Automatic Battery Charger Manual
(MODEL : SMF TYPE)

WARNING :

To prevent personal injury or equipment damage, only qualified technicians /operators should install, operate or service this device.

CAUTION :

Megger and high potential test equipment should not be used.
Incorrect use of such equipment could damage components contained in the unit.

1. APPLICATION： This automatic battery charger has been designed to continuously charge a Lead-Acid Battery to start engine generator set by the switching mode power supply (SMPS), which is most essential to give emergency power to the equipment in the event of main power failure.

2. FEATURES :
   - 2.1. Charges batteries with constant voltage and current.
   - 2.2. Protection against the reverse property of battery.
   - 2.3. Current limited automatically (does not require disconnect on engine crank).
   - 2.4. Low ripple voltage (below ±1%).
   - 2.5. Durable for continual use at maximum capacity by wide heat radiation area.
   - 2.6. Durable under a damp and vibrating environment by silicon coating.
   - 2.7. Useable for 50Hz & 60Hz.
   - 2.8. Equalizing and floating charging.
   - 2.9. High efficiency (over 80%).
   - 2.10. Battery discharge protection at AC input power off (Patented).
   - 2.11. Adopted Switching Mode Control method (SMPS).
   - 2.12. Small & light.
   - 2.13. Easily field adjustable without battery connection.

3. SPECIFICATION :
   - 3.1. Free standing type.
   - 3.2. Input voltage : 220 Vac ± 10% (110Vac : **optional**)
   - 3.3. Frequency : 60Hz or 50 Hz
   - 3.4. Phase : a single phase
   - 3.5. Output voltage : 24Vdc or 12 Vdc
   - 3.6. Output current : 10Adc , 20 Adc
   - 3.7. Output control mode : Switching Mode by use of F.E.T
   - 3.8. Output control method : constant voltage and current.
   - 3.9. Efficiency : over 80%
   - 3.10. Setting voltage for float charging ┬ 24V Battery - 26.4Vdc / └ 12V Battery - 13.2Vdc
   - 3.11. Setting voltage for equalize charging ┬ 24V Battery - 28.8Vdc / └ 12V Battery - 14.4Vdc
   - 3.12. Charging current adjustable range : less ± 20% of nominal current value
   - 3.13. Durable time at over load : 2 hours at 120% of nominal current value
   - 3.14. Voltage adjustable range for float charging and equalize changing :

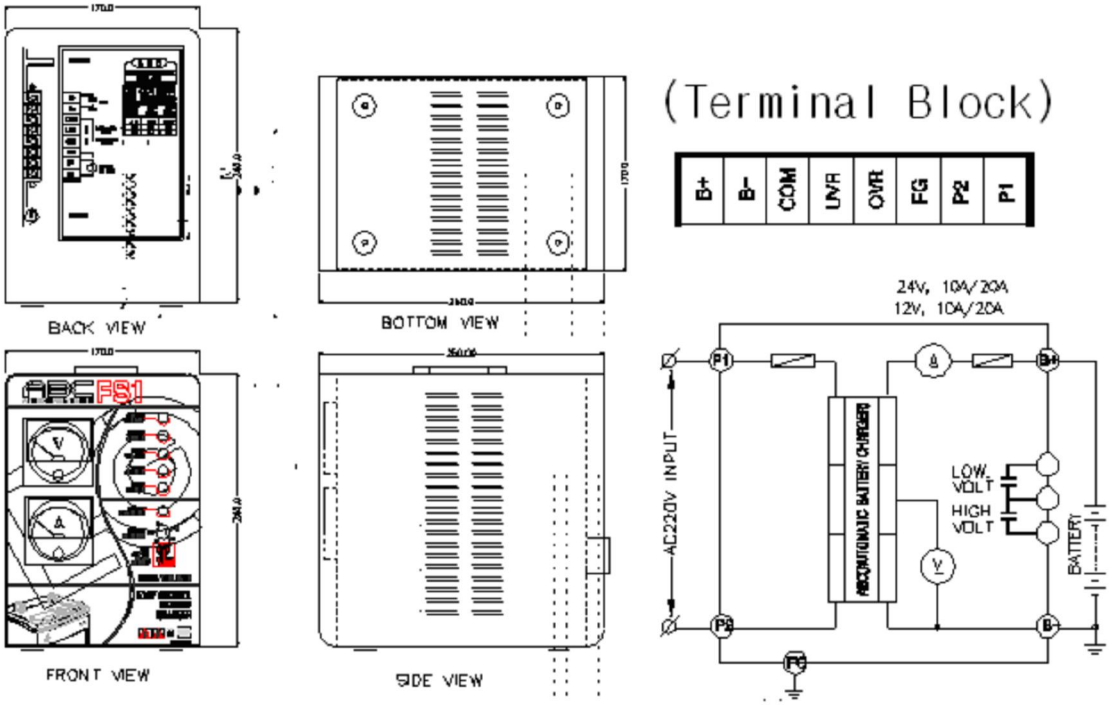
METHOD	24V battery system	12V battery system
Float charging	26.4V dc ±5% (=24 ~ 28Vdc)	13.2Vdc ±5% (=12 ~ 14Vdc)
Equalize charging	28.8V dc ±5% (=26 ~ 30Vdc)	14.4Vdc ±5% (=13 ~ 15Vdc)

