TEST REPORT

EN60950 / IEC 60 950

Safety of information technology equipment

Report	**CB / DE 1 - 30646**
Report reference No. ..... :	1924400-3335-0033 (20931)
Tested by ..... :	Frank Richter
	Name in block letters and title Signature
Approved by ..... :	
	Name in block letters and title Signature
Date of issue ..... :	04.03.04
Contents ..... :	--
..... :	

This report is based on a blank test report that was prepared by FIMKO using information obtained from the TRF originator (see below)

Testing laboratory	
Name ..... :	VDE Testing and Certification Institute
Address ..... :	Merianstraße 28, D-63069 Offenbach
Testing location ..... :	American Power Conversion, 85 Rangeway Road, Building #2, North Billerica, MA 01862, USA
	TDAP (TMP File no. 1924400-9501-0001)
Applicant/Client	
Name ..... :	American Power Conversion Corp.,
Address ..... :	85 Rangeway Road, Building #2, North Billerica, MA 01862, USA
Manufacturer	
Name ..... :	American Power Conversion Corp.,
Address ..... :	85 Rangeway Road, Building #2, North Billerica, MA 01862, USA
Factory	
Name ..... :	American Power Conversion
Address ..... :	Breaffy Ind. Centre, Breaffy Road, Castlebar Co. Mayo, Rep. of Ireland
Test specification	
Standard ..... :	IEC 60 950, 3rd Edition (1999), EN60950:2000; VDE 0805:12-2001
Test procedure ..... :	VDE / CB-scheme
Procedure deviation ..... :	--
Non-standard test method ..... :	--

Test Report Form	
Test Report Form No.	I950___F
TRF originator	FIMKO
Master TRF	Dated 99-02
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Test item	
Description	UPS
Trademark	APC
Model and/or type reference	refer to appendix 1
Rating(s)	refer to appendix 1
Particulars: test item vs. test requirements	
Equipment mobility	movable / hand-held / stationary / fixed / permanent connection / direct plug-in / for building-in
Operating condition	continuous / short-time / intermittent
Mains supply tolerance (%)	
Tested for IT power systems	Yes / No
IT testing, phase-phase voltage (V)	--
Class of equipment	Class I / Class II / Class III
Mass of equipment (kg)	>18
Protection against ingress of water	IPX0
Test case verdicts	
Test case does not apply to the test object	N/A
Test item does meet the requirement	P(ass)
Test item does not meet the requirement	F(ail)
Testing	
Date of receipt of test item	01.10.03
Date(s) of performance of test	01.10.03 – 04.03.04

General remarks

"This report is not valid as a CB Test Report unless appended to a CB Test Certificate issued by a NCB, in accordance with IECEE 02".

This report shall not be reproduced except in full without the written approval of the testing laboratory.
The test results presented in this report relate only to the item(s) tested.
"(see remark #)" refers to a remark appended to the report.
"(see Annex #)" refers to an annex appended to the report.
Throughout this report a comma is used as the decimal separator.

This test report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

Copy of marking plate and summary of test results (information/comments):

refer to appendix 2

This report contains 16 appendices:

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IEC 60 950			
Clause	Requirement - Test	Result	Verdict
1	**GENERAL**		P
1.5	COMPONENTS		P
1.5.1	Comply with IEC 950 or relevant component standard	(see appended table 1.5.1)	P
1.5.2	Evaluation and testing of components	Certified Components are used in accordance with their raitings, and they comply with applicable parts of this standard. Components not certified are use in accordence with their raitings and they comply with applicable parts of IEC60950 and the relevant component standard. Components for which no relevant IEC-standards exists, have been tested under the conditions, occurring in the equipment using applicable parts of IEC60950	P
	Dimensions (mm) of mains plug for direct plug-in .....:	Not direct plug in equipment	N
	Torque and pull test of mains plug for direct plug-in; torque (Nm); pull (N).....:		N
1.5.3	Thermal controls		P
1.5.4	Transformers	one transformer between Primary and SELV	N
1.5.5	Interconnecting cables	no interconnecting cables employed	N
1.5.6	Capacitors in primary circuits .....:	certified to IEC 384-14:1981, receptable capacitors and inductors mounted on main – PCB`s	P
1.5.7	Double or reinforced insulation bridged by components	reinforced insulation is bridged by opto insulators and one transformer	P
1.5.7.1	Bridging capacitors		N
1.5.7.2	Bridging resistors		N
1.5.7.3	Accessible parts		N
1.5.8	Components in equipment for IT power systems	not for use on IT-system	N

1.6	POWER INTERFACE		P
1.6.1	AC power distribution systems	not for use in IT-systems	P
1.6.2	Input current	refer to test pages	P
1.6.3	Voltage limit of hand-held equipment		N
1.6.4	Neutral conductor	neutral and phase is insulated from earth with basic insulation	P

1.7	MARKING AND INSTRUCTIONS		P
1.7.1	Power rating		P
	Rated voltage(s) or voltage range(s) (V) .....:	refer to appendix 1	P
	Symbol for nature of supply for d.c. .....:	AC	P
	Rated frequency or frequency range (Hz) .....:	50 - 60 Hz	P
	Rated current (A) .....:	refer to appendix 1	P
	Manufacturer's name/Trademark .....:	APC	P
	Type/model .....:	refer to appendix 1	P
	Symbol of Class II .....:	class I equipment	N
	Other symbols .....:		N
	Certification marks .....:	UL, VDE	P
1.7.2	Safety instructions	provided with each unit, in German and Englisch	P
1.7.3	Short duty cycles		N
1.7.4	Supply voltage adjustment .....:		P
1.7.5	Power outlets on the equipment .....:	Power outlet is marked with voltage and current ratings (refer to appendix 2)	N
1.7.6	Fuse identification .....:	Circuit Breaker and Fuses identification are provided in installation and schematics, refer to installation instruction	P
1.7.7	Wiring terminals		P
1.7.7.1	Protective earthing and bonding terminals	Protective earth connection to the enclosure is marked with the earth symbol (IEC 417 no. 5019)	P
1.7.7.2	Terminal for a.c. mains supply conductors	Input Connectors is marked on Terminal block with N and L1,L2,L3 Battery connectors are marked with + and -	P

1.7.8	Controls and indicators		N
1.7.8.1	Identification, location and marking .....:		P
1.7.8.2	Colours .....:	no indicatiors with colors	N
1.7.8.3	Symbols according to IEC 60417.....:	Complies with IEC 417, Nos 5007 and 5008	P
1.7.8.4	Markings using figures .....:	refer to 1.7.8.3	P
1.7.9	Isolation of multiple power sources .....:	no multiple power sources	N
1.7.10	IT power system	not intended for IT Power systems	N
1.7.11	Thermostats and other regulating devices	no adjustable thermal devices employed	N
1.7.12	Language .....:	german and englisch	P
1.7.13	Durability		P
1.7.14	Removable parts	no removable parts	N
1.7.15	Replaceable batteries	no litium battery	N
	Language .....:		—
1.7.16	Operator access with a tool.....:	not operator access with tools	N
1.7.17	Equipment for restricted access locations.....:		N

2	**PROTECTION FROM HAZARDS**		P
2.1	PROTECTION FROM ELECTRIC SHOCK AND ENERGY HAZARDS		P
2.1.1	Protection in OPERATOR access areas	no access for the operator	P
2.1.1.1	Access to energized parts	unit is enclosed by a painted steel, refer to 4.6.1	P
	Test by inspection .....:		P
	Test with test finger .....:		P
	Test with test pin .....:		P
	Test with test probe .....:		P
2.1.1.2	Battery compartments .....:	refer to 2.1.1.1	P
2.1.1.3	Access to ELV wiring		N
	Working voltage (V); distance (mm) through insulation	(see appended table 2.10.5)	—
2.1.1.4	Access to hazardous voltage circuit wiring	there is no internal wiring at hazardous voltage which is operator accessible	P
2.1.1.5	Energy hazards .....:	no energy hazard accessible to the operator	P
2.1.1.6	Manual controls	no manual controls	P
2.1.1.7	Discharge of capacitors in the primary circuit		P
	Time-constant (s); measured voltage (V).....:	< 10 sec = 0 V	—
2.1.2	Protection in service access areas		P
2.1.3	Protection in restricted access locations		N

Location	Switch Position	Vin (Vrms)	Vin (Vpeak)	37% Vin (Volts)	Vt (Volts)	T.C. (mS)
Phase A to Neutral	On	254	357	132	0	200
Phase A to Neutral	Off	254	357	132	0	200
Phase B to Neutral	On	254	357	132	0	200
Phase B to Neutral	Off	254	357	132	0	200
Phase C to Neutral	On	254	357	132	0	200
Phase C to Neutral	Off	254	357	132	0	200
Phase A to Phase B	On	254	600	222	0	200
Phase A to Phase B	Off	254	600	222	0	200
Phase B to Phase C	On	254	600	222	0	200
Phase B to Phase C	Off	254	600	222	0	200

2.2	SELV CIRCUITS		P
2.2.1	General requirements	SELV levels are maintained after single fault condition	P
2.2.2	Voltages under normal conditions (V) ..... :	less than 42.2 V peak and 60 V DC classified as SELV	P
2.2.3	Voltages under fault conditions (V) ..... :	less than 42.2 V peak and 60 V DC, all specified limits are not exceeded in the event of a single fault condition, refer to subclause 5.3 The SELV circuits are adequately constructed in order to prevent reduction of distances, loosening of terminals, breaking of wiring at terminals, accidental shorting to hazardous voltages and the improper use of connectors	P
2.2.3.1	Separation by double or reinforced insulation (method 1)	refer to subclause 2.10	P
2.2.3.2	Separation by earthed screen (method 2)	method 1	N
2.2.3.3	Protection by earthing of the SELV circuit (method 3)	method 1	N
2.2.4	Connection of SELV circuits to other circuits ..... :	SELV circuilts are not connected to other circuits	N

2.3	TNV CIRCUITS		N
2.3.1	Limits	no TNV circuits	N

2.4	LIMITED CURRENT CIRCUITS		N
2.4.1	General requirements		N

2.5	LIMITED POWER SOURCES		P
	Inherently limited output	refer to appendix 13	P

2.6	PROVISIONS FOR EARTHING AND BONDING		P
2.6.1	Protective earthing	Accessible Metal parts are reliably earthed	P
2.6.2	Functional earthing		N
2.6.3	Protective earthing and protective bonding conductors	Terminal Block (screw size 7.8mm)	P
2.6.3.1	Size of protective earthing conductors	refer to 2.6.1	P
	Rated current (A), cross-sectional area (mm^2), AWG.....:		—
2.6.3.2	Size of protective bonding conductors		P
	Rated current (A), cross-sectional area (mm^2), AWG.....:		—
2.6.3.3	Rated current (A), type and nominal thread diameter (mm).....:	refer to test results	P
	Resistance (Ω) of earthing conductors and their terminations, test current (A).....:	refer to test results	P
2.6.3.4	Colour of insulation.....:	all insulated earth conductors are green/yellow	P
2.6.4	Terminals	refer to 2.6.1	P
2.6.4.1	Protective earthing and bonding terminals	min. table 3E	P
	Rated current (A), type and nominal thread diameter (mm).....:		—
2.6.4.2	Separation of the protective earthing conductor from protective bonding conductors		P
2.6.5	Integrity of protective earthing	the chassis is connected to safety earth ground, refer to 2.6.1	P
2.6.5.1	Interconnection of equipment		N
2.6.5.2	Components in protective earthing conductors and protective bonding conductors		P
2.6.5.3	Disconnection of protective earth	it is not possible to disconnect earth without disconnecting mains	P

2.6.5.4	Parts that can be removed by an operator	no removable parts	N
2.6.5.5	Parts removed during servicing	no removable parts	N
2.6.5.6	Corrosion resistance	no risk of corrosion	P
2.6.5.7	Screws for protective bonding		P
2.6.5.8	Reliance on telecommunication network	no TNV voltage	N

2.6.3.4 - Resistance (Ohm) of earthing conductors and their terminations, test current (A)

Test Point (from)	Test Point (to)	Current (A)	Time (minutes)	Resistance (mOhms)
SYAF16KI/SYAF16KRMI				
Ground Terminal	Shelf, AC Tray	200	2	0.711
Ground Terminal	Handle, Power Module Top	200	2	0.751
Ground Terminal	Handle, Power Module Bottom	200	2	0.955
Ground Terminal	Handle, Battery Module, Top	200	2	1.108
Ground Terminal	Handle, Battery Module, Bottom	200	2	0.813
Ground Terminal	MIM Handle	200	2	0.932
SYAF8KI/SYAF8KRMI				
Ground Terminal	Shelf, AC Tray	200	2	0.758
Ground Terminal	Handle, Power Module Top	200	2	0.781
Ground Terminal	Handle, Power Module Bottom	200	2	0.815
Ground Terminal	Handle, Battery Module	200	2	0.818
Ground Terminal	Middle Divider	200	2	0.781

2.7	OVERCURRENT AND EARTH FAULT PROTECTION IN PRIMARY CIRCUITS		P
2.7.1	Basic requirements	Fuses or circuit breakers are used, see schematics and component list for details on position and ratings	P
	Instructions when protection relies on building installation	refer to appendix 4	N
2.7.2	Faults not covered in 5.3	adequate fault protection	P
2.7.3	Short-circuit backup protection	protective devices have adiquate breaking (rupturing)capacity to interrupt the max. fault current (including short circuit)	P
2.7.4	Number and location of protective devices .....:	refer to 2.7.1	P
2.7.5	Protection by several devices		N
2.7.6	Warning to service personnel.....:		N

2.8	SAFETY INTERLOCKS		N
2.8.1	General principles	No interlock system, system can only be opened by a tool	N

2.9	**ELECTRICAL INSULATION**		P
2.9.1	Properties of insulating materials	not hygroscopic, rubber or asbestos materials	P
2.9.2	Humidity conditioning	95% by 25°C	P
2.9.3	Requirements for insulation	see subclause 2.10	P
2.9.4	Insulation parameters	max. value of rated voltage is used	P
2.9.5	Categories of insulation	all requirements for basic, supplementary and reinforced insulation are issued	P

2.10	CLEARANCES, CREEPAGE DISTANCES AND DISTANCES THROUGH INSULATION		P
2.10.1	General		P
2.10.2	Determination of working voltage	determined in accordance with 2.10.1	P
2.10.3	Clearances	independent primary and SELV circuits are separated by reinforced insulation	P
2.10.3.1	General	independent primary and SELV circuits are separated by reinforced insulation	P
2.10.3.2	Clearances in primary circuit	(see appended table 2.10.3 and 2.10.4)	P
2.10.3.3	Clearances in secondary circuits	(see appended table 2.10.3 and 2.10.4)	P
2.10.3.4	Measurement of transient levels		P
2.10.4	Creepage distances	(see appended table 2.10.3 and 2.10.4)	P
	CTI tests.....:		—
2.10.5	Solid insulation		P
2.10.5.1	Minimum distance through insulation	(see appended table 2.10.5)	P
2.10.5.2	Thin sheet material		N
	Number of layers (pcs).....:		—
	Electric strength test	(see appended table 5.2)	—
2.10.5.3	Printed boards	no used	N
	Distance through insulation		N
	Electric strength test for thin sheet insulating material	(see appended table 5.2)	—

	Number of layers (pcs).....:		N
2.10.5.4	Wound components	refer to transformer construction annex C and annex U	P
	Number of layers (pcs).....:		P
	Two wires in contact inside component; angle between 45° and 90°		P
2.10.6	Coated printed boards	not used	N
2.10.6.1	General		N
2.10.6.2	Sample preparation and preliminary inspection		N
2.10.6.3	Thermal cycling		N
2.10.6.4	Thermal ageing (°C).....:		N
2.10.6.5	Electric strength test	(see appended table 5.2)	—
2.10.6.6	Abrasion resistance test		N
	Electric strength test	(see appended table 5.2)	—
2.10.7	Enclosed and sealed parts.....:	Optoisolators have an internal creepage distance of >4mm, a thermal cycling test was performed and pollution degree 1 is used. All OI are also VDE 0884 certified See critical component list for details on OI	P
	Temperature $T_1=T_2 = T_{mra} - T_{amb} +10K$ (°C).....:		P
2.10.8	Spacings filled by insulating compound .....:	Optoisolators have an internal creepage distance of >4mm, a thermal cycling test was performed with an electric strength test of AC 4800V	P
	Electric strength test	(see appended table 5.2)	—
2.10.9	Component external terminations		P
2.10.10	Insulation with varying dimensions		N

3	**WIRING, CONNECTIONS AND SUPPLY**		P
3.1	GENERAL		P
3.1.1	Current rating and overcurrent protection	all internal wiring used in the distribution of primary power protected agains overcurrent and short circuit by suitably rated protective devices	P
3.1.2	Protection against mechanical damage	wires are routed away fron sharp edges and parts which could damage insulation	P
3.1.3	Securing of internal wiring	wires are positioned in such a manner that prevents excessive stain, loosening of terminal connections and damage of conductor insulation	P
3.1.4	Insulation of conductors	(see appended table 5.2)	P
3.1.5	Beads and ceramic insulators	no beads/insulation provided in the unit	N
3.1.6	Screws for electrical contact pressure	all electical screw connections are by metal screw with more than 2 threads into a metal plate	P
3.1.7	Non-metallic materials in electrical connections	the equipment does not have any electrical connectors that rely on insulation material for adequite contact pressure	N
3.1.8	Self-tapping and spaced thread screws	thread cutting or space thread screws are not used for ele. connections, machine screws only	N
3.1.9	Termination of conductors		N
	10 N pull test		N
3.1.10	Sleeving on wiring		P

3.2	CONNECTION TO A.C. MAINS SUPPLIES		P
3.2.1	Means of connection .....:	unit is provided with a terminal block	P
3.2.2	Multiple supply connections	refer to installation instructions	P
3.2.3	Permanently connected equipment		P
	Number of conductors, diameter (mm) of cable and conduits .....:		—
3.2.4	Appliance inlets	the unit does not use an appliance inlet	N
3.2.5	Power supply cords	permanent connection, refer to installation instruction	P
	Type .....:		—
	Rated current (A), cross-sectional area (mm^2), AWG.....:		—
3.2.6	Cord anchorages and strain relief		N
	Mass of equipment (kg), pull (N) .....:		—
	Longitudinal displacement (mm) .....:		—
3.2.7	Protection against mechanical damage		P
3.2.8	Cord guards		N
	D (mm); test mass (g) .....:		—
	Radius of curvature of cord (mm) .....:		—
3.2.9	Supply wiring space		P

3.3	WIRING TERMINALS FOR CONNECTION OF EXTERNAL CONDUCTORS		N
3.3.1	Wiring terminals	Terminal Block	P
3.3.2	Connection of non-detachable power supply cords		N
3.3.3	Screw terminals	100A, 7.8mm screw size	P
3.3.4	Rated current (A), cord/cable type, cross-sectional area (mm^2) .....:		P
3.3.5	Rated current (A), type and nominal thread diameter (mm).....:		P
3.3.6	Wiring terminals design	terminals are munted such that they do not become loose, place stress on internal wiring, or reduct creepage and clearances below those prescribed in 2.9	P
3.3.7	Grouping of wiring terminals		P
3.3.8	Stranded wire		P

3.4	DISCONNECTION FROM THE A.C. MAINS SUPPLY		P
3.4.1	General requirement	unit has a disconnect divice, (main input CB , three phase)each output has ist own output breaker for disconnect the output voltage	P
3.4.2	Disconnect devices		P
3.4.3	Permanently connected equipment		P
3.4.4	Parts which remain energized		P
3.4.5	Switches in flexible cords		N
3.4.6	Single-phase equipment		N
3.4.7	Three-phase equipment		P
3.4.8	Switches as disconnect devices		N
3.4.9	Plugs as disconnect devices		N
3.4.10	Interconnected equipment	no group of units	N
3.4.11	Multiple power sources		N

3.5	INTERCONNECTION OF EQUIPMENT		P
3.5.1	General requirements	no ELV interconnection circuits	P
3.5.2	Types of interconnection circuits ..... :		P
3.5.3	ELV circuits as interconnection circuits		P

4	**PHYSICAL REQUIREMENTS**		P
4.1	STABILITY		P
	Angle of 10°	10°	P
	Test: force (N) ..... :	250N, 800N	P
4.2	MECHANICAL STRENGTH		—
4.2.1	General		P
4.2.2	Steady force test, 10 N	10N	P
4.2.3	Steady force test, 30 N	Internal enclosure 30N	P
4.2.4	Steady force test, 250 N	no distortion, electrical or mechanical hazard after 250N force applied to top and side covers	P
4.2.5	Impact test	Metal enclousure	P
4.2.6	Drop test		N
4.2.7	Stress relief	metal enclousure	N
4.2.8	Cathode ray tubes	no CRT provided	N
	Picture tube separately certified ..... :	(See separate test report or attached certificate)	N
4.2.9	High pressure lamps	no lamps provided	N
4.2.10	Wall or ceiling mounted equipment; force (N) .... :		N

800 N Test

SYAF8KI

Location	Height (cm)	With / Without Batteries	Did unit tip over ?
Right side center edge	63.5	With	No
Right side center edge	63.5	Without	No
Left side center edge	63.5	With	No
Left side center edge	63.5	Without	No

4.3	DESIGN AND CONSTRUCTION		P
4.3.1	Edges and corners	all edges and corners were judged to be sufficiently well rounded as to no cositute a hazard	P
4.3.2	Handles and manual controls; force (N).....:	20N on knops, grips, handles, levers etc.	P
4.3.3	Adjustable controls		N
4.3.4	Securing of parts	no loosing of parts impairing creepage and clearances is likely to occur	P
4.3.5	Connection of plugs and sockets		P
4.3.6	Direct plug-in equipment		N
	Torque (Nm).....:		—
4.3.7	Heating elements in earthed equipment		N
4.3.8	Batteries	refer to discharge and recharge heating test	P
4.3.9	Oil and grease	insulation is not exposed to oil, grease etc	P
4.3.10	Dust, powders, liquids and gases	equipment does not generate ionizing radiation or contain flammable liquids or gases	P
4.3.11	Containers for liquids or gases		N
4.3.12	Flammable liquids .....:		N
	Quantity of liquid (l).....:		N
	Flash point (°C) .....:		N
4.3.13	Radiation; type of radiation .....:		N
	Equipment using lasers	(See separate test report of IEC 60825-1), LED`s provided, see appendix 11	P

4.4	PROTECTION AGAINST HAZARDOUS MOVING PARTS		P
4.4.1	General	unit is provided with DC fans, no mechanical hazard for the user or the servies person	P
4.4.2	Protection in operator access areas		N
4.4.3	Protection in restricted access locations		N
4.4.4	Protection in service access areas		P

4.5	THERMAL REQUIREMENTS		P
4.5.1	Temperature rises	see heating table	P
	Normal load condition per Annex L .....:		N
4.5.2	Resistance to abnormal heat	based on the physical characteristic of the thermoplastic materials employed in the power supply, this test was not considered necassary	N

4.6	OPENINGS IN ENCLOSURES		P
4.6.1	Top and side openings	(Models SYAF8XXX): Back openings, 645 holes each hole dia. 6.1mm (Models SYAF16XXXX): Back openings, 1075 holes, each hole dia. 6.1mm. Fan openings and openings complly with 5° rule and are in compliance with fig 4C(Thickness of metal 1.6mm)	P
	Dimensions (mm) .....:		—
4.6.2	Bottoms of fire enclosures	no openings	P
	Construction of the bottom .....:		—
4.6.3	Doors or covers in fire enclosures		N
4.6.4	Openings in transportable equipment		N
4.6.5	Adhesives for constructional purposes	adhesives not used for securement of internal narriers or screens	N
	Conditioning temperature/time .....:		—

4.7	RESISTANCE TO FIRE		P
4.7.1	Reducing the risk of ignition and spread of flame	risk of ignition is minimized	P
4.7.2	Conditions for a fire enclosure	the enclosure is metal or 5V control bazel	P
4.7.2.1	Parts requiring a fire enclosure	fire enclosure covers all parts of the unit, except display board (HB), refer to subclause 2.5	P
4.7.2.2	Parts not requiring a fire enclosure		N
4.7.3	Materials		N
4.7.3.1	General		P
4.7.3.2	Materials for fire enclosures	refer to 4.7.2	P
4.7.3.3	Materials for components and other parts outside fire enclosures	see 4.7.2	P
4.7.3.4	Materials for components and other parts inside fire enclosures	all internal material are V-2 or better, or mounted on printing wiring boards rated V-1 or better, refer to critical component list	P
4.7.3.5	Materials for air filter assemblies		N
4.7.3.6	Materials used in high-voltage components	no high voltage components	N

5	**ELECTRICAL REQUIREMENTS AND SIMULATED ABNORMAL CONDITIONS**	P
5.1	TOUCH CURRENT AND PROTECTIVE CONDUCTOR CURRENT	P
5.1.1	General	P
5.1.2	Equipment under test (EUT)	P
5.1.3	Test circuit	P
5.1.4	Application of measuring instrument	P
5.1.5	Test procedure	P
5.1.6	Test measurements	P
	Test voltage (V) .....:	254VAC per phase —
	Measured current (mA) .....:	max. 11.3 mA —
	Max. allowed current (mA) .....:	3.5mA —
5.1.7	Equipment with touch current exceeding 3.5 mA .....:	unit is provided with warning label because the overall earth leakage current is over 3.5mA P
5.1.8	Touch currents to and from telecommunication networks	not connected to telecommunication networks N
5.1.8.1	Limitation of the touch current to a telecommunication network	N
	Test voltage (V) .....:	—
	Measured current (mA) .....:	—
	Max. allowed current (mA) .....:	—
5.1.8.2	Summation of touch currents from telecommunication networks..... :	N

Mode of operation	EUT Power Switch ON Forward	EUT Power Switch ON Reverse	EUT Power Switch OFF Forward	EUT Power Switch OFF Reverse	Load	Switch (e)
Normal 3ϕ	0.24 mA	0.25 mA	0.24 mA	0.24 mA	No	open
Normal 3ϕ	2.28 mA	2.38 mA	2.26 mA	2.26 mA	No	closed
Normal 1ϕ	11.3 mA	---	0.24 mA	---	No	open
Normal 1ϕ	8.92 mA	---	2.26 mA	---	No	closed

5.2	ELECTRIC STRENGTH		P
5.2.1	General	(see appended table 5.2), based on the electric strengh test the use of the insulation materials within the equipment is satisfactory	P
5.2.2	Test procedure	(see appended table 5.2)	P

5.3	ABNORMAL OPERATING AND FAULT CONDITIONS		P
5.3.1	Protection against overload and abnormal operation	(see appended table 5.3)	P
5.3.2	Motors	(see appended Annex B)	P
5.3.3	Transformers	(see appended Annex C)	P
5.3.4	Functional insulation.....:	functional insulation complies wit the requirement (a), (b) or (c)	P
5.3.5	Electromechanical components	electromechanical components refer to motor test results	P
5.3.6	Simulation of faults	refer to test results	P
5.3.7	Unattended equipment		N
5.3.8	Compliance criteria for abnormal operating and fault conditions	refer to test results	P

6	**CONNECTION TO TELECOMMUNICATION NETWORKS**	N
6.1	PROTECTION OF TELECOMMUNICATION NETWORK SERVICE PERSONNEL, AND USERS OF OTHER EQUIPMENT CONNECTED TO THE NETWORK, FROM HAZARDS IN THE EQUIPMENT	N

A	**ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE**	N

B	**ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS (SEE 4.7.2.2 AND 5.3.2), NO.1**		P
B.1	General requirements	Each power modul contains one fan (VDE, UL approved, refer to critical component list)	P
	Position ..... :		—
	Manufacturer ..... :		—
	Type ..... :		—
	Rated values ..... :		N
B.2	Test conditions		N
B.3	Maximum temperatures	(see appended table 5.3)	N
B.4	Running overload test	(see appended table 5.3)	N
B.5	Locked-rotor overload test		N
	Test duration (days) ..... :		—
	Electric strength test: test voltage (V) ..... :		—
B.6	Running overload test for DC motors in secondary circuits		N
B.7	Locked-rotor overload test for DC motors in secondary circuits		N
B.7.1	Test procedure	(see appended table 5.3)	N
B.7.2	Alternative test procedure; test time (h) ..... :		N
B.7.3	Electric strength test		N
B.8	Test for motors with capacitors	(see appended table 5.3)	N
B.9	Test for three-phase motors	(see appended table 5.3)	N
B.10	Test for series motors		N
	Operating voltage (V) ..... :		—

C	**ANNEX C, TRANSFORMERS (SEE 1.5.4 AND 5.3.3)**		P
	Position ..... :	T1	—
	Manufacturer ..... :	Falco	—
	Type ..... :	430-0090	—
	Rated values ..... :		—
	Method of protection..... :		—
C.1	Overload test		N
C.2	Insulation	triple insulated wire, Manufactorer Furukawa Type :TEX-E(VDE approved by annex U) refer to appendix 9	P

G	**ANNEX G, ALTERNATIVE METHOD FOR DETERMINING MINIMUM CLEARANCES**		N
G.1	Summary of the procedure for determining minimum clearances		N
G.2	Determination of mains transient voltage (V)..... :		N
G.3	Determination of telecommunication network transient voltage (V) ..... :		N
G.4	Determination of required withstand voltage (V) . :		N
G.5	Measurement of transient levels (V) ..... :		N
G.6	Determination of minimum clearances..... :		N

H	**ANNEX H, IONIZING RADIATION (SEE 4.3.13)**		N
	Ionizing radiation		N
	Measured radiation (mR/h) ..... :		—
	Measured high-voltage (kV) ..... :		—
	Measured focus voltage (kV) ..... :		—
	CRT markings ..... :		—

J	**ANNEX J, TABLE OF ELECTROCHEMICAL POTENTIALS (SEE 2.6.5.6)**		N
	Metal used ..... :		N

K	**ANNEX K, THERMAL CONTROLS (SEE 1.5.3 AND 5.3.7)**		N
K.1	Making and breaking capacity		N
K.2	Thermostat reliability; operating voltage (V)..... :		N
K.3	Thermostat endurance test; operating voltage (V) ..... :		N
K.4	Temperature limiter endurance; operating voltage (V) ..... :		N
K.5	Thermal cut-out reliability		N
K.6	Stability of operation	(see appended table 5.3)	N

M	**ANNEX M, CRITERIA FOR TELEPHONE RINGING SIGNALS (SEE 2.3.1)**		N
M.2	Method A		N
M.3	Method B		N
M.3.1	Ringing signal		N
M.3.1.1	Frequency (f) ..... :		—
M.3.1.2	Voltage (V) ..... :		—
M.3.1.3	Cadence; time (s), voltage (V) ..... :		—
M.3.1.4	Single fault current (mA) ..... :		—
M.3.2	Tripping device and monitoring voltage..... :		N
M.3.2.1	Conditions for use of a tripping device or a monitoring voltage		N
M.3.2.2	Tripping device		N
M.3.2.3	Monitoring voltage (V) ..... :		N

U	**ANNEX U, INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION (SEE 2.10.5.4)**		P
	Separate test report	**VDE approved wire (Furukawa)**	P

1.5.1	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
refer to appendix 3					

1.6.2	TABLE: electrical data (in normal conditions)				P
fuse #	Irated (A)	U (V)	P (W)	I (mA)	Ifuse (mA)	condition/status
						refer to appendix 14

2.10.3 and 2.10.4	TABLE: clearance and creepage distance measurements					P
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
Lines L1, L2, L3, N to Earth Ground	354	250	2.0	3.0	2.5	3.0
Primary to SELV (PWB)	354	250	2.0	5.0	5.0	5.0

2.10.5	TABLE: distance through insulation measurements			P
distance through insulation di at/of:	U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
Opto coupler	250	5400	0.4 mm	min.0.4mm

4.5	TABLE: temperature rise measurements		P
	test voltage (V) ..... :	**refer to appendix 14**	—
	t1 (°C) ..... :		—
	t2 (°C) ..... :		—

rise °C of part/at:	AC254V (°C)	AC240V (°C)	AC198V (°C)

temperature rise dT of winding:	R_1 (Ω)	R_2 (Ω)	dT (K)	allowed dT (K)	insulation class

4.5.2	TABLE: ball pressure test of thermoplastic parts		P
	allowed impression diameter (mm) ..... :	≤ 2 mm	—

part	test temperature (°C)	impression diameter (mm)
PWB	125	<2
Terminal Block	125	<2
Battery Disconnect Switch	125	<2

5.2	TABLE: electric strength tests and impulse tests		P
test voltage applied between:		test voltage (V)	breakdown Yes / No
Input to safety earth ground		AC 1500	no
Input to SELV		AC 3000	no
T1 Prim - SELV		AC 3000	no
T1 Prim - core		AC1500	no
T1 SELV - core		AC1500	no
Optoinsulators		AC4800	no
supplementary information			
Test voltage a.c. / d.c.			

5.3	**TABLE: fault condition tests**					P
	ambient temperature (°C)				25°C	—
	model/type of power supply				UPS system	—
	manufacturer of power supply				APC	—
	rated markings of power supply				refer appendix 2	—

component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
AC Output, Normal	Overload	253				Unit goes into Bypass Mode at 105% rated load.
AC Output, Battery	Overload	0	5 seconds			Unit goes into Bypass Mode at 105% rated load.
AC Output, Bypass Mode	Overload	253	2:57			100 A input circuit breaker opened.
AC Output	Short	253	4 seconds			Output shutdown (current limiting mode)
AC Output, Battery	Short	0	4 seconds			Output shutdown (current limiting mode)
Transformer T1 Pins 7, 8	Short	253				Temperatures stabilized; T1 at 70.7°C
Transormer T1 Pins 10, 12	Short	253				Temperatures stabilized; T1 at 88.3°C
Transformer T1	Overload					Maximum temperature: 86.5°C
C199	Short + to GND	253				Unit shutdown. Components F1, F2, F3, Q41, Q43 failed.
R124	Short	253				Display shut off, output shutdown.
Fan (490-0047)	Locked Rotor	24 Vdc	7 hours			Temperatures Stabilized. Temperature rise: 30.5°C UL Listed
Battery Module	Short	120 V	1 second			Battery fuse F1 (60 A) cleared.
Front/Rear Vents	Blocked	253	1:43			Power modules shutdown, unit went into Bypass Mode due to overload caused by reduced number of power modules.

5.3	**TABLE: fault condition tests**						P
	ambient temperature (°C)				25°C		—
	model/type of power supply				UPS system		—
	manufacturer of power supply				APC		—
	rated markings of power supply				refer appendix 2		—
component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result	
Front/Rear Vents	Blocked	253				60% load. Power module one shut down. UPS continued, normal. Power module two shutdown, unit went into Bypass Mode due to overload. Load was reduced until all power modules shutdown. Unit went into Bypass Mode.	
Front/Rear Vents	Blocked	0 (On Battery)	6.5 minutes			Low Battery Shutdown	

A.6.5	TABLE: flammability test for classifying materials V-0, V-1 or V-2		N
sample No. / ref.	afterflame time (s) t_1 or t_2	afterflame + afterglow (s) after 2nd flame application $t_2 + t_3$	

A.6.6	TABLE: flammability re-test for classifying materials V-0, V-1 or V-2		N
sample No.	afterflame time (s) t_1 or t_2	afterflame + afterglow (s) after 2nd flame application $t_2 + t_3$	

A.7.4, A.7.5, A.7.6 and A.7.7	TABLE: flammability test for classifying foam materials HF-1, HF-2 or HBF			N
sample No. / ref.	flame time (s)	glow time (s)	flaming/glowing distance from the end (mm)	comment (for A.7.7 burning rate mm/min)

A.7.8	TABLE: flammability re-test for classifying foam materials HF-1 or HF-2			N
sample No.	flame time (s)	glow time (s)	flaming/glowing distance from the end (mm)	comment

A.7.9	TABLE: flammability re-test for classifying foam materials HBF			N
sample No.	flame time (s)	glow time (s)	flaming/glowing distance from the end (mm)	comment (for A.7.7 burning rate mm/min)

A.8.5	TABLE: flammability test for classifying materials HB		N
sample No.	flaming/glowing rate mm/min	flaming/glowing distance from reference mark (mm)	

A.8.6	TABLE: flammability re-test for classifying materials HB		N
sample No.	flaming/glowing rate mm/min	flaming/glowing distance from reference mark (mm)	

A.9.6	TABLE: flammability test for classifying materials 5V					N
sample	test bars		test plaques			
No./ref.	flaming + glowing time (s)	burning distance (mm)	position	flaming + glowing time (s)	burning distance (mm)	

A.9.7	TABLE: flammability re-test for classifying materials 5V					
sample	test bars		test plaques			
No.	flaming + glowing time (s)	burning distance (mm)	position	flaming + glowing time (s)	burning distance (mm)	

	SPECIAL NATIONAL CONDITIONS AND NATIONAL DEVIATIONS A = National Deviation (A-deviation) C = CENELEC Common Modification F = other information S = Special National Condition		P
	C: delete all the "country" notes that appear on the following pages of the reference document (IEC 60950:1999): 85, 91, 99, 103, 117, 119, 123, 125, 149, 171, 213, 215, 219, 251, 283, 325, 327, 331, 333 and 407		OK
1.2.4.1	S (DK): certain types of Class I appliances (see subclause 3.2.1) may be provided with a plug not establishing earthing continuity when inserted into Danish socket-outlets		OK
1.5.1	A (CH, SE): add the following: NOTE: Switches containing mercury such as thermostats, relays and level controllers are not allowed		OK
1.5.8	S (NO): due to the IT power system used (see annex V, figure V.7), capacitors are required to be rated for the applicable phase-to phase voltage (230 V)		N
1.7.2	S (NO): class I pluggable equipment type A intended for connection to other equipment or a communication network shall, if safety relies on connection to protective earth, require a marking stating that the equipment must be connected to an earthed mains socket outlet		N
	S (SE): if the separation between the mains and SELV terminal relies upon connection to the safety earth, the apparatus shall have a marking stating that it must be connected to an earthed mains socket-outlet. The marking text shall be in Swedish and as follows: "Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk."		N

	A (DK): supply cords of Class I equipment, which are delivered without a plug must be provided with a visible tag with the following text: "Vigtigt! Lederen med grøn/gul isolation må kun tilsluttes en klemme mærket (IEC 417, No. 5019 eller IEC 417, No. 5017)." If essential for the safety of the equipment, the tag must in addition be provided with a diagram, which shows the connection of the other conductors, or be provided with the following text: "For tilslutning af de øvrige ledere, se medfølgende installationsvejledning."		N
1.7.5	S (DK): socket-outlets for providing power to other equipment shall be in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-3a, DK 1-5a or DK 1-7a, when used on Class I equipment		N
	A (DK): Class II equipment shall not be fitted with socket-outlets for providing power to other equipment		N
1.7.12	A (DE): (Gesetz über techische Arbeitsmittel (Gerätesicherheitsgesetz) [Law on technical labour equipment {Equipment safety law}], of 23rd October 1992, Article 3, 3rd paragraph, 2nd sentence, together with the "Allgemeine Verwaltungsvorschrift zur Durchführung des Zweiten Abschnitts des Gerätesicherheitsgesetzes" [General administrative regulation on the execution of the Second Section of the Equipment safety law], of 10th January 1996, article 2, 4th paragraph item 2) Directions for use with rules to prevent certain hazards for (among others) maintenance of the technical labour equipment, also for imported technical labour equipment shall be written in the German language. NOTE: Of this requirement, rules for use even only by service personnel are not exempted		N

1.7.15	A (CH): (Ordinance on environmentally hazardous substances SR 814.013) Annex 4.10 of SR 814.013 applies for batteries		N
	F (ALL): warning texts for lithium batteries		N
	Languages.....:		—

2.2.4	S (NO): requirements according to this annex, sub-clauses 1.7.2 and 6.1.2.1 apply		OK
2.3.2	S (NO): requirements according to this annex, sub-clause 6.1.2.1 apply		OK
2.3.3	S (NO): requirements according to this annex, sub-clause 6.1.2.1 apply		OK
2.3.4	S (NO): requirements according to this annex, sub-clauses 1.7.2 and 6.1.2.1 apply		OK
2.7.1	C: replace the subclause as follows: Basic requirements To protect against excessive current, short circuits and earth faults in primary circuits, protective devices shall be included either as integral parts of the equipment or as parts of the building installation, subject to the following, a), b), and c): a) Except as detailed in b) and c), protective devices necessary to comply with the requirements of 5.3 shall be included as integral parts of the equipment. b) For components in series with the mains input to the equipment such as the supply cord, appliance coupler, r.f.i. filter and switch, short circuit and earth fault protection may be provided by protective devices in the building installation. c) It is permitted for pluggable equipment type B or permanently connected equipment, to rely on dedicated overcurrent and short circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instruction. If reliance is placed on protection in the building installation, the installation instructions shall so state, except that for pluggable equipment type A the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet		OK

2.7.2	C: This subclause has been declared 'void'		OK
2.10.3.1	S (NO): due to the IT power distribution system used (see annex V, figure V.7), the a.c. mains supply voltage is considered to be equal to the line-to-line voltage, and will remain at 230 V in case of a single earth fault		N

3.2.1	S (CH): supply cords of equipment having a rated current not exceeding 10 A shall be provided with a plug complying with SEV 1011 or IEC 884-1 and one of the following dimensions sheets: - SEV 6532-2:1991: plug type 15, 3P+N+PE 250/400 V, 10 A - SEV 6533-2:1991: plug type 11, L+N 250 V, 10 A - SEV 6534-2:1991: plug type 12, L+N+PE 250 V, 10 A In general, EN 60 309 applies for plugs for currents exceeding 10 A. However, a 16 A plug and socket-outlet system is being introduced in Switzerland, the plugs of which are according to the following dimension sheets, published in February 1998: - SEV 5932-2:1998: plug type 25, 3L+N+PE 230/400 V, 16 A - SEV 5933-2:1998: plug type 21, L+N 250 V, 16 A - SEV 5934-2:1998: plug type 23, L+N+PE 250 V, 16 A		N

	S (DK): supply cords of single-phase equipment having a rated current not exceeding 10 A shall be provided with a plug according to the Heavy Current Regulations Section 107-2-D1. Class I equipment provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with Standard Sheet DK 2-1a or DK 2-5a. If poly-phase equipment and single-phase equipment having a rated current exceeding 10 A is provided with a supply cord with a plug, this plug shall be in accordance with the Heavy Current Regulations Section 107-D1 or EN 60309-2		N
	S (ES): supply cords of single-phase equipment having a rated current not exceeding 10 A shall be provided with a plug according to UNE 20315:1994 Supply cords of single-phase equipment having a rated current not exceeding 2,5 A shall be provided with a plug according to UNE-EN 50075:1993 Class I equipment provided with socket-outlets with earth contacts, or which are intended to be used locations where protection against indirect contact is required according to the wiring rules, shall be provided with a plug in accordance with standard UNE 20315:1994 If poly-phase equipment is provided with a supply cord with a plug, this plug shall be in accordance with UNE-EN 60309-2		N
	S (GB): apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord and plug, shall be fitted with a "standard plug" in accordance with Statutory Instrument 1768:1994 – The Plugs and Sockets etc. (Safety) Regulations 1994, unless exempted by those regulations. NOTE: "Standard plug" is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug		N

	S (IE): apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to I.S. 411 by means of that flexible cable or cord and plug shall be fitted with a 13 A plug in accordance with Statutory Instrument 525: 1997 – National Standards Authority of Ireland (section 28) (13 A Plugs and Conversion Adaptors for Domestic Use) Regulations 1997		N
3.2.3	C: delete note 1, and in table 3A delete the conduit sizes in parentheses		N
	C: replace "60245 IEC 53" by "H05 RR-F", "60227 IEC 52" by "H03 VV-F or H03 VVH2-F" and "60227 IEC 53" by "H05 VV-F or H05 VVH2-F2" In table 3B, replace the first four lines by the following: Up to and including 6 0,75 1) Over 6; up to and including 10 (0,75)2) 1,0 Over 10 up to and including 16(1,0)3) 1,5 In the conditions applicable to table 3B, delete the words "in some countries" in condition 1). In NOTE 1, delete the second sentence		OK
	S (GB): a power supply cord with conductor of 1,25 mm² is allowed for equipment with rated current over 10 A and up to and including 13 A		OK
3.3.4	C: in table 3D, delete the fourth line – conductor sizes for 10 to 13 A, and replace with the following: "Over 10 up to and including 16 1.5 to 2,5 1,5 to 4" Delete the fifth line – conductor sizes for 13 to 16 A.		OK

	S (GB): the range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current of over 10 A up to and including 13 A is: - 1,25 mm² to 1,5 mm² nominal cross-sectional area		OK
4.3.6	S (GB): the torque test is performed using a socket outlet complying with BS 1363 and the plug part of direct plug-in equipment shall be assessed to BS 1363: Part 1, 12.1, 12.2, 12.3, 12.9, 12.11, 12.12, 12.16 and 12.17, except that the test of 12.17 is performed at not less than 125 °C		N
	S (IE): direct plug-in equipment is known as plug similar devices. Such devices shall comply with Statutory Instrument 526:1997 – National Standards Authority of Ireland (Section 28) (Electrical plugs, plug similar devices and sockets for domestic use) Regulations, 1997		N

4.3.13	C: replace the second compliance paragraph by: For equipment using LEDs or lasers, compliance is checked according to EN 60825-1 NOTE 1 – If equipment falling within the scope of EN 60950 is inherently a class 1 laser product, i.e. it contains no embedded laser or LED of a higher class number, then a laser warning label or other laser warning statement is not required (see 1.1 of EN 60825-1) Renumber the NOTE below the third compliance paragraph as NOTE 2		OK
6.1.2.1	S (NO, SE): add the following text between the first and second paragraph: If this insulation is solid, including insulation forming part of a component, it shall at least consist of either - two layers of thin sheet material, each of which shall pass the electric strength test below, or - one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. If this insulation forms part of a semiconductor component e.g. an optocoupler, there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that clearances and creepage distances do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition: - passes the tests and inspection criteria of 2.10.8 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.7 shall be performed using 1,5 kV); and - is subjected to routine testing for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with a capacitor complying with EN 132400:1994, subclass Y2		OK
6.1.2.2	S (FI, NO, SE): the exclusions are applicable for permanently connected equipment and pluggable equipment type B only		OK
G.2	S (NO): due to the IT power distribution system used (see annex V, figure V.7), the a.c. mains supply voltage is considered to be equal to the line-to-line voltage, and will remain at 230 V in case of a single earth fault		OK

Annex H	C: replace the last paragraph of this annex by: At any point 10 cm from the surface of the operator access area, the dose rate shall not exceecd 1 µSv/h (0,1 mR/h) (see note). Account is taken of the background level		OK
	C: replace the NOTE as follows: NOTE – These values appear in Directive 96/29/Euratom		OK
	A (DE): (Regulation on protection against hazards by X-ray, of 8th January 1987, Article 5 [Operation of X-ray emission source], clauses 1 to 4) a) A licence is required by those who operate an X-ray emission source. b) A licence in accordance with Cl. 1 is not required by those who operate an X-ray emission source on which the electron acceleration voltage does not exceed 20 kV if 1) the local dose rate at a distance of 0,1 m from the surface does not exceed 1 µSv/h and 2) it is adequately indicated on the X-ray emission source that i) X-rays are generated and ii) the electron acceleration voltage must not exceed the maximum value stipulated by the manufacturer or importer. c) A licence in accordance with Cl. 1 is also not required by persons who operate an X-ray emission source on which the electron acceleration voltage exceeds 20 kV if 1) the X-ray emission source has been granted a type approval and 2) it is adequately indicated on the X-ray emission source that i) X-rays are generated ii) the device stipulated by the manufacturer or importer guarantees that the maximum permissible local dose rate in accordance with the type approval is not exceeded and iii) the electron acceleration voltage must not exceed the maximum value stipulated by the manufacturer or importer. d) Furthermore, a licence in accordance with Cl. 1 is also not required by persons who operate X-ray emission sources on which the electron acceleration voltage does not exceed 30 kV if 1) the X-rays are generated only by intrinsically safe CRTs complying with Enclosure III, No. 6,		N

	2) the values stipulated in accordance with Enclosure III, No. 6.2 are limited by technical measures and specified in the device and 3) it is adequately indicated on the X-ray emission source that the X-rays generated are adequately screened by the intrinsically safe CRT		
Annex P	C: replace the text of this annex by: See Annex ZA		OK
Annex Q	C: Add the following notes for the standards indicated: IEC 60127 series NOTE: Harmonized as EN 60127 series (not modified) IEC 60269-2-1 NOTE: Harmonized as HD 630.2.1 S2:1997 (modified) IEC 60529 NOTE: Harmonized as EN 60529:1991 (not modified) IEC 61032 NOTE: Harmonized as EN 61032:1998 (not modified)		OK
ANNEX ZA	C: This Europen standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate palces in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies. NOTE: When an international publication has been modivied by common modifications, indicated by (mod), the relevant EN/HD applies.		OK
	—	IEC 60050-151:1978	
	—	IEC 60050-195:1998	
	EN 600651):1993 + corr. Nov. 1993	IEC 60065 (mod):1985	
	EN 60073:1996	IEC 60073:1996	
	HD 566 S1:1990	IEC 60085:1984	
	HD 214 S2:1980	IEC 60112:1979	
	HD 212) Series	IEC 60227 (mod) Series	
	HD 223) Series	IEC 60245 (mod) Series	
	EN 60309 Series	IEC 60309 Series	
	EN 60320 Series	IEC 60320 (mod) Series	
	HD 384.3 S2:1995	IEC 60364-3 (mod):1993	
	HD 384.4.41 S2:1996	IEC 60364-4-41 (mod):1992	
	—	IEC 60384-14:1993	
	EN 60417-1:1999	IEC 60417-1:1998	
	EN 60417-2:1999	IEC 60417-2:1998	
	HD 625.1 S1:1996 + corr. Nov. 1996	IEC 60664-1 (mod):1992	

	EN 60695-2-2/1:1996	IEC 60695-2-1/1:1994 + corr. May 1995	
	EN 60695-2-2:1994	IEC 60695-2-2:1991	
	—	IEC 60695-10-2:1995	
	EN 60730-1:1995	IEC 60730-1 (mod):1993	
	EN 60825-1:1994 + corr. Feb. 1995 + A11:1996	IEC 60825-1:1993	
	EN 60851-3:1996	IEC 60851-3:1995	
	EN 60851-5:1996	IEC 60851-5:1996	
	EN 60851-6:1996	IEC 60851-6:1996	
	—	IEC 60885-1:1987	
	EN 60990:1999	IEC 60990:1999	
	—	IEC 61058-1:1996	
	—	ISO 261:1973	
	—	ISO 262:1973	
	—	ISO 3864:1984	
	—	ISO 4046:1978	
	—	ISO 7000:1989	
	ITU-T Recommendation K.17:1988, Tests on power-fed repeaters using solid-state devices in order to check the arrangements for protection from external interference		
	ITU-T Recommendation K.21:1996, Resistibility of subscribers' terminals to overvoltages and overcurrents		
	_____		
	1) EN 60065:1993 is superseded by EN 60065:1998 + corrigendum June 1999, which is based on IEC 60065:1998, mod.		
	2) The HD 21 series is related to, but not directly equivalent with the IEC 60227 series.		
	3) The HD 22 series is related to, but not directly equivalent with the IEC 60245 series.		

IEC 60950, 3rd edition (1999)
Information technology equipment including electrical business equipment
Issuance and recognition: At the date of the issue, CB Test Certificates for equipment in accordance with the standard concerned are issued and recognized by the National Certification Bodies (NCBs) of the following countries. The letter "R" adjacent to the name of the country indicates that the National Certification Body is only a Recognizing NCB for the standard in question.
Country Remark Group differ. National differ. National standard
- AT Austria Yes
– CH Switzerland Yes - pr EN 60950
CZ Czech Republic Yes
-DE Germany –
-DK Denmark –
-FI Finalnd Yes Yes EN 60950
- FR France
- GB United Kingdom –
- HU Hungary Yes - MSZ EN 60950
- The Netherlands –
- NO Norway Yes Yes NEK EN 60950
- SE Sweden Yes Yes SS EN 60950, 6 th ed
- SI Slovenia Yes
-SG Singapore –
-US United States of America Yes - UL 1950 (April 2000)
- ZA South Africa - - SABS IEC 60950

NATIONAL DIFFERENCES

Finnland FI

2.3.3	The exclusions are applicable for permanently connected equipment and pluggable equipment type B only.		N

Norway (NO)

1.5.8	In Norway, due to the IT power system used (see annex V, figure V.7), capacitors are required to be rated for the applicable phase-to- phase voltage (230 V).		P
1.7.2	In Norway, CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a communication network shall, K safety relies on connection to protective earth, require a marking stating that. the equipment must be connected to an earthed mains socket-outlet. In Sweden, if the separation between the mains and SELV terminal relies upon connection to the safety earth, the apparatus shall have a marking stating that it must be connected to an earthed mains socket-outlet The marking text shall be in Swedish and as follows: "Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk."		N
2.2.4	In Norway, requirements according to this annex, sub-clauses 1.7.2 and 6.1.2.1 apply.		P
2.3.2	In Norway, requirements according to this annex, sub-clause 6.1.2.1 apply.		N

2.3.3	In Norway, requirements according to this annex, sub-clause 6.1.2.1 apply.		N
2.3.4	In Norway, requirements according to this annex, sub-clauses 1.7.2 and 6.1.2.1 apply.		P
2.10.3.1	In Norway, due to the IT power distribution system used (see annex V, figure V.7), tire A.C. MAINS SUPPLY Voltage is considered to be equal to the line-to-line voltage, and will remain at 230 V in case of a single earth fault.		P
6.1.2.1	In Norway and Sweden, add the following text between the first and second paragraph: If this insulation is solid, including Insulation forming part of a component, it shall at least consist of either - two layers of thin sheet material, each of which shall pass the electric strength test below, or - one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. If this insulation forms part of a semiconductor component e.g. an optocoupler, there is no distance through insulation requirement for the insulation consigns of an insulating compound completely filling the casing, so that CLEARANCES and CREEPAGE DISTANCES do not exist if the component passes the electric strength test in accordance with the compliance clause below and in addition: - passes the tests and inspection criteria of 2.10.8 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.7 shall be performed using 1,5 kV): and - is subject to ROUTINE TESTING for electric strength during manufacturing, using a test voltage of 1,5 W. It Is permitted to bridge this insulation With a capacitor complying with EN 132400:1994, subclass Y2.		P
6.1.2.2	In Norway and Sweden, the exclusions are applicable for PERMANENTLY CONNECTED EQUIPMENT and PLUGGABLE- EQUIPMENT TYPE B only.		N
Annex G.2	In Norway, due to the IT power distribution system used (see annex V, figure V.7), the A.C. MAINS SUPPLY voltage Is considered to be equal to the line-to-line voltage, and will remain at 230 V in case of a single earth fault.		N

Schweden (SE)

1.5.1	Add the following: NOTE: In Sweden, switches containing mercury such as thermostats, relays and level controllers are not allowed.		N
1.7.2	In Sweden, if the separation between the mains and SELV terminal relies upon connection to the safety earth, the apparatus shall have a marking stating that it must be connected to an earthed mains socket-outlet. The marking shall be in Swedish and as follows: "Apparaten skall anslutas till j ordat uttag ndr den ansluts till ett ndtverk.		N
6.1.2.1	In Sweden, add the following text between the first and the second paragraph: If this insulation is solid, including insulation forming part of a component, it shall at least consist of either: - two layers of thin sheet material, each of which shall pass the electric strength test below, or - one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. If this insulation forms part of a semiconductor component e.g. an optocoupler, there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that CLEARANCES and CREEPAGE DISTANCES do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition: - passes the tests and inspection criteria of 2.10.8 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.7 shall be performed using 1,5 kV); and - is subjected to ROUTINE TESTING for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with a capacitor complying with EN 132400:1994, subclass Y2.		N
6.1.2.2	In Sweden, the exclusions are applicable to PERMANENTLY CONNECTED EQUIPMENT and PLUGGABLE EQUIPMENT TYPE B only.		N

GROUP DIFFERENCES

2.7.1	Replace the subclause as follows: Basic requirements To protect against excessive current, short Circuits and earth faults in PRIMARY CIRCUITS, protective devices shall be included either as integral parts of the equipment or as parts of the building installation, subject to the following, a), b), and c) a) Except as detailed in b) and c), protective devices necessary to comply with the requirements of subclause 6.3 shall be Included as parts of the equipment b) For components in series with the mains input to the equipment such as the supply cord, appliance coupler, r.f.i. filter and switch, short circuit and earth fault protection may be provided by protective devices in the building installation. c) It is permitted for PLUGGABLE EQUIPMENT TYPE B or PERMANENTLY CONNECTED EQUIPMENT, to rely on dedicated overcurrent and short circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instruction. If reliance is placed on protection in the building installation. the installation instructions shall so state, except that for PLUGGABLE EQUIPMENT TYPE A the building Installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet.		P

2.7.2	This subclause has been declared 'void'.		N
3.2.3	Delete NOTE 1, and in table 3A delete the conduit sizes in parentheses.		N
3.2.5	Replace “60245 IEC 530” by "HO5 RR-F" “60227 IEC 52” by 'HO3 W-F or H03 WH2-F” “60227 IEC 53" by “HOS W-F or H05 WH2-F2” In table 38, replace the first four lines by the following: Up to and including 6 0,75 1) Over 6 up to and including 10 (0,75)2) 1,0 Over 10 up to and including 16 (1.0)3) 1,5 In the Conditions applicable to table 3B delete the words “in some countries" in condition 1) In NOTE 1, delete the second sentence. 3.3.4 In table 30, delete the fourth line - conductor sizes for 10 to 13 A. and replace with the following: Over 10 up to and including 16 1,5 to 2,5 1,5 to 4 Delete the fifth line - conductor sizes for 13 to 16 A.		OK
4.3.13	Replace the second compliance paragraph by: For equipment using LEDs or lasers, compliance is checked according to EN 60825- 1. NOTE 1 - if equipment falling within the scope of EN 60950 Is inherently a class 1 laser product, i.e. it contains no embedded laser or LD of a higher class number, then a laser warning label or other laser warning statement is		P

	not required (see 1.1 of EN 60825-1). Renumber the NOTE below the third compliance paragraph 2S NOTE 2.		
Annex H	Replace the last paragraph of this annex by: At any point 10 cm from the surface of the OPERATOR ACCESS AREA. the dose rate shall not exceed Sv/h (0,1 mR/h) (see note). Account is taken of the background level. Replace the NOTE as follows: NOTE - These values appear in directive 96/29/Euratorm.		N
Annex P	Replace the text of this annex by: See annex ZA.		N
Annex Q	Add the following notes for the standards indicated: IEC 60127 series NOTE. Harmonized as EN 60127 series (not modified) IEC 60529 NOTE: Harmonized as EN 60629:1 991 (not modified) IEC 61032 NOTE: Harmonized as EN 61032:1998 (not modified)		OK

ANNEX FOR TEST REPORT EN 60950 3rd EDITION (2000)
DEVIATIONS FOR EUROPE

Explanations for abbreviations:
C = CENELEC Common Modification, **S** = Special National Condition, **A** = National Deviation (A-deviation), **F** = Other information, **AT** = Austria, **CH** = Switzerland, **DE** = Germany, **DK** = Denmark, **ES** = Spain, **FI** = Finland, **GB** = Great Britain, **IE** = Ireland, **NO** = Norway, **SE** = Sweden, **All** = All countries

Sub-cl.		Deviation	Result
—	C	Delete all the "country" notes that appear on the following pages of the reference document (IEC 60950:1999): 85, 91, 99, 103, 117, 119, 123, 125, 149, 171, 213, 215, 219, 251, 283, 325, 327, 331, 333 and 407. **CENELEC**	N
1.2.4.1	S	Certain types of Class I appliances (see subclause 3.2.1) may be provided with a plug not establishing earthing continuity when inserted into Danish socket-outlets. **DK**	OK
1.5.1	A	Add the following: NOTE: Switches containing mercury such as thermostats, relays and level controllers are not allowed. **CH, SE**	N
1.5.8	S	Due to the IT power system used (see annex V, figure V.7), capacitors are required to be rated for the applicable phase-to phase voltage (230 V). **NO**	P
1.7.2	S	Class I pluggable equipment type A intended for connection to other equipment or a communication network shall, if safety relies on connection to protective earth, require a marking stating that the equipment must be connected to an earthed mains socket outlet. **NO**	N
	S	If the separation between the mains and SELV terminal relies upon connection to the safety earth, the apparatus shall have a marking stating that it must be connected to an earthed mains socket-outlet. The marking text shall be in Swedish and as follows: "Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk." **SE**	N
	A	Supply cords of Class I equipment, which are delivered without a plug must be provided with a visible tag with the following text: "Vigtigt! Lederen med grøn/gul isolation må kun tilsluttes en klemme mærket eller (IEC 417, No. 5019 eller IEC 417, No. 5017)." If essential for the safety of the equipment, the tag must in addition be provided with a diagram, which shows the connection of the other conductors, or be provided with the following text: "For tilslutning af de øvrige ledere, se medfølgende installationsvejledning." **DK**	N
1.7.5	S	Socket-outlets for providing power to other equipment shall be in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-3a, DK 1-5a or DK 1-7a, when used on Class I equipment. **DK**	N

	A	Class II equipment shall not be fitted with socket-outlets for providing power to other equipment. **DK**	N
1.7.12	A	(Gesetz über techische Arbeitsmittel (Gerätesicherheitsgesetz) [Law on technical labour equipment {Equipment safety law}], of 23rd October 1992, Article 3, 3rd paragraph, 2nd sentence, together with the "Allgemeine Verwaltungsvorschrift zur Durchführung des Zweiten Abschnitts des Gerätesicherheitsgesetzes" [General administrative regulation on the execution of the Second Section of the Equipment safety law], of 10th January 1996, article 2, 4th paragraph item 2) Directions for use with rules to prevent certain hazards for (among others) maintenance of the technical labour equipment, also for imported technical labour equipment shall be written in the German language. NOTE: Of this requirement, rules for use even only by service personnel are not exempted. **DE**	N
1.7.15	A	(Ordinance on environmentally hazardous substances SR 814.013) Annex 4.10 of SR 814.013 applies for batteries. **CH**	N
	D	Warning texts for lithium batteries. **All**	N
		Languages.....:	—
2.2.4	S	Requirements according to this annex, sub-clauses 1.7.2 and 6.1.2.1 apply. **NO**	N
2.3.2	S	Requirements according to this annex, sub-clause 6.1.2.1 apply. **NO**	N
2.3.3	S	Requirements according to this annex, sub-clause 6.1.2.1 apply. **NO**	N
2.3.4	S	Requirements according to this annex, sub-clauses 1.7.2 and 6.1.2.1 apply. **NO**	N
2.7.1	C	Replace the subclause as follows: Basic requirements To protect against excessive current, short circuits and earth faults in primary circuits, protective devices shall be included either as integral parts of the equipment or as parts of the building installation, subject to the following, a), b), and c): a) Except as detailed in b) and c), protective devices necessary to comply with the requirements of 5.3 shall be included as integral parts of the equipment. b) For components in series with the mains input to the equipment such as the supply cord, appliance coupler, r.f.i. filter and switch, short circuit and earth fault protection may be provided by protective devices in the building installation. c) It is permitted for pluggable equipment type B or permanently connected equipment, to rely on dedicated overcurrent and short circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instruction. If reliance is placed on protection in the building installation, the installation instructions shall so state, except that for pluggable equipment type A the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet. **CENELEC**	OK
2.7.2	C	This subclause has been declared 'void'. **CENELEC**	OK

2.10.3.1	S	Due to the IT power distribution system used (see annex V, figure V.7), the a.c. mains supply voltage is considered to be equal to the line-to-line voltage, and will remain at 230 V in case of a single earth fault. **NO**	P
3.2.1	S	Supply cords of equipment having a rated current not exceeding 10 A shall be provided with a plug complying with SEV 1011 or IEC 884-1 and one of the following dimensions sheets: - SEV 6532-2:1991: plug type 15, 3P+N+PE 250/400 V, 10 A - SEV 6533-2:1991: plug type 11, L+N 250 V, 10 A - SEV 6534-2:1991: plug type 12, L+N+PE 250 V, 10 A In general, EN 60 309 applies for plugs for currents exceeding 10 A. However, a 16 A plug and socket-outlet system is being introduced in Switzerland, the plugs of which are according to the following dimension sheets, published in February 1998: - SEV 5932-2:1998: plug type 25, 3L+N+PE 230/400 V, 16 A - SEV 5933-2:1998: plug type 21, L+N 250 V, 16 A - SEV 5934-2:1998: plug type 23, L+N+PE 250 V, 16 A **CH**	P
	S	Supply cords of single-phase equipment having a rated current not exceeding 10 A shall be provided with a plug according to the Heavy Current Regulations Section 107-2-D1. Class I equipment provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with Standard Sheet DK 2-1a or DK 2-5a. If poly-phase equipment and single-phase equipment having a rated current exceeding 10 A is provided with a supply cord with a plug, this plug shall be in accordance with the Heavy Current Regulations Section 107-D1 or EN 60309-2. **DK**	N
	S	Supply cords of single-phase equipment having a rated current not exceeding 10 A shall be provided with a plug according to UNE 20315:1994. Supply cords of single-phase equipment having a rated current not exceeding 2,5 A shall be provided with a plug according to UNE-EN 50075:1993. Class I equipment provided with socket-outlets with earth contacts, or which are intended to be used locations where protection against indirect contact is required according to the wiring rules, shall be provided with a plug in accordance with standard UNE 20315:1994. If poly-phase equipment is provided with a supply cord with a plug, this plug shall be in accordance with UNE-EN 60309-2. **ES**	N

	S	Apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord and plug, shall be fitted with a "standard plug" in accordance with Statutory Instrument 1768:1994 – The Plugs and Sockets etc. (Safety) Regulations 1994, unless exempted by those regulations. NOTE: "Standard plug" is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug. **GB**	N
	S	Apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to I.S. 411 by means of that flexible cable or cord and plug shall be fitted with a 13 A plug in accordance with Statutory Instrument 525: 1997 – National Standards Authority of Ireland (section 28) (13 A Plugs and Conversion Adaptors for Domestic Use) Regulations 1997. **IE**	N
3.2.3	C	Delete note 1, and in table 3A delete the conduit sizes in parentheses. **CENELEC**	N
3.2.5	C	Replace "60245 IEC 53" by "H05 RR-F", "60227 IEC 52" by "H03 VV-F or H03 VVH2-F" and "60227 IEC 53" by "H05 VV-F or H05 VVH2-F2" In table 3B, replace the first four lines by the following: Up to and including 6 0,75 [1)] Over 6; up to and including 10 (0,75)[2)] 1,0 Over 10 up to and including 16(1,0)[3)] 1,5 In the conditions applicable to table 3B, delete the words "in some countries" in condition [1)]. In NOTE 1, delete the second sentence **CENELEC**	OK
	S	A power supply cord with conductor of 1,25 mm² is allowed for equipment with rated current over 10 A and up to and including 13 A. **GB**	N
3.3.4	C	In table 3D, delete the fourth line – conductor sizes for 10 to 13 A, and replace with the following: "Over 10 up to and including 161.5 to 2,5 1,5 to 4" Delete the fifth line – conductor sizes for 13 to 16 A. **CENELEC**	N
	S	The range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current of over 10 A up to and including 13 A is: - 1,25 mm² to 1,5 mm² nominal cross-sectional area **GB**	N
4.3.6	S	The torque test is performed using a socket outlet complying with BS 1363 and the plug part of direct plug-in equipment shall be assessed to BS 1363: Part 1, 12.1, 12.2, 12.3, 12.9, 12.11, 12.12, 12.16 and 12.17, except that the test of 12.17 is performed at not less than 125 °C. **GB**	N

	S	Direct plug-in equipment is known as plug similar devices. Such devices shall comply with Statutory Instrument 526:1997 – National Standards Authority of Ireland (Section 28) (Electrical plugs, plug similar devices and sockets for domestic use) Regulations, 1997. **IE**	N
4.3.13	C	Replace the second compliance paragraph by: For equipment using LEDs or lasers, compliance is checked according to EN 60825-1. NOTE 1 – If equipment falling within the scope of EN 60950 is inherently a class 1 laser product, i.e. it contains no embedded laser or LED of a higher class number, then a laser warning label or other laser warning statement is not required (see 1.1 of EN 60825-1). Renumber the NOTE below the third compliance paragraph as NOTE 2. **CENELEC**	N
6.1.2.1	S	Add the following text between the first and second paragraph: If this insulation is solid, including insulation forming part of a component, it shall at least consist of either - two layers of thin sheet material, each of which shall pass the electric strength test below, or - one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. If this insulation forms part of a semiconductor component e.g. an optocoupler, there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that clearances and creepage distances do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition: - passes the tests and inspection criteria of 2.10.8 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.7 shall be performed using 1,5 kV); and - is subjected to routine testing for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with a capacitor complying with EN 132400:1994, subclass Y2. **NO, SE**	N
6.1.2.2	S	The exclusions are applicable for permanently connected equipment and pluggable equipment type B only. **FI, NO, SE**	N
G.2	S	Due to the IT power distribution system used (see annex V, figure V.7), the a.c. mains supply voltage is considered to be equal to the line-to-line voltage, and will remain at 230 V in case of a single earth fault. **NO**	N
Annex H	C	Replace the last paragraph of this annex by: At any point 10 cm from the surface of the operator access area, the dose rate shall not exceecd 1 μSv/h (0,1 mR/h) (see note). Account is taken of the background level. **CENELEC**	N

C	Replace the NOTE as follows: NOTE – These values appear in Directive 96/29/Euratom. **CENELEC**	N
Annex H A	(Regulation on protection against hazards by X-ray, of 8th January 1987, Article 5 [Operation of X-ray emission source], clauses 1 to 4) a) A licence is required by those who operate an X-ray emission source. b) A licence in accordance with Cl. 1 is not required by those who operate an X-ray emission source on which the electron acceleration voltage does not exceed 20 kV if 1) the local dose rate at a distance of 0,1 m from the surface does not exceed 1 µSv/h and 2) it is adequately indicated on the X-ray emission source that i) X-rays are generated and ii) the electron acceleration voltage must not exceed the maximum value stipulated by the manufacturer or importer. c) A licence in accordance with Cl. 1 is also not required by persons who operate an X-ray emission source on which the electron acceleration voltage exceeds 20 kV if 1) the X-ray emission source has been granted a type approval and 2) it is adequately indicated on the X-ray emission source that i) X-rays are generated ii) the device stipulated by the manufacturer or importer guarantees that the maximum permissible local dose rate in accordance with the type approval is not exceeded and iii) the electron acceleration voltage must not exceed the maximum value stipulated by the manufacturer or importer. d) Furthermore, a licence in accordance with Cl. 1 is also not required by persons who operate X-ray emission sources on which the electron acceleration voltage does not exceed 30 kV if 1) the X-rays are generated only by intrinsically safe CRTs complying with Enclosure III, No. 6, 2) the values stipulated in accordance with Enclosure III, No. 6.2 are limited by technical measures and specified in the device and 3) it is adequately indicated on the X-ray emission source that the X-rays generated are adequately screened by the intrinsically safe CRT. **DE**	N
Annex P C	Replace the text of this annex by: See Annex ZA. **CENELEC**	N

Annex QC	Add the following notes for the standards indicated: IEC 60127 series NOTE: Harmonized as EN 60127 series (not modified) IEC 60269-2-1 NOTE: Harmonized as HD 630.2.1 S2:1997 (modified) IEC 60529 NOTE: Harmonized as EN 60529:1991 (not modified) IEC 61032 NOTE: Harmonized as EN 61032:1998 (not modified) **CENELEC**	N
Annex ZA C	This European standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate palces in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies. NOTE: When an international publication has been modivied by common modifications, indicated by (mod), the relevant EN/HD applies.	OK

—	IEC 60050-151:1978
—	IEC 60050-195:1998
EN 60065[1]:1993 + corr. Nov. 1993	IEC 60065 (mod):1985
EN 60073:1996	IEC 60073:1996
HD 566 S1:1990	IEC 60085:1984
HD 214 S2:1980	IEC 60112:1979
HD 21[2] Series	IEC 60227 (mod) Series
HD 22[3] Series	IEC 60245 (mod) Series
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—	IEC 60384-14:1993
EN 60417-1:1999	IEC 60417-1:1998
EN 60417-2:1999	IEC 60417-2:1998
HD 625.1 S1:1996 + corr. Nov. 1996	IEC 60664-1 (mod):1992
EN 60695-2-2/1:1996	IEC 60695-2-1/1:1994 + corr. May 1995
EN 60695-2-2:1994	IEC 60695-2-2:1991
—	IEC 60695-10-2:1995
EN 60730-1:1995	IEC 60730-1 (mod):1993
EN 60825-1:1994 + corr. Feb. 1995 + A11:1996	IEC 60825-1:1993
EN 60851-3:1996	IEC 60851-3:1995
EN 60851-5:1996	IEC 60851-5:1996
EN 60851-6:1996	IEC 60851-6:1996
—	IEC 60885-1:1987

	EN 60990:1999	IEC 60990:1999	
	—	IEC 61058-1:1996	
	—	ISO 261:1973	
	—	ISO 262:1973	
	—	ISO 3864:1984	
	—	ISO 4046:1978	
	—	ISO 7000:1989	
	ITU-T Recommendation K.17:1988, Tests on power-fed repeaters using solid-state devices in order to check the arrangements for protection from external interference ITU-T Recommendation K.21:1996, Resistibility of subscribers' terminals to overvoltages and overcurrents _____ [1] EN 60065:1993 is superseded by EN 60065:1998 + corrigendum June 1999, which is based on IEC 60065:1998, mod. [2] The HD 21 series is related to, but not directly equivalent with the IEC 60227 series. [3] The HD 22 series is related to, but not directly equivalent with the IEC 60245 series. **CENELEC**		

SYMMETRA – LX MATRIX

VDE Reference Number: 19244-3335-0033

Frame: SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI, SYAF16KXR9I

Input: AC 220/230/240, 1ϕ + N + GND, 50-60 Hz, 100A

AC 380/400/415, 3ϕ + N + GND, 50-60 Hz, 100A

Output: AC 220/230/240, 1ϕ + N + GND, 50-60 Hz, 100A

Total Output Power: 8kVA, 5.6 kW (SYAF8K units)
16kVA, 11.2 kW (SYAF16K units)

Model SKU	**Power Module** SYPM4KI	**Intelligence Module** SYMIM5	**Battery Module** SYBT5
SYAF8KI	3	2	2
SYAF8KRMI	3	2	2
SYAF16KI	5	2	4
SYAF16KRMI	5	2	4
SYAF16KXR9I	5	2	13

APPLICABLE DRAWING

PART #: 885-1818B
REV 03
SHEET 1 OF 1
SCALE 1:1
12/15/03
J. BRIGGS

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Symmetra LX

Input: 220/230/240V, 1Ø+N+⏚, 100A, 50-60Hz
380/400/415V, 3Ø+N+⏚, 100A, 50-60Hz
Output: 220/230/240V, 1Ø+N+⏚, 50-60Hz
Total Output Power: 16kVA, 11.2kW (SYAF16K Units)
8kVA, 5.6kW (SYAF8K Units)

N 394

Total Power Off:

1. Set System Enable Switch to Standby: ⏻
2. Set Input Circuit Breaker to Standby: ⏻
3. Disconnect the Battery Modules.
4. Disconnect external Battery Cabinet (if provided).
5. Disconnect Mains / Branch Circuit.

Caution: For installation in a controlled environment. Refer to manual for environmental conditions.

ATTENTION : Pour utilisation en atmosphère controlée. Consulter la notice technique.

Arrêt de courant total :

1. Mettre le commutateur de validation du système en position Standby (Attente) : ⏻
2. Mettre le disjoncteur de circuit d'entrée en position Standby : ⏻
3. Déconnecter les modules batterie.
4. Déconnecter l'armoire de batterie extérieure (le cas échéant).
5. Déconnecter le circuit de secteur et de dérivation.

Vollständige Ausschaltung der Spannungsversorgung:

1. Stellen Sie den System-Aktivierungsschalter auf Bereitschaft: ⏻
2. Stellen Sie den Eingangs-Überlastschalter auf Bereitschaft: ⏻
3. Trennen Sie das Batteriemodul ab.
4. Trennen Sie den externen Batterieschrank ab (falls vorhanden).
5. Trennen Sie das Gerät vom Netz.

Apagado total:

1. Coloque el Interruptor de Activación del Sistema en Espera: ⏻
2. Coloque el Interruptor de Circuitos de Entrada en Espera: ⏻
3. Desconecte los Módulos de Baterías.
4. Desconecte el Gabinete para la Batería externo (si fue provisto).
5. Desconecte el Circuito de Línea Principal/Derivado.

⚠ DANGER: For supply connection, see installation instructions.

⚠ DANGER : pour connecter à l'alimentation, voir les instructions d'installation.

⚠ GEFAHR: Für den Anschluß der Spannungs-versorgung siehe die Installationsanweisungen.

⚠ PELIGRO: Para la conexión a la alimentación, lea las instrucciones de instalación.

WARNING

HIGH LEAKAGE CURRENT, Earth connection essential before connecting supply.

COURANT DE FUITE ELEVE, Raccordement a la terre indispensable avant le raccordement au reseau.

HOHER ABLEITSTROM, Vor Inbetiebnahme Erdungsverbindung herstellen.

CORRIENTE DE ALTA FUGA, Es fundamental la conexión a tierra antes de conectar el suministro.

