



SmartBank *PRO*

Advanced Split Charge System

User & Installation Guide

Revision A

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WARNING

Your attention is drawn to “Caution!” and “Warning!” statements throughout this manual.

“Caution!” refers to practices that may cause damage to the SmartBank PRO or your electrical system.

“Warning!” identifies practices that may cause injury or death.

SmartBank^{PRO} is designed for installation by qualified and competent electrical engineers.

Qualified and competent engineers will be familiar with safe working practices, local health & safety legislation and the proper and safe use of tools and equipment. Therefore, not all obvious practices that may lead to system damage, injury or death are detailed within this manual. If you are in anyway unsure about any aspect of the installation or use of SmartBank^{PRO}, contact your Dealer or Merlin Power Systems for advice.

Precautions

- This product is designed for use in 12Volt DC and 24Volt DC vehicular systems depending on model. Use in other than its designed application may result in fire, electric shock or other injury.
- DO NOT disassemble, modify or alter. Doing so may result in an accident, fire or electric shock.
- USE ONLY in vehicles with a NEGATIVE GROUND. Failure to do so may result in fire, electric shock, damage or other injury.
- FUSES: Use the correct ampere rating when replacing fuses. Failure to do so may result in fire, injury, electric shock or damage.
- DO NOT install or operate the CPU in an explosive atmosphere.
- DO NOT install or expose the CPU to excessive temperatures or humidity.
- If in any doubt consult a suitably qualified and competent engineer or the supplier.
- DO NOT substitute Contactors or switches with any other types that have not been approved and tested.
- MAINTENANCE. If you have problems or suspect device failures DO NOT attempt to repair the unit yourself. Return it to your Dealer or Merlin for servicing.

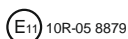
Certificate of Conformity



Declaration of Conformity

Merlin Equipment Limited, Trading as Merlin Power Systems hereby declares that the product marketed as SmartBank ^{PRO} is in compliance with the requirements of EU Electromagnetic Compatibility (EMC) Directive 2014/30/EU.

VCA Approval Number: 10R-058879



Test report: TRA-025367-38-00A



SmartBank ^{PRO} complies with RoHS (Reduction of Hazardous Substances) Directive 2011/65/EC. At the end of life, SmartBank ^{PRO} should be disposed of as normal electrical waste.

SmartBank ^{PRO} has been tested to and surpasses ISO-7637-2 for use on vehicles.

Signed:

A handwritten signature in blue ink, appearing to read 'James Hortop'.

James Hortop
Managing Director
Merlin Power Systems UK

Date: 18th January 2019

Introduction

Thank you for purchasing a Merlin SmartBank^{PRO}.

SmartBank^{PRO} is a highly advanced split charging system designed to allow charging of multiple battery banks.

SmartBank^{PRO} may be used for split charging of two or three independent battery banks. It is supplied with either a single split charge contactor (for two battery banks) or two contactors (for three battery banks).

Please take the time to read and understand this manual before installation and use.

Please note that this manual refers to the SmartBank^{PRO} retail product. SmartBank^{PRO} is available in an OEM version. The OEM version differs slightly to the retail product. However, the main printed circuit board within SmartBank^{PRO} is identical so this manual may also be used for setting up the OEM version.

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Package Contents

Two Battery Bank Version (1 Auxiliary bank):

Models: 04-8011(12V) and 04-8013(24V)

- SmartBank^{PRO} CPU x1
- SmartBank^{PRO} Contactor x1. Part Number: SU80-5162PL (12V) or Part Number: SU80-5163PL (24V)
- Emergency Parallel Switch x1
- Fuse Kit & rubber blanking plugs
- User Installation Guide (this document)

Three Battery Bank Version (2 Auxiliary banks):

Models: 04-8012(12V) and 04-8014(24V)

- SmartBank^{PRO} CPU x1
- SmartBank^{PRO} Contactor x2 - Part Numbers: SU80-5162PL (12V) or Part Number: SU80-5163PL (24V)
- Emergency Parallel Switch x1
- Fuse Kit & rubber blanking plugs
- User Installation Guide (this document)



SmartBank^{PRO} CPU



Contactor



Emergency Parallel
Switch

Installation

- **Warning!** Isolate power supply before starting installation.

