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ARPSL Welcomes to AP TRANSCO Officials

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Conventional/i-Swift Battery Chargers supplied to APTRANSCO

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BATTERY CHARGERS SUPPLIED TO AP TRANSCO SUB-STATIONS

- 132kV S/s – 220VDC/10A FC & 16A FCBC with In-built or Separate DCDBs (VRLA/NVRLA) [Conventional]
- 220kV S/s – 220VDC/22A FC & 25A FCBC with In-built or Separate DCDBs (VRLA/NVRLA) [Conventional]
- 400kV S/s – 220VDC/40A FC & 100A FCBC with Separate Dropper Diode Circuit (VRLA/NVRLA) [i-Swift]
- 48VDC/35A FCBC/DFCBC (SB LOGIC) WITH ACDB; DCDB & Dropper Diode Circuit (VRLA/NVRLA) [i-Swift]
- 48VDC/50A FCBC/DFCBC (SB LOGIC) WITH ACDB; DCDB & Dropper Diode Circuit (VRLA/NVRLA) [i-Swift]
- 48VDC/100A FCBC WITH ACDB; DCDB & Dropper Diode Circuit (VRLA) [i-Swift]

❑ All 48VDC Battery Chargers are +VE Grounded Systems

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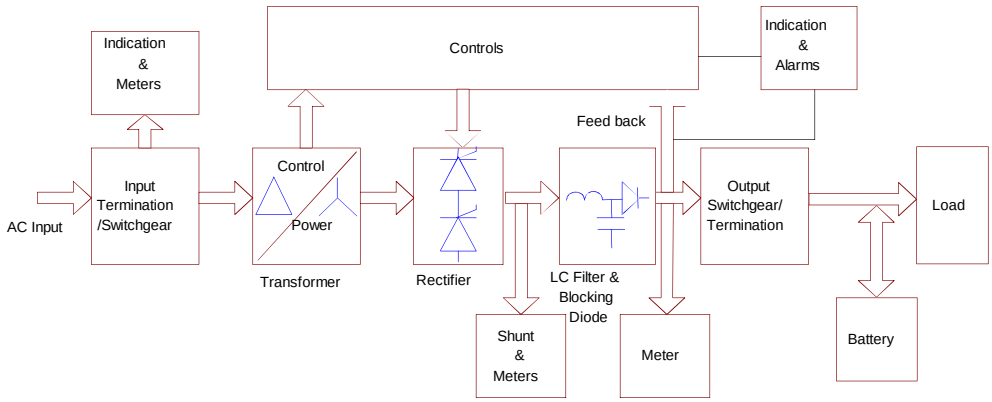
Functional Block Diagram of Conventional/i-Swift Battery Charger



Note: There is no specific IS or IEC Standards for Battery Chargers, whereas, the Components/Items used to build Battery Chargers will have these IS/IEC Standards...

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Different Battery Charging Modes

- Trickle Charging (2mA of Battery Capacity)
- Float Charging
- Boost Charging
- Equalize Charging

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Different Battery Charger Schemes/Configurations

- FCBC (Float cum Boost Charger)
- FC & FCBC (Float Charger & Float cum Boost Charger)
- DFCBC-2CL (Dual Float cum Boost Charger – 2 Contactor Logic)
- DFCBC-PL (Dual Float cum Boost Charger – Parallel Logic)
- DFCBC-SB (Dual Float cum Boost Charger – Standby Logic)