Model:

S/N:

885-1818B/3

SEE 885-1818B_REV03.DXF
FOR DIE CUT DIMENSIONS

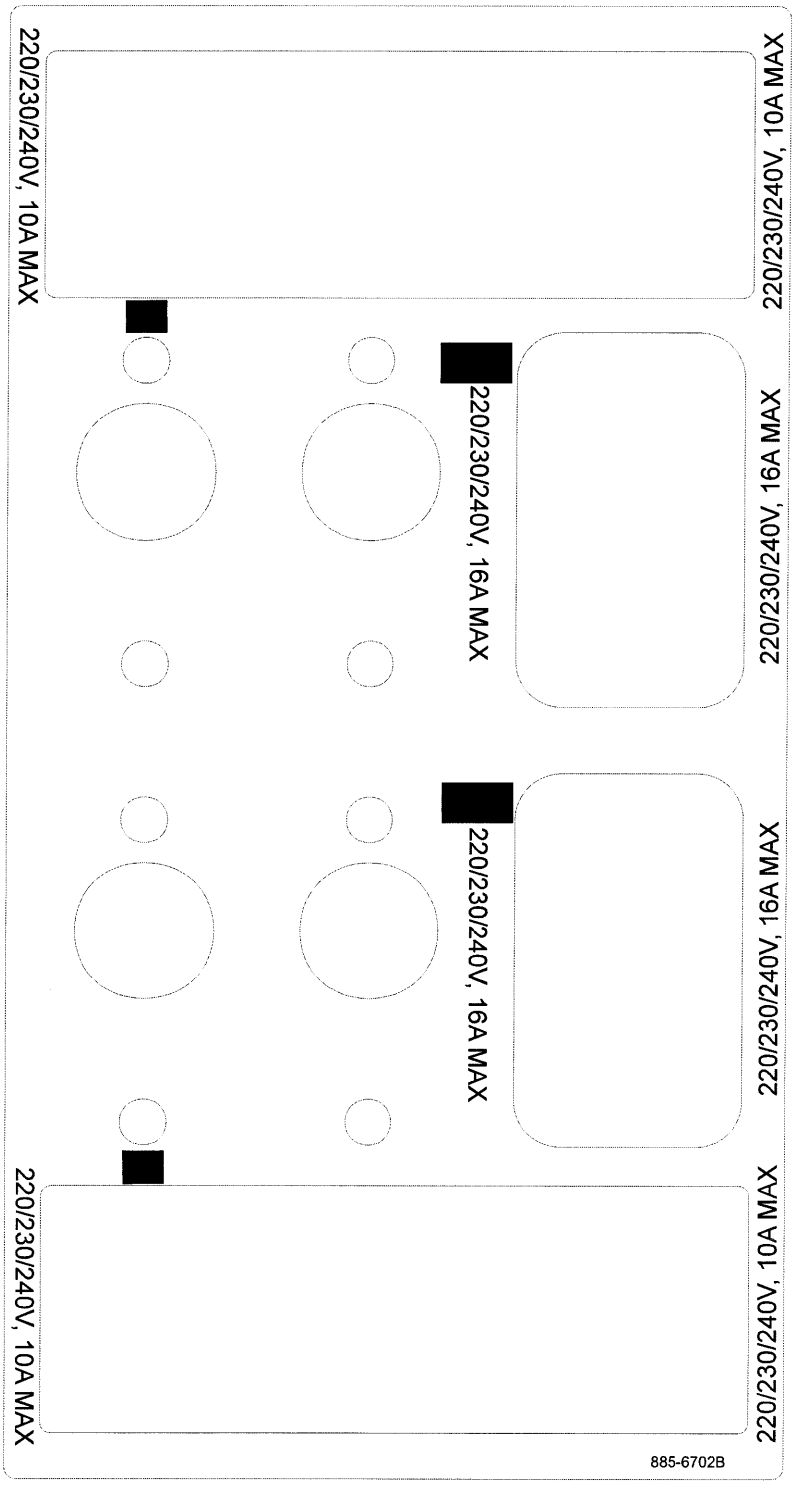
885-1818B_REV03.CDR

VDE File: 1924400-3335-0033
CB / DE 1 - 30646

Applicable Drawing

SEE DRAWING 885-6702B_REV_03.DRW
FOR DIE CUT DIMENSIONS

Part # 885-6702B
Rev. 3
Page 1

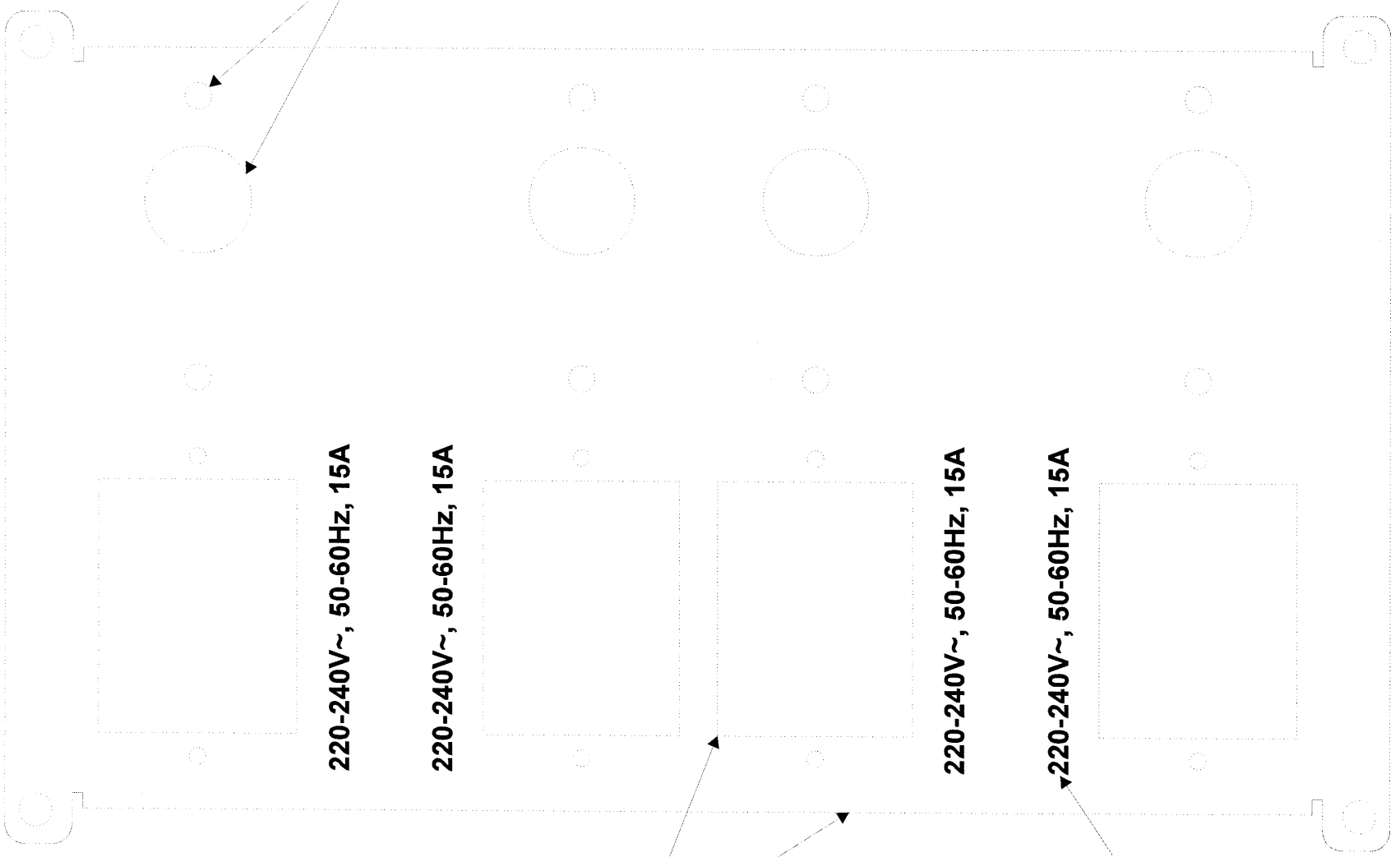


885-6702B_REV_03.CDR

VDE File: 1924400-3335-0033
CB / DE 1 - 30646

APPLICABLE DRAWING
870-41439A_REV02

L. FRANCIS 09/18/01



List of Critical Components

1924400-3335-0033

object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
AC Tray					
Circuit Breaker (APC 530-0192)	Airpax/Philips Carlingswitch	209-3-1REG4-66-4-9-100 EA3-B4-810-22A-DF	3 Pole, 100 A, 240 Vac	IEC 384-14	VDE
Bypass Switch (APC 560-0008)	Airpax/Philips Carlingswitch Inc.	219-1-1REG4-SW-4-9-100-H EA1-A4-03-810-22A-DB	100 A, 240 Vac	IEC 384-14	UL/CSA
Bypass Contactor (APC 451-0403)	Contact Industries	451-0403	125 A	IEC 384-14	UL
MOV (MV1-MV4) (APC 380-0001)	Littelfuse, Inc. Maida Epcos AG Panasonic Ceramic Products Wujin Thinking Electronic Co.,Ltd. Ceramate Technical Co., Ltd	V20E300L4B1 D6544Z0V301RA15O D6344Z0V301RA105 S18K300S5M4-8 or S20K300S5M4-8 ERZV20D471 TVR 20471(KOC4FTB) GNR20D471KC4	300 V, 160 J	IEC 384-14	VDE
Gas Discharge Tube (GDT1) (APC 381-0601)	CP Clare Corp.	CG2-600L-TR	600 V		
Fuse (F1-F4) (APC 512-0020)	Bussman Littelfuse	MDA-V20 M325020	20 A Slow Blow, 250 V		UL/CSA UL/CSA
Common Mode Inductor (APC 420-0142)	Vitec Electronics Corp	54P2981	200 µH, Class 155		
Common Mode Inductor (APC 420-0133)	ECI Electric Coils Vitec Electronics Corp.	M-2183 54P3151	800 µH, Class H (180)		
Capacitor, Y2 (APC 221-0502)	Vishay/Roederstein Panasonic Electronic Comp. Murata Erie Murata Farnell Electronic Co.	WY0472MCMCRBK ECKNTS472MF DE2E3KH472MN3A or DE1307-486E472M-KH DE1307-640E 472M 106-764	4.7 nF, 250 V	IEC 384-14	VDE
Capacitor, Y2 (APC 221-0001)	Vishay/Draloric BCE Sud S.P.A. Panasonic Elec. Components Jya Nay Co Ltd. Du San Philippines Co.	WY0472MCMUALK B472M43Y5UQWGSP ECKNVS472ME JY14E472MY5T2 DA2GYE472MU423	4.7 nF, 250 V, Y2	IEC 384-14	VDE
Capacitor (APC 232-0103)	Roederstein Electronics, Inc.	F1710-310-1030	0.01 µF, 250 V, Y2	IEC 384-14	VDE
Terminal Block, 9 Position (APC 870-1669)	Merlin Manufacturing Ltd.	870-1669	0.71 mm, 94V-0		UL

List of Critical Components

1924400-3335-0033

object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
Terminal Block, 8 Position (APC 870-1670)	Merlin Manufacturing Ltd.	870-1670	0.71 mm, 94V-0		UL
P.C. Board (APC 640-7429)	Electropac Inc.	Filter P.C. Board	94V-0		UL
Insulator (APC 850-0179)	Orion Industries	A1585	0.71 mm, 94V-0		UL
Fan (APC 490-0047)	Sunon	KDE2408PTB1-6A	24 Vdc, 80 mm		UL
P.C. Board (APC 640-7429)	Electropac Inc.	Filter Board	94V-0		UL
Power Module					
Fan (APC 490-0009)	NMB Technologies Oriental Electronics Co. Ltd.	4715KL-05W-B40-P08 F1238E24B-HP	24 Vdc, 120 mm		VDE
Switch (APC 540-0123)	Cherry Electrical Products	KWKDRACA	10 A, 250 Vac	IEC 384-14	VDE
Fuse (APC 515-1040)	Bussman Littelfuse	BK/SC-40 SLC-40	40 A, 480 V		UL/CSA
Gas Discharge Tube (GAS1, GAS2) (APC 381-0601)	CP Clare Corp.	CG2-600L-TR	600 V		
MOV (MV1-MV4) (APC 380-0005)	Maida	D6944Z0V301RA80T1N	300 V, 175 J	IEC 384-14	VDE
Capacitor X2 (C70-C72) (APC 232-0105)	Vishay/Roederstein Panasonic Electronic Comp. Tecate Industries EVOX-RIFA, INC. Arcotronics America Inc. Iskra Electronics, Inc. Okaya Electric America Inc.	F1772-510-2000 or F1778-510M2KCT0 ECQU2A105MV MPX-275/105M27 PHE830MF7100M R40105M275BS KNB1530 PA105	1 µF, 250 V	IEC 384-14	VDE
Capacitor (C58 - C69) (APC 230-0102)	Panasonic Elec. Components Division Philips / Mepco / Centralab	ECQU2A102MY 222233660102	0.001 µF, 250 V	IEC 384-14	VDE
Relay (K1-K5) (APC 450-0029)	Hasco Components Int'l Corp.	HAT901CSDC24-1	30 A, 277 V, 24 V Coil		UL/CSA
Fuse (F100, F101) (APC 512-0020)	Bussman Littelfuse	MDA-V20 M325020	20 A, 250 V		UL/CSA
Fuse (F102, F104, F106) (APC 512-0030)	Bussman	MDA-V-30BX	30 A, 250 V	IEC 384-14	UL/CSA

List of Critical Components

1924400-3335-0033

object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
Connector 50 Pin (PS1-PS4) (APC 715-1050)	AMP Inc.	102567-6	2 A, 250 V		UL/CSA
Transformer T101 (APC 430-5001)	Falco Electronics, Ltd. ECI Electric Coils	M-1614 E49009	Operational Insulation		
P.C. Board (APC 640-0447)	Electropac Inc.	Power Module Main P.C. Board	94V-0		UL
P.C. Board (APC 640-0476)	Electropac Inc. Cortec	Inverter Control P.C. Board	94V-0		UL
P.C. Board (APC 640-0448)	Electropac Inc. Cortec Epic Electronics Dae Duck Phils., Inc. China Circuit Technology (Shantou) Global Flex (Suzhou) Co. Ltd. Red Board Ltd.	PFC Control P.C. Board	94V-0		UL
Insulator, Barrier (APC 850-0121)	Orion Industries	A1585	0.71 mm, 94V-0		UL
Insulator, Fan Baffle (APC 850-0280)	Orion Industries	A1585	0.71 mm, 94V-0		UL
Battery Module					
Battery (APC 910-1209)	Panasonic Industrial Co. CSB Battery Of America Corp. B & B Battery Co. Exide Industries	UP-RW1245P1 HR 1234W F2 HR9-12 EP1234W	12 V, 9 Ah		UL
Battery Fuse (APC 515-1060)	Bussmann	SC60	60 A, 400 Vdc		UL
Connector J4 (APC 724-0026)	AMP Inc.	350428-1	10 A, 250 V		UL/CSA
P.C. Board (APC 640-7458)	Electropac Inc.	Battery Monitor Board	94V-0		UL
MIM					
Opto-isolators (IC1, IC2, IC3, IC15, IC16, IC21) (APC 312-0003)	Motorola, Inc. Siemens Components, Inc. Isocom, Inc.	4N25V IL202-X001 or 4N25-X001 IS201X	7500 V Isolation	IEC 384-14	VDE
Opto-isolators (APC 349-0137)	Hewlett Packard	HCNW137		IEC 384-14	VDE
Opto-isolators (APC 349-0137-001)	Fairchild	6N137SD		IEC 384-14	VDE
Transformer T1 (APC 430-0090)	Falco Electronics, Ltd.	E31004	400 V, Class 130 Reinforced Insulation		

List of Critical Components

1924400-3335-0033

object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
P.C. Board (APC 640-7479)	Coretec Electropac Inc.	MIM P.C. Board	94V-0		UL
Cover Insulator, PVC Sheet (APC 850-0228)	Orion Industries	A1585	0.71 mm, 94V-0		UL
Chassis Insulator, PVC Sheet (APC 850-0182)	Orion Industries	A1585	0.71 mm, 94V-0		UL
Frame					
Output Receptacle (APC 770-0006)	Qualtek Electronics Corp. Well Shin Enterprises Co. Ltd Power Dynamics, Inc. I-Sheng Electronics Richbay Company Ltd. Singapore Resource Management Elcom	742W-18/22B WS-045A 44R02-4121-200 IS-111 R-302G4 (00) SRM-045-1 EMO-14	10 A, 250 Vac	EC320	VDE
Output Receptacle (APC 770-0051)	Schurter AG Feller U.S. Corp. Panasonic Elec. Components Division Inalways Well Shin Enterprises Co. Ltd	6653.330 OH5016-6-6.3 83011350 0723-CW WS-042-3	16 A, 250 Vac	EC320	VDE
Output Circuit Breaker (APC 530-0099)	Airpax Carlingswitch	IEG1-1-63-10.0-01-V BA1-X0-07-359-121-D	10 A, 250 V, 1 Pole	IEC 384-14	VDE
Output Circuit Breaker (APC 530-0095)	Airpax Carlingswitch	IEG1-1-63-15.0-01-V BA1-X0-07-358-121-D	15 A, 250 V, 1 Pole	IEC 384-14	VDE
XR Battery Connector (APC 0W1255)	Anderson Power	113919P1 3-5692P1 6384G2-BK	160 A, 150 V		UL
System Enable Switch (APC 540-0030)	Carlingswitch Philips Airpax		30 A, 240 V, 2 Pole		UL
P.C. Board (APC 640-7455)	Electropac Inc.	2 Pos. Backplane P.C. Board	94V-0		UL
P.C. Board (APC 640-7456)	Electropac Inc.	3 Pos. Backplane P.C. Board	94V-0		UL
Insulator, PVC Sheet (APC 850-0178)	Orion Industries	A1585	0.71 mm, 94V-0		UL
Insulator, PVC Sheet (APC 850-0180)	Orion Industries	A1585	0.71 mm, 94V-0		UL

Symmetra® LX
220/230/240 V, 4–16 kVA
Electrical Installation
Tower and Rack-mount UPS

Important Safety and Installation Instructions

This manual provides instructions on how to wire and connect the Symmetra® LX tower and rack-mount UPS.

All electrical power and power control wiring must be installed by a qualified electrician and comply with local and national regulations.

Illustrations are representative. Your configuration, including components and optional APC equipment, may be different from the models shown in this guide. The procedures in the guide are applicable for the Symmetra® LX tower and rack-mount UPS and for the combination tower with the extended run cabinet. Both the tower and rack-mount UPS have optional extended run cabinets that provide backup power for the UPS.

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www.apc.com
990-1540-002, English, December 2003

Electrical Installation

Electrical Hazard

Read, understand and follow ALL safety instructions contained in the *Symmetra® LX Safety Instructions and General Information Guide*. Failure to follow safety instructions and warnings could result in equipment damage, serious injury, or death.

① Perform Pre-installation Checklist

Before beginning the electrical installation, perform the following procedures.

1.1 Verify that the circuit breaker to be used to power the UPS is in the OFF position.

1.2 Verify that the input circuit breaker Ⓐ on the UPS is in the OFF position.

1.3 Before you begin hardwiring the UPS, read and understand the input and output connection requirements contained in the table.

② Hardwire the UPS

Caution

- Check local and national codes. Many locations require that hardwiring be installed by a licensed electrician.
- Strain relief is required for all hardwiring.
- All openings in the rear of the UPS must be covered. Failure to do so may result in personal injury or equipment damage.

2.1 Remove screws Ⓑ and slide out the hardwire assembly Ⓒ. Remove the bolts Ⓓ securing the strain relief panel.

2.2 Punch holes in the input, and output (if required) knockouts Ⓔ. Larger holes can be punched if desired.

① Note

All UPS configurations can be wired as 3-phase in / 1-phase out or 1-phase in / 1-phase out.

Input Connections: Tower and Rack-mount UPS				
Maximum Load	**Method**	**Voltage (VAC)**	**Recommended Circuit Breaker Rating**	**Connection**
8 kVA	Hardwired (Standard on tower and rack-mount)	1-phase: 220 or 230 or 240 3-phase: 380 or 400 or 415	50 A	▪ External circuit breaker ▪ #6 AWG (16 mm²) ▪ Torque to 22–25 lb-in (2.5–2.8 N•m) ▪ 1-phase:3-Wire (G-N-L1) ▪ 3-phase:5-Wire (N-G-L3-L2-L1)
16 kVA	Hardwired (Standard on tower and rack-mount)	1-phase: 220 or 230 or 240 3-phase: 380 or 400 or 415	100 A	▪ External circuit breaker ▪ #3 AWG (25 mm²) ▪ Torque to 22–25 lb-in (2.5–2.8 N•m) ▪ 1-phase:3-Wire (G-N-L1) ▪ 3-phase:5-Wire (N-G-L3-L2-L1)
Output Connections: Tower and Rack-mount UPS				
Maximum Load	**Method**	**Voltage (VAC)**	**Recommended Circuit Breaker Rating**	**Connection**
8 kVA	Hardwired (Standard on tower and rack-mount)	220 or 230 or 240	50 A	▪ External circuit breaker ▪ #6 AWG (16 mm²) ▪ Torque to 22–25 lb-in (2.5–2.8 N•m) ▪ 1-phase:3-Wire (G-N-L1)
	Output plugs (Standard on rack-mount)	220 or 230 or 240	50 A	▪ 6 (IEC 320 C19) output plugs with 6 (15A, 250V) circuit breakers) ▪ 8 (IEC 320 C13) output plugs with 2 (10A 250V) circuit breakers
16 kVA	Hardwired (Standard on tower and rack-mount)	220 or 230 or 240	90 A	▪ External circuit breaker ▪ #3 AWG (25 mm²) ▪ Torque to 22–25 lb-in (2.5–2.8 N•m) ▪ 1-phase:3-Wire (G-N-L1)
	Output plugs (Standard on rack-mount)	220 or 230 or 240	90 A	▪ 10 (IEC 320 C19) output plugs with 10 (15A, 250V) circuit breakers) ▪ 8 (IEC 320 C13) output plugs with 2 (10A 250V) circuit breakers

② Hardwire the UPS (continued)

2.3 Attach input Ⓕ and output (if required) Ⓖ conduit to the terminal block.

- Feed the wires through the holes on the strain relief panel.
- Connect the wires to the terminal block Ⓗ as indicated for your configuration. Refer to the label Ⓘ on the terminal block for output ground Ⓙ, input conduit Ⓚ and optional output conduit Ⓛ connections.
- Attach strain reliefs to wiring connections.

2.4 Inspect cable connections to ensure proper installation.

2.5 Cover holes in the strain relief panel not being used for cabling.

2.6 Reinstall the hardwire assembly and fasten with provided bolts Ⓜ and screws Ⓝ. Torque to 22–25 lb-in (2.5–2.8 N-m).

2.7 Connect the input Ⓠ to the circuit breaker supplying power to the UPS. If the output needs to be hardwired, connect the output Ⓟ wires to the circuit breaker supplying power to the load.

2.8 To test the cable connection, turn ON the circuit breaker providing power to the UPS. If the value does not match your branch voltage (220/230/240), check your wiring for proper connection.

2.9 To test the wiring, turn ON the input circuit breaker (see Step 1), then perform the "Manual Bypass Operation" to ensure that power can be supplied to the load when bypassing the UPS. Measure the voltage at the PDUs or at the circuit breaker to power the load. See the *Symmetra® LX Start Up Guide* for "Manual Bypass" instructions.

2.10 Turn OFF the circuit breaker providing power to the UPS.

2.11 Turn OFF the input circuit breaker. See Step 1.

2.12 Turn OFF the maintenance bypass switch. See the *Symmetra® LX Start Up Guide* for the "Manual Bypass" instructions.

1-Phase Wiring	3-Phase Wiring
Output: G - N - L1 Input: N - G - — - — - L1	Output: G - N - L1 Input: N - G - L3 - L2 - L1

③ Connect Remote Emergency Power Off (REPO) Circuit, If Required

Note

- Please note that many locations require that the Emergency Power Off (EPO) switch be installed by a licenced electrician. Check your local and national codes.
- See the *Symmetra® LX Safety and General Information Guide* for detailed safety instructions and EPO requirements.

3.1 Remove the access panel Ⓠ to connect the circuits Ⓡ.

3.2 If your installation will use a single external switch contact, connect the EPO switch with the pre-installed jumper Ⓢ, as shown.

3.3 If your installation will use a switch contact and a 24V power supply external to the UPS, remove the jumper Ⓣ and connect the EPO switch, as shown.

④ Install Accessory Card, If Applicable

If your configuration includes an additional management accessory card, install it in the empty slot Ⓤ on the rear of the UPS. See the accompanying documentation for installation instructions.

⑤ Install PDU Panel(s) and Connect Loads to the UPS, If Applicable

Your configuration may include optional PDU panels. Follow these instructions to install PDU panels and to connect applicable loads directly to the UPS.

Caution

All openings in the rear of the UPS must be covered. Failure to do so may result in personal injury or equipment damage.

Note

- Loads can be connected directly to the UPS using the output plugs on the PDU panel. Ensure that the total load being plugged into a PDU panel DOES NOT EXCEED the branch circuit breaker rating on the PDU panel.
- Do not install a PDU panel when a PDU warning label is present.

5.1 Verify that the circuit breaker providing power to the UPS is in the OFF position.

5.2 Remove the PDU access plate Ⓥ to expose the terminal block with connecting wires and plugs Ⓦ.

5.3 Ensure that all PDU panel circuit breakers Ⓧ are in the OFF position.

5.4 Plug each UPS terminal block connector Ⓦ into its corresponding PDU panel connector Ⓨ. PDU panel configurations are shown below.

5.5 Install the PDU panel Ⓩ in the terminal block and tighten with provided screws.

5.6 Plug external PDUs (that have loads plugged into them), or loads to be directly connected to the UPS, into the PDU Panel(s) output plugs.

5.7 Ensure that PDU access plates Ⓥ securely cover all terminal blocks that do not have PDU panels installed.

⑥ Complete Post-installation Procedures and Start Up the System

Go to the *Symmetra® LX Startup Guide* to complete the post-installation procedures and to start up the system.

Symmetra® LX
220/230/240 V, 4–16 kVA
Elektrische Installation
Unterbrechungsfreie Stromversorgung (USV) in turm- und gestellmontierter Ausführung

Wichtige Sicherheits- und Installationsanweisungen

Dieses Handbuch enthält Anweisungen, wie man die USV Symmetra® LX in turm- und gestellmontierter Ausführung verdrahtet und anschließt.

Die gesamte Verdrahtung für die Stromversorgung und Steuerung muss von einem qualifizierten Elektriker vorgenommen werden und den örtlichen und nationalen Vorschriften entsprechen.

Die Darstellungen sind repräsentativ. Ihre Konfiguration einschließlich der Baugruppen und der optionalen APC-Anlage kann sich von den in diesem Handbuch gezeigten Modellen unterscheiden. Die Verfahren in diesem Handbuch gelten für die USV Symmetra® LX in turm- und gestellmontierter Ausführung mit dem Schrank für verlängerten Lauf. Die USV sowohl in turm- als auch in gestellmontierter Ausführung verfügt über optionale erweiterte Laufschränke, die ihr Ersatzenergie liefern.

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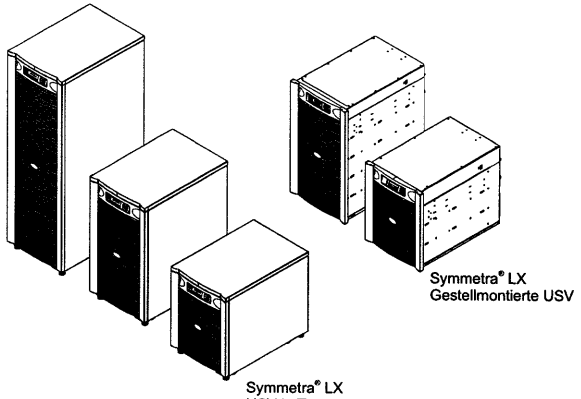


Symmetra® LX
Gestellmontierte USV

Symmetra® LX
USV in Turmausführung

www.apc.com

990-1540-002, Deutsch, Dezember 2003

Elektrische Installation

Elektrische Gefahr

Lesen, verstehen und befolgen Sie ALLE Sicherheitsanweisungen, die im *Handbuch für Sicherheitsanweisungen und allgemeine Informationen von Symmetra® LX* enthalten sind. Wenn Sie die Sicherheitsanweisungen und Warnungen nicht befolgen, kann das die Beschädigung der Anlage, schwere Verletzungen oder den Tod zur Folge haben.

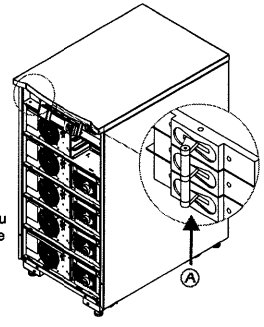
① Prüfliste vor der Installation

Bevor Sie mit der elektrischen Installation beginnen, müssen Sie folgende Vorgänge ausführen.

1.1 Überzeugen Sie sich davon, dass der zum Schutz der USV zu benutzende Leitungsschutzschalter ausgeschaltet ist.

1.2 Überzeugen Sie sich davon, dass der Leitungsschutzschalter Ⓐ am Eingang der USV ausgeschaltet ist.

1.3 Bevor Sie beginnen, die USV fest zu verdrahten, lesen und verstehen Sie die in der Tabelle enthaltenen Anforderungen für die Eingangs- und Ausgangsanschlüsse.



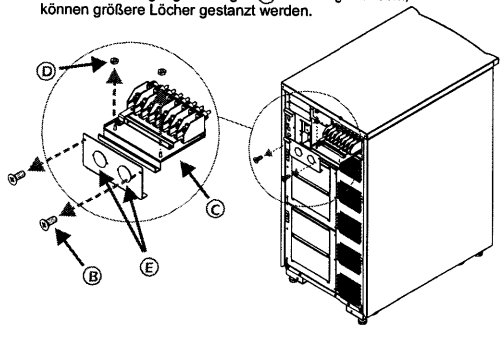
② Feste Verdrahtung der USV

Vorsicht

- Überprüfen Sie die örtlichen und nationalen Gesetze. An vielen Orten wird verlangt, dass die feste Verdrahtung von einem autorisierten Elektriker ausgeführt wird.
- Die gesamte feste Verdrahtung muss zugentlastet sein.
- Alle Öffnungen an der Rückseite der USV müssen verschlossen sein. Wenn dies nicht der Fall ist, können Personen oder Anlagen beschädigt werden.

2.1 Entfernen Sie die Schrauben Ⓑ und schieben Sie die festverdrahtete Baugruppe Ⓒ heraus. Entfernen Sie die Schrauben Ⓓ und sichern Sie die Zugentlastungstafel.

2.2 Stanzen Sie Löcher in die vorgeprägten Eingangs- und, wenn erforderlich, Ausgangsöffnungen Ⓔ . Wenn gewünscht, können größere Löcher gestanzt werden.



Anmerkung Alle USVs können als 3 Phasen hinein und 1 Phase heraus oder als 1 Phase hinein und 1 Phase heraus verdrahtet werden.

Eingangsanschlüsse: USV in turm- und gestellmontierter Ausführung				
Maximale Last	**Methode**	**Spannung (VAC)**	**Empfohlenes Nennschaltvermögen des Leitungsschutzschalters**	**Anschluss**
8 kVA	Fest verdrahtet (Standard am Turm und Einbaugestell)	1-phasig: 220 oder 230 oder 240 3-phasig: 380 oder 400 oder 415	50 A	▪ Externer Leitungsschutzschalter ▪ #6 AWG (16 mm²) ▪ Festdrehen auf 2,5 - 2,8 Nm ▪ 1-phasig:3 Leitungen (G-N-L1) ▪ 3-phasig:5 Leitungen (N-G-L3-L2-L1)
16 kVA	Fest verdrahtet (Standard am Turm und Einbaugestell)	1-phasig: 220 oder 230 oder 240 3-phasig: 380 oder 400 oder 415	100 A	▪ Externer Leitungsschutzschalter ▪ #3 AWG (25 mm²) ▪ Festdrehen auf 2,5 - 2,8 Nm ▪ 1-phasig:3 Leitungen (G-N-L1) ▪ 3-phasig:5 Leitungen (N-G-L3-L2-L1)

Ausgangsanschlüsse: USV in turm- und gestellmontierter Ausführung				
Maximale Last	**Methode**	**Spannung (VAC)**	**Empfohlenes Nennschaltvermögen des Leitungsschutzschalters**	**Anschluss**
8 kVA	Fest verdrahtet (Standard am Turm und Einbaugestell)	220 oder 230 oder 240	50 A	▪ Externer Leitungsschutzschalter ▪ #6 AWG (16 mm²) ▪ Festdrehen auf 2,5 - 2,8 Nm ▪ 1-phasig:3 Leitungen (G-N-L1)
	Ausgangsstecker (Standard am Einbaugestell)	220 oder 230 oder 240	50 A	▪ 6 Ausgangsstecker (IEC 320 C19) mit 6 Leitungsschutzschaltern (15A, 250V) ▪ 8 Ausgangsstecker (IEC 320 C13) mit 2 Leitungsschutzschaltern (10A, 250V)
16 kVA	Fest verdrahtet (Standard am Turm und Einbaugestell)	220 oder 230 oder 240	90 A	▪ Externer Leitungsschutzschalter ▪ #3 AWG (25 mm²) ▪ Festdrehen auf 2,5 - 2,8 Nm ▪ 1-phasig:3 Leitungen (G-N-L1)
	Ausgangsstecker (Standard am Einbaugestell)	220 oder 230 oder 240	90 A	▪ 10 Ausgangsstecker (IEC 320 C19) mit 10 Leitungsschutzschaltern (15A, 250V) ▪ 8 Ausgangsstecker (IEC 320 C13) mit 2 Leitungsschutzschaltern (10A, 250V)

② Feste Verdrahtung der USV (Fortsetzung)

2.3 Bringen Sie das Leitungsrohr für den Eingang Ⓕ und den Ausgang Ⓖ (falls erforderlich) an der Klemmenleiste an.

- Führen Sie die Drähte durch die Löcher an der Zugentlastungstafel.
- Schließen Sie die Drähte an die Klemmenleiste Ⓗ an, wie es für Ihre Konfiguration gezeigt ist. Das Schild Ⓘ an der Klemmenleiste zeigt Ihnen die Anschlüsse für die Ausgangserde Ⓙ, das Eingangsleitungsrohr Ⓚ und das optionale Ausgangsleitungsrohr Ⓛ.
- Bringen Sie Zugentlastungen an den Kabelanschlüssen an.

2.4 Überprüfen Sie die Kabelanschlüsse auf richtige Installation.

2.5 Verschließen Sie die Löcher in der Zugentlastungstafel, die nicht zur Verkabelung benötigt werden.

2.6 Bringen Sie die festverdrahtete Baugruppe wieder an, und befestigen Sie sie mit den mitgelieferten Bolzen Ⓜ und Schrauben Ⓝ. Drehen Sie auf 2,5 - 2,8 Nm fest.

2.7 Schließen Sie den Eingang Ⓞ an den Leitungsschutzschalter an, über den die USV mit Energie versorgt wird. Wenn der Ausgang fest verdrahtet werden muss, schließen Sie die Drähte des Ausgangs Ⓟ an den Leitungsschutzschalter an, über den die Last mit Energie versorgt wird.

2.8 Um den Kabelanschluss zu prüfen, schalten Sie den Leitungsschutzschalter ein, wodurch die USV mit Energie versorgt wird. Wenn der Wert nicht Ihrer Zweigspannung entspricht (220/230/240), überprüfen Sie die Verdrahtung auf richtigen Anschluss.

2.9 Um die Verdrahtung zu prüfen, schalten Sie den Eingangsleitungsschutzschalter ein (siehe Schritt 1), gehen Sie dann in den manuellen Umgehungsbetrieb, um zu gewährleisten, dass die Last mit Energie versorgt werden kann, wenn die USV umgangen wird. Messen Sie die Spannung, die die Last speist, an den Energieverteilungseinheiten oder am Leitungsschutzschalter. Anweisungen zur manuellen Umgehung finden Sie im *Inbetriebnahme-Handbuch von Symmetra® LX.*

2.10 Schalten Sie den Leitungsschutzschalter aus, der die USV speist.

2.11 Schalten Sie den Eingangsleitungsschutzschalter aus. Siehe Schritt 1.

2.12 Schalten Sie den Umgehungsschalter für die Wartung aus. Die Anweisungen zur manuellen Umgehung finden Sie im *Inbetriebnahme-Handbuch von Symmetra® LX.*

1-phasige Verdrahtung	3-phasige Verdrahtung
Ausgang: G - N - L1 Eingang: N - G - __ - __ - L1	Ausgang: G - N - L1 Eingang: N - G - L3 - L2 - L1

③ Anschließen der Fern-Notausschaltung (falls zutreffend)

- Beachten Sie bitte, dass an vielen Orten verlangt wird, dass der Notausschalter von einem autorisierten Elektriker installiert wird. Überprüfen Sie Ihre örtlichen und nationalen Gesetze.

Anmerkung
- Genaue Sicherheitsanweisungen und Anforderungen an die Notausschaltung finden Sie im *Handbuch für Sicherheit und allgemeine Information über Symmetra® LX.*

3.1 Nehmen Sie die Zugangstafel Ⓠ ab, um die Schaltungen Ⓡ anzuschließen.

3.2 Wenn Ihre Installation einen einzelnen externen Schaltkontakt verwendet, schließen Sie den Notausschalter mit der vorinstallierten Brücke Ⓢ an, wie es gezeigt ist.

3.3 Wenn Ihre Installation einen Schaltkontakt und eine Stromversorgung von 24 V benutzt, die sich außerhalb der USV befinden, ist die Brücke Ⓣ zu entfernen und der Notausschalter anzuschließen, wie es gezeigt ist.

④ Installation der Zubehörkarte (falls zutreffend)

Wenn zu Ihrer Konfiguration eine zusätzliche Managementzubehörkarte gehört, installieren Sie sie in einem leeren Steckplatz Ⓤ auf der Rückseite der USV. Hinweise zur Installation finden Sie in der Begleitdokumentation.

⑤ Installation der Tafel(n) der Energieverteilungseinheiten und Anschluss der Lasten an die USV (falls zutreffend)

Ihre Konfiguration kann optionale Tafeln für die Energieverteilungseinheit enthalten. Befolgen Sie diese Anweisungen, um die Tafeln der Energieverteilungseinheit zu installieren und geeignete Lasten direkt an die USV anzuschließen.

Vorsicht

Alle Öffnungen an der Rückseite der USV müssen verschlossen sein. Wenn dies nicht der Fall ist, können Personen oder Anlagen beschädigt werden.

- Lasten können unter Verwendung der Ausgangsstecker an der Energieverteilungstafel direkt an die USV angeschlossen werden. Gewährleisten Sie, dass die gesamte Last, die in eine Energieverteilungstafel gesteckt wird, das Abschaltvermögen des Leitungsschutzschalters für einen Zweig auf der Energieverteilungstafel NICHT ÜBERSCHREITET.

Anmerkung
- Installieren Sie keine Energieverteilungstafel, wenn ein Energieverteilungswannschild vorhanden ist.

5.1 Überzeugen Sie sich, dass der Leitungsschutzschalter, über den die USV gespeist wird, ausgeschaltet ist.

5.2 Nehmen Sie die Zugangsplatte Ⓥ der Energieverteilungseinheit ab, damit Sie Zugriff zur Klemmleiste mit den Anschlussdrähten und Stecker Ⓦ bekommen.

5.3 Gewährleisten Sie, dass alle Leitungsschutzschalter Ⓧ der Energieverteilungstafel ausgeschaltet sind.

5.4 Stecken Sie jeden Klemmleistenanschluss Ⓦ der USV in seinen entsprechenden Anschluss Ⓨ der Energieverteilungstafel. Die Konfigurationen der Energieverteilungstafel sind unten gezeigt.

5.5 Installieren Sie die Energieverteilungstafel Ⓩ in der Klemmenleiste und befestigen Sie sie mit den mitgelieferten Schrauben.

5.6 Stecken Sie die externen Energieverteilungseinheiten (in die Lasten eingesteckt sind) oder direkt an die USV anzuschließende Lasten in die Ausgangsstecker der Energieverteilungstafel(n).

5.7 Gewährleisten Sie, dass die Energieverteilungszugangsplatten Ⓥ alle Klemmenleisten, an denen keine Energieverteilungstafeln installiert sind, sicher abdecken.

⑥ Abschließen der Installationsarbeiten und Einrichten des Systems

Der Abschluss der Arbeiten nach der Installation und die Inbetriebnahme des Systems werden im *Inbetriebnahme-Handbuch von Symmetra® LX* beschrieben.

TEST REPORT

EN 50091-1-1 :1996

Uninterruptible power systems (UPS)

Part 1: General and safety requirements for UPS used in operator access areas

Report	
Report reference No..... :	1924400-3335-0033
Tested by (+ signature) ..... :	Frank Richter
Approved by (+ signature)..... :	K. Dornieden
Date of issue ..... :	January 05, 2004
This report is based on a blank test report that was prepared by FIMKO using information obtained from the TRF originator (see below)	
Testing laboratory	
Name ..... :	VDE Testing and Certification Institute
Address ..... :	Merianstrasse 28, D-63069 Offenbach, Germany
Testing location ..... :	American Power Conversion Corp. 85 Rangeway Road Bldg. #2 , N. Billerica,MA USA TMP (TDAP File no. 19244-9501-0001)
Client	
Name ..... :	American Power Conversion (APC)
Address ..... :	85 Rangeway Road Bldg. #2 , N. Billerica,MA USA
Test specification	
Standard..... :	EN 50091-1-1:96
Test procedure ..... :	CB / VDE
Procedure deviation ..... :	---
Non-standard test method ..... :	---
Test Report Form	
Test Report Form No. ..... :	5009111B/99-11
TRF originator . ..... :	FIMKO
Master TRF ..... :	dated 97-11

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Test item	
Description ..... :	Uninterruptible Power Supply (UPS)
Trademark ..... :	APC
Model and/or type reference ..... :	See model matrix
Manufacturer ..... :	See IEC/EN60950 Test Report
Rating(s) ..... :	See IEC/EN60950 Test Report
Particulars: test item vs. test requirements	
Equipment mobility ..... :	Rack Mount or Floor Standing
Tested for IT power systems ..... :	No
IT testing, phase-phase voltage (V) :	---
Class of equipment..... :	Class I
Mass of equipment (kg)..... :	> 18
Protection against ingress of water :	---
Test case verdicts	
Test case does not apply to the test object :	N(.A.)
Test item does meet the requirement ..... :	P(ass)
Test item does not meet the requirement .. :	F(ail)
Testing	
Date of receipt of test item ..... :	26.11.03
Date(s) of performance of test ..... :	26.11.03 – 26.01.04

General remarks

"(see remark #)" refers to a remark appended to the report.

"(see Annex #)" refers to an annex appended to the report.

This report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the item tested.

Throughout this report a comma is used as the decimal separator.

Standard EN 50091-1-1:1996 is to be used in conjunction IEC 60950:1991 + A1:1992 + A2:1993 + A3:1995 + A4:1996 / EN 60 950:1992 + A1:1993 + A2:1993 + A3:1995 + A4:1997 + A11:1997/ DIN EN 60950 (VDE 0805):1997-11+A11:1998-08, which is referred to in this TRF by ´RD´".

Copy of marking plate

See IEC/EN60950 Test Report

Cl.	Requirement – Test	Result	Verdict
1	**GENERAL**		
1.5	Components	1.5.1 – 1.5.4/RD See IEC/EN60950 Test Report for details	
1.5.1/RD	Comply with IEC 950 or relevant component standard		P
1.5.2/RD	Evaluation and testing of components		P
1.5.3/RD	Transformers		P
1.5.4/RD	High voltage components (component; manufacturer; flammability) ..... :		N
1.7	Power interfaces		
1.7.1	Neutral conductors		P
1.6.4/RD	Components in equipment intended for IT power system	1.6.4 – 1.6.5/RD See IEC/EN60950 Test Report for details	N
1.6.5/RD	Mains supply tolerance (V) ..... :		P

Cl.	Requirement – Test	Result	Verdict
1.8	Marking and instructions		
1.8.1	Rated voltage (V) ..... :	See model matrix	P
	Symbol of nature of supply for d.c. ..... :		N
	Rated frequency (Hz) ..... :	50 – 60	P
	Rated current (A) ..... :	See model matrix	P
	Number of phases (1Ø - 3Ø)..... :	See model matrix	P
	Output rated active power (W/kW) ..... :	See model matrix	P
	Output rated apparent power (VA/kVA) ..... :	See model matrix	P
	Maximum ambient operating temperature range (°C) [optional] ..... :	40	P
	Stored energy time (min/h) [optional] ..... :	---	N
	Manufacturer ..... :	American Power Conversion	P
	Trademark ..... :	APC	P
	Type/model ..... :	See model matrix	P
	Symbol of Class II ..... :		N
	Supply ratings given in installation instructions for units with additional separate automatic bypass/maintenance bypass, additional input a.c. supply for external batteries ..... :		N
	Text referring to installation instructions on/near point of connection ..... :		N

Cl.	Requirement – Test	Result	Verdict
	Certification marks.....:		N
1.8.2	Safety instructions	Provided with each unit	P
1.8.3 1.7.4/RD	Marking for voltage setting/frequency setting ....:		N
1.8.4 1.7.5/RD	Marking at power outlets .....:	See IEC/EN60950 Test Report for details	P
1.8.5	Marking at fuseholders .....:	all fuses and circuit breakers are marked with ratings or F1, See schematics	P
1.8.6	Protective earthing terminals .....:	Located on Terminal Block Assembly	P
1.8.7	Battery terminals	Marked '+' and '-' on Battery connector	P
1.8.8 1.7.8/RD	Identification and location of switches and controls .....:		P
	Colours of controls and indicators .....:		P
	Symbols according to IEC 417 .....:		P
	Figures used for marking .....:		P
	Location of markings and indications for switches and controls .....:		P
1.8.9 1.7.9/RD	Isolation of multiple power sources .....:		N
1.8.10 1.7.10/RD	Instructions for installation to IT power system		N
1.8.11	Instructions when protection relies on building installation		N
1.8.12 1.7.12/RD	High leakage current	See IEC/EN60950 Test Report for details	P
	Marking when leakage current exceeds 3,5 mA	See IEC/EN60950 Test Report for details	P
1.8.12.1	Installation manual defining connection method		N
1.8.12.2	Warning label and installation manual defining connection method		N
1.8.13 1.7.13/RD	Indication at thermostats and regulating devices		N
1.8.14 1.7.14/RD	Language of safety markings/instructions		P
	Language .....:	German / English	
1.8.15 1.7.15/RD	Durability and legibility	See IEC/EN60950 Test Report for details	P
1.8.16 1.7.16/RD	Removable parts		N

Cl.	Requirement – Test	Result	Verdict
1.8.17 1.7.17/RD	Warning text for replaceable lithium batteries	No lithium batteries	N
	Language ..... :		
1.8.18 1.7.18/RD	Operator access with a tool ..... :	See IEC/EN60950 Test Report for details	N
1.8.19	a) Battery type and number of blocks or cells ... :	Lead-Acid	P
	b) Nominal voltage of total battery (V) ..... :	DC 120 V	P
	c) Nominal capacity of total battery [optional] .... :		N
	d) Warning label denoting energy/electrical shock and chemical hazard, reference to maintenance handling and disposal requirements ..... :		N
	Instructions for internally mounted battery	See Manual for details	P
	Instructions for externally mounted battery		N
	External battery cabinets	See Manual for details	P
1.8.20	Signalling circuits		N
1.8.21	Internal circuit configuration		N

Cl.	Requirement – Test	Result	Verdict
2	**FUNDAMENTAL DESIGN REQUIREMENTS**		
2.1	Protection against electric shock and energy hazards		
2.1.1 2.1.5/RD	Access to energized parts	See IEC/EN60950 Test Report for details	P
2.1.2 2.1.2/RD	Protection in operator access areas		P
	Test by inspection ..... :		P
	Test with test finger ..... :		P
	Test with test pin ..... :		P
	Insulation of internal wiring in an ELV circuit accessible to operator		N
	Working voltage (V); distance (mm) through insulation ..... :		N
	Operator accessible insulation of internal wiring at hazardous voltage	See IEC/EN60950 Test Report for details	P
2.1.3	Risk of electric shock from stored charge on capacitors connected to external circuit	See IEC/EN60950 Test Report for details	P
	Time-constant (s); measured voltage (V) ..... :		
2.1.4	Backfeed protection in UPS with flexible cord and plug		N
2.1.4/RD	Protection in service access areas	See IEC/EN60950 Test Report for details	P
2.1.5	All-pole type switching device		
	Protection time(s) ..... :		
2.1.5/RD	Energy hazard in operator access area		
2.1.6	Emergency switching device		N
2.1.6/RD	Clearances behind conductive enclosures	See IEC/EN60950 Test Report for details	P
2.1.7/RD	Shafts of manual controls		P
2.1.8/RD	Isolation of manual controls		P
2.1.9/RD	Conductive casings of capacitors		P

Cl.	Requirement – Test	Result	Verdict
2.2	Insulation		
2.2.1 2.2.1/RD	Methods of insulation	2.2.1 – 2.2.6/RD See IEC/EN60950 Test Report for details	P
2.2.2/RD	Properties of insulating materials		P
2.2.3/RD	Humidity treatment		P
	Humidity (%) .....:		
	Temperature (°C) .....:		
2.2.4/RD	Requirements for insulation		P
2.2.5/RD	Insulation parameters		P
2.2.6/RD	Categories of insulation		P
2.3	Safety extra-low voltage (SELV) circuits		
2.3.1	Multiway plugs and sockets, location of uninsulated parts at hazardous voltage, SELV connectors not compatible with IEC 320	2.3.1 – 2.3.10/RD See IEC/EN60950 Test Report for details	P
2.3.1/RD	Voltage (V) of SELV circuits under normal operating conditions and after a single fault .....:		
2.3.2/RD	Voltage (V) between any two conductors of SELV circuit(s) and for Class I equipment between any conductor of SELV circuit and equipment protective earthing terminal under normal operating conditions .....:		P
2.3.3/RD	Voltage (V) of SELV in the event of a single failure of basic or supplementary insulation or of a component .....:		
	Method used for separation .....:	Method 1	P
2.3.4/RD	Additional constructional requirements		P
2.3.5/RD	Connection of SELV circuits to other circuits		P
2.4	Limited current circuits		
2.4.1/RD 2.4.2/RD	Frequency (Hz) .....:	50 Hz	
	Measured current (mA) .....:		N
2.4.3/RD	Measured voltage (V) .....:		
	Measured capacitance (µF) .....:		N
2.4.4/RD	Measured voltage (V) .....:		
	Measured charge (µC) .....:		N
2.4.5/RD	Measured voltage (V) .....:		
	Measured energy (mJ) .....:		N

Cl.	Requirement – Test	Result	Verdict
2.5	Provisions for protective earthing		
2.5.1	Class I equipment	2.5.1 – 2.5.11/RD See IEC/EN60950 Test Report for details	P
	Warning label for service personnel		N
2.5.2	Sufficient terminals , earthed socket-outlets or other means for equipment bonding to the UPS from other Class I equipment including UPS battery cabinets		P
2.5.2/RD	Protective earthing in Class II equipment		N
2.5.3/RD	Switches/fuses in earthing conductors		P
2.5.4/RD	Assured earthing connection for Class I equipment in systems comprising Class I and Class II equipment		N
2.5.5/RD	Green/yellow insulation		P
2.5.6/RD	Continuity of earth connections		P
2.5.7/RD	Making and breaking of protective earthing connections		P
2.5.8/RD	Disconnection protective earthing connections		P
2.5.9/RD	Protective earthing terminals for fixed supply conductors or for non-detachable power supply cords		N
2.5.10/RD	Corrosion resistance		P
2.5.11/RD	Resistance (Ω) of protective earthing conductors ≤ 0,1 Ω		P
	Test current (A) .....:	200	

Cl.	Requirement – Test	Result	Verdict
2.6	A.C. and D.C. power isolation		
2.6.1	Disconnection devices	See IEC/EN60950 Test Report for details	P
2.6.2	For three-phase equipment simultaneous disconnection of all phase conductors of supply For IT equipment simultaneous disconnection of neutral conductor	See IEC/EN60950 Test Report for details	P
2.6.2/RD	Type of disconnect device .....:	See IEC/EN60950 Test Report for details	P
2.6.3	Marking of on/off positions	See IEC/EN60950 Test Report for details	N
2.6.3/RD	Disconnect device in permanently connected equipment	See IEC/EN60950 Test Report for details	P
2.6.4	Permanently connected unit receiving power from more than one external source		N
2.6.4/RD	Parts of disconnect device which remain energized	See IEC/EN60950 Test Report for details	P
2.6.5	Opening of all ungrounded conductors of battery(s)	Connector for Battery disconnection	P
2.6.5/RD	Switches in flexible cords		N
2.6.6/RD	Disconnection of both poles simultaneously in single-phase equipment	See IEC/EN60950 Test Report for details	P
2.6.9/RD	Installation instructions if plug on power supply cord acts as disconnect device		N
	Language .....:		
2.6.10/RD	Disconnection of protective earthing connection		P
2.6.11/RD	Interconnected equipment		P
2.6.12	Multiple power sources		N
2.6.13/RD	Compliance with requirements of 2.6		P

Cl.	Requirement – Test	Result	Verdict
2.7	Overcurrent and earth fault protection		
2.7.1 a)	Protective devices as integral parts of equipment		P
2.7.1 b)	Protective devices in building installation for components in series with mains input		N
2.7.1 c)	Reliance based on protection in building installation. Installation instructions		N
2.7.1 d)	Available fault current under most unfavourable conditions		N
	Specified by manufacturer (mA) .....:		N
	Limiting of inverter output current (A) and period of operation(s) .....:		N
2.7.2	Overcurrent protection of battery supply circuit		P
2.7.3 2.7.3/RD	Short-circuit backup protection	See IEC/EN60950 Test Report for details	P
2.7.4 2.7.4/RD	Location of overcurrent protective device where batteries are installed outside UPS		N
	Number and location of protective devices .....:		N
2.7.5 2.7.5/RD	Protection by several devices	See IEC/EN60950 Test Report for details	P
	Rating of overcurrent protective device located internally	See IEC/EN60950 Test Report for details	P
	Rating of protective device in instruction manual for separate battery supply		
2.7.6/RD	Warning to service personnel		N

Cl.	Requirement – Test	Result	Verdict
2.8	Protection of personnel - safety interlocks		
2.8.1	Requirements applying to service personnel		N
2.8.2	Arranging parts at hazardous voltage or energy		N
2.8.3	Reducing likelihood of unintentional contact by service personnel		N
2.8.4	Parts at hazardous voltage/energy level located on rear side of door		N
2.8.5/RD	Overriding an interlock		N
2.8.5	Location of energized component		N
2.8.6	Adjustment with screwdriver Contact gap (mm) ..... :		N
2.8.7	Moving parts causing injury		N
2.8.8	Discharging of capacitor banks Discharge time(s), time to reduce hazard to safe level (min) ..... :		N
2.8.9	Arranging of internal batteries Interconnection method:		N

Cl.	Requirement – Test	Result	Verdict
2.9	Clearances, creepage distances and distances through insulation		
	Nominal voltage (V) .....:	2.9.1 – 2.9.8 See IEC/EN60950 Test Report for details	
2.9.1/RD	General requirements		P
2.9.2/RD	Clearances		P
2.9.2	Clearances in primary circuits		P
2.9.2	Clearances in secondary circuits		P
2.9.3/RD	Creepage distances		P
	CTI tests .....:		
2.9.4/RD	Minimum distances through insulation		P
	Thin sheet material		N
2.9.5/RD	Distances on coated printed boards		N
	Routine testing for electric strength		N
2.9.6/RD	Enclosed and sealed parts		P
2.9.7/RD	Spacings filled by insulating compound		P
2.9.8/RD	Component external terminations		P
2.10	External signalling circuits		
	General requirements	See IEC/EN60950 Test Report for details	P
	Type of interconnection circuits .....:	See IEC/EN60950 Test Report for details	P
	ELV circuits as interconnection circuits		N
2.11	Limited power source		N
2.11/RD	Use of limited power source .....:		
2.12	Protection of applied load		P
	Value of static output voltage variations not exceeding values of static input voltage tolerances .....:		

Cl.	Requirement – Test	Result	Verdict
3	**WIRING, CONNECTIONS AND SUPPLY**		
3.1/RD	General		
3.1.1/RD	Cross-sectional area of internal wiring/ interconnecting cables	3.1 – 3.1.11 See IEC/EN60950 Test Report for details	P
	Protection of internal wiring and interconnecting cables		P
3.1.2/RD	Wireways		P
3.1.3/RD	Fixing of internal wiring		P
3.1.4/RD	Fixing of uninsulated conductors		N
3.1.5/RD	Insulation of internal wiring		P
3.1.6/RD	Wires coloured green/yellow only for protective earth connection		P
3.1.7/RD	Fixing of beads and similar ceramic insulators		P
3.1.8/RD	Required electrical contact pressure		P
3.1.9/RD	Reliable electrical connections		P
3.1.10/RD	End of stranded conductor		P
3.1.11/RD	Use of spaced thread screws/thread-cutting screws		N

3.2	Connection to power		
3.2.1	Type of connection .....:	See IEC/EN60950 Test Report for details	P
	Design of product with more than one supply connection .....:		N
3.2.2/RD	Provision for permanent connection .....:		P
	Size (mm) of cables and conduits .....:		P
3.2.3/RD	Appliance inlet		N
3.2.4/RD	Type and cross-sectional area (mm^2) of power supply cord .....:		N
3.2.5/RD	Cord anchorage		N
	Test: 25 times; 1 s; pull (N) .....:		–
	Longitudinal displacement ≤ 2 mm .....:		–
3.2.6/RD	Protection of power supply cord		N
3.2.7/RD	Cord guard		N
	D (mm) .....:		
	Test: mass (g) .....:		
	Radius of curvature of the cord ≤ 1,5 D		N
3.2.8/RD	Supply wiring space		P

Cl.	Requirement – Test	Result	Verdict
3.3	Wiring terminals for external power supply conductors		
3.3.1/RD	Terminals	3.3.1 – 3.3.9 See IEC/EN60950 Test Report for details	P
3.3.2/RD	Special non-detachable cord		N
	Type of connection .....:		
	Pull test at 5 N		N
3.3.3/RD	Screws and nuts		N
3.3.4/RD	Fixing of conductors		N
3.3.5/RD	Connection of connectors		P
3.3.6/RD	Size of terminals		N
	Nominal thread diameter (mm) .....:		N
3.3.7/RD	Protection against damage of conductors		P
3.3.8/RD	Terminal location		N
3.3.9/RD	Test with 8 mm stranded wire		P
4	**PHYSICAL REQUIREMENTS**		
	Frame of chassis and use of enclosure		P
4.1	Stability and mechanical hazards		P
4.1.1	Stability tests		P
	Angle of 10°		P
	Test: force (N) .....:	See IEC/EN60950 Test Report for details	P
4.1.2/RD	Protection against personal injury		P
4.1.3/RD	Warning and means provided for stopping the moving part .....:		N
4.1.4/RD	Edges and corners		P
4.1.5/RD	Enclosure of a high pressure lamp		N
4.2	Mechanical strength and stress relief		
4.2.1/RD	General	4.2.1 – 4.2.7 See IEC/EN60950 Test Report for details	P
4.2.2/RD	Internal enclosures 30 N ± 3 N; 5 s		N
4.2.3/RD	External enclosures 250 N ± 10 N; 5 s		N
4.2.4/RD	Steel ball tests		P
	Fall test		N
	Swing test		N
4.2.6/RD	Heat test for enclosures of moulded or formed thermoplastic materials: 7 h; T (°C) .....:		N
4.2.7/RD	Compliance criteria		P

Cl.	Requirement – Test	Result	Verdict
4.3	Construction details		
4.3.1	Openings vertically above bare parts at hazardous voltages in top of enclosure .....:	See IEC/EN60950 Test Report for details	N
4.3.1/RD	Changing of setting for different power supply voltages	See IEC/EN60950 Test Report for details	N
4.3.2	Openings in the side of fire enclosure or electrical enclosure	See IEC/EN60950 Test Report for details	N
4.3.2/RD	Adjustment of accessible control devices	See IEC/EN60950 Test Report for details	N
4.3.3	Safeguards against risk of dangerous gas concentration and dangerous external spillage in case of using batteries	Sealed Battery	P
4.3.3/RD	Prevention of penetration or spilt liquid	See IEC/EN60950 Test Report for details	N
4.3.4	Equipment provided with castors Brakes on wheels		N
4.3.5/RD	Fixing of knobs, grips, handles, levers		N
	Test: force (N) .....:		N
4.3.6/RD	Driving belts/couplings shall not ensure electrical insulation	4.3.6 – 4.3.21 See IEC/EN60950 Test Report for details	N
4.3.7/RD	Retaining of sleeves		N
4.3.8/RD	Gaps in supplementary or basic insulation		P
4.3.9/RD	Protection of loosening parts		P
4.3.10/RD	Protection of supplementary and reinforced insulation		P
4.3.11/RD	Resistance to oil and grease		N
4.3.13/RD	Securing of screwed connections		P
4.3.17/RD	Interchangeable plugs and sockets		N
4.3.21/RD	Protection of lithium batteries		N
	Construction of protection circuit .....:		N

Cl.	Requirement – Test	Result	Verdict
4.4	Resistance to fire		
4.4.1/RD	Methods of achieving resistance to fire	4.4.1 – 4.4.8 See IEC/EN60950 Test Report for details	P
4.4.2/RD	Minimizing the risk of ignition		P
	Printed board: manufacturer; type; flammability ..		P
4.4.3 4.4.3/RD	Flammability of batteries Flammability of materials and components	Battery is min. V2	P
4.4.3.2/RD	Material and component: manufacturer; type; flammability		P
4.4.3.3/RD	Exemptions		N
4.4.3.4/RD	Wiring harnesses: manufacturer; flammability		P
4.4.3.5/RD	Cord anchorage bushings: manufacturer; flammability		N
4.4.3.6/RD	Air filter assemblies: manufacturer; flammability:		N
4.4.4/RD	Enclosures and decorative parts: manufacturer; type; flammability		P
4.4.5/RD	Conditions for fire enclosures		P
4.4.5.1/RD	Components requiring fire enclosure: manufacturer; flammability		P
4.4.5.2/RD	Components not requiring fire enclosure		N
4.4.6/RD	Fire enclosure construction		P
4.4.7/RD	Doors or covers in fire enclosures		P
4.4.8/RD	Flammable liquids		N

4.5	Battery location		
4.5.1	General requirements for installation .....:		P
	Accessibility and maintainability .....:		P
	Ingress of dust, solid objects and moisture .....:		P
	Temperature range .....:		P
	Vibration .....:		P
	Distance .....:		P
	Insulation .....:		P
	Wiring .....:	See IEC/EN60950 Test Report for details	P
	Electrolytic spillage .....:	Sealed Battery	P
	Ventilation .....:		P
	Charging voltages (V) .....:		P

Cl.	Requirement – Test	Result	Verdict
5	**THERMAL AND ELECTRICAL REQUIREMENTS**		
5.1	Heating		P
	Heating tests	See IEC/EN60950 Test Report for details	P
5.2	Earth leakage current (see appended table)		P
5.2.1 5.2.1/RD	Protective earth conductor carrying the sum of UPS and connected load earth leakage currents General	See IEC/EN60950 Test Report for details	P
5.2.2	Non-detachable power supply cord for pluggable type B equipment		N
5.2.2/RD	Leakage current	See IEC/EN60950 Test Report for details	P
5.2.3/RD	Single-phase equipment		N
	Test voltage (V) .....:		
	Measured current (mA) .....:		
	Max. allowed current (mA) .....:		
5.2.4/RD	Three-phase equipment	See IEC/EN60950 Test Report for details	P
	Test voltage (V) .....:		
	Measured current (mA) .....:		
	Max. allowed current (mA) .....:		
5.2.5/RD	Equipment with earth leakage current exceeding 3,5 mA	See IEC/EN60950 Test Report for details	P
	Test voltage (V) .....:	See IEC/EN60950 Test Report for details	
	Measured current (mA) .....:	See IEC/EN60950 Test Report for details	
	Max. allowed current (mA) .....:	3.5	
	Cross-sectional area (mm^2) of internal protective earthing conductor .....:		
	Warning label		P
5.3	Electric strength		
5.3.1/RD	General	See IEC/EN60950 Test Report for details	P
5.3.2/RD	Test procedure		P

Cl.	Requirement – Test	Result	Verdict
5.4	Abnormal operating and fault conditions		
5.4.1 5.4.1/RD	Simulating faults	See IEC/EN60950 Test Report for details	P
5.4.2 5.4.2/RD	Testing in normal use and foreseeable misuse Motors		P
5.4.3/RD	Transformers	See IEC/EN60950 Test Report for details	P
5.4.4/RD	Compliance of operational insulation		P
	Method used .....:	See IEC/EN60950 Test Report for details	P
5.4.5	Electromechanical components in secondary circuits		N
5.4.8/RD	Unattended use of equipment having thermostats, temperature limiters etc.		N
5.4.9/RD	Compliance	See IEC/EN60950 Test Report for details	P
5.4.10/RD	Ball-pressure test of thermoplastic parts; impression shall not exceed 2 mm	See IEC/EN60950 Test Report for details	P

Cl.	Requirement – Test	Result	Verdict

A/RD	**ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE**		
A.1/RD	Flammability test for fire enclosures of moveable equipment having a total mass exceeding 18 kg, and of stationary equipment		N
A.2/RD	Flammability test for fire enclosures of moveable equipment having a total mass not exceeding 18 kg, and for materials located within fire enclosures		N
A.3/RD	High current arcing ignition test		N
A.3.6/RD	Number of arcs .....:		N
A.4/RD	Hot wire ignition test		N
A.4.6/RD	Ignition time (s) .....:		N
A.5/RD	Hot flaming oil test		N
A.6/RD	Flammability test for classifying materials V-0, V-1 or V-2		N
A.7/RD	Flammability test for classifying foamed materials HF-1, HF-2 or HBF		N
A.8/RD	Flammability test for classifying materials HB		N
A.9/RD	Flammability test for classifying materials 5V		N
A/RD	Tested material		N
	Preconditioning: 7 days (168 h); temperature (°C):		
	Mounting of samples during test .....:		
	Wall thickness .....:		
	Sample 1 burning time .....:		N
	Sample 2 burning time .....:		N
	Sample 3 burning time .....:		N
	Material: compliance with the requirements		N
	Manufacturer of tested material .....:		
	Type of tested material .....:		
	Additional information .....:		

Cl.	Requirement – Test	Result	Verdict
B/RD	**ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS**		
B.1/RD	General requirements	See IEC/EN60950 Test Report for details	P
	Position ..... :		N
	Manufacturer ..... :		N
	Type ..... :		N
	Rated voltage (V) or current (A) ..... :		N
B.2/RD	Test conditions		N
B.3/RD	Maximum temperatures		N
B.4/RD	Running overload test		N
B.5/RD	Locked-rotor overload test		N
	Test duration (days) ..... :		N
	Electric strength test: test voltage (V) ..... :		N
B.6/RD	Running overload test for DC motor in secondary circuits	See IEC/EN60950 Test Report for details	P
B.7/RD	Locked-rotor overload test for DC motor in secondary circuits		P
B.7.2/RD	Test time (h) ..... :	7	P
B.7.3/RD	Test time (h) ..... :		N
B.8/RD	Test for motors with capacitors		N
B.9/RD	Test for three-phase motors		N
B.10/RD	Test for series motors		N
	Test voltage (V) ..... :		—

C/RD	**ANNEX C, TRANSFORMERS**		
	Position ..... :	See IEC/EN60950 Test Report for details	
	Manufacturer ..... :		
	Type ..... :		
	Rated values ..... :		
	Temperatures		P
	Thermal cut-out		N
C.1/RD	Overload test		N
	Conventional transformer		N
C.2/RD	Insulation		P
	Precautions ..... :		P
	Retaining of end turns of all windings		P
	Earthing test at 25 A		N
	Electric strength test		P

Cl.	Requirement – Test	Result	Verdict
H	**ANNEX H, GUIDANCE ON PROTECTION AGAINST INGRESS OF WATER AND FOREIGN OBJECTS**		
H.1	Protection selected from IEC 529 .....:		N
L	**ANNEX L, BACKFEED PROTECTION TEST**		
L.1	Test for pluggable type A or B UPS		N
	1. Current (mA) under no fault and any single fault condition .....:		N
	2. Protection provided by, internal system operation time(s) .....:		N
L.2	Test for permanently connected UPS (only for UPS with backfeed protection)		N
	Current (mA) under no fault and any single fault condition .....:		N
	Operation time(s) .....:		N
M	**ANNEX M, REFERENCE LOAD CONDITIONS**		
	Type of load used .....:	RLC load	P
N	**ANNEX N, VENTILATION OF BATTERY COMPARTMENTS**		
	Ventilation arrangements .....:		P

Cl.	Requirement – Test	Result	Verdict

1.5.1	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity
See IEC/EN60950 Test Report for details					

1.6	TABLE: electrical data (in normal conditions)				P
	Irated (A)	U (V)	P (W)	I (A)	Ifuse (A)	condition/status
See IEC/EN60950 Test Report for details						

2.9.2 and 2.9.3	TABLE: clearance and creepage distance measurements					P
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
See IEC/EN60950 Test Report for details						

2.9.4.1	TABLE: distance through insulation measurements	P

distance through insulation di at/of:	U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
See IEC/EN60950 Test Report for details				

Cl.	Requirement – Test	Result	Verdict

5.1	TABLE: temperature rise measurements		P
	test voltage (V) ..... :		
	t1 (°C) ..... :		
	t2 (°C) ..... :		

rise dT of part/at:	dT (K)	required dT (K)
See IEC/EN60950 Test Report for details		

temperature rise dT of winding:	R_1 (Ω)	R_2 (Ω)	dT (K)	required dT (K)	insulation class

5.2.2	TABLE: leakage current	P
See IEC/EN60950 Test Report for details		

5.3	TABLE: electric strength measurements	P

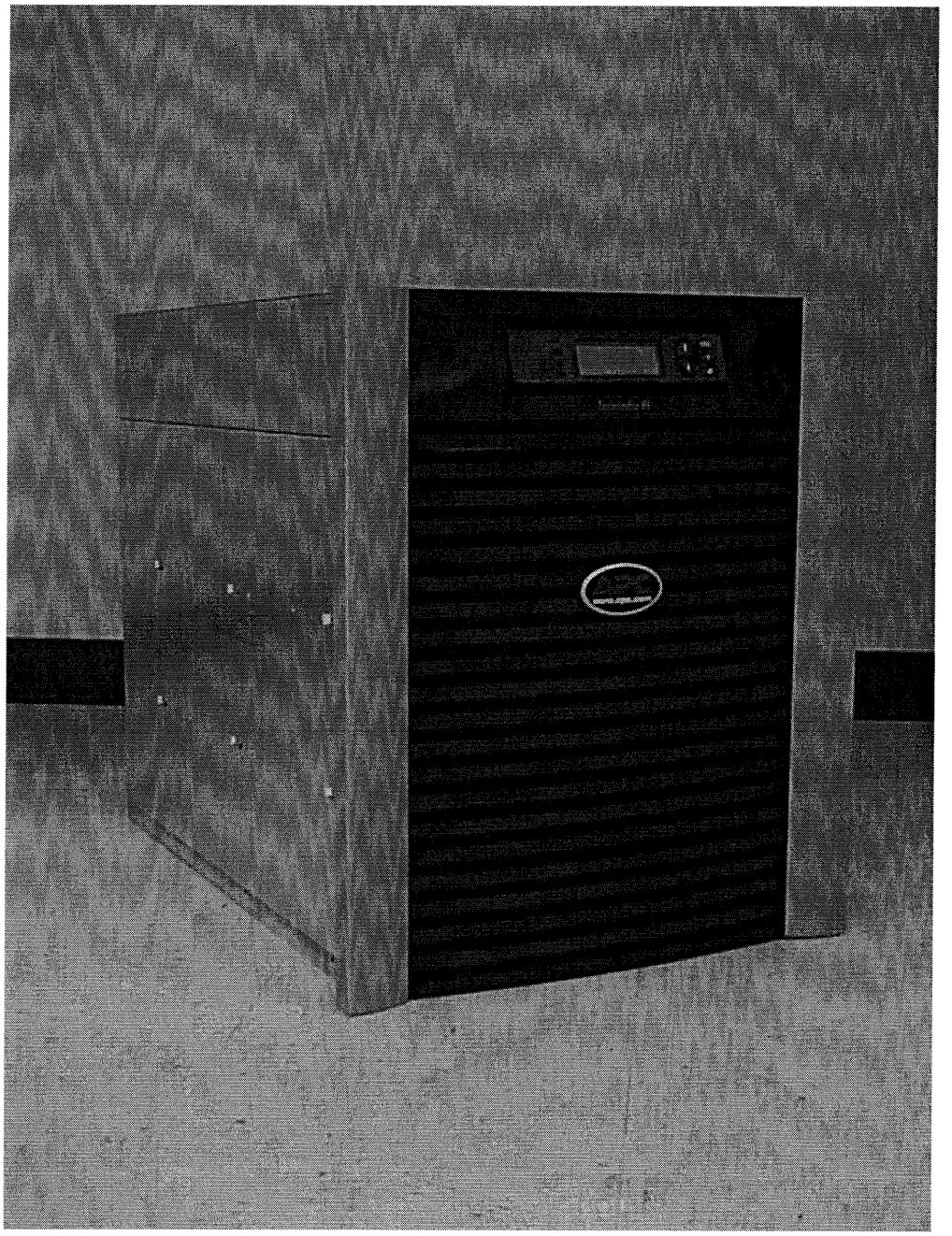
test voltage applied between:	test voltage (V)	breakdown Yes / No
See IEC/EN60950 Test Report for details		
supplementary information		

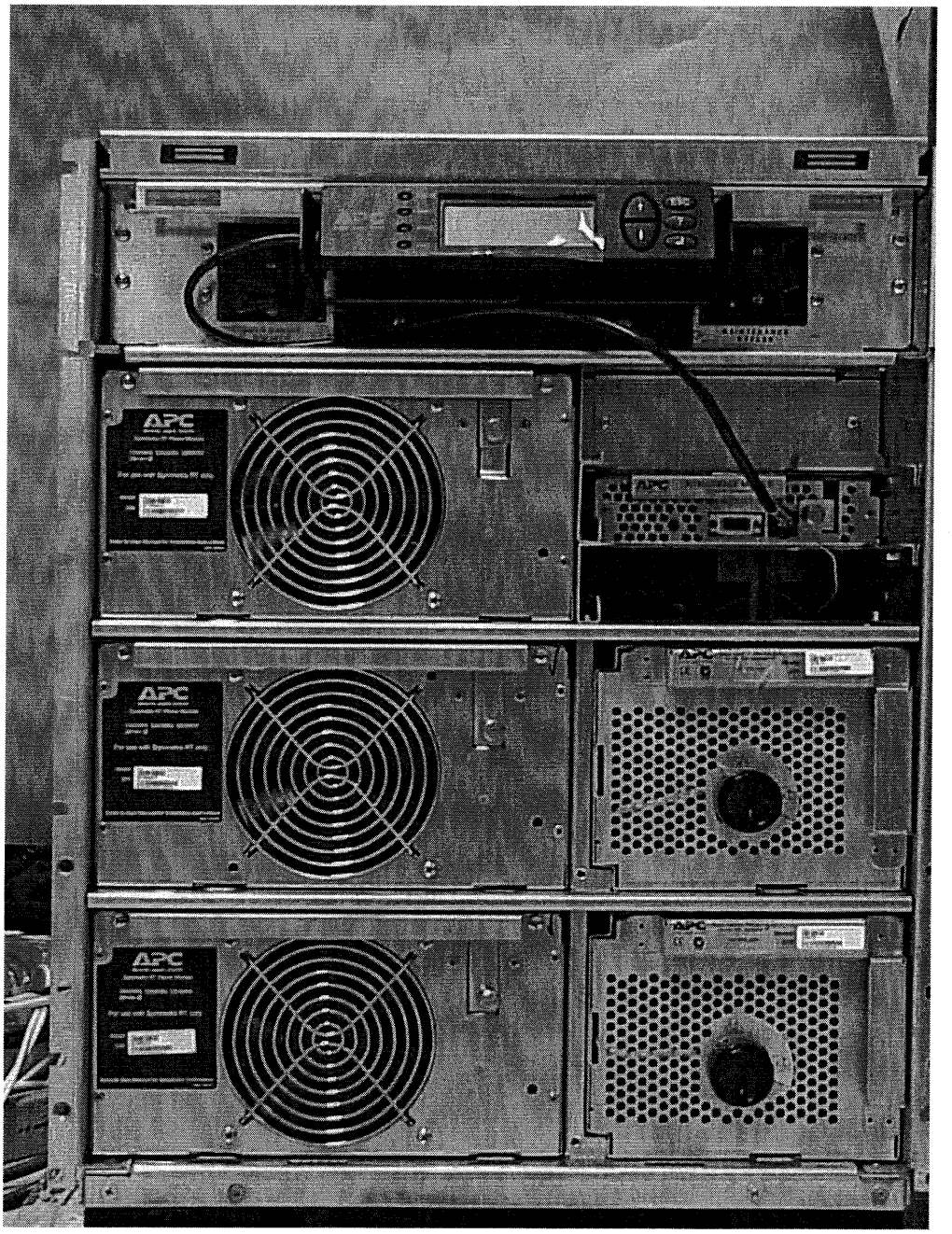
Cl.	Requirement – Test	Result	Verdict

5.4	TABLE: fault condition tests		P
	ambient temperature (°C) ..... :		
	model/type of power supply ..... :		
	manufacturer of power supply ..... :		
	rated markings of power supply ..... :		

	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	Result
See IEC/EN60950 Test Report for details							
supplementary information							

5.4.10	TABLE: ball pressure test of thermoplastics		P
	required impression diameter (mm) ..... :	≤ 2 mm	
		test temperature (°C)	impression diameter (mm)
See IEC/EN60950 Test Report for details			