Positioning of Parts

The following should be observed as parts of SmartBank ^{PRO} are designed for wet/dirty environments, but others are not.

Main CPU

Caution! *Damage will occur if the CPU is allowed to get wet.*

Warning! *Do not install the CPU in a petrol/gas engine room environment.*

The CPU is designed for location in a dry environment (such as on cab side of engine room bulkhead or a cupboard). It is suitable for installation in drier engine compartments on boats. However, it is not sealed against moisture ingress. The CPU is **NOT** suitable for installation or operation in atmospheres where there is a risk of ignition or explosion.

Contactors

These are designed to be installed under hood, in wet engine room environments and battery compartments. The contactors are IP66 rated and will withstand hose downs.

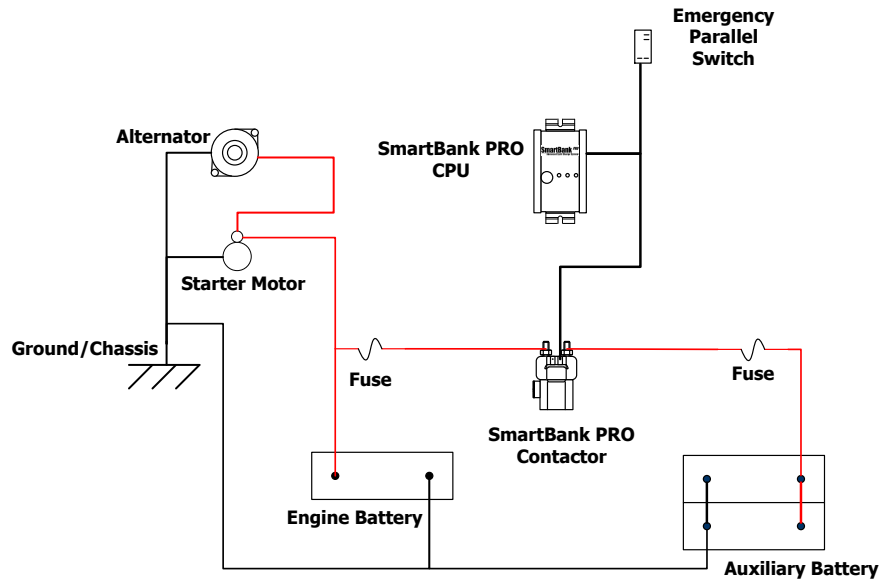
Emergency Parallel Switch

The switch is IP66 rated and fully waterproof. It can safely be installed in engine rooms, on dashboards, on flybridges etc. Will withstand hose downs.