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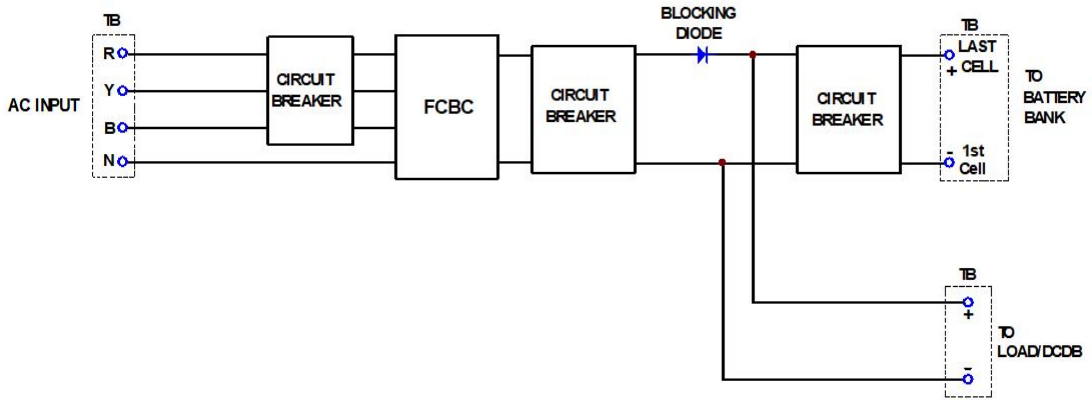
Single Line Diagram of Float cum Boost Charger



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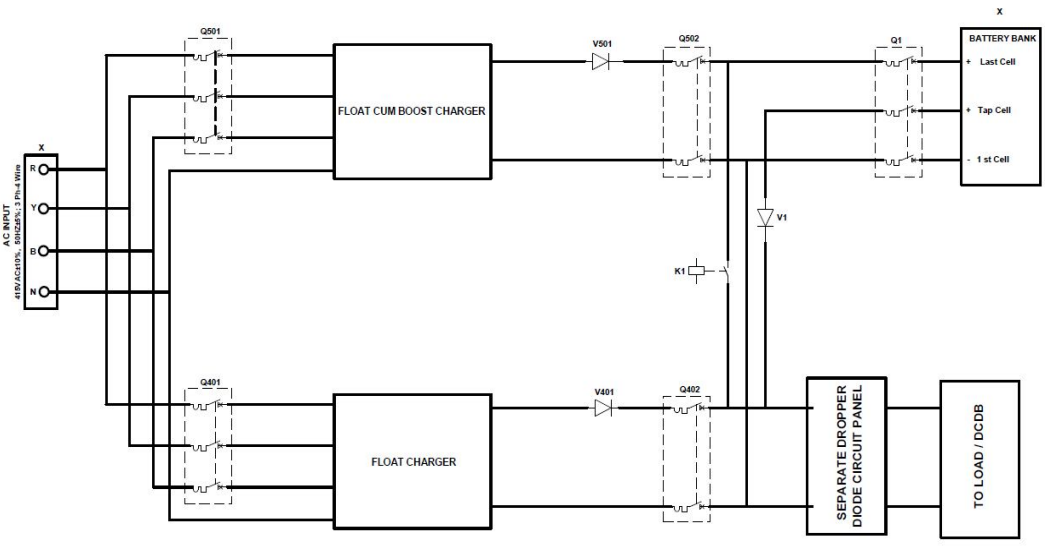
Single Line Diagram of Float Charger & Float cum Boost Charger



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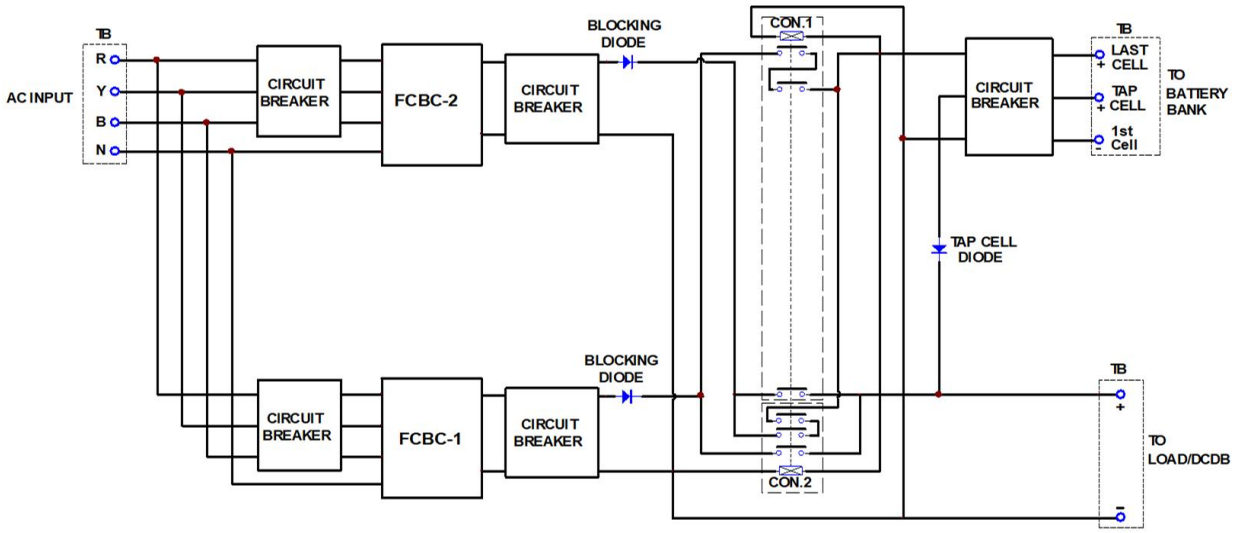
Single Line Diagram of Dual Float cum Boost Charger – 2 Contactor Logic