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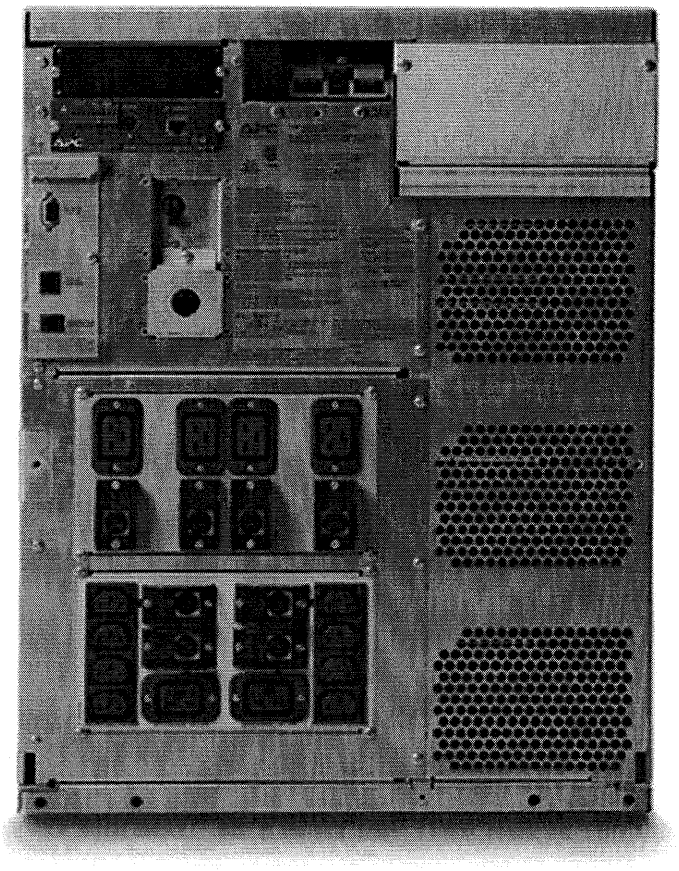

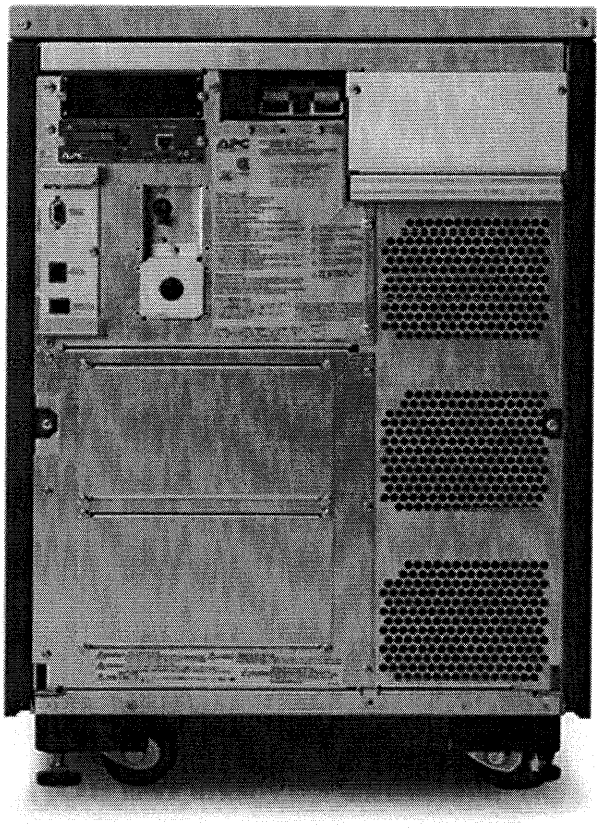

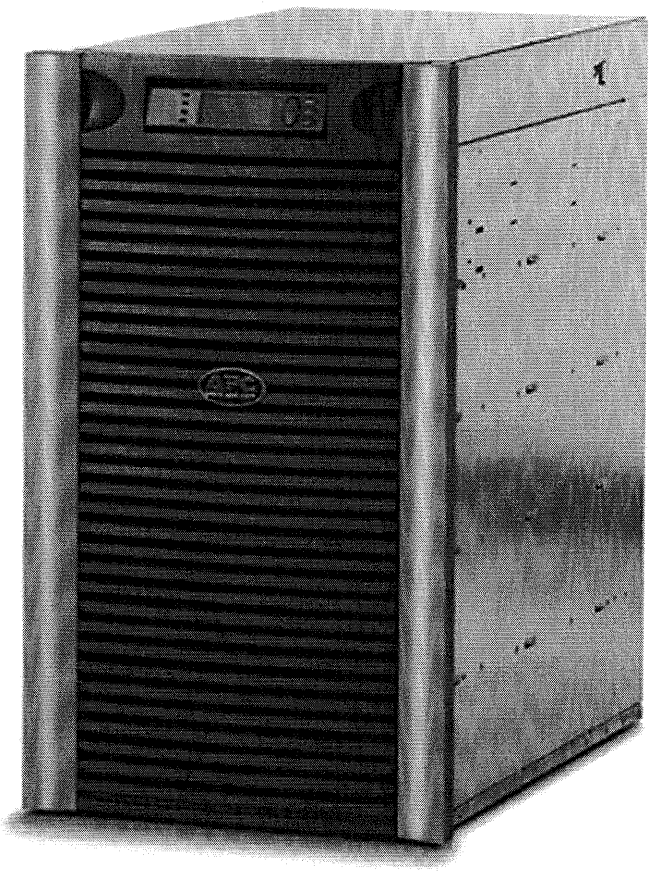

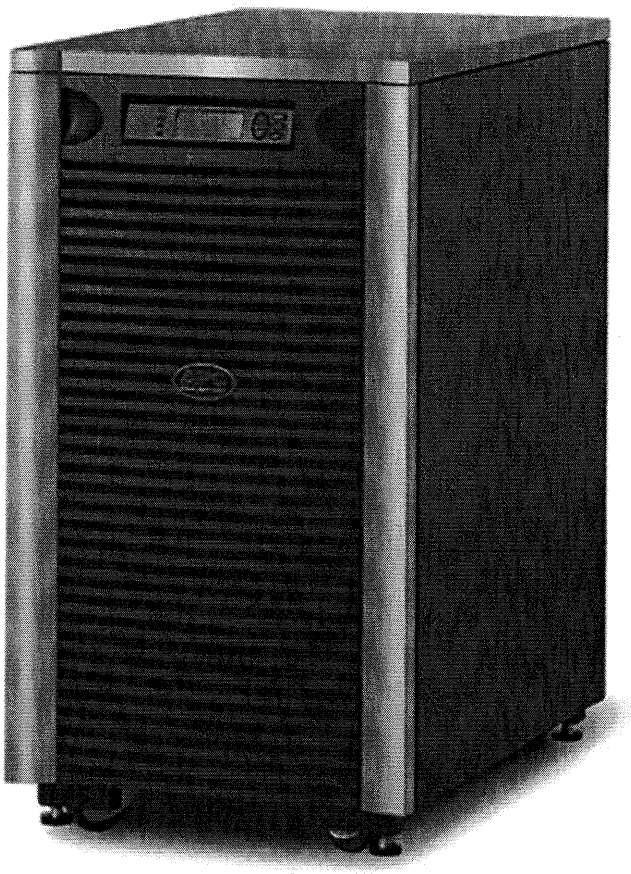

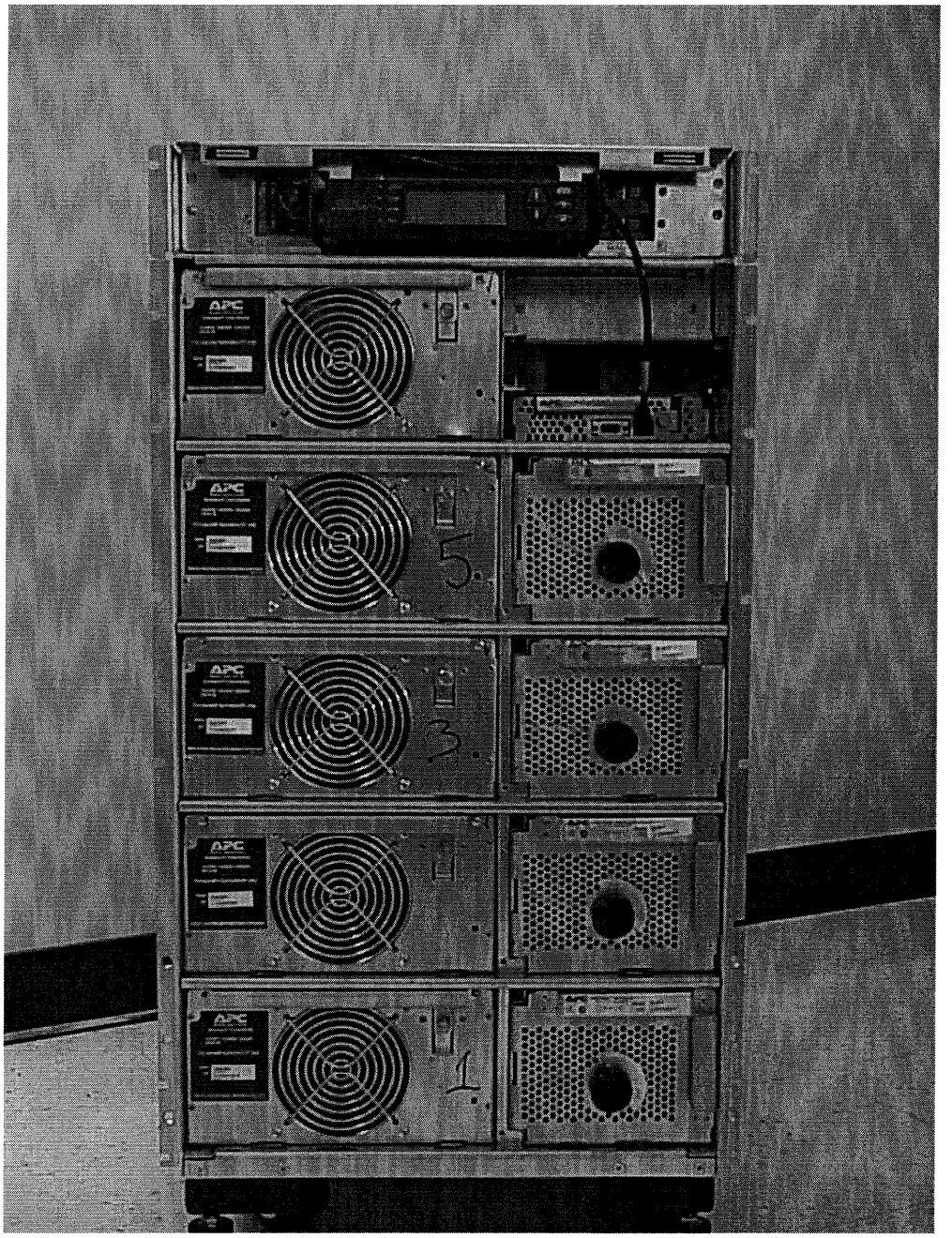
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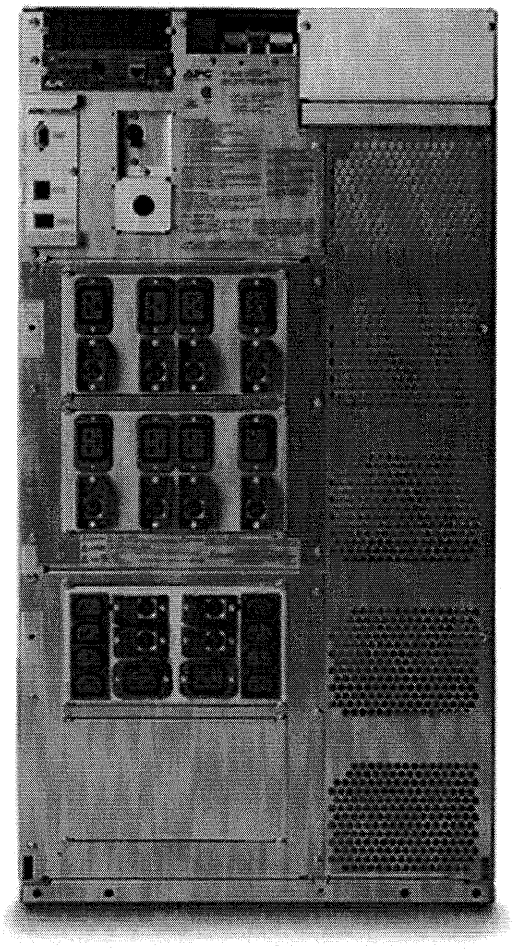

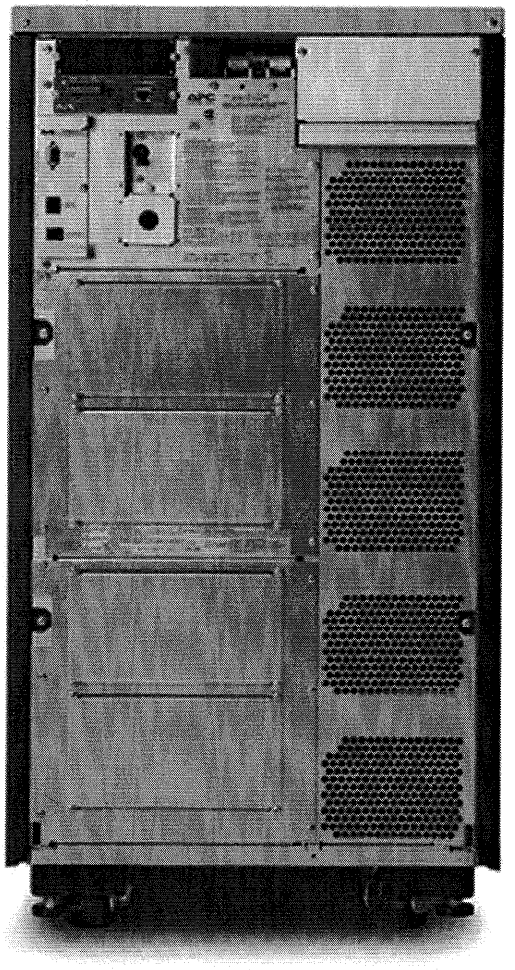

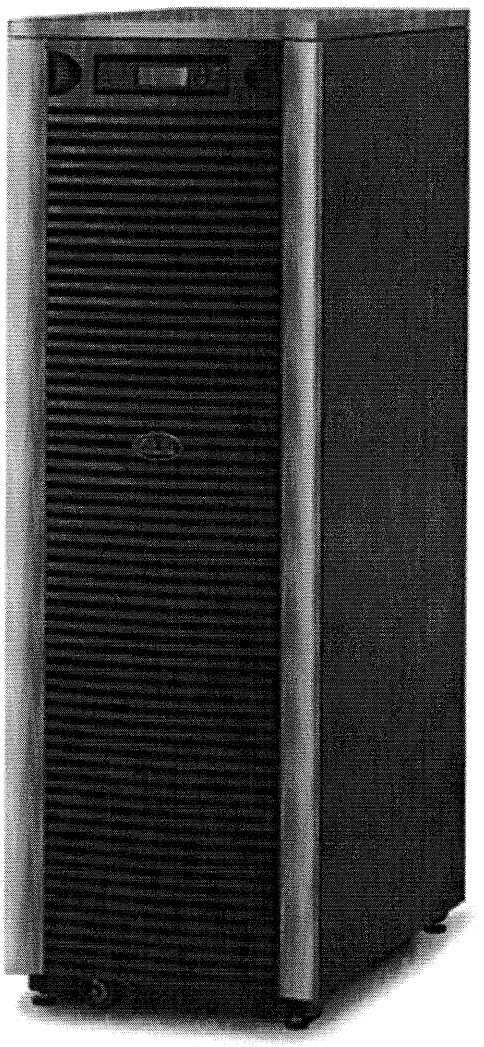

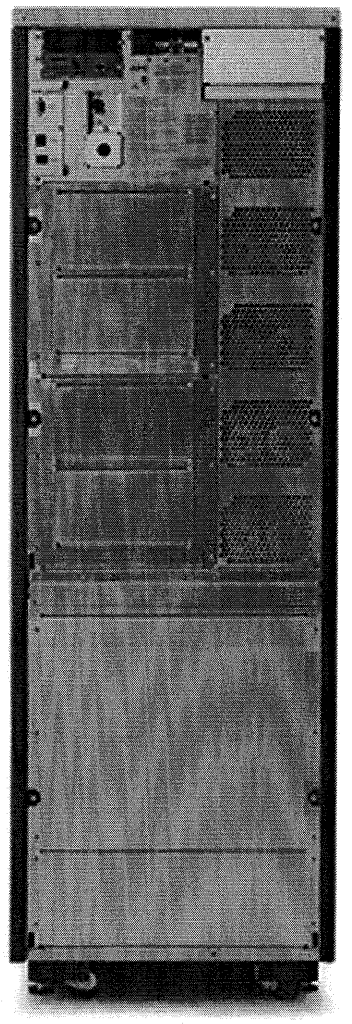

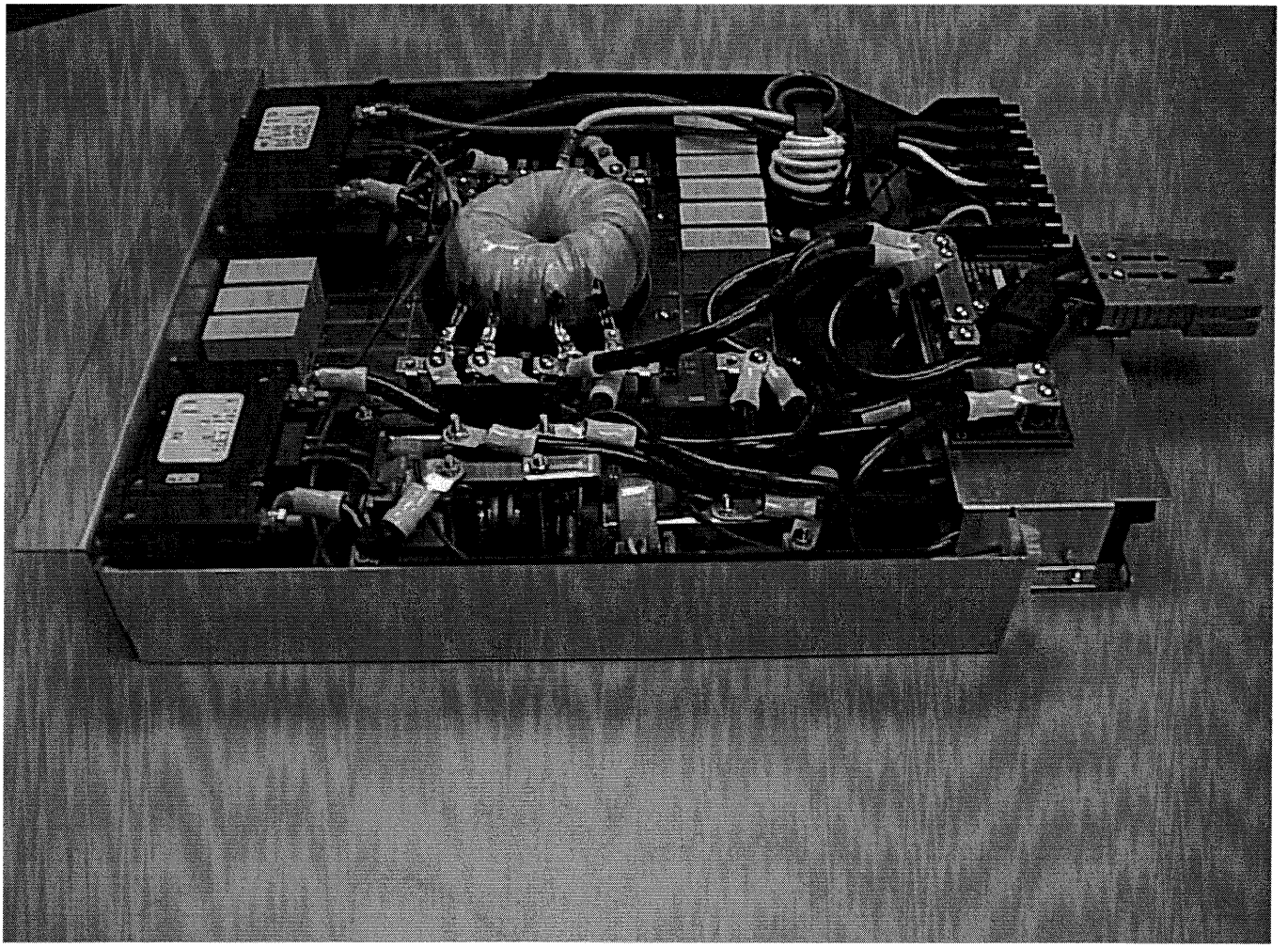

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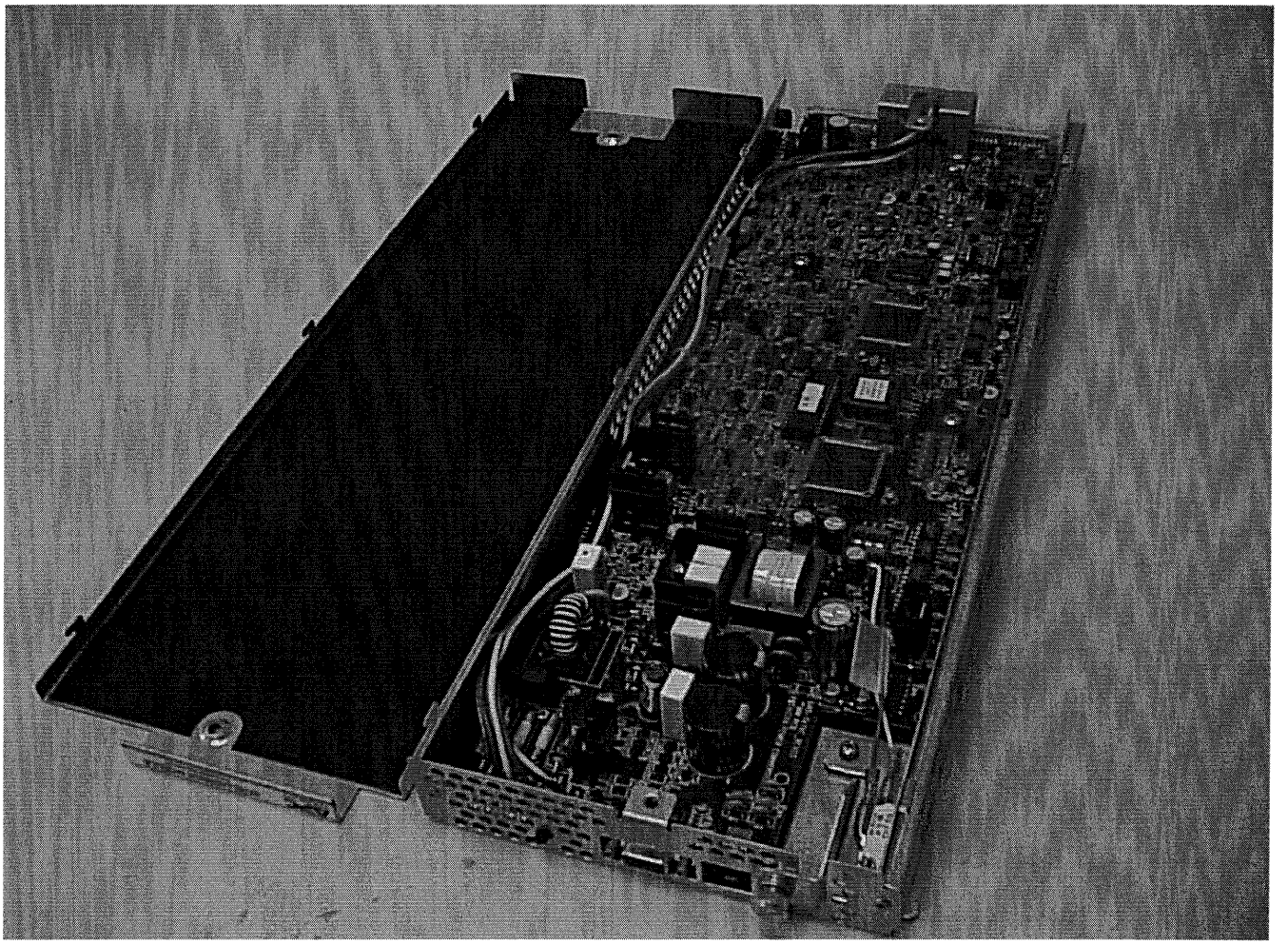

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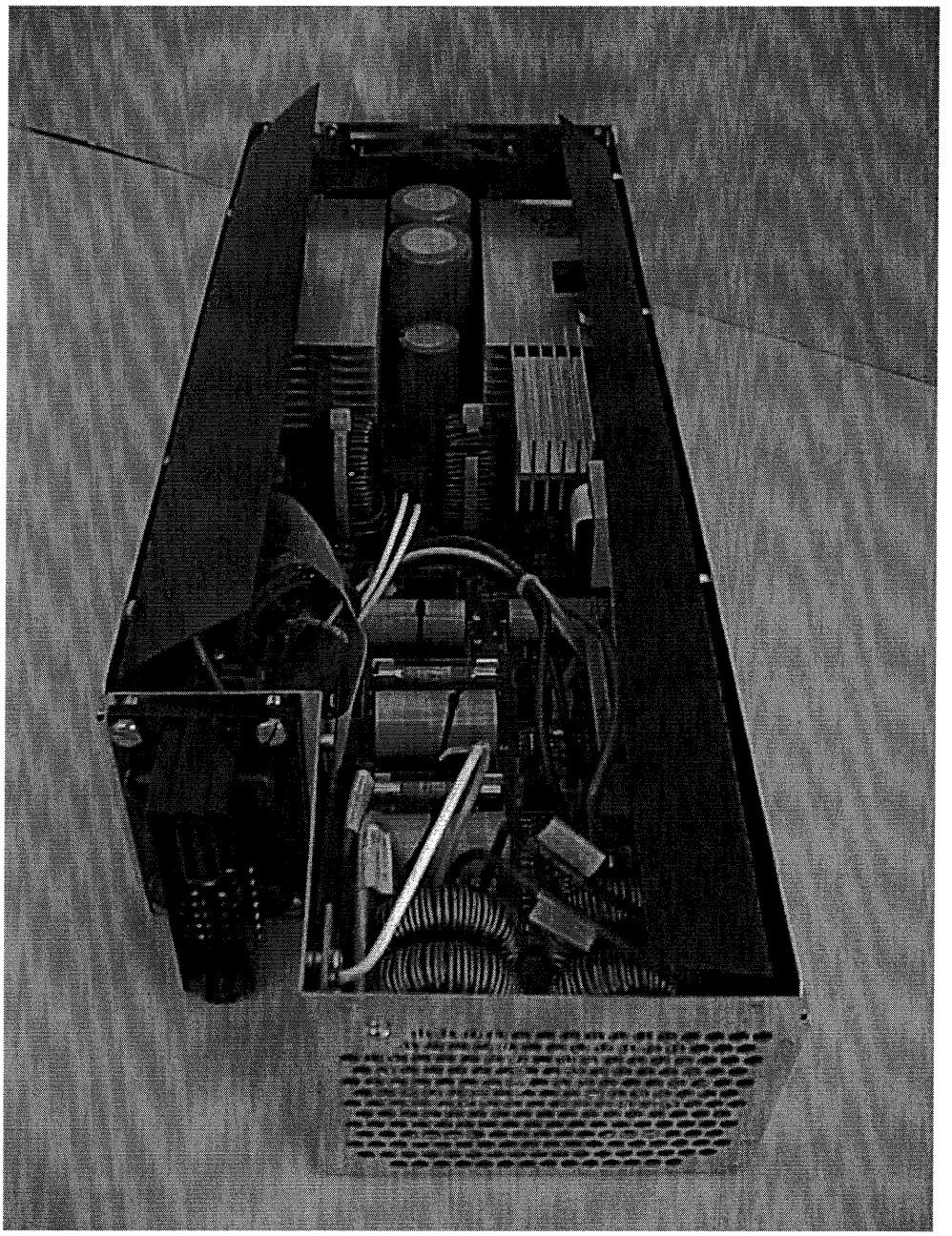

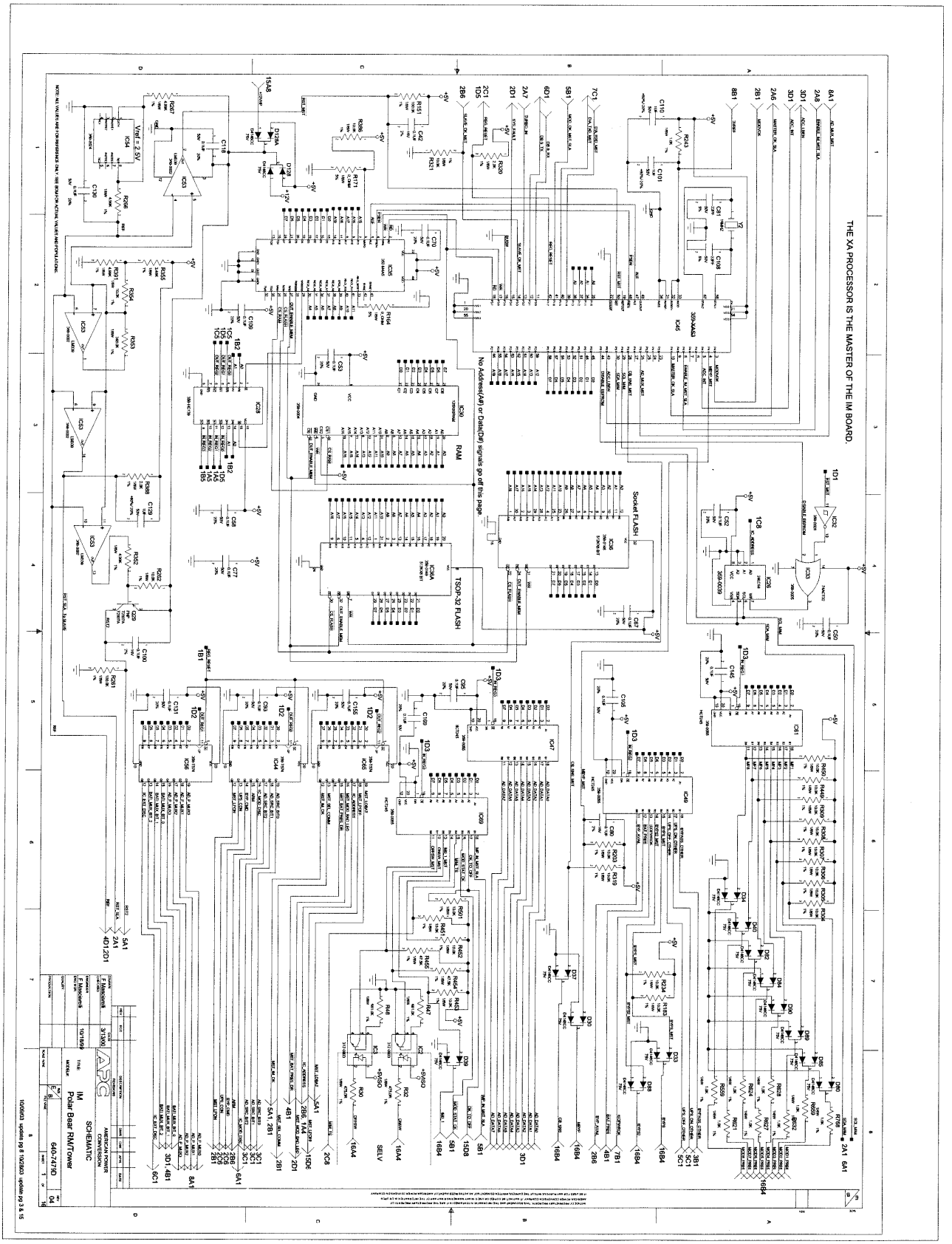
THE XA PROCESSOR IS THE MASTER OF THE IM BOARD.
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Socket FLASH
Vref = 2.5V
IM
Polar Bear RMTower
SCHEMATIC
AMERICAN POWER CONVERSION
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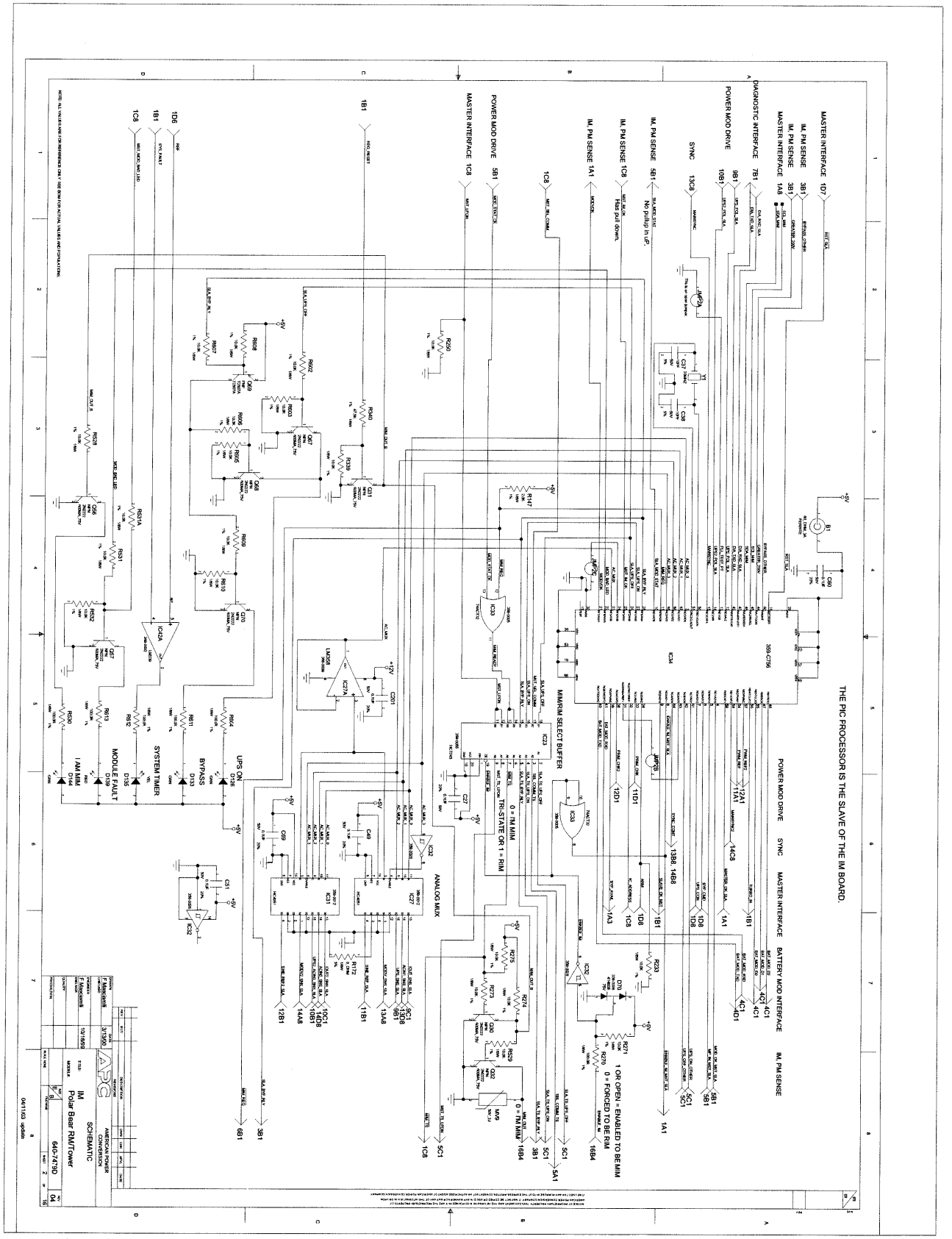

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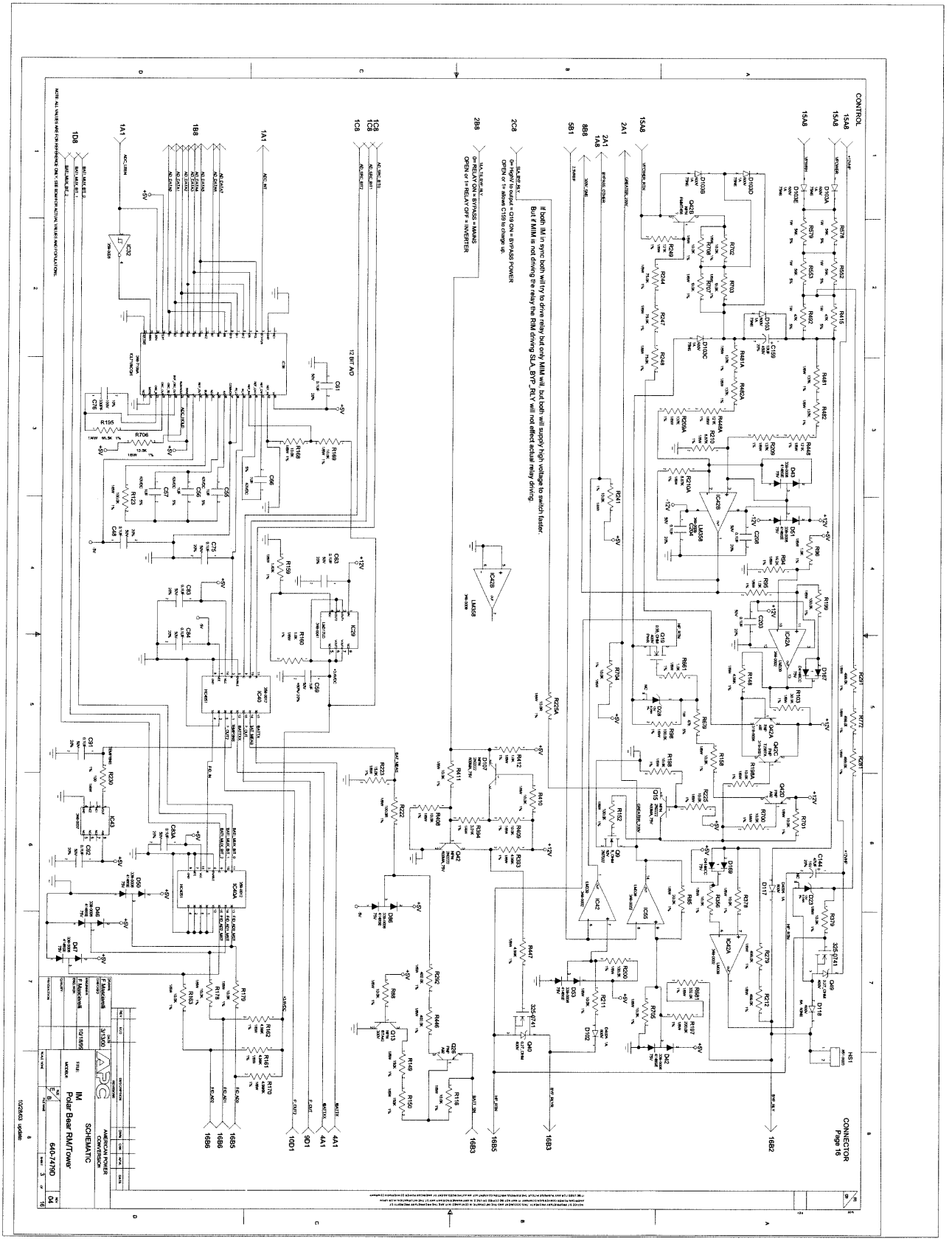
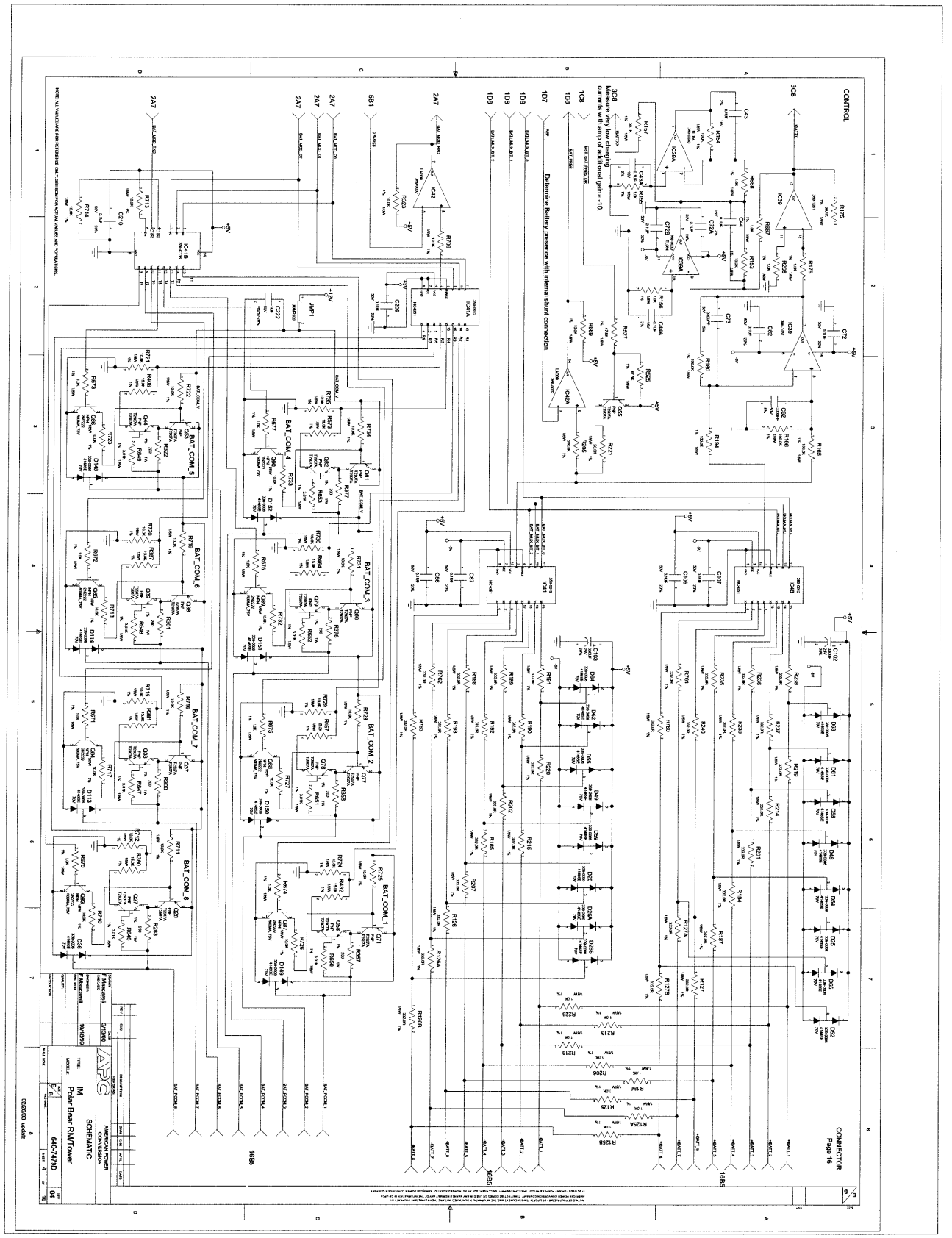
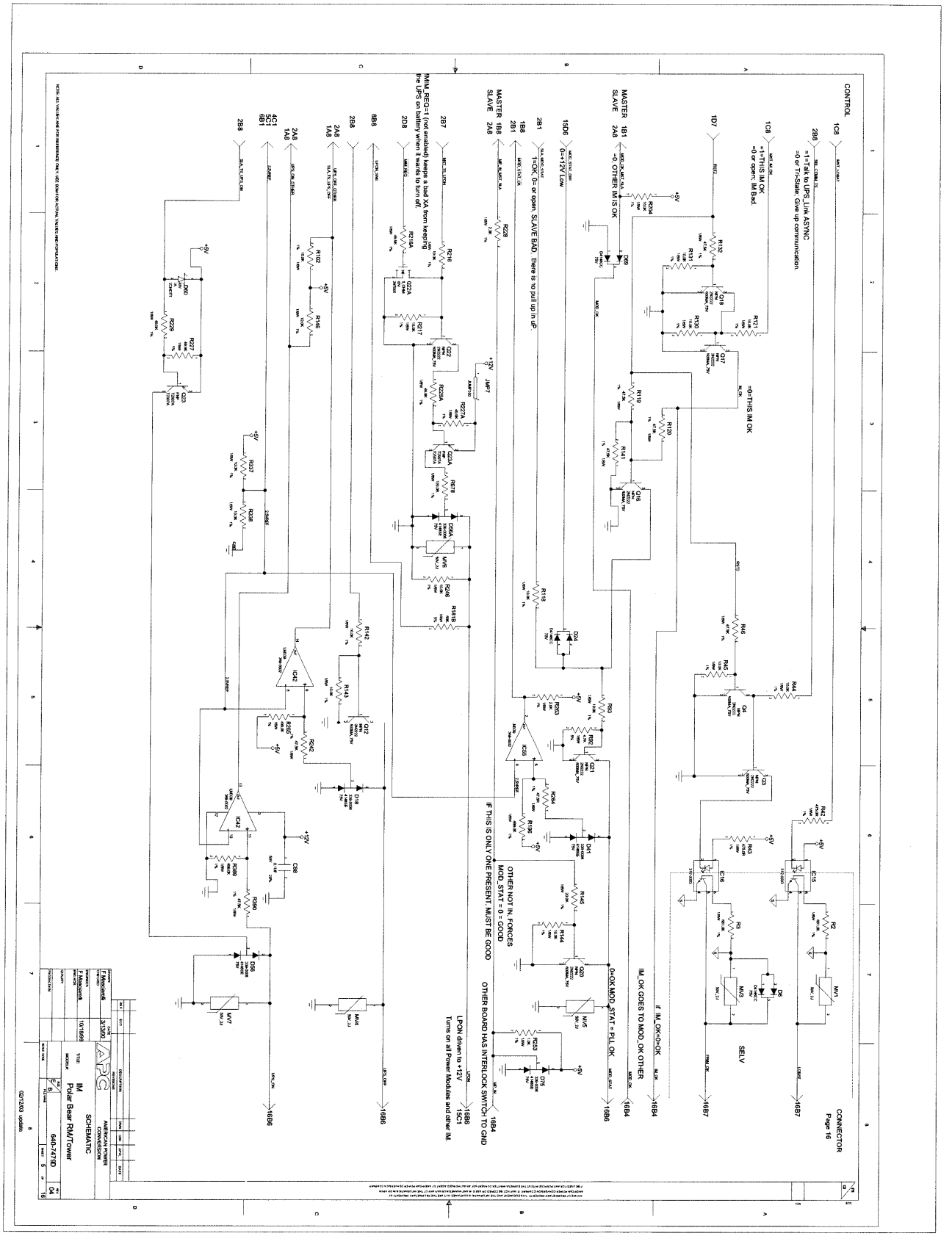
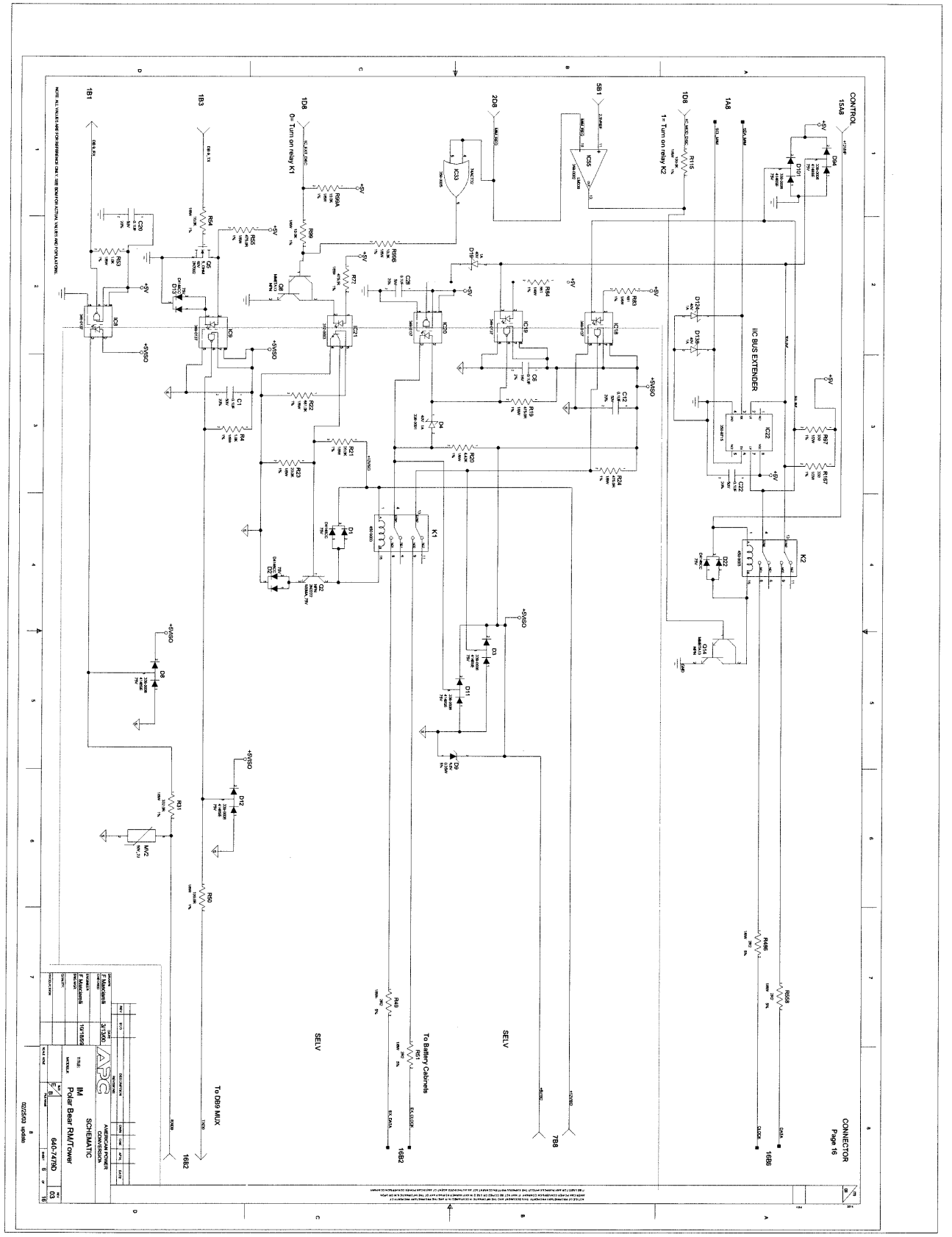
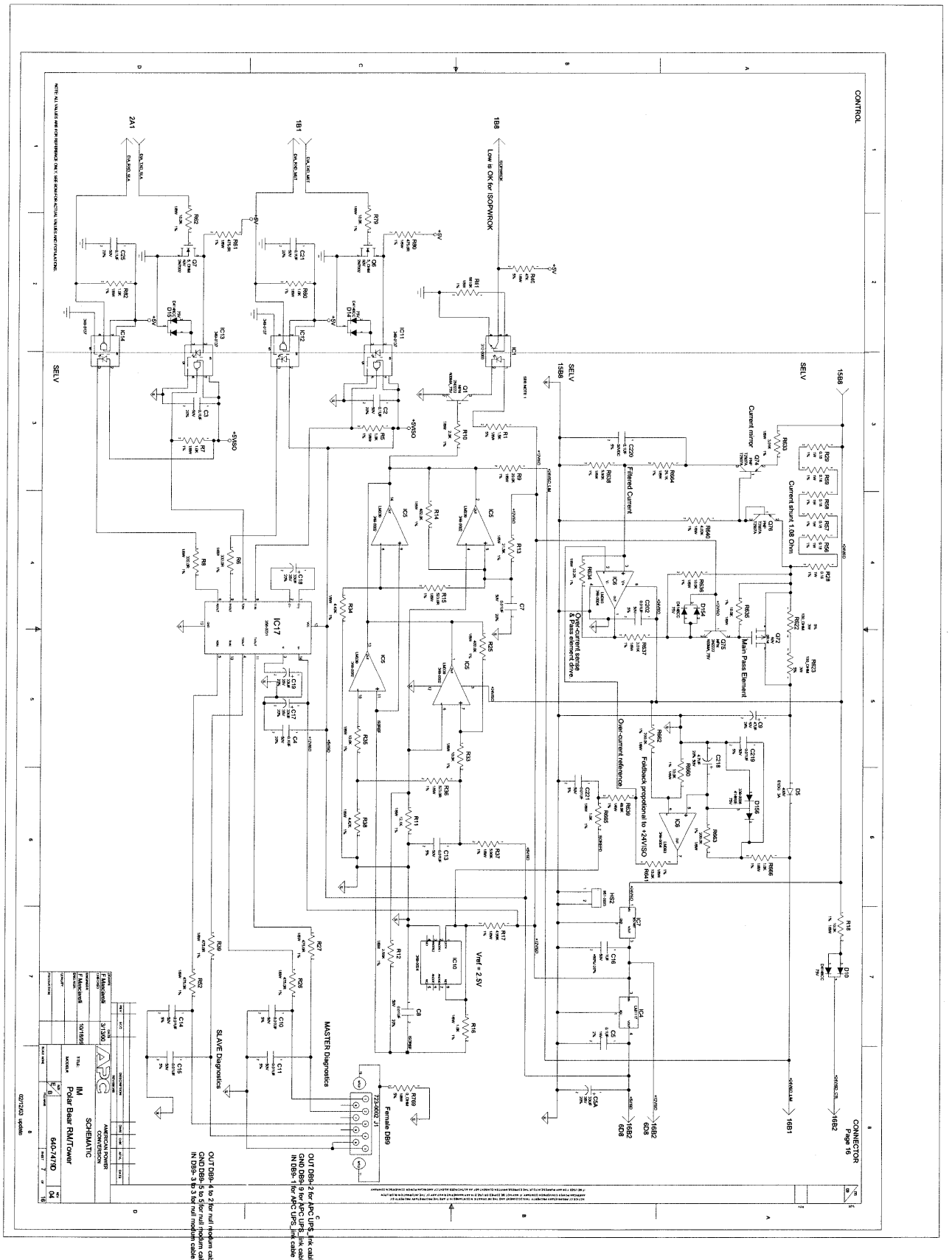

CONTROL
CONNECTOR Page 16
If both IM in sync both will try to drive relay but only MIM will, but both will supply high voltage to switch faster.
But if MIM is not driving the relay the RIM driving SLA_BYP_RLY will not affect actual relay driving.
SLA_BYP_RLY
0= High/V to output = C19 ON = BYPASS POWER
OPEN or 1= allows C159 to charge up.
SLA_BYP_RLY
0= RELAY ON = BYPASS = MAINS
OPEN or 1= RELAY OFF = INVERTER
IM
Polar Bear RM/Tower
640-7490
SCHEMATIC
AMERICAN POWER CONVERSION


CONTROL
CONNECTR Page 16
Determine Battery presence with internal shunt connection.
Measure very low charging currents with amp of additional gain= -10.
BAT_COM_1
BAT_COM_2
BAT_COM_3
BAT_COM_4
BAT_COM_5
BAT_COM_6
BAT_COM_7
BAT_COM_8
IM
Polar Bear RM/Tower
640-7479D
SCHEMATIC
AMERICAN POWER CONVERSION
02/26/03 update

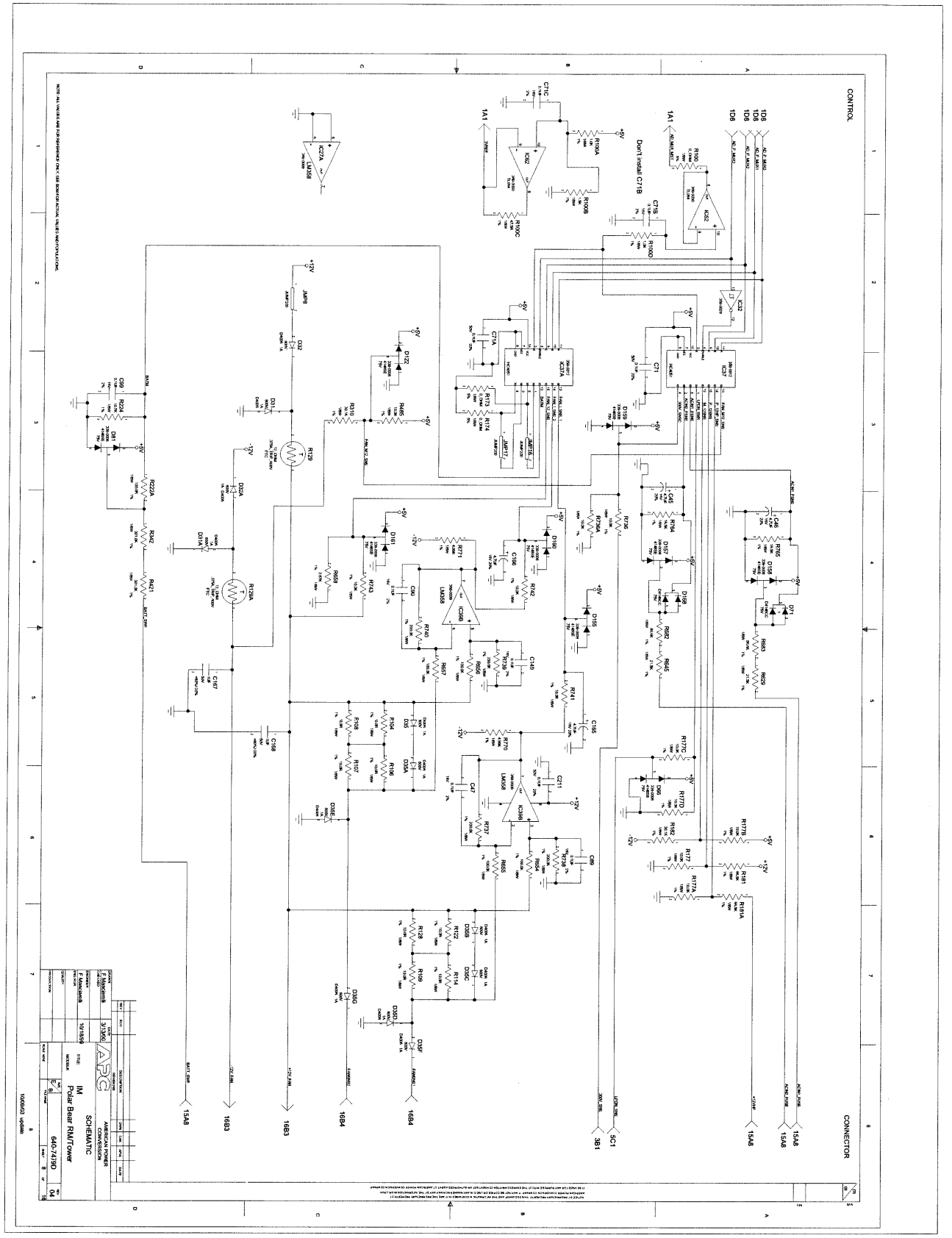


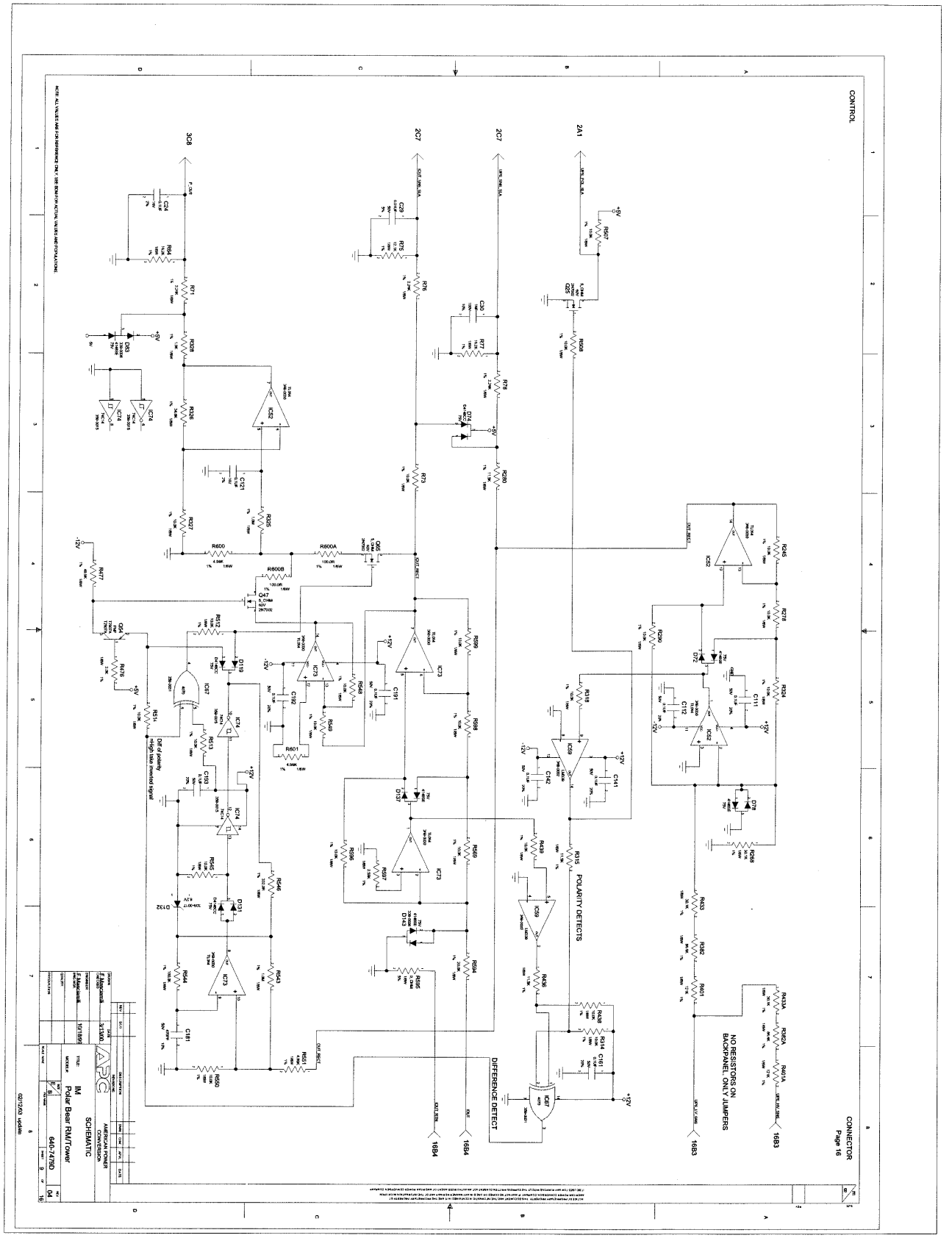
VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 7, Page 5 of 41

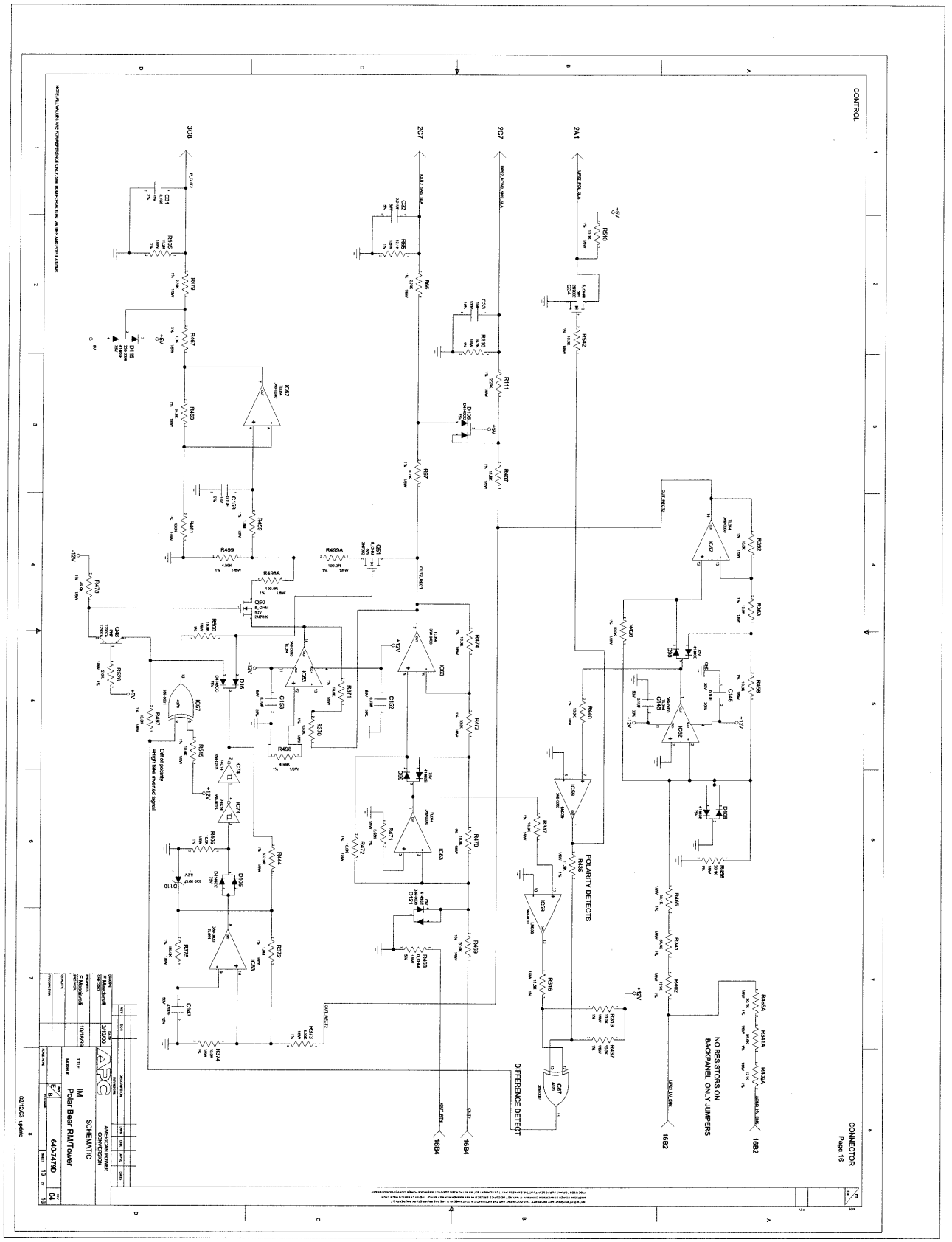

CONTROL
1A8
IIC BUS EXTENDER
CONNECTOR
Page 16
To DB9 MUX
To Battery Cabinets
SELV
SELV
IM
Polar Bear RMT/Tower
640-7479D
SCHEMATIC
AMERICAN POWER CONVERSION
02/25/03 update

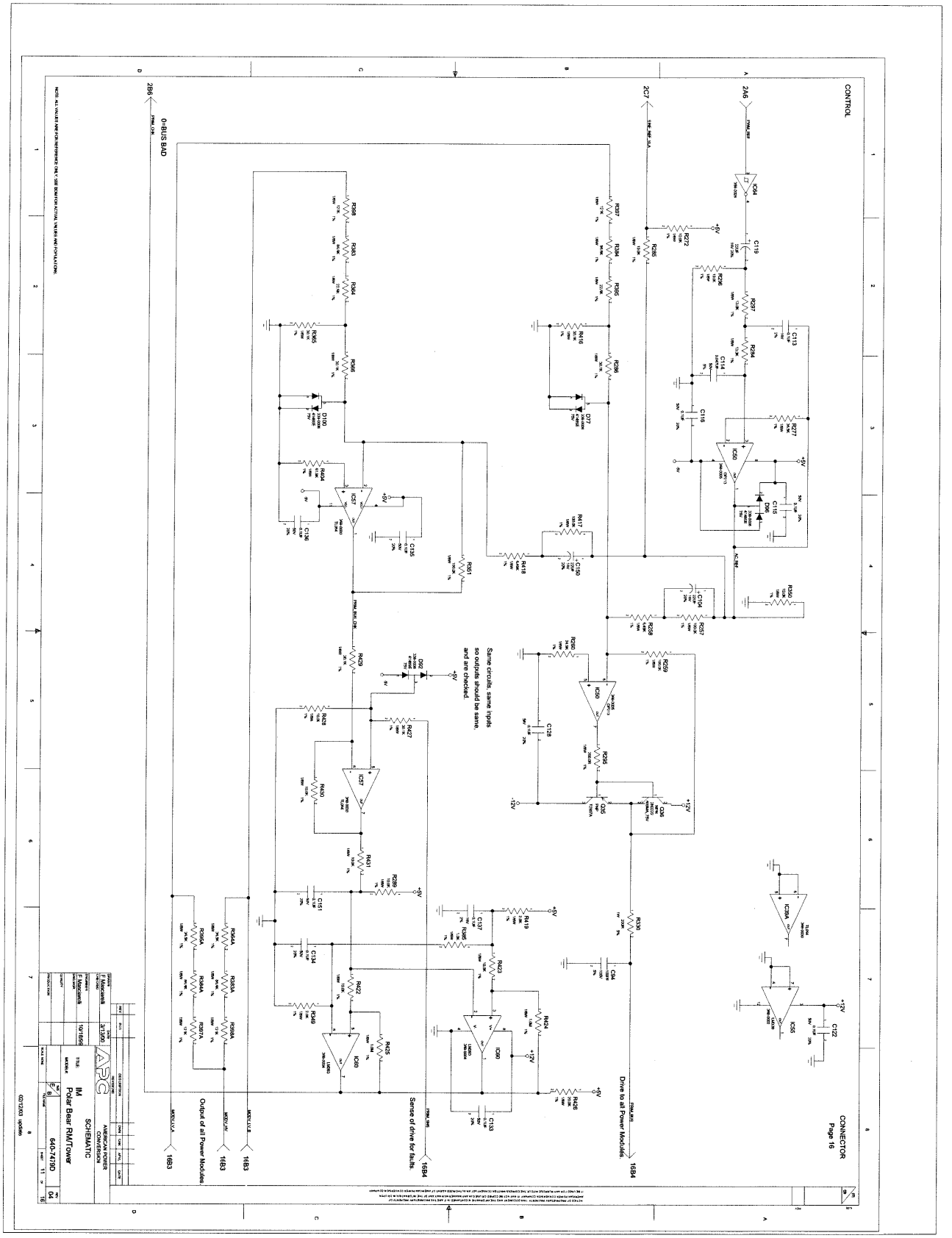


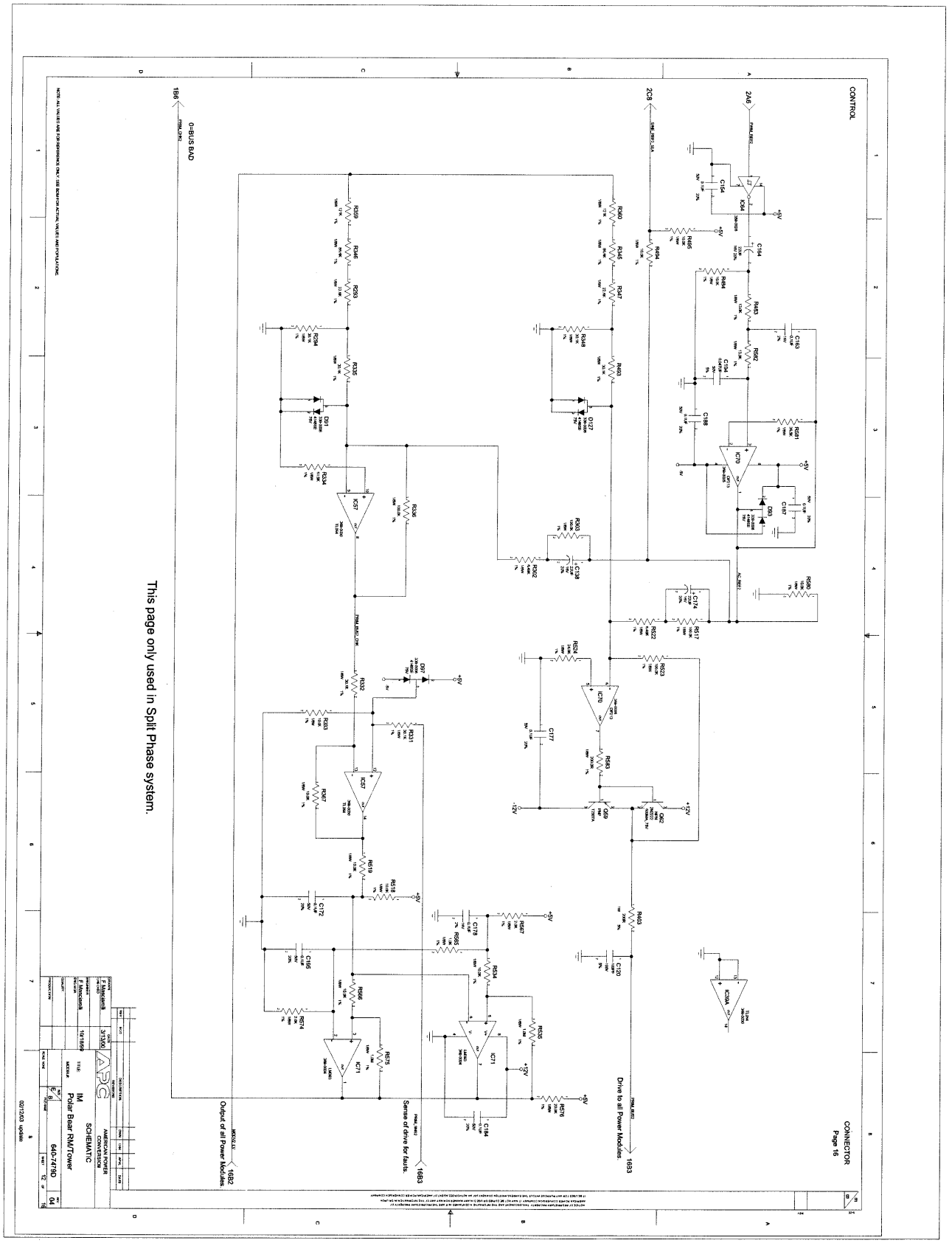
VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 7, Page 7 of 41

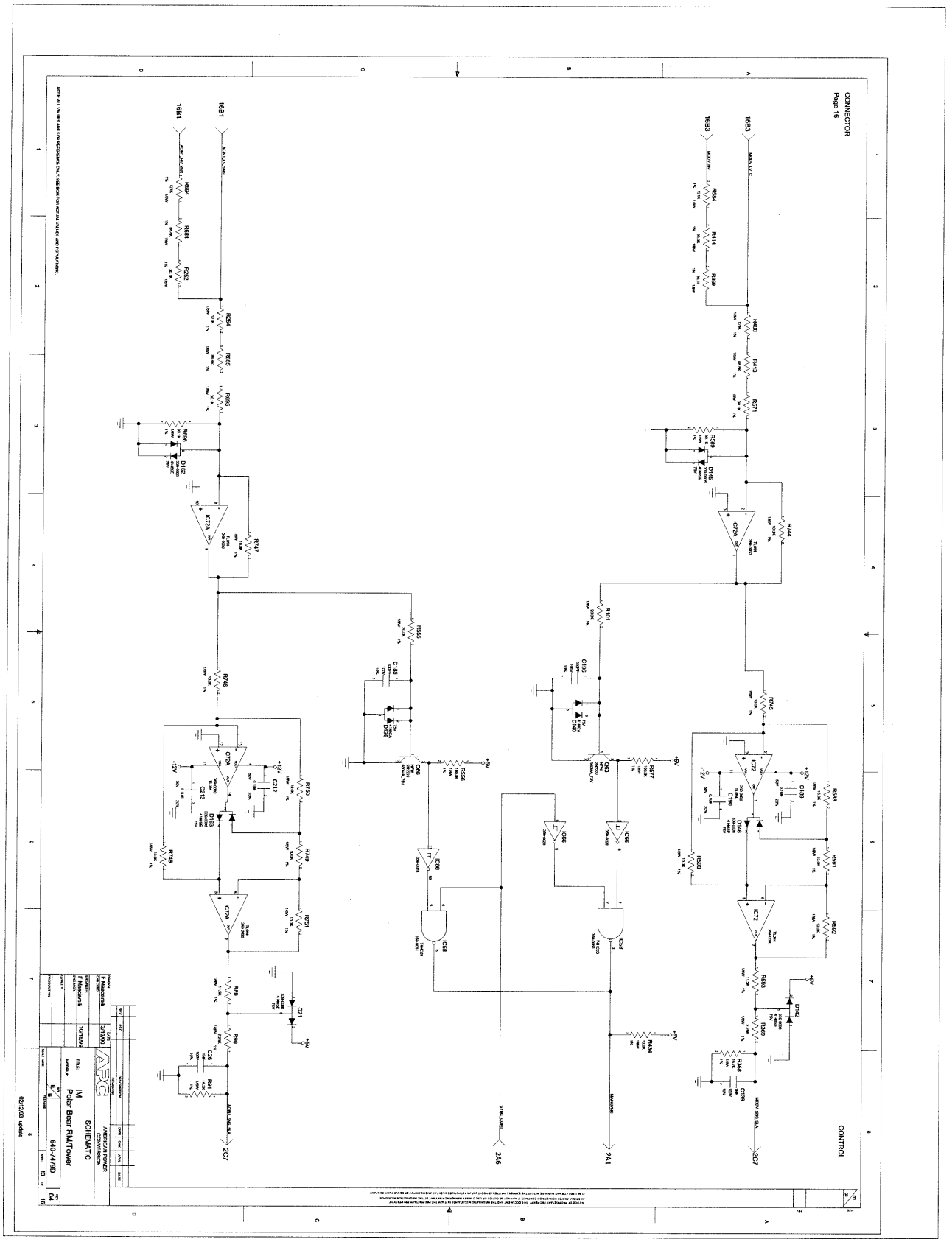

CONTROL
CONNECTOR
Don't install C71B
SCHEMATIC
Polar Bear RM/Tower
840-7490D
AMERICAN POWER CONVERSION