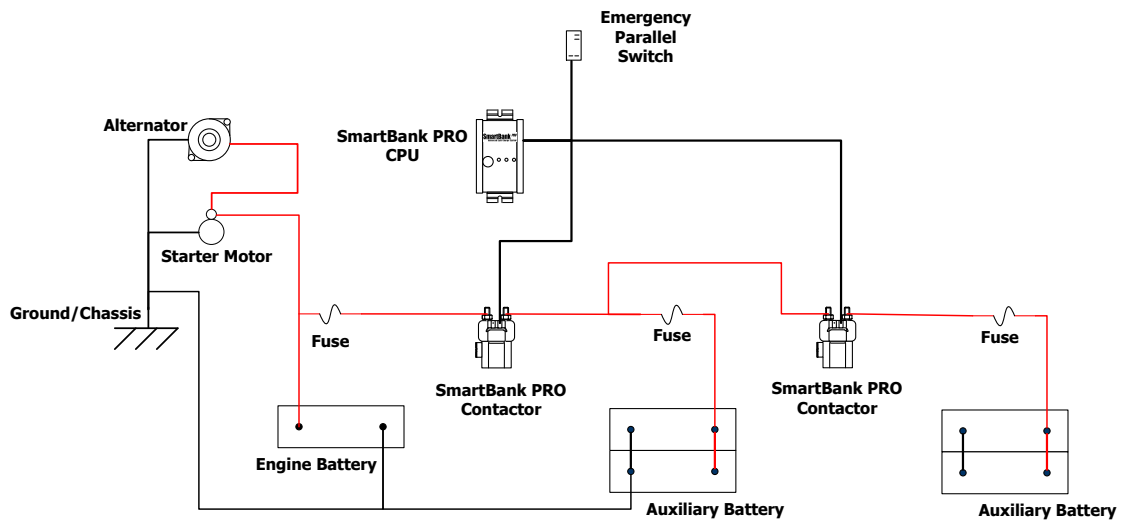
Wiring Layouts

These wiring layouts cover the majority of installations.

Typical 2 Battery Schematic:



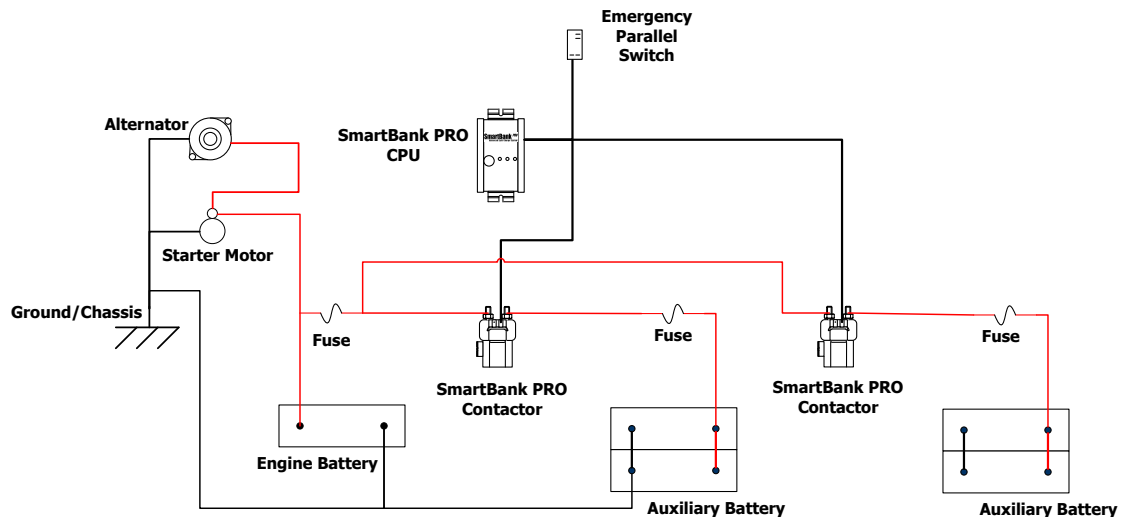
Typical 3 Battery Schematic:



Prioritising Charging

In the case of a three battery bank system, it is possible to prioritise charging. In the example above (3 battery system), the engine battery would charge first, then the auxiliary and then the 2nd auxiliary battery. This priority can be changed by moving the contactor connections. This allows you to execute a priority charge strategy depending on the order in which you want batteries charged and from which charge sources.

In the example below the 2nd auxiliary battery charge would be prioritised.

