Automatic Station Battery Chargers.

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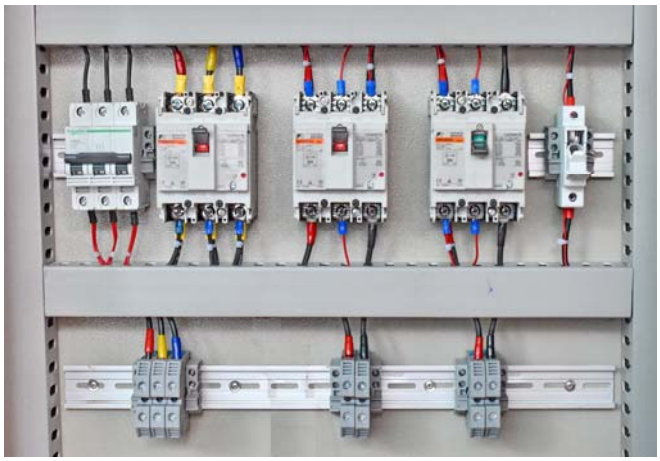
Introduction

Internal View of Dual Battery Charger.
Design for Control of Grid Station.



MCCB, MCB's & In/Output Terminal Blocks.

Portable Charger for Generator Set.

Battery chargers are used in combination with Battery sets to make uninterruptible DC power supply system. These systems are required for a diverse range of critical applications such as :

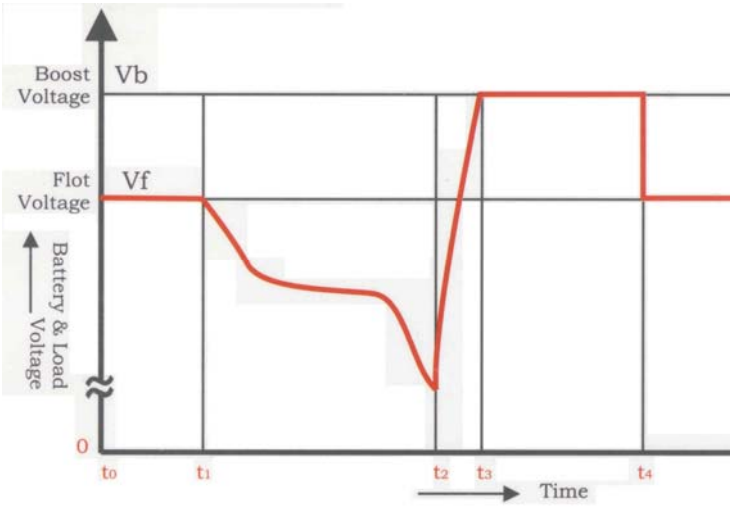
1. Control of switchgear equipment in electrical power generation and distribution networks.
2. Supply of power for telecommunication systems.
3. Operation of process control and regulating equipment in industry.
4. Automatic emergency lighting systems for hospitals, offices & factories etc.
5. Powering of invertors for making AC un-interruptible power supplies (UPS) which are used in high performance data processing, industrial control and communication systems.
6. Railway signaling & traffic control system.

Evence Battery chargers can be used as standalone rectifiers (Without batteries) for direct operation of DC loads which do not require uninterruptible supply. Filters can be provided in such cases to maintain ripple with in acceptable limits.

Principle of Operation

The mains supply is stepped down by a transformer, converted to DC by a bridge circuit consisting of thyristors and diodes, filtered, and then connected to the charger output terminals. As shown in Fig-2, a voltage feedback circuit maintains the output voltage at a fixed float or boost value, irrespective of charges in load current or supply voltage by adjusting the thyristors firing angle. Another feedback circuit monitors the output voltage and current, and in case of overload forces a reduction in the output voltage so that the rated charger current is not exceeded. This "fold back" characteristic for limiting the output current protects the charger against overload condition.

In automatic mode, the charger normally feeds the load and also keeps the battery in a float charging condition as shown in Fig-1. However, in case of mains failure (time t1) the battery starts feeding the load, and gradually thus gets drained. When the mains supply is restored (time t2), the batteries are automatically recharged, initially at a constant current up to the boost voltage (time t3), and then at the constant boost voltage until the



Load Voltage Characteristics

3 Phase Main Isolated Transformer.

Control & Measuring Instruments.

charging current reduces to a present limit which indicates that the battery has been fully charged. It then switches to the float mode (time t4), and remains in this condition until the mains supply is interrupted again.