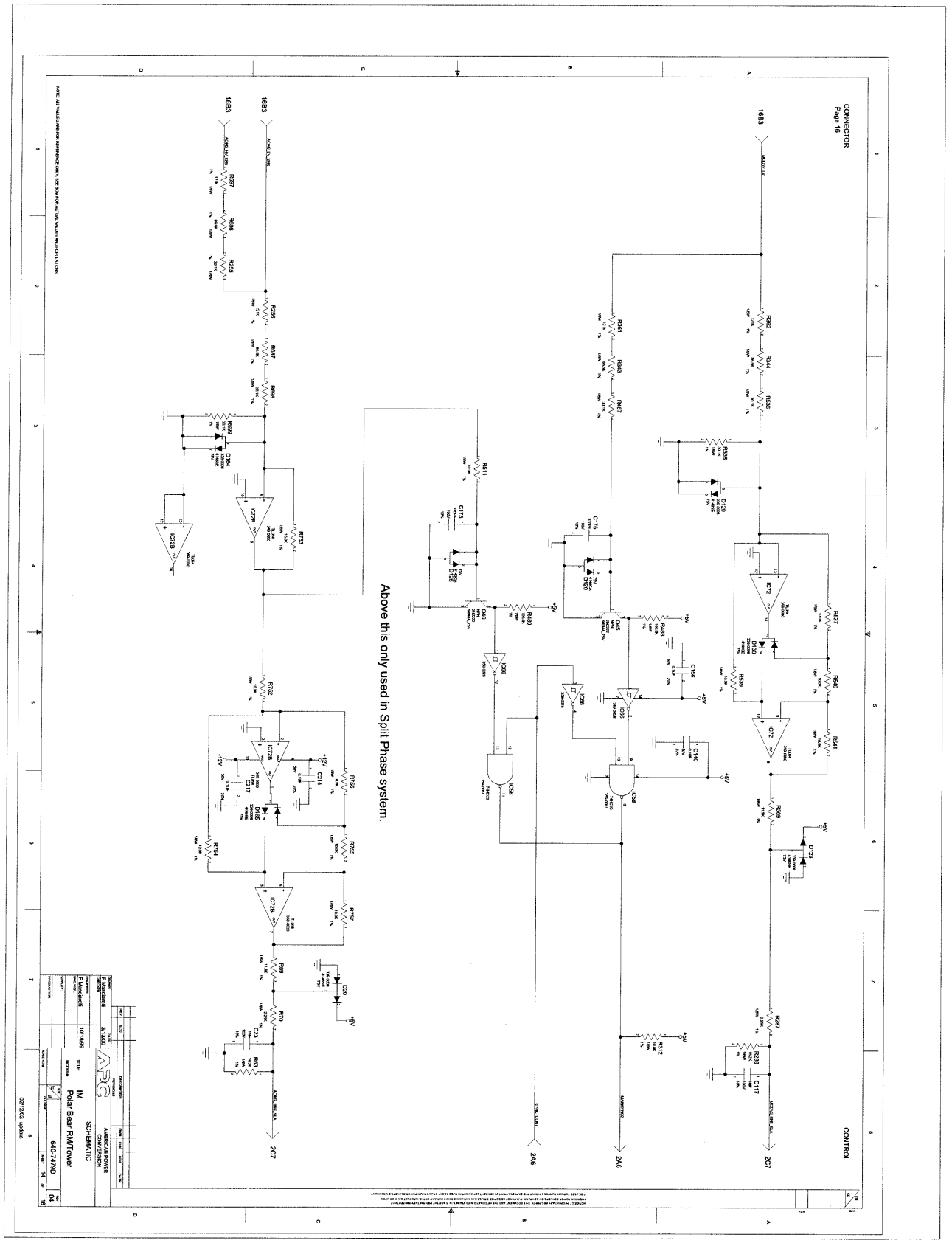

CONTROL
CONNECTOR
Page 16
POLARITY DETECTS
DIFFERENCE DETECT
NO RESISTORS ON
BACKPANEL ONLY JUMPERS
Diff of polarity
=high take inverted signal
IM
Polar Bear RMT/Tower
SCHEMATIC
AMERICAN POWER
CONVERSION
640-7470D

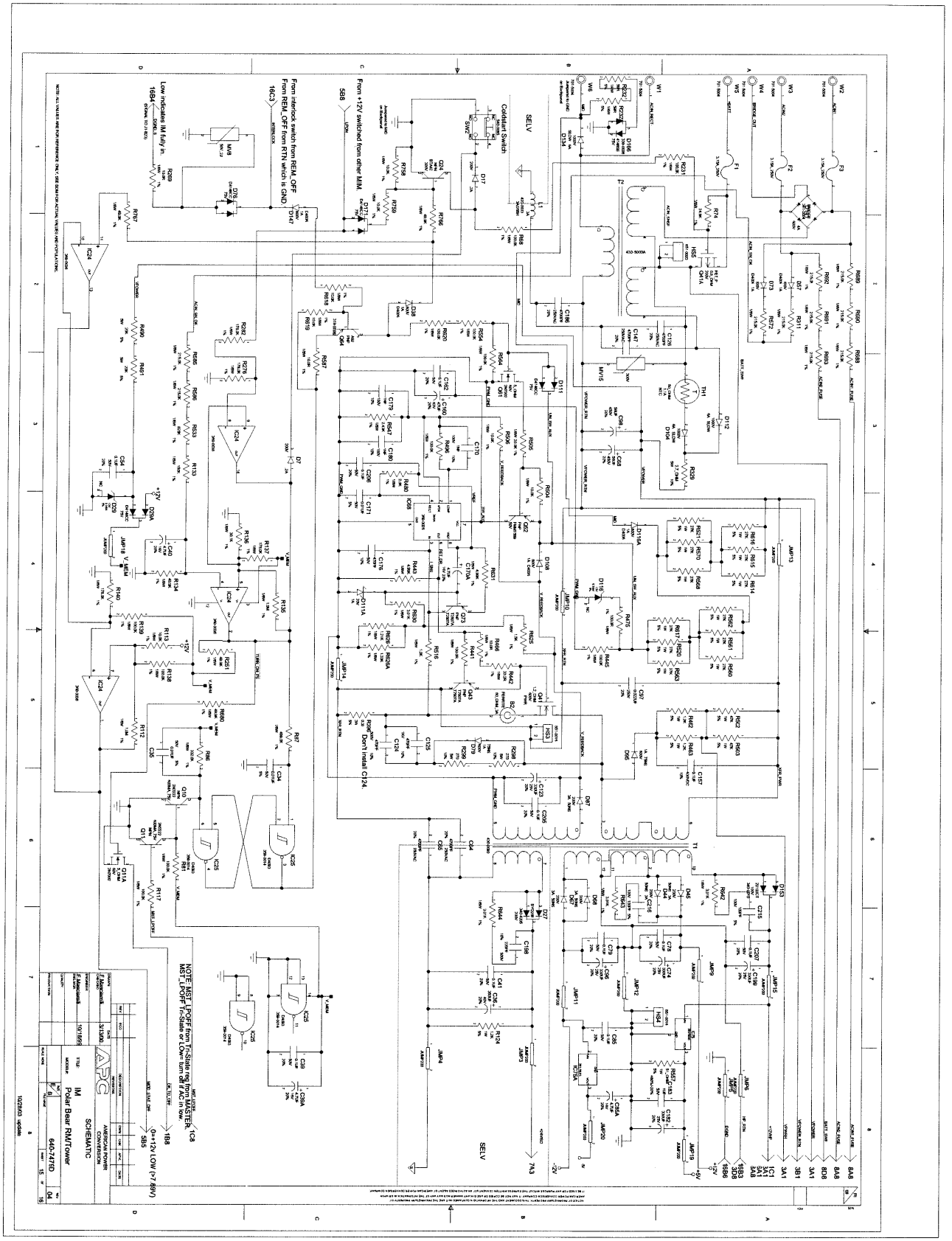

CONTROL
CONNECTOR
Page 16
POLARITY DETECTS
DIFFERENCE DETECT
NO RESISTORS ON
BACKPANEL ONLY JUMPERS
SCHEMATIC
IM
Polar Bear RM/Tower
640-7479D
AMERICAN POWER
CONVERSION
02/12/03 update


CONTROL
CONNECTOR
Page 16
Same circuits, same inputs
so outputs should be same,
and are checked.
Drive to all Power Modules:
Sense of drive for fails.
Output of all Power Modules:
0-BUS BAD
AMERICAN POWER CONVERSION
SCHEMATIC
IM
Polar Bear RM/Tower
6417490


CONTROL
CONNECTOR
Page 16
0=BUS BAD
1B6
2C6
2A6
1B2
Output of all Power Modules.
1B3
Sense of drive for fails.
1B3
Drive to all Power Modules.
This page only used in Split Phase system.
AMERICAN POWER CONVERSION
SCHEMATIC
IM
Polar Baar RM/Tower
840-7479D
02/12/03 update


CONNECTOR
Page 16
CONTROL
IM
Polar Bear RM/Tower
640-7470
SCHEMATIC
AMERICAN POWER CONVERSION


CONNECTOR
Page 16
CONTROL
Above this only used in Split Phase system.
IM
Polar Bear RMTower
640-7476D
SCHEMATIC
AMERICAN POWER CONVERSION



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CB / DE 1 - 30646
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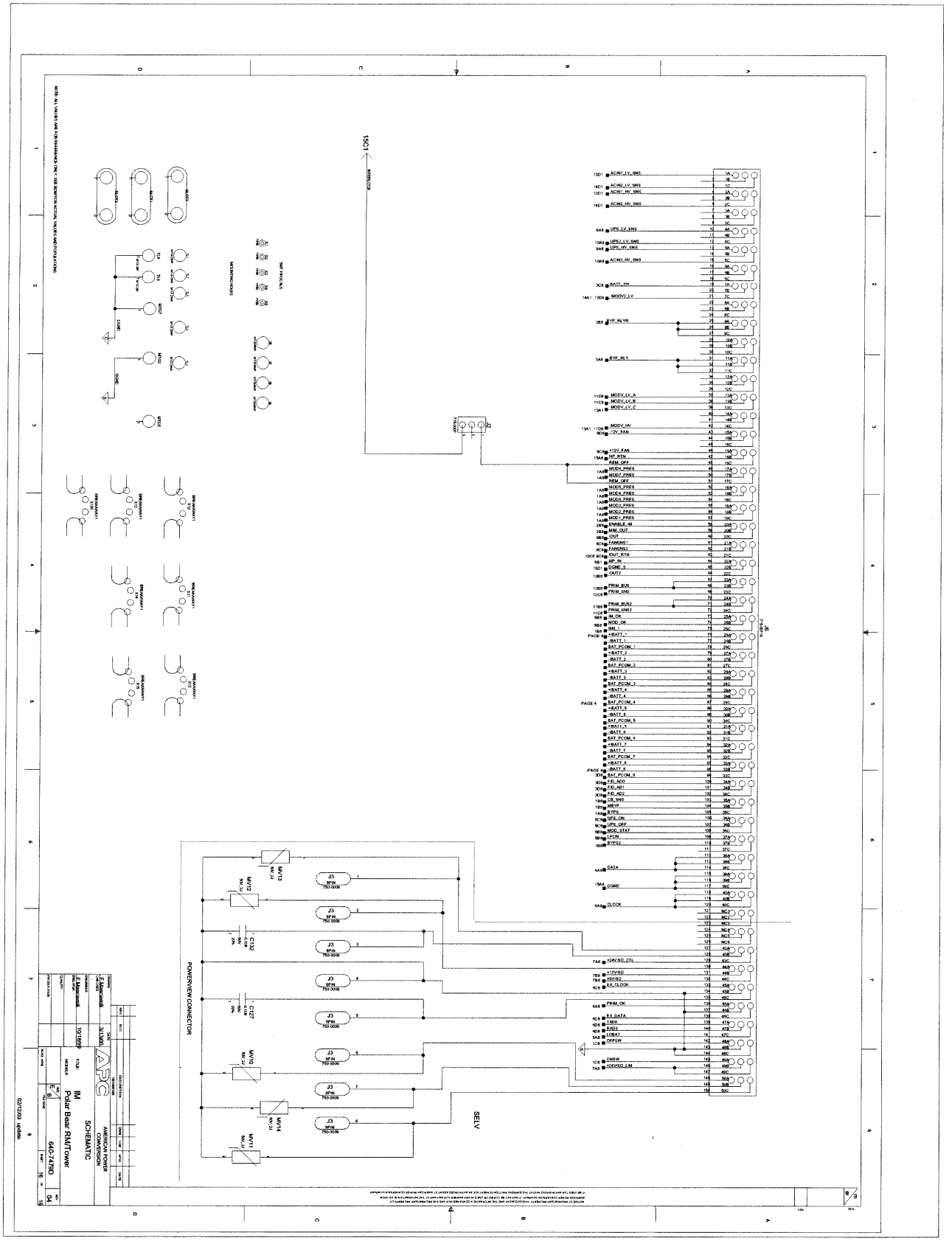
IM
Polar Bear RM/Tower
640-74790
SCHEMATIC
AMERICAN POWER CONVERSION
POWERVIEW CONNECTOR
SELV

640-7479E_REV05.pcb - Fri Jan 16 10:53:52 2004

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CB / DE 1 - 30646
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640-7479E_REV05.pcb - Fri Jan 16 10:52:23 2004

640-7479E_REV05.pcb - Fri Jan 16 10:52:42 2004

VDE File: 1924400-3335-0033
CB / DE 1 - 30646
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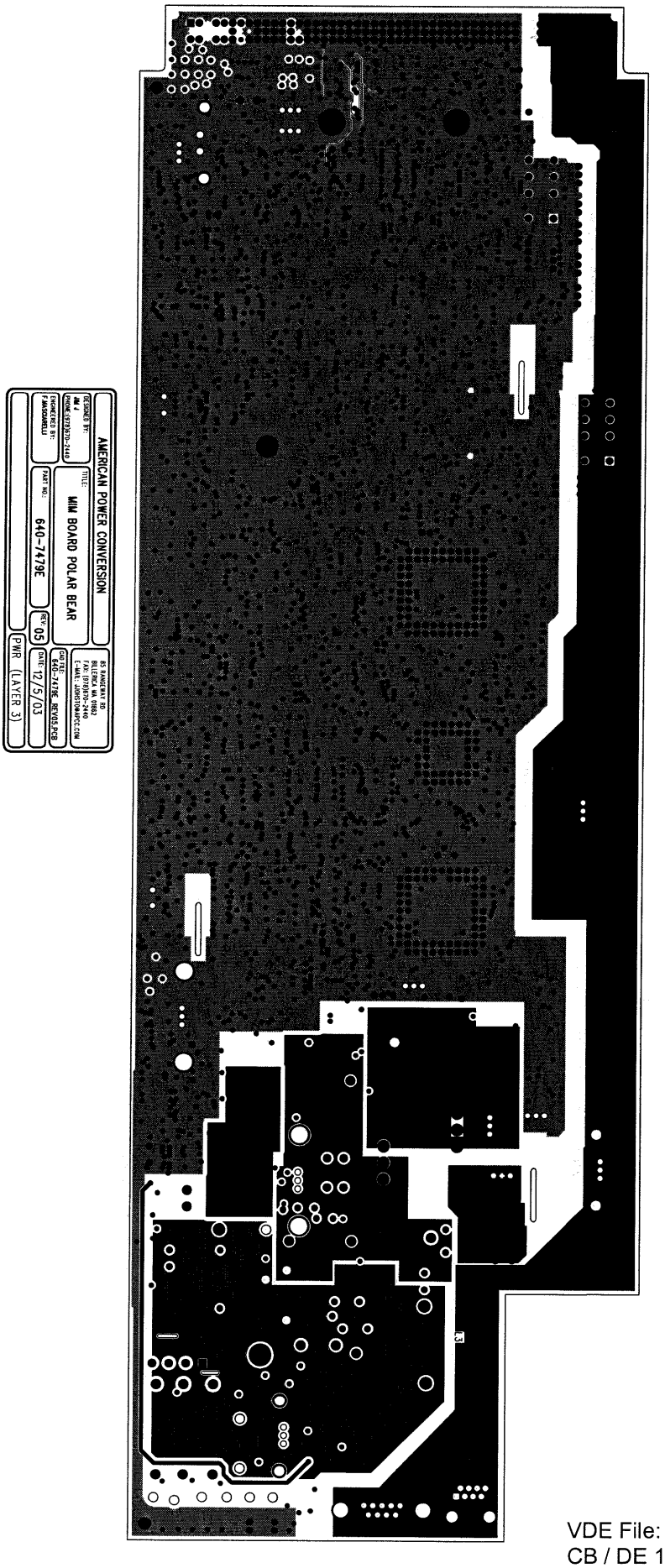
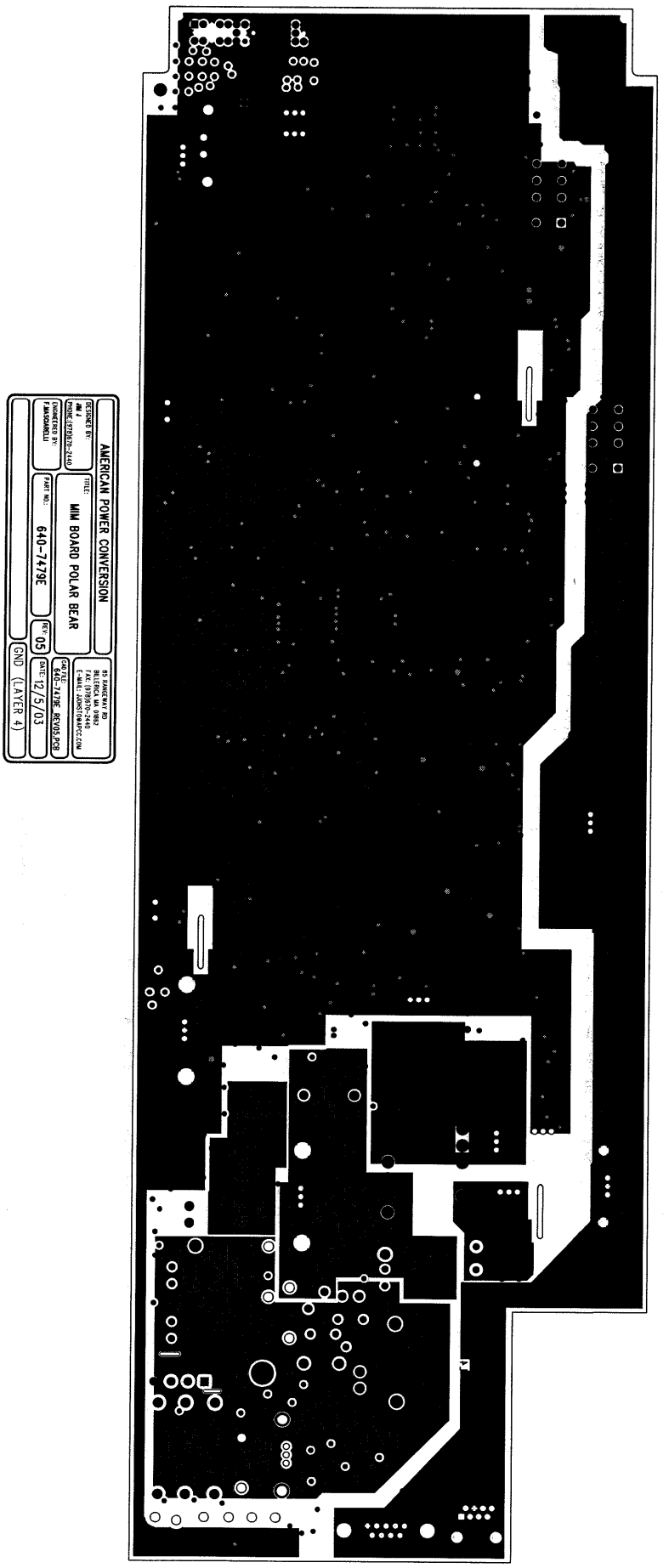
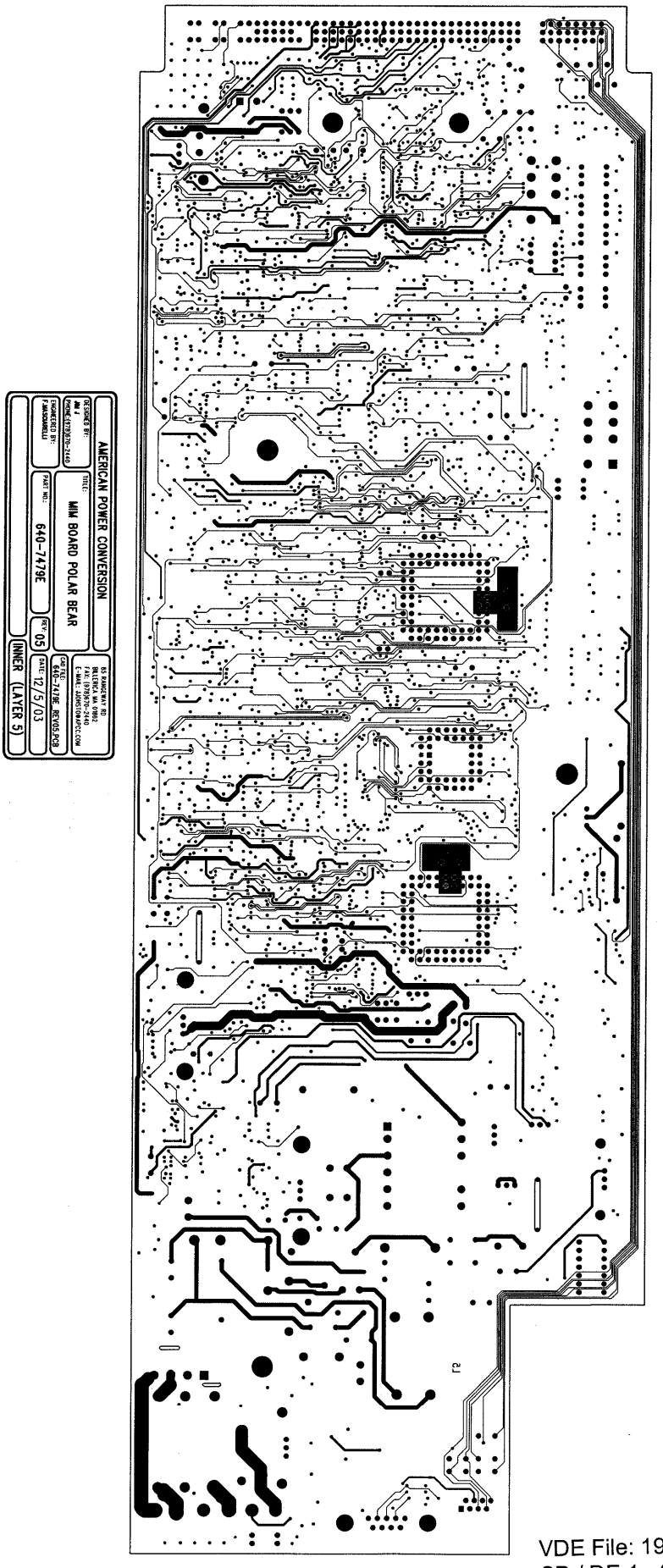
640-7479E_REV05.pcb - Fri Jan 16 10:52:50 2004



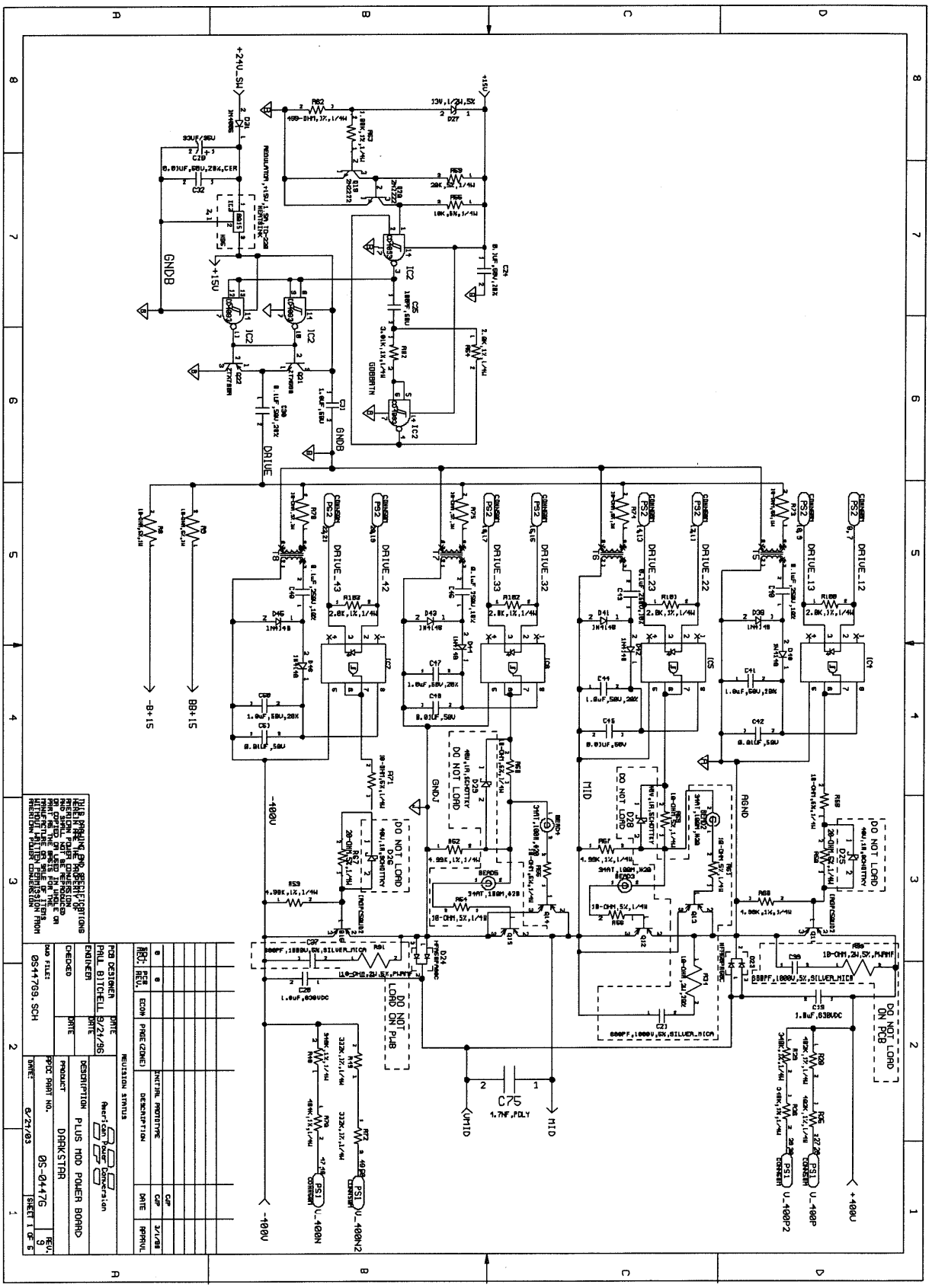


640-7479E_REV05.pcb - Fri Jan 16 10:53:12 2004



VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 7, Page 22 of 41

640-7479E_REV05.pcb - Fri Jan 16 10:53:46 2004



VDE File: 1924400-3335-0033
CB / DE 1 - 30646
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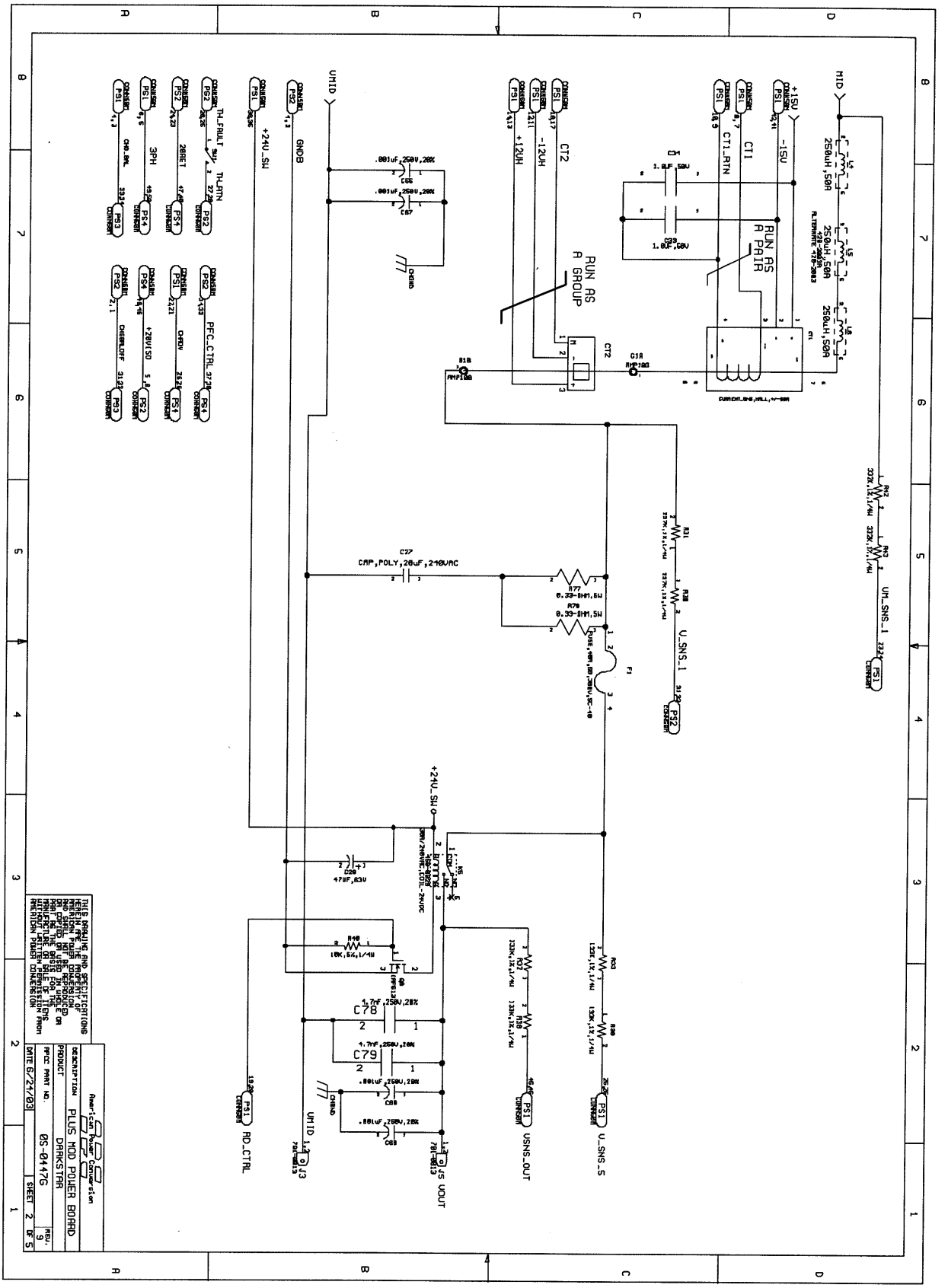
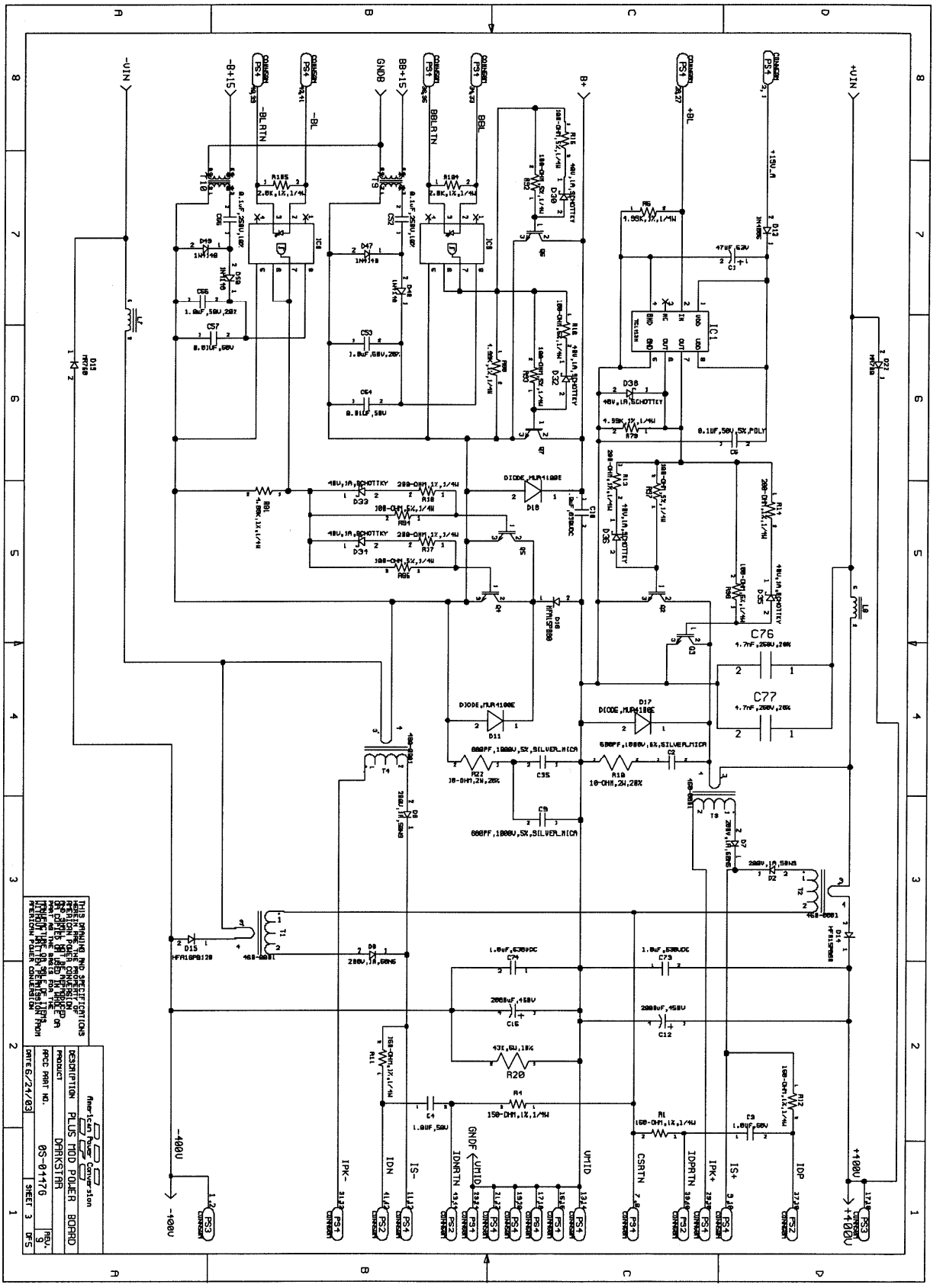
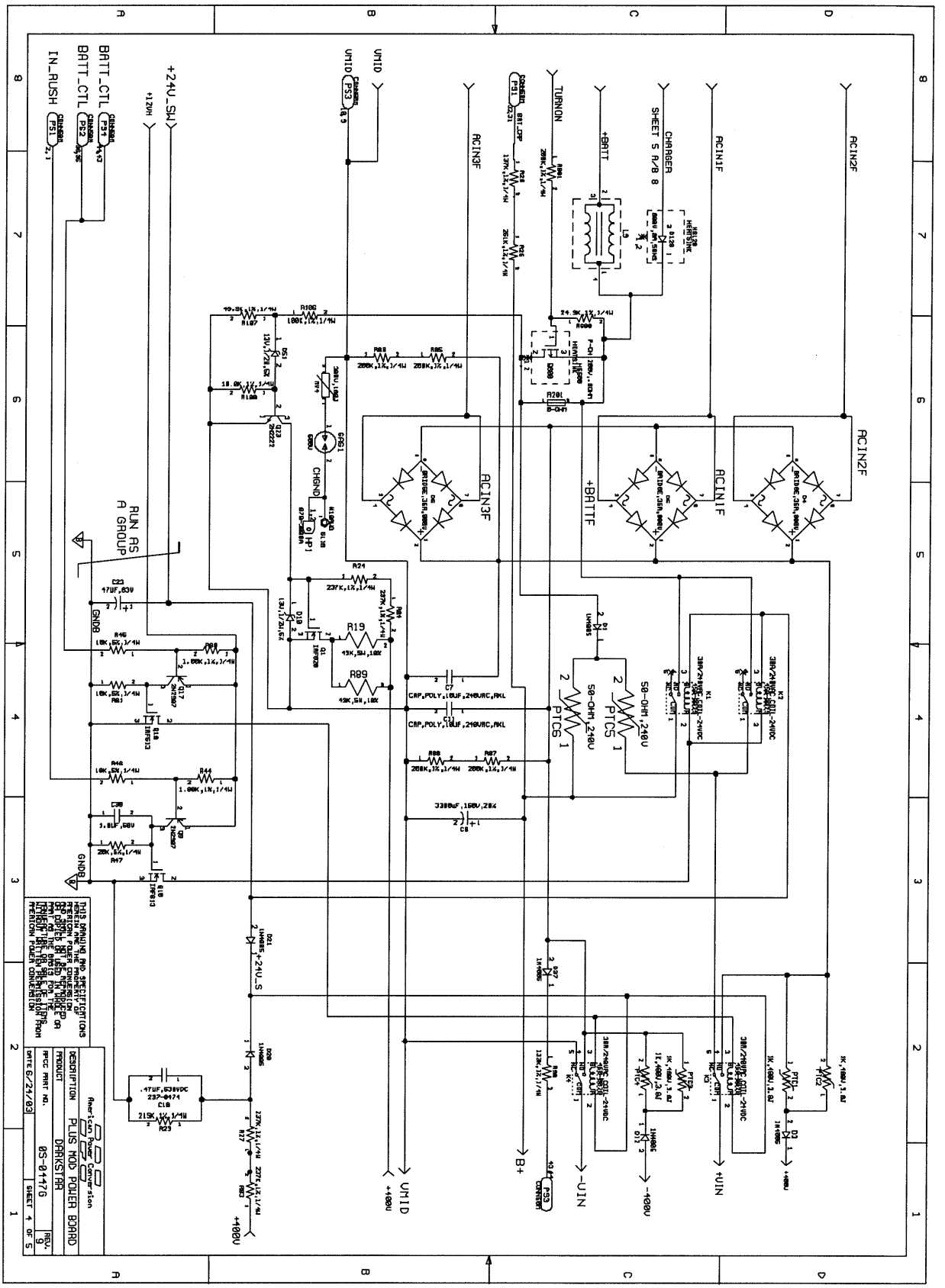
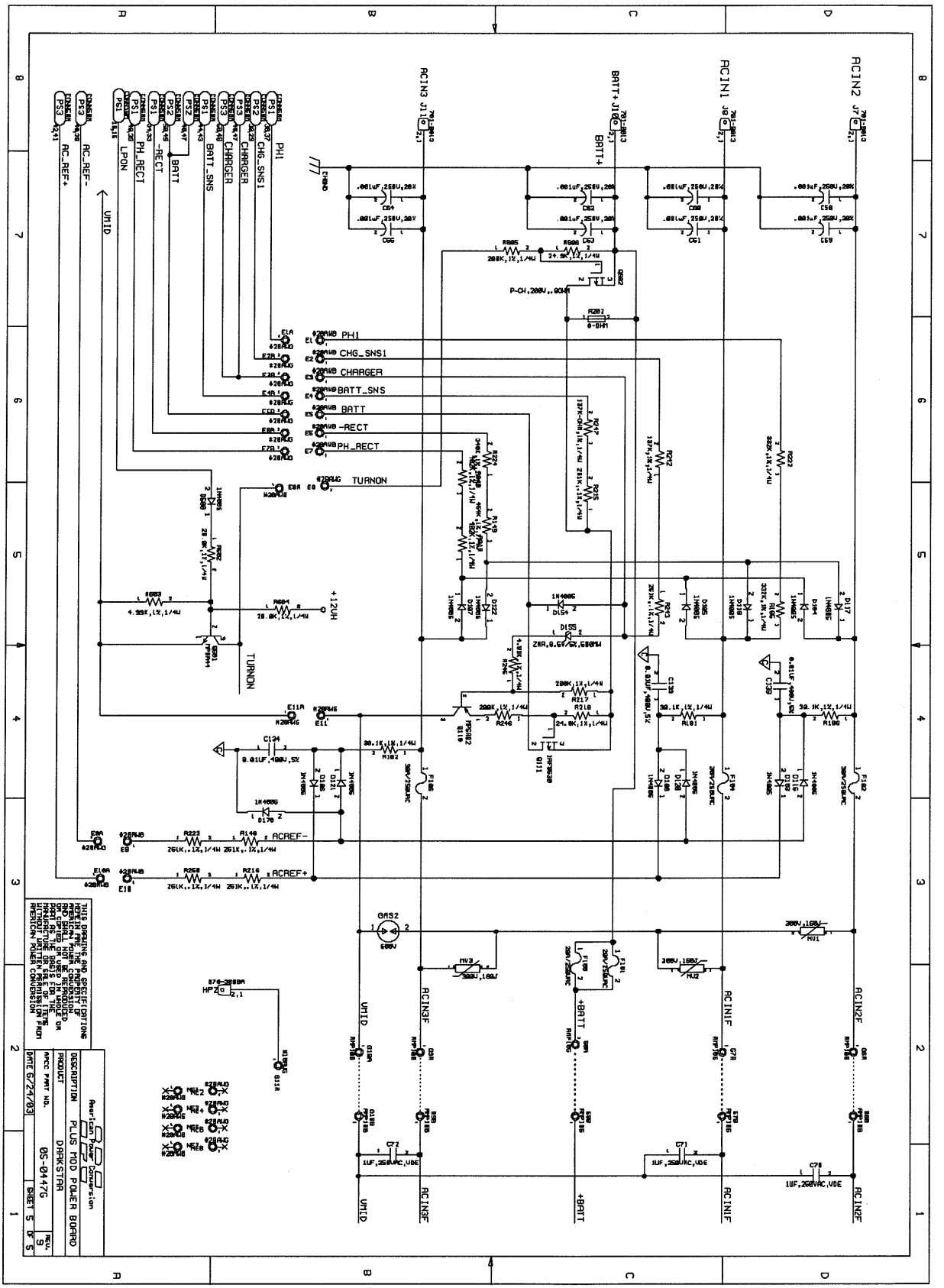


VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 7, Page 25 of 41


DESCRIPTION PLUS MOD POWER BOARD
PRODUCT DARKSTAR
APEC PART NO. 05-01476
DATE 6/24/03
SHEET 3 OF 5


ACIN2F
ACIN1F
ACIN3F
+BATTF
TURNION
+BATT
CHARGER
VMID
+24V_SW
+12VH
BATT_CTL
IN_RUSH
RUN AS A GROUP
GNDB
PTC5
PTC6
50-OHM,240V
B+
-VIN
+VIN
-400V
+400V
VMID
+24V_S
PLUS MOD POWER BOARD
DARKSTAR
05-01470
American Power Conversion



VDE File: 1924400-3335-0033
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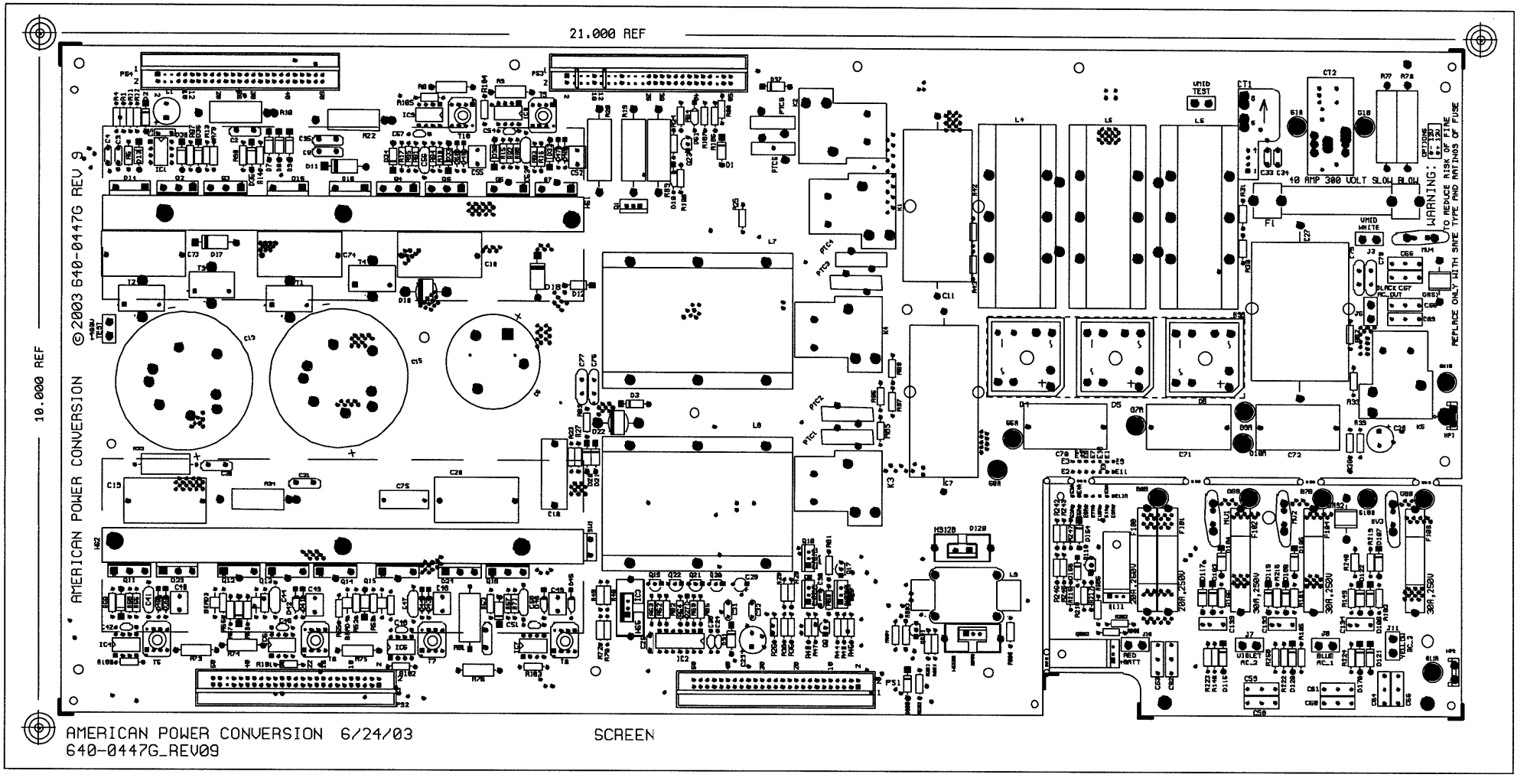

VDE File: 1924400-3335-0033
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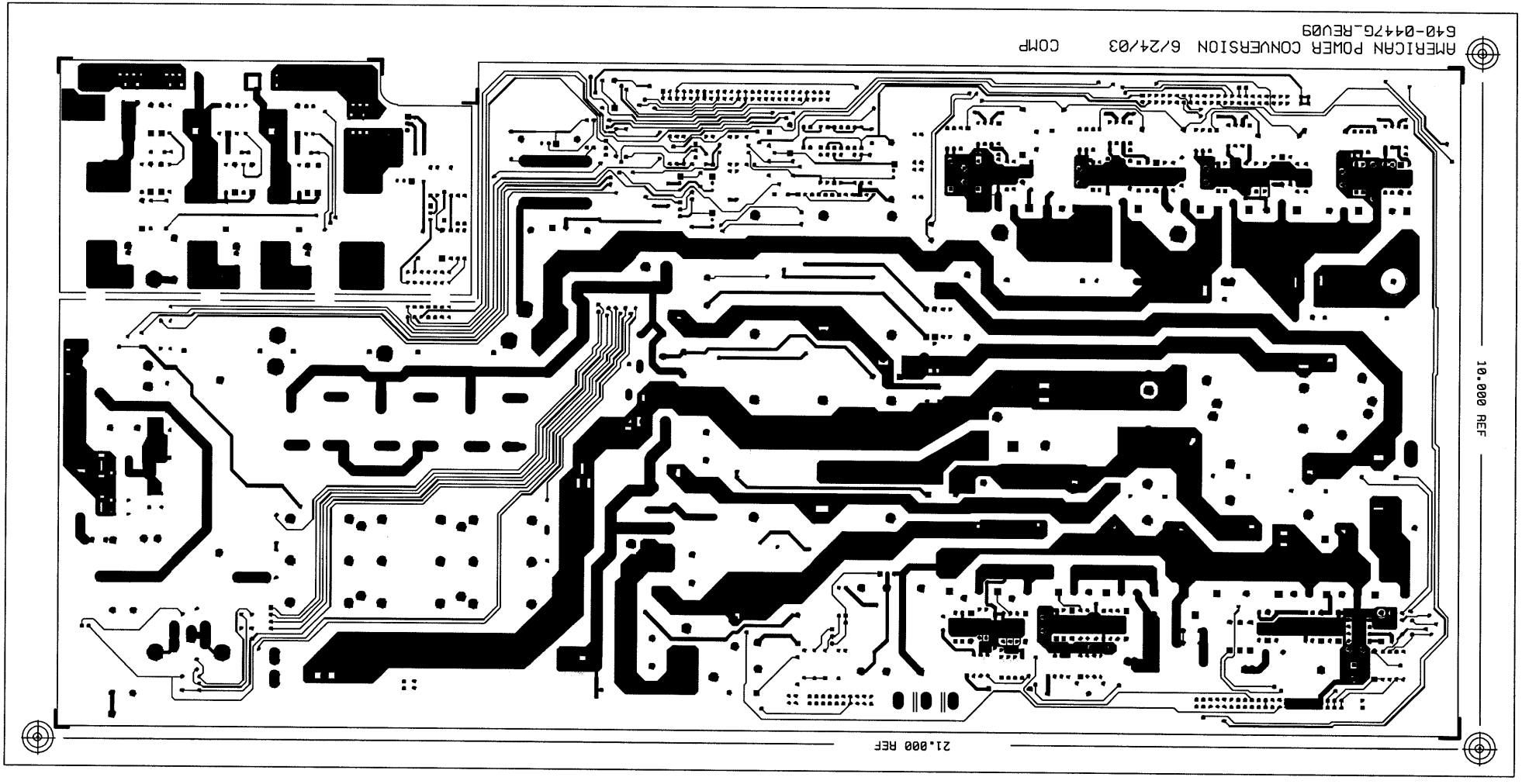
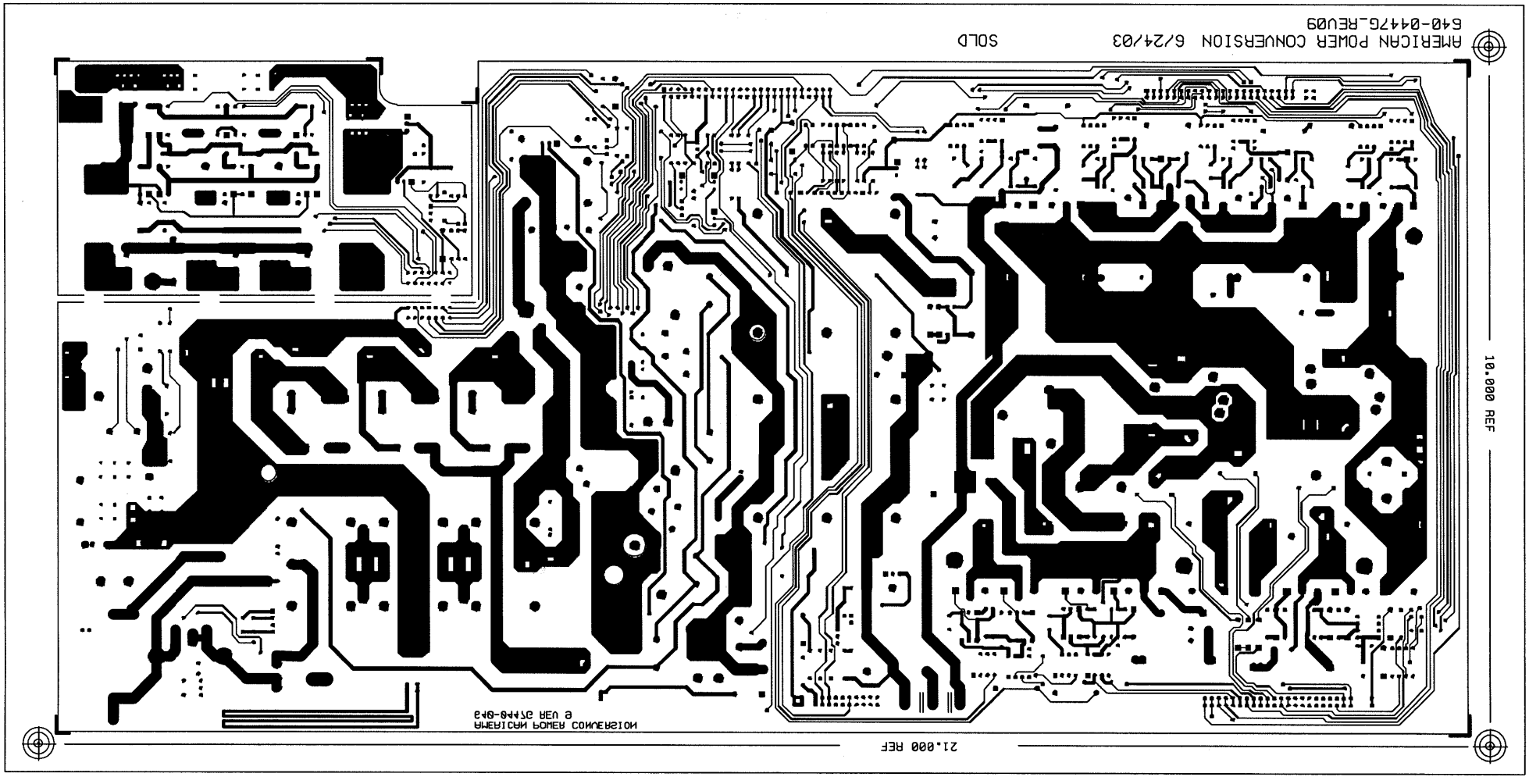
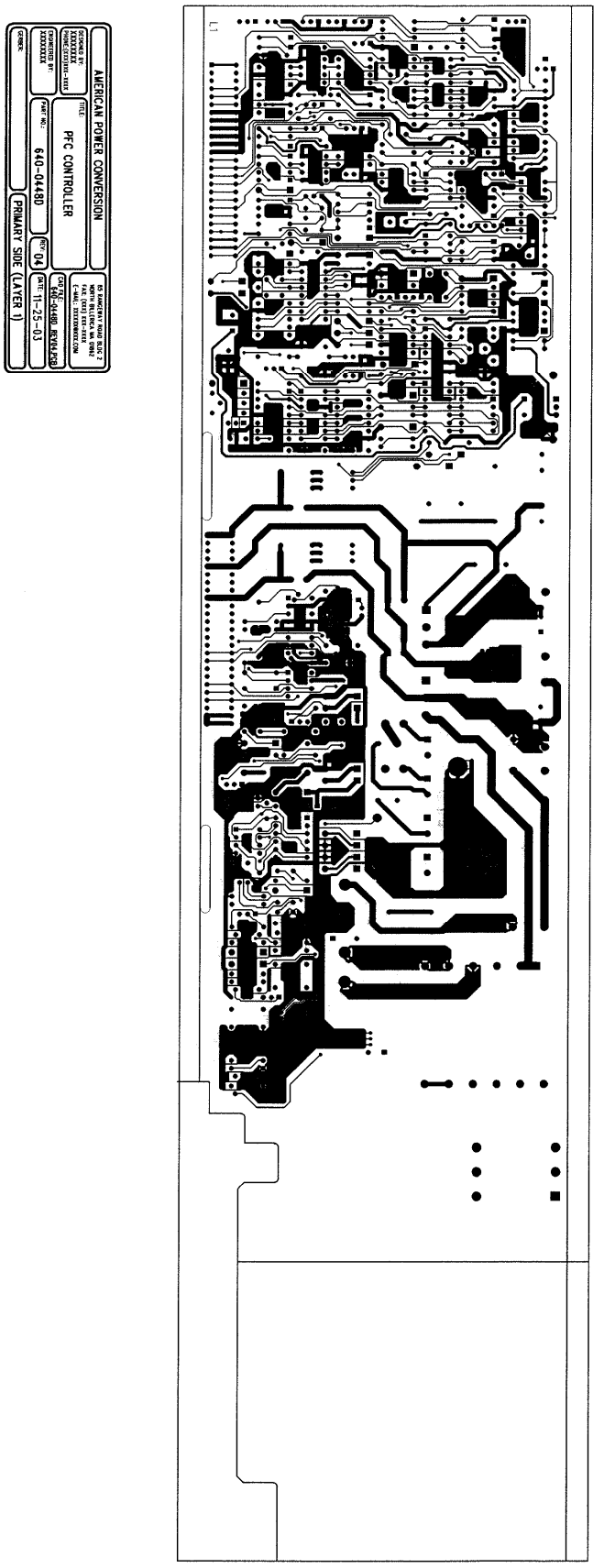
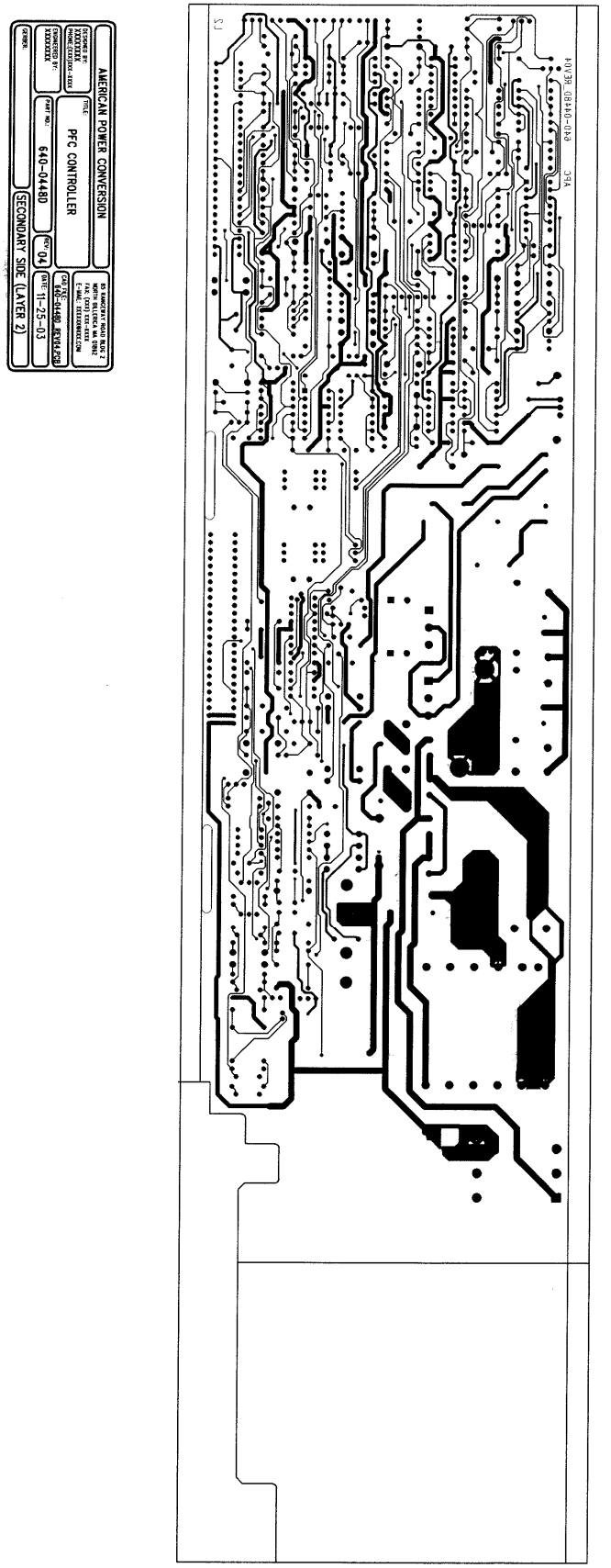

AMERICAN POWER CONVERSION 6/24/03 COMP
640-04476_REV09
10.000 REF
21.000 REF

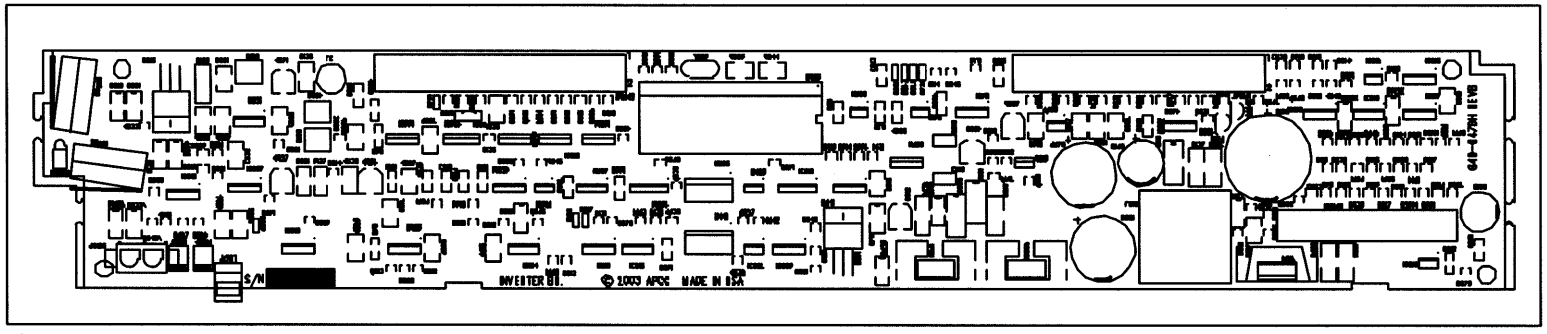

AMERICAN POWER CONVERSION 6/24/03
640-04476_REV09
SOLD
10.000 REF
21.000 REF

640-0448D_REV04.PCB - Wed Jan 07 10:59:53 2004

VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 7, Page 32 of 41

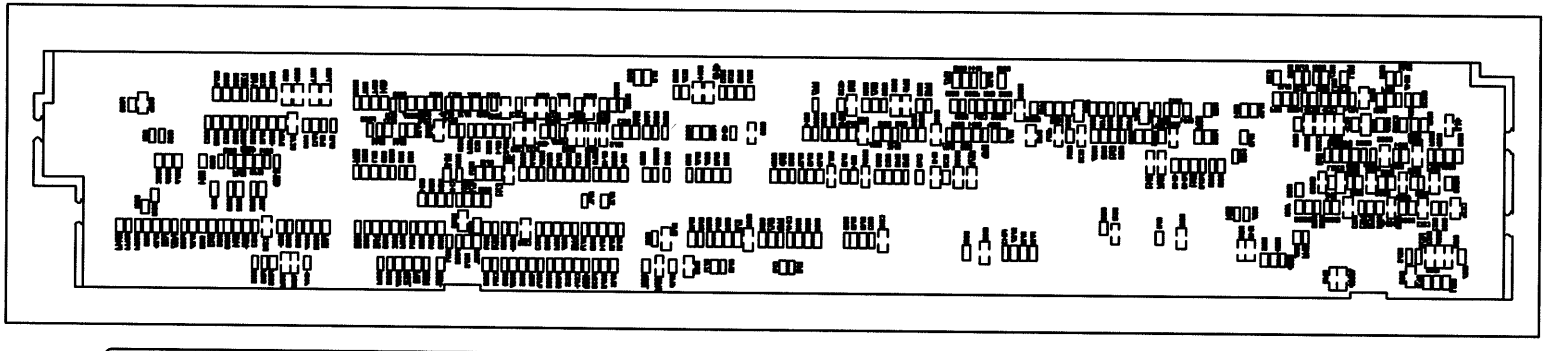

AMERICAN POWER CONVERSION
DESIGNED BY:
XXXXXXXX
MANUFACTURED BY:
XXXXXXXX
TITLE:
PFC CONTROLLER
PART NO.:
640-0448D
REV:
04
DATE:
11-25-03
CHECKED BY:
XXXXXXXX
CAD FILE:
640-0448D_REV04.PCB
PRIMARY SIDE (LAYER 1)


AMERICAN POWER CONVERSION
PFC CONTROLLER
640-0448D
04
11-25-03
SECONDARY SIDE (LAYER 2)



AMERICAN POWER CONVERSION			
	INVERTER CONTROLLER		
	640-0476H	08	7/10/03
	PRIMARY SIDE SILKSCREEN		

640-0476H_REV08.pcb – Wed Jan 07 15:09:04 2004

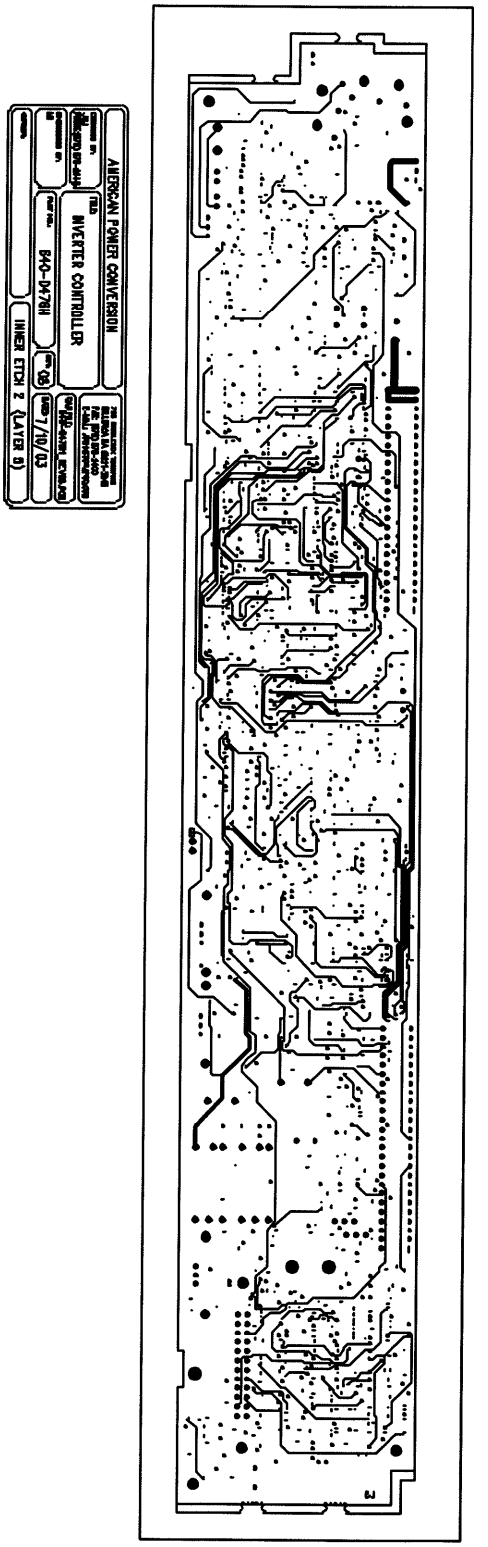


AMERICAN POWER CONVERSION			
	TITLE: INVERTER CONTROLLER		
	PART NO.: 640-0476H	REV: 08	DATE: 7/10/03
		SECONDARY SIDE SILKSCREEN	

640-0476H_REV08.pcb – Wed Jan 07 15:09:34 2004

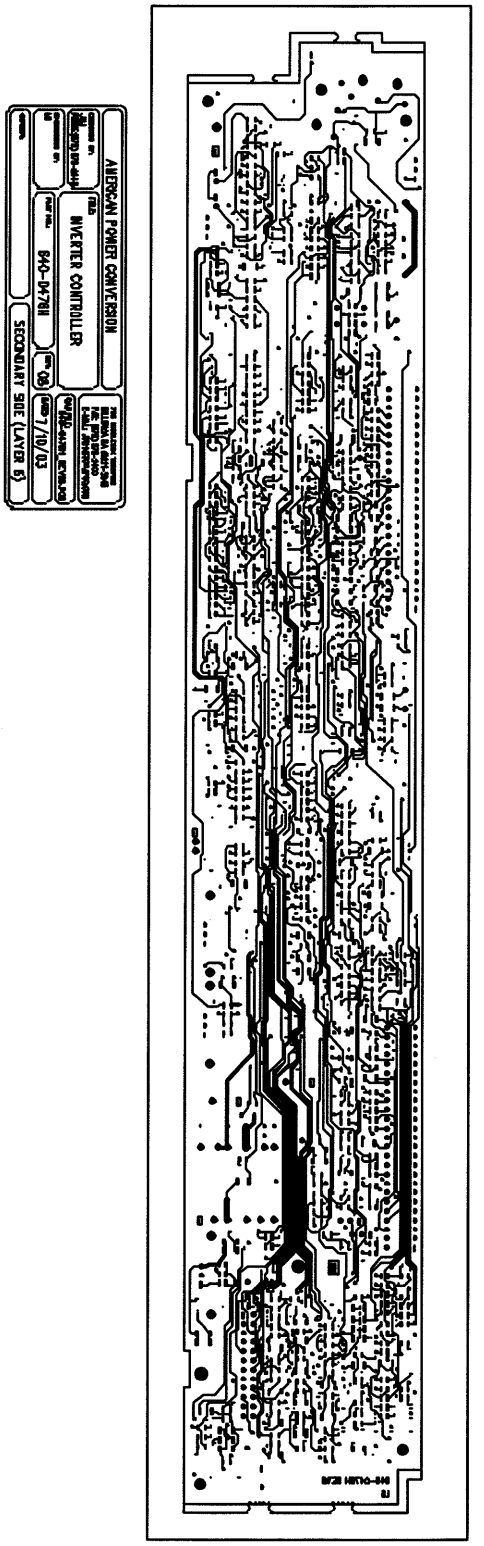
640-0476H_REV08.pcb - Wed Jan 07 15:07:01 2004

640-0476H_REV08.pcb - Wed Jan 07 15:08:14 2004



640-0476H_REV08.pcb - Wed Jan 07 15:07:56 2004

640-0476H_REV08.pcb - Wed Jan 07 15:08:35 2004



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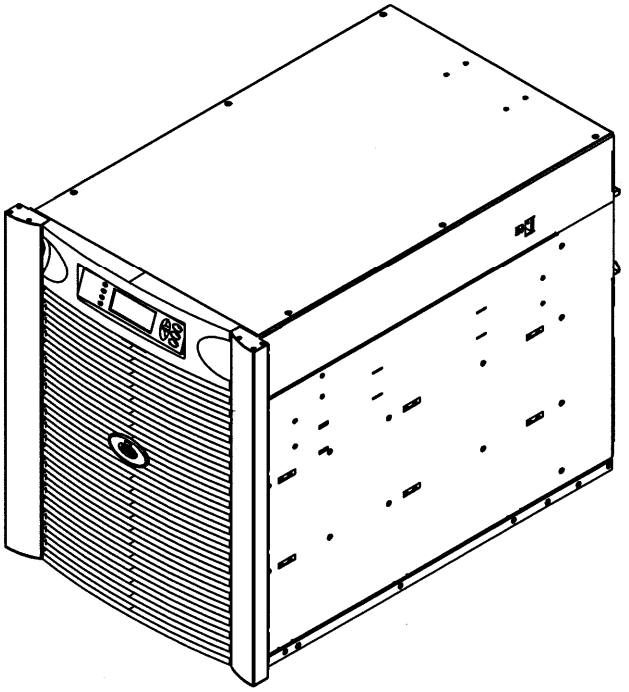
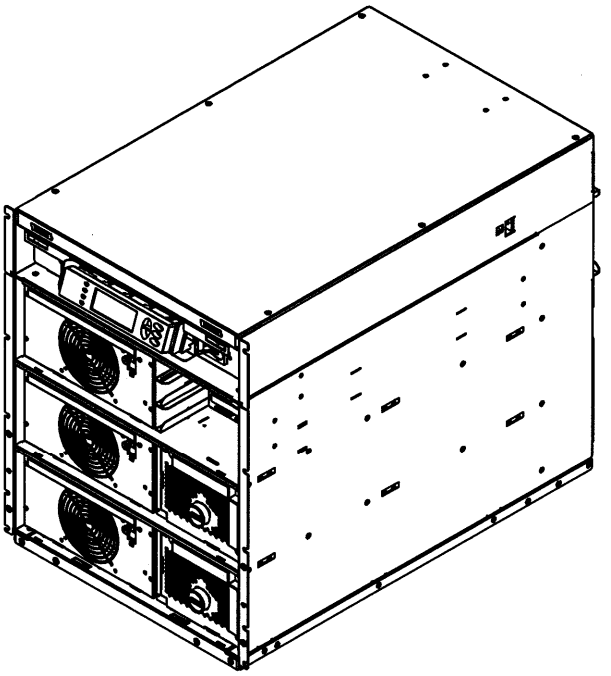
REVISIONS

REV	DESCRIPTION	DATE	APPR
1	RELEASE	12/29/03	DS





VDE File: 1924400-3335-0033
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Appendix 8, Page 1 of 12

ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:

FRACTIONS	DECIMALS	ANGLES
±1/16	.XXX±.005 .XX±.01 .X±.03	±1/2°

MATERIAL: SEE NOTES

FINISH: SEE NOTES

DO NOT SCALE DRAWING

ENGINEER	D SCHUTTLER	12/29/2003
CHECKED	XXXXXX	XX/XX/XXXX
ISSUED	XXXXXX	XX/XX/XXXX

ARCHIVE MEDIA CODE

THIRD ANGLE PROJECTION

AMERICAN POWER CONVERSION
NORTH BILLERICA DESIGN CENTER
85 RANGEWAY ROAD
NORTH BILLERICA, MA 01862
(978) 670-2440 (978) 670-2380 FAX
www.apc.com

ITEM: 8 KVA SYMMETRA LX RM 3 PH

PROJECT: POLAR BEAR

SIZE	DWG. NO.	REV
A	SYAF8KRMI	1

SCALE 1:10 | FIRST USED ON | SHEET 1 OF 1

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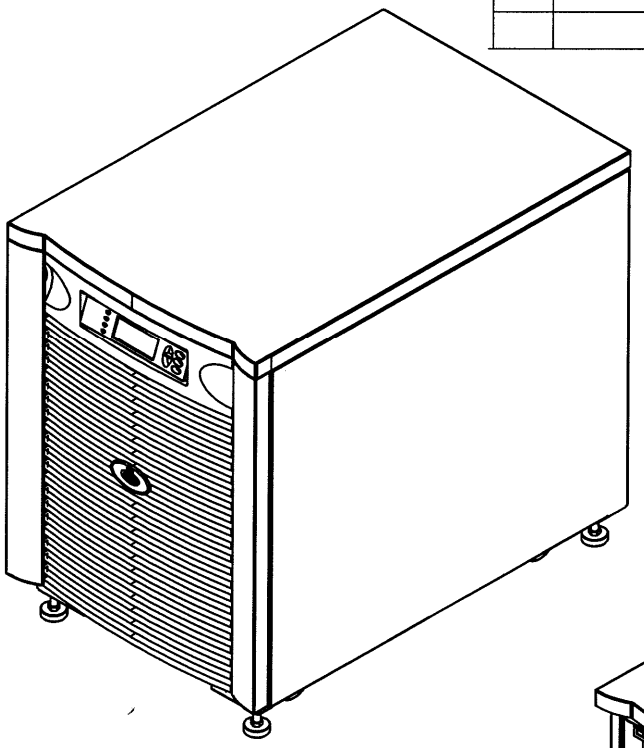
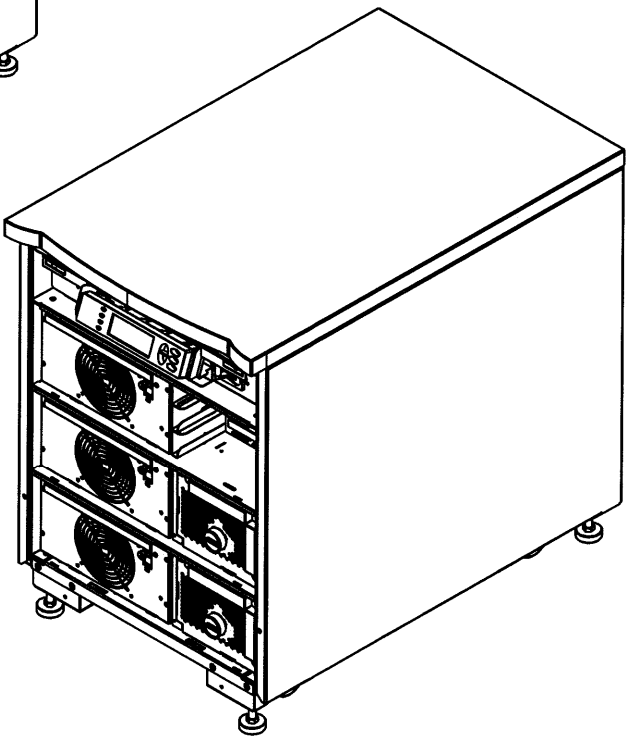
REVISIONS

REV	DESCRIPTION	DATE	APPR
1	RELEASE	12/29/03	DS





VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 8, Page 2 of 12

ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

FRACTIONS ±1/16 DECIMALS .XXX±.005 .XX±.01 .X±.03 ANGLES ±1/2°

ENGINEER D SCHUTTLER	12/29/2003	
CHECKED XXXXXX	XX/XX/XXXX	
ISSUED XXXXXX	XX/XX/XXXX	

AMERICAN POWER CONVERSION
NORTH BILLERICA DESIGN CENTER
85 RANGEWAY ROAD
NORTH BILLERICA, MA 01862
(978) 670-2440 (978) 670-2380 FAX
www.apc.com

