

Sentinel 150P series

Programmable, automatic switch mode battery chargers

Installation, Operation and Maintenance

This Manual Refers to the Following Models

Open
frame
models

SNTL150P1205CD
SNTL150P2405CD
SNTL150P1205CDA
SNTL150P2405CDA



For safe and correct use of these chargers, read and save the safety information that precedes the installation and operation instructions.

This guide contains 8 pages (including this one). If any pages are missing, contact the battery charger supplier or manufacturer for replacement documentation.



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Important Safety Information – Read and Save These Instructions

This manual contains important safety and operating instructions for all SNTL150P models.

- Do not expose the battery charger to rain, snow or wet environments.
- The use of any attachment not recommended or sold by the battery charger manufacturer may result in risk of fire, electric shock or injury to persons.
- Do not operate the charger if it has received a sharp blow, been dropped, or otherwise damaged in any way: return to supplier.
- Do not disassemble the charger: return to supplier when service or repair is required. Incorrect re-assembly may result in a risk of electric shock, fire or faulty operation.

WARNING – RISK OF EXPLOSIVE GASES

WORKING IN THE VICINITY OF A LEAD ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION.

To reduce the risk of battery explosion, follow these instructions and those published by battery manufacturers and the manufacturer of any equipment you intend to use in the vicinity of the battery. Review cautionary marking on these products and any attached equipment.

PERSONAL PRECAUTIONS.

- (i) Someone should be within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
- (ii) Have plenty of fresh water and soap nearby in case battery acid contacts skin, eyes or clothing.
- (iii) Wear complete eye protection and clothing protection. Avoid touching eyes whilst working near batteries.
- (iv) If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eyes, immediately flood eyes with running cold water for at least 10 minutes and get immediate medical attention.
- (v) NEVER smoke or allow a spark or flame in vicinity of battery.
- (vi) Be extra cautious to reduce risk of dropping a metal tool on to the battery. It may spark or short-circuit the battery or other electrical part that may cause explosion.
- (vii) Remove personal metal items such as rings, bracelets, necklaces and watches when working with batteries. High power batteries can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burns.
- (viii) Use the charger only for charging battery types as stated on the charger. Do not use the charger for charging dry-cell batteries that are commonly used with home appliances. These batteries may burst and cause injury to persons and damage to property.
- (ix) **DANGER OF EXPLOSION!** NEVER CHARGE A FROZEN BATTERY

PRIOR TO INSTALLATION / COMMISSIONING

- Clean battery terminals. Be careful to keep corrosion from coming into contact with eyes.
- Add distilled water in each cell until the battery acid reaches a level specified by battery manufacturer. This helps purge excessive gas from the cell. Do not overfill. For a battery without cell caps, carefully follow manufacturer's recharging instructions.
- Study all battery manufacturer's specific precautions, such as removing or not removing cell caps while charging and recommended rates of charge.
- Determine the voltage of battery by referring to engine manual and ensure this matches the charger's output voltage.

CHARGER LOCATION AND CONNECTION

- **DANGER OF EXPLOSION!** Never place the charger directly above battery being charged: gases from the battery will corrode and damage the charger.
- Never allow battery acid to drip on to the charger when reading specific gravity or filling battery.
- Do not operate the charger in a closed-in area or restrict ventilation in any way.
- The battery charger should be connected to a grounded, metal, permanent wiring system; or an equipment-grounding conductor should be run with circuit conductors not connected to equipment-grounding terminal on the battery charger.
- Connections to the battery charger should comply with all local codes and ordinances.
- Open frame SNTL models – these chargers should be installed so that they are not likely to be contacted by people.
- Wiring for the AC supply input, DC charge output and DC control (e.g. alarm output) circuits must be physically separate, e.g. using separate wire harnesses and cable gland access. For AC input and ground leads, use 1mm²/17 AWG or larger wire conductors rated to 90°C/194°F. For DC (charger to battery) leads, use 2.5mm²/13 AWG or larger.