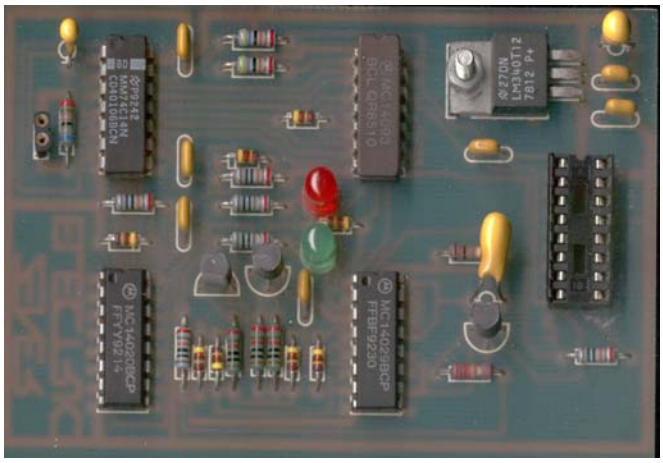
At the end of a mains failure period of short duration, the battery drainage will normally be small. If the charger detects such a condition (from the battery voltage drop), it will go directly to "float mode" when the supply is restored.

In manual mode, the charger output voltage can be set by the operator to (adjustable) float or boost value. For safety, the current limiting feature is kept operative in this mode also.

- t0 – t1:- Normal operation, charger in float mode.
- t1 – t2:- Mains failure, battery discharging.
- t2 – t3:- Mains restored, battery charging at constant current (boost mode).
- t3 – t4:- Battery charging at constant voltage Vb (boost mode).
- t4 + :- Battery charging at constant voltage Vf (float mode).

General features

- Ideal for both lead-acid and nickel-cadmium batteries.
- Parallel operation of two or more similar units is possible for higher output currents.
- Mains supply voltage indication (with selector switch for 3 phase model).
- Output current and voltage indication.
- Optional output voltage regulator for stable supply to auxiliary load.
- Auto / manual and boost / float mode selector switches and lamps indications.
- MCB and fuse protection for input supply, charger output, and optional regulated load supply.
- Adjustable output current limiter for protection of charger against overload condition.
- "Soft start" provision for gradual increase of output voltage up to float / boost voltage. This limits starting current and protects the charger against turning on with a short-circuited output.
- Tripping with annunciation in case of phase / fuse, failure battery over voltage, and output over current conditions.
- Alarms in case of battery under voltage, control supply fuse failure and charger



Automatic Fault Reset Card

Single Phase Isolated Power Transformer.

Production Line

failure conditions.

- Alarms / annunciation are visual and audio (with manual reset).
- Cooling by natural or forced ventilation, depending on size.

Chargers can also be customized for special client requirements.

Auto Rest / Restart.

This option device is for applications requiring the automatic start of equipment after a fault condition has caused it to trip. It reset / restarts the equipment within five seconds. Its fault counter allows five (05) consecutive reset / restart attempts of 2 m-seconds durations. In case there is real fault in the equipment their latch it self after five attempts and hence no more attempt unless equipment is attended. Being such a small duration of resetting pulse no fear of damage to the equipment due to existing fault condition.

If the equipment successfully restarts and continues to run for 15 minutes the fault counter reset to five counts again.

It can be supplied with or without case as demanded. Being very small in size it can easily be installed within the enclosure of equipment. It does not require so many alterations only four wires need to be terminate with existing circuitry of the equipment. Hans easy to tie-up. It consumes only 50 m-Amps at 12 to 18VDC supplies.

Boost Charge Protection Function (Boost Inhibit)

This function is designed for “Parallel Redundant Industrial Charger with Two Battery Groups” systems. In parallel operation, if two rectifiers start boost-charging at the same time there is danger the load would be damaged by overvoltage. So, the principle idea of Inhibit facility is to block any one of the two chargers feeding the load in Boost mode when the other rectifier is charging the batteries in Boost mode. Only one rectifier can be in boost mode, both rectifiers cannot be on boost mode at the same time. When one rectifier applies boost voltage, it will be disconnected from the load (only its battery will be charged on boost) and other rectifier will supply the total load current on float charge mode. So the system prevents applying overvoltage to the load. This function is primarily handled by a powerful communication between two rectifiers and the use of contactors.