ITEM: 8 KVA SYMMETRA LX TOWER 3 PH

MATERIAL: SEE NOTES

ARCHIVE MEDIA CODE

PROJECT: POLAR BEAR

FINISH: SEE NOTES

THIRD ANGLE PROJECTION

SIZE A | DWG. NO. SYAF8KI | REV 1

DO NOT SCALE DRAWING

SCALE 1:10 | FIRST USED ON | SHEET 1 OF 1

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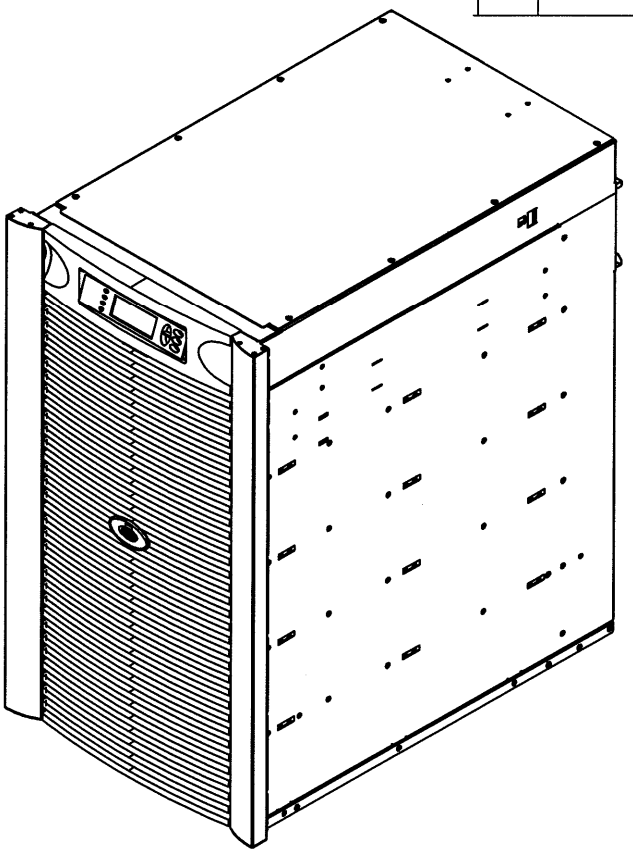
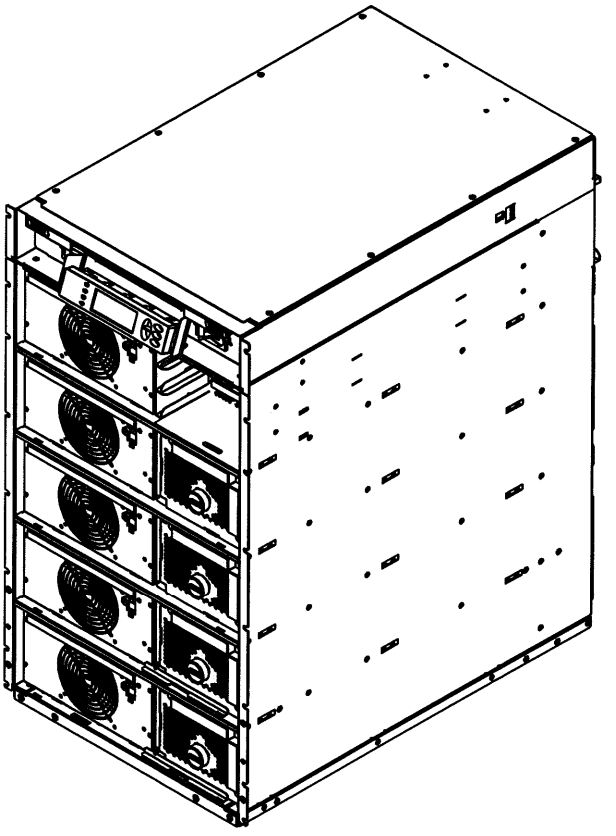
REVISIONS

REV	DESCRIPTION	DATE	APPR
1	RELEASE	12/29/03	DS





VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 8, Page 3 of 12

ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:

FRACTIONS ±1/16 | DECIMALS .XXX±.005 .XX±.01 .X±.03 | ANGLES ±1/2°

MATERIAL: SEE NOTES

FINISH: SEE NOTES

DO NOT SCALE DRAWING

ENGINEER	D SCHUTTLER	12/29/2003
CHECKED	XXXXXX	XX/XX/XXXX
ISSUED	XXXXXX	XX/XX/XXXX

ARCHIVE MEDIA CODE

THIRD ANGLE PROJECTION

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ITEM 16 KVA SYMMETRA LX RM 3 PH

PROJECT POLAR BEAR

SIZE A | DWG. NO. SYAF16KRMI | REV 1

SCALE 1:10 | FIRST USED ON | SHEET 1 OF 1

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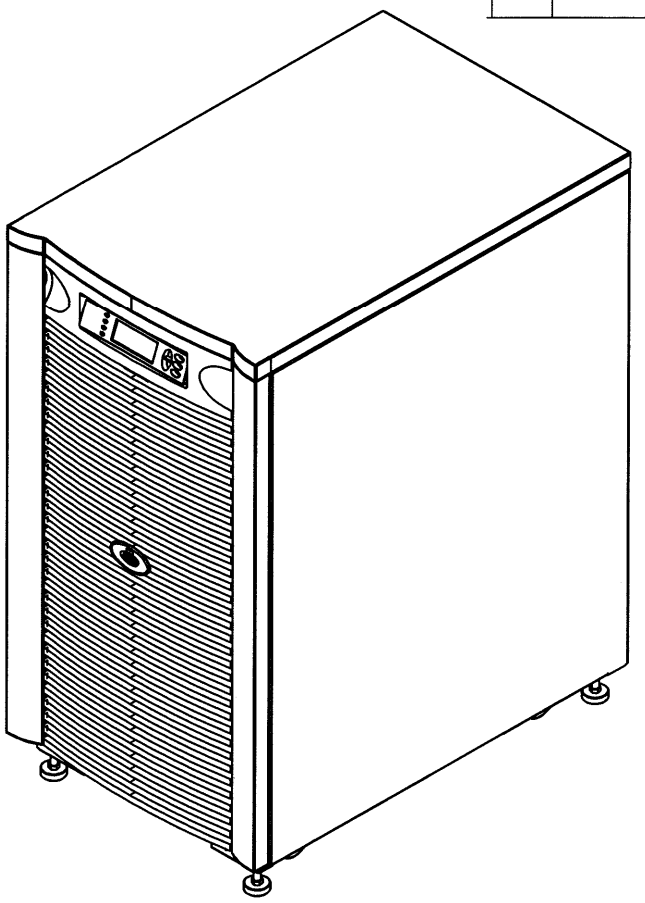
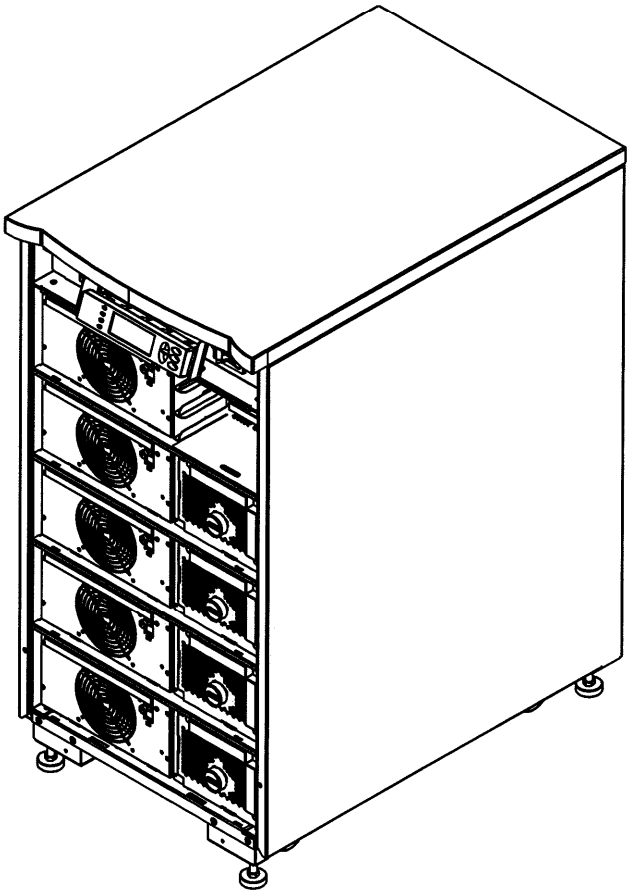
REVISIONS

REV	DESCRIPTION	DATE	APPR
1	RELEASE	12/29/03	DS





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ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

PARTS LIST

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FRACTIONS ±1/16 | DECIMALS .XXX±.005 .XX±.01 .X±.03 | ANGLES ±1/2°

MATERIAL: SEE NOTES

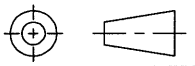
FINISH: SEE NOTES

DO NOT SCALE DRAWING

ENGINEER	D SCHUTTLER	12/29/2003
CHECKED	XXXXXX	XX/XX/XXXX
ISSUED	XXXXXX	XX/XX/XXXX

ARCHIVE MEDIA CODE

THIRD ANGLE PROJECTION



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ITEM 16 KVA SYMMETRA LX TOWER 3 PH

PROJECT POLAR BEAR

SIZE A | DWG. NO. SYAF16KI | REV 1

SCALE 1:10 | FIRST USED ON | SHEET 1 OF 1

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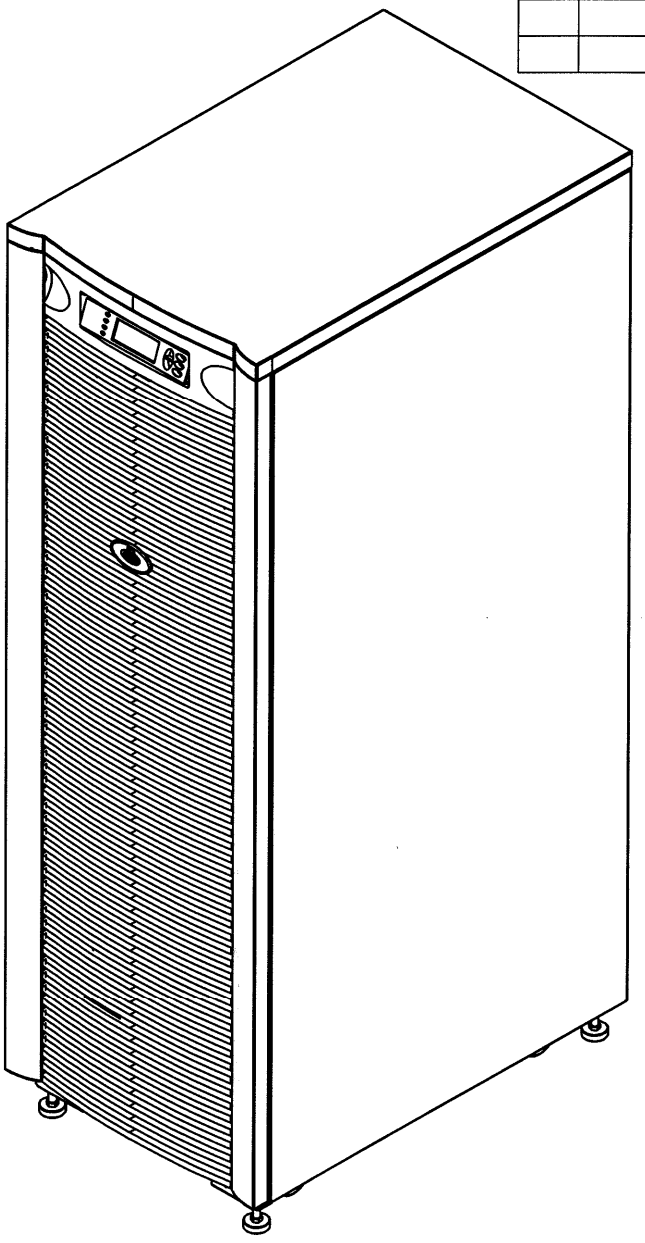

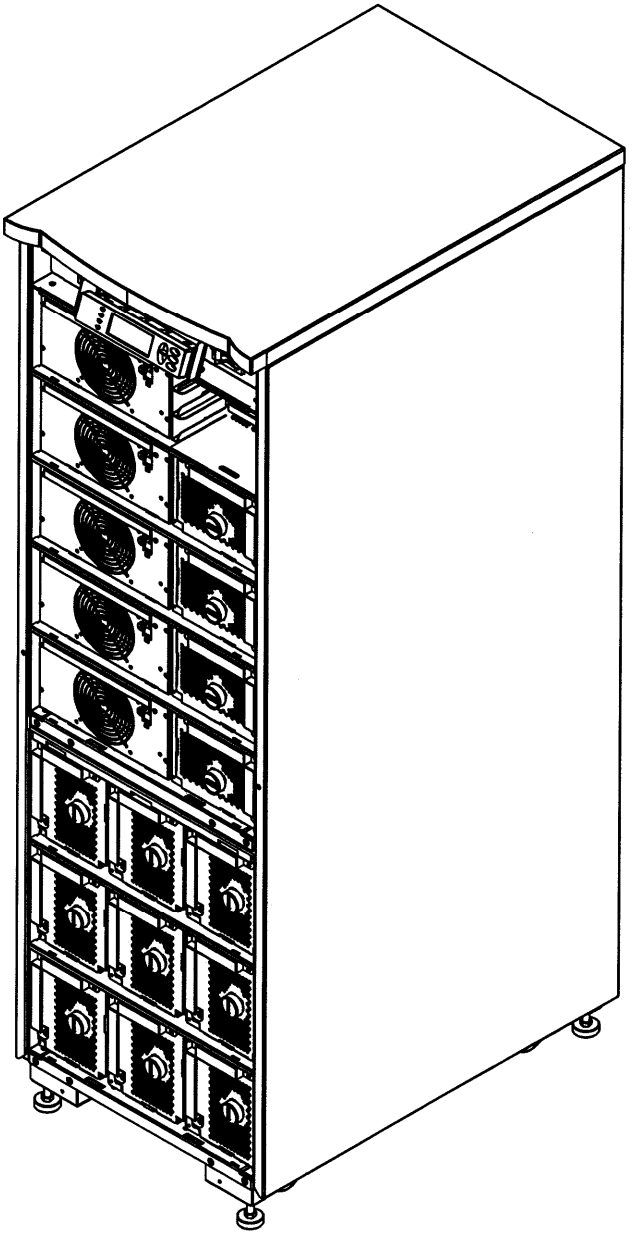

ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATI

VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 8, Page 5 of 12

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

FRACTIONS ±1/16 | DECIMALS .XXX±.005 .XX±.01 .X±.03 | ANGLES ±1/2°

MATERIAL: SEE NOTES

FINISH: SEE NOTES

DO NOT SCALE DRAWING

ENGINEER	D SCHUTTLER	12/29/2003
CHECKED	XXXXXX	XX/XX/XXXX
ISSUED	XXXXXX	XX/XX/XXXX

ARCHIVE MEDIA CODE

THIRD ANGLE PROJECTION

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ITEM: 16 KVA SYMMETRA LX TOWER XR 3 PH

PROJECT: POLAR BEAR

SIZE	DWG. NO.	REV
A	SYAF16KXR9I	1

SCALE 1:10 | FIRST USED ON | SHEET 1 OF 1

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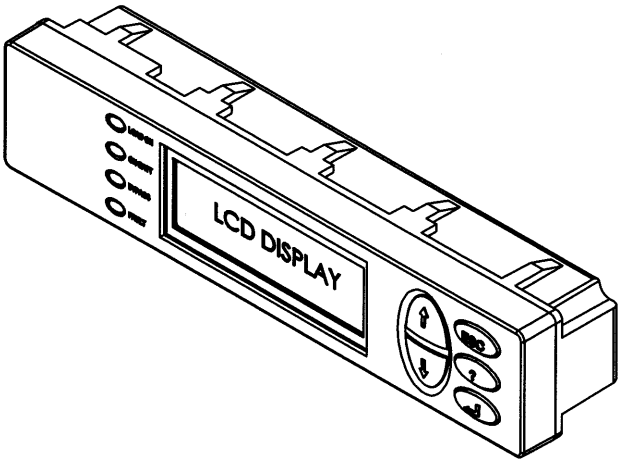
REV	DESCRIPTION	DATE	APPR
1	RELEASE	08/08/00	DS



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ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:

FRACTIONS ±1/16 | DECIMALS .XXX±.005 .XX±.01 .X±.03 | ANGLES ±1/2°

ENGINEER D SCHUTTLER	01/07/04	
CHECKED XXXXXX	XX/XX/XXXX	
ISSUED XXXXXX	XX/XX/XXXX	

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ITEM: POWERVIEW DISPLAY

MATERIAL: SEE NOTES

ARCHIVE MEDIA CODE

PROJECT: POLAR BEAR

FINISH: SEE NOTES

THIRD ANGLE PROJECTION

SIZE: A | DWG. NO.: 0G-9215RM | REV: 1

DO NOT SCALE DRAWING

SCALE 1:2 | FIRST USED ON | SHEET 1 OF 1

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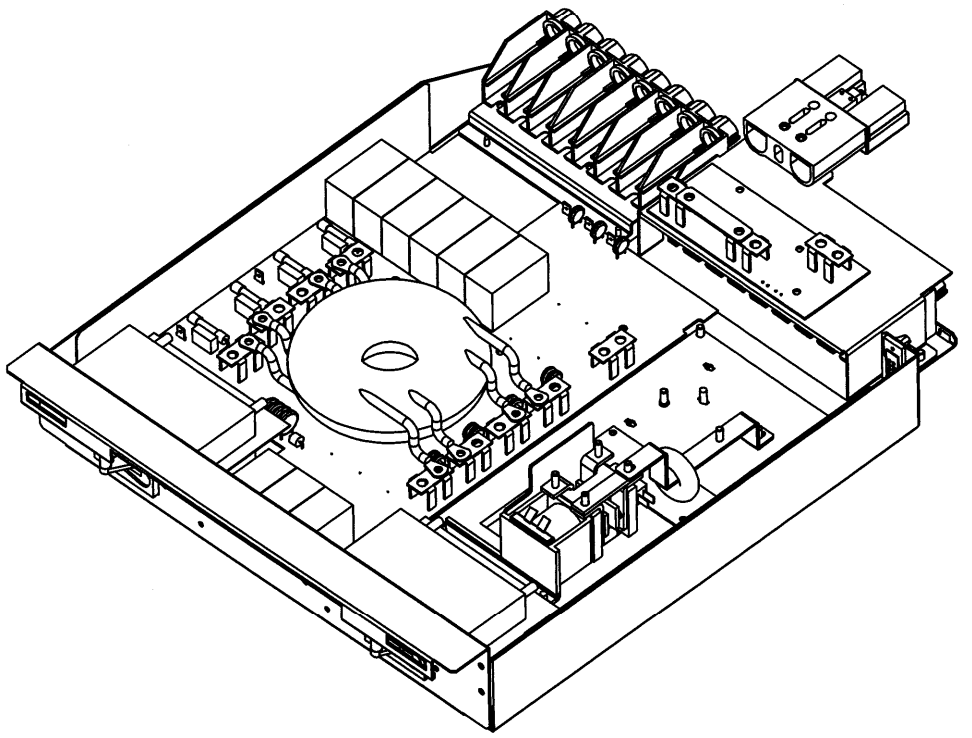
REV	DESCRIPTION	DATE	APPR
1	RELEASE	12/30/03	DS



VDE File: 1924400-3335-0033
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ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

PARTS LIST

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FRACTIONS ±1/16 DECIMALS .XXX±.005 .XX±.01 .X±.03 ANGLES ±1/2°

ENGINEER D SCHUTTLER	12/30/03	
CHECKED XXXXXX	XX/XX/XXXX	
ISSUED XXXXXX	XX/XX/XXXX	

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ITEM 3 PHASE AC TRAY

MATERIAL: SEE NOTES

ARCHIVE MEDIA CODE N/A

PROJECT POLAR BEAR / SYMETRA LX

FINISH: SEE NOTES

THIRD ANGLE PROJECTION

SIZE A | DWG. NO. 0M-2372 | REV 1

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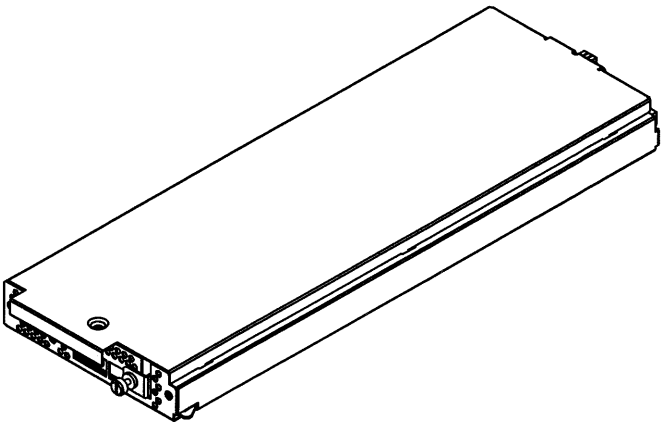
1	RELEASE	12/30/03	DS



VDE File: 1924400-3335-0033
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Appendix 8, Page 8 of 12

ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

PARTS LIST

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TOLERANCES ARE:

FRACTIONS ±1/16 | DECIMALS .XXX±.005 .XX±.01 .X±.03 | ANGLES ±1/2°

MATERIAL: SEE NOTES

FINISH: SEE NOTES

DO NOT SCALE DRAWING

ENGINEER	D SCHUTTLER	12/30/03
CHECKED	XXXXXX	XX/XX/XXXX
ISSUED	XXXXXX	XX/XX/XXXX

ARCHIVE MEDIA CODE: N/A

THIRD ANGLE PROJECTION

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ITEM: INTELLIGENCE MODULE

PROJECT: POLAR BEAR / SYMETRA LX

SIZE: A | DWG. NO.: SYMIM5 | REV: 1

1:5 | FIRST USED ON | SHEET 1 OF 1

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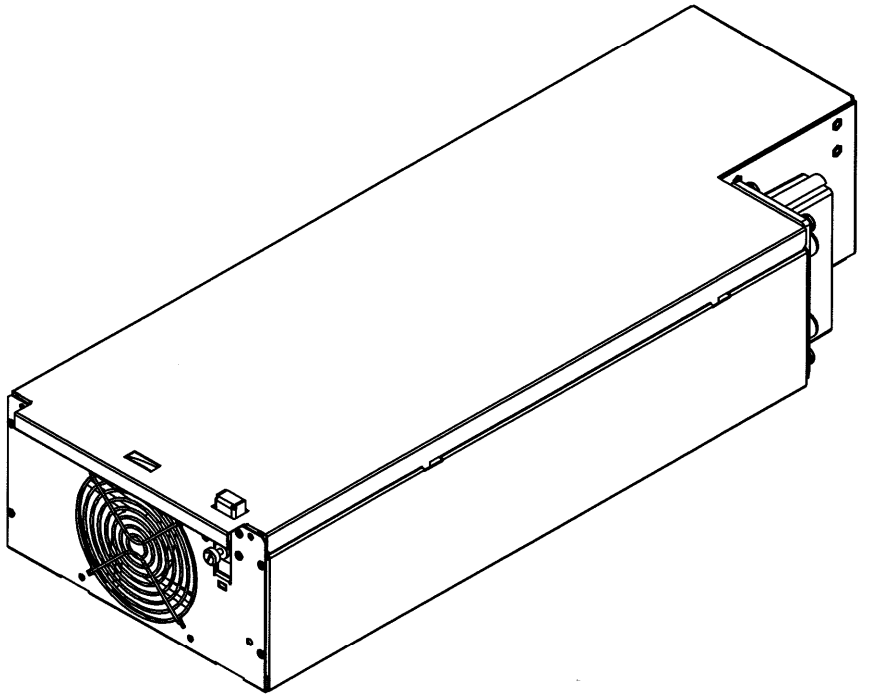
REV	DESCRIPTION	DATE	APPR
1	RELEASE	12/30/03	DS



VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 8, Page 9 of 12

ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

FRACTIONS ±1/16 | DECIMALS .XXX±.005 .XX±.01 .X±.03 | ANGLES ±1/2°

ENGINEER D SCHUTTLER	12/30/03	
CHECKED XXXXXX	XX/XX/XXXX	
ISSUED XXXXXX	XX/XX/XXXX	

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ITEM 3 PHASE POWER MODULE

MATERIAL: SEE NOTES

ARCHIVE MEDIA CODE N/A

PROJECT POLAR BEAR / SYMETRA LX

FINISH: SEE NOTES

THIRD ANGLE PROJECTION

SIZE A | DWG. NO. SYPM4KI | REV 1

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REV	DESCRIPTION	DATE	APPR
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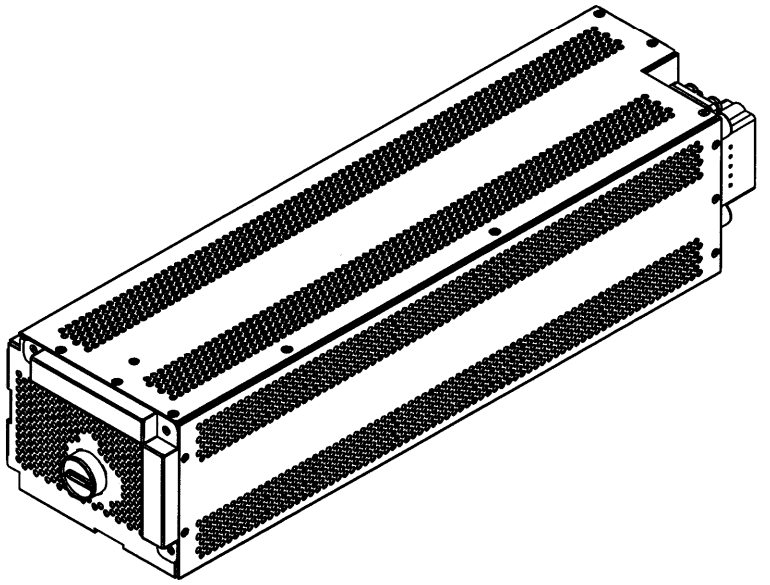

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ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

FRACTIONS ±1/16 | DECIMALS .XXX±.005 .XX±.01 .X±.03 | ANGLES ±1/2°

MATERIAL: SEE NOTES

FINISH: SEE NOTES

DO NOT SCALE DRAWING

ENGINEER	D SCHUTTLER	12/30/03
CHECKED	XXXXXX	XX/XX/XXXX
ISSUED	XXXXXX	XX/XX/XXXX

ARCHIVE MEDIA CODE N/A

THIRD ANGLE PROJECTION

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ITEM 120V BATTERY MODULE

PROJECT POLAR BEAR / SYMETRA LX

SIZE A | DWG. NO. SYBT5 | REV 1

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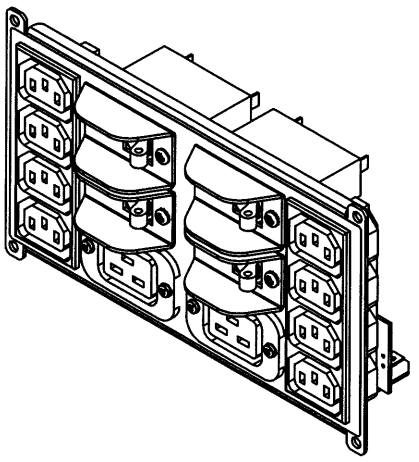
REV	DESCRIPTION	DATE	APPR
1	RELEASE	12/30/03	DS



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CB / DE 1 - 30646
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ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

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ENGINEER D SCHUTTLER	12/30/03	
CHECKED XXXXXX	XX/XX/XXXX	
ISSUED XXXXXX	XX/XX/XXXX	

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ITEM INTERNATIONAL PDU

MATERIAL: SEE NOTES

ARCHIVE MEDIA CODE N/A

PROJECT POLAR BEAR / SYMETRA LX

FINISH: SEE NOTES

THIRD ANGLE PROJECTION

SIZE A | DWG. NO. 0M-6142A | REV 1

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1:3 | FIRST USED ON | SHEET 1 OF 1

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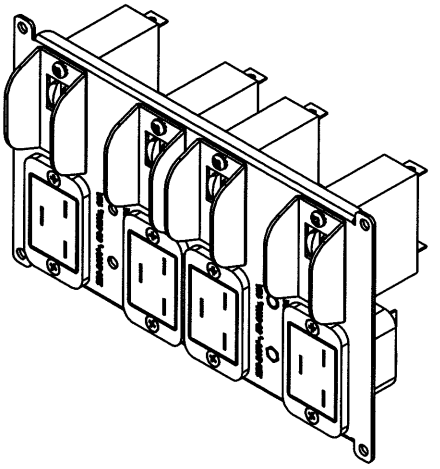

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Appendix 8, Page 12 of 12

ITEM NO.	APC PART NUMBER	VENDOR PART NUMBER	DESCRIPTION/MATERIAL/SPECIFICATION	QTY.

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MATERIAL: SEE NOTES

FINISH: SEE NOTES

DO NOT SCALE DRAWING

ENGINEER	D SCHUTTLER	12/30/03
CHECKED	XXXXXX	XX/XX/XXXX
ISSUED	XXXXXX	XX/XX/XXXX

ARCHIVE MEDIA CODE N/A

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ITEM INTERNATIONAL PDU

PROJECT POLAR BEAR / SYMETRA LX

SIZE A | DWG. NO. 0G-SYPD8 | REV 1

1:3 | FIRST USED ON | SHEET 1 OF 1

F142A.02.09.08

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	Aufbau-Übersicht / *Constructional data*	Seite 1 von 3 / *Page 1 of 3*	**Form AUe F142A**

1.1	Hersteller *Manufacturer*	:	Falco Electronics
1.2	Fertigungsstätte(n) *Manufacturing site(s)*	:	Mexico
2.1	Produktbezeichnung *Product designation*	:	**Transformatoren zum Einbau in Geräte/Built in transformers for equipment** nach / *according to* DIN EN 60950 (VDE 0805)
2.2	Typenbezeichnung *Type designation*	:	TRANSFORMER
3.1	Ursprungszeichen *Trade Mark*	:	N/A
3.2	Sonstige Aufschriften *Other markings*	:	430-0090, Rev.1, Date Code, Falco, CL-B
4.1	Bauart (Trenn-, Isoliertransformator usw.) *Type of construction (Isolating transformer etc.)*	:	XFRMR AUX 70W HF
5.1	Schutzklasse *Protection against electric shock*	:	--
5.2	Höchste Nenn-Umgebungstemperatur *Maximum rated ambient temperature*	:	ta = N/A °C
5.3	Isolationsklasse nach IEC 60085 *) *Insulation class according to IEC 60085 *)*	:	B / 130 °C Bitte VDE-Form AUeF162A beifügen ! *Please attach VDE-Form AUe162A !*

				Eingang (Primär) *Input (primary)*	Ausgang (Sekundär) *Output (secondary)*
6.	Elektrische Daten *Electrical values*		:		
6.1	Bemessungsspitzenspannung *Rated peak voltage*	[V]	:	COSTUMER PROVIDED	COSTUMER PROVIDED
6.2	Bemessungsspannung (effektiv) *Rated voltage (rms)*	[V]	:	COSTUMER PROVIDED	COSTUMER PROVIDED
6.3	Bemessungsfrequenz *Rated frequency*	[Hz]	:	COSTUMER PROVIDED	COSTUMER PROVIDED
6.3	Bemessungsstrom *Rated current*	[A]	:	COSTUMER PROVIDED	COSTUMER PROVIDED
6.4	Bemessungsleistung *Rated power*	[VA]	:	COSTUMER PROVIDED	COSTUMER PROVIDED
7.	Wicklungen *Windings*				
7.1	Anzahl Wicklungen *Number of Windings*		:	3	1
7.2	Windungsanzahl *Number of turn*		:	On primary #1(W2): 19+19, #2(W4): 5, #3(W3):5	11 (W5)
7.3	Drahtdurchmesser *Diameter of wire*	[mm]	:	W2 y W3:1X0.50, W4 (2-12), (11-1):1X0.50, W4 (4-5): 1X0.65	1X0.65 (W5)
7.4	Kaltwiderstand in Ω bei 25 °C *Cold resistance in Ω at 25 °C*		:	(3-6) 0.25, (11-1, 4-5) 0.040, (2-12) 0.035, (10-12) 0.015	(7-8) 0.066

J:\F1\FORMULARE\AUE (PROBEBETRIEB FÜR F1)\AUE F142A BUILT IN TRANSFORMERS FOR EQUIPMENT.DOC

8. Isolation
Insulation

8.1 Spulenkörpermaterial (Hersteller, Typ) : Dupont (Rynite FR530L), E375
Bobbin material (Manufacturer, type)

8.1.1 Entflammbarkeitskategorie Spulenkörper : 94-VO
Flammability category bobbin

8.2 Material der Drahtisolation (Hersteller, Typ) : Single MW80-C / TEX-E (FURUKAWA)
Material of wire insulation (Manufacturer, type)

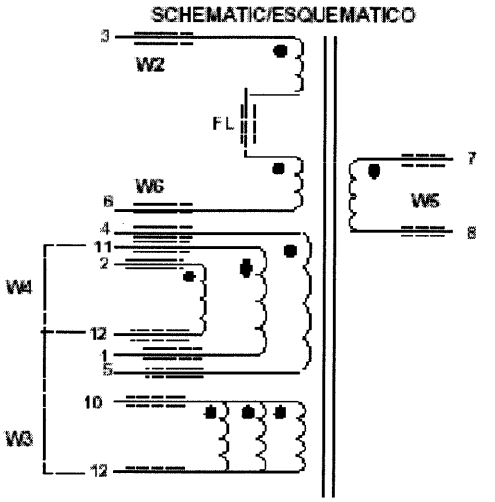
8.2.1 Lacktyp der Drahtisolation : BC Polyurethane, TC Polyamide
Type of varnish for wire insulation

8.2.2 Lackisolation nach IEC 60317 : --
Varnish for insulation in acc. to IEC 60317

8.3 Lagenisolationsmaterial (Hersteller, Typ) : 1MIL MYLAR TAPE 0.690 WIDTH
Material of layer insulation (Manufacturer, type)

8.4 Leitungen (Isolationsmaterial) : P.T.F.E, Tubbing "s" type
Lead insulation material

8.5 Wicklungsschema-Schaltbild (mit Klemmenbezeichnung, Farben der Anschlußenden usw.) :
Circuit diagram (which terminal markings, color of wires etc.)

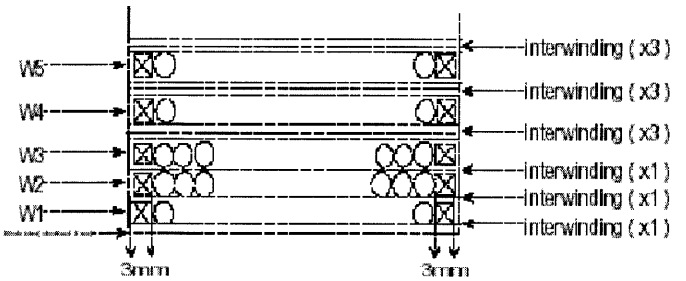


9. Eisenkern / *Iron core*

9.1 Blech, Materialsorte / *Sheet metall, material* : Soft Ferrrite: Mn-Zn

9.2 Hauptabmessungen / *Main dimensions* : 34.9mm x 27.8mm x9.2

9.3 Schnittskizze / *Cross-sectional drawing*



10. Aufbau / *Construction*

10.1 Konstruktionsmerkmale *Construction details*	:	-- ,	Getränkt / Impregnated
10.2 Tränkungsmittel (Hersteller, Typ) *Impregnating substances (Manufacturer, Type)*	:	Jonh C. Dolph Co. , Clear Baking Varnish	
10.3 Tränkungsverfahren *Impregnation procedure*	:	☒ Unterdruck *Underpressure* ☐ Überdruck *Overpressure*	bei 25 °C *at*
10.4 Vergußmasse (Hersteller, Typ) *Potting material (Manufacturer, Type)*	:	N/A	
10.5 Entflammbarkeitskategorie Vergußmasse *Flammability category potting material*	:	N/A	
10.6 Baustoff der Abdeckung *Material of the cover*	:	N/A	
10.7 Entflammbarkeitskategorie der Abdeckung *Flammability category of cover*	:	N/A	
10.8 Baustoff des Gehäuses *Material of the enclosure*	:	N/A	
10.9 Entflammbarkeitskategorie des Gehäuses *Flammability category of enclosure*	:	N/A	

11. Im Transformator eingebaute Einzelteile (Schutzeinrichtungen, Kabel, Stecker, Schalter usw.):
Components builtin the transformer (Protective means, cables, plugs, switches etc.): N/A

Einzelteil *Component*	Hersteller *Manufacturer*	Typ *Type*	Referenz/Tech. Daten*) *Reference / techn. Data*	Prüfzeichen *) *Certification mark*

*) Bitte weitere technische Informationen, Zertifikate, Prüfberichte u. a. beifügen.
Please provide further technical information, Certificates, Testreports etc. if applicable

12. Sonstiges (Besondere konstruktive Merkmale usw.) :
Other data (special constructional feature etc.)
N/A

Offenbach

VDE Prüf- und Zertifizierungsinstitut
VDE Testing and Certification Institute
Fachgebiet **F13** / *Section **F13***

i. A. _____

Ort / *Place:* **Merida, Yucatan Mexico** Datum / *Date:* 9/10/2003

Verantwortlich für die Angaben
Responsible for the details

Alejandro Palma
Name

INFORMATION REQUIRED BY SAFETY AGENCIES

TRANSFORMERS AND INDUCTOR CONSTRUCTION DESCRIPTION

1. IDENTIFICATION

1.1 CUSTOMER: **APC BILLERICA** PART NO: **430-0090** REVISION: **1**

1.2 MAGNETIC TYPE: **TRANSFORMER AUXILIARY, HIGH FREQUENCY, 70 W.**

1.3 TYPE: Linear [ ] Switching [X] Other (specify)

1.4 MANUFACTURER **FALCO ELECTRONICS MEXICO** MANUFACTURER PART No. **E31004**

1.5 MAGNETIC UL RECOGNIZED: YES [ ] NO [X] VENDOR FILE NO.: **N/A**

1.6 IF USING (OBJY2) R/C INSULATION CLASS SYSTEM UL FILE NO.: **E147168**

1.7 **FOLLOW INFORMATION IS NOT REQUIRED IF MAGNETIC COMPONENT IS RECOGNIZED BY UL**

2. CORE

2.1 SEE ATTACHED FALCO DRAWING YES [ ] NO [X] IF IS **NO** THE FOLLOWING INFORMATION MUST BE FILL

2.2 DESCRIPTION Powdered [ ] Lamination [ ] Ferrite [X] Other (Specify

2.3 CORE MATERIAL GRADE MN-ZN [X] NI-ZN [ ] SHAPE OF CORE **EE**

2.4 DIMENSION (mm)

LENGTH / OUTER DIAMETER	WIDTH / INNER DIAMETER	THICKNESS / HEIGHT
34.90	**27.8**	**9.20**

3 BOBBIN INFORMATION

3.1 SEE ATTACHED FALCO DRAWING YES [ ] NO [X] IF IS **NO** THE FOLLOWING INFORMATION MUST BE FILL

3.2 BOBBIN RAW MATERIAL MANUFACTURER: **EI DUPONT DE NEMOURS** PART NO. **RYNITE FR-530**

3.3 RAW MATERIAL DESIGNATION **PET GLASS REINFORCED, FLAME R.** (MUST BE UL RECOGNIZED)

3.4 UL FILE NO.: **E69578** BOBBIN WALL THICKNESS: **0.35 mm MIN.**

3.5 FLAMMABILITY RATING **94V-0** TEMPERATURE RATING **155** °C

3.6 BOBBIN DIMENSION (mm):

LENGTH	WIDTH	HEIGHT	THICKNESS
37.50	**26.50**	**25.6**	**0.35 mm MIN.**

4 WINDING INFORMATION

		AWG or mm²	*No. TURNS*	*No. LAYERS*	*WIRE INSULATION COATING*	*UL FILE*	*DC RESISTANCE*	*TEMP. (°C)*
4.1	PRIMARY 1	**24**	**19 + 19**	**1**	**SINGLE**	**MANY**	**0.25 Ω MAX..**	**25**
4.2	PRIMARY 2	**3X24**	**5**	**1**	**SINGLE**	**MANY**	**0.0150 Ω MAX..**	**25**
4.3	PRIMARY 3	**2X24 PLUS 1X22AWG TIW**	**5**	**1**	**SINGLE PLUS 0.65mm TEX-E (FURUKAWA)**	**MANY E206440**	**0.040 Ω MAX..**	**25**
4.4	SECONDARY							
	No. 1	**22 AWG**	**11**	**1**	**0.65 mm TEX-E (FURUKAWA)**	**E206440**	**0.066 Ω MAX.**	**25**
	No. 2							
	No. 3							

4.5 PRIMARY MAGNET WIRE: TYPE ANSI MW **MW-80** TEMPERATURE CLASS **F** RATING: **155°** °C

4.6 SECONDARY MAGNET WIRE: TYPE ANSI MW **N/A** TEMPERATURE CLASS _____ RATING: _____ °C

5 INSULATION SYSTEM

		MATERIAL	*MAT. THCK*	*No. OF LAYERS*	*TEMP. RATING (°C)*	*MANUFACTURER*	*UL FILE*
5.1	PRIMARY / CORE	**SEE BOBBIN PLUS ONE LAYER OF MYLAR TAPE**	**0.001"**	**1**	**130°C**	**YAHUA ADHESIVE TAPE CO. LTD**	**E178516**
5.2	PRIMARY / SHIELD	**N/A**					
5.3	PRIMARY / SECONDARY	**MYLAR TAPE**	**0.001"**	**3**	**130°C**	**YAHUA ADHESIVE TAPE CO. LTD**	**E178516**
5.4	SEC. No. 1 / CORE						
5.5	SEC. No. 2 / SEC. No. 3						
5.6	SEC. No. 3 / SEC. No. 4						
5.7	SEC. No. 4 / SEC. No. 5						
5.8	SEC. No. 5 / SEC. No. 6						

		MATERIAL PART No.	*TEMPERATURE RATING (°C)*	*MANUFACTURER*	*UL FILE*
5.9	CROSSOVER INSULATION	**0.001" MYLAR TAPE**	**130**	**YAHUA ADHESIVE TAPE CO. LTD**	**E178516**
5.10	WINDOW INSULATION	**N/A**	**N/A**	**N/A**	**N/A**
5.11	OUTER WRAP	**0.001" MYLAR TAPE**	**130**	**YAHUA ADHESIVE TAPE CO LTD**	**E178516**
5.12	LEAD WIRE				
5.13	IMPREGNATION / VARNISH	**BC346**	**130 MIN**	**DOLPH'S**	**E51047**
5.14	SLEEVING	**P.T.F.E.**	**200**	**GREAT HOLDING IND.**	**E156256**

6 POTTED COMPONENT INFORMATION

6.1 CASE MANUFACTURER **N/A** CASE PART No. _____

6.2 CASE RAW MATERIAL MANUFACTURER _____ PART No. _____

6.3 RAW MATERIAL DESIGNATION: _____ (MUST BE UL RECOGNIZED)

6.4 UL FILE No. E _____ BOBBIN WALL THICKNESS _____

6.5 FLAMMABILITY RATING: UL 94 _____ TEMPERATURE RATING (°C): _____

6.6 CASE DIMENSION (mm): LENGTH WIDTH HIEGHT THICNESS

6.7 POTTING MATERIAL MANUFACTURER: _____ PART No.: _____

6.8 POTTING MATERIAL DESIGNATION: _____ MUST BE UL RECOGNIZED

6.9 UL FILE No. : E _____ FLAMMABILITY RATING : UL 94 _____ TEMPERATURE RATING (°C): _____

7 ELECTRICAL RATINGS

		FREQUENCY	*VOLTAGE*	*CURRENT*	*POWER / CAPACITY*	
7.1	PRIMARY	**N/A**				VA
7.2	SECONDARY No.					VA

7.3	SECONDARY No.		VA
7.4	SECONDARY No.		VA
7.5	SECONDARY No.		VA
7.6	SECONDARY No.		VA

8 SPACING DATA (CREEPAGE / CLEARANCE)

8.1	PRIMARY TO SECONDARIES		
	LAYER MATERIAL (SPECIFY MATERIAL USAGE, SEE SECTION 5)		TAPE / FLEXIBLE INSULATION / SLEEVING
8.1.1	**6.4**	mm	
8.1.2	**3.2**	mm + 1 LAYER	
8.1.3	**3**	LAYERS	
8.2	PRIMARY TO GROUND		
8.2.1	**3.2**	mm (1/2 OF 8.1.1)	
8.2.2	**2**	LAYERS	
8.3	ADD CROSS SECTION OF BOBBIN DRAWING.		

COMPANY INFORMATION

Mexico Factory:
Calle 23 # 311 x 46 Fracc. Itzincab
Merida, Yucatan, Mexico, 97392

Place: **Merida, Yucatan, Mexico**

Date : **12/23/03**

Originator: **Karen Silveira**

Approved by

Engineering Manager (Name + Signature)

PD Manager (Name + Signature)

Certificate of Conformity

issued by Curtis-Straus

Company: APC Corporation NPS Division
Product Tested: SYAF16KI and SYAF8KI
Testing Date: September 12, 15-18, 2003
Report No.: ED0704-2

A sample of the product as configured in the accompanying test report has been found to comply with the following standards:

EMC Emissions:

- EN 50091-2:96 Uninterruptible Power Systems (UPS) – emissions requirements
- EN 55022:1998 Class A ITE emissions requirements (EU)
- FCC 47 CFR Part 15 Class A emissions requirements (USA)
- VCCI Class A ITE emissions requirements (Japan)

Registration numbers for all open area test sites can be found in the "*Test Equipment Used*" Section starting on page 41 of the attached report.

EMC Immunity:

- EN 50091-2:1996 Uninterruptible Power Systems (UPS) – immunity requirements *for the following – except for D.6 Immunity to low frequency signals:*
- EN 55024:1998/A1:2001 Information technology equipment - immunity characteristics *for the following:*
  - EN61000-4-1:1997 Overview of immunity
  - EN61000-4-2:1999 Electrostatic discharge immunity
  - EN61000-4-3:1998 Radiated, radio-frequency, electromagnetic field immunity
  - EN61000-4-4:1995 Electrical fast transient/burst immunity
  - EN61000-4-5:1995 Surge immunity
  - EN61000-4-6:1996 Immunity to conducted disturbances, induced by radio-frequency fields
  - EN61000-4-8:1994 Magnetic immunity
  - EN61000-4-11:1994 Voltage dips, short interruptions and voltage variations immunity

Attested to by the hands and seals:

For Curtis-Straus		For the Manufacturer or Importer
Test Engineer	Date	Date
EMC Manager	Date	

10/15/03

10/15/03

VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 10, Page 1 of 1

APCC Proprietary

APC

Part Specification Cover Sheet

Originator: Steve Diggins On: 08/03/1995
Last Editor: Steve Diggins On: 06/24/1996
Requestor: On:05 - Dec - 2003

X-Reference Part Number:	Oracle Description of Specification:	**PreRelease Rev:** (use this for controlled release revisions)
	LED T1 RED T/R FLUSH MTD	0
	Oracle Status: **MRP Updated**	

Production Revision History:

REVISION HISTORY TABLE:

Rev: 1	Date:	By: (full name)	ECO #:	Alpha Letter:	Description of Change

OLD Revison Table - for Reference Only

* - denotes required data fields

Specification Details:

Product Line: *
CNS

Project Name *or* SKU numbers where first used:
SUVS650

Drawing Package: CorelDraw

* **Safety Critical Components:** - - - - - - - - - - - - - - - - - No

* **PL Chief Engineer approval required ?** - - - - - - - - - - - - No

* **Will this Part be mounted on a Printed Circuit Board?** - - - - -

* **Will there be a Solid Works model created for this part?** - - - Yes

Expanded description:
Clear lens. LED is vertically flush mountable to a pc board.

Applicable Standards:

APC standards:
0S-ME-PKG

Industry standards:
N/A

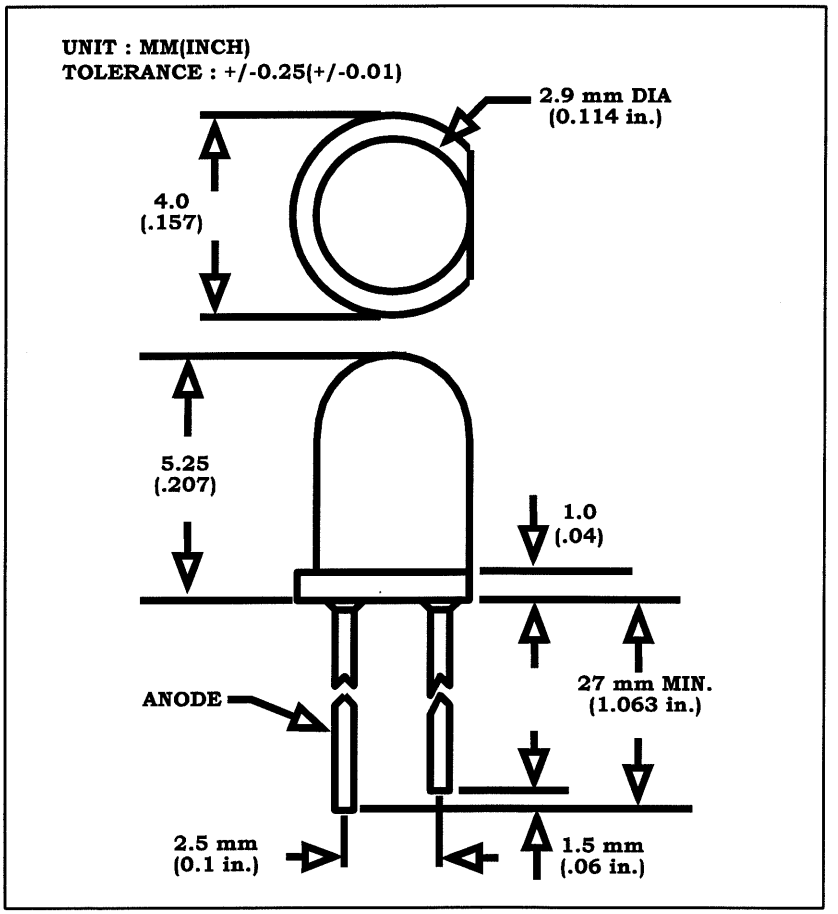
Drawing / File Attachments:

Retrieve Drawing File

Latest Zip File On Record: G:\SPECS\300 BILLERICA
(format is part number_dateftp'd.zip)

(READ ONLY - ZIP FILES SHOULD NOW BE FTP'd BY USING THE BUTTON ABOVE.)

ONLY PDF FILES ARE TO BE ATTACHED. ZIP FILES SHOULD BE FTP'D



3700037.CDR

Component Parameters:

NOTES:**ELECTRICAL CHARACTERISTICS:**

Absolute Maximum Ratings: Unless otherwise specified T_A=25°C.

Parameter	Symbol	Value	Units
Maximum Average Forward Current	$I_{F(avg)}$		mA
Maximum Peak Forward Current	$I_{F(peak)}$	150	mA
Maximum DC Forward Current	I_F	30	mA
Maximum DC Reverse Current at Rated DC Blocking Voltage	I_R	10	µA
Maximum Power Dissipation	P_D	120	mW
Maximum LED Junction Temperature	T_J		°C
Operating Temperature Range	T_{OPT}	-40 to +85	°C
Storage Temperature Range	T_{STG}	-40 to +85	°C

Parameter	Symbol	Min.	Max.	Units
Reverse Breakdown Voltage (I_R= 10µA)	V_R		5	Volt
Forward Voltage (I_F= 20mA)	V_f		1.85	mA
Peak Wavlength	$\lambda_{(peak)}$		660	nm
Luminous Intensity (I_F= 20mA)	I_V	100	400	mcd
Reverse Current at Rated DC Blocking Voltage	I_R		10	µA
Luminous Intesity Points (View Angle)			50	Degree
Junction to Lead Thermal Resistance	$R\theta_{J\text{-}PIN}$			°C/W

NOTES: Wave soldering specs; <= 260C, 3 sec. max. Distance from solder joint to case > 2mm, 4mm @ 5sec.

Notice of Deviation:

(Description of deviation from current release of drawings.)

Special Instructions:

APC Part Number 370-0037 **-- Production Rev.** 1

Shipping Packaging:

Method and materials:

Enter any other shipping packaging info here:

Inbound Shipping Package Marking requirements:

Complete APCC Part Number, Date Code or Lot Code, Quantity, APCC Purchase Order Number, Manufacturer's part # and Manufacture Identification per APC Standard OS-ME-PKG.

Part Markings:

Special Qualifying Instructions / Drawings:

Approved Manufacturer List:

APC Part Number 370-0037 **-- Production Rev.** 1

Commodity Type is : Electronics

(**Only manufacturers' qualified for the commodity type of this part can be added below.
If you can't find a manuf name listed this might be the reason why.**)

Manufacturer's Name **All manufacturer's listed below must be Qualified before submitting this part specification for approval. Removing a manufacturer requires that a manuf. disqual has been started.	**Manufacturer's Part Num**	**Qualification Request #**	**Manufacturer Specific Notes** ** Enter manuf. specfic information in this field. (e.g. Vendor must use XXX glue or Manuf USA factory only is approved.)
KINGBRIGHT CORP.	L3XSRTSL/B-APC		

Vendors Removed from Approved Vendors List:

Part Spec Reviewers Section:

Requested Reviewers	Vote	Review date & time	Comments:

THE SOLIDWORKS TAB IS ONLY FOR MODELS THAT ARE TO BE PLACED IN THE CORP SOLIDWORKS LIBRARY. USE THE DETAILED TAB FOR FTP'ING THE COMPLETE SET OF FILES THAT WILL DEFINE THE PART. THE SOLIDWORKS MODEL FILE SHOULD BE IN THE SET OF FILES DEFINING THE PART ON THE DETAILED TAB AND THE SOLIDWORKS MODEL FILE SHOULD BE FTP'D ON THE LIBRARY TAB IF THERE IS A LIKELIHOOD OF REUSE FOR THE PART.

(Only last 35 changes kept)

APCC Proprietary

APC

Part Specification Cover Sheet

Originator: Kin Keat On: 05/16/1996
Last Editor: Ken Steeves On: 07/20/2001
Requestor: Kin Keat On:12/29/1998

X-Reference Part Number:	Oracle Description of Specification:	**PreRelease Rev:** (use this for controlled release revisions)
	LED T1 YELLOW T/R FLUSH MTD	0
	Oracle Status: **Released in Oracle**	

Production Revision History:

REVISION HISTORY TABLE:

Rev: 1	Date:	By: (full name)	ECO #:	Alpha Letter:	Description of Change

OLD Revison Table - for Reference Only

* - denotes required data fields

Specification Details:

Product Line: *
CNS

Project Name *or* SKU numbers where first used:

Drawing Package:	CorelDraw
* **Safety Critical Components:** - - - - - - - - - - - - - - - - -	No
* **PL Chief Engineer approval required ?** - - - - - - - - - - - -	No
* **Will this Part be mounted on a Printed Circuit Board?** - - - - -	Yes - PCAD Legacy
* **Will there be a Solid Works model created for this part?** - - -	Yes

Expanded description:
Clear lens. LED is vertically flush mountable to a pc board.

Applicable Standards:

APC standards:
0S-ME-PKG

Industry standards:
N/A

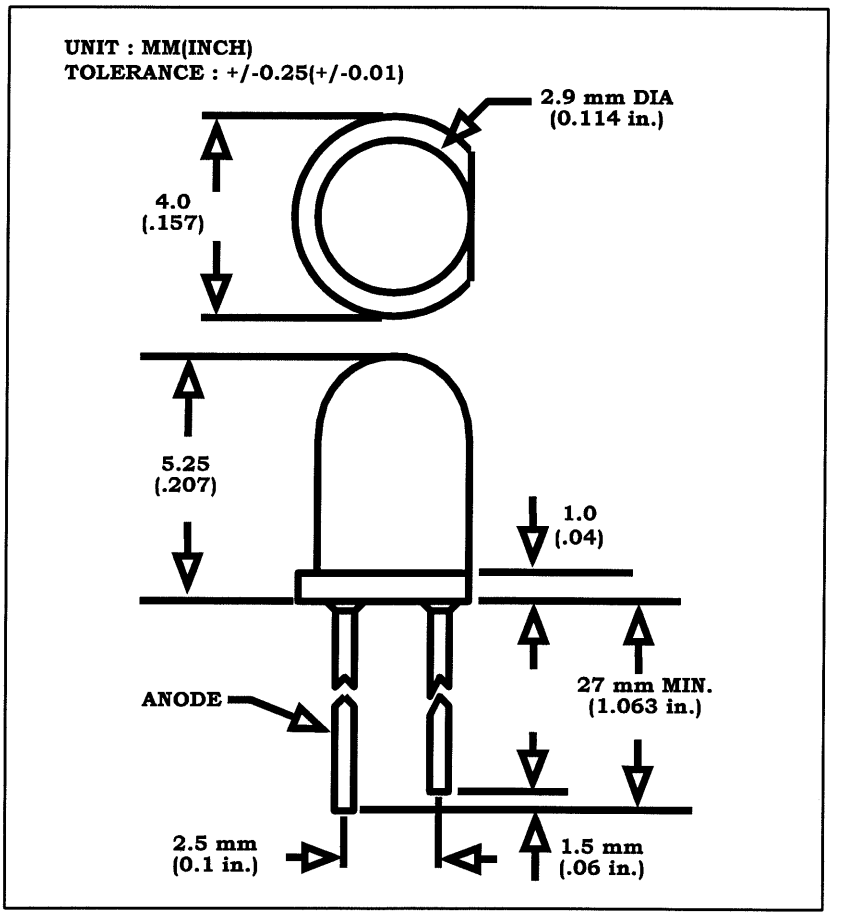
Drawing / File Attachments:

Retrieve Drawing File

Latest Zip File On Record: 370-0039_REV03.zip
(format is part number_dateftp'd.zip)

(READ ONLY - ZIP FILES SHOULD NOW BE FTP'd BY USING THE BUTTON ABOVE.)

ONLY PDF FILES ARE TO BE ATTACHED. ZIP FILES SHOULD BE FTP'D



Component Parameters:

NOTES:**ELECTRICAL CHARACTERISTICS:**

Absolute Maximum Ratings: Unless otherwise specified T_A=25°C.

Parameter	Symbol	Value	Units
Maximum Average Forward Current	$I_{F(avg)}$		mA

Maximum Peak Forward Current	$I_{F(peak)}$	150	mA
Maximum DC Forward Current	I_F	30	mA
Maximum DC Reverse Current at Rated DC Blocking Voltage	I_R	10	µA
Maximum Power Dissipation	P_D	105	mW
Maximum LED Junction Temperature	T_J		°C
Operating Temperature Range	T_{OPT}	-40 to +85	°C
Storage Temperature Range	T_{STG}	-40 to +85	°C

Parameter	**Symbol**	**Min.**	**Max.**	**Units**
Reverse Breakdown Voltage (I_R= 10µA)	V_R		5	Volt
Forward Voltage (I_F= 20mA)	Vf		2.1	mA
Peak Wavlength	$\lambda_{(peak)}$		590	nm
Luminous Intensity (I_F= 20mA)	I_v	40	70	mcd
Reverse Current at Rated DC Blocking Voltage	I_R		10	µA
Luminous Intesity Points (View Angle)			50	Degree
Junction to Lead Thermal Resistance	$R\theta_{J\text{-}PIN}$			°C/W

NOTES: Wave soldering specs; <= 260C, 3 sec. max. Distance from solder joint to case > 2mm, 4mm @ 5sec.

Notice of Deviation:

(Description of deviation from current release of drawings.)

Special Instructions:

APC Part Number 370-0039 **-- Production Rev.** 3

Shipping Packaging:

Method and materials:

Enter any other shipping packaging info here:

Inbound Shipping Package Marking requirements:

Part Markings:

Special Qualifying Instructions / Drawings:

Approved Manufacturer List:

APC Part Number 370-0039 **-- Production Rev.** 3
Commodity Type is : Electronics
(**Only manufacturers' qualified for the commodity type of this part can be added below.
If you can't find a manuf name listed this might be the reason why.**)

Manufacturer's Name **All manufacturer's listed below must be Qualified before submitting this part specification for approval. Removing a manufacturer requires that a manuf. disqual has been started.	**Manufacturer's Part Num**	**Qualification Request #**	**Manufacturer Specific Notes** ** Enter manuf. specfic information in this field. (e.g. Vendor must use XXX glue or Manuf USA factory only is approved.)
KINGBRIGHT CORP.	L3XNTSL-APC		

Vendors Removed from Approved Vendors List:

Part Spec Reviewers Section:

Requested Reviewers	Vote	Review date & time	Comments:

THE SOLIDWORKS TAB IS ONLY FOR MODELS THAT ARE TO BE PLACED IN THE CORP SOLIDWORKS LIBRARY. USE THE DETAILED TAB FOR FTP'ING THE COMPLETE SET OF FILES THAT WILL DEFINE THE PART. THE SOLIDWORKS MODEL FILE SHOULD BE IN THE SET OF FILES DEFINING THE PART ON THE DETAILED TAB AND THE SOLIDWORKS MODEL FILE SHOULD BE FTP'D ON THE LIBRARY TAB IF THERE IS A LIKELIHOOD OF REUSE FOR THE PART.

(Only last 35 changes kept)

APCC Proprietary

APC

Part Specification Cover Sheet

Originator: Kin Keat On: 05/16/1996
Last Editor: Ken Steeves On: 07/20/2001
Requestor: Kin Keat On:12/29/1998

X-Reference Part Number:	Oracle Description of Specification:	**PreRelease Rev:** (use this for controlled release revisions)
	LED T1 GREEN T/R FLUSH MTD	0
	Oracle Status: **Released in Oracle**	

Production Revision History:

REVISION HISTORY TABLE:

Rev: 1	Date:	By: (full name)	ECO #:	Alpha Letter:	Description of Change

OLD Revison Table - for Reference Only

* - denotes required data fields

Specification Details:

Product Line: *
CNS

Project Name *or* SKU numbers where first used:

Drawing Package: CorelDraw

* **Safety Critical Components:** - - - - - - - - - - - - - - - - - No

* **PL Chief Engineer approval required ?** - - - - - - - - - - - - No

* **Will this Part be mounted on a Printed Circuit Board?** - - - - - Yes - PCAD Legacy

* **Will there be a Solid Works model created for this part?** - - - Yes

Expanded description:
Clear lens. LED is vertically flush mountable to a pc board.

Applicable Standards:

APC standards:
0S-ME-PKG

VDE File: 1924400-3335-0033
CB / DE 1 - 30646
Appendix 11, Page 11 of 15

Industry standards:
N/A

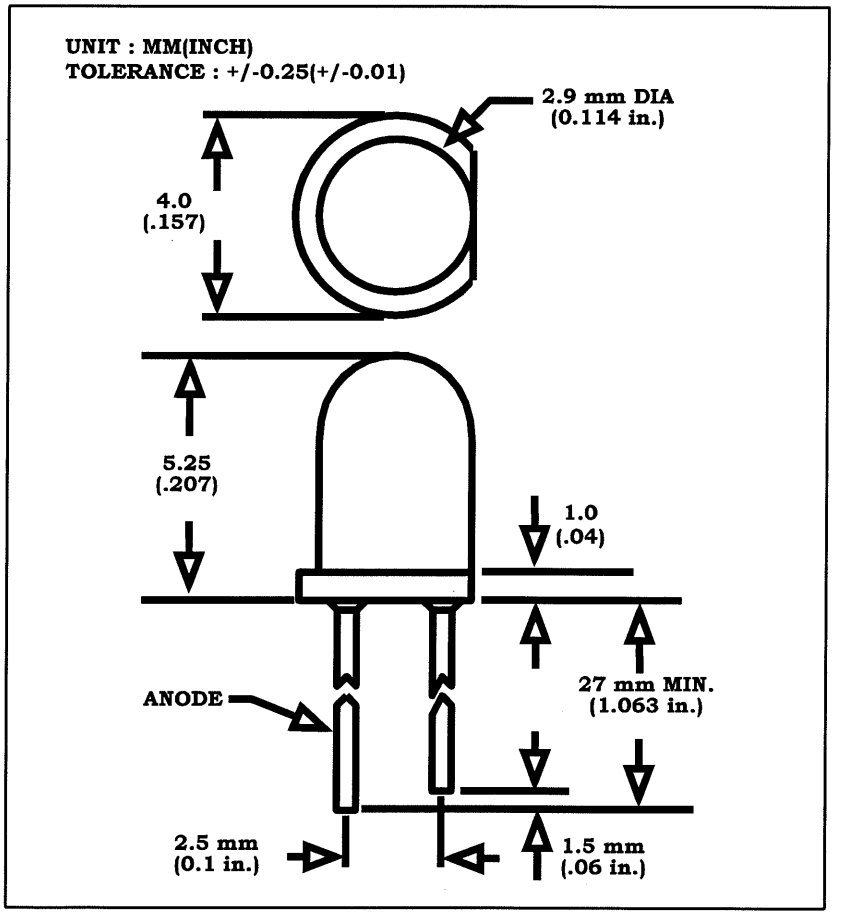
Drawing / File Attachments:

Retrieve Drawing File

Latest Zip File On Record: 370-0038_REV03.zip
(format is part number_dateftp'd.zip)

(READ ONLY - ZIP FILES SHOULD NOW BE FTP'd BY USING THE BUTTON ABOVE.)

ONLY PDF FILES ARE TO BE ATTACHED. ZIP FILES SHOULD BE FTP'D



Component Parameters:

NOTES:**ELECTRICAL CHARACTERISTICS:**

Absolute Maximum Ratings: Unless otherwise specified T_A=25°C.

Parameter	Symbol	Value	Units
Maximum Average Forward Current	$I_{F(avg)}$		mA

Maximum Peak Forward Current	$I_{F(peak)}$	150	mA
Maximum DC Forward Current	I_F	25	mA
Maximum DC Reverse Current at Rated DC Blocking Voltage	I_R	10	µA
Maximum Power Dissipation	P_D	105	mW
Maximum LED Junction Temperature	T_J		°C
Operating Temperature Range	T_{OPT}	-40 to +85	°C
Storage Temperature Range	T_{STG}	-40 to +85	°C

Parameter	**Symbol**	**Min.**	**Max.**	**Units**
Reverse Breakdown Voltage (I_R= 10µA)	V_R		5	Volt
Forward Voltage (I_F= 20mA)	Vf		2.2	mA
Peak Wavlength	$\lambda_{(peak)}$		565	nm
Luminous Intensity (I_F= 20mA)	I_v	80	200	mcd
Reverse Current at Rated DC Blocking Voltage	I_R		10	µA
Luminous Intesity Points (View Angle)			50	Degree
Junction to Lead Thermal Resistance	$R\theta_{J\text{-}PIN}$			°C/W

NOTES: Wave soldering specs; <= 260C, 3 sec. max. Distance from solder joint to case > 2mm, 4mm @ 5sec.

Notice of Deviation:

(Description of deviation from current release of drawings.)

Special Instructions:

APC Part Number 370-0038 **-- Production Rev.** 3

Shipping Packaging:

Method and materials:

Enter any other shipping packaging info here:

Inbound Shipping Package Marking requirements:

Part Markings:

Special Qualifying Instructions / Drawings:

Approved Manufacturer List:

APC Part Number 370-0038 **-- Production Rev.** 3
Commodity Type is : Electronics
(**Only manufacturers' qualified for the commodity type of this part can be added below.
If you can't find a manuf name listed this might be the reason why.**)

Manufacturer's Name **All manufacturer's listed below must be Qualified before submitting this part specification for approval. Removing a manufacturer requires that a manuf. disqual has been started.	**Manufacturer's Part Num**	**Qualification Request #**	**Manufacturer Specific Notes** ** Enter manuf. specfic information in this field. (e.g. Vendor must use XXX glue or Manuf USA factory only is approved.)
KINGBRIGHT CORP.	L3XUGTSL-APC		

Vendors Removed from Approved Vendors List:

Part Spec Reviewers Section:

Requested Reviewers	Vote	Review date & time	Comments:

THE SOLIDWORKS TAB IS ONLY FOR MODELS THAT ARE TO BE PLACED IN THE CORP SOLIDWORKS LIBRARY. USE THE DETAILED TAB FOR FTP'ING THE COMPLETE SET OF FILES THAT WILL DEFINE THE PART. THE SOLIDWORKS MODEL FILE SHOULD BE IN THE SET OF FILES DEFINING THE PART ON THE DETAILED TAB AND THE SOLIDWORKS MODEL FILE SHOULD BE FTP'D ON THE LIBRARY TAB IF THERE IS A LIKELIHOOD OF REUSE FOR THE PART.

(Only last 35 changes kept)

APCC Proprietary

Part Specification Cover Sheet

Originator: On: 01/22/1999
Last Editor: Antonio Endaya On: 08/13/2003
Requestor: Antonio Endaya On:08/13/2003

X-Reference Part Number:

Oracle Description of Specification:
BATTERY 12V 9AH

Oracle Status:
Released in Oracle

PreRelease Rev:
(use this for controlled release revisions)

Production Revision History:

REVISION HISTORY TABLE:

Rev: 4	Date: May/03/2002	By: (full name) Ilya Goretoy	ECO #:	Alpha Letter:	Description of Change Add battery HR9-12 part qual H307 to AVL
Rev: 5	Date: Jul/28/2003	By: (full name)Prithviraj Nath	ECO #:	Alpha Letter:	Description of Change Add vendor to AML per Qual CA1552

OLD Revison Table - for Reference Only

* - denotes required data fields

Specification Details:

Product Line: *
Smart-UPS (over 1.5 kVA)

Project Name *or* SKU numbers where first used:

Drawing Package:	N/A
* **Safety Critical Components:** - - - - - - - - - - - - - - - - -	Yes
* **PL Chief Engineer approval required ?** - - - - - - - - - - - -	Yes
* **Will this Part be mounted on a Printed Circuit Board?** - - - - -	No
* **Will there be a Solid Works model created for this part?** - - -	Yes

Expanded description:
BATTERY, WET, NON-SPILLABLE, LEAD ACID, SEALED, 12 VOLT, 9 AMP-HOUR, 0.250" QUICK CONNECT TABS

Applicable Standards:

APC standards:
0S-ME-PKG

Industry standards:

1. DOT 49 CFR, 173.159 (d) [Department of Transport USA]
2. ICAO UN2800 and Special Provision A67 [International Civil Aviation Organization]
3. IMO - IMDG Code (Statement on page 8, 121) [International Maritime Organization-International Maritime Dangerous Goods Code]
4. UL1989-Standard for Sealed Lead Acid Batteries

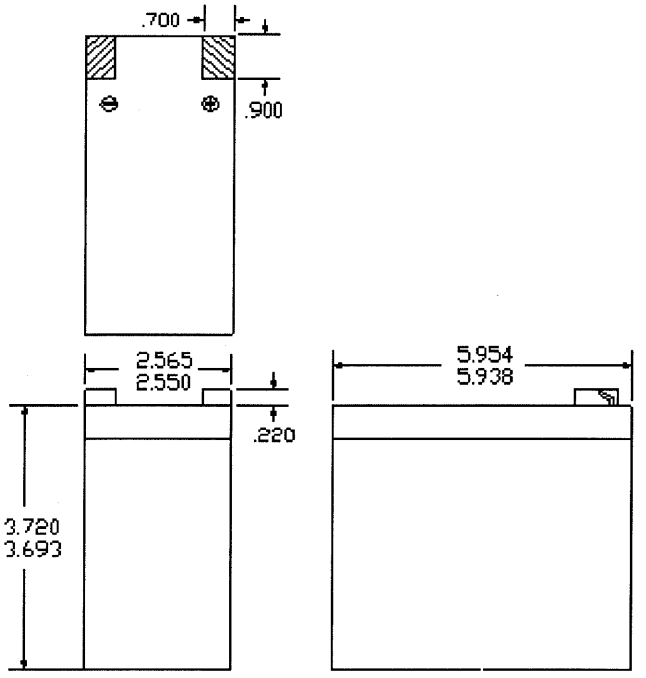
Drawing / File Attachments:

Retrieve Drawing File

Latest Zip File On Record: Specs\
(format is part number_dateftp'd.zip)

(READ ONLY - ZIP FILES SHOULD NOW BE FTP'd BY USING THE BUTTON ABOVE.)

ONLY PDF FILES ARE TO BE ATTACHED. ZIP FILES SHOULD BE FTP'D



Component Parameters:

General Battery Information:

Battery type	Sealed Lead Acid	
Battery Case Material	ABS	
Battery Weight	5.7	lbs. typ.
Typical Cell Vent Pressure	0.1 TO 0.5	kg/cm^2
Storage Temperature Range	-40 TO 60	°C
Discharge Temperature Range	-15 TO 50	°C

Charge Temperature Range	0 TO 40	°C
Number of Cells	6	Cells
Voltage per Cell	2.28	Volt
Battery Termination	0.250 X 0.032" TABS	
Termination Mate	0.250" F/O	
Termination Hardware	N/A	

General Requirements:

Safety Agency Approvals: Must be marked with UL Recognition
Storage Time at 25°C: 2880 Hours (80% capacity due to internal self-discharge)

State of Charge Upon Delivery: The Battery must be charged to 90% of rated 20 hour capacity upon delivery to APCC.
Max. Age Upon Delivery: The max. age of the battery (based upon manufacturer's date code) shall not exceed 3 months at the time of delivery to APCC.
Service Life: Shall not be less than 3.0 years in standby service.
Deep Discharge Life: Shall not be less than 200 charge/discharge cycles.
One cycle is defined as the complete discharge and subsequent recharge of a fully charged battery in accordance with the electrical specifications outlined above.
Warranty: The batteries shall be guaranteed to be free from defects in materials or workmanship for a period of not less than one year from the date of delivery.

Label:

Battery recycle label per vendors standard.
Nonspillable.

Electrical Requirements:

Parameter	Min.	Max.	Units
Battery Voltage	12	13.1	Volt
Battery Internal Impedance			Ohm
Battery Capacity	9.0 *		Amp Hour
Float Voltage Range	2.25	2.3	Volt
Maximum Dischage Rate			Amp
APCC System Discharge Time	8		Minutes

Notes: * discharge time at 204 watts = 15 minutes

Notice of Deviation:

(Description of deviation from current release of drawings.)

Special Instructions:

Shipping Packaging:

Method and materials:
The batteries shall be packaged in corrugated cardboard box, not to exceed fifty (50) pounds in weight. The boxes shall be stacked on a standard 4.0 ft. x 4.0 ft. wooden pallet, not to exceed 1900 lbs. in weight
Enter any other shipping packaging info here:

Inbound Shipping Package Marking requirements:
see 0S-ME-PKG

Part Markings:

As noted below under General Requirements.

Special Qualifying Instructions / Drawings:

Approved Manufacturer List:

APC Part Number 910-1209 **-- Production Rev.** 5
Commodity Type is : Battery
(**Only manufacturers' qualified for the commodity type of this part can be added below.
If you can't find a manuf name listed this might be the reason why.**)

Manufacturer's Name **All manufacturer's listed below must be Qualified before submitting this part specification for approval. Removing a manufacturer requires that a manuf. disqual has been started.	**Manufacturer's Part Num**	**Qualification Request #**	**Manufacturer Specific Notes** ** Enter manuf. specfic information in this field. (e.g. Vendor must use XXX glue or Manuf USA factory only is approved.)
PANASONIC INDUSTRIAL CO. CONDITIONALLY QUALIFIED 1 Masbac Way Columbus Georgia 31907 USA	UP-RW1245P1	H226	
CSB BATTERY OF AMERICA CORP. (TAIWAN) CONDITIONALLY QUALIFIED USA	HR 1234W F2	BM24	
B & B BATTERY CO. (CONDITIONALLY QUALIFIED) 6098 Rickenbacker Rd City of Commerce California 90040 China	HR9-12	H307	
EXIDE INDUSTRIES CONDITIONALLY QUALIFIED : EXIDE INDUSTRIES LIMITED, : Survey No : 246, Chichurakanapalli, Sevaganapalli Panchayath, Hosur Road, Dharmapuri Dist, Tamilnadu - 635103 INDIA	EP1234W	CA1552	

Vendors Removed from Approved Vendors List:

Part Spec Reviewers Section:

Requested Reviewers	Vote	Review date & time	Comments:

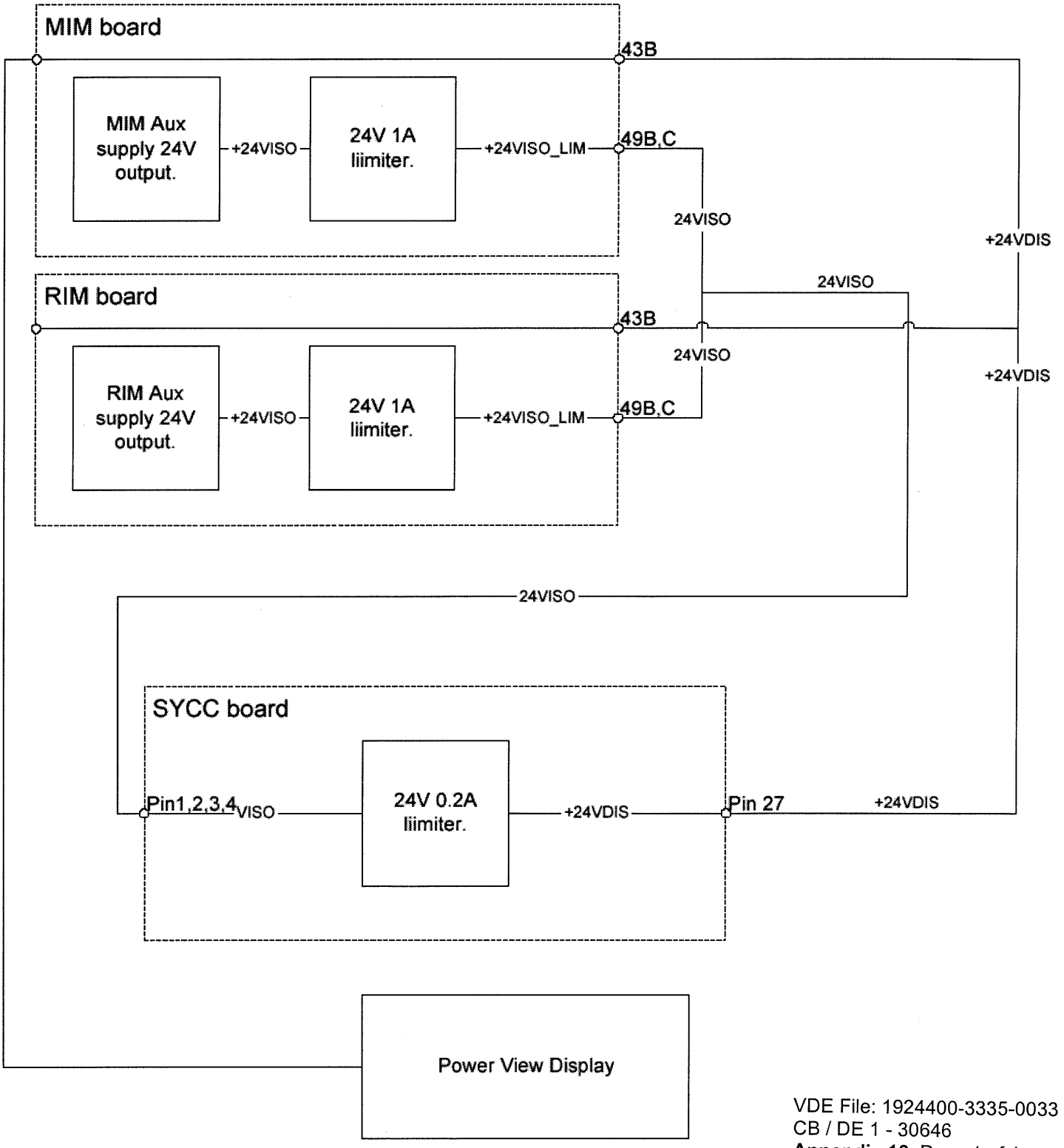
THE SOLIDWORKS TAB IS ONLY FOR MODELS THAT ARE TO BE PLACED IN THE CORP SOLIDWORKS LIBRARY. USE THE DETAILED TAB FOR FTP'ING THE COMPLETE SET OF FILES THAT WILL DEFINE THE PART. THE SOLIDWORKS MODEL FILE SHOULD BE IN THE SET OF FILES DEFINING THE PART ON THE DETAILED TAB AND THE SOLIDWORKS MODEL FILE SHOULD BE FTP'D ON THE LIBRARY TAB IF THERE IS A LIKELIHOOD OF REUSE FOR THE PART.