For safe and correct use of the charger, follow the following steps. Should you have any problems or the unit does not function as expected, consult our troubleshooting guide at the end of these instructions.

- Visually inspect unit for any signs of damage, caused by transport or storage.
- Mount the charger as outlined above, paying attention to ambient temperature.
- Ensure the mains AC supply is isolated, and ensure the correct rated input voltage before connection.
- Ensure the charger is earthed at the marked earth terminal/stud.
- Check batteries in accordance with the manufacturer's guidelines.
- Check that the charger is correct for battery type and voltage.
- Connect the charger to the batteries, observing correct polarity and ensuring a secure and tight connection.
- Switch on the charger at the mains AC power supply.

General Information

Please read the following before installing. A visual inspection of this product for damage during shipping is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product. If in doubt, please contact your local Murphy representative.



Sentinel 150P battery chargers provide new levels of DC power control, monitoring and protection for engine starting and standby battery applications. Murphy advanced charger features included as standard:

- **Switch mode charging technology:** high power efficiency and low heat dissipation, plus wide supply voltage tolerance, in a compact and lightweight package.
- **Multistage charging:** float, bulk, absorption and AutoBoost stages ensure no compromise between rapid charge recovery and long term battery capacity and life.
- **Low output ripple:** <1% ripple, beneficial for vented lead acid & NiCd cells, essential for VRLA, and configurable for use as a stand-alone DC power supply.
- **AutoBoost:** triggered automatically on low battery voltage levels, or by a programmable interval timer, AutoBoost temporarily increases the charge voltage to give battery cell charge equalization, without overcharge and gassing. At the end of the AutoBoost cycle, Sentinel automatically returns to float mode charging. AutoBoost maximizes battery power, capacity and service life.

On SNTL150P...CDA models, a programmable input can be configured to activate AutoBoost, regardless of battery voltage. The input is typically triggered using an operator-initiated panel push-switch.

- **Temperature compensation:** ensures batteries are charged at the optimal voltage, which varies significantly with ambient temperature. Sentinel can measure temperature with a battery mounted sensor, and adjust output voltage to prevent under or over charging.
- **PC software tool:** allows flexible, custom configurations, plus real time monitoring and diagnostics. See page 6 for details of Sentinel to PC hardware connection, or separate document ci0052 for information on software installation, operation and program options.

All Sentinel 150P chargers are available as an open-frame module (with protective cover) for surface mounting in an enclosed panel. Electrical connection of the AC supply, battery and control circuits is via screw terminal blocks.

Model options

Model codes with suffix 'A' (SNTL150P... CDA) additionally include an input for charger control and an output for remote signalling of alarm conditions.

Both input and output functions are programmable using the SNTL150P-PCSUITE software tool. See Configuration section for a list of programmable input and output functions.

Specifications

	SNTL150P 1205CD(A)	SNTL150P 2405CD(A)
power supply:		
operating voltage range:	95 – 265 V AC	
operating frequency	47 – 63 Hz	

DC charge output:

	12	24
nominal voltage	12	24
float / boost voltages	see DC output calibration table	
current limit	5	5
voltage ripple	< 1%	
line regulation	< 2%	
load regulation	< 2%	

input/output (SNTL150P...A models only):

input (x1)	digital (switch) input, close to –DC to activate, programmable control function
output (x1)	relay switched +DC, 1A max @ 30 VDC, programmable alarm function

general:

operating temperature	–30 to +60 °C / –22 to +140 °F
storage temperature	–40 to +60 °C / –40 to +140 °F
humidity	20% to 90% RH
dimensions	see Dimensions & Assembly
weights	see Dimensions & Assembly
electrical safety	2006/95/EC (EN 60065)
electromagnetic compatibility	2004/108/EC (EN 61000-6-2, EN 61000-6-4)

