

DRAWINGS
FOR
APPROVAL

RATING : 220V/22A FLOAT CHARGER
220V/25A FLOAT CUM BOOST CHARGER WITH
DCDB

PROJECT : 220KV SUBSTATION

CUSTOMER : APTRANSCO

P.O.NO. : -----

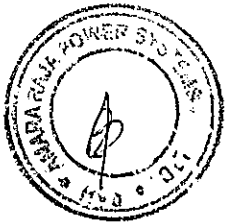
S.O. NO. : -----

JOB.NO : -----

MANUFACTURER: AMARA RAJA POWER SYSTEMS LTD,

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GENERAL DESCRIPTION

The Battery Charger is for charging the Battery in various modes and at the same time to meet the Load requirement. The system consists of two Battery Chargers (Float and Float cum Boost Chargers) with interlocking contactor circuit & dcdB. Each Battery Charger consists of Double Wound Charger Input Transformer, Rectifier Bridge Circuit, Filter Circuit, Common Alarm Indicator and Interlocking Circuit. For clear understanding, refer the enclosed Functional Block Diagram.

During normal operation, the Mode Selector Switch remains in AUTO position where the Float Charger supplies Load current and Battery Trickle charging requirement and the Float cum Boost Charger remains in OFF condition. Whenever the Battery requires Boost charging, the same can be selected by throwing the AUTO/FLOAT/BOOST Selector Switch to BOOST mode in Float cum Boost Charger. Also, provision is available to select the charging modes Float/Boost automatically by keeping the same switch in AUTO position.

The Battery Chargers work on 415V AC, Three Phase, 50 Hz. supply. The Chargers are capable of delivering the full rated Load at the specified voltage at output terminals. This voltage is maintained for AC input variation of +10%, -15% and Load variation from 0-100% full Load.

The Battery Chargers, FC & FCBC are housed in a single cabinet of free standing sheet steel construction. The cabinets are provided with front and back doors for easy accessibility. Panel Meters, Meter Selector Switches are provided on the front panel of the cabinet and also cable entry is provided at front bottom of the cabinet. By opening the front bottom door, one can reach the termination easily.



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TECHNICAL SPECIFICATION OF CHARGER

TYPE : FLOAT AND FLOAT CUM BOOST CHARGER

MODEL : FULL WAVE FULL CONTROLLED

RATINGS : 220V/22A FC & 25A FCBC WITH DCDB (Suitable for 220V/200AH VRLA battery)

1.0 AC INPUT

- a. Voltage : 415VAC +10% & -15%
- b. Frequency : 50Hz ± 5%
- c. Phase : 3 Phase, 4 Wire

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[Signature] 8/12/2011

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2.0 DC OUTPUT

a. Float Charger

- 1. Voltage : 247.5V DC adjustable by +2%, -5%
- 2. Regulation : Better than ± 1% at full voltage
- 3. Ripple : Less than 2% RMS
- 4. Current : 22A

b. Float Cum Boost Charger

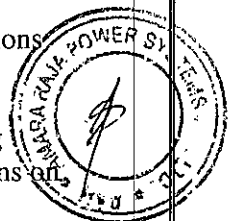
- 1. Float Voltage : 247.5V DC adjustable by +2%, -5%
- 2. Boost Voltage : 253V DC adjustable by +2%, -5%
- 3. Regulation : Better than ± 1% at full voltage
- 4. Ripple : Less than 2% RMS
- 5. Current : 25A

c. At Load output : 247.5V DC + 1%V DC (at load terminals)

d. Efficiency : Better than 85% at Full load

1. METERS : Following Analog type meters of size 96 x 96 sqmm with 240° deflection are provided in the system for monitoring the respective parameters.
- a. AC Voltmeter with selector switch to monitor L-L & L-N voltage
 - b. DC Voltmeter with selector switch (FC / FCBC / Load / Batt)
 - c. DC Ammeter for both FC & FCBC
 - d. Centro zero battery ammeter
 - e. Centro zero earth leakage milli ammeter

2. INDICATIONS : 1. Pilot lamps are provided for the following conditions
- a. AC Mains ON (R, Y & B)
2. LED type indicators are provided for the following conditions with audio alarm for abnormal conditions on each charger



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- a. AC Mains Fail
- b. AC Input CB trip /off(FC & FCBC)
- c. Rectifier fuse failure(FC & FCBC)
- d. Filter cap fuse failure(FC & FCBC)
- e. DC out put CB trip off(FC & FCBC)
- f. DC Over voltage
- g. DC under voltage
- h. Battery/DC earth fault
- i. DC Contactor ON
- j. ChargerON(FC & FCBC)

5. PROTECTIONS : Following protections are provided in the system
- a. AC input MCB is provided for both FC & FCBC
 - b. DC output MCB is provided for both FC & FCBC
 - c. Over voltage cutback protection for both FC & FCBC
 - d. Charger over load protection for both FC & FCBC
 - e. Fast acting semiconductor fuses for rectifier bridge for both FC & FCBC
 - f. Battery input MCB

6. CONTROLS & SWITCHES:
- a. AC input MCB for both FC & FCBC
 - b. DC output MCB for both FC & FCBC
 - c. Auto/Float/Boost mode selector switch
 - d. Float & Boost voltage variable potentiometers.
 - e. DC voltage selector switch
 - f. AC Voltmeter selector switch
 - g. Door lamp power supply ON/OFF toggle switch with fuse
 - h. Socket power supply ON/OFF toggle switch with fuse
 - i. Heater power supply ON/OFF toggle switch with fuse.

7. SPECIAL FEATURES : The following features are provided in the system.
- a. Soft start on DC side.
 - b. Class-F insulation for all magnetic
 - c. Automatic voltage regulation using digital control logic
 - d. Automatic float to boost and vice versa change over based on current drawn by battery
 - e. Filter circuit to limit ripple
 - f. Charger current limiting.
 - g. Built-in Auto phase reversal operation

8. DCDB : Charger built in DCDB for 200AH battery charger

Incomer : 100A-2P-DC-MCCB – 1 No

Outgoing feeders : 20A – 2P –DC- MCB – 12 Nos

10A – 2P – DC-MCB – 24Nos

Indication : DC incomer ON & DC outgoing feeder ON indication for all feeders is provided.



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9. GENERAL :
1. Cabinet :

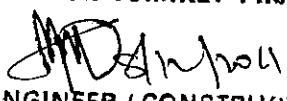
Free standing cabinet, floor mounting type, sheet steel construction, easy access for installation and maintenance.
2. Paint :

Light Grey – 631 of IS 5
3. Ambient Temperature range of operation :

0-50°C
4. Relative Humidity :

0 - 95% non condensing

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CHARGER THEORY

The system consists of one Float Charger, one Float cum Boost Charger, Interlocking contactor circuit, Alarm Indicator Circuit. The Float and Float cum Boost Chargers are similar in nature and works on the same principle. These chargers are rated to meet the requirement of Load and Battery Charging current as specified. For clear understanding of system description, refer schematic drawing enclosed.

The Float and Float cum Boost Chargers are connected to the AC input power through individual circuit breaker Q 401/501. The transformer T 401/501 steps down the AC input to the required level and this AC power is fed to the respective power bridge. (SCR/V (401-403/501-503)). The charger control board PC 401/501 provides the regulation and current limit to the charger circuit, in addition to supply gate pulses to the power SCRs. The output voltage of Float/ Float cum Boost Charger is adjusted using the potentiometer R 401/501-502 respectively.

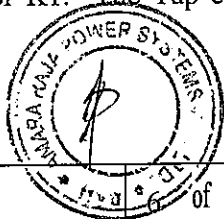
The DC power is filtered and smoothened using filter chokes L 401/501 and DC capacitors bank C 402/502.

Proper operation of the charger is a matter of carefully determining the precise moment to fire the SCRs by supplying proper gate pulses. The charger control board PC 401/501 accomplishes this function. The control board PC 401/501 detects the zero cross over (-ve to +ve) of input sine wave and send the gate pulses to SCRs at appropriate timings. The DC output voltage is fed back to the control board PC 401/501 for regulation.

The meter P 401/501 with shunt SH 401/501 provides the current feedback to the charger control board PC 401/501 which causes the unit to go into current limit beyond the set value. These characteristics cause the output voltage to go down when the battery is run down, so as to maintain a constant level of charging current.

The meters P 401/501 with shunt SH 401/501 monitors the respective charger output DC current. The DC voltmeter P1 monitors the FC/FCBC/ Load / Battery voltages through selector switch (S 1), P 2 is used to measure battery charger/discharge current

The battery input is connected to the DC bus through interlocking contactor K1. The Tap cell diode of the battery bank is connected to positive DC bus through Diode V 1.



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INTERLOCKING CONTACTOR (K1) OPERATION:

Provision is made to close the K1 for various conditions of operation. The contactor operates on battery through potential free contacts of FC & FCBC output voltage sensing boards PC 403 & relay board PC 503. The precautions are taken for the following conditions.

- a. If mains power supply failed, through PC 404 and PC 504 energized the contactor and ensures total Battery bank on DC bus.
- b. In Float cum Boost Charger, if F 501 or 502 is blown or charger fails (when the batteries on Float cum boost charger) the contactor K1 closes through FCBC output relay sensing board PC 503 so that the battery is connected to Float charger.
- c. If Float charger or Float cum Boost charger failed then also the contactor K1 is closed and providing full battery voltage to load.
- d. If float charger fails, then the Float cum Boost charger should come in to Float mode automatically (whatever may be the mode selector switch position) and supplies Load requirement by closing the contactor K1 through FC output PC 404.

PRINCIPLE OF OPERATION

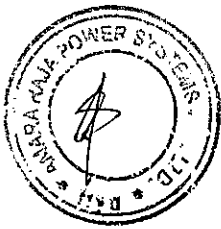
During normal operation the float charger supplies load current and Battery Trickle current and Float cum Boost charger will be in Off condition and Inter locking contactor K 1 in Closed condition. The Float cum Boost Charger is kept in auto mode (switch S 501 in auto position) to select the battery charging mode (Float or Boost) automatically based on battery condition.