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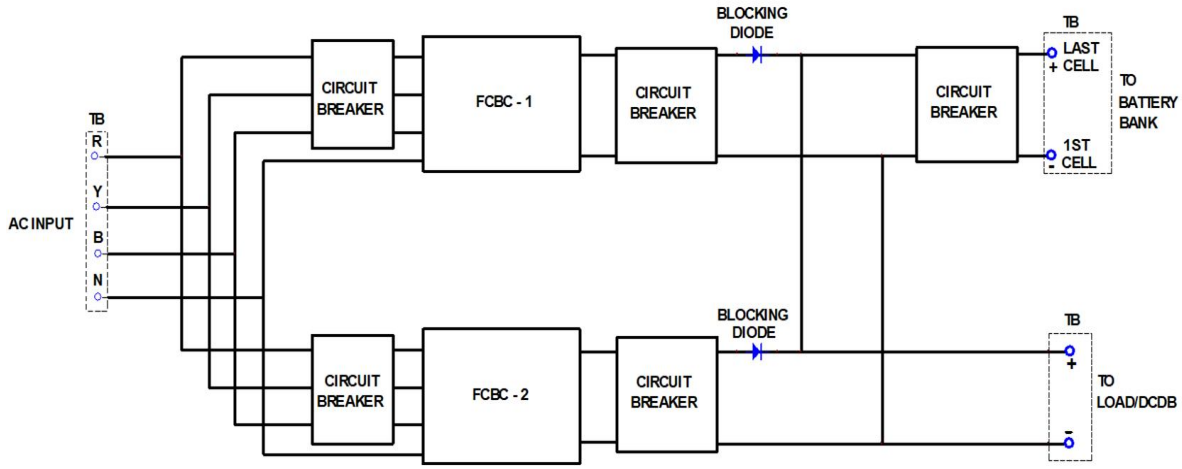
Single Line Diagram of Dual Float cum Boost Charger – Parallel Logic



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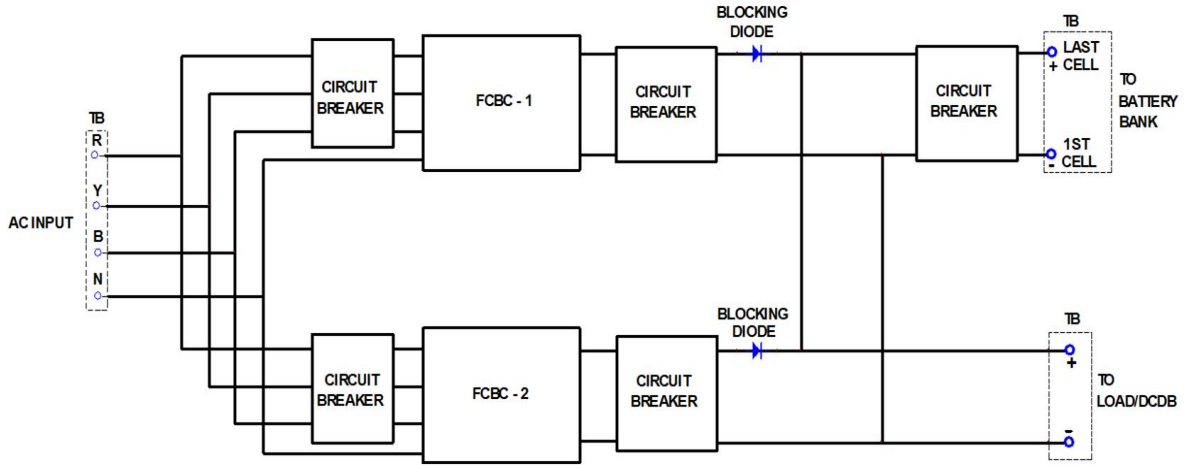
Single Line Diagram of Dual Float cum Boost Charger – Standby Logic