(Only last 35 changes kept)

Limited Power Source: Management Display Assembly connected to MIM (SYMIM5)

Worst-case conditions: 24V / 2A

1. If one 24V 1A limiter on either MIM or RIM is faulted so it passes full power of Aux Supply 24V the limiter on the SYCC still limits to 0.2A on short on Power View Display or its wiring.
2. If the limiter on the SYCC faults so it passes full power each 24V 1A limiter on MIM and RIM is limited to 1A each setting the max to 2 A on short on Power View Display or its wiring.



Test E5-3I: EN 60950, Clause 1.6.1.

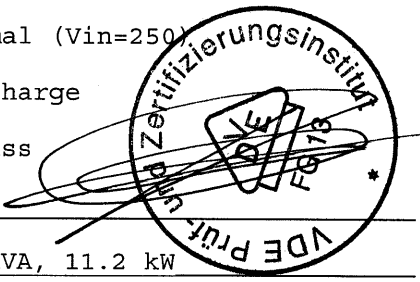
Model **SYAF16KI, SYAF16KRMI, SYAF16KXR9I *** was connected to a 3Ø source and operated at the voltages listed below. Input current was measured using a True RMS ammeter while operating at max load. Measured input current cannot exceed rated input current by more than 10%.

Input

Voltage (VAC)	Freq (Hz)	Current (Amps) Ø1	Ø2	Ø3	Power [W] [kW] Ø1	Ø2	Ø3	UPS Mode
207/360	50	21	24	21	4.0	4.6	3.9	Normal
207/360	50	23.1	26.9	23.9	4.4	5.1	4.5	Recharge
207/360	50	45	2.0	2.3	9.4	107W	146.5W	Bypass
230/400	50	17.7	21.6	19.2	3.7	4.5	3.94	Normal
230/400	50	20.5	24.1	21.6	4.4	5.1	4.48	Recharge
230/400	50	50.7	2.17	2.33	11.6	98.6W	139.5W	Bypass
250/440	50	15.8	19.4	17.5	3.6	4.46	3.829	Normal
250/440	50	11.4	13.4	12.3	2.58	3.0	2.699	Recharge
250/440	50	54.8	2.0	2.4	13.7	69.5W	181.2W	Bypass

1Ø Output

Voltage (VAC)	Freq (Hz)	Current (Amps)	Power [kW]	[kVA]	UPS Mode
229.5	50	48.9	11.8	11.2	Normal (Vin=207)
229.5	50	48.9	11.9	11.2	Recharge
207	50	45.0	9.3	9.3	Bypass
229.5	50	48.7	11.2	11.2	Normal (Vin=230)
229.5	50	48.8	11.2	11.2	Recharge
229.9	50	50.0	11.4	11.5	Bypass
229.5	50	48.9	11.2	11.2	Normal (Vin=250)
229.5	50	48.7	11.2	11.2	Rescharge
250	50	54.5	13.6	13.6	Bypass



Rated Input: 230/400 V, 100 A, 50-60 Hz 3Ø

Rated Output: 220/230/240, 1 Phase+N+GND, 50/60 Hz, 16 kVA, 11.2 kW

Comments: * Representative of SYAF8KI, SYAF8KRMI also rated 100 A.

Equipment ID & Range: #1368 PM3000A Power Analyer, #834 & 3317 Avtron Resistive loads

Tested by: Stephen Lee Date Tested: 01/05/04 Report#:

Reviewed by: [P] [F]:

Test E2: EN 60950, Clause 2.1.10.

Model **Symmetra LX *** was connected to 250 Vrms, 50 Hz, and operated in a steady state condition. The unit was then disconnected from the supply source and the voltage across the powercord's pins were measured within 1 second of disconnection using a storage oscilloscope with probes each having a minimum input impedance of 10 megohms. Data was recorded on the positive half and negative half of the sine wave. The test was performed with the ON/OFF switch in both positions.

The peak measured voltage at the time of disconnection (Vo), the voltage measured after 1 second (Vt), and the time for the voltage to decay to 37%Vo (actual time constant "T.C.") are to be recorded.
Note: Vo is to be within 5% of the sine wave's peak at the time of disconnection.

[The test was not performed between phase and ground, nor between neutral and ground since the total capacitance between those points was less than 0.1 μF.]

Location	Switch Position	Sine Polarity	Vin (Vrms)	Vo (Vpeak)	37%Vo (Volts)	Vt (Volts)	T.C. (ms)
Phase A to Neutral	On	Pos	254	357	132	0	200
Phase A to Neutral	On	Neg	254	357	132	0	200
Phase A to Neutral	Off	Pos	254	357	132	0	200
Phase A to Neutral	Off	Neg	254	357	132	0	200
Phase B to Neutral	On	Pos	254	357	132	0	200
Phase B to Neutral	On	Neg	254	357	132	0	200
Phase B to Neutral	Off	Pos	254	357	132	0	200
Phase B to Neutral	Off	Neg	254	357	132	0	200

Pass/Fail Criteria:
EN 60950 - Time constant must not exceed: 1 second for type A pluggable equipment; or 10 seconds for permanently connected and type B pluggable equipment.
UL 1778 - Maximum voltage across the capacitor (Vt) after five seconds is based on the capacitance. For example: 1184V if 0.5μF, 729V if 1μF, 449V if 2μF, 367V if 13.9μF, 284V if 20μF, 150V if 50μF, etc. Refer to Table 8.2 for all values.
CSA 107.1 - Refer to Test E1 (Electric Shock & Energy Hazards).
Must be less than 42.4 Vpk or 60 Vdc and 20 Joules after two seconds.

Comments: _____

*-Represents SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI, SYAF16KXR9I

Equipment ID & Range: Oscilloscope #2939, Diff. Probe #3382

Tested by: Stephen Lee Date Tested: 09 Jan 04 Report#: _____

Reviewed by: [P] [F]: _____ Data Sheet Rev. 8 (6/13/95)

Test E2: EN 60950, Clause 2.1.10.

Model **Symmetra LX *** was connected to 250 Vrms, 50 Hz, and operated in a steady state condition. The unit was then disconnected from the supply source and the voltage across the powercord's pins were measured within 1 second of disconnection using a storage oscilloscope with probes each having a minimum input impedance of 10 megohms. Data was recorded on the positive half and negative half of the sine wave. The test was performed with the ON/OFF switch in both positions.

The peak measured voltage at the time of disconnection (Vo), the voltage measured after 1 second (Vt), and the time for the voltage to decay to 37%Vo (actual time constant "T.C.") are to be recorded.
Note: Vo is to be within 5% of the sine wave's peak at the time of disconnection.

[The test was not performed between phase and ground, nor between neutral and ground since the total capacitance between those points was less than 0.1 μF.]

Location	Switch Position	Sine Polarity	Vin (Vrms)	Vo (Vpeak)	37%Vo (Volts)	Vt (Volts)	T.C. (ms)
Phase C to Neutral	On	Pos	254	357	132	0	200
Phase C to Neutral	On	Neg	254	357	132	0	200
Phase C to Neutral	Off	Pos	254	357	132	0	200
Phase C to Neutral	Off	Neg	254	357	132	0	200
Phase A to Phase B	On	Pos	254	600	222	0	200
Phase A to Phase B	On	Neg	254	600	222	0	200
Phase A to Phase B	Off	Pos	254	600	222	0	200
Phase A to Phase B	Off	Neg	254	600	222	0	200

Pass/Fail Criteria:
EN 60950 - Time constant must not exceed: 1 second for type A pluggable equipment; or 10 seconds for permanently connected and type B pluggable equipment.
UL 1778 - Maximum voltage across the capacitor (Vt) after five seconds is based on the capacitance. For example: 1184V if 0.5μF, 729V if 1μF, 449V if 2μF, 367V if 13.9μF, 284V if 20μF, 150V if 50μF, etc. Refer to Table 8.2 for all values.
CSA 107.1 - Refer to Test E1 (Electric Shock & Energy Hazards).
Must be less than 42.4 Vpk or 60 Vdc and 20 Joules after two seconds.

Comments:

*-Represents SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI, SYAF16KXR9I

Equipment ID & Range: Oscilloscope #2939, Diff. Probe #3382

Tested by: Stephen Lee Date Tested: 09 Jan 04 Report#:

Reviewed by: [P] [F]: Data Sheet Rev 3 (6/13/95)

Test E2: EN 60950, Clause 2.1.10.

Model **Symmetra LX *** was connected to 250 Vrms, 50 Hz, and operated in a steady state condition. The unit was then disconnected from the supply source and the voltage across the powercord's pins were measured within 1 second of disconnection using a storage oscilloscope with probes each having a minimum input impedance of 10 megohms. Data was recorded on the positive half and negative half of the sine wave. The test was performed with the ON/OFF switch in both positions.

The peak measured voltage at the time of disconnection (Vo), the voltage measured after 1 second (Vt), and the time for the voltage to decay to 37%Vo (actual time constant "T.C.") are to be recorded.
Note: Vo is to be within 5% of the sine wave's peak at the time of disconnection.

[The test was not performed between phase and ground, nor between neutral and ground since the total capacitance between those points was less than 0.1 μF.]

Location	Switch Position	Sine Polarity	Vin (Vrms)	Vo (Vpeak)	37%Vo (Volts)	Vt (Volts)	T.C. (ms)
Phase B to Phase C	On	Pos	254	600	222	0	200
Phase B to Phase C	On	Neg	254	600	222	0	200
Phase B to Phase C	Off	Pos	254	600	222	0	200
Phase B to Phase C	Off	Neg	254	600	222	0	200
Phase C to Phase A	On	Pos	254	600	222	0	200
Phase C to Phase A	On	Neg	254	600	222	0	200
Phase C to Phase A	Off	Pos	254	600	222	0	200
Phase C to Phase A	Off	Neg	254	600	222	0	200

Pass/Fail Criteria:
EN 60950 - Time constant must not exceed: 1 second for type A pluggable equipment; or 10 seconds for permanently connected and type B pluggable equipment.
UL 1778 - Maximum voltage across the capacitor (Vt) after five seconds is based on the capacitance. For example: 1184V if 0.5μF, 729V if 1μF, 449V if 2μF, 367V if 13.9μF, 284V if 20μF, 150V if 50μF, etc. Refer to Table 8.2 for all values.
CSA 107.1 - Refer to Test E1 (Electric Shock & Energy Hazards).
Must be less than 42.4 Vpk or 60 Vdc and 20 Joules after two seconds.

Comments: _____

*-Represents SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI, SYAF16KXR9I

Equipment ID & Range: Oscilloscope #2939, Diff. Probe #3382

Tested by: Stephen Lee Date Tested: 09 Jan 04 Report#: _____

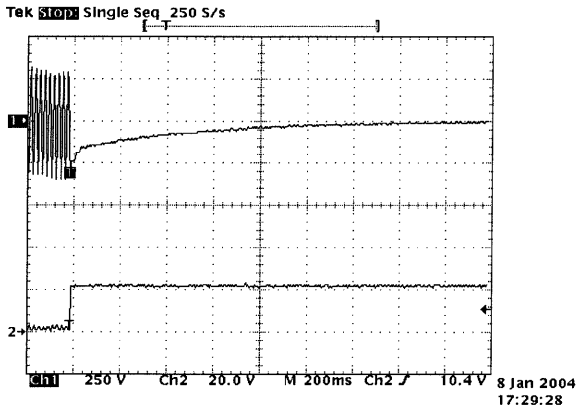
Reviewed by: [P] [F]: _____ Data Sheet Rev 3 (6/13/95)

Hidden fileds from previous dB design:

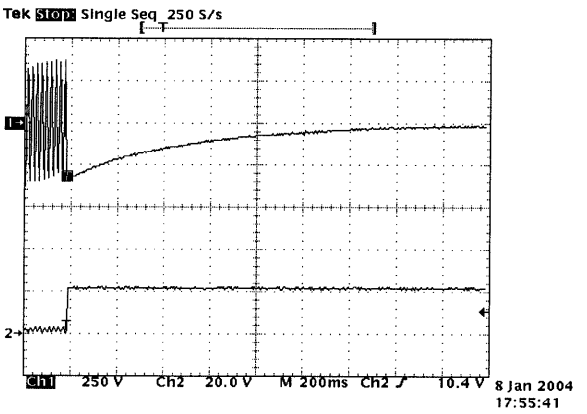
Oscilloscope Photographs
Line Cord Discharge Test

Symmetral LX

PHASE A TO NEUTRAL



NEG SW PWR SWITCH ON



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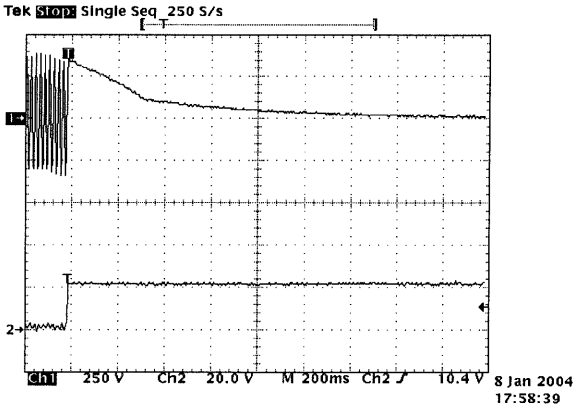

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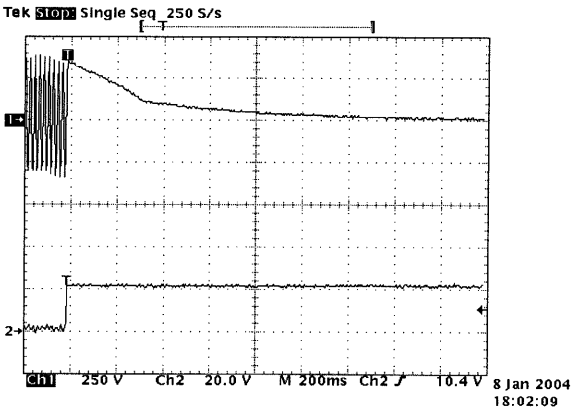
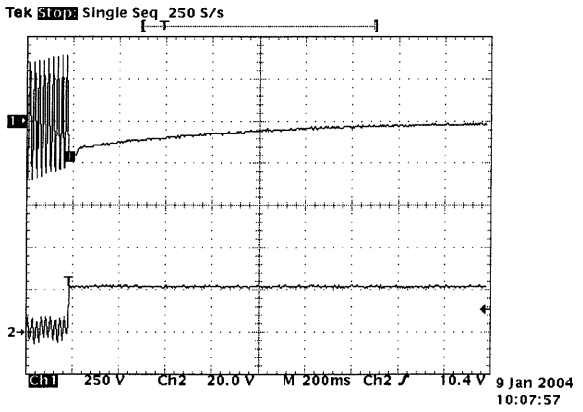


POS SW PWR SWITCH OFF

PHASE B TO NEUTRAL



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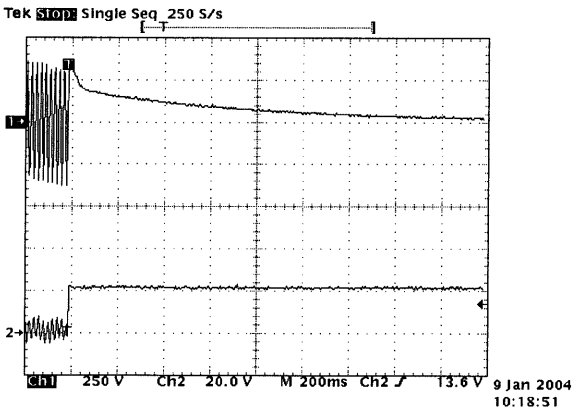

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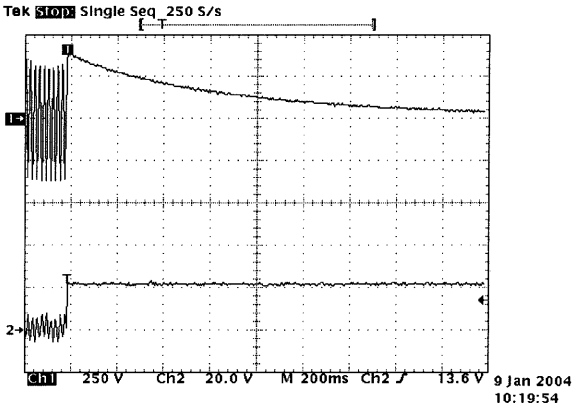

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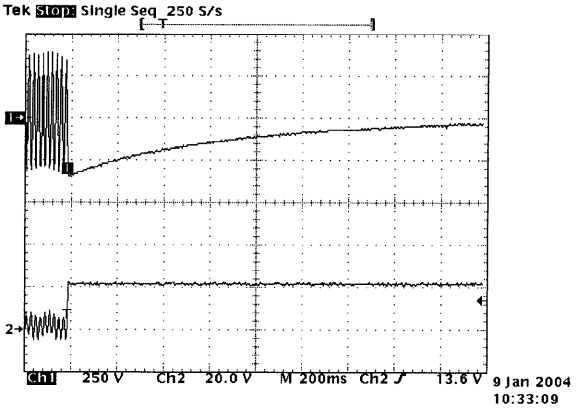
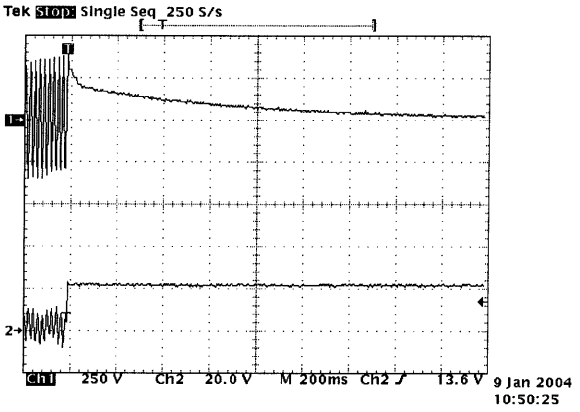


NEG SW PWR SWITCH OFF

PHASE C TO NEUTRAL



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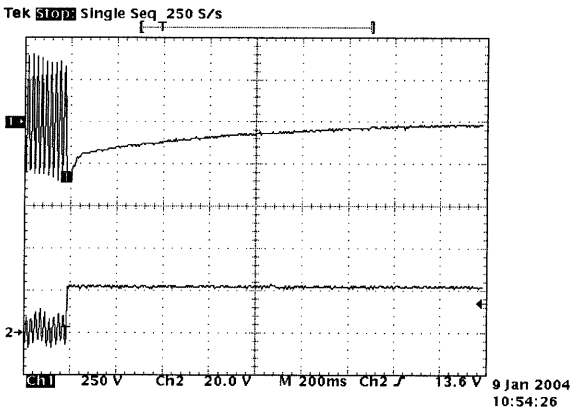

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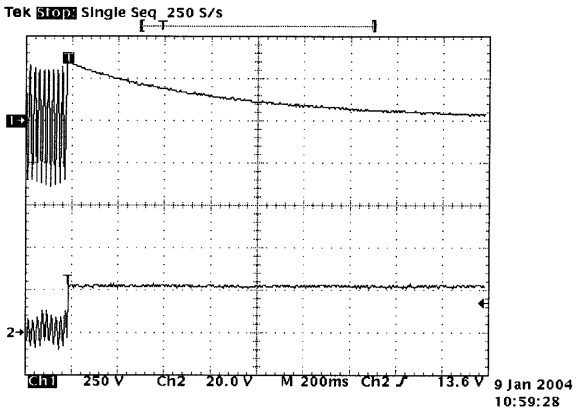

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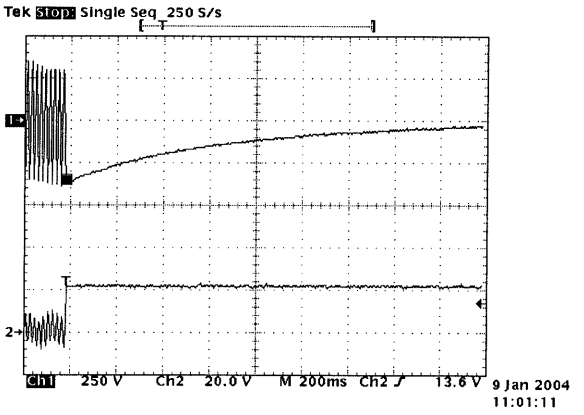
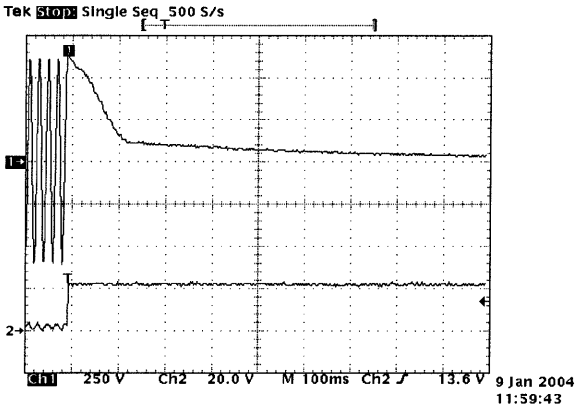


NEG SW PWR SWITCH OFF

PHASE A TO PHASE B



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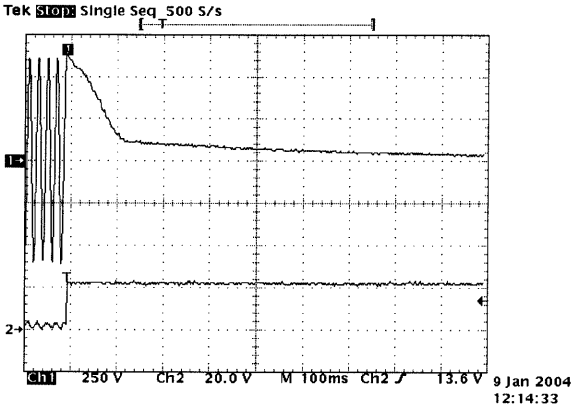

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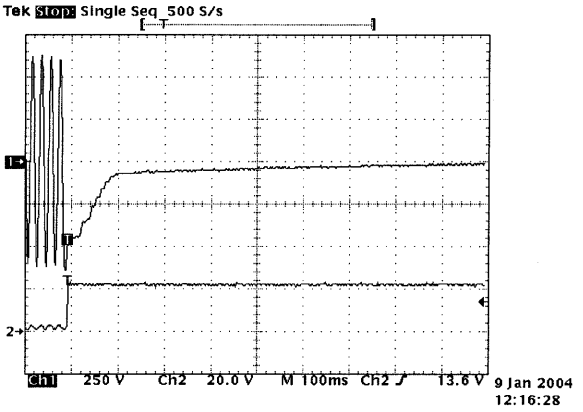

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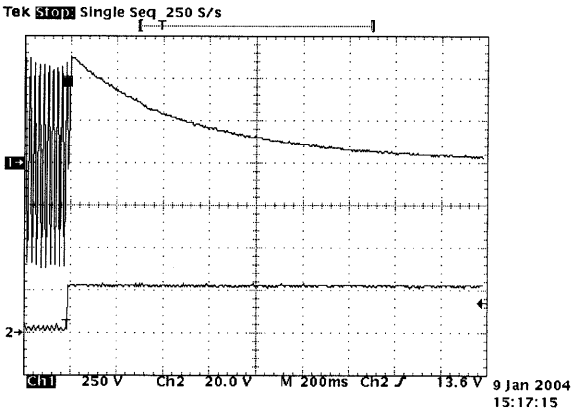

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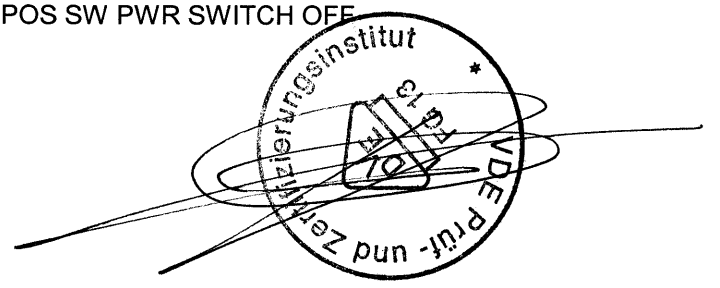
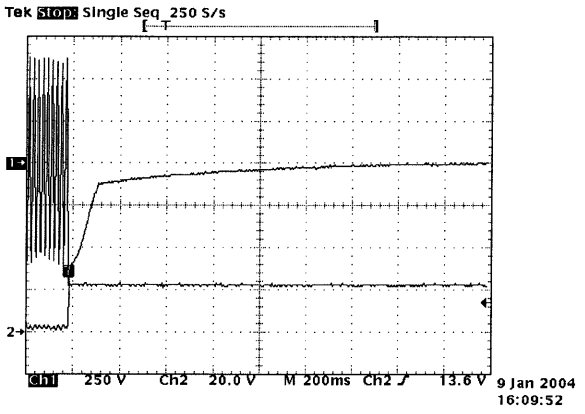


PHASE B TO PHASE C



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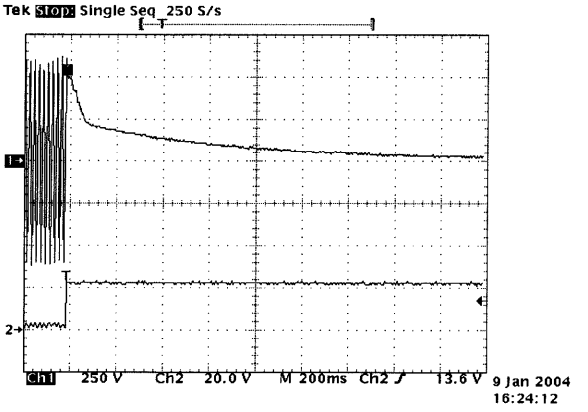

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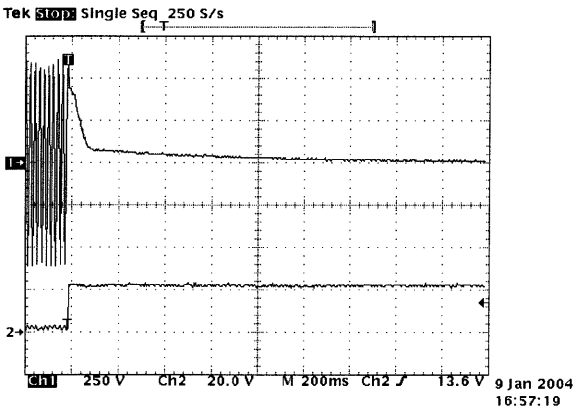
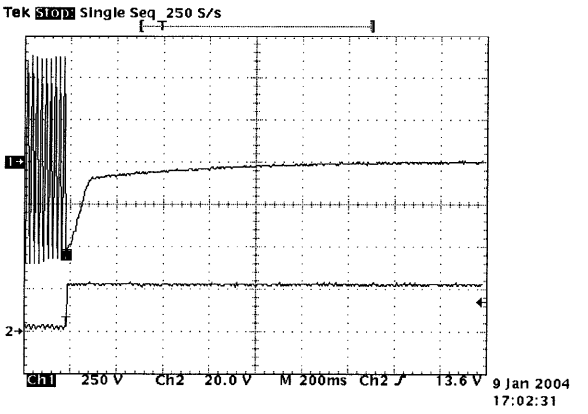


POS SW PWR SWITCH OFF

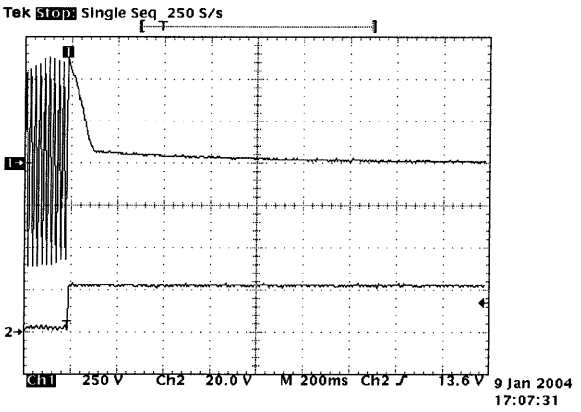


NEG SW PWR SWITCH OFF

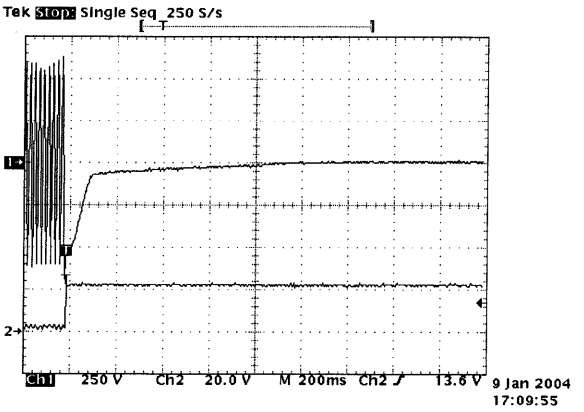
Oscilloscope Photographs
Line Cord Discharge Test

Symmetral LX

PHASE C TO PHASE A



POS SW PWR SWITCH ON



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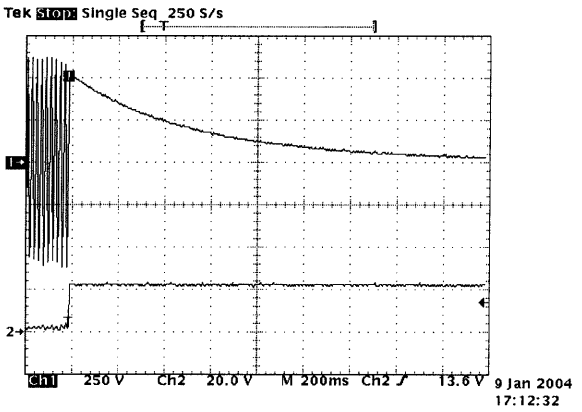
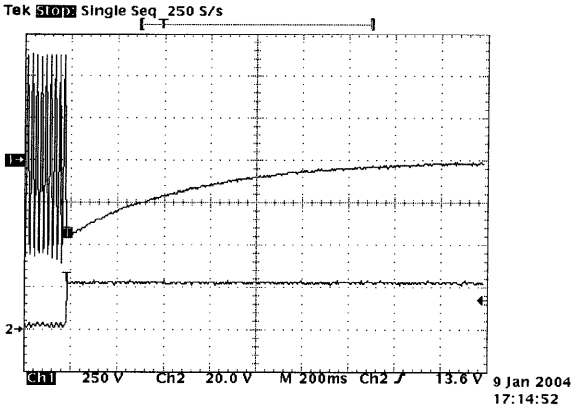
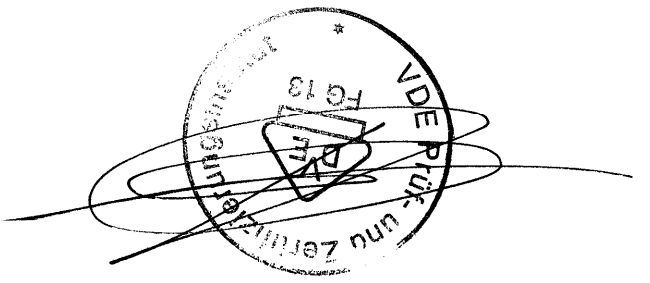


POS SW PWR SWITCH OFF



NEG SW PWR SWITCH OFF



OUTPUT OVERLOAD ABNORMAL TEST

Test A3: EN60950/EN50091, Clause 5.4.

Model **Model Symmetra LX *** was placed on a white tissue-paper covered surface, and a single layer of cheesecloth was loosely draped over it to determine if flaming particles escaped the enclosure. Immediately following the test, the unit was subjected to hipot testing to determine if insulation had been damaged.

The unit was connected to a 230 V, 50 Hz, 200 A supply, and was operating in its Normal mode, delivering maximum rated output power (230V , 11kW) into an adjustable load. After thermal stabilization was reached, the load was increased in 10% increments and held for 1/2 hour. Maximum loading was the point just before the ** A input overcurrent protector opened. The unit operated with maximum loading until temperatures of magnetic components stabilized.

Input with maximum output power (Normal Mode): 230 V, 58.5 A, 12.3kW

Output with maximum output power (Normal Mode): 229 V, 48.7 A, 11.17kW

For standby UPS's, the test was repeated with the unit operating on inverter. With the load reset to its normal value, a power failure was simulated. While operating on inverter, the load was adjusted for maximum VA, and maintained at maximum VA until low battery shutdown.

Output with maximum output power (Inverter Mode): 230V , 70A , 15.9kW

Note: unit shutdown at 70.2 Amps.

Inverter Mode Runtime: 2 minutes, 57 seconds

Emission of flaming or glowing material or molten metal?	[~~Yes~~] **[No]**
Enclosure deformed as to permit access to a hazard?	[~~Yes~~] **[No]**
Rupturing of battery case, or venting of a battery?	[~~Yes~~] **[No]**
2121 Vdc AC Input to Chassis Hipot:	**[Pass]** [~~Fail~~]
2121 Vdc AC Output to Chassis Hipot:	**[Pass]** [~~Fail~~]

Comments: * Represents Models SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI, SYAF16KXR9I

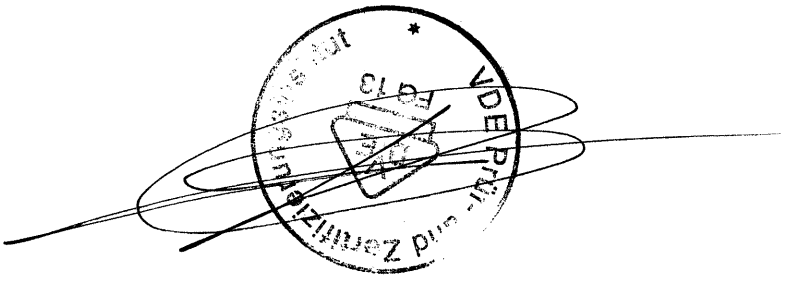
** Unit transferred to Bypass mode at 16.26kW (approx 141% of load). Satisfactory for a redundant system with 5 power modules

Equipment ID & Range: #1368 PM3000A Power Analyzer, #834 & 3317 Avtron Resistive Loads

Tested by: Stephen Lee Date Tested: 01/05/04 Report#: _____

Reviewed by: [P] [F]: _____ Data Sheet Rev 3 (10/29/97)

Hidden fileds from previous dB design:



Test A4: EN60950, Clause 5.4.

Model **Symmetra LX *** was connected to a 440V, 3 Ø, 50 Hz, 100A supply before the test circled below was conducted. The unit was placed on a white tissue-paper covered surface, and a single layer of cheesecloth was loosely draped over it to determine if flaming particles escaped the enclosure. Immediately following the test, the unit was subjected to hipot testing to determine if insulation had been damaged.

1. The unit was operating in its Normal mode when the AC Output was short circuited. The test was terminated in **4 Seconds** :
a. the branch circuit breaker opened.
b. the UPS's supplementary protector opened and was reset ten times.
c. the UPS's UL489/CSA#5 circuit breaker opened and was reset three times.
d. the automatic reset protector functioned so the test continued for 7 hours.
e. circuit was interrupted due to failure of components: _____
f. unit shut down (current limiting mode).
g. temperature of transformer stabilized at _____ °C.
h. low battery shutdown.

2. The unit was operating in its Inverter mode, with fully charged batteries, when the AC Output was shorted. The test was terminated in _____ hr:min:sec when:
a. the branch circuit breaker opened.
b. the UPS's supplementary protector opened and was reset ten times.
c. the UPS's UL489/CSA#5 circuit breaker opened and was reset three times.
d. the automatic reset protector functioned so the test continued for 7 hours.
e. circuit was interrupted due to failure of components: _____
f. unit shut down (current limiting mode).
g. temperature of transformer stabilized at _____ °C.
h. low battery shutdown.

3. The test was repeated with the unit operating in its Inverter mode, with fully charged batteries, when the DC battery circuit was short cicuited at a point immediately after the battery's fuse. This test was terminated [instantaneously] [in _____ hr:min:sec] when _____

Pass/Fail Criteria:

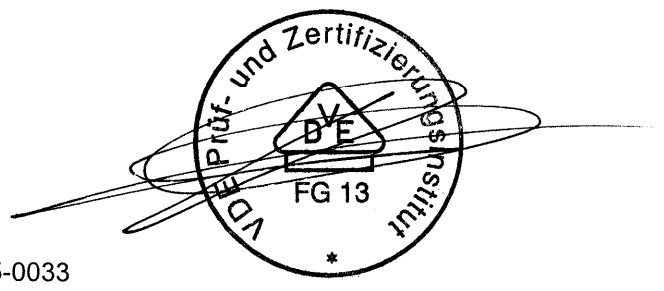
Emission of flaming or glowing material or molten metal?	[~~Yes~~] **[No]**
Enclosure deformed as to permit access to a hazard?	[~~Yes~~] **[No]**
Rupturing of battery case or venting of a battery?	[~~Yes~~] [~~No~~] **[N/A]**
2121 Vdc AC Input to Chassis Hipot:	**[Pass]** [~~Fail~~]
2121 Vdc AC Output to Chassis Hipot:	**[Pass]** [~~Fail~~]

Comments: *-Represents SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI, SYAF16KXR9I

Equipment ID & Range: _____

Tested by: Steve Lee Date Tested: _____ Report#: _____

Reviewed by: [P] [F]: _____ Data Sheet Rev 6 (6/19/98)



Test A4: EN60950, Clause 5.4.

Model **Symmetra LX *** was connected to a 440V, 3 Ø, 50 Hz, 100A supply before the test circled below was conducted. The unit was placed on a white tissue-paper covered surface, and a single layer of cheesecloth was loosely draped over it to determine if flaming particles escaped the enclosure. Immediately following the test, the unit was subjected to hipot testing to determine if insulation had been damaged.

1. The unit was operating in its Normal mode when the AC Output was short circuited. The test was terminated in _____:
a. the branch circuit breaker opened.
b. the UPS's supplementary protector opened and was reset ten times.
c. the UPS's UL489/CSA#5 circuit breaker opened and was reset three times.
d. the automatic reset protector functioned so the test continued for 7 hours.
e. circuit was interrupted due to failure of components: _____
f. unit shut down (current limiting mode).
g. temperature of transformer stabilized at _____ °C.
h. low battery shutdown.

2. The unit was operating in its Inverter mode, with fully charged batteries, when the AC Output was shorted. The test was terminated in **4 seconds** when:
a. the branch circuit breaker opened.
b. the UPS's supplementary protector opened and was reset ten times.
c. the UPS's UL489/CSA#5 circuit breaker opened and was reset three times.
d. the automatic reset protector functioned so the test continued for 7 hours.
e. circuit was interrupted due to failure of components: _____
f. unit shut down (current limiting mode).
g. temperature of transformer stabilized at _____ °C.
h. low battery shutdown.

3. The test was repeated with the unit operating in its Inverter mode, with fully charged batteries, when the DC battery circuit was short cicuited at a point immediately after the battery's fuse. This test was terminated [instantaneously] [in _____ hr:min:sec] when _____

Pass/Fail Criteria:

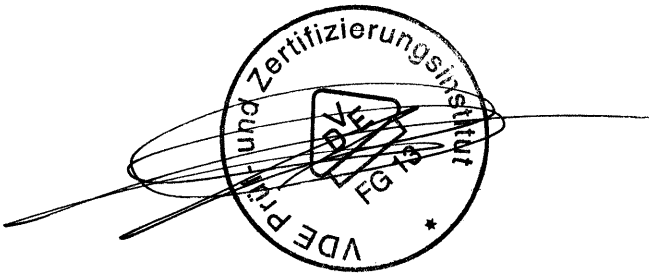
Emission of flaming or glowing material or molten metal?	[~~Yes~~] **[No]**
Enclosure deformed as to permit access to a hazard?	[~~Yes~~] **[No]**
Rupturing of battery case or venting of a battery?	[~~Yes~~] [~~No~~] **[N/A]**
2121 Vdc AC Input to Chassis Hipot:	**[Pass]** [~~Fail~~]
2121 Vdc AC Output to Chassis Hipot:	**[Pass]** [~~Fail~~]

Comments: *-Represents SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI, SYAF16KXR9I

Equipment ID & Range: _____

Tested by: Steve Lee Date Tested: _____ Report#: _____

Reviewed by: [P] [F]: _____ Data Sheet Rev 6 (6/19/98)



Test A4: EN60950, Clause 5.4.

Model **Symmetra LX *** was connected to a ____V, 50 Hz, 100A supply before the test circled below was conducted. The unit was placed on a white tissue-paper covered surface, and a single layer of cheesecloth was loosely draped over it to determine if flaming particles escaped the enclosure. Immediately following the test, the unit was subjected to hipot testing to determine if insulation had been damaged.

1. The unit was operating in its Normal mode when the AC Output was short circuited. The test was terminated in _____:
a. the branch circuit breaker opened.
b. the UPS's supplementary protector opened and was reset ten times.
c. the UPS's UL489/CSA#5 circuit breaker opened and was reset three times.
d. the automatic reset protector functioned so the test continued for 7 hours.
e. circuit was interrupted due to failure of components: _____
f. unit shut down (current limiting mode).
g. temperature of transformer stabilized at _____ °C.
h. low battery shutdown.

2. The unit was operating in its Inverter mode, with fully charged batteries, when the AC Output was shorted. The test was terminated in _____ hr:min:sec when:
a. the branch circuit breaker opened.
b. the UPS's supplementary protector opened and was reset ten times.
c. the UPS's UL489/CSA#5 circuit breaker opened and was reset three times.
d. the automatic reset protector functioned so the test continued for 7 hours.
e. circuit was interrupted due to failure of components: _____
f. unit shut down (current limiting mode).
g. temperature of transformer stabilized at _____ °C.
h. low battery shutdown.

3. The test was repeated with the unit operating in its Inverter mode, with fully charged batteries, when the DC battery circuit was short cicuited at a point immediately after the battery's fuse. This test was terminated [instantaneously] [in _____ hr:min:sec] when _____

Pass/Fail Criteria:

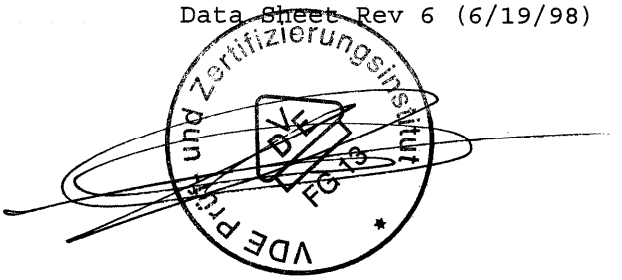
Emission of flaming or glowing material or molten metal?	[~~Yes~~] **[No]**
Enclosure deformed as to permit access to a hazard?	[~~Yes~~] **[No]**
Rupturing of battery case or venting of a battery?	[~~Yes~~] [~~No~~] **[N/A]**
2121 Vdc AC Input to Chassis Hipot:	**[Pass]** [~~Fail~~]
2121 Vdc AC Output to Chassis Hipot:	**[Pass]** [~~Fail~~]

Comments: *-Represents SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI, SYAF16KXR9I

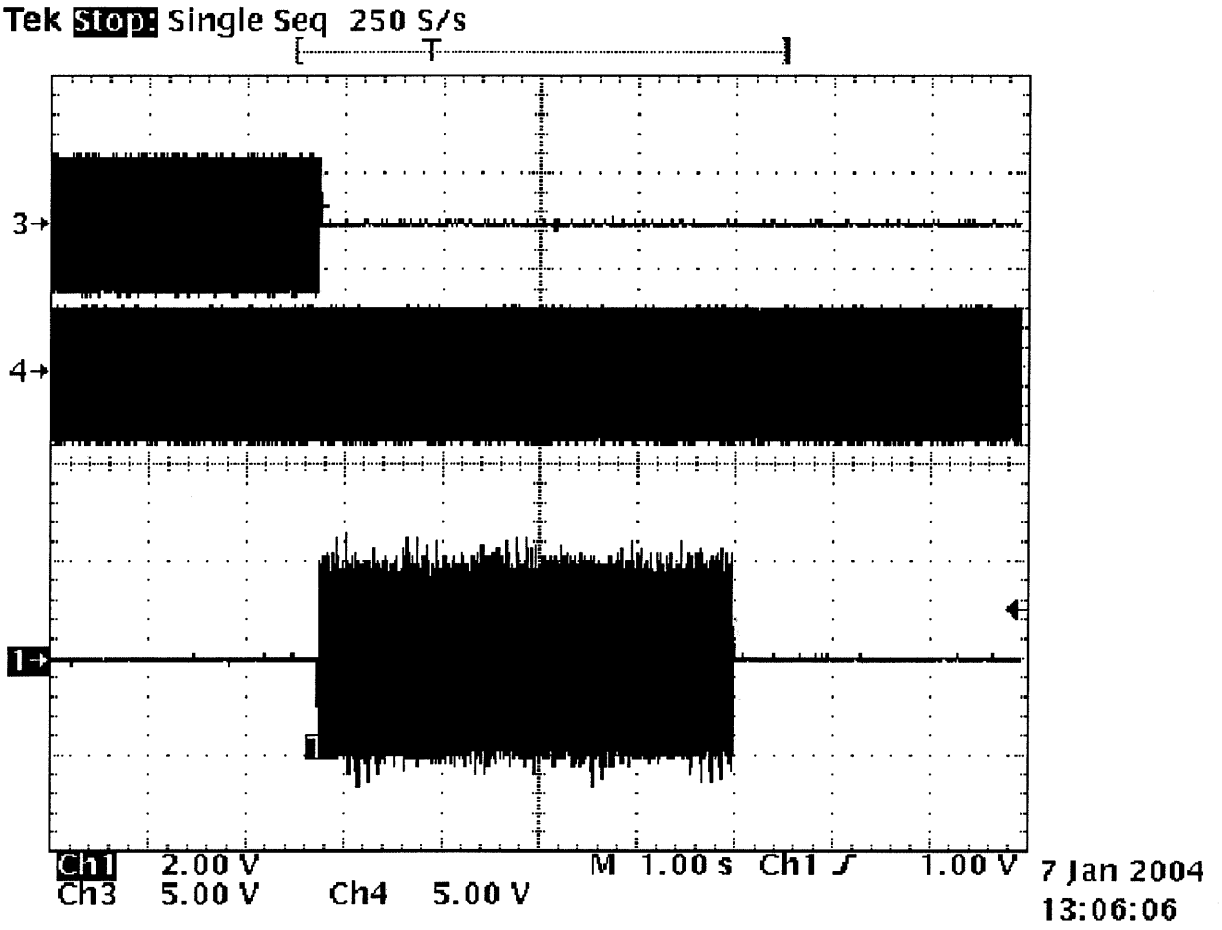
Equipment ID & Range: _____

Tested by: Steve Lee Date Tested: _____ Report#: _____

Reviewed by: [P] [F]: _____ Data Sheet Rev 6 (6/19/98)



Output Short Circuit Test (A4) Model: **Symmetra LX**

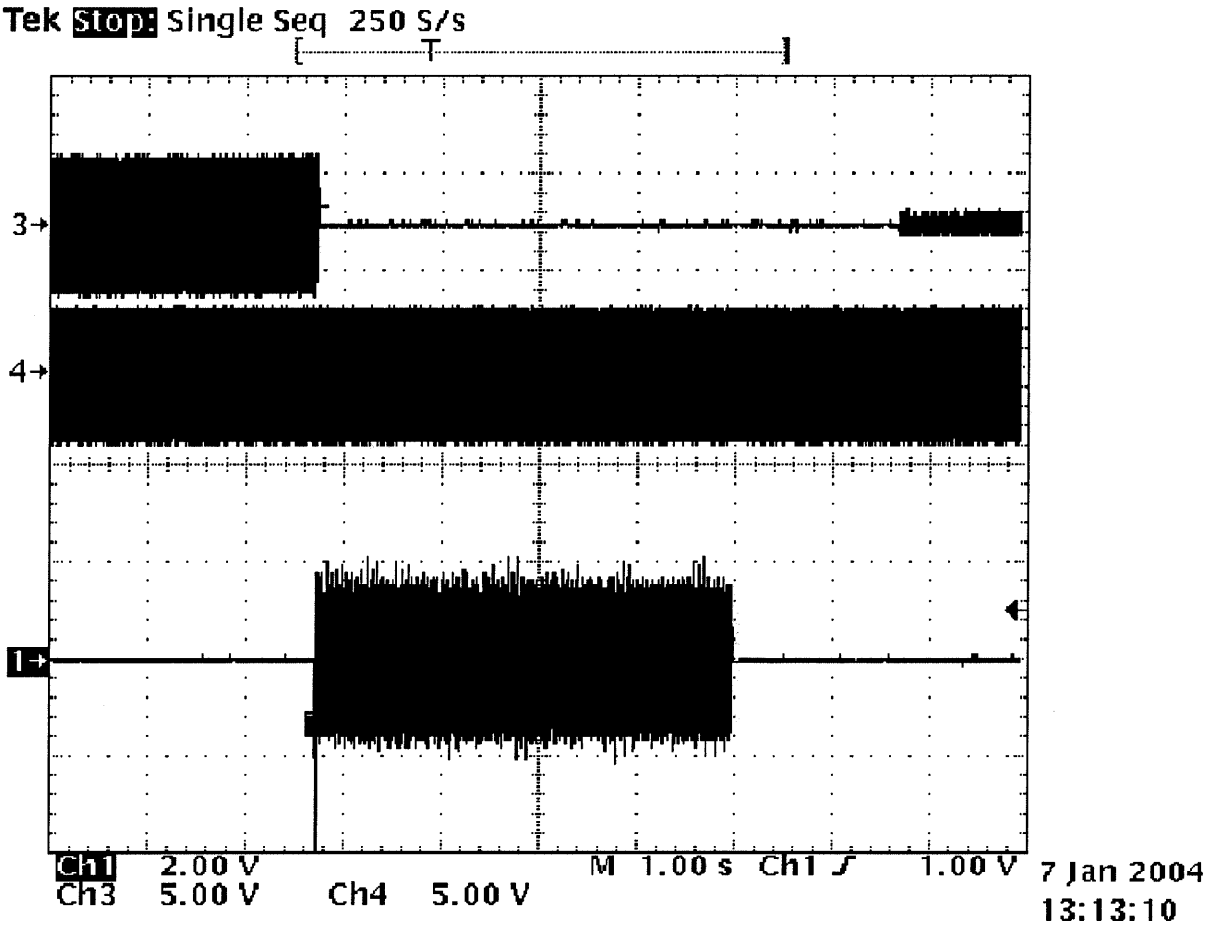


Output Short Circuit Abnormal Test
Online
5 Power Modules, 4 Battery Modules

Legend:

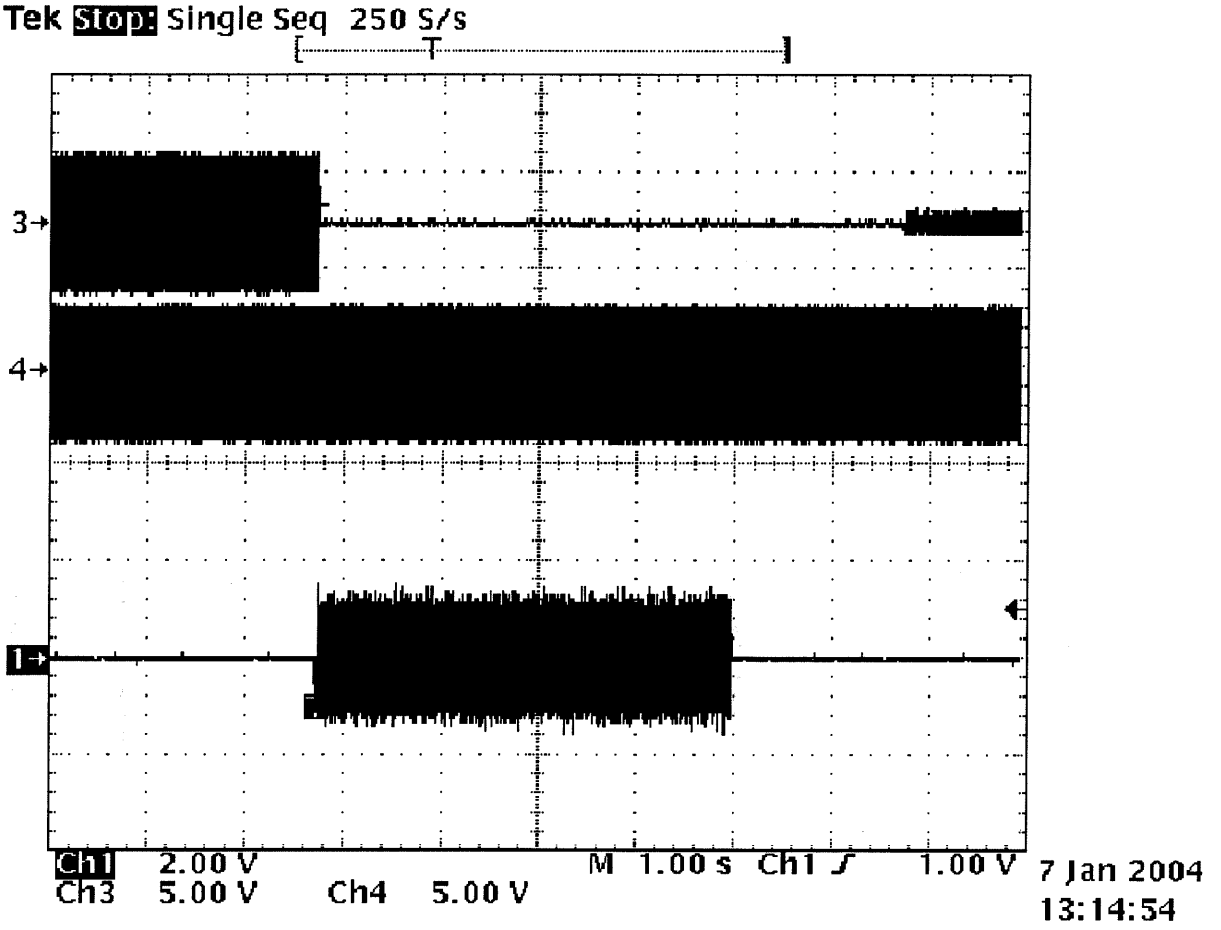
Voltage scale: 250 V/division
Channel 3 is output voltage (230 Vrms)
Channel 4 is input voltage (214 Vrms)
Channel 1 is output current: 200 A/division

Output Short Circuit Test (A4) Model: **Symmetra LX**



Output Short Circuit Abnormal Test
Online
4 Power Modules, 4 Battery Modules

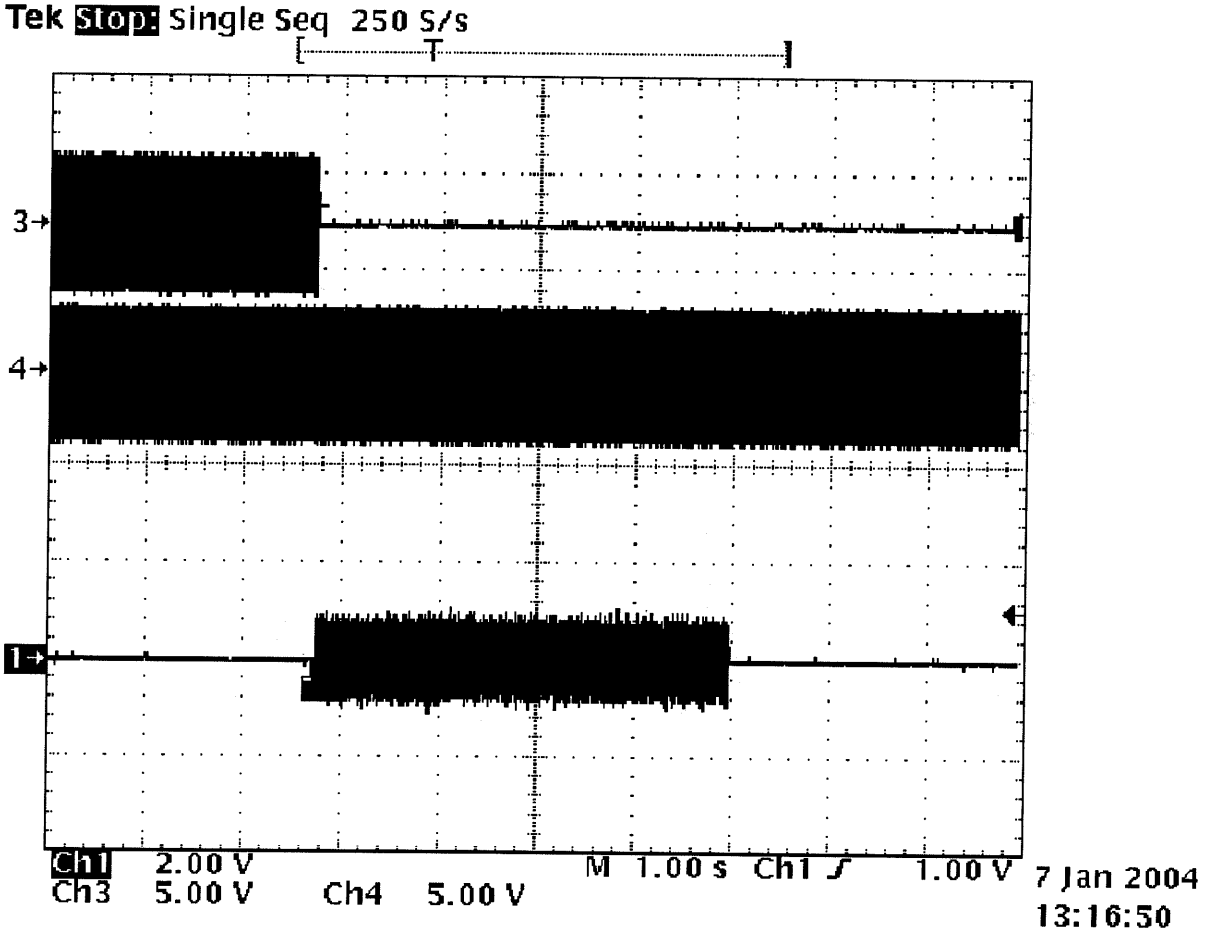
Output Short Circuit Test (A4) Model: **Symmetra LX**



Output Short Circuit Abnormal Test
Online
3 Power Modules, 3 Battery Modules

Output Short Circuit Test (A4)

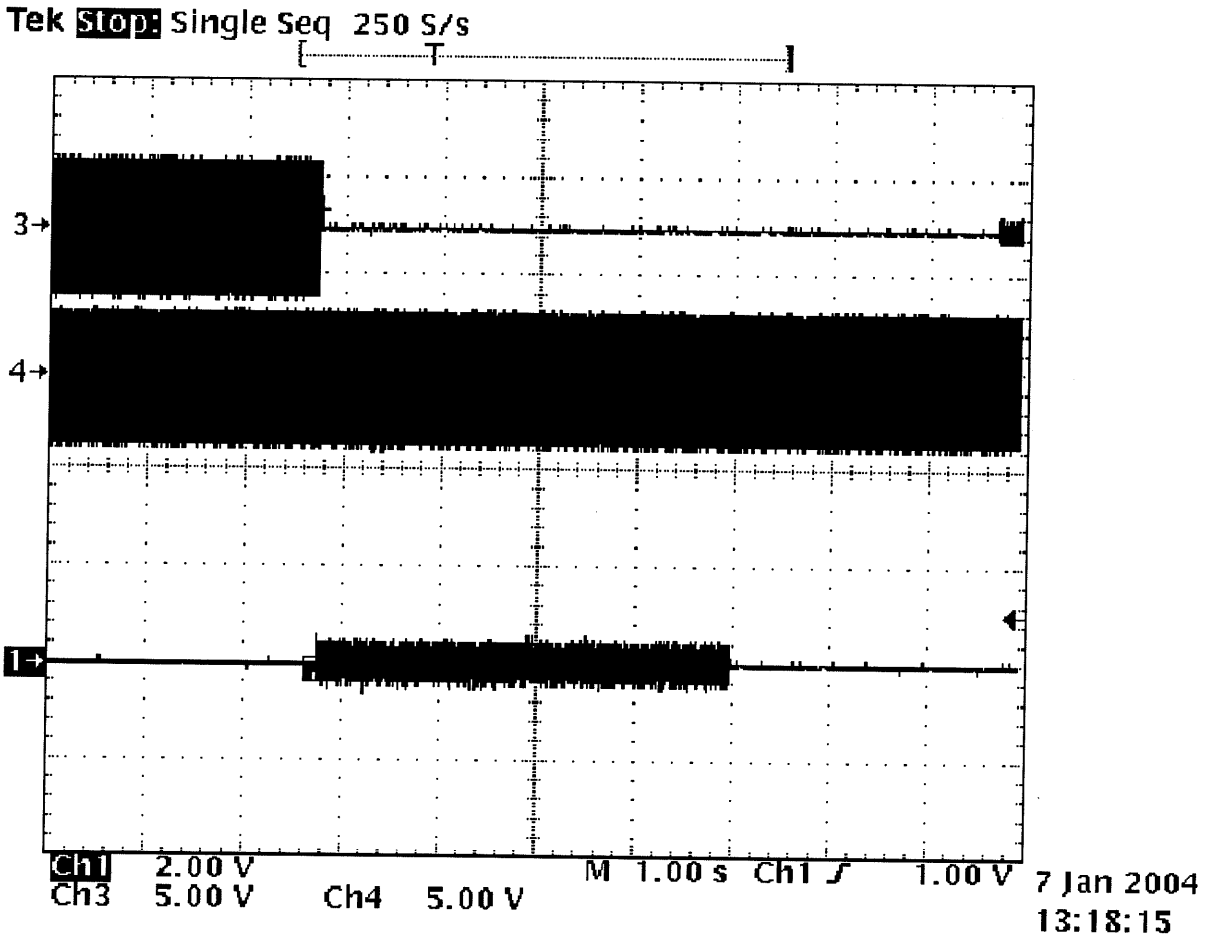
Model: **Symmetra LX**



Output Short Circuit Abnormal Test
Online
2 Power Modules, 2 Battery Modules

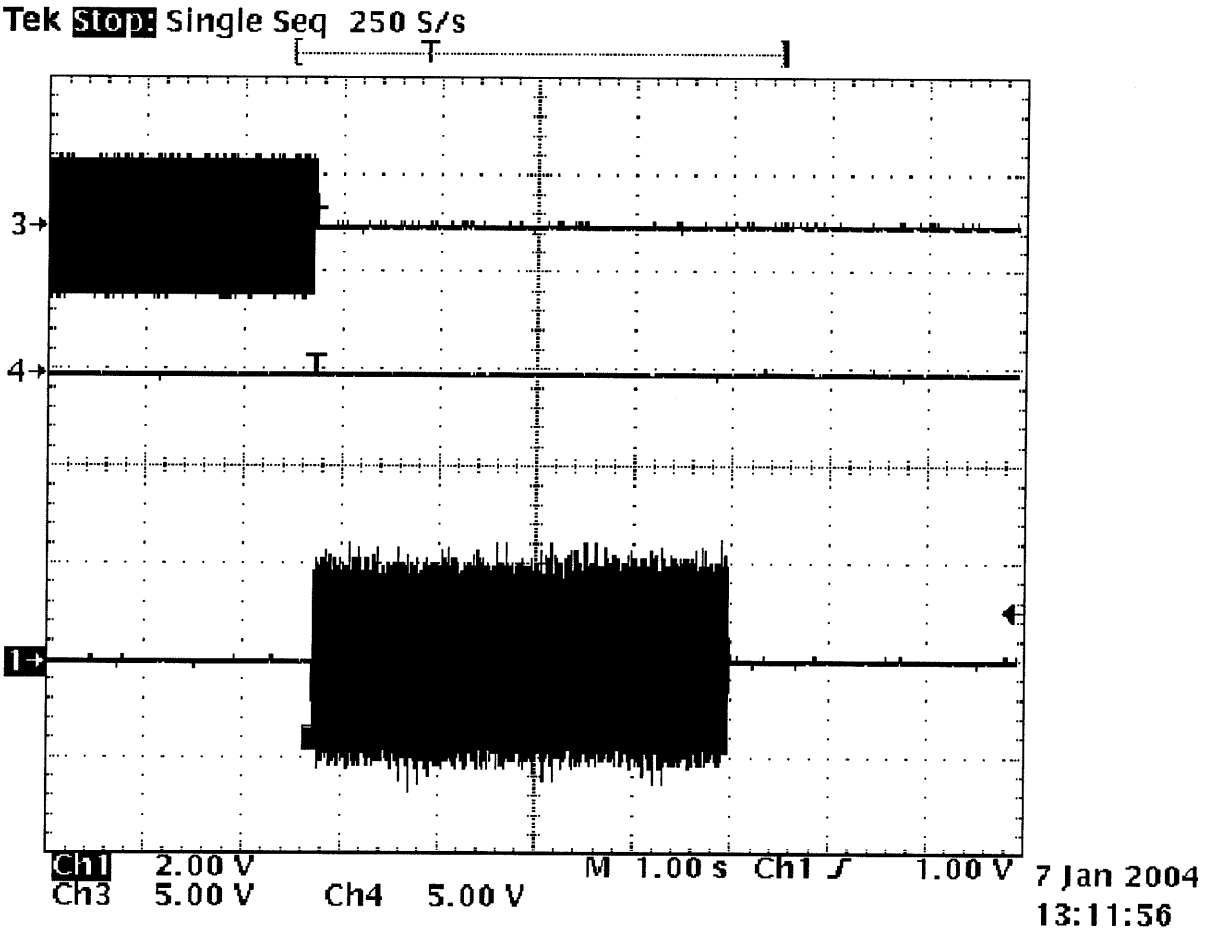
Output Short Circuit Test (A4)

Model: **Symmetra LX**

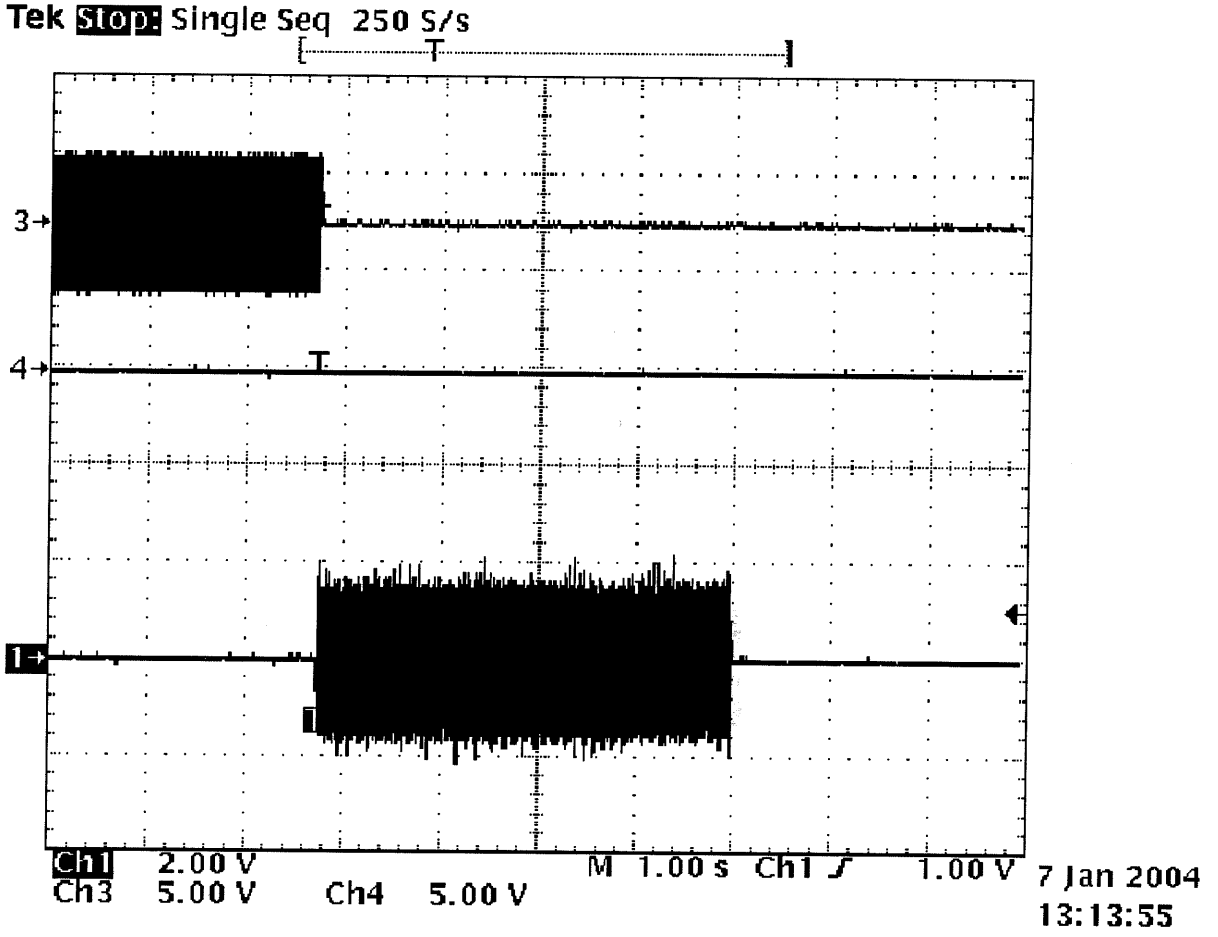


Output Short Circuit Abnormal Test
Online
1 Power Module, 2 Battery Modules

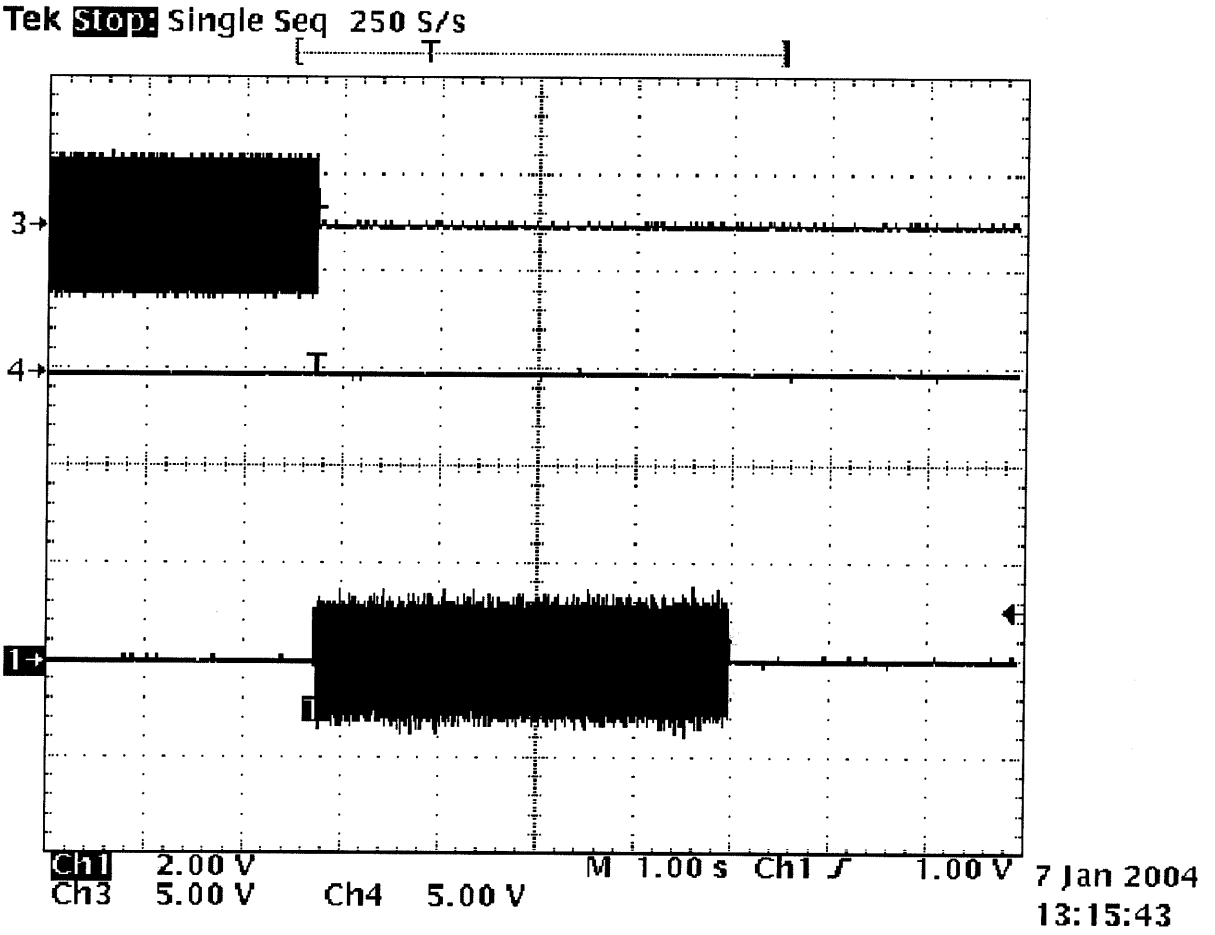
Output Short Circuit Test (A4) Model: **Symmetra LX**



Output Short Circuit Abnormal Test
On Battery
5 Power Modules, 4 Battery Modules

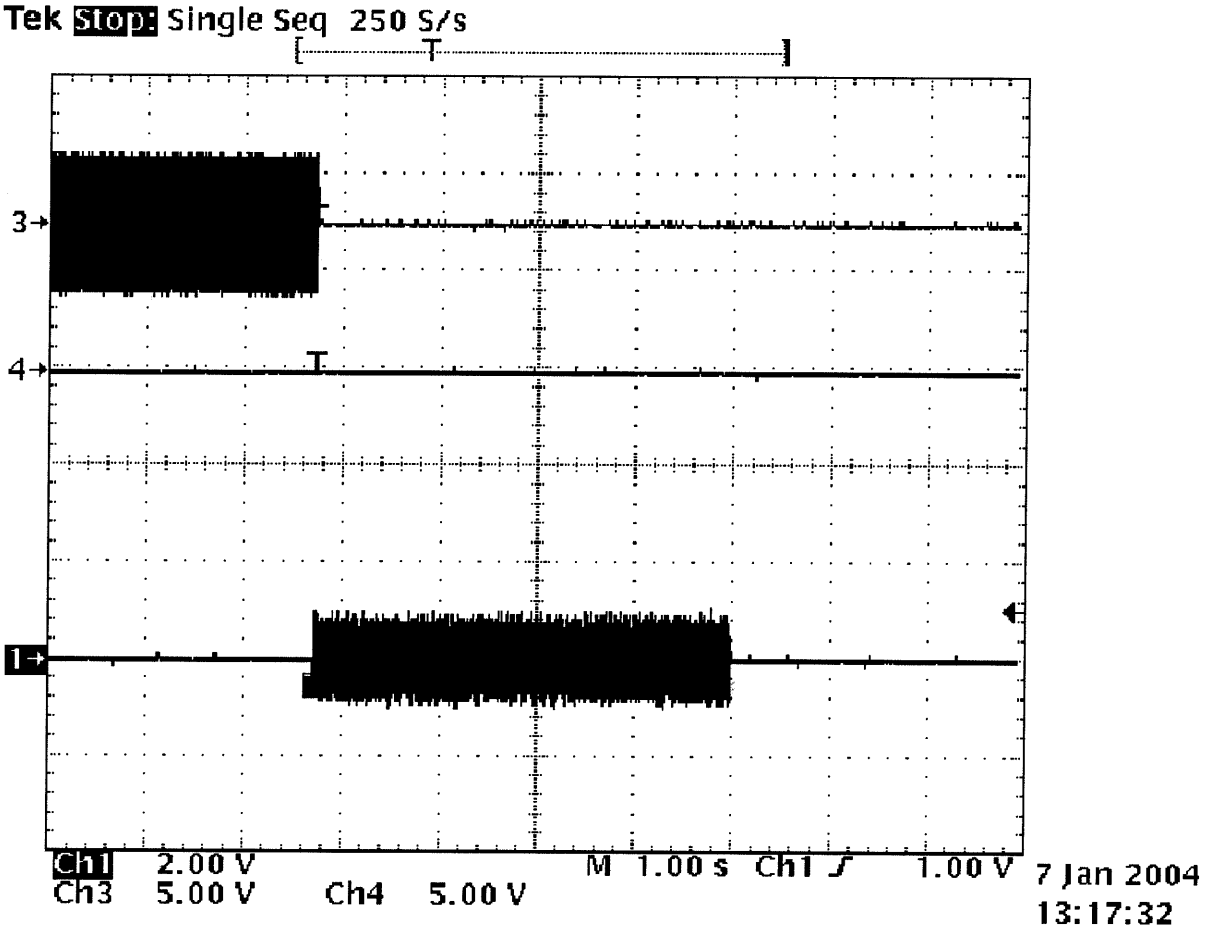


Output Short Circuit Abnormal Test
On Battery
4 Power Modules, 4 Battery Modules



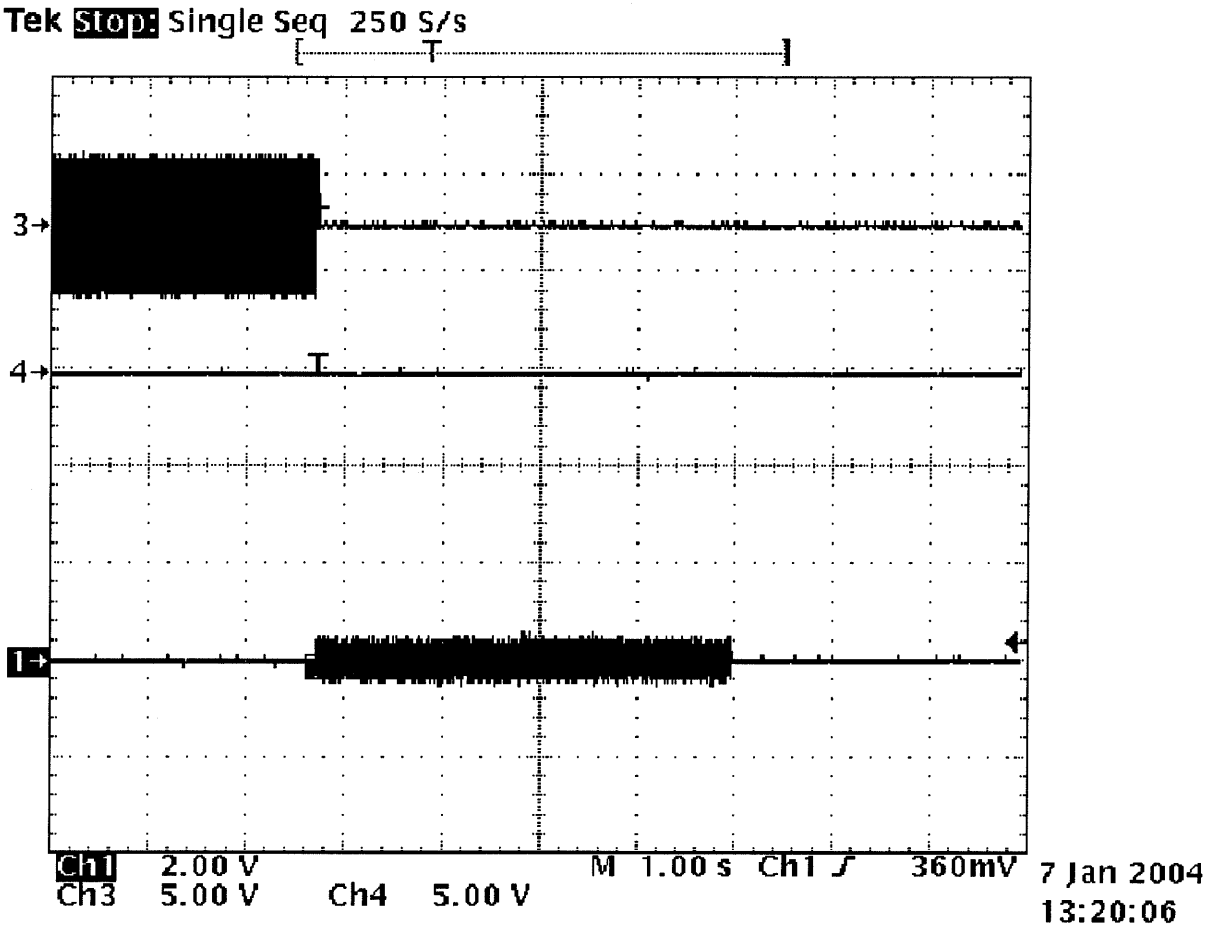
Output Short Circuit Abnormal Test
On Battery
3 Power Modules, 3 Battery Modules

Output Short Circuit Test (A4) Model: **Symmetra LX**



Output Short Circuit Abnormal Test
On Battery
2 Power Modules, 2 Battery Modules

Output Short Circuit Test (A4) Model: **Symmetra LX**



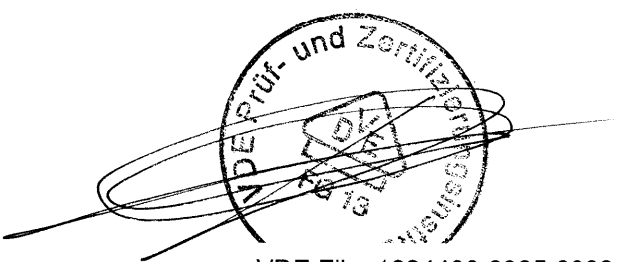
Output Short Circuit Abnormal Test
On Battery
1 Power Module, 2 Battery Modules

Test E4: EN 60950, Clause 5.1.