The Master Auto current detector board PC 1 senses the battery charging current, and whenever the Float charging current is more than the preset value, the relay board PC 2 connected through the Master Auto Current Detect Board will change the status of its relay potential free contacts and makes the FCBC to come into Boost mode.

Provision is available to put the batteries in boost charge mode manually by using the selector switch SW 501. This manual mode over rides the battery condition and the batteries will be kept in boost mode. During this mode , if FLOAT CHAGER fails , then tap cell, will supply load momentarily, soon after the Interlocking Contactor closes and the FLOAT CUM BOOST CHARGER come into Float mode automatically and supplies Load and Battery trickle requirement.

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Standardised Drawing for 220 KV Substations 220V/22A
FC & 25A FCBC CHARGER(AMARA RAJA make).

STD/GTP-DWG/Approval No. 260-1 Revision No. 0

Prepared & Approved during November- 2011

Customer ref : APTRANSCO

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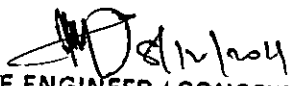
Annexure - 1

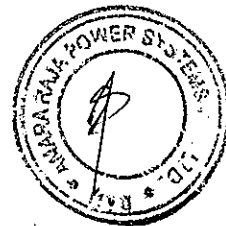
GUARANTEED TECHNICAL PARTICULARS

FOR BATTERY CHARGING EQUIPEMENT (220V)

S.No.	Description	220V DC, 200AH
1.	Type of rectifier	: 3phase, full wave Full controlled using thyristors .
2.	No. of units	: Two i.e. One FC and One FCBC
3.	Manufacturer's type designation	: Float and Float Cum Boost Charger
4.	AC supply	:
	a) Voltage (Volts)	: 415 V AC +10%, -15%
	b) Current (Amps)	:
	i.) Float Charger	: Around 9.86A
	ii) Boost Charger	: Around 11.20A
c)	No. of phases	: Three Phase, Four Wire
d)	Frequency, cycles / Sec	: 50Hz $\pm$ 5%
e)	Power factor	: 0.75 lag at nominal AC Input
5.	Percentage taps provided on transformer	: Nil, not required for thyristor based rectifier.
6.	Rated D.C output for	:
	a) Boost charger (k W)	: 6.32KW
	b) Float Charger (k W)	: 5.44KW
7.	Rated D.C. output voltage for	:
	a) Boost charger (Volts)	: 253V DC
	b) Float charger (Volts)	: 247.5V DC
8.	Rated D.C. output current for	:
	a) Boost charger (amps)	: 25A
	b) Float charger (amps)	: 22A
9.	Rate of D.C. voltage control for	:
	a) Boost charger (Volts)	: 253V DC
	b) Float charger (Volts)	: 247.5V DC

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APTRANSCO/VIDYUTH SOUNDERPALLY/HYD.



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S.No. Description

220V DC, 200AH

10. D.C. output voltage regulation from no load to : Better than $\pm 1\%$ of set value
full load volts
11. Maximum ripple content % : Less than 2% RMS
12. Maximum permissible temperature rise over :
an ambient temperature of 50 Deg.C
- Magnetics : 90°C
- SCR's : 70°C
- Diode's : 90°C
13. Overall efficiency : Not less than 85% at full load
14. Unit dimensions (With Canopy panel) : Refer enclosed dimensional drgs
Width x Height x Depth mm
15. Unit shipping weight Kgs. : Refer enclosed dimensional drgs
16. Load limiting feature (Please attach characteri- : Current is limited at 110% of rated load
stics showing variation of voltage with increase in load)
17. Recommended settings for thermostat :
- a) Operation temperature Deg.C : 50°C
- b) Reset temperature Deg.C : 0°C

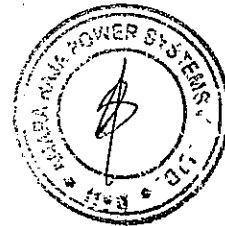
18. List of major accessories provided : Not applicable

19. The type tests should have been conducted not earlier than 5 years in standard
third party laboratory. The manufacturer shall produce the type test reports at
the time of acceptance tests.

20. Quality of material held applicable standard B.P.S. The manufacturer
shall produce the valid B.P.S certification at the time of acceptance tests.

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APTRANSCO/VIDYUTH SOUDHA/HYD.



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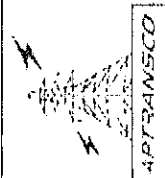
ENG-SFS-01/REV 0

9

Standardised Guaranteed Technical Particulars for 220 KV
Substations 220V/22A FC & 25A FCBC CHARGER(
AMARA RAJA make)

STD/GTP-DWG/Approval No. 260-2 Revision No. 0

Prepared & Approved during November 2011

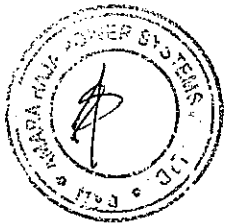


TECHNICAL DEVIATION / JUSTIFICATIONS

SI No	Clause no	Deviation / Justification
1.	5.3 (iii), 5.4 (iii), (iv), (v) & (vi)	As we employing thyristor based rectification for both float and boost chargers, there is no necessity to provide AC input contactor along with thermal over load relay, ballast chokes to give tapered charging, taps on transformer and coarse & fine control switch since it has precise control at the output DC side. Offered version has better regulation, lower ripple content and higher efficiency etc. Further offered battery charger has in built DC over load / short circuit protection and hence, input doesn't exceeds the set value.
2.	5.5 (vi)	As MCCB with O/L & S/C release is considered at battery input, there is no necessity to provide HRC fuses.
3.	5.8 (c to f)	As MCB's being considered at the input and output, MCB trip/off indication will be provided in place of fuse blown.
4.	5.15	Offered charger has analog type meters of size 96Sq.mm with 240° deflection instead of 270°.
5.	5.19.4 (a to f)	DCDB Incomer & outgoing feeders will be MCBs Instead of Switch with fuses
6.	5.20	All cubicles undergo 7 tank cleaning process according to IS 6005, class C followed by powdered coating process instead of primary coats of red-oxide. Offered process is latest one having higher life.

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Standardised Drawing for 220 KV Substations 220V/22A FC & 25A FCBC CHARGER(AMARA RAJA make).
STD/GTP-DWG/Approval No. 260-3 Revision No. 0

Prepared & Approved during November - 2011

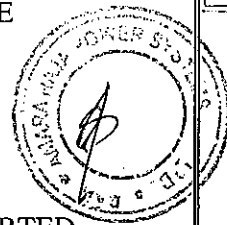
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AMARA RAJA STANDARD SUB-VENDOR LIST

1. Air Circuit Breakers	GECA / C&S / HAVELLS / LG / INDOASIAN
2. Switch-Fuse Units	L & T / GECA
3. Rotary Switches	SALZER (L&T) / KAYCEE
4. Current Transformers (CTs)	KAPPA / NIPPEN
5. Toggle Switches	RGK / RECOM
6. Moulded Case Circuit Breakers (MCCBs)	C&S / SCHNEIDER / INDOASIAN
7. Miniature Circuit Breakers (MCBs)	LEGRAND / SCHNEIDER / INDOASIAN
8. Fuses (HRC & HBC) / Fuse Bases	BUSSMANN
9. Fuses (GLASS) / Fuse Bases (FUSE BASES)	PROTECTRON (FUSES)/CONNECTWELL
10. AC Contactors	ABB / L&T / C&S
11. Bi-metallic Over Load Relays (OLTs)	ABB / L&T / C&S
12. DC Contactors	ANDREW YULE / POWNIX
13. Timers	L&T / EAPL
14. Meters	BEEMET / RISHAB
15. Push Buttons / Indicating Lamps	TEKNIC / L&T/SIEMENS/RGK
16. Wire Wound Resistor	PEC / VEPL / DIAGRAM
17. Potentiometers	POTEL / BOURNS
18. Heat Sinks	GLOBAL ALUMINIUM
19. Thyristors / Power Diodes	HIRECT / RIR
20. Control Diodes	NAINA / KHEL / MIC
21. Populated PCBs	AMARA RAJA POWER SYSTEMS (P) LTD.
22. AC/DC Aux. Relays in Populated PCBs	PLA / OEN
23. Electrolytic Capacitors	SARADA/ALCON
24. Polyester Capacitors	EL-CI-AR
25. KVAR / AC Capacitors	CHITANYA / SARADA
26. Light Emitting Diodes (LEDs)	KWALITY / SANKEN
27. Terminal Blocks	ELMEX / ESSEN / PHOENIX / ELECTROLS
28. Shunts	BEEMET / NIPPEN
29. Metal Oxide Varistors (MOVs)	ELPRO / GMEL / HARRIS
30. Cable Glands	HMI / NOVOFLEX
31. Cables	APPROVED FOR TURNKEY PROJECTS OR BIS APPROVED MAKE
32. Bus Bars	CUBEX TUBINGS / HARINAM
33. Thermal Switches	UTILITY APPLICATIONS
34. Heaters	CHIEF ENGINEER / CONSTRUCTION APTRANSCO/VIDYUTH SOJDA/HYO.
35. Knife Switches	EE
36. Fans	EBM / HI-COOL / SUNON / IMPORTED
37. Alarm Annunciator (Facia Display Unit)	SUN INDUSTRIAL AUTOMATION (I) LTD.
38. Current & Voltage Transducers	RISHABH
39. Magnetics (Transformers & Chokes)	AMARA RAJA POWER SYSTEMS (P) LTD.
40. Cabinets / Panels	MPPL (SISTER CONCERN OF AMARA RAJA)

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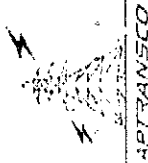
CHIEF ENGINEER / CONSTRUCTION
APTRANSCO/VIDYUTH SOJDA/HYO.