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Battery Charger Sizing Calculations

- **FCBC (Float cum Boost Charger)**

  FCBC Sizing = Continuous Load Current + Battery Boost Charging Current

- **FC&FCBC (Float & Float cum Boost Charger)**

  FC Sizing = Continuous Load Current + Battery Float Charging Current

  FCBC Sizing = FC Rating (or) Battery Boost Charging Current whichever is high

- **DFCBC-2CL (Dual Float cum Boost Charger-2 Contactor Logic)**

  Each FCBC Sizing = Continuous Load Current + Battery Float Charging Current
  (or)
  Battery Boost Charging Current
  whichever is high

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Battery Charger Sizing Calculations

- **DFCBC-PL (Dual Float cum Boost Charger-Parallel Logic)**

  Each FCBC Sizing = Continuous Load Current + Battery Boost Charging Current

- **DFCBC-SB (Dual Float cum Boost Charger-Standby Logic)**

  Each FCBC Sizing = Continuous Load Current + Battery Boost Charging Current

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Special Features of Battery Chargers

- Auto Phase Reversal Operation
- Soft Start on DC Side
- Class-F Insulation with Class-F Temperature Limits for all Magnetics
- Automatic Voltage Regulation using Digital Control
- Filter Circuit to Limit Ripple
- Charger Current Limiting
- Battery Path Current Limiting
- Automatic Float to Boost changeover based on current drawn by Battery
- Automatic Boost to Float changeover based on Current drawn by the Battery or Voltage at Battery Input
- Anti-condensation Space Heater with Thermostat Control
- Over Voltage Cutback
- Short Circuit Protection

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TECHNICAL SPECIFICATION OF THE BATTERY CHARGER

SCHEME : FLOAT CHARGER & FLOAT CUM BOOST CHARGER
TYPE : FULL WAVE FULL CONTROLLED

CHARGER RATING : 48VDC/35A FCBC/DFCBC (SB LOGIC) WITH ACDB; DCDB & Dropper Diode Circuit (VRLA/NVRLA)
48VDC/50A FCBC/DFCBC (SB LOGIC) WITH ACDB; DCDB & Dropper Diode Circuit (VRLA/NVRLA)
48VDC/100A FCBC WITH ACDB; DCDB & Dropper Diode Circuit (VRLA)

TYPE OF BATTERY : VRLA/NVRLA BATTERY (24 CELLS)

INPUT
Three phase Input : 415V AC ±15% (Three Phase, Four Wire)
Frequency : 50Hz ± 5%

OUTPUT
Nominal Voltage : **48V**
Ripple : 2% RMS (Without Battery connected)
Efficiency : > 85%

TYPE OF BATTERY	VRLA
NO. OF CELLS	24 Nos.
FLOAT VOLTAGE	54V DC
BOOST VOLTAGE	55.2V DC
EQUALIZING VOLTAGE	---
CHARGER O/P VOLTAGE	54V DC
CHARGER O/P CURRENT FC	35A DC/50A DC/100A DC
CHARGER O/P CURRENT FCBC	35A DC/50A DC/100A DC

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VOLTAGE REGULATION

Charger output is ±**1%** of the set value in the following conditions in set mode (FLOAT /BOOST/AUTO)

Load variation : 10-100%
Line variation : ± 10%
Frequency Variations : ± 5%
Temperature Variations : 0 ºC to +50 ºC

The following Analogue Meters of size 96x96Sqmm with 240° deflection 1.5% Accuracy will be Provided:
Battery Charge/Discharge Ammeter
Earth leakage Ammeter.