Battery Charger Three In One.

Internal View Three In One Charging System.

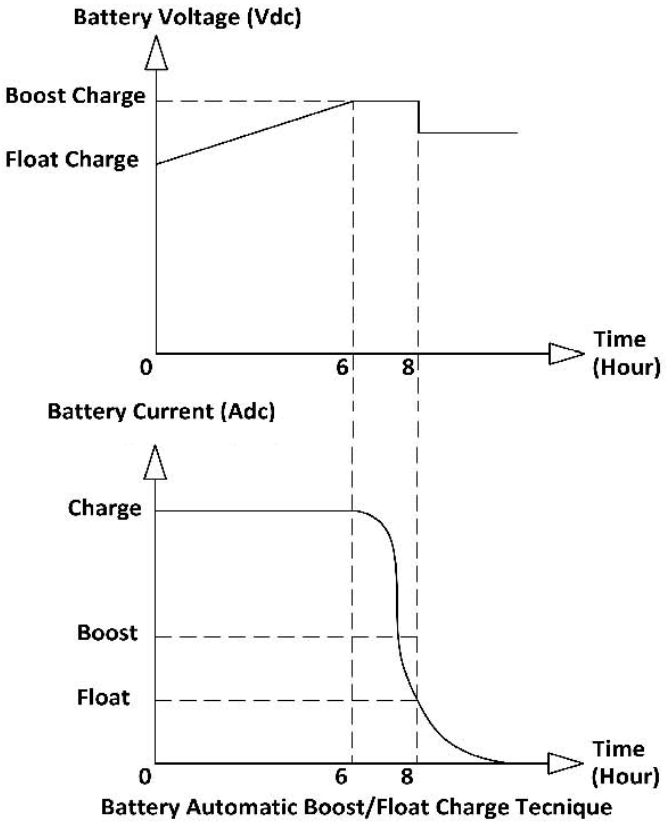
On-Line Battery Test

Battery test function tests the battery capacity based on discharge current, minimum voltage and autonomy time. The operator adjusts battery discharge current (expected load current), expected autonomy time and the voltage level that is assumed as battery discharged. Then the load is fed through the battery during this autonomy time. If the voltage of the battery does not fall to battery discharged alarm level in the adjusted autonomy time, the battery test result is PASSING If not, the Battery Test Fail Alarm will be activated on front panel. Battery test function can be activated manually or set automatically. Automatic battery test intervals can be set from the Timer.

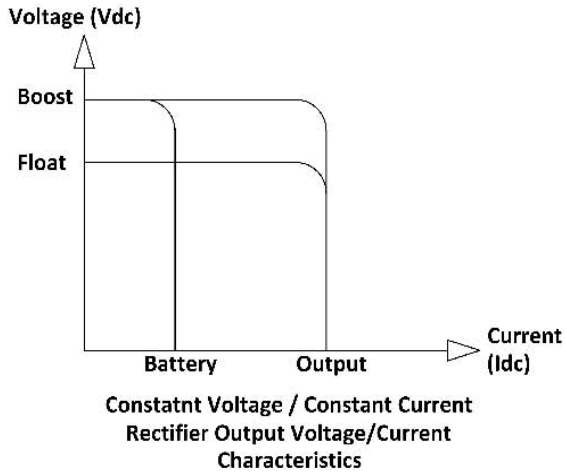
EXAMPLE:

System Description for example: Nominal Voltage: 110VDCCharger Output: 60A Adjustable Values: Low Battery: 90VDC (Adjustable through the control Card) Discharge I= 10A (Adjustable through the control Card) Note: This value should be adjusted lower than the load current. If the load is lower than the adjusted battery discharge current, then test will be cancelled automatically Discharge T=60minutes (Adjustable through Timer)