Standardised Drawing for 220 KV Substations 220V/22A FC
& 25A FCBC CHARGER(AMARA RAJA make)
STD/GTP-DWG/Approval No. 260-4 Revision No. 0

Prepared & Approved during November - 2011

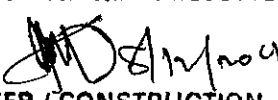
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Amara Raja POWER SYSTEMS Pvt. Ltd.				Bill Of Material Report				Doc Ref No: ENG-SFS-08/REV 0			
Item Code	40480210102	Variant	##	Description	Resistor-10R-0.25W-1%-6.2mm-MFR-	Qty	1	UOM	NOS	Rev	0
S.No	Rev	Circuit Designation	Item Code	Description	Variant	Var Description	Qty	UOM	System	UOM	Sub
1	0	-B1	425000000067V	THERMAL SW-SET AT65°C-NC	U007	UTILITY APPLIACES		1.000			
2	0	-BZ1	4250000000069V	Buzzer-12V-20mm-CE-27-01	M064	Metronix		1.000		NOS	
3	0	-C401,-C501	407304000200V	capacitor-polyster-2mfd-400V-axial	E013	2µF/±20%400VDC/KT12		2.000		NOS	
4	0	-C402,-C502	40713503300V	Cap-Elec-3300mfd-350VDC	A006	ALCON		2.000		NOS	
5	0	-DL1	425000002104	BULB-CFL-5W-230VAC	P007	Philips		1.000		NOS	
6	0	-DL1*	425000000236V	BULB HOLDER	A008	Anchor		1.000		NOS	
7	0	-DS1	47311000200V	PB-door lamp-NC-(Refrig switch)	STD	STD Vendor		1.000		NOS	
8	0	-E1	425000000011V	SPACE HEATER -100W-240VAC	P013	PYRO		1.000		NOS	
9	0	-F1*,F403*,F404*,F405*,F406*,F407*,F408*,F409*,F410*,F503*,F504*,F505*,F506*	475120000063	Fuse base-1A-6.3A-600V W/O fuse	C059	Connectwell-CSFL4U		13.000		NOS	
10	0	-F1,-F403,-F404,-F405,-F406,-F407,-F408,-F409,-F503,-F504,-F505,-F506	47504200100V	Glass Fuse-fast-1A-250VAC-20MM	P011	PROTECTRON		12.000		NOS	
11	0	-F401,-F402,-F501,-F502	47501126025	Semiconductor fuse-fast-25A-690V AC	B017	Bussman-25ET		4.000		NOS	
12	0	-F410	475042000600	Glass Fuse-fast-6A-250VAC-20mm	P011	Protec-PSF6A		1.000			
13	0	-F411*,F507*	47512000016V	Fuse base-32A-415/500V AC	B017	Bussmann-FA32		2.000		NOS	
14	0	-F411,-F507	47503074016	HRC fuse-slow-16A-415/550V AC-clip on	B017	BUSSMAN-NSD16		2.000		NOS	
15	0	-H401	47712105221	Clustered LED-assy-240VAC-22.5mm-red	E007	L&T ESBE: EIL R 240A		1.000		NOS	yes
16	0	-H402	47712105222	Clustered LED-assy-240VAC-22.5mm-yellow	E007	L&T ESBE: EIL Y 240A		1.000		NOS	yes
17	0	-H403	47712105224	Clustered LED-assy-240VAC-22.5mm-Blue	E007	L&T ESBE: EIL B 240A		1.000		NOS	yes
18	0	-K1	47930246032	Contacto-32A-220VDC coil-2NO+2NC	A009	PAK-20US-220VDC		1.000		NOS	
19	0	-K401*,K402*,K403	47480200311V	Relay base-PNL-11pin-3C/O	P008	PLA		3.000			

APPROVED FOR TURNKEY PROJECTS



CHIEF ENGINEER / CONSTRUCTION-1
APTRANSCO/VIDYUTH SOUDHA/HYD.

APTRANSCO-22A-25A

Amara Raja POWER SYSTEMS Pvt. Ltd.				Bill Of Material Report				Doc Ref No: ENG-SFS-08/REV 0			
Item Code	40480210102	Variant	#	Description	Resistor-10R-0.25W-1%-6.2mm-MFR-	Qty	1	UOM	NOS	Rev	0
S.No	Rev	Circuit Designation	Item Code	Description	Variant	Var Description	Qty	System	UOM	SUB	Remarks
20	0	-K401,-K402,-K403	47410131600V	Relay-240VAC-panel mount-240A-mpc-3c/o	P008	PLA-3C/O-MPC-240A		3.000	NOS		
21	0	-L401,-L501	43200006315	Filter choke-5.0mH-0030253	A010	ARP-AT-6315		2.000	NOS	yes	
22	0	-LED(1-12)	40477112001V	LED-RED-ROUND-5mm	K013	KL53SBLRL6L-M		12.000	NOS		
23	0	-LED(1-50)*	42500002804	LED Holder-5mm round-press fit-white	L016	Lalwani Elect-LHO-5		50.000	NOS		
24	0	-LED401,-LED501,-L ED(13-50)	40477112003V	LED-GREEN-ROUND-5mm	K013	KL53LBYGDIN-N		38.000	NOS		
25	0	-MOV401,-MOV402,-MOV403,-MOV404,-MOV405,-MOV406,-MOV501,-MOV502,-MOV503,-MOV504,-MOV505,-MOV506	40413061400V	MOV-60V-14mm	STD	STD Vendor		12.000	NOS		
26	0	-P1	47610934030	DC voltmeter-0-300V-1.5-240D	B011	Beemet-DVF-96		1.000	NOS		
27	0	-P2	476111434010	DC ammeter-100-0-100A/75mV-1.5-240D-96	B011	Beemet-DVF96		1.000	NOS		
28	0	-P3	476111534100	DC ammeter-100-0-100mA-1.5-240D	B011	Beemet-DVF96		1.000	NOS	yes	
29	0	-P401,-P501	47610534003	DC ammeter-0-30A/75mV-1.5-240D	B011	Beemet-DVF-96		2.000	NOS		
30	0	-P402	47610834050	AC voltmeter-0-500V-1.5-240D	B011	Beemet-SVF-96		1.000	NOS		
31	0	-PB1,-PB2	47310000104V	PB-microswitch-1C/O-black	R001	R.G.KESWANI-MR3/FPBB		2.000	NOS		
32	0	-PC1	ARE02018202	PCB-MST-ACDB-48VDC	A041	AREPL-P02018202		1.000	NOS		
33	0	-PC2,-PC504	ARE02002015	PCB-PLA-RELAY-260VDC-2C/O CONT.	A041	AREPL-P02002015		2.000	NOS		
34	0	-PC3	ARE02018235	PCB-MST-UV/OV-RD-220VDC	A041	AREPL-P02018235		1.000	NOS		
35	0	-PC4	ARE02017017	PCB-ALARM-48VDC-TB	A041	AREPL-P02017017		1.000	NOS		
36	0	-PC401*,-PC501*	ARE02009011	PCB-POWER SUPPLY BD-6P	A041	AREPL-P02009011		2.000	NOS		
37	0	-PC401*,-PC501*	ARE02009022	PCB-REG CTRL-6P-220V	A041	AREPL-P02009022		2.000	NOS		
38	0	-PC401*,-PC501*	ARE02009031	PCB-GATE PULSE DRIVE-6P	A041	AREPL-P02009031		4.000	NOS		
39	0	-PC401,-PC501,-PC502,-PC503,-PC504,-PC505,-PC506	ARE02009000	PCB-CHGR-6P-MOTHER BD	A041	AREPL-P02009000		2.000	NOS		
40	0	-PC402,-PC502	ARE02001101	PCB-FILTER-1MFD 1000V-TB	A041	AREPL-P02001101		2.000	NOS		
BOM Status :				HEMALATHA.K	APTRANSCO-22A-25A						
Report Run Date & Time :				29/01/2011 16:40:02	Prepared By		Checked By		Approved By		
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										BOM Ref Doc No	
										Page No 2 Of 4	

APPROVED FOR TURNKEY PROJECTS

CHIEF ENGINEER / CONSTRUCTION-1
APTRANSCO/VIDYUTH SOUDHA/HYD.