The following Digital Multifunction Meters with RS-485 port of size 96mm x 96mm with 1.0% accuracy will be provided:

AC Voltage & Current
FC Voltage & Current
FCBC Voltage & Current
Battery Input Voltage & Current
Load Voltage & Current

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INDICATIONS

Clustered LEDs will be provided for the following conditions

AC Mains ON (R, Y & B)
Float Charger ON
Float Cum Boost Charger ON

Alarm Annunciator (Facia Display Unit) with RS-485 port will be provided for the following conditions with audio alarm for abnormalities:

AC Mains Fail
FC AC I/P Circuit Breaker Trip/OFF
FC DC O/P Circuit Breaker Trip/OFF
FCBC AC I/P Circuit Breaker Trip/OFF
FCBC DC O/P Circuit Breaker Trip/OFF
DC Under Voltage
DC Over Voltage
Battery Earth fault
FC Rectifier/Thyristor fuse fail
FCBC Rectifier/Thyristor fuse fail
FC Filter/Capacitor fuse fail
FCBC Filter/Capacitor fuse fail
DC Contactor OFF
Battery Input Circuit Breaker Trip/OFF
Phase Fail

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POTENTIAL FREE CONTACTS

The following Potential Free Contacts will be available on FC & FCBC:
AC Mains Fail
FC AC I/P Circuit Breaker Trip/OFF
FCBC AC I/P Circuit Breaker Trip/OFF
FC DC O/P Circuit Breaker Trip/OFF
FCBC DC O/P Circuit Breaker Trip/OFF
Battery Earth Fault
FC Rectifier Fuse Fail
FCBC Rectifier Fuse Fail
FC Filter Fuse Fail
FCBC Filter Fuse Fail
DC Over Voltage
DC Under Voltage
Battery Input Circuit Breaker Trip/OFF
Group Alarm
Alarm Accept
Alarm Reset
DC Contactor OFF
Phase Fail

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PROTECTIONS

The following protections will be provided:

AC input Circuit Breaker is provided for both FCBC & DFCBC
DC output Circuit Breaker is provided for both FCBC & DFCBC
Filter cap fuses for both FCBC & DFCBC
Over voltage cutback protection for both FCBC & DFCBC
Fast acting semiconductor fuses for rectifier bridge for both FCBC & DFCBC
Battery input Circuit Breaker
Battery Current Limit
Charger Current Limit
Blocking Diodes
DC Short Circuit

CONTROLS & SWITCHES

AC input MCCB for both FCBC & DFCBC
DC output MCCB for both FCBC & DFCBC
Auto/Float/Boost mode selector switch
Float & Boost voltage variable potentiometers.
Mode selector switch (VRLA Battery)
Mode selector switch (NVRLA Battery)
Door lamp power supply ON/OFF toggle switch with fuse
Socket power supply ON/OFF toggle switch with fuse
Space Heater power supply ON/OFF toggle switch with fuse.
Battery Selection Switch
Battery input Circuit Breaker

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SPECIAL FEATURES

Auto Phase Reversal Operation
Soft Start on DC side
Class-F Insulation with Class-F Temperature Limits for all Magnetics
Automatic Voltage Regulation using Digital control
Filter Circuit to Limit Ripple
Charger Current Limiting
Battery Current Limiting
Automatic Float to Boost changeover based on current drawn by Battery
Automatic Boost to Float changeover based on Current or Voltage.
Anti-condensation Heater with Thermostat Control

TRANSDUCERS

Following 4–20mA (Single I/P & Single O/P) Transducers will be provided:

DC Earth Leakage Transducer – 1 No.