4. STRUCTURE

▶Size (W * D * H) —— 170 * 240 * 250(mm) - 12Vdc-10A, 20A Charger.
24Vdc-10A, 20A Charger.

▶Color : Bottom- ivory , Cover- dark blue

▶Weight : about 4 kg



5. CONDITION FOR USE :

5.1. Ambient Temperature : -10℃ +40 ℃
(storage temperature : -25 ~ 60 ℃)

5.2. Relative Humidity : 85 %

●NOTE 1

Be sure area around battery is well ventilated and away from a damp, vibrating environment and contaminated substance.

6. INDICATIORS AND ADJUSTER :

6.1. Input power [green] : indicates when AC input power turns on.

6.2. Connection error [yellow] : indicates B+ and B- line reverse connection to the battery.

6.3. AC Failure [red]
AC input failure lamp indicates that there is no AC power to the charger.

6.4. High Batt.V [red]

Indicates that there is overcharging to the battery.
This is set at factory before ex-work as follows
- 15Vdc for 12Vdc battery system.
- 30Vdc for 24Vdc battery system.

6.5. Low Batt.V [red]
Indicates that battery voltage has fallen below a pre-set minimum level
- 12Vdc for 12Vdc battery system.
- 24Vdc for 24Vdc battery system.

6.6. Equalize charging[green] : indicates that the charger is operating in equalizing mode.
6.7. Equalize charging potentiometer adjusts equalize charging time from 0 to 12hours.
6.8. Equalize charging start (Push button) S/W :
To equalize the battery's cells, a higher charging voltage by switching should be requested.
Turning on the S/W raises the charger output voltage for the setting time interval .
At the end of the timed charging period, the charger automatically switches back to the float charging mode.

7. INPUT & OUTPUT TERMINALS :

7.1. P1,P2 ; AC power input terminals to 220Vac power
7.2. B+,B- ; DC power output terminals, B+ should be connected to the positive terminal of the battery and B- to the negative.
7.3. Alarm contact : 1C (=1a, 1b), contact rating : 1A

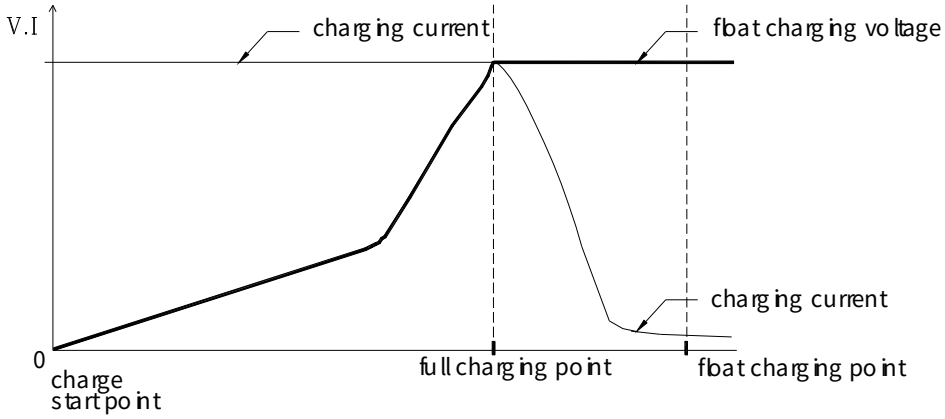
8. INSTALLATION AND CONNECTION

8.1. Installation
Put the battery charger the nearest place from the battery, which shall be well ventilated away from a damp, vibrating, environment and without substance to obstruct maintenance and access.
8.2. Connect the specified AC input power with P1, P2 terminal of battery charger.
8.3. Connect the positive line of battery to B+ and the negative line to B-, respectively.
8.4. Check if connection error lamp indicates in above8.3, and correct the properties of the lines (B+, B-) to the battery.