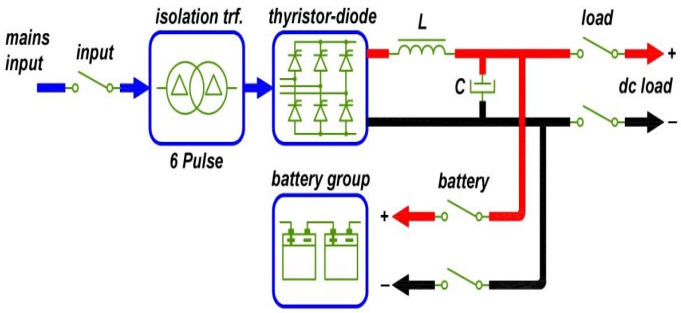
Considering the load as 15A, during battery test 10A will be supplied through battery and remaining 5A will be supplied through rectifier. During battery test, battery charger will check the battery voltage continuously. If battery voltage decreases to low battery level in less than 60 minutes, then battery test will fail. But, if battery voltage does not reach to the discharged voltage level in 60 minutes, then battery group will pass the test.



Battery Automatic Boost/Float Charge Tecnique



Constatnt Voltage / Constant Current
Rectifier Output Voltage/Current
Characteristics



3 Phase 6 Pulse Phase Angle Controlled Rectifier

Automatic Boost Charge (Auto Boost).

The Auto Boost Charge is a function that provides charger make automatically a choice between float or boost charge modes according to the battery discharge status. This feature allows charging the battery quickly for the optimum duration after discharge without need to intervene manually after each discharge.

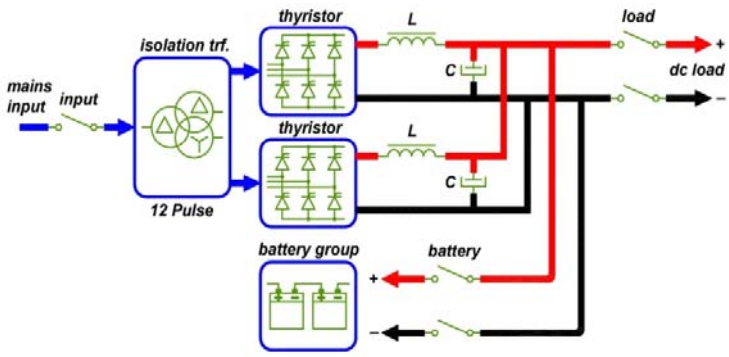
Auto Charge Function is set as appropriate according to the battery characteristics and is determined to be engaged in what value the boost charge. Automatic switching between Boost Charge and Float Charge is done by measuring current drawn by battery after the discharge. The user can set reference Battery charging current values via the Control Card.

Two reference current value must be set for Float Charge and Boost Charge. After being discharged in any way the battery, while the battery is being recharged, if the drawn charging current value is greater than set reference Boost charge current then the Auto boost function will begin to apply boost charge voltage to the battery. Applied Boost charge time is determined by the charge current drawn by the battery. Battery charge current decreases during charging battery. When the reduced battery charge current drops to the set reference value, the rectifier will automatically switch to Float Charge from Boost Charge.

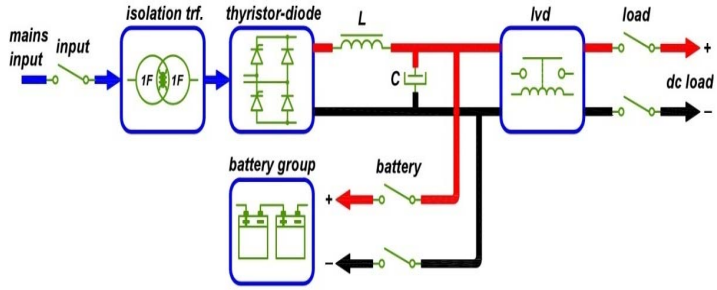
The Auto boosts function, Boost charge voltage applied to the battery after the discharge is not a fixed period. The boost charge duration will be determined according to the battery need. This function will prevent to damage the battery and shortening of battery life due to exposed long-term high voltage during boost charger.

Uninterrupted Protection with Full Isolation

ETES Charger is completely isolated from the input thanks to usage of input isolation transformer and DC current control by DC current module. Thus, the surge voltage at the input and even in systems with high-frequency noise, the charger and load are under safety.