Model **SYAF16KI,SYAF16KRMI** was connected to a 440V, 3 Ø, 50 Hz source of supply and operated in the modes stated in the table below. Temperatures were monitored until thermal equilibrium. Maximum temperatures obtained during the test were measured by means of 30 AWG, Type K (chromel-alumel) thermocouples placed on the components.

Maximum Measured Temperature Rise (°C)

Thermocouple # and Location	Normal Mode	Discharge Mode	Recharge Mode
1. Room Ambient	29.5	28.8	26.7
2. IGBT Q11	8.5	8.8	10.4
3. IGBT Q16	14.7	15.2	16.5
4. IGBT Q12	14.5	14.8	16.2
5. Diode D24	12.2	12.6	13.8
6. Diode D14	7.6	19.9	13.4
7. Diode D15	9.1	25.8	14.5
8. IGBT Q2	0.5	0.9	1.6
9. IGBT Q4	7.2	24.5	14.5
10. IGBT Q7	6.2	39.4	15.8
11. Inductor L4	15.8	20.2	20.3
12. Inductor L5	19.0	22.7	22.2
13. Relay K2	17.1	25.6	24.3
14. Relay K1	17.1	26.1	24.1
15. MOV MV2	7.2	9.8	12.0
16. MOV MV3	7.2	9.6	11.8
17. Capacitor C7	8.1	13.5	15.6
18. Capacitor C11	7.8	14.6	16.7
19. Capacitor C27	13.4	13.8	16.5
PFC Control Board			
20. Inductor L100	17.3	34.8	59.3
21. Transformer T101	23.2	41.8	60.2
22. FET Q104	17.4	25.9	30.2
Power Module			
23. Int. Ambient, Battery/PCB	6.9	13.0	15.1
Ac Tray			
24. Circuit Breaker 100A	5.9	6.6	8.1
25. Comm. Mode Inductor L1	9.0	9.6	11.6
26. Bypass Contactor	7.0	7.7	9.1
27. Capacitor C8	7.7	8.3	10.4
28. MOV MV1	7.2	7.8	9.5
Power Module			
29. Int. Amb. Above L5	3.1	15.8	17.4
PFC Control Board			
30. Resistor R100	17.4	15.2	19.3



Model **SYAF16KI,SYAF16KRMI**

	Maximum Measured Temperature Rise (°C)		
Thermocouple # and Location	Normal Mode	Discharge Mode	Recharge Mode
Power Module			
31. Int. Amb. Above C6	2.9	5.5	5.9
PFC Control Board			
32. Diode D126	16.5	25.6	28.4

Pass/Fail Criteria (excluding abnormal results):

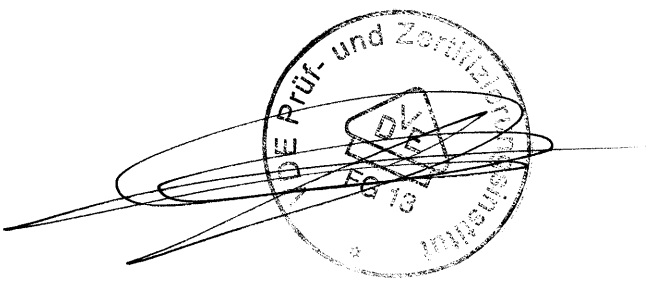
1. XFMR & inductor insulation of products with a specified ambient of 40°C shall be limited to the following temperature rises (measured temp - measured ambient): Class A(105), 50°C; Class B(130), 70°C; Class F(155), 90°C; Class H(180), 115°C; Class N(200), 125°C; Class R(220), 140°C.
2. Components such as caps & PC Boards are limited to the components specified rating minus the difference between the UUT's specified ambient and room ambient.
3. External surfaces are limited to the following temperature rises:
   - Carrying handles or knobs: 25 if metal; 35 if non-metallic.
   - Handles or knobs that are contacted but do not involve lifting or carrying: 35 if metal; 45 if glass or porcelain; 60 if plastic or rubber.
   - External surfaces which may be touched: 45 if metal; 55 if glass or porcelain; 70 if plastic or rubber.

Comments: _____

Equipment ID & Range: Power Analyzer #1368,Agilent #3212, DMM # 2425, #231

Tested by: Steve Lee Date Tested: 12 Dec. 03 Report#: _____

Reviewed by: [P] [F]: _____ Data Sheet Rev 3 (5/27/03)

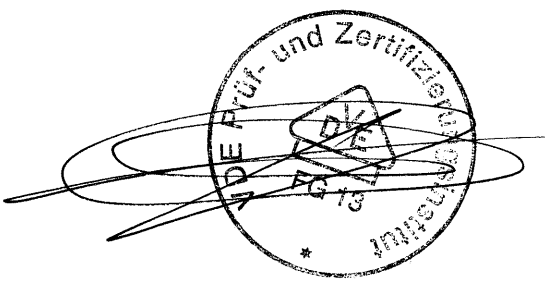


Test E4: EN 60950, Clause 5.1.

Model **SYAF16KI,SYAF16KRMI** was connected to a 440V, 3 Ø, 50 Hz source of supply and operated in the modes stated in the table below. Temperatures were monitored until thermal equilibrium. Maximum temperatures obtained during the test were measured by means of 30 AWG, Type K (chromel-alumel) thermocouples placed on the components.

Maximum Measured Temperature Rise (°C)

Thermocouple # and Location	Normal Mode	Discharge Mode	Recharge Mode
1. Room Ambient	27.0	25.7	22.0
2. IGBT Q11	11.7	10.7	15.5
3. IGBT Q16	17.4	16.5	21.5
4. IGBT Q12	17.2	16.1	21.1
5. Diode D24	15.1	14.1	19.0
6. Diode D14	10.3	21.1	17.5
7. Diode D15	11.6	27.0	18.7
8. IGBT Q2	2.5	2.5	6.1
9. IGBT Q4	9.8	26.0	19.2
10. IGBT Q7	8.8	41.1	20.9
11. Inductor L4	18.5	21.6	24.0
12. Inductor L5	21.6	24.0	26.4
13. Relay K2	19.7	27.1	31.1
14. Relay K1	19.8	27.5	31.3
15. MOV MV2	9.9	10.3	14.3
16. MOV MV3	9.8	10.1	14.3
17. Capacitor C7	10.7	14.5	18.5
18. Capacitor C11	10.5	16.0	20.0
19. Capacitor C27	15.6	14.6	20.6
PFC Control Board			
20. Inductor L100	20.0	36.5	64.0
21. Transformer T101	26.5	44.0	66.0
22. FET Q104	20.2	27.3	35.1
Power Module			
23. Int. Ambient, Battery/PCB	9.8	8.5	12.7
Ac Tray			
24. Circuit Breaker 100A	7.8	8.4	12.6
25. Comm. Mode Inductor L1	10.9	11.4	16.2
26. Bypass Contactor	9.4	9.4	14.0
27. Capacitor C8	10.3	10.1	15.2
28. MOV MV1	9.3	9.7	14.2
Power Module			
29. Int. Amb. Above L5	6.0	17.8	21.8
Battery Tray			
30. Battery, Middle 2 Rear Battery.	7.5	12.8	21.4
31. Battery Pack Top Rear Battery	6.2	13.8	26.1
PFC Control Board			
32. Resistor R100	6.6	17.1	23.5



Model **SYAF16KI,SYAF16KRMI**

Thermocouple # and Location	Maximum Measured Temperature Rise (°C) Normal Mode	Discharge Mode	Recharge Mode
33. Capacitor C6	9.8	8.5	15.5
Power Module			
34. Int. Amb. Above C6	6.2	6.3	10.2
PFC Control Board			
35. Diode D126	19.3	27.6	33.4

Pass/Fail Criteria (excluding abnormal results):

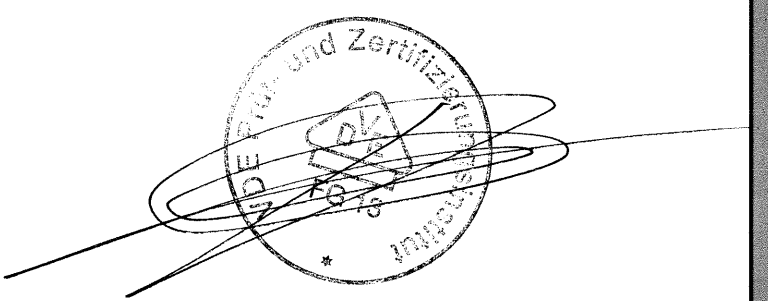
1. XFMR & inductor insulation of products with a specified ambient of 40°C shall be limited to the following temperature rises (measured temp - measured ambient): Class A(105), 50°C; Class B(130), 70°C; Class F(155), 90°C; Class H(180), 115°C; Class N(200), 125°C; Class R(220), 140°C.
2. Components such as caps & PC Boards are limited to the component's specified rating minus the difference between the UUT's specified ambient and room ambient.
3. External surfaces are limited to the following temperature rises:
   - Carrying handles or knobs: 25 if metal; 35 if non-metallic.
   - Handles or knobs that are contacted but do not involve lifting or carrying: 35 if metal; 45 if glass or porcelain; 60 if plastic or rubber.
   - External surfaces which may be touched: 45 if metal; 55 if glass or porcelain; 70 if plastic or rubber.

Comments: _____

Equipment ID & Range: Power Analyzer #1368,Agilent #3212, DMM # 2425, #231

Tested by: Steve Lee Date Tested: 12 Dec. 03 Report#: _____

Reviewed by: [P] [F]: _____ Data Sheet Rev 3 (5/27/03)



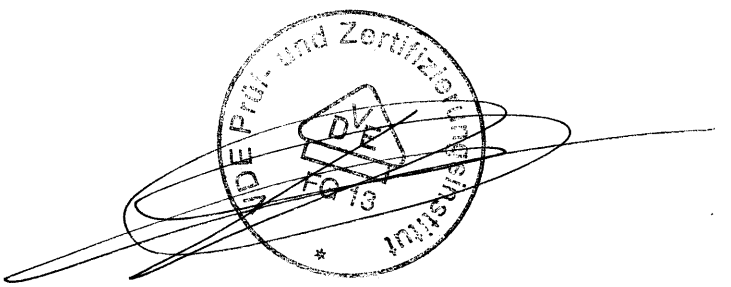
VDE File: 1924400-3335-0033
CB / DE 1 - 30646

Test E4: EN 60950, Clause 5.1.

Model **SYAF16KI,SYAF16KRMI** was connected to a 440V, 3 Ø, 50 Hz source of supply and operated in the modes stated in the table below. Temperatures were monitored until thermal equilibrium. Maximum temperatures obtained during the test were measured by means of 30 AWG, Type K (chromel-alumel) thermocouples placed on the components.

Maximum Measured Temperature Rise (°C)

Thermocouple # and Location	Normal Mode	Discharge Mode	Recharge Mode
1. Room Ambient	27.5	28.3	27.1
2. IGBT Q11	10.8	10.8	8.8
3. IGBT Q16	16.8	16.9	10.5
4. IGBT Q12	16.4	14.4	9.7
5. Diode D24	14.3	22.3	10.4
6. Diode D14	13.0	28.4	14.4
7. Diode D15	15.2	1.4	15.5
8. IGBT Q2	1.8	27.6	2.0
9. IGBT Q4	14.0	41.8	15.6
10. IGBT Q7	11.6	23.1	17.0
11. Inductor L4	19.8	25.4	21.8
12. Inductor L5	23.0	27.5	23.5
13. Relay K2	20.2	28.3	25.2
14. Relay K1	20.5	11.8	25.3
15. MOV MV2	10.4	11.7	13.1
16. MOV MV3	10.2	15.3	13.0
17. Capacitor C7	11.6	16.7	15.9
18. Capacitor C11	11.5	15.3	17.6
19. Capacitor C27	18.9	16.7	17.2
PFC Control Board			
20. Inductor L100	20.1	37.0	51.1
21. Transformer T101	26.5	43.4	55.9
22. FET Q104	20.3	28.1	35.9
Power Module			
23. Int. Ambient, Battery/PCB	6.8	10.0	11.2
Battery Tray			
24. Battery Rear Left Side	6.2	14.1	15.1
Ac Tray			
25. Circuit Breaker 100A	7.8	7.8	8.4
26. Comm. Mode Inductor L1	11.9	11.3	9.9
27. Bypass Contactor	8.6	8.3	8.6
28. Capacitor C8	9.3	8.8	9.2
29. MOV MV1	9.6	9.0	
Power Module			
30. Int. Amb. Above L5	16.9	19.9	17.0
PFC Control Board			
31. Resistor R100	6.1	14.1	15.1



Model **SYAF16KI,SYAF16KRMI**

Thermocouple # and Location	Maximum Measured Temperature Rise (°C) Normal Mode	Discharge Mode	Recharge Mode
Power Module			
32. Int. Amb. Above C6	4.5	12.0	12.8
PFC Control Board			
33. Diode D126	14.6	28.3	34.6

Pass/Fail Criteria (excluding abnormal results):

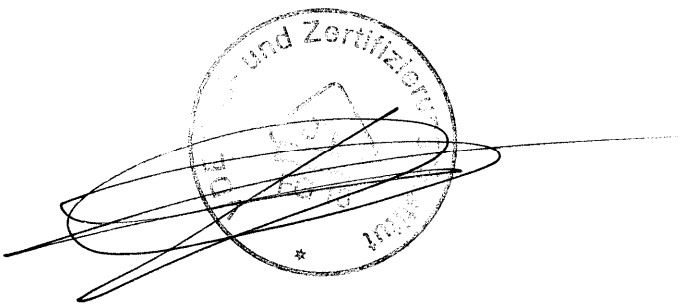
1. XFMR & inductor insulation of products with a specified ambient of 40°C shall be limited to the following temperature rises (measured temp - measured ambient): Class A(105), 50°C; Class B(130), 70°C; Class F(155), 90°C; Class H(180), 115°C; Class N(200), 125°C; Class R(220), 140°C.
2. Components such as caps & PC Boards are limited to the component's specified rating minus the difference between the UUT's specified ambient and room ambient.
3. External surfaces are limited to the following temperature rises:
   - Carrying handles or knobs: 25 if metal; 35 if non-metallic.
   - Handles or knobs that are contacted but do not involve lifting or carrying: 35 if metal; 45 if glass or porcelain; 60 if plastic or rubber.
   - External surfaces which may be touched: 45 if metal; 55 if glass or porcelain; 70 if plastic or rubber.

Comments: _____

Equipment ID & Range: Power Analyzer #1368,Agilent #3212, DMM # 2425, #231

Tested by: Steve Lee Date Tested: 12 Dec 03 Report#: _____

Reviewed by: [P] [F]: _____ Data Sheet Rev 3 (5/27/03)



Test E4: EN 60950, Clause 5.1.

Model **SYAF16KI,SYAF16KRMI** was connected to a 440V, 3 Ø, 50 Hz source of supply and operated in the modes stated in the table below. Temperatures were monitored until thermal equilibrium. Maximum temperatures obtained during the test were measured by means of 30 AWG, Type K (chromel-alumel) thermocouples placed on the components.

Maximum Measured Temperature Rise (°C)

Thermocouple # and Location	Normal Mode	Discharge Mode	Recharge Mode
1. Chamber Ambient	40.17	40.2	40.13
2. Battery Ambient	8.3	22.8	21.4
3. Battery Fuse	8.2	61.6	63.2
4. Battery, Rear, Middle	6.1	9.7	14.7
5. Battery, Rear, Left	6.7	13.5	14.7
6. Battery, Rear, Top	7.6	10.6	13.3
7. Battery, Front	4.2	6.7	8.4
8. Battery, Front, Top	6.1	9.4	12.2

Pass/Fail Criteria (excluding abnormal results):

1. XFMR & inductor insulation of products with a specified ambient of 40°C shall be limited to the following temperature rises (measured temp - measured ambient): Class A(105), 50°C; Class B(130), 70°C; Class F(155), 90°C; Class H(180), 115°C; Class N(200), 125°C; Class R(220), 140°C.
2. Components such as caps & PC Boards are limited to the component's specified rating minus the difference between the UUT's specified ambient and room ambient.
3. External surfaces are limited to the following temperature rises:
   - Carrying handles or knobs: 25 if metal; 35 if non-metallic.
   - Handles or knobs that are contacted but do not involve lifting or carrying: 35 if metal; 45 if glass or porcelain; 60 if plastic or rubber.
   - External surfaces which may be touched: 45 if metal; 55 if glass or porcelain; 70 if plastic or rubber.

Comments: _____

Equipment ID & Range: Power Analyzer #1368,Agilent #3212, DMM # 2425, #231

Tested by: Rick Everett Date Tested: 24,25,26 Feb 04 Report#: _____

Reviewed by: [P] [F]: _____ Data Sheet Rev 3 (5/27/03)

TEST REPORT
IEC 146-4 (1986) 1st Edition,

Product name:	Uninterruptible Power Supply (UPS)
Model/Type:	Symmetra LX (See model matrix)
Trademark:	APC
Serial no.:	---
Name and address of the Applicant:	see IEC 60950 Test Report
Name and address of the Responsible Organization:	see IEC 60950 Test Report
Name and address of the Factory:	see IEC 60950 Test Report

	RESULTS			
	PASS	FAIL	N/A	ENCL.
The equipment complies with the publication	[X]	[ ]	[ ]	[ ]
National deviations:	[ ]	[ ]	[X]	[ ]
Other requirements:	[ ]	[ ]	[X]	[ ]

Name and address of the testing laboratory: VDE Testing and Certification Institute
APC, 85 Rangeway Road, N. Billerica,MA USA
SMP (TDAP) under File #19244-9501-0001

Tested by: _____ 01.03.04
signature Frank Richter date

Reviewed by: _____ 01.03 - 2004
signature date

EXPLANATIONS FOR ABBREVIATIONS OF THE RESULT COLUMN:

FACTORY LOCATIONS

1. American Power Conversion (APC)
- A - Breaffy Industrial Centre, Breaffy Road, Castlebar Co Mayo, Rep. Of Ireland
2.
3.
4.

7. TESTS FOR UPS

		RESULTS			
		PASS	FAIL	N/A	ENCL.
7.4	Test Specifications	[X]	[ ]	[ ]	[ ]
7.4.1	Interconnection Cable Check	[ ]	[ ]	[X]	[ ]
7.4.2	Light Load Test	[X]	[ ]	[ ]	[ ]
7.4.3	Checking of Auxiliary Devices	[ ]	[ ]	[X]	[ ]
7.4.4	Synchronization Tests	[ ]	[ ]	[X]	[ ]
7.4.5	AC Input Failure Test	[X]	[ ]	[ ]	[ ]
7.4.6	AC Input Return Test	[X]	[ ]	[ ]	[ ]
7.4.7	Simulation of Parallel Redundant UPS Fault	[ ]	[ ]	[X]	[ ]
7.4.8	Transfer Test	[X]	[ ]	[ ]	[ ]
7.4.9	Full Load Test	[X]	[ ]	[ ]	[ ]
7.4.10	UPS Efficiency	[X]	[ ]	[ ]	[X]

Comments:

7.4	Equipment tested per manufacturer's instructions
7.4.2	Functional test done. No problems
7.4.5/7.4.6	See EN50091 Test Report
7.4.9	See EN50091 Test Report Heating Test

7. TESTS FOR UPS (con't)

		RESULTS			
		PASS	FAIL	N/A	ENCL.
7.4.11	Unbalanced Load Test	[ ]	[ ]	[X]	[ ]
7.4.12	Output Voltage Unbalance	[ ]	[ ]	[X]	[ ]
7.4.13	Actual Load Test	[X]	[ ]	[ ]	[ ]
7.4.14	Current Division in Parallel UPS	[ ]	[ ]	[X]	[ ]
7.4.15	Rated Stored Energy Time (Battery Test)	[X]	[ ]	[ ]	[X]
7.4.16	Rated Restored Energy Time	[X]	[ ]	[ ]	[ ]
7.4.17	Battery Ripple Current	[ ]	[ ]	[X]	[ ]
7.4.18	On-Site Ventilation Test	[ ]	[ ]	[X]	[ ]
7.4.19	Overload Capability Test	[X]	[ ]	[ ]	[ ]
7.4.20	Short-Circuit Current Capability	[ ]	[ ]	[X]	[ ]

Comments:

7.4.13 See EN50091 Heating Test
7.4.15 See EN50091 Heating Test and attached Performance Test Data
7.4.19 Tested at +6%, 10% rated voltage
7.4.20 Not Specified

7. TESTS FOR UPS (con't)

		RESULTS			
		PASS	FAIL	N/A	ENCL.
7.4.21	Short Circuit Fuse Test	[ ]	[ ]	[X]	[ ]
7.4.22	Restart	[X]	[ ]	[ ]	[ ]
7.4.23	Output Overvoltage	[ ]	[ ]	[X]	[ ]
7.4.24	Parallel Output Voltage Modulation	[ ]	[ ]	[X]	[ ]
7.4.25	Frequency Modulation	[X]	[ ]	[ ]	[ ]
7.4.26	Radio Freq. Interference & Conducted Noise	[X]	[ ]	[ ]	[ ]
7.4.27	Harmonic Components	[ ]	[ ]	[X]	[ ]
7.4.28	Audible Noise	[ ]	[ ]	[X]	[ ]
7.4.29	Earth Fault Test	[X]	[ ]	[ ]	[ ]
7.4.30	Additional Tests	[ ]	[ ]	[X]	[ ]

Comments:

7.4.21 Not Specified

7.4.26 Test Data provided

7.4.29 See Test data results. No Hazard

DVT REPORT

Revision: 19

Test Status: Done - Pending Review

Created on Date: 06/20/2003

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

GENERAL TEST INFORMATION:

Test Title: Efficiency	**Test Group:**
Test Category: Electrical Performance	**Test Setup:** Both On-Line and On-Battery
Division: DATA CENTER SOLUTIONS	**Test Type:** Output Characteristics
Platform: Smart-UPS	**Program:** Polar Bear
SKU's: SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI	**Program Subset:** System
Sequence by Group:	**DVT Engineer:** Scott Derushia
Test Planned Time (in hours):	
Applicable Standards: Unit specification	

TEST METHOD

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

Test Objective: Determine inverter (on-battery) efficiency at 10%, 25%, 50%, 80% and 100% of rated watt loads at battery capacities of 90% and 20% (or equivalent battery voltages as close as possible). Determine on-line efficiency at 10%, 25%, 50%, 80% and 100% of rated watt loads at maximum and minimum battery charging conditions. Determine power dissipated on-battery and on-line and in BTU/hr.

Test Equipment (use the following equipment or equivalent): DVT rack (test computer, AC source, power meter, full rated watt load, voltmeter) or equivalent; current shunt; RUNTIME DVT software; extra internal battery packs (optional)

Setup:

- Connect the UUT to the DVT rack.
  - If applicable, initialize the RUNTIME DVT software or applicable data acquisition software on test computer.
  - Connect UUT input to AC source. Set to UUT's nominal input AC voltage.
  - Place power meter connections as close as possible to the UUT's input and output.
  - Set load to full rated watt load.
  - Continuously measure battery current, using a current shunt, and battery voltage via voltmeter.
- For XL, use internal batteries only for all steps.

Procedure:

1. Start the RUNTIME DVT software
   - Setup for a full discharge.
2. Perform a full discharge with batteries fully charged to low battery shutdown.
   - Batteries fully charged is defined as input power minus output power equals the tare loss for the UUT
3. Graph for the discharge on-battery efficiency versus battery capacity (UPS-Link "f"). Curve fit the data points.
   - On-battery efficiency is defined as 100 multiplied by output power over battery power . Battery power which is the power produced by the battery (multiply battery current and battery voltage). Output power is the power consumed by the load.

4. Place UUT on-line. With UUT now under maximum charging conditions (input AC voltage applied to UUT after low battery shutdown), measure and record input and output power.
5. Recharge (or replace) batteries of UUT so they are at full capacity and place the UUT on-line. With UUT now under minimum charging conditions (batteries fully charged), record input and output power.
6. Repeat steps# 2 through 5 for the rest of the required loads.
7. Graph at 20% and 90% battery capacities (or as close as possible) on-battery efficiency versus load . Curve fit the data points. Include actual battery capacities in graph title.
   - Obtain on-battery efficiency from each discharge graph (from step# 3) at two points only, 20% and 90% battery capacities.
8. Graph at 20% and 90% battery capacities power dissipated in BTU/hr versus load . Curve fit the data points.
   - Obtain battery and output power from each discharge the data used to calculate on-battery efficiency in step# 3 at two points only, 20% and 90% battery capacities.
   - Power dissipated is derived from the power difference (battery power minus output power) multiplied by the conversion formula, 3.41 BTU/hr over watts.
9. Graph at maximum and minimum battery charging conditions on-line efficiency versus load. Curve fit the data points.
   - On-line efficiency is defined as 100 multiplied by output power over input power.
   - Output and input power is the data gathered from steps# 4 and 5.
10. Graph at maximum and minimum battery charging conditions power dissipated in BTU/hr versus load. Curve fit the data points.
    - Output and input power is the data gathered from steps# 4 and 5.
    - Power dissipated is derived from the power difference (input power minus output power) multiplied by the conversion formula, 3.41 BTU/hr over watts.

- $$\frac{(Power_difference_in_watts) * 3.41_BTU/hr}{watts}$$

Test Specifications: Determining characteristics.

TEST RESULTS

If the Status is PROPOSED or APPROVED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

SPECIFIC TEST INFORMATION:

Tester Operator(s): Scott Derushia	**Date Completed:** 10/10/2003
Test Location: 85 Rangeway Rd.	**Test Actual Time (in hours):**
SKU #: SYAF16KI	**F/W Rev #:** 31
Build Phase: Alpha	**Serial#:** DVT-1
Comments:	

Final Result:
PASS

Summary Results:

Test Data:

		Efficiency On Line Batteries Fully Charged		
	Power In	Power Out	Efficiency	
100%	12310	11223	91.16978067	5 Modules
50%	6300	5605	88.96825397	
100%	12270	11221	91.45069275	4 Modules
50%	6240	5605	89.82371795	
100%	9220	8410	91.21475054	3 Modules
50%	4700	4225	89.89361702	
100%	6160	5605	90.99025974	2 Modules
50%	3160	2810	88.92405063	
		Efficiency On Line Batteries Fully Charging		
	Power In	Power Out	Efficiency	
100%	13950	11220	80.43010753	5 Modules
50%	7960	5590	70.22613065	
100%	13580	11210	82.54786451	4 Modules
50%	7570	5607	74.06869221	
100%	10200	8420	82.54901961	3 Modules
50%	5660	4205	74.29328622	
100%	6840	5615	82.09064327	2 Modules
50%	3845	2830	73.60208062	
		Efficiency On-Battery		
	Power In	Power Out	Efficiency	
100%	13120.8	11215	85.47497104	5 Modules
50%	6070.9	5148	84.79797065	
100%	13180.2	11215	85.08975585	4 Modules
50%	6089.6	5148	84.53757225	
100%	9388.5	8370	89.15162166	3 Modules
50%	4860.9	4200	86.40375239	
100%	6405.3	5610	87.58371973	2 Modules
50%	3268.1	2800	85.67669288	

Revision History:

Rev	Author	Date
10	20 - Jun - 2003 by Scott Derushia	Status: Proposed
11	20 - Jun - 2003 by Scott Derushia	Status: Proposed - Pending Approval
12	20 - Jun - 2003 by Scott Derushia	Status: Proposed - Pending Approval
13	18 - Jul - 2003 by Dan Turley	Status: Proposed - Pending Approval
14	18 - Jul - 2003 by Dan Turley	Status: Approved
15	18 - Jul - 2003 by Dan Turley	Status: Approved
16	20 - Oct - 2003 by Scott Derushia	Status: Approved
17	20 - Oct - 2003 by Scott Derushia	Status: Done - Pending Review
18	20 - Oct - 2003 by Scott Derushia	Status: Done - Pending Review
19	11 - Dec - 2003 by Scott Derushia	Status: Done - Pending Review

Change made:

DVT REPORT

Revision: 13

Test Status: Done - Pending Review

Created on Date: 07/18/2003

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

GENERAL TEST INFORMATION:

Test Title: Run time verification	**Test Group:**
Test Category: Electrical Performance	**Test Setup:** On-Battery
Division: DATA CENTER SOLUTIONS	**Test Type:** Battery Characteristics
Platform: Symmetra	**Program:** Polar Bear
SKU's: SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI	**Program Subset:** System
Sequence by Group:	**DVT Engineer:** Dan Turley
Test Planned Time (in hours):	
Applicable Standards: Unit specification	

TEST METHOD

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

Test Objective: Determine ambient run time at loads of 10%, 50%, 80% and 100% of full rated load and if an XL with 1, 5 and 10 battery packs (see Table 1 below). Investigate run times at 50% and 100% of full rated load over all environmental extremes. Monitor accuracy of run time meter (with all battery vendors), verify low battery times selectable with UPS-Link.

Test Equipment (use the following equipment or equivalent): DVT rack (test computer, AC source, power meter, full rated load, voltmeter, temperature monitor); RUNTIME DVT software; environmental chamber

Setup:

- Place UUT in the environmental chamber.
- Connect the UUT to the DVT rack.
  - If applicable, initialize the RUNTIME DVT software or applicable data acquisition software on test computer.
  - Connect UUT input to AC source. Set to UUT's nominal input AC voltage.
  - Place power meter connections as close as possible to the UUT's input and output.
  - Continuously measure battery voltage via voltmeter.
  - Set temperature monitor to monitor the environmental chamber environment.

Procedure: Table 1: Discharges required at ambient for Run time verification by UUT battery configuration

% of full rated load >>> Number of battery packs \/	10	50	80	100
0	XL, non-XL	XL, non-XL	XL, non-XL	XL, non-XL
1	-	XL only	-	XL only
5	-	-	-	XL only
10	-	-	-	XL only

1. Start the RUNTIME DVT software.
   - Setup a multiple charge and discharge as per Table 1 at ambient, always starting with the 10% load and increasing up to the 100% load.

- Setup a multiple charge and discharge at 50% and 100% rated load over all environmental extremes.

2. Graph the following discharges as listed under Test Results below of run time meter output (UPS-Link 'j'), reported output AC voltage (UPS-Link "O"), measured output AC voltage and battery capacity (UPS-Link 'f') versus time. Include on the second y-axis run time meter output error, reported battery voltage (UPS-Link 'B') and measured battery voltage.
   - Determining run time meter output error. First, determine the measured run time remaining which is the difference between total measured run time and the measured current time stamp. Second, multiply 100 by the difference of the measured run time remaining and the run time meter output (UPS-Link "j"), then divide by the total measured run time.
3. Fill out included Excel spreadsheet below <Run time verification curves & calculations for SmartUPS.xls>:
   - Enter Project name and SKU# in cell B1.
   - Enter in tare loss (load consumed by the UUT only) in cell B34 which is the difference between output power and battery power. Battery power is the power produced by the battery (multiply battery current and battery voltage).
   - Enter in battery data, battery pack data and full rated load in watts in the appropriate cells, B149 through B153.
   - Enter in run time for the load at which the test was performed, rounded to the nearest watt amount displayed, in cells B43 through B137. If XL, enter run times for the various external battery pack setups in the appropriate cells within the C, D, and E column.
   - Adjust "Scaling for VAhr" to move entered data (in the form of data points) with the curves displayed to attempt a best curve fit. Ensure consistency with battery pack amounts.

Test Specifications: Determining characteristics. Note any scaling for VAhr values >1.15 or <0.85.

TEST RESULTS

If the Status is PROPOSED or APPROVED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

SPECIFIC TEST INFORMATION:

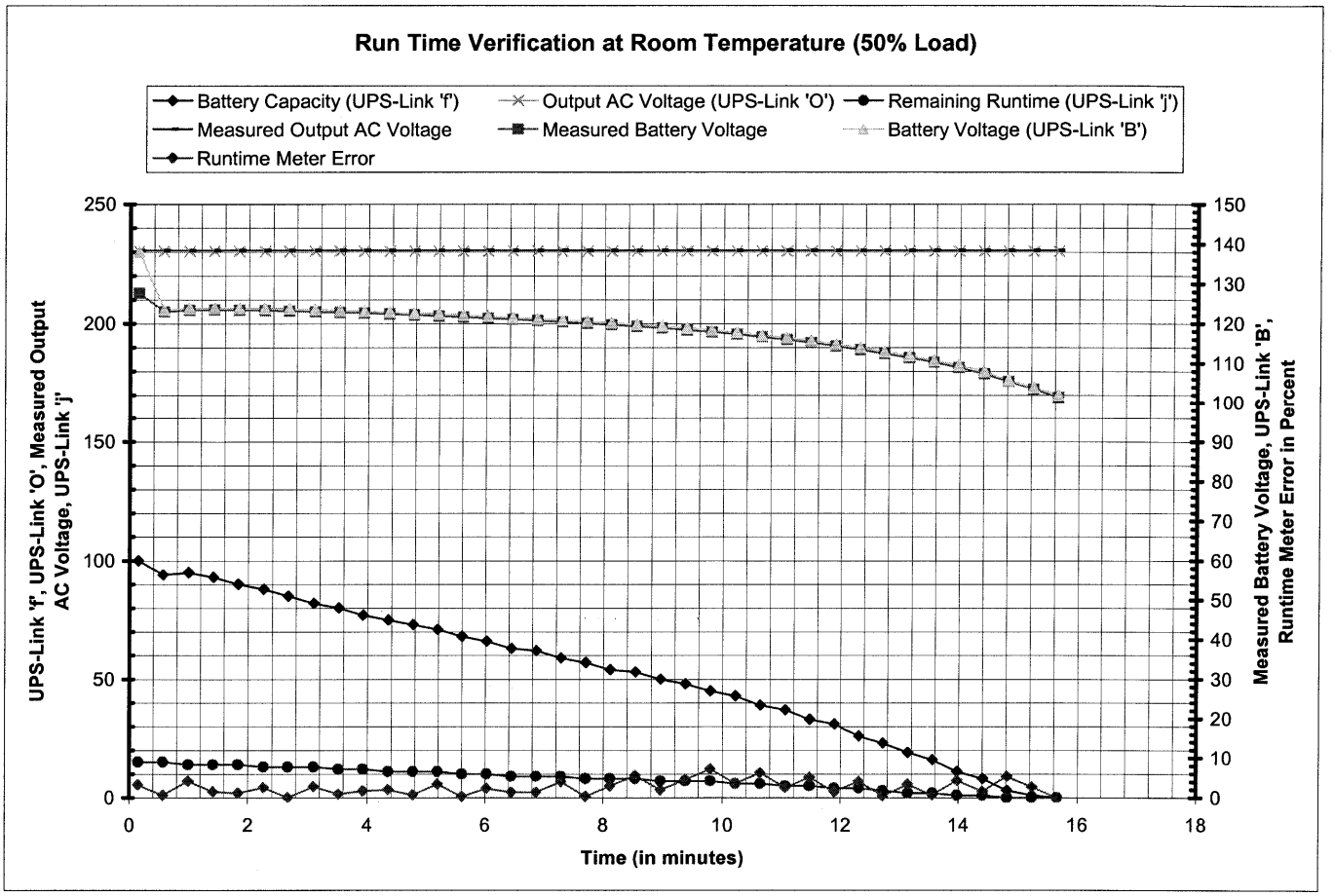
Tester Operator(s): Scott Derushia	**Date Completed:** 09/18/2003
Test Location: 85 Rangeway Rd.	**Test Actual Time (in hours):**
SKU #: SYAF16KI	**F/W Rev #:** 29
Build Phase: Alpha	**Serial#:** DVT-1
Comments:	

Final Result:
PASS

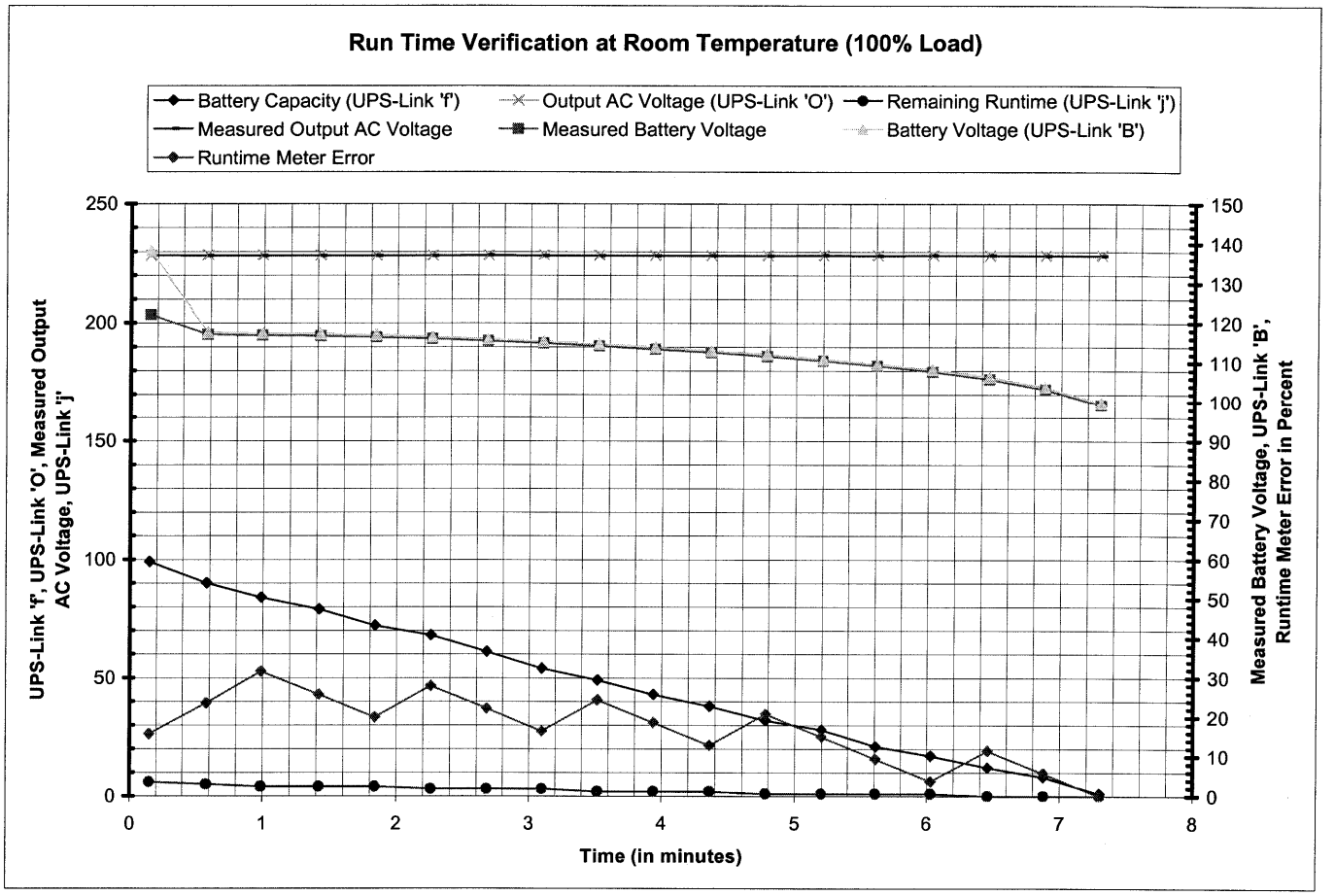
Summary Results:

Test Data:

Below is graph of run time meter error during 50% load discharge internal batteries only at ambient conditions:



Below is graph of run time meter error during 100% load discharge internal batteries only at ambient conditions:



Run time verification curves & calculations for SmartUPS.ı

Revision History:

Rev	Author	Date
5	18 - Jul - 2003 by Dan Turley	Status: Proposed
6	18 - Jul - 2003 by Dan Turley	Status: Proposed - Pending Approval
7	18 - Jul - 2003 by Dan Turley	Status: Proposed - Pending Approval
8	18 - Jul - 2003 by Dan Turley	Status: Approved
9	18 - Jul - 2003 by Dan Turley	Status: Approved
10	11 - Dec - 2003 by Scott Derushia	Status: Approved
11	17 - Dec - 2003 by Scott Derushia	Status: Approved
12	17 - Dec - 2003 by Scott Derushia	Status: Done - Pending Review
13	17 - Dec - 2003 by Scott Derushia	Status: Done - Pending Review

Change made:

DVT REPORT

Revision: 23

Test Status: Done - Pending Review

Created on Date: 06/20/2003

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

GENERAL TEST INFORMATION:

Test Title: Input voltage measured by UPS	**Test Group:**
Test Category: Electrical Performance	**Test Setup:** On-Line
Division: DATA CENTER SOLUTIONS	**Test Type:** Input Characteristics
Platform: Smart-UPS	**Program:** Polar Bear
SKU's: SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI	**Program Subset:** System
Sequence by Group:	**DVT Engineer:** Scott Derushia
Test Planned Time (in hours):	
Applicable Standards: Unit specification	

TEST METHOD

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

Test Objective: Determine accuracy of input AC voltage as reported by the UUT over all rated input AC voltages, frequencies and operating temperature limits.

Test Equipment (use the following equipment or equivalent): DVT rack (test computer, AC source, power meter, full rated load) or equivalent; STEADY DVT software; environmental chamber.

Setup:

- Place UUT in the environmental chamber.
- Connect the UUT to the DVT rack.
  - Connect UUT input to AC source. Set to UUT's nominal input AC voltage.
  - Place power meter connections as close as possible to the UUT's input and output.
  - Set load to 100% full rated load.
  - Continuously measure battery voltage via voltmeter.
  - Continuously verify chamber temperature via temperature monitor.
- Set chamber to one of the specified operating temperature limits and allow ample time for UUT temperature and humidity to stabilize before testing.

Procedure:

1. Start STEADY DVT software.
   - Setup for voltage sweeps.
   - Increase the input AC voltage of the AC source until the UUT transfers to inverter. Measure and record the upper transfer voltage to inverter.
   - Decrease the input AC voltage of the AC source until the UUT is online. Continue to decrease the voltage until the UUT transfers to inverter. Measure and record the lower transfer voltage to inverter.
   - Perform voltage sweeps within all rated input AC voltage.
2. Setup for frequency sweeps.
   - Start frequency sweeps at the nominal input AC frequency. Increase to one (1) hertz above the maximum rated input AC frequency, sweep down to one (1) hertz below the minimum rated input AC frequency and sweep

up ending at the nominal input AC frequency.

3. Perform each voltage and frequency sweeps at all operating temperature limits for a total of six (6) sweeps.
4. Graph for each sweep, voltage and frequency, measured input AC voltage and input AC voltage (UPS-Link "L"), output power (UPS-Link 'P') and measured input AC frequency. Include on the second y-axis input AC voltage error.
   - Input AC voltage error is defined as 100 multiplied by the difference between measured input AC voltage and input AC voltage (UPS-Link "L") over the measured input AC voltage.

Test Specifications: Usually +/- 4% of measured input AC voltage.

TEST RESULTS

If the Status is PROPOSED or APPROVED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

SPECIFIC TEST INFORMATION:

Tester Operator(s): Scott Derushia	**Date Completed:** 09/24/2003
Test Location: 85 Rangeway Rd.	**Test Actual Time (in hours):**
SKU #: SYAF16KI	**F/W Rev #:** 29
Build Phase: Alpha	**Serial#:** DVT-1
Comments:	

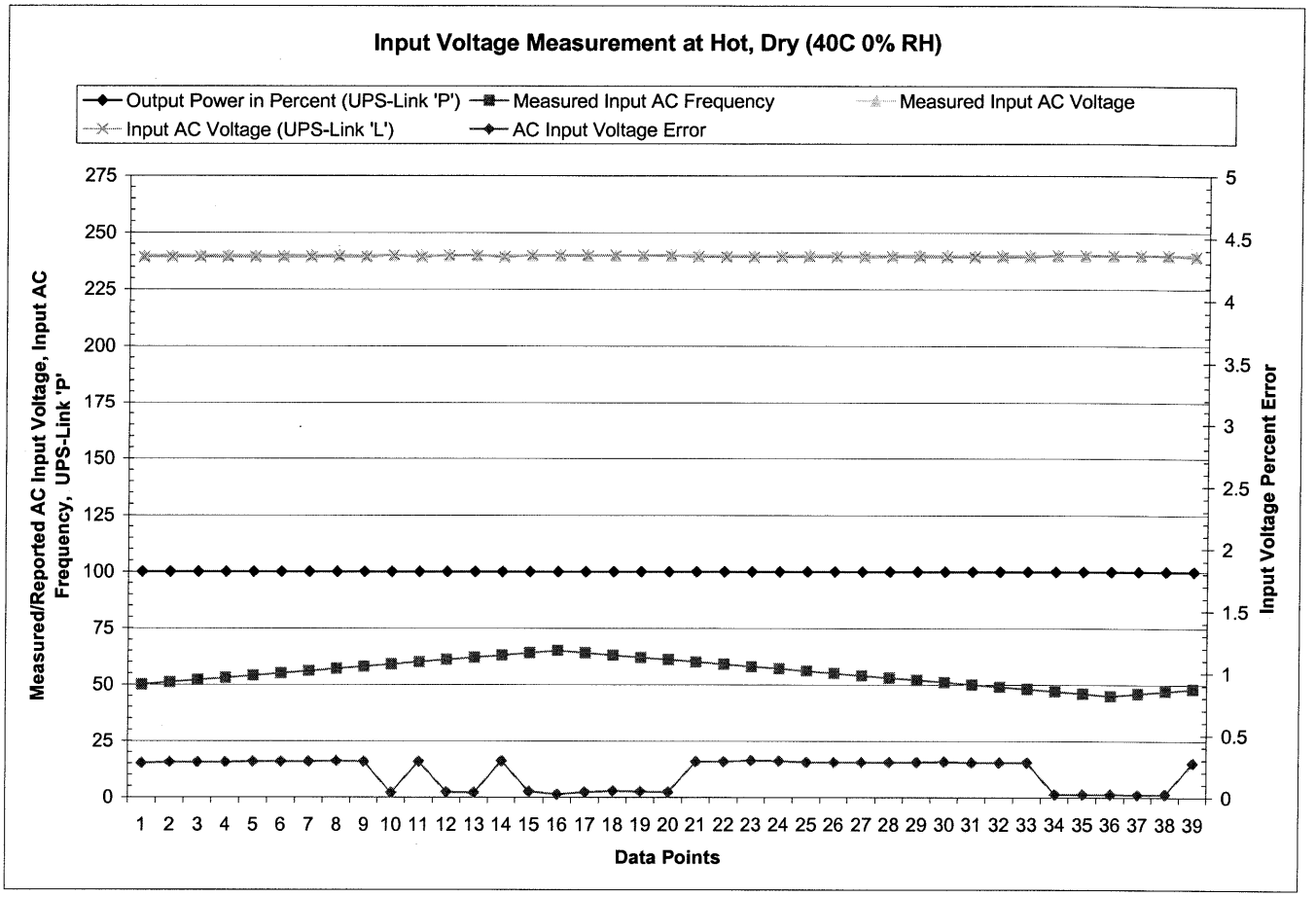
Final Result:
PASS

Summary Results:

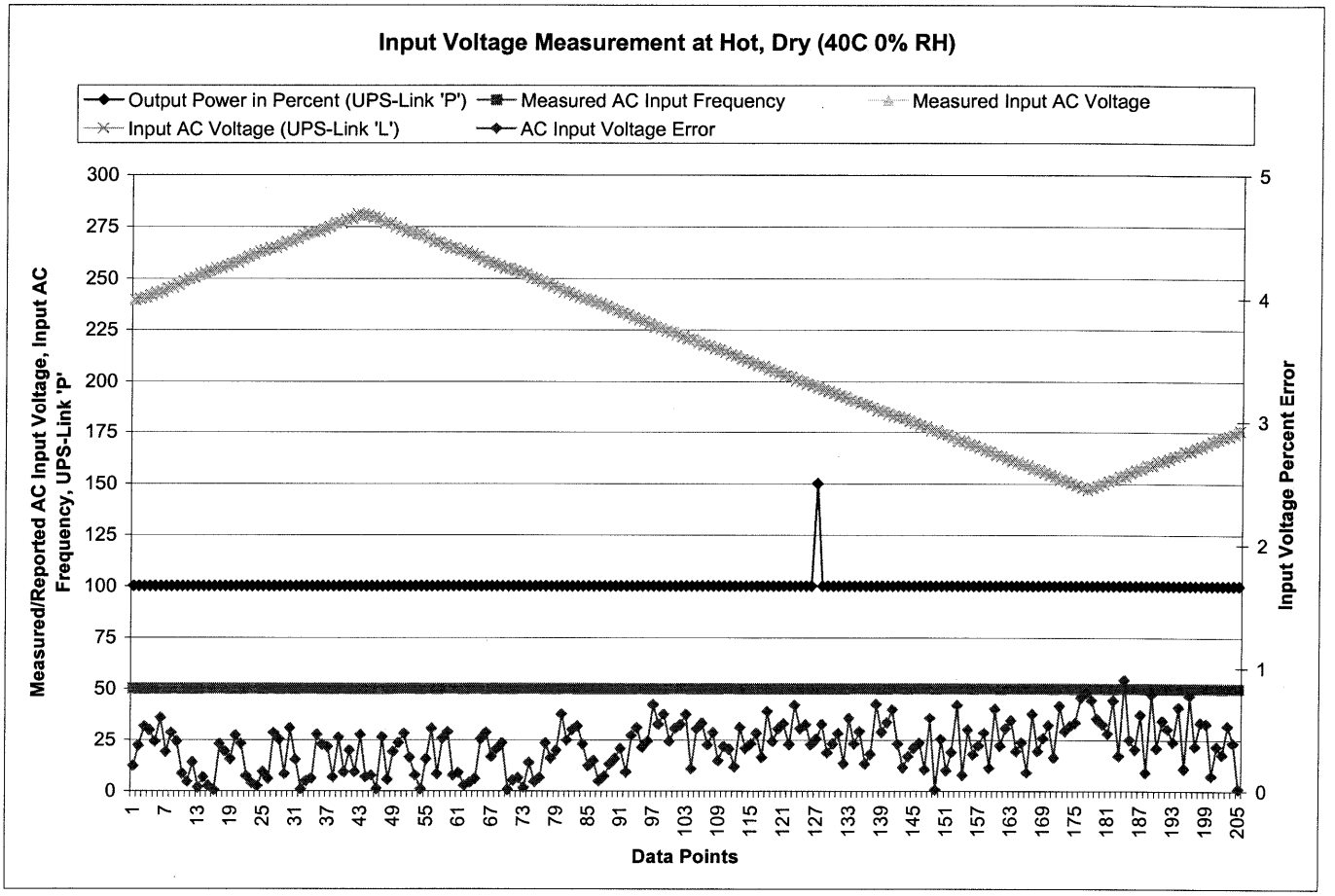
Test Data:

	Volts AC
Upper transfer voltage to inverter for voltage sweeps	284
Lower transfer voltage to inverter for voltage sweeps	146

Below is graph of AC voltage error during a frequency sweep at ambient operating temperature limit:



Below is graph of AC voltage error during a voltage sweep at ambient operating temperature limit:



Revision History:

Rev	Author	Date
12	20 - Jun - 2003 by Scott Derushia	Status: Proposed
13	20 - Jun - 2003 by Scott Derushia	Status: Proposed - Pending Approval
14	20 - Jun - 2003 by Scott Derushia	Status: Proposed - Pending Approval
15	18 - Jul - 2003 by Dan Turley	Status: Proposed - Pending Approval
16	18 - Jul - 2003 by Dan Turley	Status: Proposed - Pending Approval
17	18 - Jul - 2003 by Dan Turley	Status: Approved
18	18 - Jul - 2003 by Dan Turley	Status: Approved
19	18 - Jul - 2003 by Dan Turley	Status: Approved
20	11 - Dec - 2003 by Scott Derushia	Status: Approved
21	17 - Dec - 2003 by Scott Derushia	Status: Approved
22	17 - Dec - 2003 by Scott Derushia	Status: Done - Pending Review
23	17 - Dec - 2003 by Scott Derushia	Status: Done - Pending Review

Change made:

DVT REPORT

Revision: 14

Test Status: On-Hold

Created on Date: 10/15/2002

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

GENERAL TEST INFORMATION:

Test Title: Battery voltage measured by UPS	**Test Group:**
Test Category: Electrical Performance	**Test Setup:** Both On-Line and On-Battery
Division: DATA CENTER SOLUTIONS	**Test Type:** Battery Characteristics
Platform: Symmetra	**Program:** Polar Bear
SKU's: SYAF8KT, SYAF8KRMT, SYAF8KI, SYAF8KRMI, SYAF8KJ, SYAF16KT, SYAF16KRMT, SYAF16KI, SYAF16KRMI, SYAF16KJ, SYAF16KRMJ, SYAF8KRMJ	**Program Subset:** System
Sequence by Group:	**DVT Engineer:** Scott Derushia
Test Planned Time (in hours):	
Applicable Standards: Unit specification	

TEST METHOD

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

Test Objective: Determine the accuracy of battery voltage measurement over a discharge and recharge conditions in all rated environmental extremes.

Test Equipment (use the following equipment or equivalent): DVT rack (test computer, AC source, power meter, full rated load, voltmeter, temperature monitor) or equivalent; RUNTIME DVT software; environmental chamber

Setup:

- Place UUT in the environmental chamber.
- Connect the UUT to the DVT rack.
  - If applicable, initialize the RUNTIME DVT software or applicable data acquisition software on test computer.
  - Connect UUT input to AC source. Set to UUT's nominal input AC voltage.
  - Place power meter connections as close as possible to the UUT's input and output.
  - Set load to 100% full rated load.
  - Continuously measure battery voltage via voltmeter.
  - Continuously verify chamber temperature via temperature monitor.

Procedure:

1. Manually turn off the AC source output and check that the UUT indicates it's on-battery. Turn the AC source output on.
2. Start RUNTIME software. Run a discharge and a recharge of the UUT at each environmental extreme.
3. Graph for each discharge and recharge measured battery voltage and the UUT's battery voltage measurement (UPS-Link 'B') versus time. Include on the second y-axis the 'battery voltage error' between the measured battery voltage and the UUT's battery voltage measurement (UPS-Link 'B').
   - Battery voltage error is defined as 100 multiplied by the difference between measured battery voltage and

the UUT's battery voltage measurement (UPS-Link 'B') over the measured battery voltage.

Test Specifications: Usually <= 1%

TEST RESULTS

If the Status is PROPOSED or APPROVED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

SPECIFIC TEST INFORMATION:

Tester Operator(s): Scott Derushia	**Date Completed:** 05/15/2003
Test Location: 85 Rangeway Rd (DVT Lab)	**Test Actual Time (in hours):**
SKU #: SYAF16KT	**F/W Rev #:** 29
Build Phase: Alpha	**Serial#:** DVT-1
Comments:	

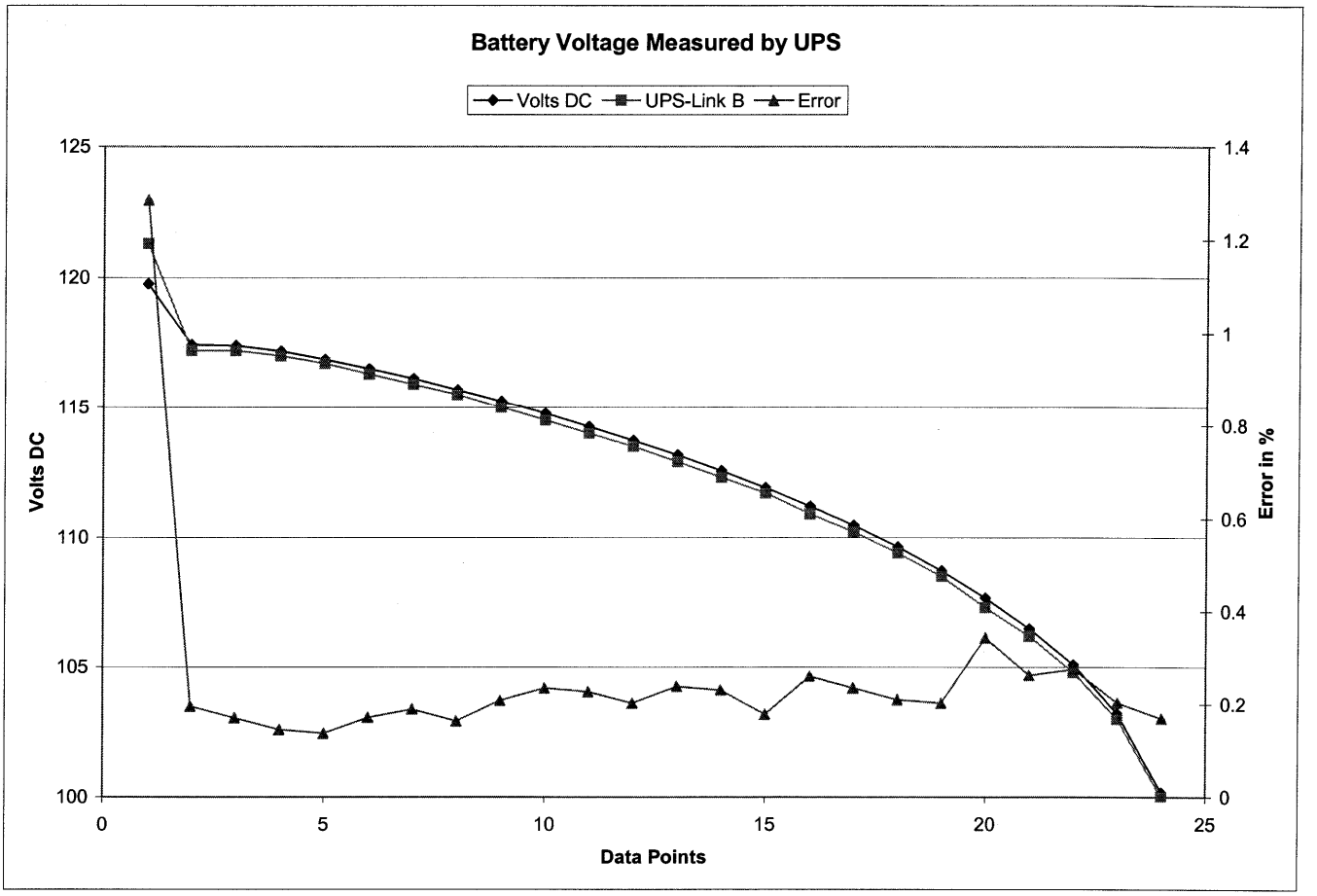
Final Result:
PASS

Summary Results:
During Hot Dry recharge the Battery voltage rose to 146 Volts DC this was not observed at the other temperatures.

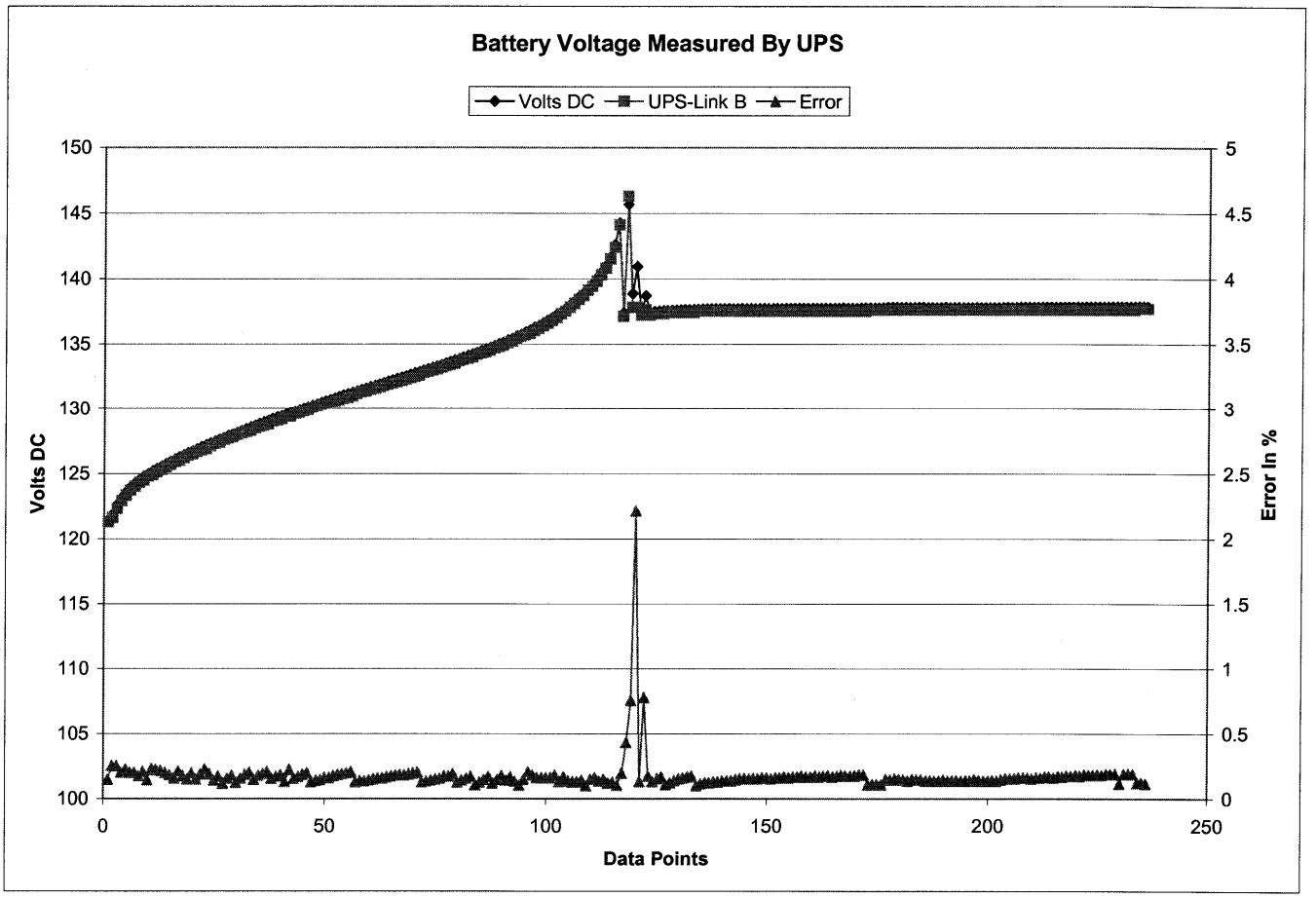
Test Data:

UUT indicates on-battery (yes or no)	**Yes**

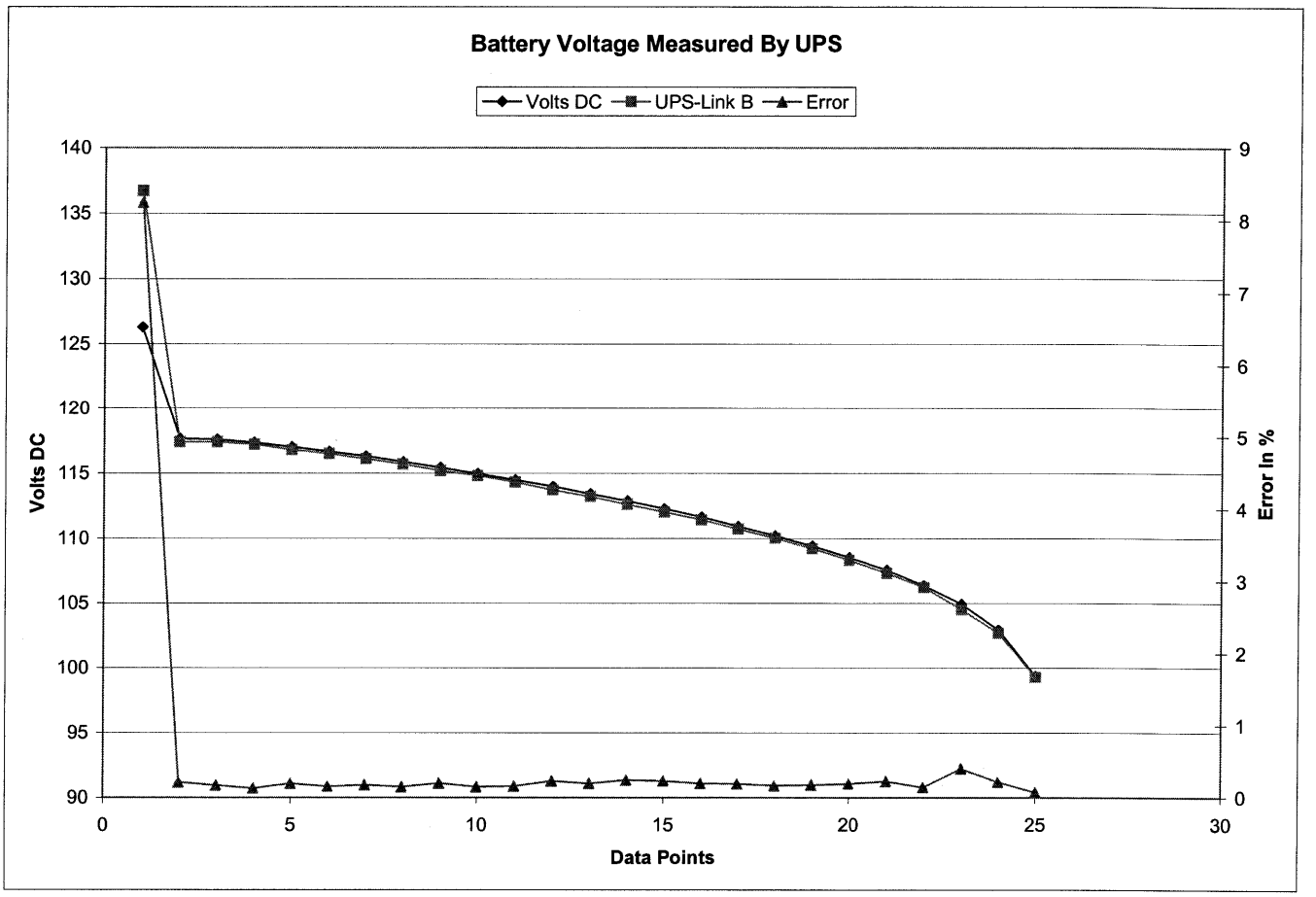
Below is a graph of battery voltage error during a discharge at hot,dry:



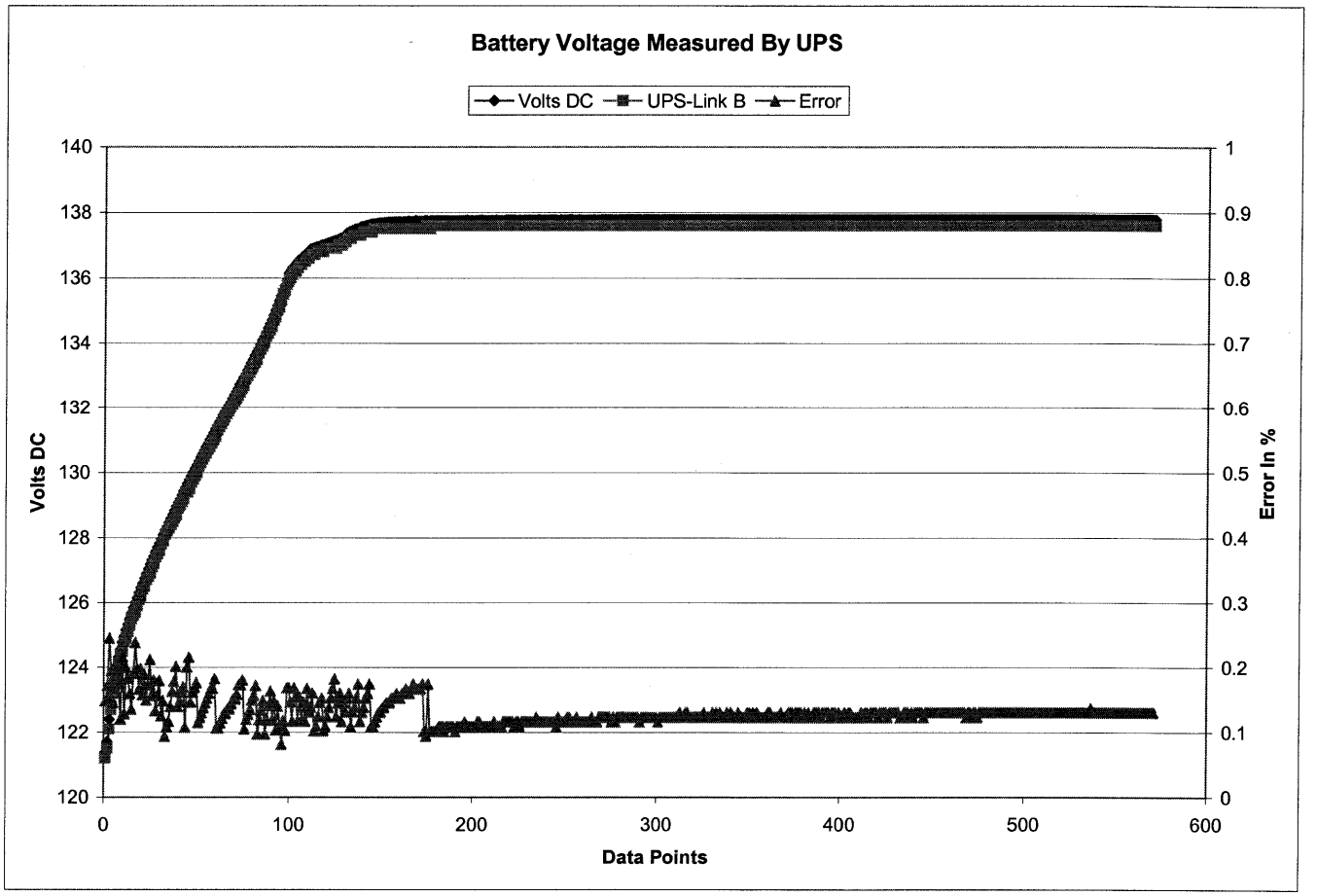
Below is a graph of battery voltage error during a recharge at hot,dry:



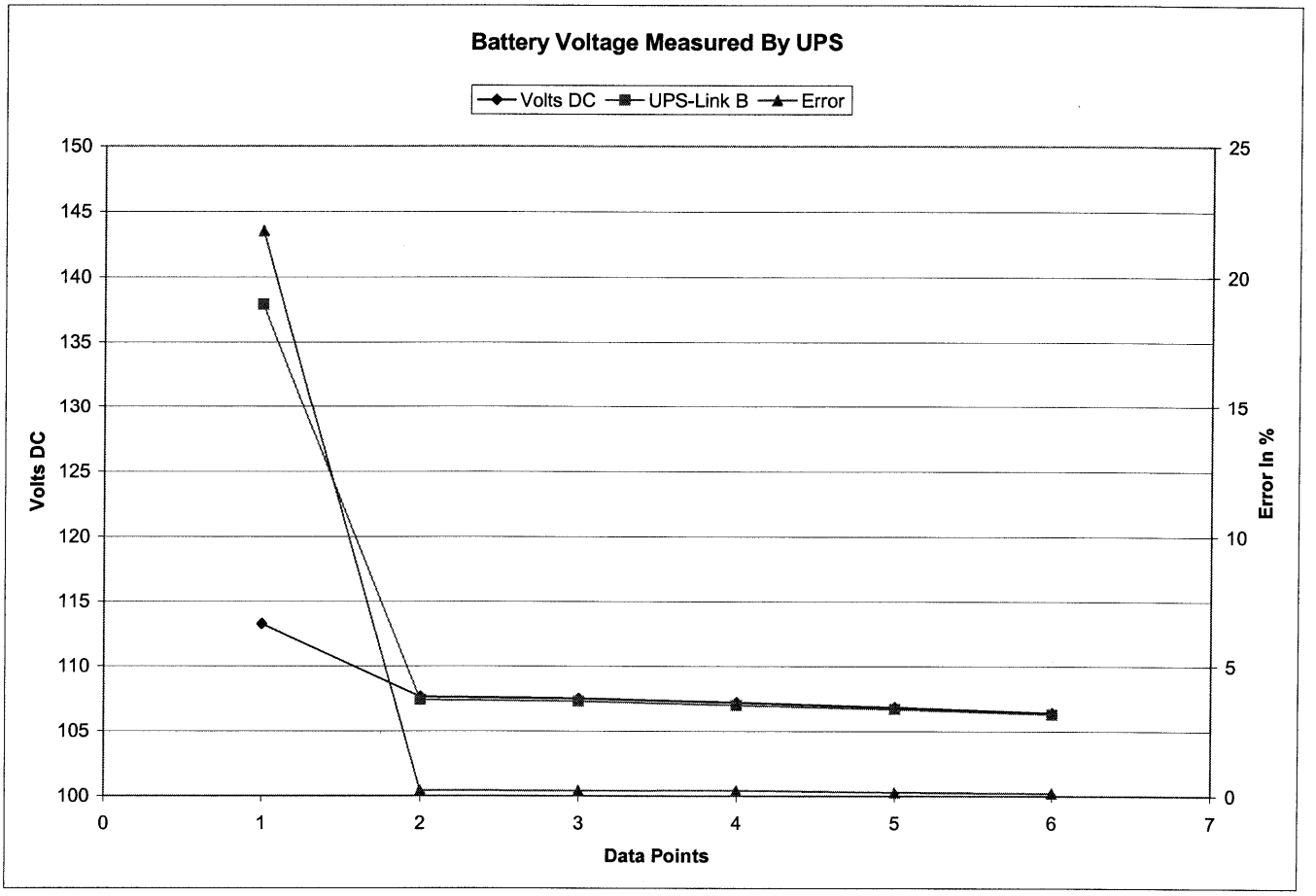
Below is a graph of battery voltage error during a discharge at hot,wet:



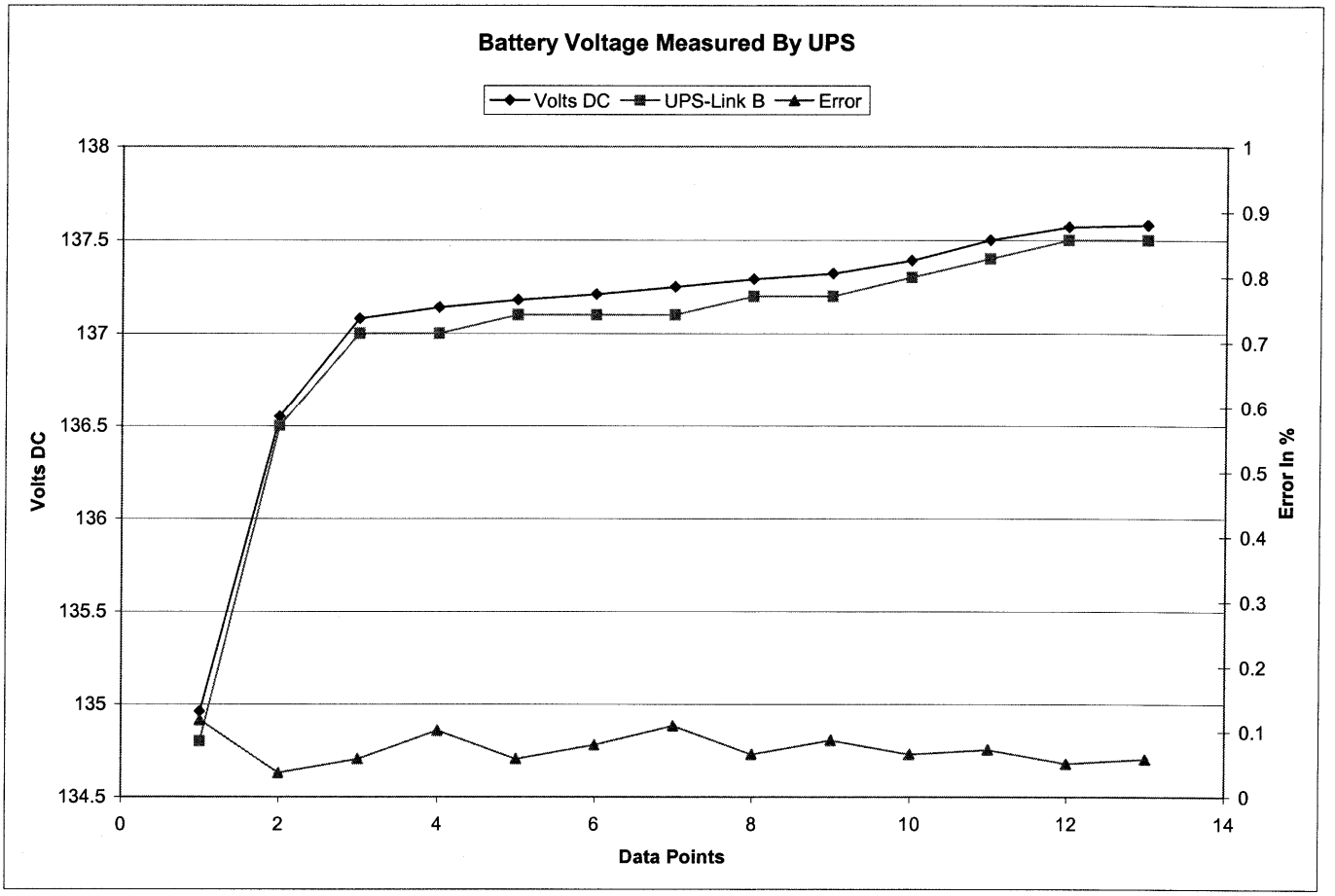
Below is a graph of battery voltage error during a recharge at hot,wet:



Below is a graph of battery voltage error during a disharge at cold:



Below is a graph of battery voltage error during a recharge at cold:



Revision History:

Rev	Author	Date
4	15 - Oct - 2002 by Dan Turley	Status: Proposed
5	18 - Jun - 2003 by Scott Derushia	Status: Proposed
6	20 - Jun - 2003 by Scott Derushia	Status: Proposed
7	20 - Jun - 2003 by Scott Derushia	Status: Proposed - Pending Approval
8	20 - Jun - 2003 by Scott Derushia	Status: Proposed - Pending Approval
9	28 - Jul - 2003 by Scott Derushia	Status: Proposed - Pending Approval
10	28 - Jul - 2003 by Scott Derushia	Status: Approved
11	28 - Jul - 2003 by Scott Derushia	Status: Approved
12	28 - Jul - 2003 by Scott Derushia	Status: On-Hold
13	28 - Jul - 2003 by Scott Derushia	Status: On-Hold
14	19 - Nov - 2003 by Dan Turley	Status: On-Hold

Change made:

DVT REPORT

Revision: 13

Test Status: Proposed

Created on Date: 02/26/2003

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

GENERAL TEST INFORMATION:

Test Title: Quiescent input current	**Test Group:**
Test Category: Electrical Performance	**Test Setup:** On-Line
Division: NETWORK POWER SOLUTIONS	**Test Type:** Input Characteristics
Platform: Symmetra	**Program:** Polar Bear
SKU's: SYAF8KT, SYAF8KRMT, SYAF8KI, SYAF8KRMI, SYAF8KJ, SYAF16KT, SYAF16KRMT, SYAF16KI, SYAF16KRMI, SYAF16KJ, SYAF16KRMJ, SYAF8KRMJ	**Program Subset:** System
Sequence by Group:	**DVT Engineer:**
Test Planned Time (in hours):	
Applicable Standards: Unit specification	

TEST METHOD

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

Test Objective: To determine minimum loading of the input source when UPS is at 0% load in multiple configurations.