9. TEST AND OPERATION

9.1. Input AC power in dicator lights.
9.2. If the connection error indicator lights, check the properties of battery.
9.3. Charging method selection

▶ Float charging
This charging is normal operation mode to charge the battery for starting the engine genset, which stands by main power cut off. When all connection have been completed as per above wiring connection drawing, charger starts charging action at float charging.



FLOAT CHARGING CURVE

As the battery is installed from storage condition and the charger start charging battery charger operates along with above float charging curve. In other words, when two breakers turn on, the charger supply the nominal current to the battery at low voltage until it reaches full charge point, from this point the current decrease slowly to keep on a little current at constant voltage (= float charging voltage),

NOTE 2

Generally, on float charging mode not to need a rush current like engine starting, the battery charger must keep output voltage to be a constant float charging voltage at the full charged condition of the battery and output current below 1.5 ~ 2Adc, which is the current to supply the consumption quantity for the electrical loads connected to the battery. But when engine starting occurs with the battery under-charged below float charging voltage, the charger will supply all of theses current to the load and it may cause battery damage.

▶ Equalize charging

The purpose of the periodic equalize charging is to ensure that all of the battery cell are at full charge. but, equalizing voltage charge should be done until the equalize charging time expires one time every 3 months.

This charging starts by pushing equalize charging start push button [red color], equalize charging voltage is set at the factory before it ex-work.

9.4. Adjusting floating and equalizing voltage are set by VR2 on the PCB inside of battery charger. Pushing the equalize charging start button on the front cover begins equalizing charge, after charge finish for the setting time(0 ~ 12hours), it automatically returns to the float charging mode.

9.5. Limit current adjustment.
Turing potentiometer VR1 on the PCB of battery charger cause to change DC output current limit up to ±20% of nominal current. This current limit values is set at the factory prior to ex-work.

9.6. Charging the dead battery by force
If ammeter doesn't work at DC output breaker "ON", check the remaining voltage in the battery whether it is below 7Vdc for 12Vdc battery system (14Vdc for 24Vdc battery).
Then turn off the two breakers (Input, Output) and remove battery positive line from the

terminal B+ and directly move it to terminal V+.
When the battery voltage recovers it's nominal voltage, disconnect battery positive on the terminal V+ and then reconnect to the B+.

NOTE 3

If the battery discharge below 7Vdc for 12Vdc battery (14Vdc for 24Vdc), the charge will not start.

10. TROUBLE SHOOTING

SECTION	SYMPTOMS	PROBABLE CAUSE	ACTION
No output	No DC output and AC failure lamp lights.	1.AC input power is cut off. 2.AC input FUSE open 3.DC output FUSE open 4.Battery voltage dead	1.Check the AC input lines and fuse inside of the charger. 2. FUSE Chinge(10A:3A, 20A:5A) 3. FUSE Chinge(10A:15A, 20A:25A) 4.Check the voltage of battery, if it is below 7Vdc, start the charging by force (refer to 9.7 paragraphs).
Fault	Connection Error Lamp lights.	Two lines(B+,B-) to the battery has wrong connection.	Check the property of the battery and correct the lines.
SECTION	SYMPTOMS	PROBABLE CAUSE	ACTION
Fault	High Batt. Lamp Lights.	1.The charger is over-charging. 2.High batt. Indicator adjuster on the PCB is set too low. 3.The poor charger.	1.Turn VR2 on the rear PCB CCW until DC output decrease, up to requested voltage. 2.Turn the adjust CW. 3.Replace with new one.
	Low Batt. Lamp Lights.	1.The charge is under-charging. 2.Low batt. indicator adjuster is set two high. 3.The poor charger.	1.Turn VR2 CW until DC output increase up to requested voltage. 2.Turn the adjuster CCW. 3.Replace with new one.
Battery's Problem	1.The charger doesn't work. 2.Charger's input breaker off immediately.	1-1.Battery's remaining voltage is below 7Vdc. 1-2.The poor battery charger 2.Leads(wires) short circuit.	1-1.Refer to 9.7 paragraph. 1-2.Replace with new one. 2.Open the cover and check leads inside of the charger.