Amara Raja POWER SYSTEMS Pvt. Ltd.				Bill Of Material Report				Doc Ref No: ENG-SFS-08/REV 0			
Item Code	40480210102	Variant	#	Description	Resistor-10R-0.25W-1%-6.2mm-MFR-	Qty	1	UOM	NOS	Rev	0
S.No	Rev	Circuit Designation	Item Code	Description	Variant	Var Description	Qty	System	UOM	SUB	Remarks
41	0	-PC403*,PC405*,PC 47599990000V 503*		Fuse Trip indicator	G001	GEC-TI300		6.000	NOS		
42	0	-PC403,-PC405,-PC5 03	ARE02008301	PCB-FUSE FAIL-DUAL DPSS	A041	AREPL-P02008301		3.000	NOS		
43	0	-PC404	ARE02008202	PCB-VOLTAGE DETECTOR Bd-260VDC	A041	AREPL-P02008202		1.000	NOS		
44	0	-PC406	ARE02018400	PCB-RELAY-SPP-OEN	A041	AREPL-P02018400		1.000	NOS		
45	0	-PC5	ARE-EFD220A	EFD Module-220V	A041	AREPL		1.000	NOS		
46	0	-Q(15-38)	40071609100	MCB-10A-2P-DC	S049	Schn-MGN22325		24.000	NOS		
47	0	-Q(3-14)	40071609200	MCB-20A-2P-DC	S049	Schn-MGN22327		12.000	NOS		
48	0	-Q1	48631100010	MCCB-3P-10KA-100A-DC	C034	C&S-CS2A3100		1.000	NOS		
49	0	-Q2	48622100010	MCCB-100A-2P-10KA-DC	C034	CS2A2-100A		1.000	NOS		
50	0	-Q401(aux),-Q501(aux)	40071900009	Auxiliary C/O Switch-6A-250V AC	L021	Legrand-007350		2.000	NOS		
51	0	-Q401,-Q501	40071299007	MCB-32A-3P-10KA-AC-D-Curve	L021	Leg-D32 604976		2.000	NOS		
52	0	-Q402(aux),-Q502(aux)	40071900003	Aux switch-1NO+1NC-26924	S049	Schneider-26924		2.000	NOS		
53	0	-Q402,-Q502	40071609320	MCB-32A-2P-DC	S049	Schn-MGN22329-10KA		2.000	NOS		
54	0	-R(17-53),-R410,-R50 5	40483326803V	Resistor-68K-2W-5%-wire wound	P005	PIA-68K-2W-5%		39.000	NOS		
55	0	-R1,-R2,-R3 (2 in series each)	40486470252V	Resistor-variable-2.5K-25W-Wire wound	D023	Diagram		6.000	NOS		
56	0	-R401,-R501,-R502	40486341203V	POT-panel mount-20K-3W-1T	P009	POTEL		3.000	NOS		
57	0	-R402,-R403,-R503,-R504	40483371003V	Resistor-10K-10W-5%-wire wound	D023	Diagram		4.000	NOS		
58	0	-R404,-R405,-R406	40483381203V	Resistor-12K-25W-5%-wire wound	D023	Diagram-DRP25		3.000	NOS		
59	0	-R407,-R408,-R409,R(4-16)	40483321002V	Resistor-1K-2W-5%-Wire wound	D023	DIAGRAM		16.000	NOS		
60	0	-S1	40070214201	Rotary switch-6A-1P-4W-ACDC	S003	Sal-61050SAB13TDYR		1.000	NOS		

APPROVED FOR TURNKEY PROJECTS

CHIEF ENGINEER / CONSTRUCTION-1

APTRANSCO/VIDYUTH SOUDHA/HYD.

APTRANSCO-22A-25A

Amara Raja POWER SYSTEMS Pvt. Ltd.				Bill Of Material Report				Doc Ref No: ENG-SFS-08/REV 0			
Item Code	40480210102	Variant	##	Description	Resistor-10R-0.25W-1%-6.2mm-MFR-	Qty	1	UOM	NOS	Rev	0
S.No	Rev	Circuit Designation	Item Code	Description	Variant	Var Description	Qty	System	UOM	SUB	Remarks
61	0	-S2,-S3,-S4	40072110110V	Toggle switch-pm-SPST-ON/OFF-10A	R001	R.G.KESWANI			3.000	NOS	
62	0	-S401	40070720002	Rotary switc-10A-AC volts select-L&L-N	S003	SAL-61313SBB13TDYR			1.000	NOS	
63	0	-S501	40070223201	Rotary switch-6A-2P-3W-ACDC	S003	SAL-61069SAB13TDYR			1.000	NOS	
64	0	-SC1	42500000245V	SOCKET-3PIN-5A	A008	Anchor			1.000	NOS	
65	0	-SCR(401-406/501-506)	46040212025	Dual SCR block-slow-25A-1200V	R006	RIR-JRKT-26/12			6.000	NOS	
66	0	-SCR(401-406/501-506)*	44804000300	Heat sink-PI-80AD-300mm	G040	Global Alum : 3082			2.000	NOS	
67	0	-SH1	47602110100	Shunt-100A/75mV-±0.5%	B011	Beemet			1.000	NOS	
68	0	-SH401,-SH501	47602110030	Shunt-30A/75mV	B011	Beemet			2.000	NOS	
69	0	-T401	432000003864	Charger I/P Xfr-415V/129V,8.7KVA	A010	ARP-AT-3864			1.000	NOS	yes
70	0	-T402,-T502	432000003696	Control Xformer-415V/2 x 23.5V-0.16KVA	A010	ARP-AT-3696			2.000	NOS	yes
71	0	-T501	432000003865	Charger I/P Xfr-415V/131.5V,10.0KVA	A010	ARP-AT-3865			1.000	NOS	yes
72	0	-V1	46011112150	Diode-Forward-150A-1200V-stud	H004	Hirect-S12HNS150			1.000	NOS	
73	0	-V1*	44802000200W	Heat sink-130HD-200mm	G040	Global Alum : 130HD			1.000	NOS	
74	0	-V2	46011112012	Diode-Forward-12A-1200V-stud	H004	S12HN14			1.000	NOS	
75	0	-V2*	44192005006	Bus bar-aluminium-50x6sqmm	A003	AFCOCET			1.000	KGS	
76	0	-V3	40462108002V	Diode-GP-3A-1000V-DO-27-1N5408	M036	MIC			1.000	NOS	
77	0	-V4,-V5,-V6,-V7,-V8,-V9,-V10,-V11,-V12,-V13,-V14,-V15,-V16,-V402,-V403,-V502,-V503	40462101003V	Diode-GP-1A-1000V-SOD-81-1N4007	K003	KHEL			17.000	NOS	
78	0	-V401*,-V501*	44801000150W	Heat sink-PI-20-150mm	G040	Global Alum : 3027			2.000	NOS	
79	0	-V401,-V501	46011112070	Diode-Forward-70A-1200V-stud	H004	HIRECT-S12BN71			2.000	NOS	
80	0	-X(2-37)	44004002057	Terminal block-phoenix-57A-single-UK6N	P022	Phoenix-UK6N			72.000	NOS	
81	0	-X1,-X401	41004001110V	Terminal block-power-110A-single	E015	ELMEX-CBT110			7.000	NOS	

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CHIEF ENGINEER / CONSTRUCTION-I

APTRANSCO/VIDYUTH SQUADHA/HYD.

APTRANSCO-22A-25A

BOM Ref Doc No

Page No 4 Of 4

Approved By

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Checked By

Report Run Date & Time 23/07/2011 16:40:02

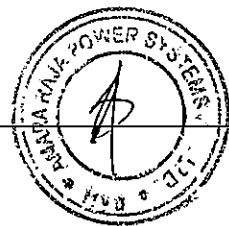
Prepared By HEMALATHA.K

Standardised Drawing for 220 KV Substations 220V/22A FC & 25A FCBC CHARGER(AMARA RAJA make).

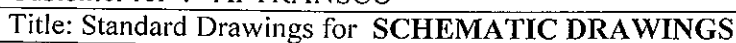
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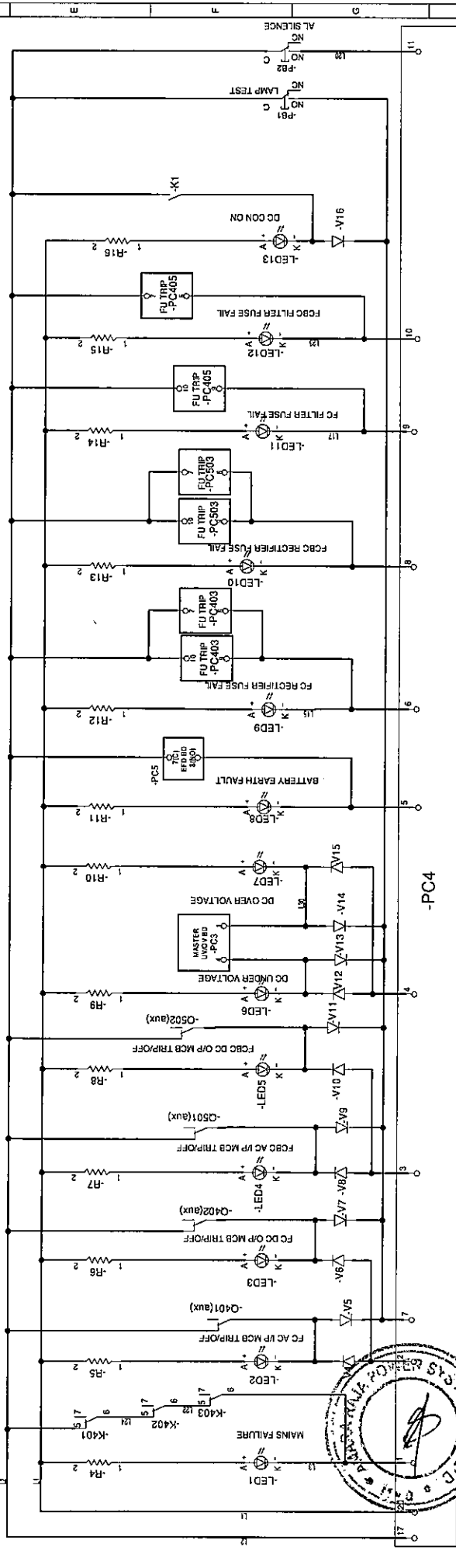
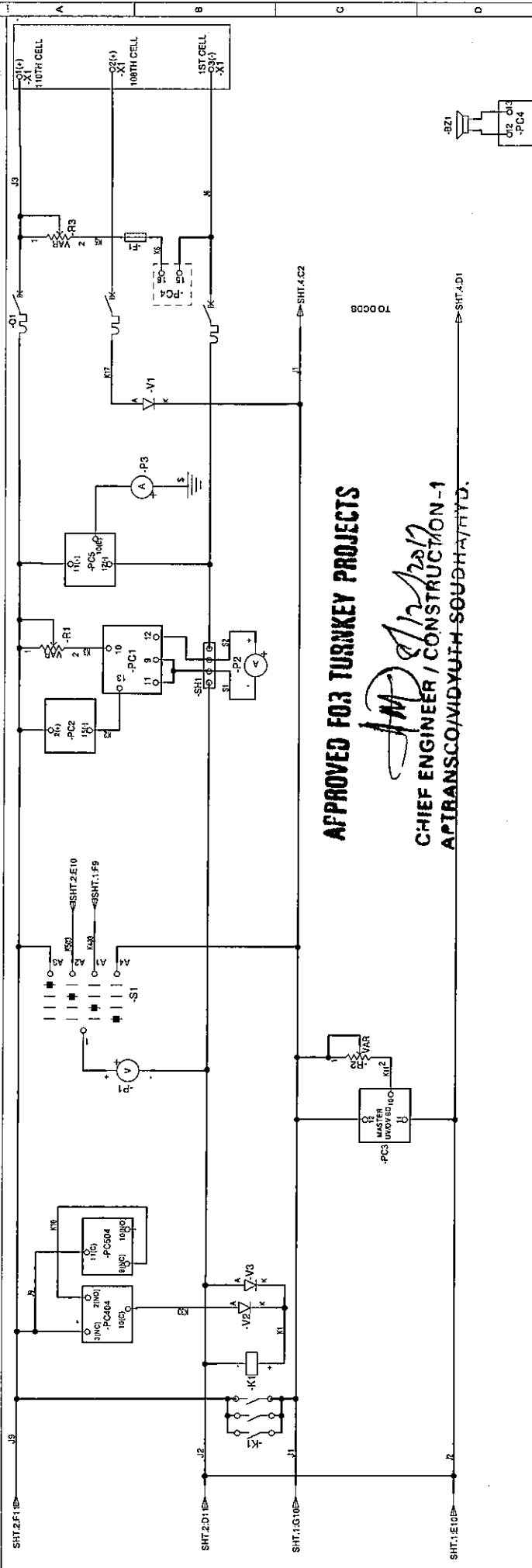
Prepared & Approved during November - 2011