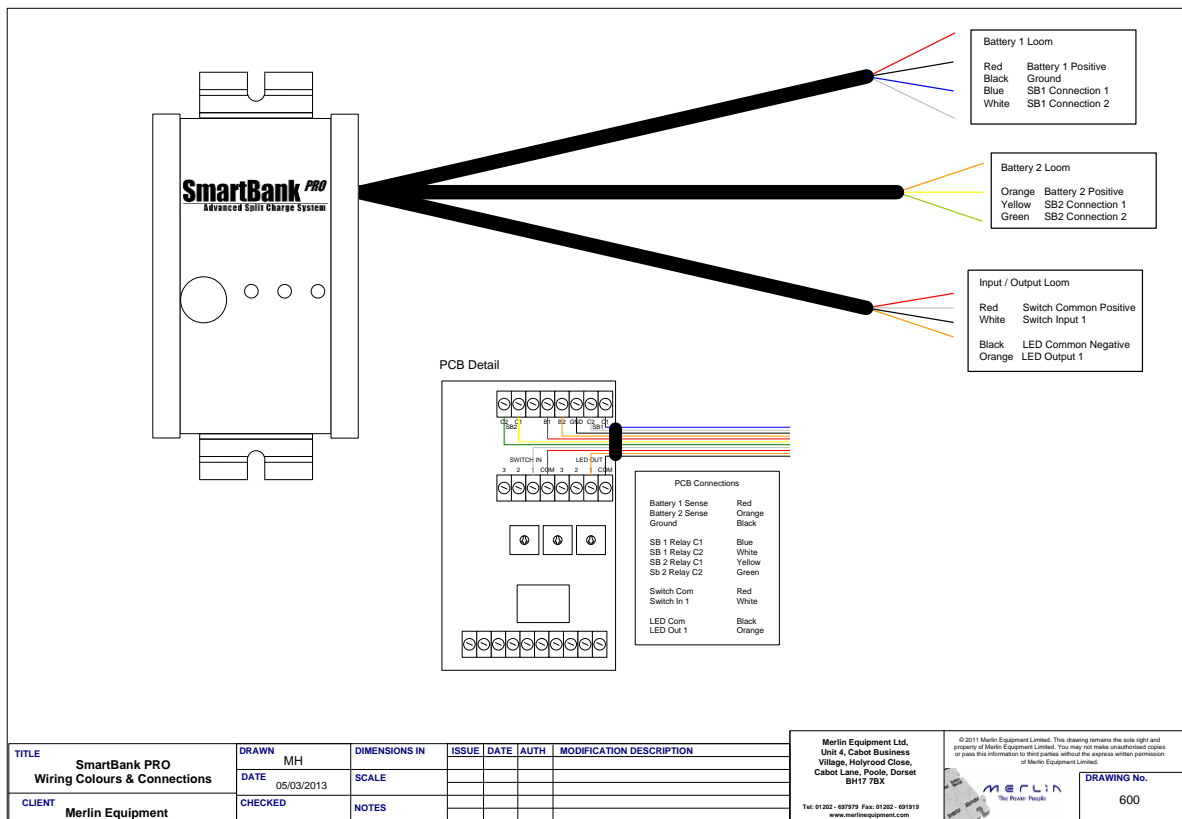
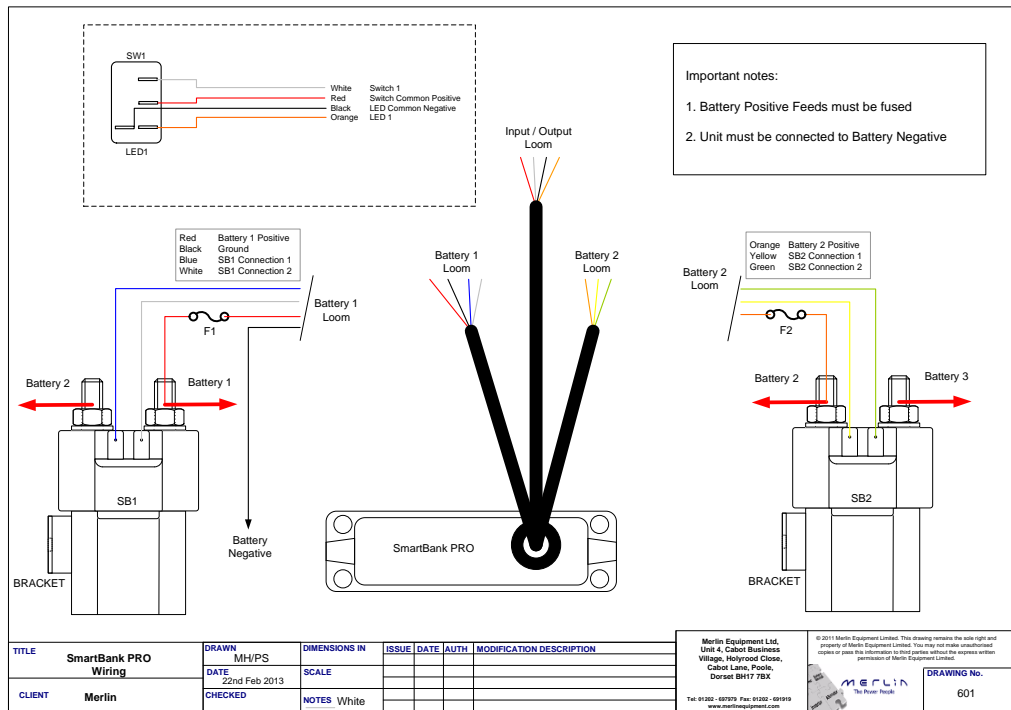