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GENERAL

Cabinet	:	Freestanding Cabinet; Floor Mounting Type, Sheet Steel Construction; Easy for Installation and Maintenance; Components are accessible from Front & Rear; Cable entry at Front Bottom of the Cabinet
Protection	:	IP – 42
Paint Shade	:	Exterior/Interior: 631 of IS-5
Component Mounting: Plates		Glossy White
CRCA Sheet Thickness	:	Load bearing sections – 2.5mm Non-load bearing sections – 2.0mm Undrilled Cable Gland Plate – 3.0mm
Nature of Cooling	:	Natural Air Cooling
Dimensions in mm	:	As per the Dimensional Drawings

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Bringing Intelligence and Standardization in Battery Chargers

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i-Swift Battery Charger to AP TRANSCO

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WHY i-Swift Chargers??

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- Standard Technical Specifications
- Standard Product
- Reliable and Qualitative Product
- Reasonable Price
- Faster Deliveries
- Better Customer Support
- Customer Satisfaction

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Intelligent System

LCD Display and LEDs

Indication Description	LCD	LED
AC Main Fail		
SCR Fuse Fail		
Battery Fuse Fail		
Charger Fail		
Charger Under Voltage		
Charger Over Voltage		
Battery Earth Fault		
Load Under Voltage		
Load Over Voltage		
Phase Fail		

BC-Comparison

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iSWift™

16 PCBs Brought down to only **4** and hence Optimization

FRONT VIEW

Feature/Facility	Conventional Charger	i-Swift Charger
AC Input Supply	3 Phase-3 Wire or 3 Phase-4 Wire	3 Phase-3 Wire and 3 Phase-4 Wire
Measuring - Parameters like Voltages & Currents	Low Accuracy	High Accuracy
Voltage Regulation	± 1% of Set Value	± 0.5% of Set Value
Metering & Measurements	Analog AC/DC Volt & Ammeters	No Meters. LCD with Key Pad
Selector Switches like AC Volt-Amp Select, DC Volts Select, Mode Select etc.	Required	Not required. LCD with Key Pad is used.
Automatic Voltage Regulation	Using Digital Controlled Logic	Using Microcontroller
Charger Shutdown Facility	Not available	Available
Blocking Diode Short sensing	Not available	Available
RS-485 serial Port communication using Universal MODBUS Protocol	Not available	Available
Charger compatibility against Battery Type (VRLA; NI-CD; Plante & Tubular)	Suitable to charge only one type of Battery among the four varieties	Suitable to charge any type of Battery among the four varieties
Temperature Range of Operation	0 - 50 ºC	-5 ºC to 50 ºC
No of PCB's	More than- 15No.s	3Nos.
Inventory	More	Less

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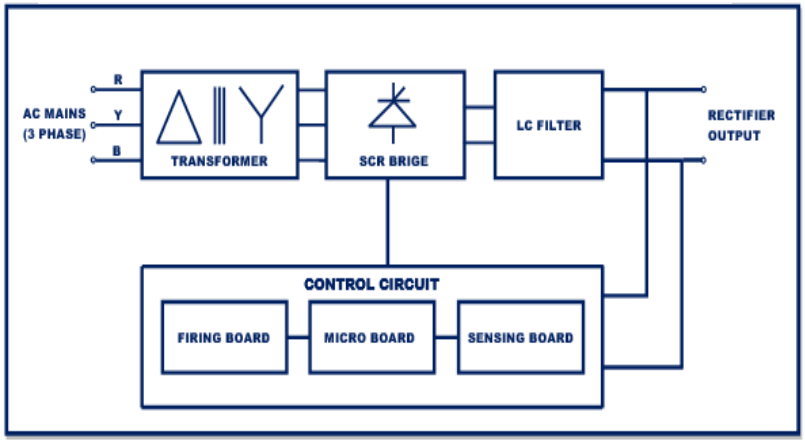
FUNCTIONAL BLOCK DIAGRAM OF A MICROBASED RECTIFIER UNIT



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Advantages of Micro Controller based Battery Charger

- Process of Controlling and Monitoring Charger Parameters through Micro Controller.
- Micro Controller generates the accurate references for Voltage and Current control.
- Real Time Remote Monitoring of the Charger through RS-485 Communication
- Menu Driven LCD to Display all System Parameters
- Remote Monitoring of System Parameters.