Customer ref : APTRANSCO



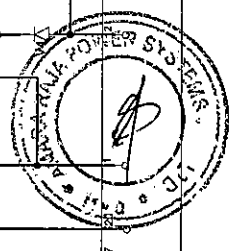
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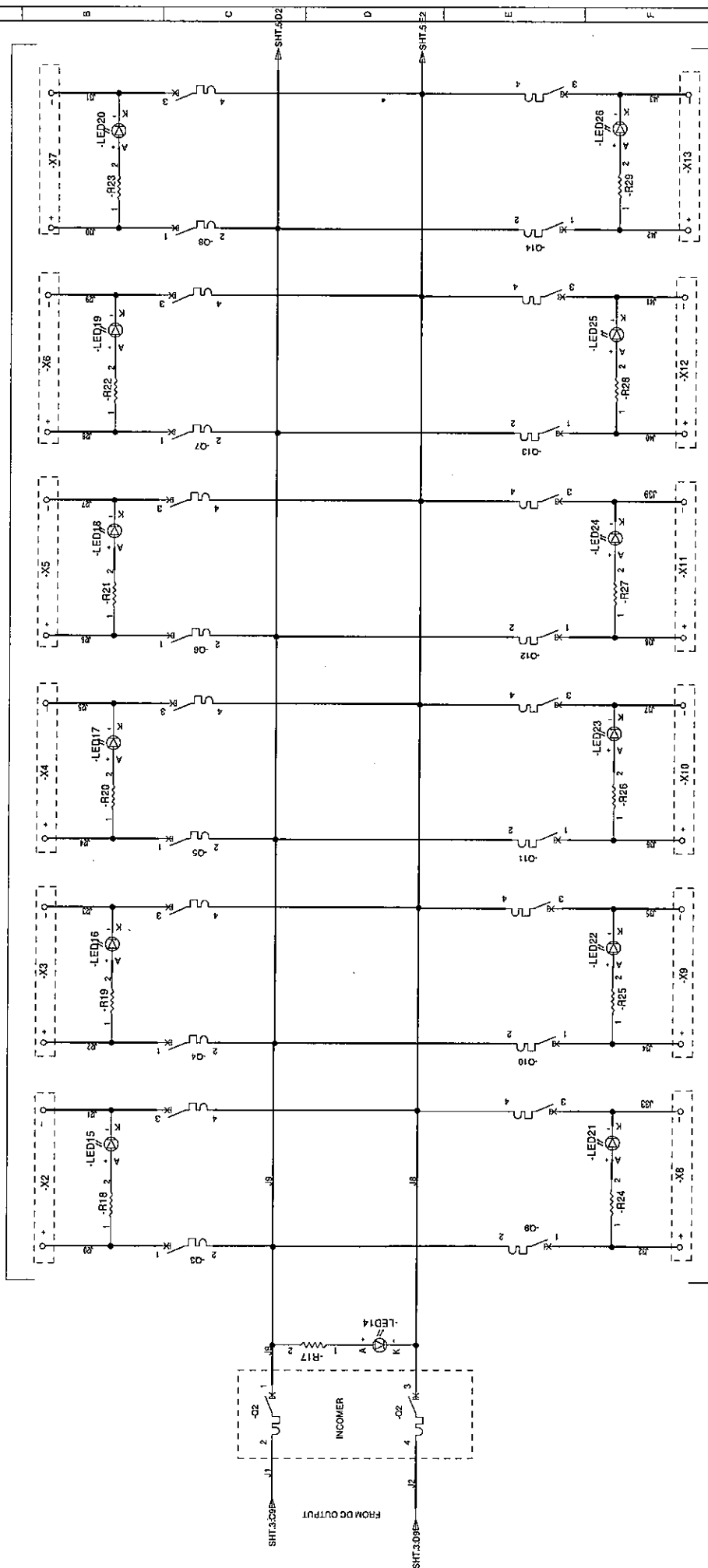
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CHIEF ENGINEER / CONSTRUCTION - 1
APTRANSCO/VIDYUTH SOUDHA/RYD.

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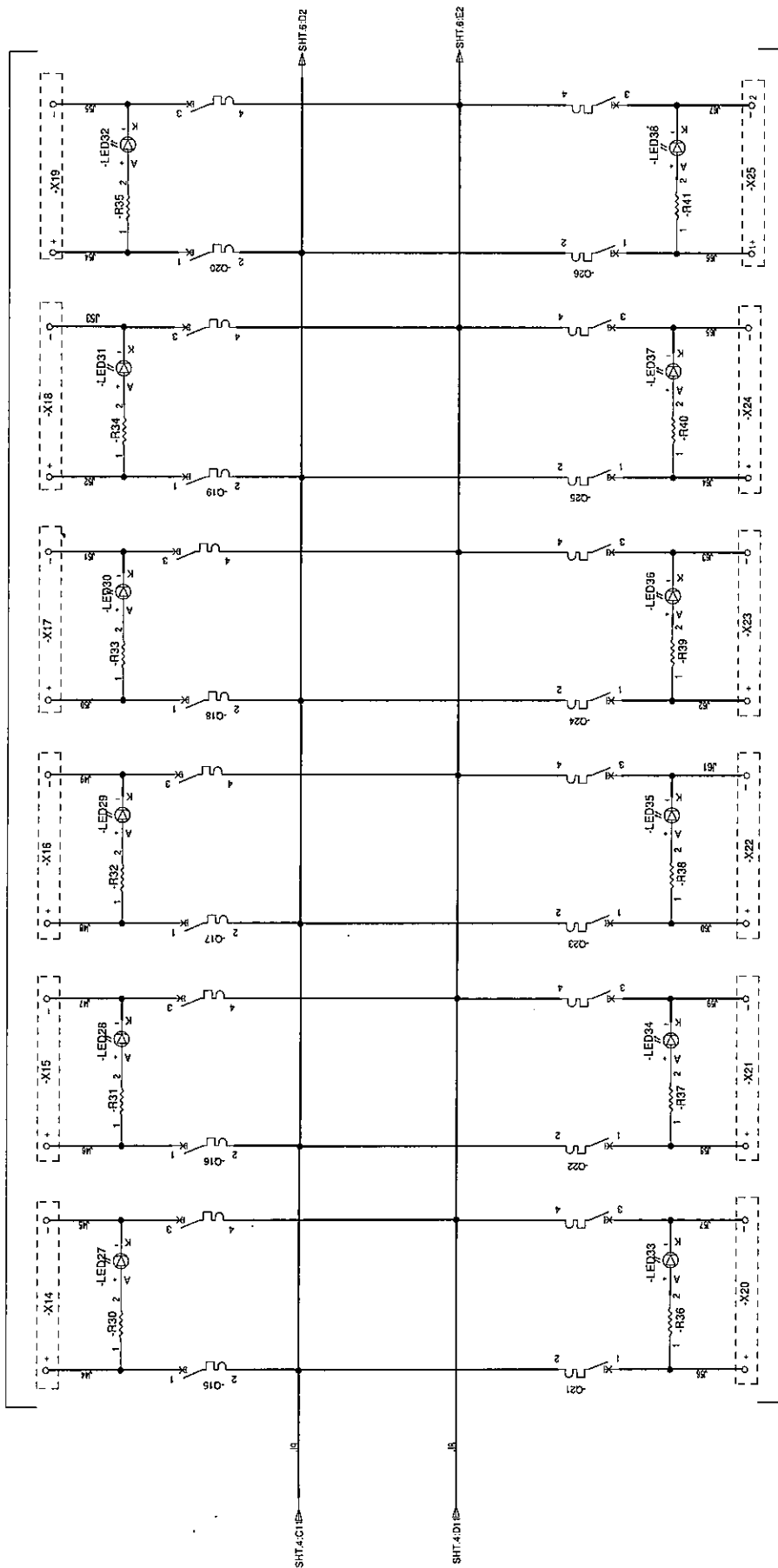
CHIEF ENGINEER / CONSTRUCTION.1
APTRANSCO/VIDYUTH SOUDHA/HYD.