Caution & Warning: We recommend that appropriately rated fuses or circuit breakers are inserted between batteries and contactors to protect against short circuits. These should be located as close as possible to the battery positive terminal of each battery bank. SmartBank^{PRO} is supplied also with small inline fuses for the B1 and B2 sense wires – these must be used in every installation.

Contactor Rating

Contactors are rated for charging systems of up to 200A continuously. They will also handle intermittent cranking current of engines of up to 725A.

CPU Wiring:



Caution: Care should be taken with the contactor coil control wiring. Serious damage to the SmartBank PRO will occur if these wires are incorrectly connected or short circuited.

Location and Connections

Prior to installation ensure that the vehicle/boat is safely secured and the power is isolated. For example, remove ignition keys, disconnect batteries, ensure parking brake is secured etc. Only connect the power feed fuses to SmartBank^{PRO} once all wiring is completed and checked.

Install the SmartBank^{PRO} following the schematic shown on page 10.

Contacto(r)s

The Contactor(s) may be installed under hood or within exterior lockers. The wiring and connectors used should be rated appropriately.

The main high-power cables should be terminated with heavy-duty crimp ring terminal suitable for M8 stud. The stud nuts should be tightened to a torque of 11 to 12 Nm.

Warning! *Incorrectly specifying the cable current rating or inadequate cable termination could result in malfunction, fire, injury or serious damage.*

Caution & Warning! *Do NOT overtighten. However, failure to tighten the stud nuts adequately may result in an intermittent connection and/or arcing which may cause overheating or ignition.*

CPU

Caution! *Damage will occur if the CPU is allowed to get wet.*

Warning! *Do not install the CPU in a petrol/gas engine room environment.*

The CPU is designed for location in a dry environment (such as on cab side of engine room bulkhead or a cupboard). It is suitable for installation in drier engine compartments on boats. However, it is not sealed against moisture ingress. The CPU is **NOT** suitable for installation or operation in atmospheres where there is a risk of ignition or explosion.

Emergency Parallel Switch

This would usually be mounted in locations such as dashboards or helm panels without needing to run heavy duty cables throughout the vehicle/boat. The switches are IP66 rated and fully waterproof.

Extending wiring loom.

Caution & Warning! *Substandard wiring and connectors may cause malfunction or damage to the SmartBank^{PRO} unit. Malfunctions may result in hazardous situations.*

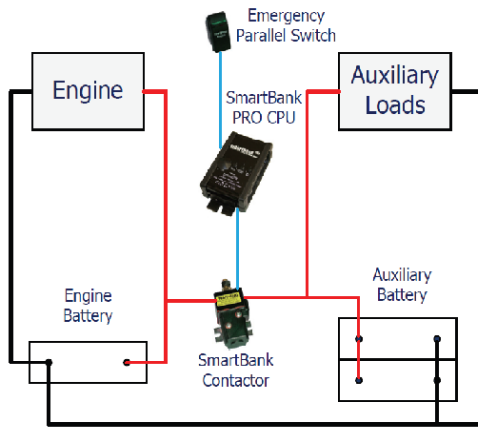
SmartBank^{PRO} is provided with a 1.5m (4') wiring loom. You may shorten wires as necessary. If you need to extend wires, you may do so using the same quality and size of wire as provided in the loom.

A minimum of 18AWG (0.75mm² CSA) is recommended. The cable should be high temperature thin wall low voltage cable suitable for use in automotive, marine and allied industries.