DC output calibration

Standard calibrations / battery types		float volts (V DC)	boost volts (V DC)
12V	Vented lead acid (6 cells) *	13.5	14.1
	Calcium-Calcium (6 cells)	13.8	15.6
	Lead acid antimony (6 cells)	13.5	14.7
	VRLA, AGM (6 cells)	13.5	14.4
	VRLA, Gel (6 cells)	13.5	13.8
	NiCd (10 cells)	14.1	14.5
	Power supply	12.0	n/a
24V	Vented Lead acid (12 cells) *	27.0	28.2
	Calcium-Calcium (12 cells)	27.6	31.2
	Lead acid antimony (12 cells)	27.0	29.4
	VRLA, AGM (12 cells)	27.0	28.8
	VRLA, Gel (12 cells)	27.0	27.6
	NiCd (18 cells)	25.6	26.1
	NiCd (20 cells)	28.2	29.0
	Power supply	24.0	n/a

* Unless specified otherwise, factory default calibrations are for vented lead acid

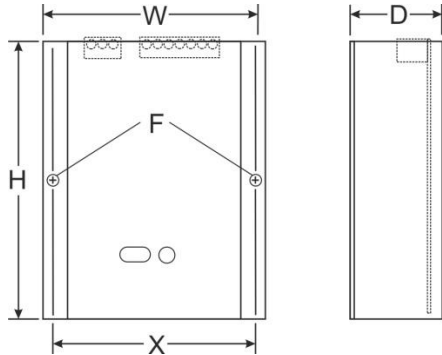
Note: Calibration figures at 20 deg C. Output voltage will vary if temperature compensation is enabled – see Electrical Connection & Configuration section.

Dimensions and Assembly



CAUTION: Sentinel 150P chargers should be handled by the circuit board cover. Care should be taken not to handle static sensitive components through exposed circuit boards and terminals.

SNTL150P



	12V models	24V models
Overall:		
W	108.6 mm / 4.28 in.	
H	135 mm / 5.31 in.	
D	45 mm / 1.77 in.	55 mm / 2.17 in.
Fixing holes:		
X	99 mm / 3.90 in.	
F	Ø 5.65 mm / 0.22 in.	
Weight:		
	0.65 kg / 1.43 lb.	0.75 kg / 1.65 lb.

- These chargers are designed for mounting in a vertical plane inside an enclosed control panel or housing. Mounting orientation should be as shown above, with electrical connection terminals uppermost.
- For safe heat dissipation, mount Sentinel in the orientation shown, with a minimum air-gap clearance of 40mm/1.5 in. above/below and 25mm/1 in. at the sides. Consideration must be given to ventilation for proper heat dissipation.
- For surface mounting, use the 2 centre fixing holes (Ø 5.65mm/0.22 in.). Ensure that the mounting studs/bolts/nuts/screws adequately support the charger, and are tightened sufficiently to not to become loose during normal use, e.g. due to engine/equipment vibration..

Electrical Connection & Configuration



WARNING: DANGER OF INJURY OR DEATH. During normal operation, Sentinel is connected to high voltage AC circuits. Before connection, disconnection or handling of these chargers, ensure isolation of all AC power supplies. Connection or disconnection with live wiring can also cause hazardous sparking and component damage.

Connection terminals (general)

The Sentinel 150P uses a pair of two-part connectors with removable screw terminal blocks:

- **CN1:** a 7-way block for connection of the DC charge output, temperature compensation remote sensor, relay output and configurable input. Use a 5 mm/0.2 in. flat-head screwdriver to tighten/loosen the terminals. For the DC output, use 2.5mm/13AWG or larger connecting wire.
- **CN3:** a 3-way block for connection of the mains AC power supply live, neutral and ground. Use a 5mm/0.2in flat-head screwdriver to tighten/loosen the terminals. For all AC supply/ground wiring, use 1mm/17AWG or larger wire conductors rated for temperature 90°C/194°F. For external fuse details, see the **AC Input (power supply)** section following.