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APTRANSCO

Prepared & Approved during November – 2011

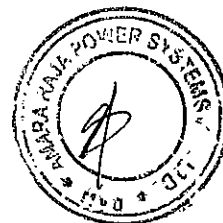
Title:Standard drawing for SCHEMATIC DRAWINGS



10A DC OUT GONG FEEDERS

APPROVED FOR TURNKEY PROJECTS

Mr. A. V. S. Soudha
CHIEF ENGINEER / CONSTRUCTION 1
APTRANSCO/VIDYUTH Soudha/HYD.

[illegible]

Prepared & Approved during November – 2011

Title: Standard Diagram for **SCHEMATIC DRAWINGS**



Customer ref : APTRANSCO

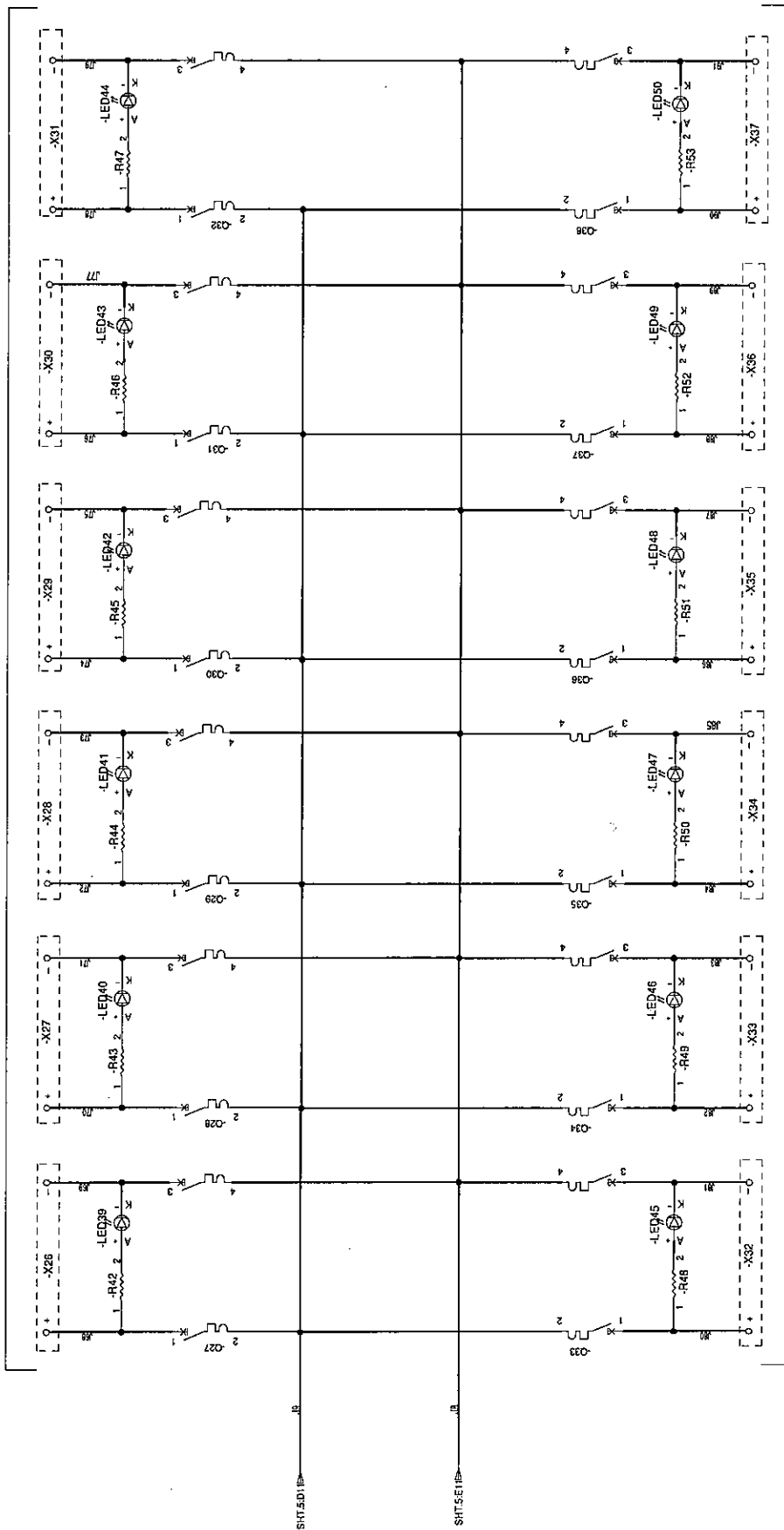
File:Standard drawing for SCHEMATIC DRAWINGS

Standardised Drawing for 220 KV Substations 220V/22A FC & 25A FCBC CHARGER(AMARA RAJA make).

STD/GTP-DWG/Approval No. 260-6-sheet6 Revision No. 0

Prepared & Approved during November – 2011

10A DC OUT GOING FEEDERS



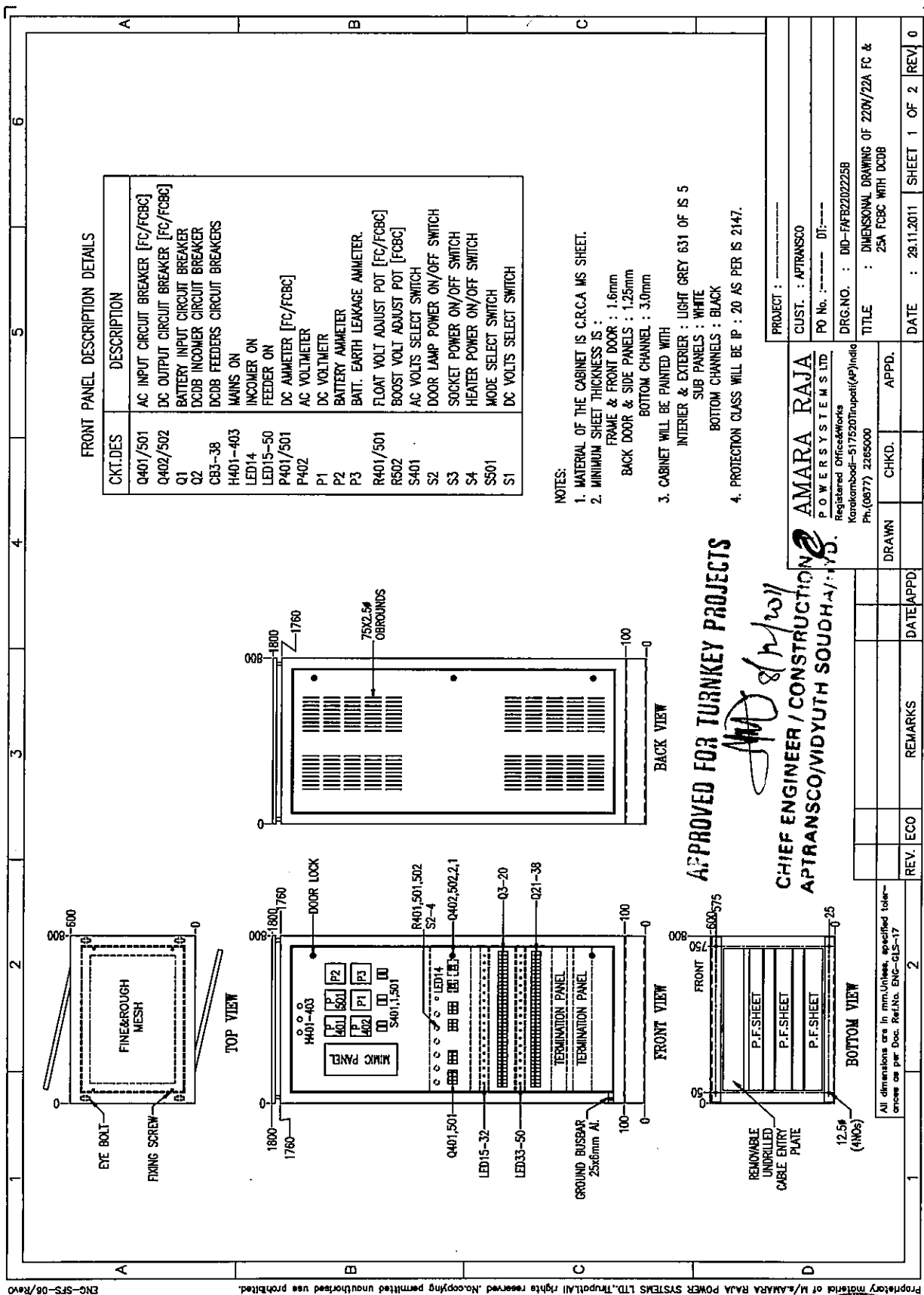
10A DC OUT GOING FEEDERS

APPROVED FOR TURNKEY PROJECTS



CHIEF ENGINEER / CONSTRUCTION-1
APTRANSCO/VIDYUTH SOUDHA/HYD.