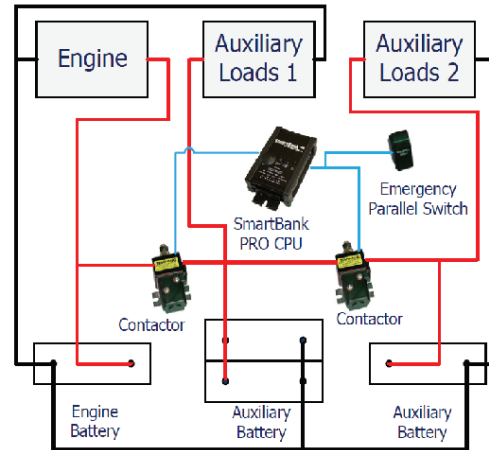
Set Up and Adjustments

SmartBank^{PRO} will work 'out of the box' for both 2 and 3 battery bank systems.

Installation Example: 2 Battery System



Installation Example: 3 Battery System



Manual adjustment of split charge settings is achieved using rotary trimming potentiometers ("trim pots") which are accessible through the front case of the CPU.

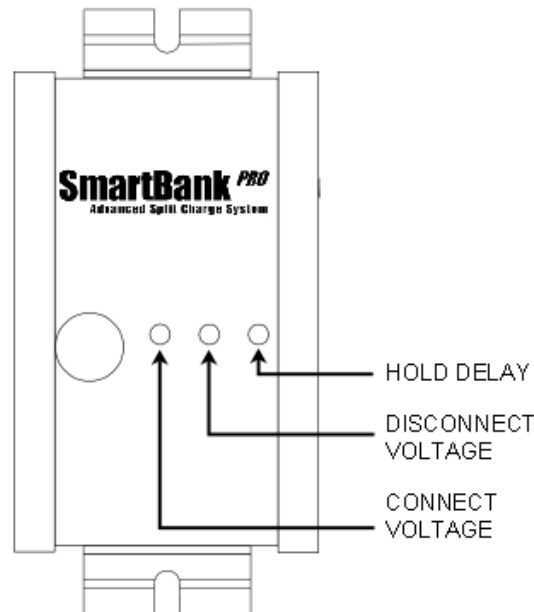
The trim pots on the front of the CPU allow you to adjust the Connect Voltage, Disconnect Voltage and Hold Timer settings.

Connect range = 13.0 to 13.8 Vdc (26.0 to 27.6V for 24V Operation)

Disconnect range = 12.5 to 13.3 Vdc (25.0 to 26.6V for 24V Operation)

Hold timer range = 0 to 255 seconds.

Adjustment is made by rotating the trim pots using a trimming tool or a small (1.5mm) flat-blade screwdriver. These are accessed through holes in the front face of the enclosure. Protective rubber blanking plugs cover the holes and need to be removed in order to adjust the trim pots.



The left-hand trim pot adjusts the connection voltage threshold. The middle trim pot adjusts the disconnection voltage threshold. Voltage adjustment range is almost perfectly linear.

For example, with the control in the 12 o'clock position, this would be in the middle of the adjustment range (e.g. 13.4 Vdc for Connection).

The right-hand trim pot adjusts the time delay between zero and 255 seconds and again the adjustment is linear.

For a 3-battery bank system, the 2nd contactor will operate at the same Connect Voltage, Disconnect Voltage and Hold Timer settings as the first. However, a small time delay is built in which activates/deactivates the 2nd contactor after the 1st.

Emergency Parallel Switch

The emergency parallel switch, when pressed, will close the contactor(s) and hold all batteries in parallel for the same time period as the Hold Timer is set for. This allows for emergency jump starting of the engine if the engine battery has been allowed to run flat or fails.

The LED on the emergency parallel switch will be illuminated whenever the split charge contactor is connected

Notes

Digital Signal Processing

SmartBank^{PRO} senses and processes voltages using a Digital Signal Processor (DSP) which filters out transient spikes and electrical noise preventing SmartBank^{PRO} connecting/disconnecting erroneously.

The DSP operation means that SmartBank^{PRO} will take time to respond to sudden changes in voltage, so it may appear that there is a short time-lag between the voltage reaching a certain level and the SmartBank^{PRO} reacting to it. This is normal operation.