3 LEDs (coloured blue, green, red) provide indication of AC supply, DC charge output and fault status.

For all models, wire connections for the DC charge output (connector block CN1) and AC input supply (CN3) must be physically separated, e.g. separate wire harnesses, separately routed through the panels/ducting.

DC Charge Output



Before DC connection or disconnection:-

- Ensure AC supply input is isolated. **Disconnecting the batteries while the AC supply is live can result in sparking at the battery terminals, ignition of battery gasses and serious personal injury.**
- Check that the charger model and output ratings are compatible with battery type & voltage (see table below). **Incompatibility may result in damage to the charger, batteries and serious personal injury.**

Connect the Sentinel DC charge output to the battery terminals, observing the warnings above and the correct DC polarity:

CN1 pin	Function
1	+ DC charge output
2	- DC charge output

All SNTL150P models include an electronic, self-resetting DC output fuse for protection of reverse polarity and short-circuit faults. In the event of such faults, remove the cause of fault: the charger will then attempt to automatically reset its fuse and re-initialise the output. If the fuse fails to reset, contact your supplier for further advice.

Electrical Connection & Configuration (cont.)

TC: Temperature Compensation

CN1 pin	Function
3 4	RTC (remote temperature compensation) sensor+ Ground (for RTC sensor return)

These terminals allow optional connection of a Murphy RTC temperature sensor. With the RTC sensor connected, and the sensor head positioned to give the most accurate/representative measurement of battery temperature, the SNTL150P will automatically vary DC output voltage for optimal charging.

Temperature compensation is enabled automatically when a remote RTC sensor is connected. For each 1°C change in ambient temperature above or below 20°C (within the range -10 to +50°C), output voltage automatically varies by 3mV per cell. Increasing ambient temperatures causes decreasing output voltages; decreasing ambient temperatures causes increasing output voltages.

CN1 terminals 3 and 4 are designed for connection to a Murphy RTC sensor only. DO NOT connect other types of temperature sensor, such as thermocouples, thermistors or resistance probes. The standard Murphy RTC sensor (part code 42.70.3900) includes a 3 metre/10 feet lead assembly. Non-standard lead lengths are available to special order.

An RTC sensor short-circuit fault is indicated by a fast-flashing red LED in the Sentinel's protective cover.

If no RTC sensor is connected, temperature compensation is automatically disabled and the output voltage does not vary with ambient temperature.

Programmable input and output

CN1 pin	Function
5	Relay output (switched +ve DC)
6	Output/input common return (-ve DC)
7	Input (-ve DC to activate)

Model codes with suffix 'A' (models SNTL150P...CDA) additionally include one relay output and one digital (switch) input. The functions of input and output can be configured using the SNTL150P-PCSUITE software tool.

Output

The switched +DC relay output allows the signalling of battery and charger faults to remote alarms, annunciators or other equipment. Maximum output load is 1A @ 30VDC.

The software tool allows configuration of the output to activate on one or more fault conditions:

- mains fail *
- DC connection error *
- battery missing
- remote temp sensor short
- high voltage alarm
- low voltage alarm
- charge fail alarm *

* enabled as factory default

For most combinations of the above faults, the output relay operates as follows:

Charger conditions	Pin 5 relay output state
Normal operation, no faults	+ DC (relay energised)
Any fault	Open circuit (relay de-energised)

The exception to the rule above is when the output is configured to signal ONLY high battery voltage, in which case relay operation is:

Charger conditions	Pin 5 relay output state
Normal operation, no faults	Open circuit (relay de-energised)
High battery voltage fault	+ DC (relay energised)

See software tool document ci0052 for full information on programmable alarm output options.

Input – optional charger control

Input pin 7 is activated by connection to battery negative DC (e.g. connection to pin 6 via external relay/switch contacts).

The input can be used for optional control of several charger functions, depending on the application and levels of control needed. Programmable input functions include:

- return to float mode
- ramp to boost
- boost extension
- perform battery check
- reduce to nominal voltage
- turn output off

For full details of all programmable input functions, please refer to SNTL150P-PCSUITE installation manual, document reference ci0052.