PROJECT : APTRANSCO		DWG NO : FAFB202225B	
CUST : APTRANSCO		S.O. NO : SCH-220V	
CONSULTANCY : P.O.NO.		220V/22A FC & 25A FCBC +DCDB	
DATE : 10/10/11		AMARA RAJA POWER SYSTEMS LTD.	
DRAWN : SGT		Registered Office & Works:	
CHECKED : SGT		No. 16/171, 123/555, 10/123/555	
DATE : 10/10/11		Page 6 of 6	



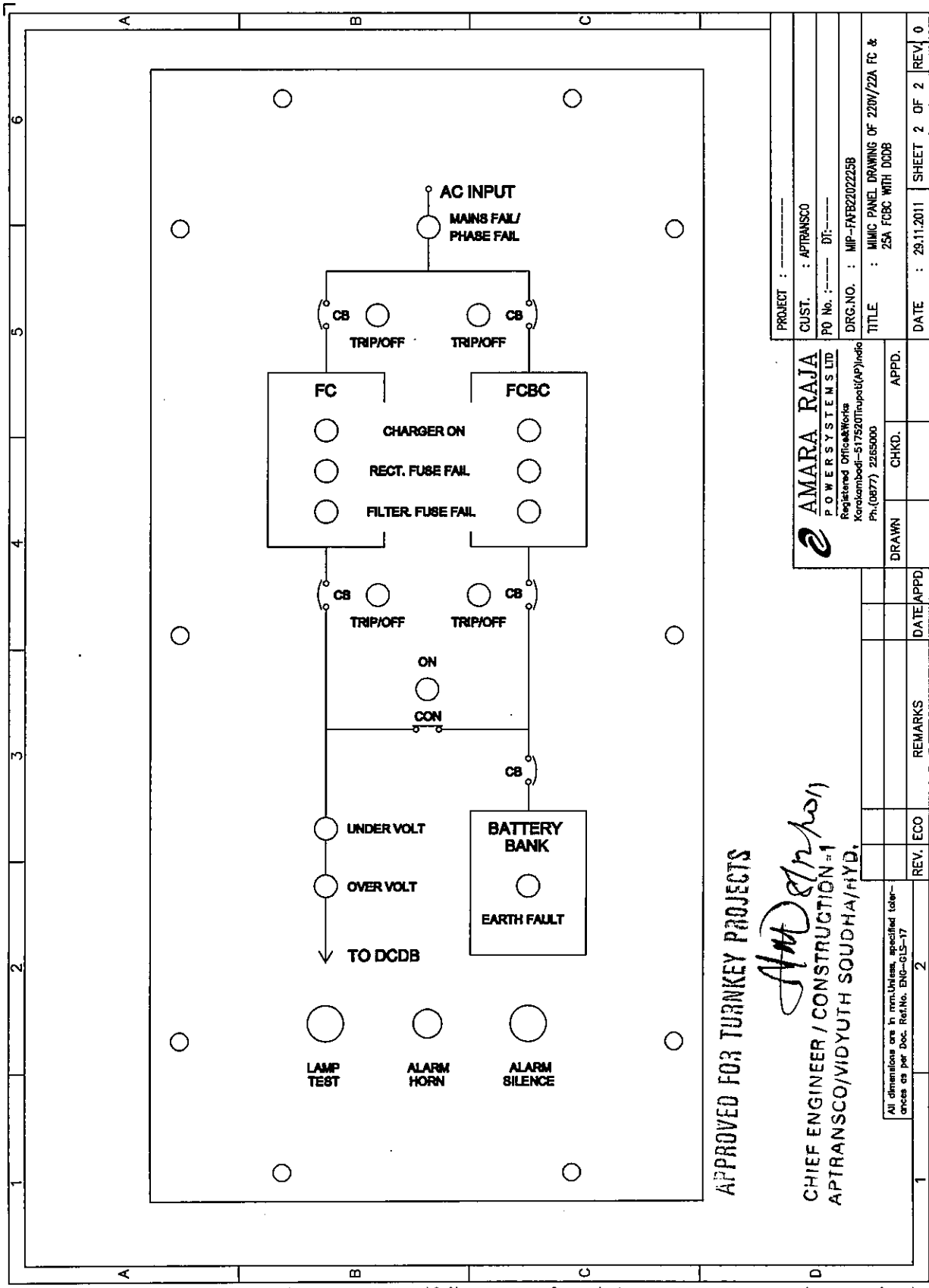
APPROVED FOR TURNKEY PROJECTS

CHIEF ENGINEER / CONSTRUCTION
APTRANSCO/VIDYUTH SOUDHA, HYD.

CHIEF ENGINEER / CONSTRUCTION
APTRANSCO/VIDYUTH SOUDHA, HYD.

PROJECT : PROJECT NO. 2011/2012/2258	
CUST. : AFRANSKO	
PO No. : 2011/2012/2258 DT: 2011/2012/2258	
DRG.NO. : DID-FAFB2022258	
TITLE : DIMENSIONAL DRAWING OF 220V/22A FC & 25A FCBC WITH DCDB	
DATE : 28.11.2011	SHEET 1 OF 2
REV: 0	

REV.	ECO	REMARKS	DATE	APPD.



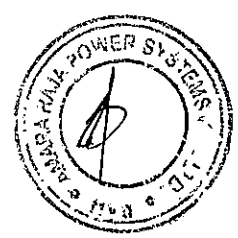
PROJECT :	CUST. : APTRANSCO	PD No. : --- DT: ---	DRG.NO. : MP-FNB202225B	TITLE : MIMIC PANEL DRAWING OF 220V/22A FC & 25A FCBC WITH DCDB	DATE : 29.11.2011	SHEET 2 OF 2	REV. 0
AMARA RAJA POWER SYSTEMS LTD	Registered Office: Korumburdi-517520(Tirupathi(AP)Jedde Ph.(0877) 2265000	DRAWN	CHKD.	APPD.	DATE/APPD	REMARKS	REV. ECO
All dimensions are in mm, unless specified otherwise as per Doc. Ref.No. ENG-Q15-17							

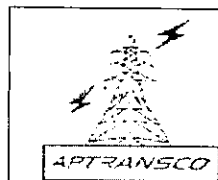
APPROVED FOR TURNKEY PROJECTS

Ant 28/12/2011
CHIEF ENGINEER / CONSTRUCTION - 1
APTRANSCO/VIDYUTH Soudha/HYD.



Standardised Drawing for 220 KV Substations 220V/22A FC & 25A FCBC CHARGER(AMARA RAJA make).
STD/GTP-DWG/Approval No. . 260-7-sheet 2 Revision No. 0
Prepared & Approved during November – 2011
Customer ref : APTRANSCO
Title: Diagram for DIMENSIONAL DRAWINGS





Standardised Guaranteed Technical Particulars for 220 V ,200 AH BATTERY SET

STD/GTP-DWG/Approval No. 260-8 Revision No. 0

Prepared & Approved during November - 2011

Amara Raja

Guaranteed Technical Particulars

DOCREF: IAE/ GTP-1/11-12/Rev:00

Battery Particulars

- | | |
|----------------------------------|--|
| • Battery Type | : Maintenance Free Valve Regulated Lead Acid (MF-VRLA) |
| • Battery Rating | : 220V-200Ah to 1.75 ECV C ₁₀ at 27°C |
| • Manufacturers Cell Designation | : F 200 P-IP6009 |
| • No of Cells | : 110 Nos. |
| • Cell dimensions (LxDxH) | : (198.4 X 76.8 X 318) mm Approx. |
| • Single Cell weight | : 12.8 Kg. Approx. |
| • Battery bank dimensions | : (2268 X 405 X 1380) mm Approx. |
| • Battery bank weight | : 1610 Kg. Approx. |

Charge Regime:

- | | |
|--------------------------|---|
| • Float charging voltage | : Batteries shall be charged in constant potential mode with current limit. |
| • Boost charging voltage | : 2.23- 2.25 Volts Per Cell |
| • Current limit | : 2.30 Volts Per Cell |
| | : Minimum 20 Amps to Maximum 40 Amps. |

Product Details :

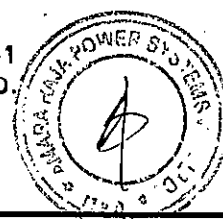
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|---|---|
| • AH efficiency | : Above 90% |
| • WH efficiency | : Above 80% |
| • Self Discharge/Week | : <1% of rated capacity |
| • Max. allowable Ambient Temp. at which cell can safely operate | : 55° C continuous and 70° C short time. |
| • Recommended Max period of storage | : 6 Months from the date of manufacturing and the batteries shall be Stored in covered area at 27°C |
| • Material of container | : Polypropylene co-polymer. |
| • Type of separator | : Highly absorbent Micro porous spun glass matrix.(AGM) |
| • Type of +ve & -ve plates | : Flat pasted. |
| • Material of tray & color | : Mild steel coated with acid resistance paint. |
| • Method of connection between cells | : Bolted |
| • Voltage ripple allowable | : < 2% of the RMS. Value |
| • Type of connectors | : Lead coated Heavy duty copper strips. |
| • Cycle Life of Battery @27°C | : 4000 cycles for 20% Depth Of Discharge (DOD)
(or)
1200 cycles for 80% Depth Of Discharge |
| • Time required for Boost charge from fully discharged condition at 27°C. | : 8 Hrs for 90% State Of Charge (SOC)
(or)
16 Hrs for 100% State Of Charge |

Applicable Standards

- Batteries generally conforms to
 - (i) IS15549:2005.
 - (ii) IEEE1188&1189
 - (iii) BS-6290, PART-IV.
 - (iv) IEC 60896-21&22:2004,PART-II

APPROVED FOR TURNKEY PROJECTS

CHIEF ENGINEER / CONSTRUCTION -1
APTRANSCO/VIDYUTH SOUDHA/HYD.