3 Phase 12 Pulse Phase Angle Controlled Rectifier



LVD Block Schematic

Portable Charger

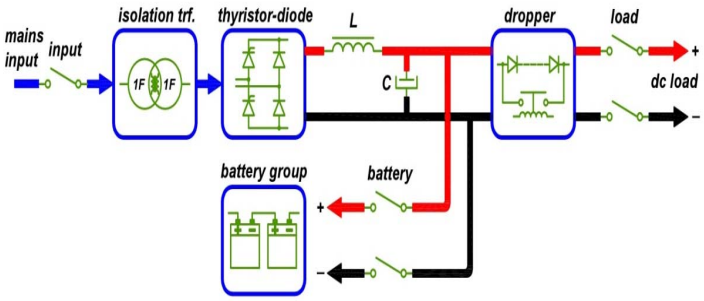
Protections

With the input isolation transformer, the load is fully isolated from the mains and protected. Input, load and battery outputs are protected by circuit breakers. In case of excessive heat, the related alarms will be activated and output will be cut off after a while. Electronic protections are available for short circuit, over / under voltage. All components can be accessed easily to do maintenance thanks to simple structure.

LVD

Long mains failure (no AC on the input) period may cause deep charge on the battery if the mains failure period is longer than the expected back up time of the battery. Although battery run out and depleted, without AC voltage in the input of the charger, battery will keep discharging to the lower voltage levels. This deep discharge may damage some kind of battery types (especially AGM type). Additionally, the charging time of a deep discharged battery will take longer time than normally. To protect the battery from deep discharge, a contactor can be used to disconnect the battery and the load from each other when battery voltage reaches to the minimum discharge value in case of a mains failure. This protection is called as LVD (Low Voltage Disconnect).

Rectifier Control PCB operates the LVD contactor by monitoring the battery voltage. The minimum discharge voltage (Low Battery value) can be adjusted from PCB Card and the LCD front panel or through communication software. During battery discharge, if the battery voltage decreases down to the adjusted “Low Battery” value, LVD Contactor will disconnect the battery from load to protect the battery from deep discharge. When the mains come back and input AC becomes “ON”, automatically DC bus voltage will be generated, battery will be charged and load will be supplied.



Dropper Block Schematic

Portable Charger

DROPPER

The function of this item is to drop/decrease the voltage on the load. If there is no dropper diode, the battery voltage (float or boost) will be directly reflected to the load. If there is no dropper in the system and float or boost voltage is higher than the maximum operating voltage of the load, then load may not operate and damaged. The dropper consists of diodes that are connected in serial and made on-line or off-line with by a contractor. The quantity of the dropper diodes and steps on the dropper circuit is based on the load operating voltage range, battery quantity and battery charge voltage (float and boost).

Parallel / Serial Connection

The charger is designed according to the easy accessibility principle to provide service and maintenance easily and also it is simple to connect in series or parallel according to need. In case of parallel connection with the correct capacity selection, one of the charger will be redundant and will be able to continue uninterrupted to supply the load in the event of any failure.

Voltage Ripple < %1

DC output is filtered by L/C, so DC ripple at full load always lower than 1% to increase battery life.

Wide Usage

ETES Rectifier Systems are reliable and ideal for transformer energy distribution centers, gas oil energy distribution centers, natural gas energy distribution centers, mining industry security and lighting, building automation systems and for special telecommunication and signaling applications.

Specifications

• Input supply voltage	1 phase model 3 phase model	220/240VAC +10% -15% 380 / 415VAC +10% -15%
• Supply frequency		50Hz ± 5%
• Nominal Output voltage of charger		12/24/48/60/110/220V DC
• Rated max. Output current of charger		10 to 1000A as specified
• Duty cycle at full load		100%
• Float charge voltage setting range		1.2 to 2.3V/cell ± 1%
• Boost charge voltage setting range		1.6 to 2.7V/cell ± 1%
• Regulation of float/boost voltage for 0 to 100% charge in output current		± 1%
• Output voltage ripple with battery		Less than 2%
• Optional smoothing of output voltage Ripple for telecom applications, Sophomorically weighted to 800 Hz		Possible up to 2mV RMS with battery
• Automatic boost charge current According to IU-characteristics		Up to rated maximum current ±2%
• Manual charging current limit Adjustment as per W-characteristics		Up to 110% of rated max. current
• Manual charging peak voltage		Adjustment as required
• Insulation test voltage (for 1 minute)		2KV RMS, 50 Hz
• Ambient temperature for rated current		-20 to +50 Degrees Celsius
• Relative Humidity		0% to 100%
• RF protection		Grade N
• Protection class		IP-20