Bi-Directional Charging

SmartBank^{PRO} acts as a Bi-Directional charge system. This means that it will sense charge on both batteries installed. Therefore, it will operate when say, the engine is running (and charging the engine battery) and, when say, a battery charger is running (and charging just the auxiliary battery). SmartBank^{PRO} will handle any number of charge sources no matter which battery they are connected to.

Note that SmartBank^{PRO} has two voltage sensors and is bi-directional for Battery Banks 1 and 2. In systems using 3 battery-banks, it is mono-directional for battery 3. Therefore, if you wish for charge sources to charge all batteries, they should be connected to battery banks 1 or 2. Connecting a charge source to battery bank 3 will mean that only battery 3 is charged from that specific charge source.

After Installation

After installation and set-up, the rubber blanking plugs (provided) should be re-placed into the holes in the front of the unit. Note that they are designed to be difficult to remove so make sure you are finished before inserting them! The rubber blanking plugs restrict ingress of moisture and dirt into the CPU.

If you are unsure about any aspect please consult a suitably qualified engineer, your Dealer or Merlin Equipment Ltd before commissioning the unit.

Product Specifications

	12V Models		24V Models	
Part #	04-8011	04-8012	04-8013	04-8014
Number Of Batteries	2	3	2	3
Contactors Current Continuous	200A			
Contactors Current 5 mins	250A			
Contactors Current Cranking	725A			
Power Consumption	<10mA		<6mA	
CPU Dimensions LxWxH (inch)	68x110x32mm (2.67x4.33x1.26)			
CPU Weight ex cables (lbs)	178g (0.39 lbs)			
Contactors Dimensions LxWxH (inch)	91x50x39mm (3.59x1.97x1.54)			
Contactors Weight (lbs)	375g (0.83 lbs)			

Warranty

SmartBank^{PRO} is warranted to be free of defects caused during manufacture for a period of 2 years from purchase. The warranty may be invalidated if the device has been altered, misused, installed incorrectly or operated in adverse conditions described in the “Precautions” section of this document.

What does this warranty cover and how long does it last? This Limited Warranty is provided by Merlin Equipment Limited. (“Merlin”) and covers defects in workmanship and materials in your SmartBank^{PRO}. This warranty period lasts for 24 months from the date of purchase at the point of sale to you, the original end user customer, unless otherwise agreed in writing (the “Warranty Period”). You will be required to demonstrate proof of purchase to make warranty claims.

This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period. Subsequent owners also require original proof of purchase as described in “What proof of purchase is required?”

What will Merlin do? During the Warranty Period Merlin will, at its option, repair the product (if economically feasible) or replace the defective product free of charge, provided that you notify Merlin of the product defect within the Warranty Period, and provided that Merlin through inspection establishes the existence of such a defect and that it is covered by this Limited Warranty.

Merlin will, at its option, use new and/or reconditioned parts in performing warranty repair and building replacement products. Merlin reserves the right to use parts or products of original or improved design in the repair or replacement. If Merlin repairs or replaces a product, its warranty continues for the remaining portion of the original Warranty period or 90 days from the date of the return shipment to the customer, whichever is greater. All replaced products and all parts removed from repaired products become the property of Merlin.

Merlin covers both parts and labour necessary to repair the product, and return shipment to the customer via a Merlin-selected non-expedited surface freight within the contiguous United States and Canada. Alaska, Hawaii and outside of the United States and Canada are excluded. In Europe, this is the EMEA. Contact Merlin Customer Service for details on freight policy for return shipments from excluded areas.

How do you get service? If your product requires troubleshooting or warranty service, contact your merchant. If you are unable to contact your merchant, or the merchant is unable to provide service, contact Merlin directly at: Merlin Equipment Ltd, Unit 4, Cabot Business Village, Poole BH17 7BA, United Kingdom. Tel: +44 (0) 1202 697979.

REVISION PAGE – NOT FOR PUBLICATION.

Rev 1.5 Correcting E Number Page 4
Rev - Updated to standards and general revisions.