Authorized signature

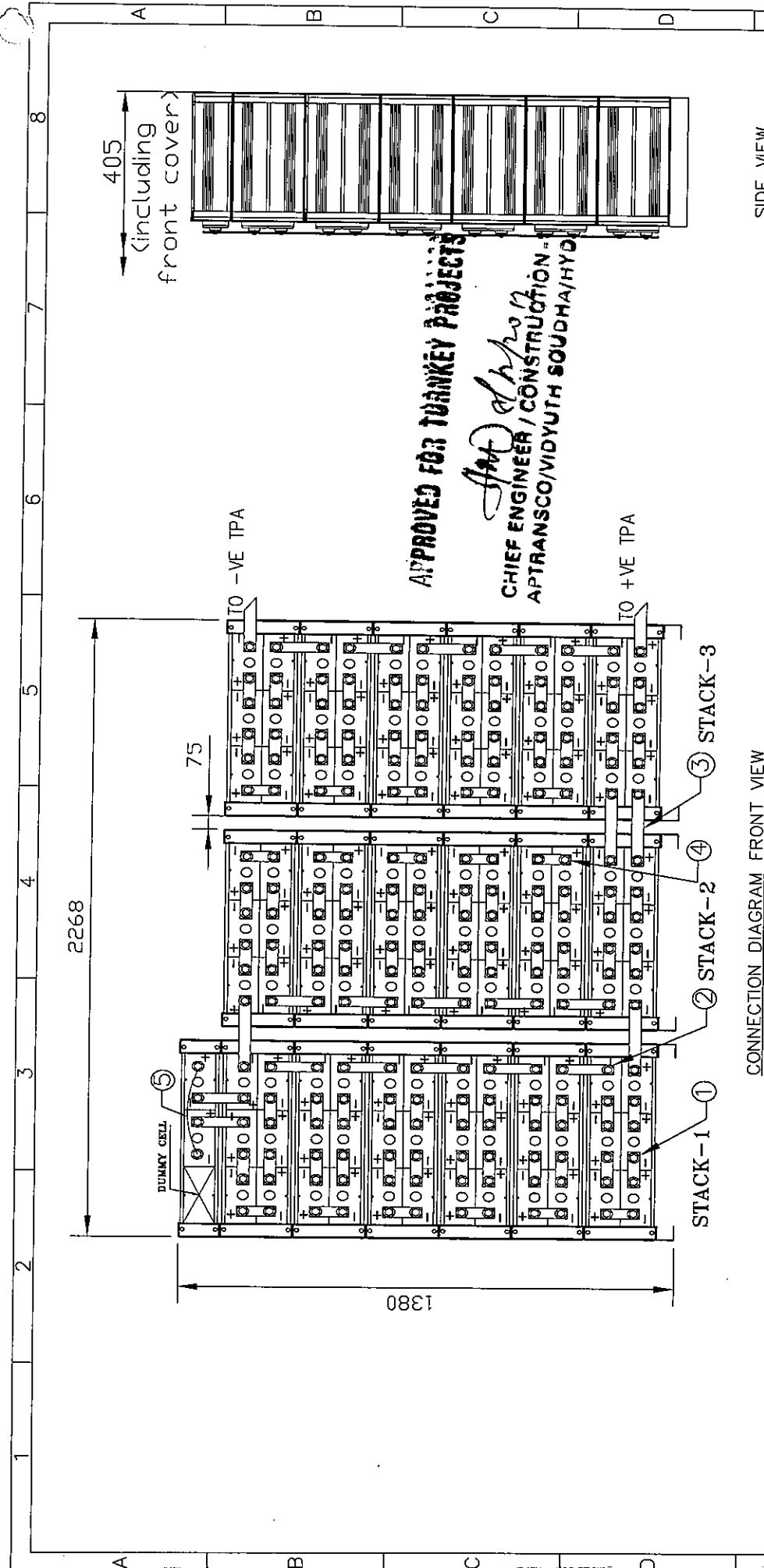
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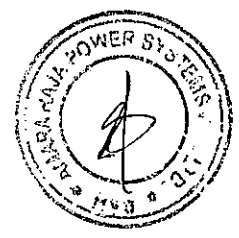
**Due to on going improvement the specifications are subjected to modification without prior notice.

- 1) The type tests should have been conducted not earlier than 5 years in standard third party laboratory. The manufacturer shall produce the type tests reports at the time of acceptance tests.
- 2) Quality of material held applicable standard B.I.S. The manufacturer shall produce the valid B.I.S. Certification at the time of acceptance tests



SIDE VIEW

UNLESS OTHERWISE SPECIFIED TOLERANCES ON		TITLE:		220V-200Ah SYSTEM CONNECTION DIAGRAM		Amara Raja Batteries Ltd.	
LINEAR	ANGULAR	AS SPECIFIED IN THE DRAWING	SIGN.	DATE	SCALE: N.T.S	Registered office & works	
X ±5.0	X ±	XX ±	DRN.	PUSHPA 13.10.11		Karakambodi-517520, TPT, (A.P) INDIA.	
			CHD.			ph: (0877)2265000, FAX: (0877)2285600.	
			RECHD.			DRG. NO.	
			APPD.			11 501 417 A	
					SHEET 2 OF: 2		
SHEET SIZE A3 (297 x 420)			PROPRIETARY MATERIAL OF M/S AMARARAJA BATTERIES LTD. TRUPATI ALL RIGHTS RESERVED NO COPYING PERMITTED UNAUTHORISED USE PROHIBITED.				



SYSTEM DETAILS			
Type of cell	2V-200Ah		
Total no. of cells	110		
Volts per cell	2V		
No. of modules	19		
Total system weight	1610Kgs (Approx)		

CONNECTOR DETAILS			
ITEM NO	DESCRIPTION	DIMENSIONS	QTY/CON/STV/SYS
5	50 sq mm elastomeric cable	600 mm	1
4	Inter cell connector(V)	10.3X20X2	1
3	Inter stack connector	280X20X2	1
2	Inter module connector	148X20X2	1
1	Inter cell connector(H)	110X20X2	1

	Standardised Drawing for 220 V ,200 AH BATTERY SET	
	STD/GTP-DWG/Approval No. <u>260-09</u> Revision No. <u>0</u>	
	Prepared & Approved during November – 2011	
	Customer ref : APTRANSCO	
Title: Connection Diagram for 220 V ,200 AH Battery Set		

- NOTES:
- a. Batteries are located inside the trays of MS HRCA sheet painted with RAL7040(Window grey)colour.Trays are mounted on C-channels.
 - b. All cell connectors are made of lead coated copper busbar.
 - c. No separate foundation is required for installation of battery bank.
 - d. No special ventilation is required.Normal ventilation is sufficient.
 - e. Terminal plate assembly(TPA) comprises of lead coated copper strip designed for 114 A current.
 - f. Floor area required for battery bank is 2268X405 sq mm.
 - g. 0.5 to 1 mts aisle space on all sides should be provided to permit initial installation service and surveillance.
 - h. For any correspondence quote DRG.NO:
- *** FLOOR LOAD : 1753Kg/sq.m.
- *** All the Connectors are designed for 1 Hr discharge rate.
- *** Manufacturer's Model No : IP6009
- *** Tie plates has to be connected at rear side of the battery bank.

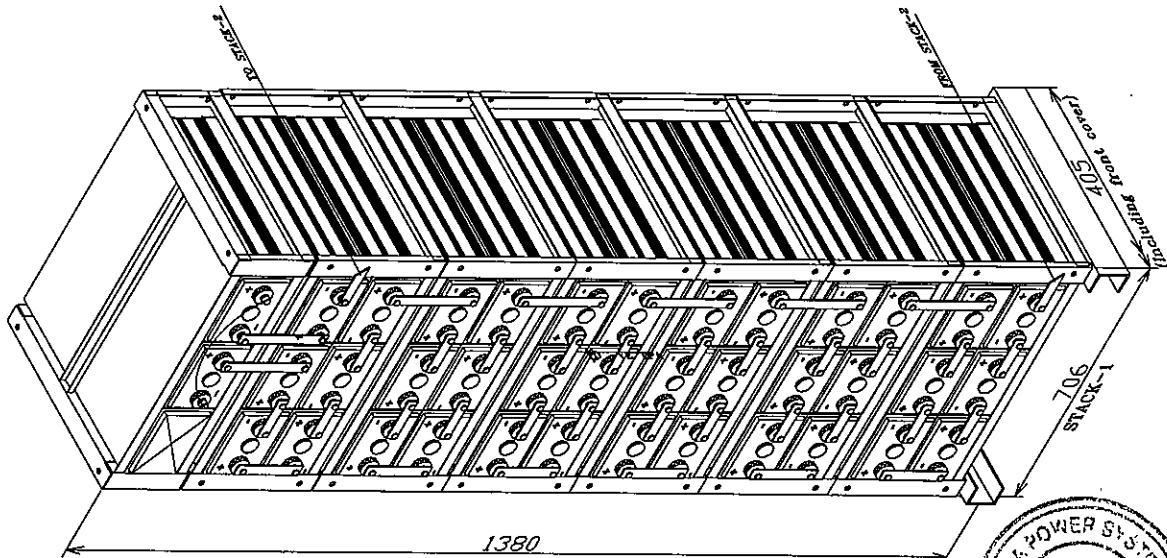
Standardised Drawing for 220 V,200 AH BATTERY SET .

STD/GTP-DWG/Approval No. 260-10 Revision No. 0

Prepared & Approved during November - 2011

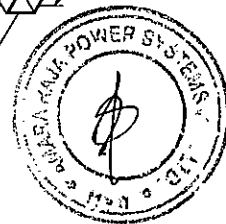
Customer ref : APTRANSCO

Title: Installation Drawings for 220 V,200 AH Battery Set am.



APPROVED FOR TURNKEY PROJECTS

CHIEF ENGINEER / CONSTRUCTION-1
APTRANSCO/VIDYUTH SOUDHA/HYD.



UNLESS OTHERWISE SPECIFIED TOLERANCES ON		TITLE:		220V-200Ah SYSTEM INSTALLATION DIAGRAM		Amara Raja Batteries AMARA RAJA BATTERIES LTD. Registered office & works Korakambadi-517520, JPT(A.P) INDIA. ph.(0877)2265000;FAX:(0877)2285600.	
LINEAR	ANGULAR	DRN.	SIGN.	DATE	SCALE: N.T.S	DRG. NO.	
X ±5.0	AS SPECIFIED		PUSHPA	13.10.11		11 501 417 A	
.X ±	IN THE	CHD.				SHEET 1 OF: 2	
.XX ±	DRAWING	RECHD.					
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN MILLIMETRES		APPD.					
SHEET SIZE A3 (297 x 420)		PROPRIETARY MATERIAL OF M/S AMARARAJA BATTERIES LTD.TIRUPATI. ALL RIGHTS RESERVED NO COPYING PERMITTED UNAUTHORISED USE PROHIBITED.					