Test Equipment (use the following equipment or equivalent): DVT rack (AC source, power meter) or equivalent

Setup: Split phase systems- connect to two phases and neutral of an AC source. Source should be able to provide from 90 to 140 vac 50/60 Hz line to neutral.
3:1 systems are connected to 3 phases and neutral . The source should be capable of providing from 155 to 300 vac 50/60 Hz line to neutral. If a step up transformer is used make sure that current measurements are made on the input to the system.

Procedure:

Configuration 1	Configuration 2	Configuration 3	Configuration 4
Frame: 16KVA split phase # of UPS modules:5 # of Battery modules:4 IM Installed:Yes RIM Installed:No Load: See procedure State: On line	Frame: 8KVA split phase # of UPS modules:3 # of Battery modules:2 IM Installed:Yes RIM Installed:No Load: See procedure State: On line	Frame: 16KVA 3:1 # of UPS modules:5 # of Battery modules:4 IM Installed:Yes RIM Installed:No Load: See procedure State: On line	Frame: 8KVA 3:1 # of UPS modules:3 # of Battery modules:2 IM Installed:Yes RIM Installed:No Load: See procedure State: On line

Each configuration is to be operated and the current recorded at no load, **charging and not charging** at the voltages shown below.

Configuration	Input voltages	Inverter
1,2	155/208/230 Line to Line	on and no load
3,4	155/220/240 Line to neutral	on and no load

Test Specifications: Determining characteristics.

TEST RESULTS

If the Status is PROPOSED or APPROVED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

SPECIFIC TEST INFORMATION:

Tester Operator(s): Srdan Mutabdzija	**Date Completed:**
Test Location: Billerica	**Test Actual Time (in hours):**
SKU #: SYAF8KT; SYAF8KRMT; SYAF8KI; SYAF8KRMI; SYAF8KJ; SYAF8KRMJ; SYAF16KT; SYAF16KRMT; SYAF16KH; SYAF16KRMH; SYAF16KJ; SYAF16KRMJ	**F/W Rev #:**
Build Phase: Alpha/Pilot	**Serial#:**
Comments:	

Final Result:
INCOMPLETE

Summary Results:

Test Data:

Configuration 1

Description: On line, 60Hz, batteries fully charged					**Description: On line, 50Hz, batteries fully charged**				
Input Voltage L-L (Vrms)	Input Voltage Phase 1 (Vrms)	Input Voltage Phase 2 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)	Input Voltage L-L (Vrms)	Input Voltage Phase 1 (Vrms)	Input Voltage Phase 2 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)
~155	90	90	3.87	4.83	~155	90	90	4.07	4.05
~208	120.5	116.5	2.91	4.31	~208	121.5	119.5	2.93	3.65
~230	135	131.5	2.6	4.03	~230	133.5	131.5	2.69	3.6

Description: On line, 60Hz, batteries charging					**Description: On line, 50Hz, batteries charging**				
Input Voltage	Input Voltage	Input Voltage	Input Current	Input Current	Input Voltage	Input Voltage	Input Voltage	Input Current	Input Current

L-L (Vrms)	Phase 1 (Vrms)	Phase 2 (Vrms)	Phase 1 (Arms)	Phase 2 (Arms)	L-L (Vrms)	Phase 1 (Vrms)	Phase 2 (Vrms)	Phase 1 (Arms)	Phase 2 (Arms)
~155	89	87.5	12.08	15.4	~155	88	88	12.2	14.64
~208	120	114.5	8.88	13.32	~208	120.5	119	8.72	12.24
~230	133	133	7.48	11.56	~230	133.5	132	7.92	11.64

*****all the graphs can be found in N/NPS/polarbear/DVT/Pre-DVT/Quiescent _input_current/SplitPhase_16kva**
**** graphs with fully charged batteries have 5A/div scaling and with batteries charging 20A/div**

Configuration 2

Description: On line, 60Hz, batteries fully charged					**Description: On line, 50Hz, batteries fully charged**				
Input Voltage L-L (Vrms)	Input Voltage Phase 1 (Vrms)	Input Voltage Phase 2 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)	Input Voltage L-L (Vrms)	Input Voltage Phase 1 (Vrms)	Input Voltage Phase 2 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)
~155	90.5	90	2.13	2.55	~155	90.5	89.5	2.2	2.16
~208	122	121.5	1.66	2.52	~208	121.5	120	1.65	2.13
~230	134.5	132.5	1.48	2.38	~230	133.5	131.5	1.57	2.14

Description: On line, 60Hz, battery charging					**Description: On line, 50Hz, battery charging**				
Input Voltage L-L (Vrms)	Input Voltage Phase 1 (Vrms)	Input Voltage Phase 2 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)	Input Voltage L-L (Vrms)	Input Voltage Phase 1 (Vrms)	Input Voltage Phase 2 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)
~155	88.5	89	7.10	9.20	~155	89	88	7.18	8.72
~208	121.5	121.5	5.14	7.92	~208	121	119.5	5.14	7.32
~230	132.5	133	4.68	7.46	~230	134.5	132	4.66	7.04

*****all the graphs can be found in N/NPS/polarbear/DVT/Pre-DVT/Quiescent _input_current/SplitPhase_8kva**
**** graphs with fully charged batteries have 5A/div scaling and with batteries charging 10A/div**

Configuration 3

Description: On line, 60Hz, batteries fully charged				Description: On line, 50Hz, batteries fully charged			
Input Voltage Phase 1 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)	Input Current Phase 3 (Arms)	Input Voltage Phase 1 (Vrms)	Input Current Phase 1 (Vrms)	Input Current Phase 2 (Arms)	Input Current Phase 3 (Arms)
154.9	2.67	2.76	2.31	154.9	2.58	2.54	2.19
220.9	2.82	2.89	2.38	221.3	2.78	2.66	2.21
240.7	2.86	2.97	2.42	241.2	2.79	2.69	2.26

Description: On line, 60Hz, batteries charging				Description: On line, 50Hz, batteries charging			
Input Voltage Phase 1 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)	Input Current Phase 3 (Arms)	Input Voltage Phase 1 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)	Input Current Phase 3 (Arms)
154.3	6.90	7.14	6.06	154.3	6.66	6.38	5.80
220.5	6.28	6.66	5.44	218.8	6.08	6.00	5.38
240.4	6.16	6.60	5.38	240.1	6.02	5.94	5.04

*****all the graphs can be found in N/NPS/polarbear/DVT/Pre-DVT/Quiescent _input_current/3Phase_16kva**
**** graphs with fully charged batteries have 5A/div scaling and with batteries charging 10A/div**

Configuration 4

Description: On line, 60Hz, batteries fully charged				Description: On line, 50Hz, batteries fully charged			
Input Voltage Phase 1 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)	Input Current Phase 3 (Arms)	Input Voltage Phase 1 (Vrms)	Input Current Phase 1 (Vrms)	Input Current Phase 2 (Arms)	Input Current Phase 3 (Arms)
154.8	2.44	2.58	1.88	154.8	2.42	2.41	1.73
220	2.65	2.74	2.10	220.4	2.56	2.56	1.95
240.7	2.74	2.86	2.22	240.1	2.64	2.62	2.01

Description: On line, 60Hz, batteries charging				Description: On line, 50Hz, batteries charging			
Input Voltage Phase 1 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)	Input Current Phase 3 (Arms)	Input Voltage Phase 1 (Vrms)	Input Current Phase 1 (Arms)	Input Current Phase 2 (Arms)	Input Current Phase 3 (Arms)
155.1	5.24	5.60	3.98	155.1	5.06	5.04	3.80
220.5	5.06	5.48	3.84	219.2	4.98	5.02	3.58
240.4	5.04	5.48	3.84	241.7	5.00	5.06	3.60

*****all the graphs can be found in N/NPS/polarbear/DVT/Pre-DVT/Quiescent _input_current/3Phase_8kva**
**** graphs with fully charged batteries have 5A/div scaling and with batteries charging 10A/div**

Revision History:

Rev	Author	Date
4	26 - Feb - 2003 by Mike Ingemi	Status: Proposed
5	26 - Feb - 2003 by Mike Ingemi	Status: Proposed
6	26 - Feb - 2003 by Mike Ingemi	Status: Proposed
7	04 - Mar - 2003 by Srdan Mutabdzija	Status: Proposed
8	04 - Mar - 2003 by Srdan Mutabdzija	Status: Proposed
9	05 - Mar - 2003 by Srdan Mutabdzija	Status: Proposed
10	15 - Apr - 2003 by Srdan Mutabdzija	Status: Proposed
11	15 - Apr - 2003 by Srdan Mutabdzija	Status: Proposed
12	27 - Aug - 2003 by Srdan Mutabdzija	Status: Proposed
13	05 - Nov - 2003 by Srdan Mutabdzija	Status: Proposed

Change made:

DVT REPORT

Revision: 19

Test Status: Done - Pending Review

Created on Date: 06/20/2003

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

GENERAL TEST INFORMATION:

Test Title: Efficiency	**Test Group:**
Test Category: Electrical Performance	**Test Setup:** Both On-Line and On-Battery
Division: DATA CENTER SOLUTIONS	**Test Type:** Output Characteristics
Platform: Smart-UPS	**Program:** Polar Bear
SKU's: SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI	**Program Subset:** System
Sequence by Group:	**DVT Engineer:** Scott Derushia
Test Planned Time (in hours):	
Applicable Standards: Unit specification	

TEST METHOD

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

Test Objective: Determine inverter (on-battery) efficiency at 10%, 25%, 50%, 80% and 100% of rated watt loads at battery capacities of 90% and 20% (or equivalent battery voltages as close as possible). Determine on-line efficiency at 10%, 25%, 50%, 80% and 100% of rated watt loads at maximum and minimum battery charging conditions. Determine power dissipated on-battery and on-line and in BTU/hr.

Test Equipment (use the following equipment or equivalent): DVT rack (test computer, AC source, power meter, full rated watt load, voltmeter) or equivalent; current shunt; RUNTIME DVT software; extra internal battery packs (optional)

Setup:

- Connect the UUT to the DVT rack.
  - If applicable, initialize the RUNTIME DVT software or applicable data acquisition software on test computer.
  - Connect UUT input to AC source. Set to UUT's nominal input AC voltage.
  - Place power meter connections as close as possible to the UUT's input and output.
  - Set load to full rated watt load.
  - Continuously measure battery current, using a current shunt, and battery voltage via voltmeter.
- For XL, use internal batteries only for all steps.

Procedure:

1. Start the RUNTIME DVT software
   - Setup for a full discharge.
2. Perform a full discharge with batteries fully charged to low battery shutdown.
   - Batteries fully charged is defined as input power minus output power equals the tare loss for the UUT
3. Graph for the discharge on-battery efficiency versus battery capacity (UPS-Link "f"). Curve fit the data points.
   - On-battery efficiency is defined as 100 multiplied by output power over battery power . Battery power which is the power produced by the battery (multiply battery current and battery voltage). Output power is the power consumed by the load.

4. Place UUT on-line. With UUT now under maximum charging conditions (input AC voltage applied to UUT after low battery shutdown), measure and record input and output power.
5. Recharge (or replace) batteries of UUT so they are at full capacity and place the UUT on-line. With UUT now under minimum charging conditions (batteries fully charged), record input and output power.
6. Repeat steps# 2 through 5 for the rest of the required loads.
7. Graph at 20% and 90% battery capacities (or as close as possible) on-battery efficiency versus load . Curve fit the data points. Include actual battery capacities in graph title.
   - Obtain on-battery efficiency from each discharge graph (from step# 3) at two points only, 20% and 90% battery capacities.
8. Graph at 20% and 90% battery capacities power dissipated in BTU/hr versus load . Curve fit the data points.
   - Obtain battery and output power from each discharge the data used to calculate on-battery efficiency in step# 3 at two points only, 20% and 90% battery capacities.
   - Power dissipated is derived from the power difference (battery power minus output power) multiplied by the conversion formula, 3.41 BTU/hr over watts.
9. Graph at maximum and minimum battery charging conditions on-line efficiency versus load. Curve fit the data points.
   - On-line efficiency is defined as 100 multiplied by output power over input power.
   - Output and input power is the data gathered from steps# 4 and 5.
10. Graph at maximum and minimum battery charging conditions power dissipated in BTU/hr versus load. Curve fit the data points.
    - Output and input power is the data gathered from steps# 4 and 5.
    - Power dissipated is derived from the power difference (input power minus output power) multiplied by the conversion formula, 3.41 BTU/hr over watts.

$$\frac{(Power_difference_in_watts) * 3.41_BTU/hr}{watts}$$

Test Specifications: Determining characteristics.

TEST RESULTS

If the Status is PROPOSED or APPROVED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

SPECIFIC TEST INFORMATION:

Tester Operator(s): Scott Derushia	**Date Completed:** 10/10/2003
Test Location: 85 Rangeway Rd.	**Test Actual Time (in hours):**
SKU #: SYAF16KI	**F/W Rev #:** 31
Build Phase: Alpha	**Serial#:** DVT-1
Comments:	

Final Result:
PASS

Summary Results:

Test Data:

		Efficiency On Line Batteries Fully Charged		
	Power In	Power Out	Efficiency	
100%	12310	11223	91.16978067	5 Modules
50%	6300	5605	88.96825397	
100%	12270	11221	91.45069275	4 Modules
50%	6240	5605	89.82371795	
100%	9220	8410	91.21475054	3 Modules
50%	4700	4225	89.89361702	
100%	6160	5605	90.99025974	2 Modules
50%	3160	2810	88.92405063	
		Efficiency On Line Batteries Fully Charging		
	Power In	Power Out	Efficiency	
100%	13950	11220	80.43010753	5 Modules
50%	7960	5590	70.22613065	
100%	13580	11210	82.54786451	4 Modules
50%	7570	5607	74.06869221	
100%	10200	8420	82.54901961	3 Modules
50%	5660	4205	74.29328622	
100%	6840	5615	82.09064327	2 Modules
50%	3845	2830	73.60208062	
		Efficiency On-Battery		
	Power In	Power Out	Efficiency	
100%	13120.8	11215	85.47497104	5 Modules
50%	6070.9	5148	84.79797065	
100%	13180.2	11215	85.08975585	4 Modules
50%	6089.6	5148	84.53757225	
100%	9388.5	8370	89.15162166	3 Modules
50%	4860.9	4200	86.40375239	
100%	6405.3	5610	87.58371973	2 Modules
50%	3268.1	2800	85.67669288	

Revision History:

Rev	Author	Date
10	20 - Jun - 2003 by Scott Derushia	Status: Proposed
11	20 - Jun - 2003 by Scott Derushia	Status: Proposed - Pending Approval
12	20 - Jun - 2003 by Scott Derushia	Status: Proposed - Pending Approval
13	18 - Jul - 2003 by Dan Turley	Status: Proposed - Pending Approval
14	18 - Jul - 2003 by Dan Turley	Status: Approved
15	18 - Jul - 2003 by Dan Turley	Status: Approved
16	20 - Oct - 2003 by Scott Derushia	Status: Approved
17	20 - Oct - 2003 by Scott Derushia	Status: Done - Pending Review
18	20 - Oct - 2003 by Scott Derushia	Status: Done - Pending Review
19	11 - Dec - 2003 by Scott Derushia	Status: Done - Pending Review

Change made:

DVT REPORT

Revision: 19

Test Status: Done - Pending Review

Created on Date: 06/20/2003

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

GENERAL TEST INFORMATION:

Test Title: Efficiency	**Test Group:**
Test Category: Electrical Performance	**Test Setup:** Both On-Line and On-Battery
Division: DATA CENTER SOLUTIONS	**Test Type:** Output Characteristics
Platform: Smart-UPS	**Program:** Polar Bear
SKU's: SYAF8KI, SYAF8KRMI, SYAF16KI, SYAF16KRMI	**Program Subset:** System
Sequence by Group:	**DVT Engineer:** Scott Derushia
Test Planned Time (in hours):	
Applicable Standards: Unit specification	

TEST METHOD

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

Test Objective: Determine inverter (on-battery) efficiency at 10%, 25%, 50%, 80% and 100% of rated watt loads at battery capacities of 90% and 20% (or equivalent battery voltages as close as possible). Determine on-line efficiency at 10%, 25%, 50%, 80% and 100% of rated watt loads at maximum and minimum battery charging conditions. Determine power dissipated on-battery and on-line and in BTU/hr.

Test Equipment (use the following equipment or equivalent): DVT rack (test computer, AC source, power meter, full rated watt load, voltmeter) or equivalent; current shunt; RUNTIME DVT software; extra internal battery packs (optional)

Setup:

- Connect the UUT to the DVT rack.
  - If applicable, initialize the RUNTIME DVT software or applicable data acquisition software on test computer.
  - Connect UUT input to AC source. Set to UUT's nominal input AC voltage.
  - Place power meter connections as close as possible to the UUT's input and output.
  - Set load to full rated watt load.
  - Continuously measure battery current, using a current shunt, and battery voltage via voltmeter.
- For XL, use internal batteries only for all steps.

Procedure:

1. Start the RUNTIME DVT software
   - Setup for a full discharge.
2. Perform a full discharge with batteries fully charged to low battery shutdown.
   - Batteries fully charged is defined as input power minus output power equals the tare loss for the UUT
3. Graph for the discharge on-battery efficiency versus battery capacity (UPS-Link "f"). Curve fit the data points.
   - On-battery efficiency is defined as 100 multiplied by output power over battery power . Battery power which is the power produced by the battery (multiply battery current and battery voltage). Output power is the power consumed by the load.

4. Place UUT on-line. With UUT now under maximum charging conditions (input AC voltage applied to UUT after low battery shutdown), measure and record input and output power.
5. Recharge (or replace) batteries of UUT so they are at full capacity and place the UUT on-line. With UUT now under minimum charging conditions (batteries fully charged), record input and output power.
6. Repeat steps# 2 through 5 for the rest of the required loads.
7. Graph at 20% and 90% battery capacities (or as close as possible) on-battery efficiency versus load . Curve fit the data points. Include actual battery capacities in graph title.
   - Obtain on-battery efficiency from each discharge graph (from step# 3) at two points only, 20% and 90% battery capacities.
8. Graph at 20% and 90% battery capacities power dissipated in BTU/hr versus load . Curve fit the data points.
   - Obtain battery and output power from each discharge the data used to calculate on-battery efficiency in step# 3 at two points only, 20% and 90% battery capacities.
   - Power dissipated is derived from the power difference (battery power minus output power) multiplied by the conversion formula, 3.41 BTU/hr over watts.
9. Graph at maximum and minimum battery charging conditions on-line efficiency versus load. Curve fit the data points.
   - On-line efficiency is defined as 100 multiplied by output power over input power.
   - Output and input power is the data gathered from steps# 4 and 5.
10. Graph at maximum and minimum battery charging conditions power dissipated in BTU/hr versus load. Curve fit the data points.
    - Output and input power is the data gathered from steps# 4 and 5.
    - Power dissipated is derived from the power difference (input power minus output power) multiplied by the conversion formula, 3.41 BTU/hr over watts.

$$\frac{(Power_difference_in_watts) * 3.41_BTU/hr}{watts}$$

Test Specifications: Determining characteristics.

TEST RESULTS

If the Status is PROPOSED or APPROVED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

SPECIFIC TEST INFORMATION:

Tester Operator(s): Scott Derushia	**Date Completed:** 10/10/2003
Test Location: 85 Rangeway Rd.	**Test Actual Time (in hours):**
SKU #: SYAF16KI	**F/W Rev #:** 31
Build Phase: Alpha	**Serial#:** DVT-1
Comments:	

Final Result:
PASS

Summary Results:

Test Data:

		Efficiency On Line Batteries Fully Charged		
	Power In	Power Out	Efficiency	
100%	12310	11223	91.16978067	5 Modules
50%	6300	5605	88.96825397	
100%	12270	11221	91.45069275	4 Modules
50%	6240	5605	89.82371795	
100%	9220	8410	91.21475054	3 Modules
50%	4700	4225	89.89361702	
100%	6160	5605	90.99025974	2 Modules
50%	3160	2810	88.92405063	
		Efficiency On Line Batteries Fully Charging		
	Power In	Power Out	Efficiency	
100%	13950	11220	80.43010753	5 Modules
50%	7960	5590	70.22613065	
100%	13580	11210	82.54786451	4 Modules
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100%	6840	5615	82.09064327	2 Modules
50%	3845	2830	73.60208062	
		Efficiency On-Battery		
	Power In	Power Out	Efficiency	
100%	13120.8	11215	85.47497104	5 Modules
50%	6070.9	5148	84.79797065	
100%	13180.2	11215	85.08975585	4 Modules
50%	6089.6	5148	84.53757225	
100%	9388.5	8370	89.15162166	3 Modules
50%	4860.9	4200	86.40375239	
100%	6405.3	5610	87.58371973	2 Modules
50%	3268.1	2800	85.67669288	

Revision History:

Rev	Author	Date

10 20 - Jun - 2003 by Scott Derushia Status: Proposed
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12 20 - Jun - 2003 by Scott Derushia Status: Proposed - Pending Approval
13 18 - Jul - 2003 by Dan Turley Status: Proposed - Pending Approval
14 18 - Jul - 2003 by Dan Turley Status: Approved
15 18 - Jul - 2003 by Dan Turley Status: Approved
16 20 - Oct - 2003 by Scott Derushia Status: Approved
17 20 - Oct - 2003 by Scott Derushia Status: Done - Pending Review
18 20 - Oct - 2003 by Scott Derushia Status: Done - Pending Review
19 11 - Dec - 2003 by Scott Derushia Status: Done - Pending Review

Change made:

DVT REPORT

Revision: 21

Test Status: On-Hold

Created on Date: 12/31/2003

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

GENERAL TEST INFORMATION:

Test Title: Transfer/retransfer dropouts: frequency and voltages	**Test Group:**
Test Category: Operational Performance	**Test Setup:** Both On-Line and On-Battery
Division: NETWORK POWER SOLUTIONS	**Test Type:** Transient Characteristics
Platform: Smart-UPS	**Program:** Polar Bear
SKU's: SYAF16KI	**Program Subset:** System
Sequence by Group:	**DVT Engineer:** Scott Derushia
Test Planned Time (in hours):	
Applicable Standards: Unit specification	

TEST METHOD

If the Status is PROPOSED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

Test Objective: Investigate transfer/retransfer operation versus input frequency (at nominal and limits) via dropouts at different phase angle steps with 100% of full rated load. Record minimum dropout width for transfer/retransfer at nominal input frequency. Investigate transfer/retransfer operation versus nominal, maximum and minimum input AC voltage via recorded dropouts at different phase angle steps with 100% of full rated load and no load.

Test Equipment (use the following equipment or equivalent): DVT rack (test computer, programmable AC source, 100% of full rated load); TRANSIT DVT software; digital storage oscilloscope

Setup:

- Connect the UUT to the DVT rack.
  - Connect UUT input to AC source. Set to UUT's nominal input AC voltage and frequency.
  - Place power meter connections as close as possible to the UUT's input.
- Connect the digital storage oscilloscope to monitor input AC voltage and current, as well as output AC voltage and current.
  - Set trigger source as external.

Procedure:

1. Start TRANSIT DVT software or applicable data acquisition software on test computer.
2. Set input AC frequency and input AC voltage to nominal and connect the UUT to 100% of full rated load.
3. Step through the waveform in 45° steps starting at 45° to 360° plus at 150° and 330° at both 50 and 60 Hz. Record each minimum dropout width to cause a transfer/retransfer operation. Investigate the waveform from the transfer/retransfer operation. For nominal frequency only take waveform pictures and display below.
4. Set the input AC voltage to nominal and the input operating frequency to 47 Hz.
5. Step through the waveform in 45° steps starting at 45° to 360° plus at 150° and 330°, for a dropout width of 100ms, at both 50 and 60 Hz. Measure and record the time for the UUT to transfer to inverter after the dropout occurs.
6. Repeat step#5 at 47 and 63 Hz.
7. If applicable, enter the phase angle and dropout width in the appropriate fields within the DVT software or

applicable data acquisition software.
- Send this information to the AC source.
- Set the oscilloscope auto-trigger.
- Send the dropout and investigate the transfer/retransfer of the UUT with each dropout.

8. Set input AC frequency to the high operating limit.
9. Step through the waveform in 45° steps starting at 45° to 360° plus at 150° and 330°. Cause a transfer/retransfer operation using the recorded corresponding dropout width as needed from step #3 and investigate the waveform.
10. If applicable, enter the phase angle and dropout width in the appropriate fields within the DVT software or applicable data acquisition software.
    - Send this information to the AC source.
    - Set the oscilloscope auto-trigger.
    - Send the dropout and investigate the transfer/retransfer of the UUT with each dropout.
11. Repeat step #9 at low operating limit of input AC frequency.
12. If applicable, enter the phase angle and dropout width in the appropriate fields within the DVT software or applicable data acquisition software.
    - Send this information to the AC source.
    - Set the oscilloscope auto-trigger.
    - Send the dropout and investigate the transfer/retransfer of the UUT with each dropout.
13. Set input AC frequency to nominal.
14. Repeat step #9 for each of the input AC voltage: 2 volts below maximum trim and two volts below maximum boost or double boost (if applicable) voltages.
15. If applicable, enter the phase angle and dropout width in the appropriate fields within the DVT software or applicable data acquisition software.
    - Send this information to the AC source.
    - Set the oscilloscope auto-trigger.
    - Send the dropout and investigate the transfer/retransfer of the UUT with each dropout.
16. Set load to no load.
17. Repeat step #9 for nominal input AC voltage.
18. If applicable, enter the phase angle and dropout width in the appropriate fields within the DVT software or applicable data acquisition software.
    - Send this information to the AC source.
    - Set the oscilloscope auto-trigger.
    - Send the dropout and investigate the transfer/retransfer of the UUT with each dropout.
19. Set the input AC voltage to nominal.
20. Run the frequency jitter program and fill out the data sheet. Determine the maximum frequency jitter the UUT will not switch to battery. Determine the minimum frequency jitter that the UUT will not switch back to line.

Test Specifications: Determining characteristics. Any questionable transfer/retransfer is to be labeled as not acceptable and are to be accompanied by a comment.

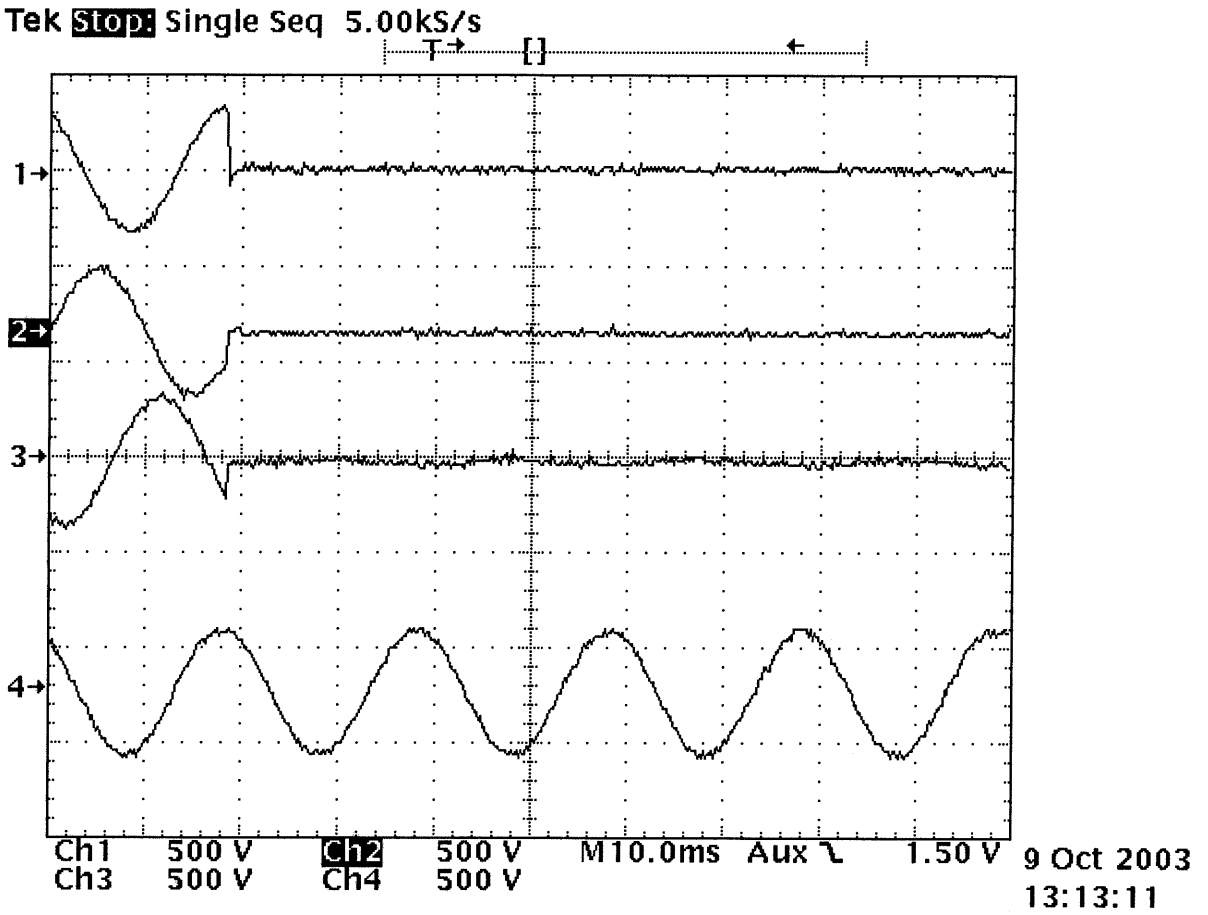
TEST RESULTS

If the Status is PROPOSED or APPROVED anyone can edit this section otherwise this section is LOCKED and only editable by the DVT Engineer and Program Manager.

SPECIFIC TEST INFORMATION:

Tester Operator(s): Scott Derushia	**Date Completed:** 12/18/2003
Test Location: 85 Rangeway Rd.	**Test Actual Time (in hours):**
SKU #: SYAF16KI	**F/W Rev #:** 32
Build Phase: Alpha	**Serial#:** DVT-1
Comments:	

Final Result:
INCOMPLETE



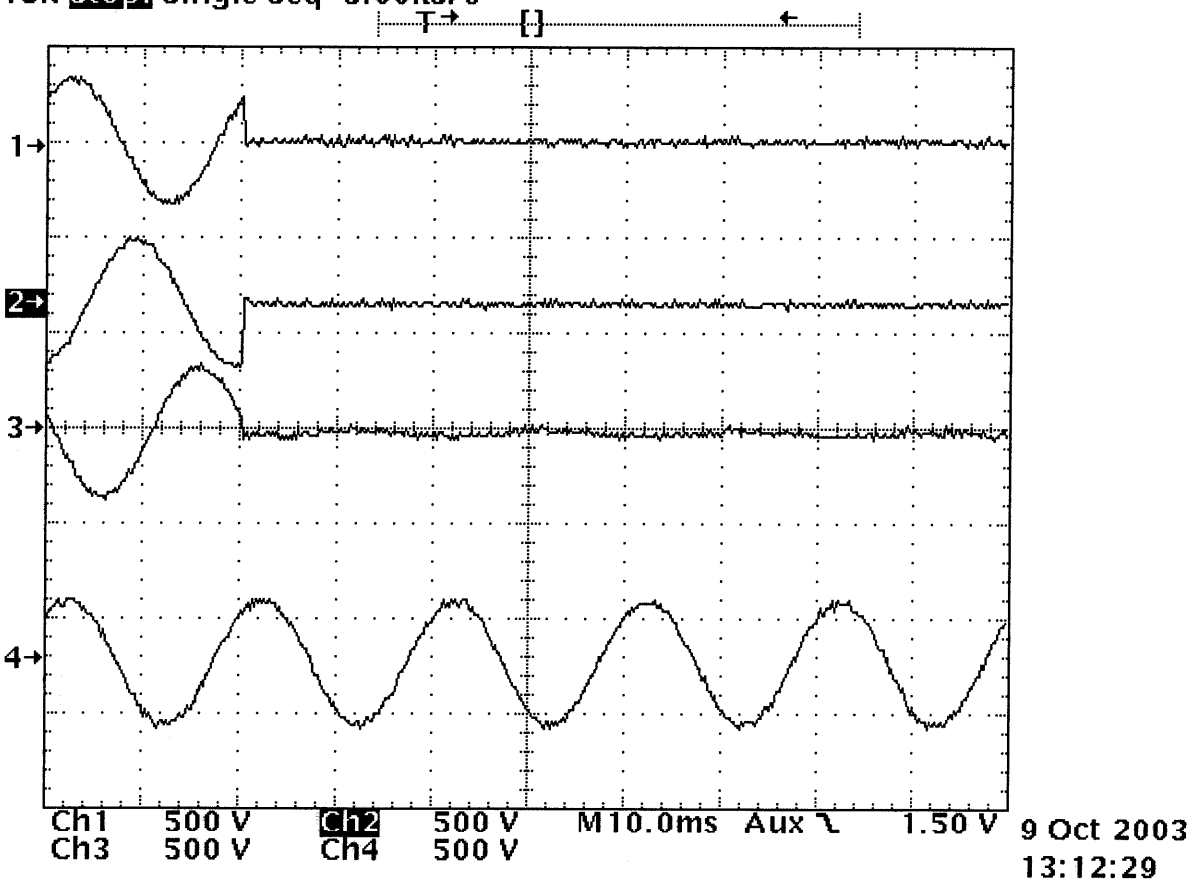
Channel 1: Input Voltage Phase A
Channel 2: Input Voltage Phase B
Channel 3: Input Voltage Phase C
Channel 4: Output Voltage

Below is the oscilloscope picture from step 2 of minimum dropout width, phase angle 135°:

Summary Results:

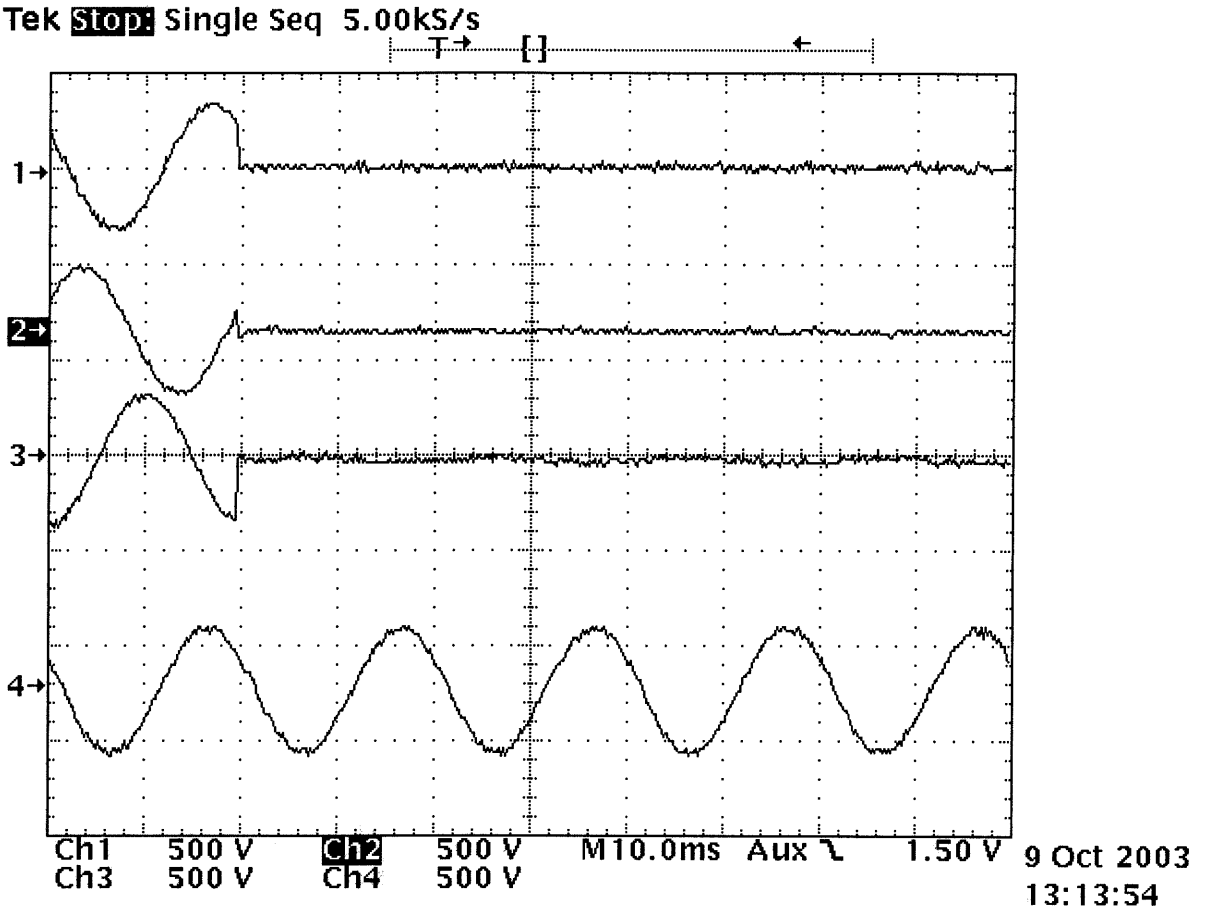
Test Data:

Below is the oscilloscope picture from step 2 of minimum dropout width, phase angle 45°:



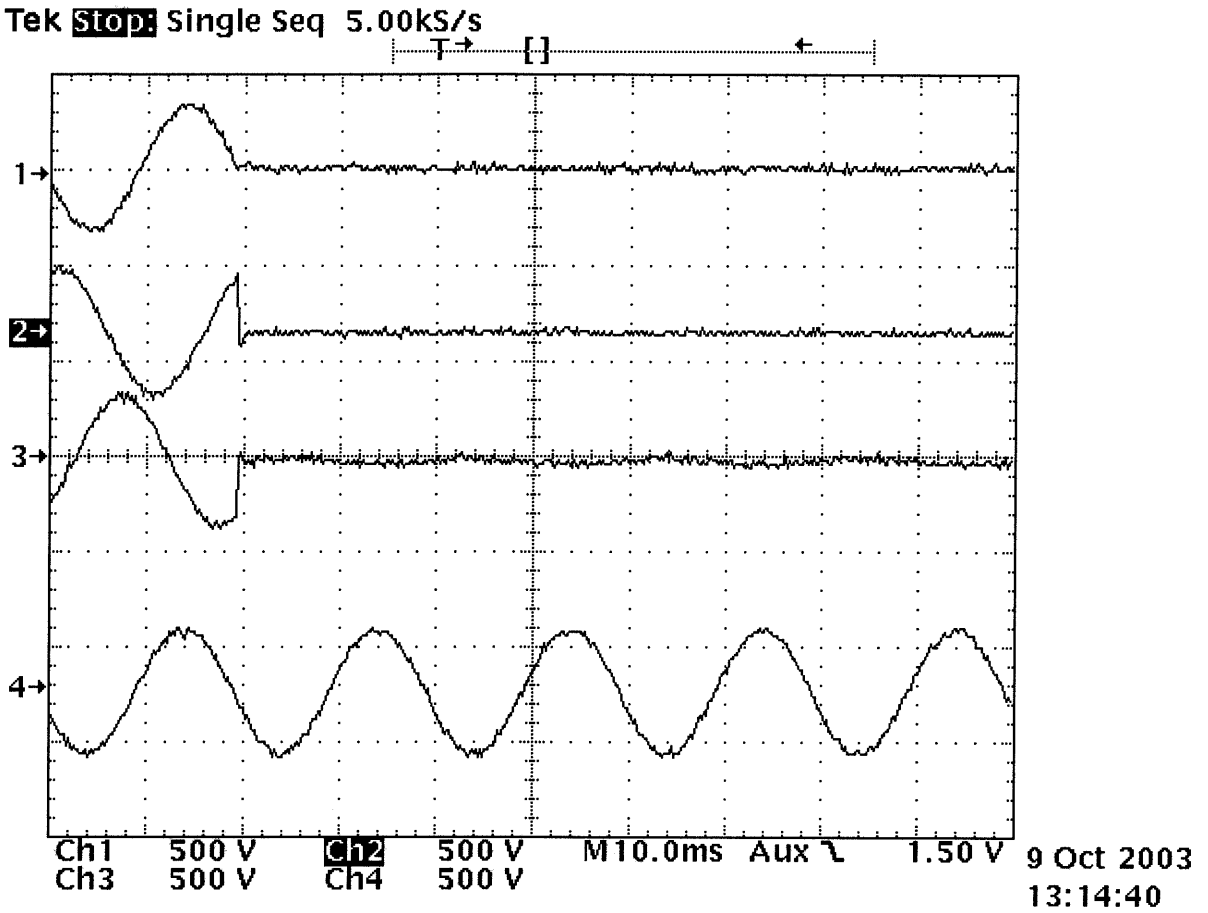
Channel 1: Input Voltage Phase A
Channel 2: Input Voltage Phase B
Channel 3: Input Voltage Phase C
Channel 4: Output Voltage

Below is the oscilloscope picture from step 2 of minimum dropout width, phase angle 90°:



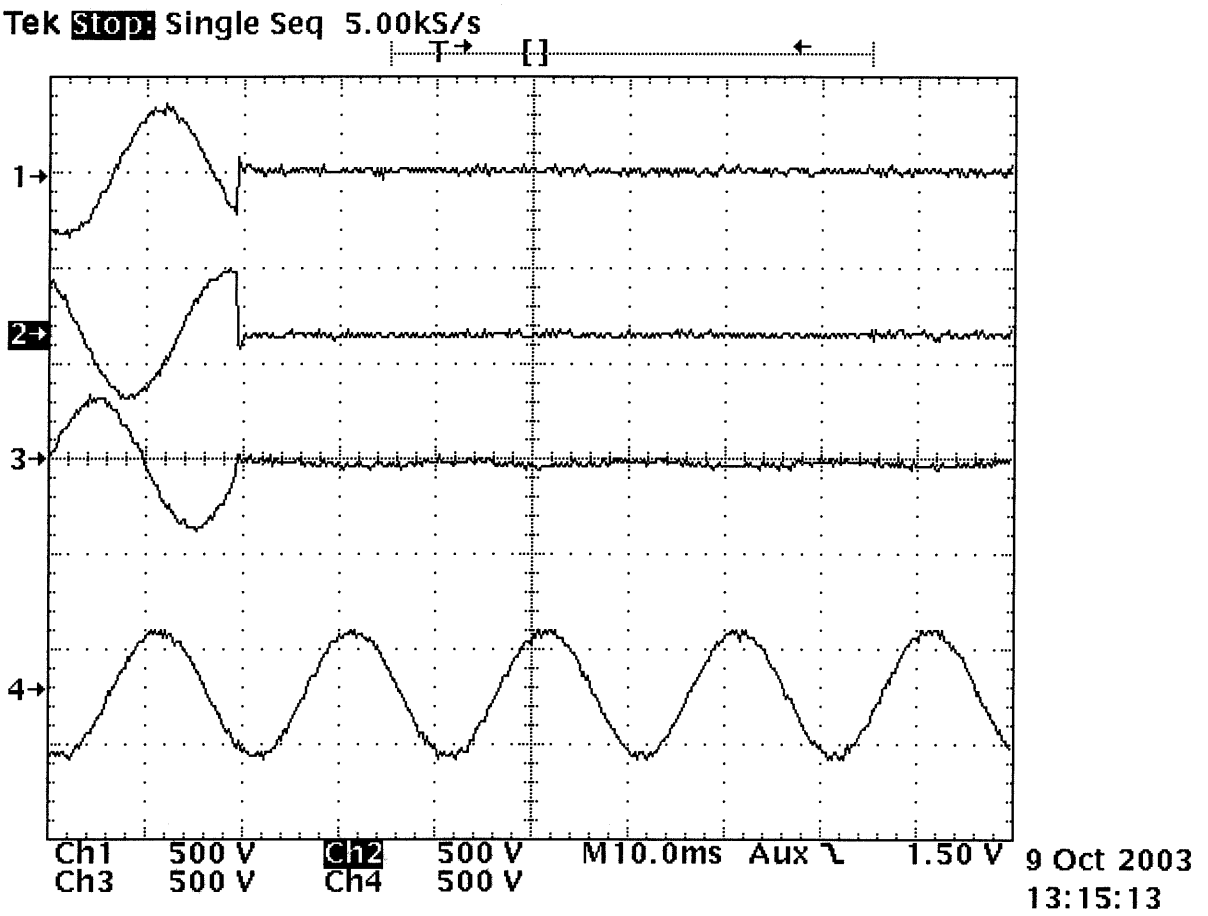
Channel 1: Input Voltage Phase A
Channel 2: Input Voltage Phase B
Channel 3: Input Voltage Phase C
Channel 4: Output Voltage

Below is the oscilloscope picture from step 2 of minimum dropout width, phase angle 180°:



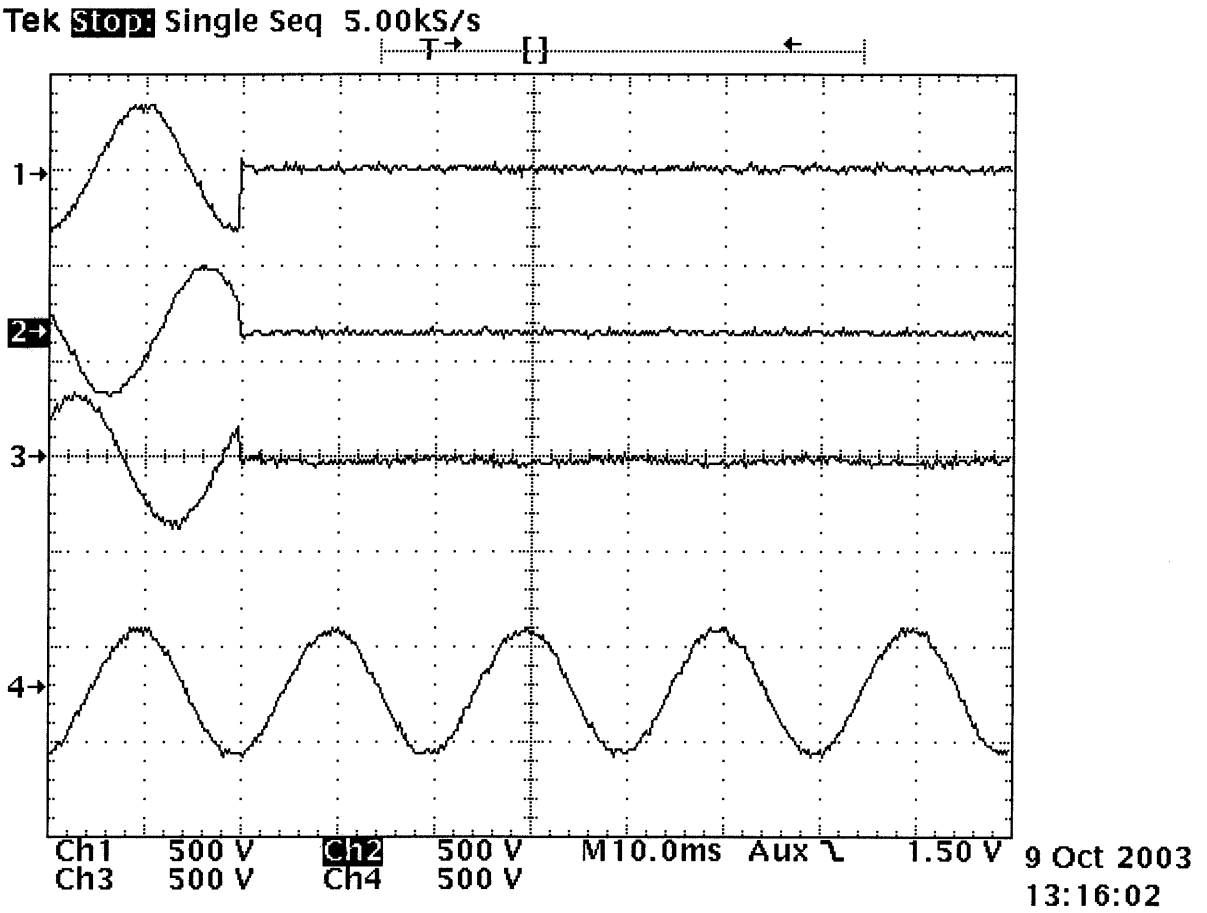
Channel 1: Input Voltage Phase A
Channel 2: Input Voltage Phase B
Channel 3: Input Voltage Phase C
Channel 4: Output Voltage

Below is the oscilloscope picture from step 2 of minimum dropout width, phase angle 225°:



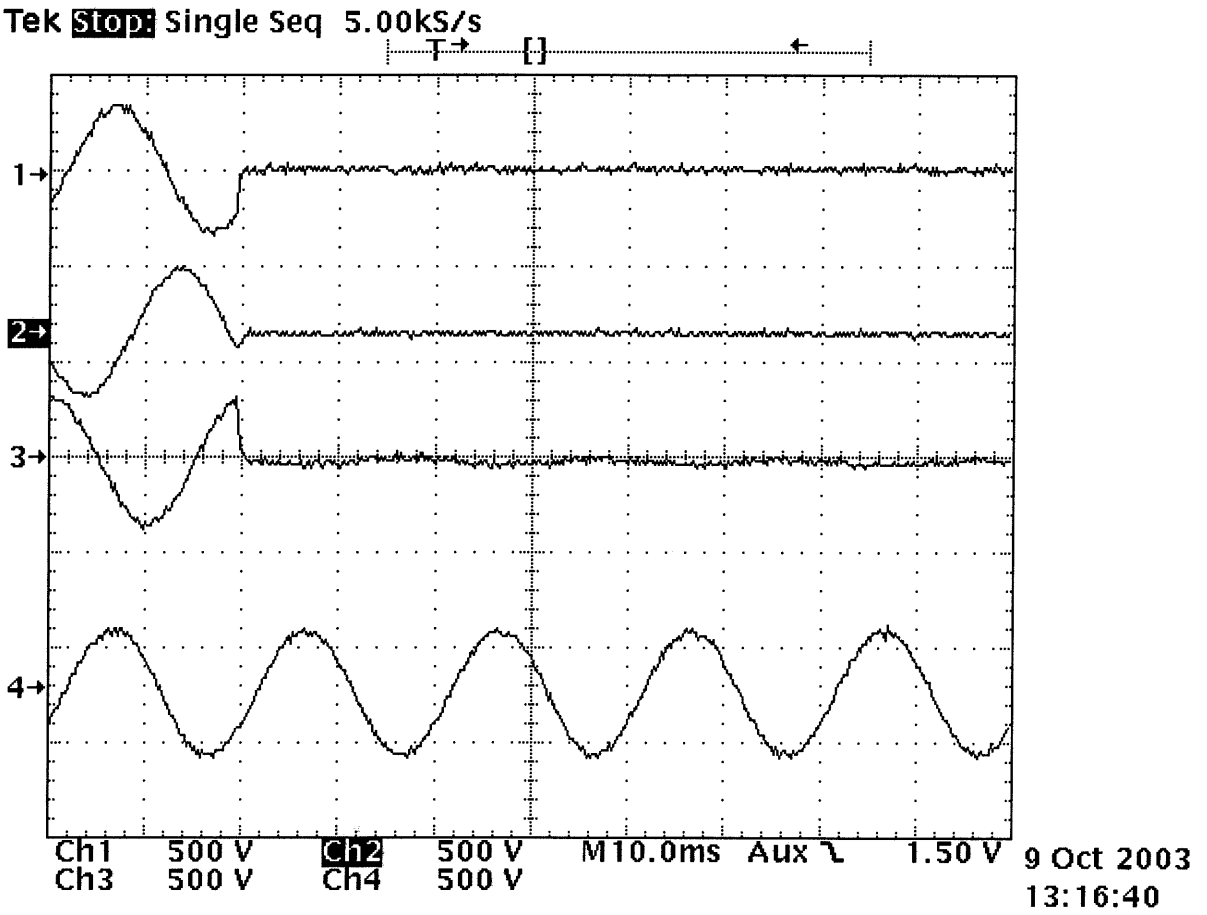
Channel 1: Input Voltage Phase A
Channel 2: Input Voltage Phase B
Channel 3: Input Voltage Phase C
Channel 4: Output Voltage

Below is the oscilloscope picture from step 2 of minimum dropout width, phase angle 270°:



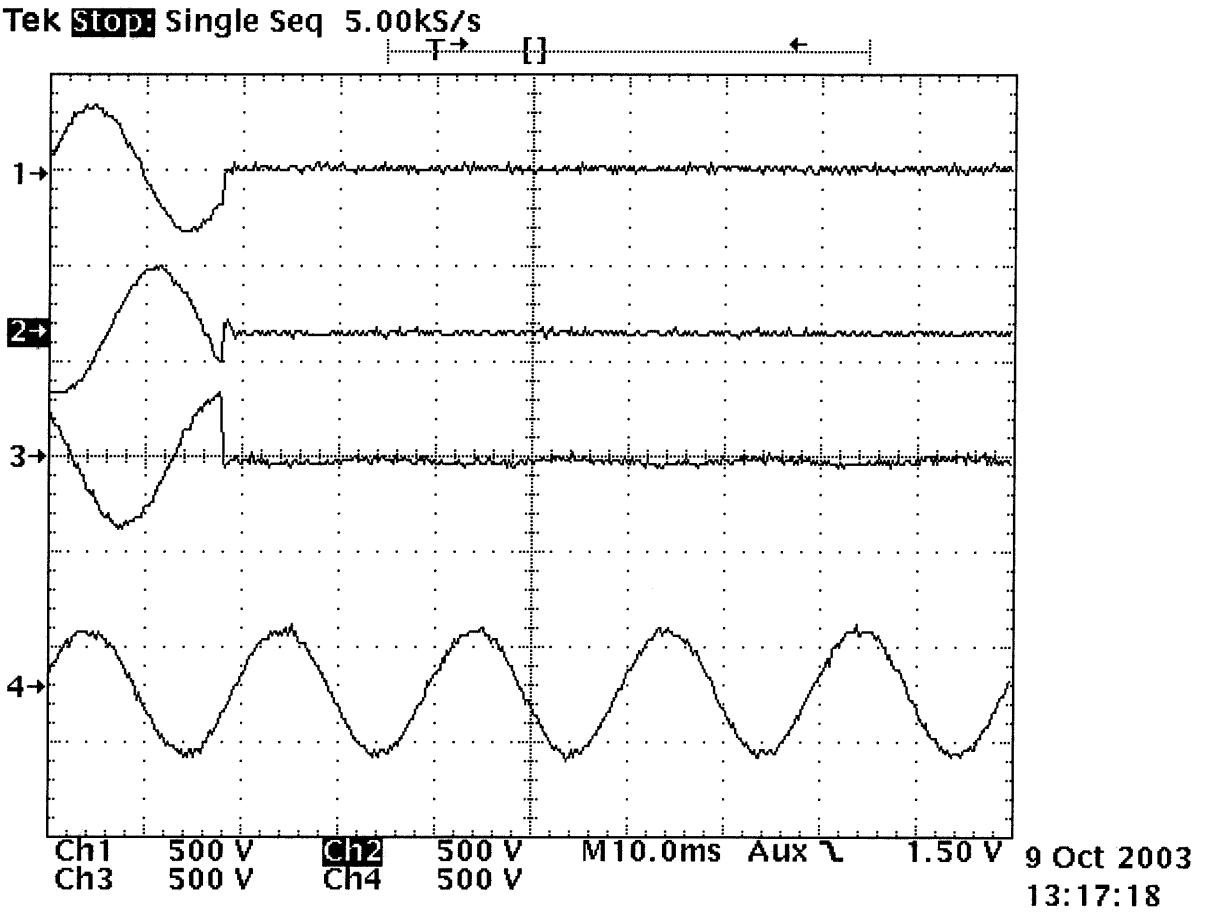
Channel 1: Input Voltage Phase A
Channel 2: Input Voltage Phase B
Channel 3: Input Voltage Phase C
Channel 4: Output Voltage

Below is the oscilloscope picture from step 2 of minimum dropout width, phase angle 315°:



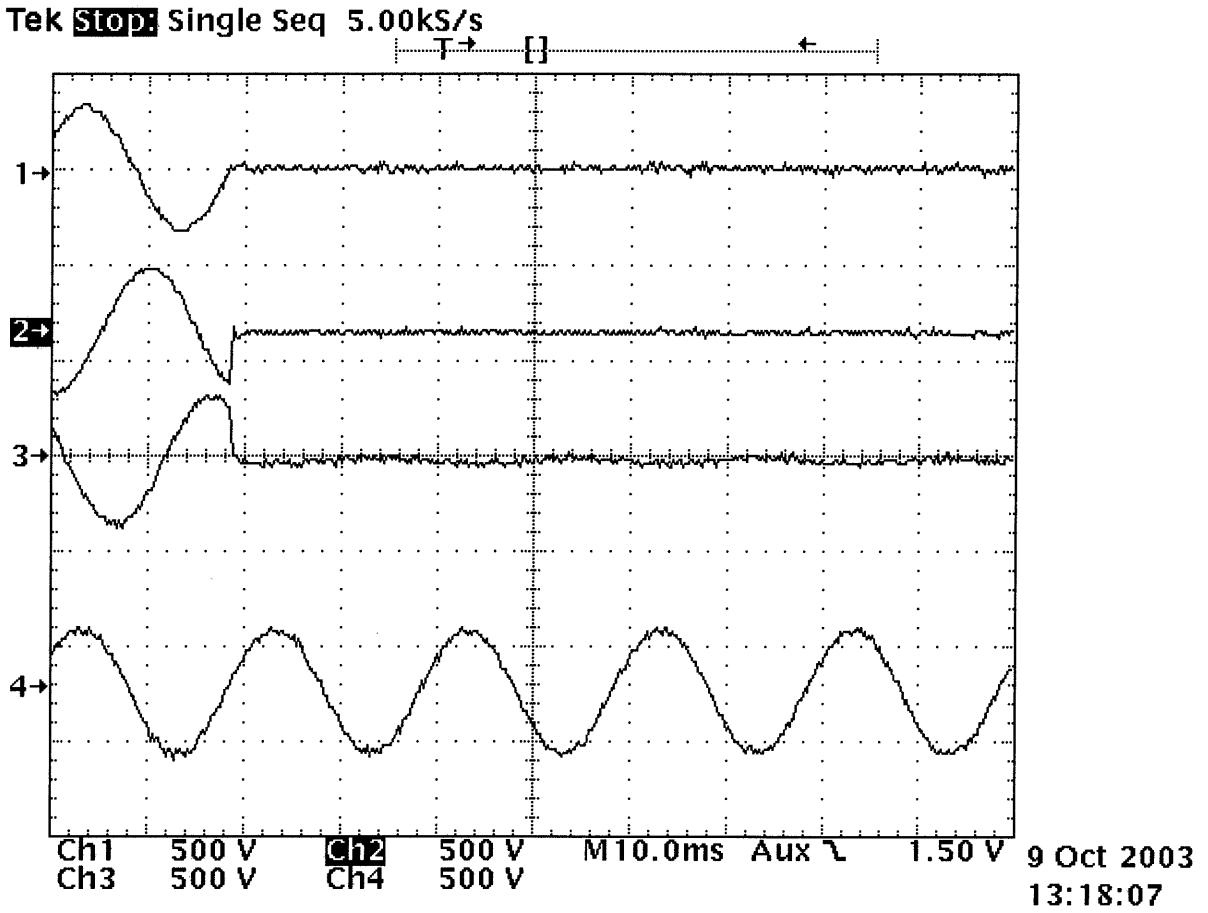
Channel 1: Input Voltage Phase A
Channel 2: Input Voltage Phase B
Channel 3: Input Voltage Phase C
Channel 4: Output Voltage

Below is the oscilloscope picture from step 2 of minimum dropout width, phase angle 330°:



Channel 1: Input Voltage Phase A
Channel 2: Input Voltage Phase B
Channel 3: Input Voltage Phase C
Channel 4: Output Voltage

Below is the oscilloscope picture from step 2 of minimum dropout width, phase angle 360°:



Channel 1: Input Voltage Phase A
Channel 2: Input Voltage Phase B
Channel 3: Input Voltage Phase C
Channel 4: Output Voltage

Table 1: Data table for Step 2 (100% of full rated load, 50 and 60 Hz input frequencies and AC voltage)

Input AC frequency (Hz)	Phase angle (°)	Minimum dropout width (msec)	Acceptable transfer/retransfer operation?	Comments
50	45			
50	90			
50	135			
50	150			
50	180			
50	225			
50	270			
50	315			
50	330			
50	360			
60	45			
60	90			
60	135			
60	150			
60	180			
60	225			
60	270			
60	315			

60	330			
60	360			

Table 3: Data table for Steps 8 and 9 (100% of full rated load, nominal input AC voltage)

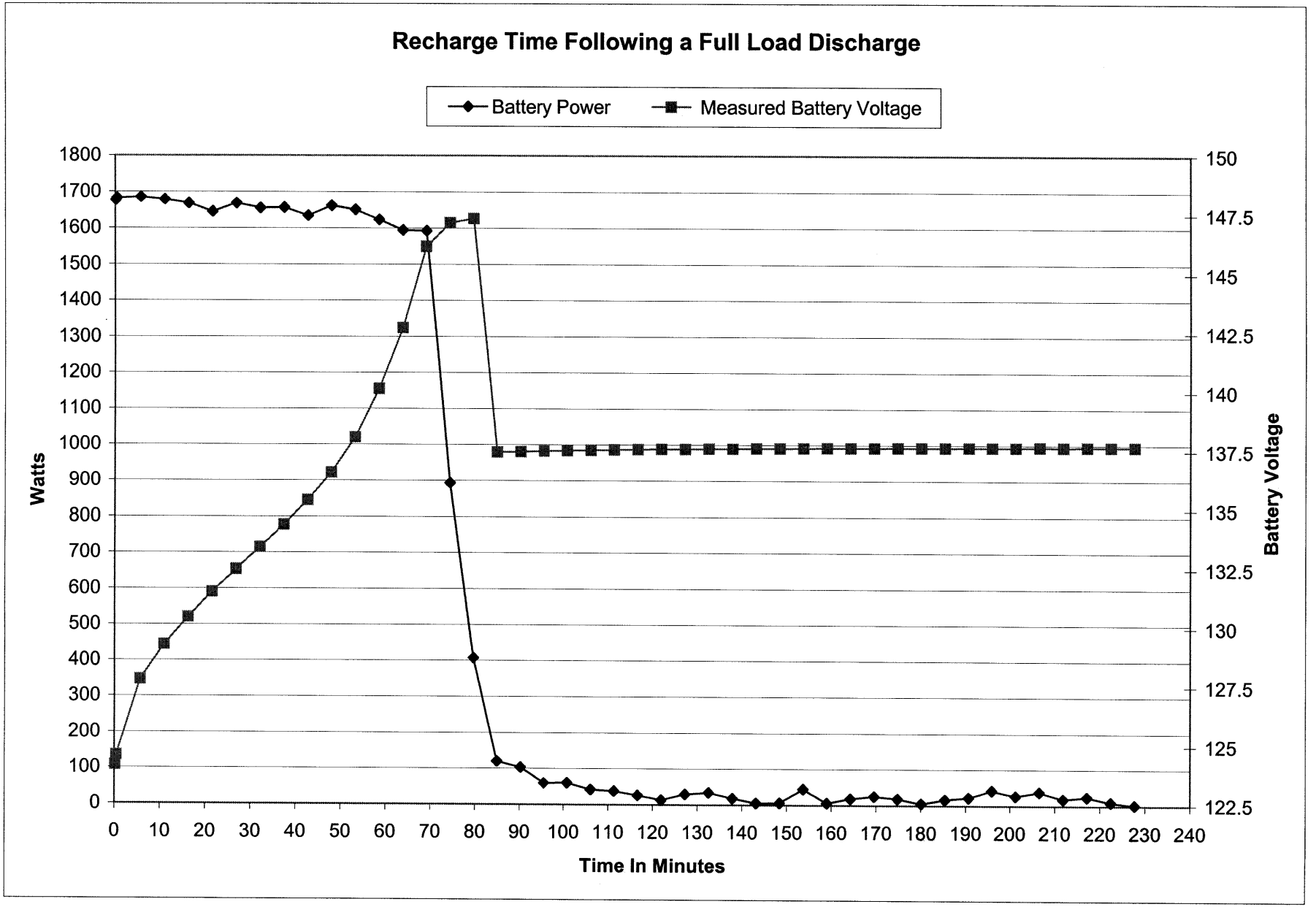
Input AC frequency	Phase angle (°)	Acceptable transfer/retransfer operation?	Comments
High operating limit	45	Yes	
High operating limit	90	Yes	
High operating limit	135	Yes	
High operating limit	150	Yes	
High operating limit	180	Yes	
High operating limit	225	Yes	
High operating limit	270	Yes	
High operating limit	315	Yes	
High operating limit	330	Yes	
High operating limit	360	Yes	
Low operating limit	45	Yes	
Low operating limit	90	Yes	
Low operating limit	135	Yes	
Low operating limit	150	Yes	
Low operating limit	180	Yes	
Low operating limit	225	Yes	
Low operating limit	270	Yes	
Low operating limit	315	Yes	
Low operating limit	330	Yes	
Low operating limit	360	Yes	

Revision History:

Rev Author Date

14 31 - Dec - 2003 by Scott Derushia Status: Proposed
15 31 - Dec - 2003 by Scott Derushia Status: Proposed - Pending Approval
16 31 - Dec - 2003 by Scott Derushia Status: Proposed - Pending Approval
17 31 - Dec - 2003 by Scott Derushia Status: Approved
18 31 - Dec - 2003 by Scott Derushia Status: Approved
19 31 - Dec - 2003 by Scott Derushia Status: Approved
20 31 - Dec - 2003 by Scott Derushia Status: On-Hold
21 31 - Dec - 2003 by Scott Derushia Status: On-Hold

Change made:


Recharge Time Following a Full Load Discharge
Battery Power
Measured Battery Voltage
Watts
Battery Voltage
Time In Minutes
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
150
147.5
145
142.5
140
137.5
135
132.5
130
127.5
125
122.5
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240

Harmonic Testing 2/20/2003

Operator Mike Ingemi Model 16KVa serial System rating 208 Input Current
split phase dvt VA 16000 Watts 600(Vac Harmonic
Verification.

	Phase A	Phase B
Vin Phase-neutral	138	138
Power factor	0.0839	0.95
Input current	20.58	19.04
Vthd	3.05%	3.45%
Athd	26.80%	13.71%
current crest factor	2.095	1.489
60 hz current	19.742	18.55

Frequency	Harmonic	% fundemental current phase A	% fundemental current phase B
0	0	0	0
60	1	20%	19%
120	2	1%	2%
180	3	16%	7%
240	4	1%	76%
300	5	8%	1%
360	6	0%	0%
420	7	6%	3%
480	8	0%	0%
540	9	7%	6%
600	10	1%	0%
660	11	6%	4%
720	12	0%	0%
780	13	4%	3%
840	14	1%	0%
900	15	4%	2%
960	16	1%	1%
1020	17	4%	0%
1080	18	0%	0%
1140	19	5%	1%
1200	20	1%	0%

1260	21	5%	2%
1320	22	0%	0%
1380	23	4%	3%
1440	24	0%	1%
1500	25	5%	2%
1560	26	0%	0%
1620	27	5%	1%
1680	28	1%	0%
1740	29	4%	1%
1800	30	1%	0%
1860	31	3%	2%
1920	32	1%	0%
1980	33	3%	2%
2040	34	1%	0%
2100	35	3%	1%
2160	36	1%	0%
2220	37	2%	2%
2280	38	1%	0%
2340	39	1%	1%
2400	40	0%	0%

Harmonic Testing 2/20/2003

Operator Mike Ingemi Model 16KVa serial System rating 208 Input Current Harmonic Verification.
split phase dvt VA 16000 Watts 128(Vac

	Phase A	Phase B
Vin Phase-neutral	124.66	124.68
Power factor	0.982	0.986
Input current	36.47	37.28
Vthd	1.50%	1.76%
Athd	13.62%	13.59%
current crest factor	1.55	1.65
60 hz current	35.84	36.65

180 Degrees out of phase

Frequency	Harmonic	% fundemental current phase A	% fundemental current phase B

0	0	0	0
60	1	36%	37%
120	2	3%	3%
180	3	6%	7%
240	4	1%	1%
300	5	2%	3%
360	6	0%	0%
420	7	3%	3%
480	8	0%	0%
540	9	1%	1%
600	10	0%	0%
660	11	1%	0%
720	12	0%	0%
780	13	1%	0%
840	14	0%	0%
900	15	1%	1%
960	16	0%	0%
1020	17	0%	1%
1080	18	0%	0%
1140	19	1%	1%
1200	20	0%	0%
1260	21	1%	1%
1320	22	0%	0%
1380	23	0%	1%
1440	24	0%	0%
1500	25	0%	0%
1560	26	0%	0%
1620	27	0%	0%
1680	28	0%	0%
1740	29	1%	1%
1800	30	0%	0%
1860	31	0%	0%
1920	32	0%	0%
1980	33	1%	0%
2040	34	0%	0%
2100	35	0%	0%
2160	36	0%	0%

2220	37	0%	0%
2280	38	0%	0%
2340	39	0%	0%
2400	40	0%	0%

Regulatory Compliance Test Equipment

Equipment	Manufacturer	Model	Serial No.	APC No.	Calibration Date
Digital Power Meter	Yokogowa Power Meter	WT130	2535GA052	2719	09/01/04
Digital Power Meter	Yokogowa Power Meter	WT130	27BW0085	1864	09/01/04
Power Analyzer	Voltec	PM3000A	5514	1368	11/14/04
Power Analyzer	Voltech	PM3000A	5590	523	10/28/04
Hipot Tester	Hypotronics	HD100 Series	00000	2412	03/11/04
Impedance Tester	Associated Research	3030D	A140024	2411	10/01/04
Data Acquisition and Switching System	Agilent	34970A	US37036764	3212	07/25/04
Data Acquisition and Switching System	Agilent	34970A	US37043432	3328	10/01/04
Data Acquisition and Switching System	Agilent	34970A	US37037447	3329	10/01/04
Oscilloscope	Tektronix	TDS430A	B062324	2939	02/03/04
Differential Probe	Tektronix	P5205	B016520	3382	07/01/04
Differential Probe	Tektronix	P5200	B017885	2940	02/03/04
Leakage Tester	ED & D	LT-30HC	A02250053	676	12/01/04
Leakage Tester	ED & D	LT-30HC	02280067	1722	09/23/04
Leakage Tester	ED & D	LT-952HC	H04300122	2607	05/19/04

Regulatory Compliance Test Equipment

Equipment	Manufacturer	Model	Serial No.	APC No.	Calibration Date
Sharp Edge Tester	Technical Eng. Service	SET – 50	N/A	3335	10/01/04
Digital Force Gauge	Chatillon	DFIS 200	25605	1209	12/01/04
Leakage Current Meter	Simpson	229-2	N/A	2847	11/01/04
Clamp Meter	Fluke	Model 36	74815624	2712	12/01/04
Clamp Meter	Fluke	Model 33	5900166	630	09/22/04
Multimeter	Fluke	Model 70	53200782	233	12/01/04
Leakage Current Meter	Simpson	Model 229-2	N/A	2847	11/01/04 s.w.
Digital Power Meter	Yokogowa Power Meter	WT130	12B918042J	3801	04/18/04
Power Analyzer	Voltec	PM3000A	6633	748	10/01/04
Thermometer	Fluke	Model 51	4910076	232	10/27/04
Thermometer	Fluke	Model 52	5120320	231	10/27/04
Data Acquisition and Switching System	Agilent	34970A	US37021824	2699	01/01/04
Digital Multimeter	Fluke	Model 45	8256009	3800	12/01/04
Current Clamp	Voltec	C 103	CB59/5778	4134	07/08/04
Current Clamp	Voltec	C 103	CB59/5774	4135	07/08/04
Current Clamp	Voltec	CL 100	CA90/8368	4136	07/08/04
Current Clamp	Voltec	CL 100	CA90/8367	4137	07/08/04