Electrical Connection & Configuration (cont.)

AC Input (power supply)



**DANGER !
HIGH VOLTS**

Before AC connection, disconnection or fuse replacement:

- Isolate the AC supply
- Ensure a good ground/earth connection to the charger (CN3 screw terminal).
- Ensure the AC supply voltage is compatible with the charger's supply rating. **Exceeding the rated voltage may result in damage to the charger and connected equipment, and cause serious personal injury.**
- Fit external supply fuses in accordance with the charger's labelled types/ratings.
- **WARNING:** Sentinel should be fused separately from other equipment. This will prevent Sentinel being isolated, and ensure batteries remain on charge, in the event that other equipment fails.

Connect the AC input supply (live, neutral and ground) wires to Sentinel connector CN3:

CN3 pin	Function
1	AC supply live, 95 to 265 VAC, 47 to 63 Hz
2	AC supply neutral
3	AC supply ground/earth

AC supply and ground connections require 1mm²/17 AWG or larger wire conductors, rated for temperature 90°C/194°F. The AC live wiring must incorporate fuse ratings/types as indicated on the charger labelling.

Sentinel – PC connection

SNTL150P-PCCON configuration software kit

To allow the full range of programmable functions and options, Sentinel must be connected to a Windows®-based PC or laptop running SNTL150P-PCSUITE software.

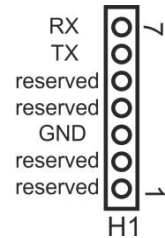
Configuration kit model SNTL150P-PCCON provides all the necessary hardware for communication between PC and Sentinel 150P charger.

The kit includes a communication lead with a 7-way pin header, which connects to the Sentinel 150P circuit board. Sentinel back view:

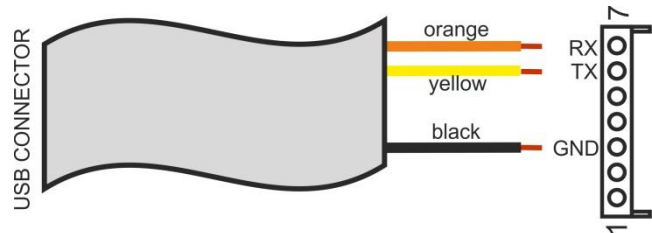


7 way pin header H1

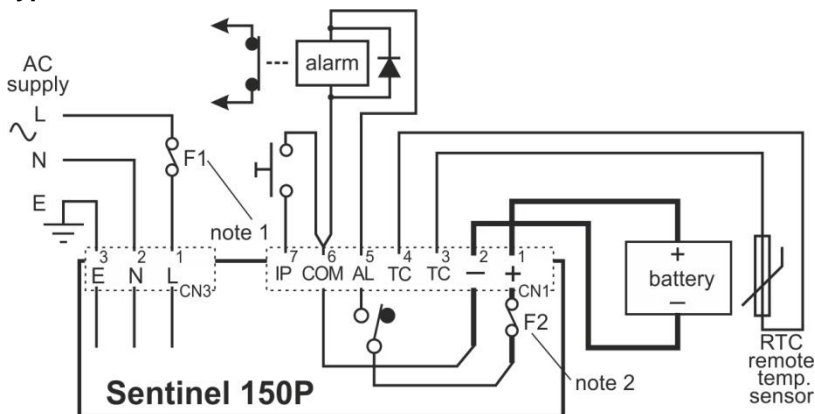
Connection:



Ensure correct polarity when mating with USB to Serial TTL converter cable (as supplied with 42.70.3825):



Typical Connection



Notes:

- 1) External AC fusing (F1): see AC Input (power supply) section
- 2) DC self-resetting fuse (F2): see DC Output section
- 3) Battery output is isolated from chassis.
- 4) Alarm output relay shown in de-energised state. Output function is configurable.
- 5) Input (pin 7) shown with momentary action switch. Input function is software configurable.