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TECHNICAL SPECIFICATION OF THE BATTERY CHARGER

SCHEME : FLOAT CUM BOOST CHARGER WITH DROPPER DIODE CIRCUIT, ACDB & DCDB

TYPE : FULL WAVE FULL CONTROLLED

CHARGER RATING : 48VDC/100A FCBC SUITABLE FOR 400AH/425AH BATTERY

TYPE OF BATTERY : VRLA /NVRLA BATTERY (24 CELLS)

INPUT

Three phase Input : 415V AC ±10% (Three Phase, Four Wire)
Frequency : 50Hz ± 5%

OUTPUT

Nominal Voltage : **48V**
Ripple : < 2% RMS
Efficiency : > 85%

Type of Battery	VRLA	NVRLA
No. of Cells	24 No's	24 No's
Nominal Voltage [2 VPC X 24 Cells]	48.0V DC	48.0V DC
Float Voltage [2.25 VPC X 24 Cells]	54.0V DC	54.0V DC
Boost Voltage [2.3 VPC for VRLA & 2.65VPC for NVRLA X 24 Cells]	55.2V DC	63.6V DC
Equalizing Voltage [2.75 VPC X 24 Cells]	----	66.0V DC
Load Voltage (Voltage applied on Load)	52.0V DC ± 2V at Load Terminal after Dropper Diode Circuit	

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VOLTAGE REGULATION

Charger output is ±**1%** of the set value in the following conditions in set mode (FLOAT /BOOST/AUTO)

Load variation : 10-100%
Line variation : ± 10%
Frequency Variations : ± 5%
Temperature Variations : 0 °C to +50 °C

INDICATIONS

Cluster LED Lamps are provided for "AC Mains ON (R, Y, B)" condition.
The following indications are indicated by 5mm LEDs:

AC Mains ON : Green LED
Charger ON : Green LED
Float ON : Green LED
Boost ON (in FCBC only) : Amber LED
AC Mains Fail : Red LED
Charger OV : Red LED
Charger UV : Red LED
SCR Fuse Fail : Red LED
Charger Fail : Red LED
Group Alarm : Red LED

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Battery Earth Fault	:	Red LED **(This Indication is Inactivate)**
Load Under Voltage	:	Red LED
Load Over Voltage	:	Red LED
Battery Under Voltage	:	Red LED
Battery over voltage	:	Red LED

DISPLAY

The following parameters are displayed on LCD:

AC Input Voltage either Line to Line or Line to Neutral
AC Input Current in each phase
Charger Output Voltage
Charger Output Current
Charger ON/OFF
Battery Voltage
Battery Charging Current / Discharging Current
Load Voltage
Load Current
Alarms

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ALARMS WITH BUZZERS:

The following alarms(through LCD as a text message) shall be displayed:

AC mains fail or out of limit	:	Both LCD and LED indication
SCR fuse Fail	:	Both LCD and LED indication
Charger Fail	:	Both LCD and LED indication
Charger Under Voltage	:	Both LCD and LED indication
Charger Over Voltage	:	Both LCD and LED indication
Group alarm	:	LED indication
Battery Earth fault	:	Both LCD and LED indication
Load under voltage	:	Both LCD and LED indication
Load over voltage	:	Both LCD and LED indication

SPECIAL FEATURES:

Auto Phase Reversal Operation
Soft start on DC Side
Class-F insulation for all Magnetics
Automatic Voltage Regulation using Digital Control Logic
Filter Circuit to limit Ripple
Charger Current Limiting
Battery Current Limiting
Automatic Float to Boost changeover based current drawn by Battery
Automatic Boost to Float changeover based on current or voltage
Anti-condensation Space Heaters with thermostat control

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METERING:

The following Analogue meters of 96mm x 96mm with 90° deflection will be provided:

AC input voltmeter with Selector switch
DC output ammeter
DC voltmeter with selector switches to monitor FCBC/Load/Battery
Battery Charge/Discharge Ammeter(In smart switch)

PROTECTIONS:

The following protections shall be provided.
AC Input circuit breaker
Fast acting semiconductor fuse for SCR bridge
DC over voltage cutback/Shut down
DC overload
DC output circuit breaker
Battery input Fuses
Battery current limiting.
Blocking diode to protect the reverse currents to charger

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CONTROLS & SWITCHES:

AC Input ON/OFF Circuit Breaker
DC Output ON/OFF Circuit Breaker
Battery Input Fuses
Socket ON/OFF Switch
Space Heater ON/OFF Switch
Door Lamp ON/OFF Push Button
Push Buttons: Menu; Increment; Decrement; Enter & Back

ENVIRONMENTAL STABILITY

Operating Temperature	:	-5 ºC to +50 ºC
Storage	:	25 ºC to +70 ºC
Relative Humidity	:	0-95% (Non-condensing)
Noise Level	:	< 70 dB (A)

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Following ACDB & DCDB will provided in the Same Enclosure:

I. AC DISTRIBUTION BOARD DETAILS:

- **Outgoing Feeders** : 6A – SPN – AC- MCB – 6 Nos.

II. DC DISTRIBUTION BOARD DETAILS:

- **Outgoing Feeders** : 6A – SP – DC- MCB – 32 Nos.

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GENERAL

Cabinet	:	Freestanding Cabinet; Floor Mounting Type, Sheet Steel Construction; Easy for Installation and Maintenance; Components are accessible from Front & Rear; Cable entry at Front Bottom of the Cabinet
Protection	:	IP – 42
Paint Shade	:	Exterior/Interior: 631 of IS-5
Component Mounting: Plates		Glossy White
CRCA Sheet Thickness	:	Load bearing sections – 2.5mm Non-load bearing sections – 2.0mm Undrilled Cable Gland Plate – 3.0mm
Nature of Cooling	:	Natural Air Cooling
Dimensions in mm	:	As per the Dimensional Drawings

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DIFFERENT SCHEMES in i-Swift

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iSWIFT™

Voltage/ Current	25A	50A	75A	100A	125A	150A
220V	√	√	√	√	√	√
110V	√	√	√	√	√	√
48V	√	√	√	√	√	√
24V	√	√	√	√	√	√

i-Swift charger's compatible to all types of batteries : VRLA, Ni-Cd, Tubular & Plante

i-Swift Chargers-in Export Market

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Customer : ABB- Bangalore
PROJECT : Northern Bangkok Monorail

HIGHLIGHTS OF THE ORDER

- 1st Export Order for Metro
- Highest PO Value in DCP
- VRLA batteries for Metro rail
- I-Swift based Charger

- Nos.of systems : 55 No's

i-Swift Applications

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CEMENT

Application Segments

PAPER

DC Power

Power

METAL

TEXTILE

SOLAR

FOOD PROCESSING

For various Industrial Requirements and Substation Requirements

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INSTRUCTIONS TO BE FOLLOWED DURING OPERATION & MAINTENANCE OF CHARGER

- **Before switching ON, ensure**
  - **All the Input / Output Connections are made properly.**
  - **Rated Voltage is available at Input Terminals.**
- **Do not switch ON the system with out proper Earthing.**
- **Ensure The system total OFF condition with all controls in initial status as per Product Manual.**
- **Do not disturb the Potentiometers used in PCBs as they are already set at Factory.**
- **Do not Switch ON the Faulty Rectifier without knowing the basic cause.**
- **Do not use Wire Fuses. Ensure to replace blown Fuses with exact Fuse and Fuse Trips.**
- **Do not allow Unauthorized People to Service the Battery Charger.**

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MAINTENANCE AND TROUBLE SHOOTING

Maintenance

- Charger requires very little maintenance
- Need general checkup once in 6 months
  - Verify the Float/Equalize/Boost Voltage
  - Physical condition of Capacitor Bank

Troubleshooting

- DC Over Voltage - Refer the manual and adjust the respective Potentiometer
- DC Under Voltage - Check whether the Battery Bank is supplying Load Current, if that is the case, Check the Battery Voltage and disconnect the Load before Battery reaches it's ECV.
- DC Earth fault-Check Battery and load +Ve/-Ve Earthing. Remove the Earthing

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MAINTENANCE AND TROUBLE SHOOTING

Charger Fail

- Check all the AC input conditions
- Check if all the Bridge Devices are in Healthy condition.
- Replace Bridge devices with new one as per BOM only
- Check the Battery condition, if it is fully Discharged then disconnect the Battery from Load