. Tristar TS-45 regulator

The Tristar TS-45 regulator controls battery charging. This is a sophisticated unit with many options and care should be taken to use the correct connections and settings. References in these instructions refer to pages, sections, paragraphs and diagrams from the TriStar Installation and Operation Manual.

### Recommended mode of operation

The preferred mode for use with a wind turbine is 'Diversion Charge Control' for which the wiring diagram is shown as Figure 2.2b. Diversion + and Diversion - are prewired to suitable divert load resistors. Page 7, below Figure 2.2b lists the connection steps. Section 6.0, starting on page 37 explains this mode in detail. Use of other modes does not provide the same degree of protection for the battery and the wind turbine.

### DIP switch settings

Appendix 2, starting on page 55 shows the setting options for Diversion Charge Control. Switches 1 and 7 must be in the ON position and for 24V operation switch 2 should be ON and switch 3 must be OFF; all other settings are optional. Table 4.2 on page 27 and section 9.0 starting on page 46 provide background information on switch settings for different battery types. For sealed batteries, switches 4, 5 and 6 should be set to off for longest battery life but two other settings can be used for increased charge limit if battery type is known and suitable. For flooded batteries, switches 4,5 and 6 should be set to OFF, ON and ON respectively for longest battery life but three other settings can be used for increased charge limit if battery type is known and suitable. Switch 8 should normally be set to ON for automatic battery equalisation.

### Sense leads

It is recommended that sense leads as shown in Figure 2.2b of the regulator manual should always be used.

### Temperature Compensation

Section 4.3 starting on page 28 covers the optional use of a remote temperature sensor.

## 4. Divert resistors

There are two 2 ohm, 300 W, divert resistors, mounted in the base of the cabinet. These absorb the power of the wind turbine if the batteries are fully charged. In doing so they will become hot so the cabinet should be mounted in a location where this does not pose a fire hazard. The cabinet must be mounted vertically to allow air flow past the resistors.

## 5. Fuses

There are two 16 A fuses for the main battery connection to protect the system from inadvertent overload. These are in DIN rail mounted fuse holders and are accessible without removing the cabinet lid. If either fuse, or both fuses, should blow then replace with identical types, having first ascertained the reason for overload.

## 6. Ammeter

This measures the current from the rectifier into the battery or, if the batteries are fully charged, into the divert resistors.

## 7. Voltmeter

This is not fitted to the 48V version.

## 8. Turbine terminals

There is one 6 stud ring tag terminal block for the wind turbine connection. It is marked TURBINE I/P TERMINALS in the picture. Connect the three wires from the turbine in any order. Connections must be tight with the correct wire terminations, i.e. 6mm ring terminals. Wire gauge for connection to the turbine should be at least 2.5 square mm for lengths up to 4m, thus allowing for currents up to 12.5A / phase. For longer lengths see table below. Connections must be tight with the correct wire terminations, i.e. 6mm ring terminals. A single 32mm cable gland is provided to allow for a range of cable diameters. Adaptors or nitrile bushes of varying diameters can be used to reduce the clamping diameter.

Length (m)	4	6	10	16	25
Wire gauge (square mm)	2.5	4	6	10	16

## 9. Battery terminals

There is one 6 stud ring tag terminal block for battery connection. Connect the battery positive lead to the left-hand terminal and the negative battery lead to the left-hand terminal. The centre terminal is provided for an earth connection. Wire gauge for connection to battery should be at least 2.5 square mm for lengths up to 3m, thus

allowing for currents up to 15A. For longer lengths see table below. Connections must be tight with the correct wire terminations, i.e. 6mm ring terminals. One 20mm cable gland is provided for each battery lead and a third 20mm cable gland is provided for an earth lead (if required).

Length (m)	3	4.5	7.5	12	20
Wire gauge (square mm)	2.5	4	6	10	16

### 10. Battery sense leads

The left-hand of the two 12mm cable glands is for battery sense leads (marked BATTERY SENSE above) which can be wired direct to battery terminals, bypassing any blocking diodes, current shunts, or other items which may cause the regulator to detect an incorrect battery voltage via the main battery connection. It also means there is no need to open the regulator. Wire termination is not critical due to the low currents. Sense leads are prewired within the cabinet.

### 11. Temperature sense leads

The right-hand of the two 12mm cable glands is provided for optional temperature sense leads. This is a special feature available on request at additional cost.

### 12. Voltage sensing relay

This relay monitors the voltage from the rectifier and, if it exceeds 62V, disconnects the Tristar input and diverts the connections to the dump load resistors. The settings should be left as follows:

Range	1
Hysteresis	10%
Delay	1s
Latch	OFF
Set Volts	60V

### 13. Slave relay

This provides higher current contacts than those in the voltage sensing relay that drives it.

Note: 12 and 13 above are fitted in case the battery is disconnected by accident or a fuse blows. This overvoltage condition is expressly prohibited in the Tristar manual so should be avoided if possible.