Operation

LED indication

3 LEDs, positioned in the middle of the Sentinel's protective cover (with the product label), provide user indication of AC power, DC charge and fault conditions:

LED colour	LED state	charger condition
blue	<i>AC power condition:</i>	
	solid on	AC power on
green	<i>DC output and charge condition:</i>	
	solid on	Float charging
	slow flash	Ramp to Boost (bulk charge)
	fast flash	Boost extension (absorption charge)
red	<i>Faults/warnings:</i>	
	solid on	AC mains fail and/or charge fail
	slow flash	DC connection error
	fast flash	High volts alarm, low volts alarm, RTC sensor short or battery missing
	solid off	No fault detected

On models with a programmable input, an active input is indicated by rapid flashing green and red LEDs.

Initial Power-Up – Commissioning Charge

When powered up for the first time, with both AC and DC connected, the Sentinel 150P performs an AutoBoost charge with the boost extension timer is set to 6 hours (regardless of the profile configuration). This ensures the connected batteries receive a full commissioning charge.

After completion of this commissioning charge, Sentinel's boost extension time reverts to the profile's set level (factory default time is 2 hours).

Float charge operation

Sentinel operates an intelligent, multi-stage battery charge regime. In normal charging mode, the charger maintains the battery at a pre-calibrated float voltage (see page 3 - DC Output Calibration table), while supplying any additional DC load up to the specified current limit. The Sentinel 150P has a maximum default current limit of 5A, but the software configurator allows this to be reduced if required.

When fully charged, a battery will only accept the charge required to replace internal losses (approx. 1mA per AH of battery). E.g. for a system with a 1 Amp standing load and a fully charged 50 AH lead acid battery, Sentinel will typically supply 1.05 Amps.

AutoBoost operation

AutoBoost mode provides a temporary increase in output voltage. It may be initiated:

- automatically on battery low voltage (programmable level, factory default 12.0V / 24.0V)
- automatically on expiry of a time interval since the last AutoBoost (programmable level, factory default 28 days)
- by an operator-controlled, panel-mounted momentary push switch, if the Sentinel has a switch input configured for "AutoBoost initiate".

Sentinel charges the batteries in AutoBoost mode for a preset time (also programmable), after which it automatically returns to float mode.

AutoBoost provides charge equalisation between cells, without overcharge, maximising battery capacity, power and service life.

Battery check

As part of its diagnostic process, Sentinel can periodically check for a 'battery missing' condition by reducing its charge output and measuring battery voltage.

Sentinel performs a Battery Check:

- at power up
- at the end of an AutoBoost cycle
- periodically, while in float mode (programmable time, default is every 60 minutes)

On detection of a battery missing fault (voltage below a programmed threshold, factory default 12V), Sentinel can be configured to operate the alarm output and/or maintain/reduce the charge output. It will also carry out further battery checks every minute until the fault clears. Time/voltage parameters and responses can be changed or disabled using the software configurator tool.

The Battery Check feature does not operate during AutoBoost cycles, and a battery missing condition will inhibit initialisation of AutoBoost.

Fault Finding, Warranty and Maintenance

Warranty and servicing

Sentinel chargers are supplied with a 2 year warranty on parts and workmanship.

Maintenance is limited to keeping the charger free from ingress of dust, dirt or moisture, and ensuring clear air-flow for ventilation.

In the event of an operating query or suspected fault, please consult the sections in this manual, including the troubleshooting flowchart on page 8, or contact your supplier for further advice before returning the charger.



WARNING: Sentinel battery chargers and internal components are not user-serviceable. No attempt should be made to repair the charger. Any attempt to do so may invalidate warranties, cause permanent damage to the charger and connected equipment, and result in serious personal injury.

Fault Finding, Warranty and Maintenance

Troubleshooting Flowchart:

