

File E186249
Project 02NK81877

August 12, 2000

REPORT

on

COMPONENT - POWER SUPPLIES, INFORMATION TECHNOLOGY EQUIPMENT
INCLUDING ELECTRICAL BUSINESS EQUIPMENT

Astec Custom Power (Philippines) Inc.
Metro Manila, Philippines

Copyright © 2002 Underwriters Laboratories Inc.

Underwriters Laboratories Inc. authorizes the above-named company to reproduce this Report provided it is reproduced in its entirety.

or

Underwriters Laboratories Inc. authorizes the above-named company to reproduce that portion of this Report consisting of this Cover Page through Page 2.

DESCRIPTION

PRODUCT COVERED:

USR, CNR Component - Switching Power Supplies, Models LPS173 and LPS172 for use in Information Technology Equipment, Including Electrical Business Equipment.

ELECTRICAL RATINGS:

MODEL	INPUT	OUTPUT
LPS173	AC 100 - 250 V 4 A 50 / 60 Hz DC 120 V min. - 300 V max. 4 A	(at 30 CFM Forced air cooling) DC +6 - 12 V, 15 A max. DC +5 VSTBY, 2 A max. DC +12 V (FAN_OUT), 1 A max. (at Convection cooling) DC +6 - 12 V, 9.1 A max. DC +5 VSTBY, 1 A max. DC +12 V (FAN_OUT), 0.5 A max.

- Maximum continuous output power is 180 W with 30 CFM forced air cooling, unit without cover.
- Maximum continuous output power is 130 W with 30 CFM forced air cooling, unit with cover.
- Maximum continuous output power is 110 W with convection cooling, unit without cover.

LPS172	AC 100 - 250 V 4 A 50 / 60 Hz DC 120 V min. - 300 V max. 4 A	(at 30 CFM Forced air cooling) DC +2.5 - 6.0 V, 35 A max. DC +5 VSTBY, 2 A max. DC +12 V (FAN_OUT), 1 A max. (at Convection cooling) DC +2.5 - 6.0 V, 22 A max. DC +5 VSTBY, 1 A max. DC +12 V (FAN_OUT), 0.5 A max.
--------	--	---

- Maximum continuous output power is 175 W with 30 CFM forced air cooling, unit without cover.
- Maximum continuous output power is 130 W with 30 CFM forced air cooling, unit with cover.
- Maximum continuous output power is 110 W with convection cooling, unit without cover.

ENGINEERING CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

General - The unit is for use in product where the acceptability of the combination is determined by Underwriters Laboratories Inc.

Both USR and CNR indicate investigation to the Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment, UL 60950 and CAN/CSA C22.2 No. 60950-00, Third Edition.

Conditions of Acceptability - When installed in the end-use equipment, the following are the considerations to be made:

1. This component has been judged on the basis of the required creepages and clearances in the Third Edition of the Standard for Safety of Information Technology Equipment Including Electrical Business Equipment, UL 60950 and CAN/CSA C22.2 No. 60950-00, Sub-clause 2.10, which covers the end-use product for which the component was designed. The operational insulations have been evaluated by conducting Component Failure Test per Sub-clause 5.3.4(c) of UL 60950 and CAN/CSA C22.2 No. 60950-00, Third Edition.
2. This power supply has only been evaluated for use in a pollution degree 2 environment.
3. This power supply was evaluated with the assumption that the power source is a TN-S system as defined by UL 60950 and CAN/CSA C22.2 No. 60950-00, Third Edition.
4. A suitable enclosure shall be provided by end use equipment.
5. This power supply has been evaluated for use in Class I equipment as defined in UL 60950 and CAN/CSA C22.2 No. 60950-00, Third Edition and shall be properly earthed or bonded to earth in the end-use. An additional evaluation shall be made if the power supply is intended for use in other than Class I equipment.
6. The secondary outputs of the power supply are unearthed non-energy hazard SELV. Sub-clause 2.2.3.1 per UL 60950 and CAN/CSA C22.2 No. 60950-00, Third Edition were used to maintain the insulation of SELV from primary circuits.
7. This power supply has been evaluated for use in 25°C and 50°C ambient.
8. Transformers, T1, T2, T3, T4 and T5 employ Class F electrical insulation system.
9. The input and secondary output connectors have not been evaluated for field connections.
10. This power supply is classified Level 3 as defined by UL 60950 and CAN/CSA C22.2 No. 60950-00, Third Edition.
11. A suitable power supply disconnection means is to be provided by the end-use equipment.
12. This power supply has been evaluated under a specified forced air cooling and convection. Refer to ILL. 3 for details of forced air cooling ventilation system.
13. Maximum current per output at convection cooling must be computed as per Installation and Operating Instruction.

CONSTRUCTION DETAILS:

Spacing - The following spacings are maintained in the power supply, Models LPS173 and LPS172.

1. Minimum 5.0 mm creepage distance and minimum 4.0 mm clearance distance between primary and secondary pins and traces of power transformer (T1).
2. Minimum 8.2 mm creepage distance and minimum 4.6 mm clearance distance between primary and secondary pins and traces of auxiliary transformer (T2).
3. Minimum 5.2 mm creepage distance and minimum 4.2 mm clearance distance between primary and secondary pins and traces of gate drive transformers (T3, T4).
4. Minimum 7.2 mm creepage distance and minimum 4.0 mm clearance distance between primary and secondary pins and traces of current transformer (T5).
5. Minimum 5.0 mm creepage distance and minimum 4.0 mm clearance distance between primary and secondary pins and traces other than above items.
6. Minimum 2.5 mm creepage distance and minimum 2.0 mm clearance distance between the primary pins of power transformer (T1) and protective earth.
7. Minimum 4.1 mm creepage distance and minimum 2.3 mm clearance distance between the primary pins of auxiliary transformer (T2) and protective earth.
8. Minimum 2.5 mm creepage distance and minimum 2.0 mm clearance distance between live and neutral traces before the fuse (F1) and between primary and earthed traces other than items 4 and 5.

See ILLS. 1 and 2 for details.

Section General - The following construction items are described in the Section General.

Factory Location and Identification
Abbreviations
Corrosion Protection
Segregation
Marking Methods
Internal Polymeric Materials
Wire Connections
Earthing/Bonding
Mechanical Assembly
Earthing Symbol
Capacitors

Voltage Surge Suppressors
C-UL Requirements
Internal Wiring
Wire Positioning Devices
Markings
Printed Wiring Boards
Connectors and Receptacles
Insulating Tubing/Sleeving
Tolerances
Optocouplers

ILLUSTRATION:

- ILL. 1 - Main PWB Trace Layout (Component Side)
- ILL. 2 - Main PWB Trace Layout (Solder Side)
- ILL. 3 - Ventilation Set-up for LPS173 and LPS172
(Not for Field Representative's Use)

Model Difference - Model LPS173 is identical to Model LPS172 except for some components and output rating.

General - The general design, shape and arrangement shall be as illustrated, in the following figures, except where variations are specifically described.

MODEL LPS173 and LPS172 - FIG. 1

1. Base - Metal, U-shaped, minimum 2.0 mm thick, with an overall dimension of 216 by 108 by 38 mm. Provided with a total of eighteen slots on one side, thirteen slots of which measure 25 by 3.0 mm each, five slots measure 40 by 3.0 mm each, and a total of thirty slots on the other side, nine slots of which measure 11.5 by 3.0 mm each, another nine slots measure 18 by 3.0 mm slots each, eight slots measure 24 by 3.0 mm each and four slots measure 38 by 3.0 mm each. Insulated from Main PWB, Item 3, solder side by R/C (QMFZ2), General Electric Co., Valox Type FR1 or General Electric Co., Lexan Type FR700, minimum 0.25 mm thick, measures 215 by 122 mm.
2. Cover - (Optional) Metal, minimum 1.0 mm thick, with an overall dimension of 216 by 108 mm. Insulated from primary components by R/C (QMFZ2), General Electric Co., Valox Type FR1, minimum 0.25 mm thick, overall 102 by 97 mm.
3. Main Printed Wiring Board (Main PWB) - (ZPMV2), Refer to Section General for details. See Ills. 1 and 2 for trace layout. Secured to Base, Item 1, by three screws. Overall dimension of 213 by 100 mm.
4. Input Connector (SK4) - R/C (ECBT2), Cvilux Corp., Type CI5105P1V1, rated 7 A, 250 V ac/dc.

Alternate - Same as above except Land Win Electronic Corp., Type 3061P.

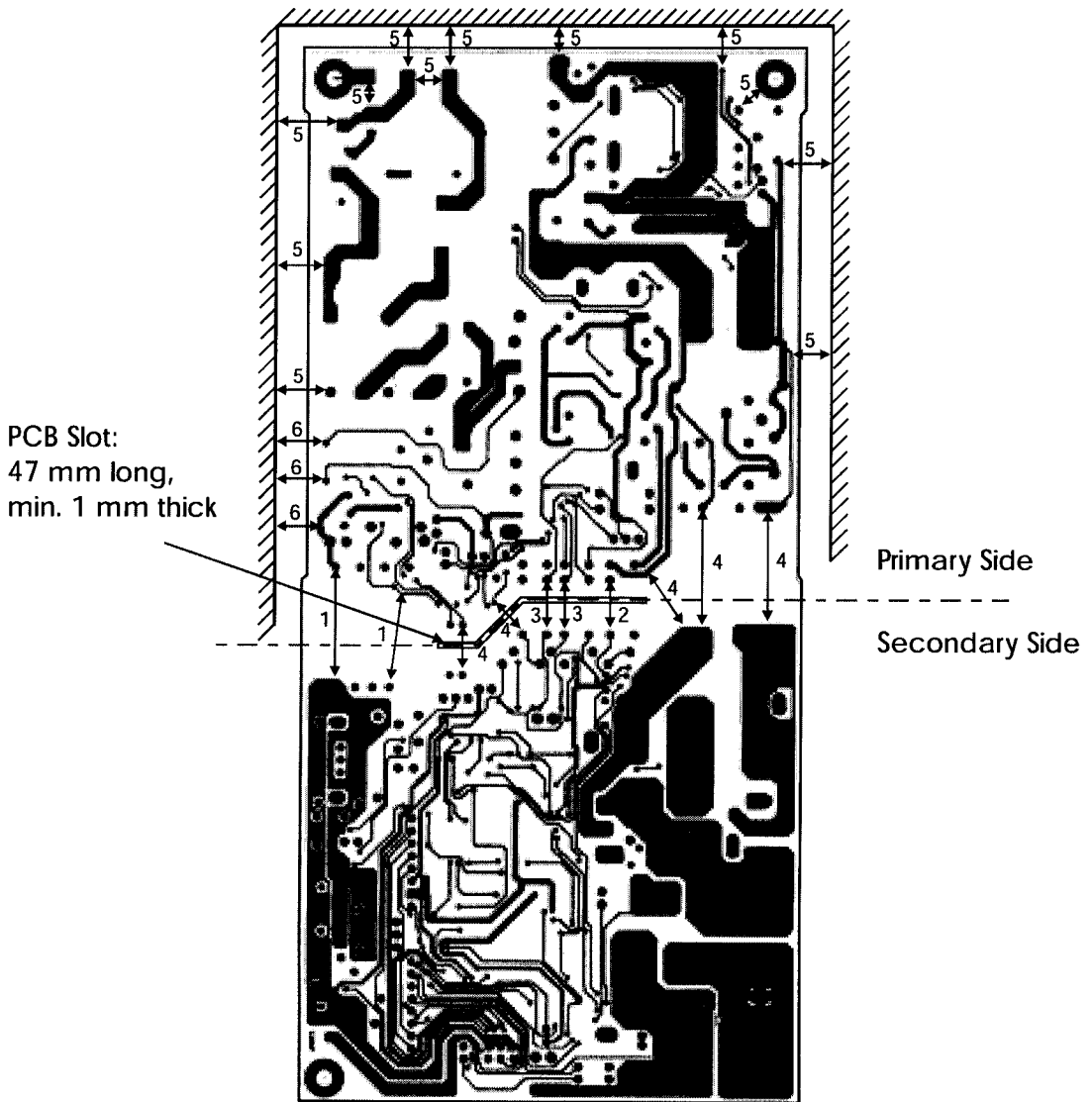
5. Fuse (F1) - (JDYX2), Bussmann, Type S501/GDA-V, rated 4 A, 250 Vac. Soldered to Main PWB, Item 2. Fuse rating permanently marked on Main PWB adjacent to the fuse.

Alternate - Same as above except Wickmann, Type 194/19194.

6. Capacitors (C1) - (Across-the-line). See Section General for manufacturer and catalog number. Each rated maximum 0.47 μ F, minimum 250 Vac.
7. Capacitors (C4) - (Across-the-line). See Section General for manufacturer and catalog number. Each rated maximum 0.22 μ F, minimum 250 Vac.
8. Capacitors (C5, C6) - (Line-to-Protective Earth). See Section General for manufacturer and catalog number. Each rated maximum 3.3 nF, minimum 250 Vac.
9. Capacitor (C107) - (Primary DC-to-Protective Earth). See Section General for manufacturer and catalog number. Each rated maximum 4.7 nF, minimum 250 Vac.
10. Discharge Resistors (R1, R2, R3) - Each rated maximum 180 Kohm, minimum 1/4 W.
11. Bridge Rectifier (D1) - Rated minimum 8 A, minimum 600 V. Secured to primary heatsink, Item , by a screw and nut.

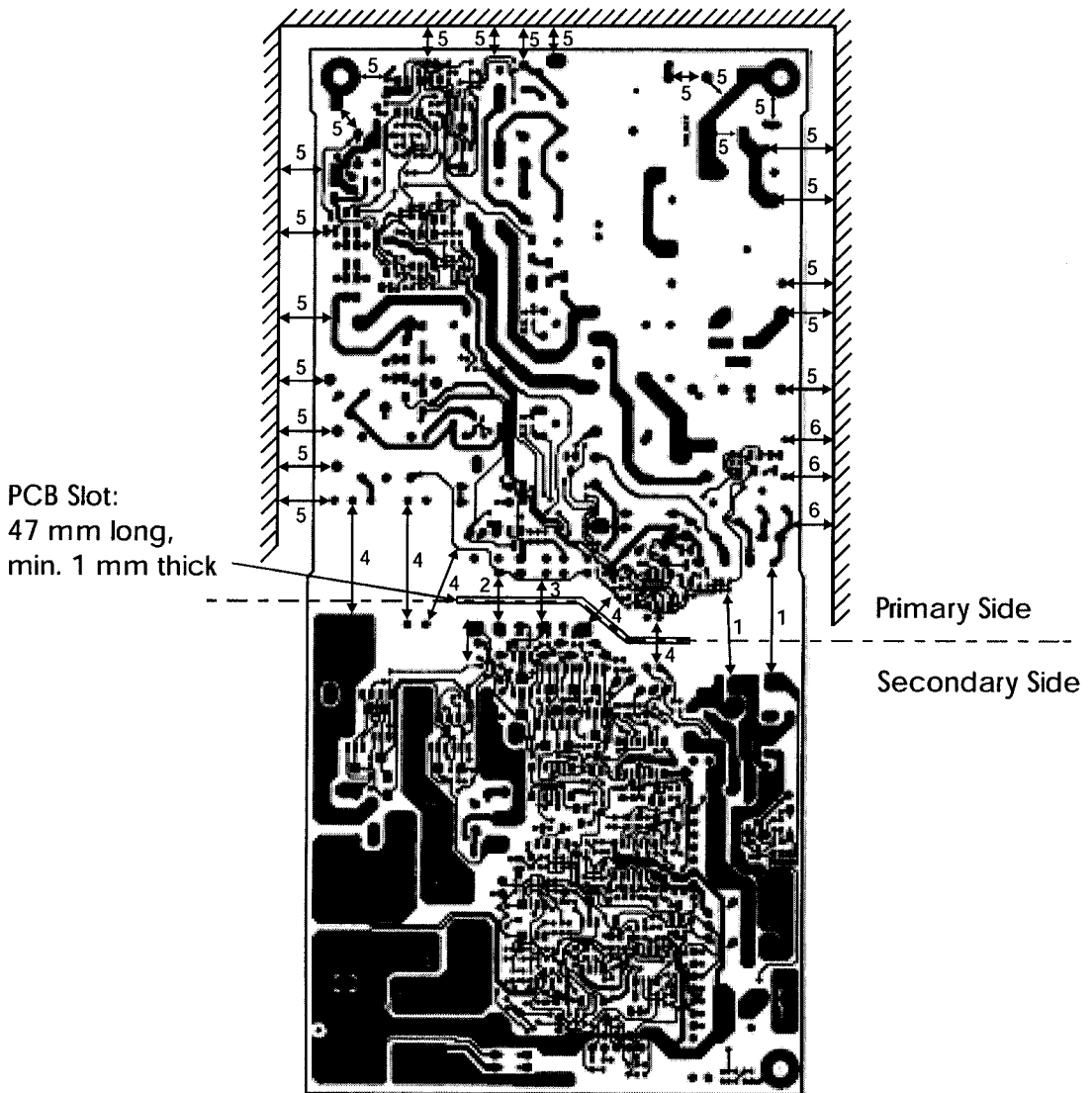
12. Electrolytic Capacitor (C106) - With integral pressure relief, rated minimum 180 μ F, minimum 420 V, minimum 105°C.
13. Common Mode Choke (L1) - Astec P/N: 852-66007310.
14. Differential Chokes (L2, L3) - Astec P/N: 852-66006060.
15. Common Mode Choke (L4) - Astec P/N: 852-66006100.
16. PFC Choke (L5) - Astec P/N: 852-66006390.
17. Snubber Choke (L201) - Astec P/N: 852-66006870.
18. PFC Transistor (Q101) - Rated minimum 20 A, minimum 500 V.
19. Power Transistors (Q201) - Rated minimum 6.5 A, minimum 600 V.
20. Power Transistors (Q11, Q12, Q13, Q14) - Rated minimum 8 A, minimum 500 V.
21. Optocouplers (IC203) - See Section General for manufacturer and catalog number. Rated minimum 3000 Vac isolation test voltage.
22. Power Transformer (T1) - Astec P/N: 852-66007340. Provided with (OBJY2), Astec International Ltd., Class 155 (F) insulation system, designated 155-10B.
23. Auxiliary Transformer (T2) - Astec P/N: 852-66006800. Provided with (OBJY2), Astec International Ltd., Class 155 (F) insulation system, designated 155-10B.
24. Gate Drive Transformer (T3, T4) - Astec P/N: 852-66006140. Provided with (OBJY2), Astec International Ltd., Class 155 (F) insulation system, designated 155-10B.
25. Current Transformer (T5) - Astec P/N: 852-66006080. Provided with (OBJY2), Astec International Ltd., Class 155 (F) insulation system, designated 155-10B.
26. Output Choke (L23) - Astec P/N: 852-20101260.
27. Insulator between F1 and PE screw - (QMFZ2), General Electric, Valox Type FR1, minimum 0.25 mm thick. Overall dimension of 21 by 8.5 mm.
28. Primary Heatsink - Metal, shaped as shown. Min. 2 mm thick, overall dimension of 95 by 70 mm.
29. Q11, Q12, Q13, Q14 heatsink - Metal, shaped as shown. Min. 2 mm thick, measures 42 by 28.5 mm.

ILL. 1 - PWB TRACE LAYOUT (COMPONENT SIDE)



- LOCATION: 1 - Minimum 8.2 mm creepage distance, minimum 4.6 mm clearance
LOCATION: 2 - Minimum 7.2 mm creepage distance, minimum 4.0 mm clearance
LOCATION: 3 - Minimum 5.2 mm creepage distance, minimum 4.2 mm clearance
LOCATION: 4 - Minimum 5.0 mm creepage distance, minimum 4.0 mm clearance
LOCATION: 5 - Minimum 2.5 mm creepage distance, minimum 2.0 mm clearance
LOCATION: 6 - Minimum 4.1 mm creepage distance, minimum 2.3 mm clearance

ILL. 2 - PWB TRACE LAYOUT (SOLDER SIDE)



LOCATION: 1 - Minimum 8.2 mm creepage distance, minimum 4.6 mm clearance

LOCATION: 2 - Minimum 7.2 mm creepage distance, minimum 4.0 mm clearance

LOCATION: 3 - Minimum 5.2 mm creepage distance, minimum 4.2 mm clearance

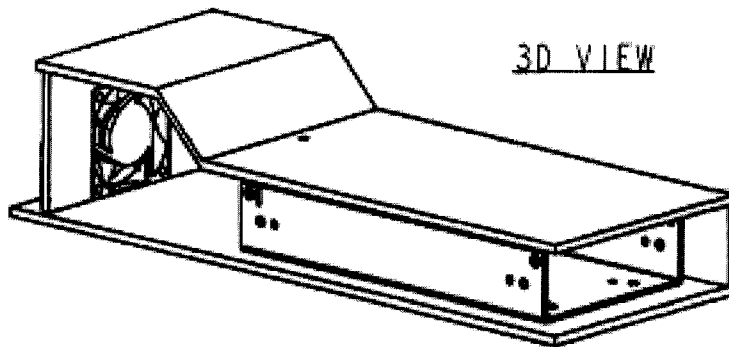
LOCATION: 4 - Minimum 5.0 mm creepage distance, minimum 4.0 mm clearance

LOCATION: 5 - Minimum 2.5 mm creepage distance, minimum 2.0 mm clearance

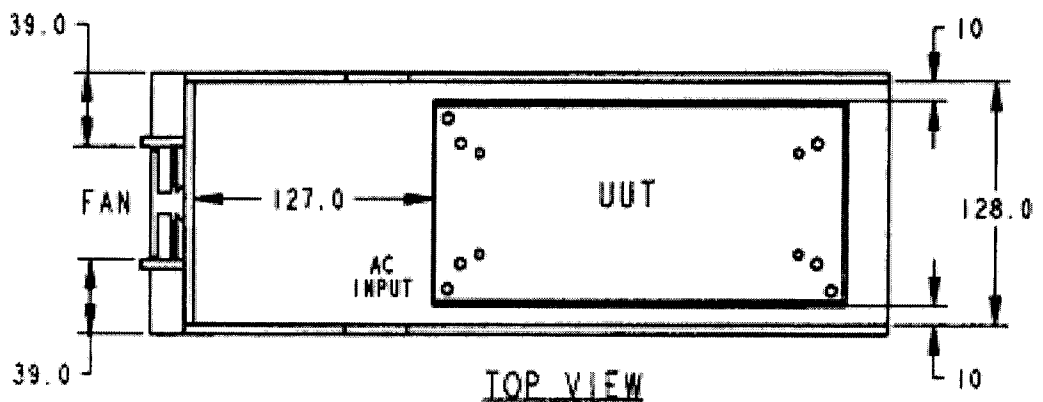
LOCATION: 6 - Minimum 4.1 mm creepage distance, minimum 2.3 mm clearance

ILL. 3 - VENTILATION SET-UP FOR LPS173 AND 172

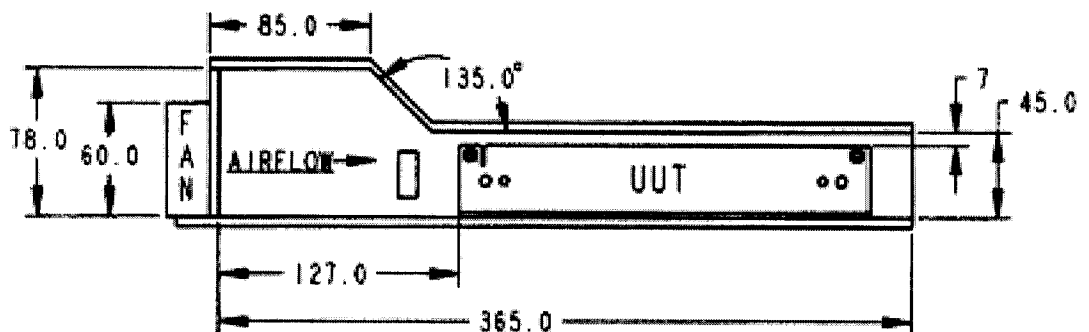
Fan used: 1 pc. Rated 12V dc, 30 CFM



3D VIEW



TOP VIEW



SIDE VIEW

TEST RECORD NO. 1

GENERAL

The test results reported relate only to the items tested.

SAMPLES:

Samples of Model LPS173 were submitted for review and testing under the TCP.

The following tests were conducted in accordance with U.S. and Canadian (Bi-National) Standard for Safety of Information Technology Equipment, CSA C22.2, No. 60950 / UL 60950, Third Edition, including revisions through revision date March 15, 2002.

The following tests were conducted:

<u>Ref. Clause No.</u>	<u>Test Title</u>	<u>Test Ref. No.</u>
1.) 1.2.8.4	Hazardous Voltage	TR-AL02003-01
2.) 1.2.8.8	Output Power Limitation	TR-AL02003-02
3.) 1.6.2	Input Test	TR-AL02003-03
4.) 1.7.13	Marking Permanency	TR-AL02003-04
5.) 2.1.1.7	Energy Discharge Test	TR-AL02003-05
6.) 2.6.3.3	Protective Earthing Test	TR-AL02003-06
7.) 2.9.2, 5.2	Humidity and Electric Strength Test for Power Supply	TR-AL02003-07
8.) 2.9.2, 5.2	Humidity and Electric Strength Test for Power Transformer	TR-AL02003-08
9.) 2.9.2, 5.2	Humidity and Electric Strength Test for Auxiliary Transformer	TR-AL02003-09
10.) 2.9.2, 5.2	Humidity and Electric Strength Test for Gate Drive Transformers	TR-AL02003-10
11.) 2.9.2, 5.2	Humidity and Electric Strength Test for Current Transformer	TR-AL02003-11
12.) 2.9.2, 5.2	Humidity and Electric Strength Test for Insulating Components and materials	TR-AL02003-12
13.) 2.10	Creepage and Clearance Distance	TR-AL02003-13
14.) 2.10.2	Working Voltage Measurement	TR-AL02003-14
15.) 4.2.3, 4.2.4	Enclosure Deflection Test	TR-AL02003-15
16.) 4.5.1	Heating Test	TR-AL02003-16
17.) 4.5.2	Ball Pressure Test	TR-AL02003-17
18.) 5.1	Touch Current Test	TR-AL02003-18
19.) 5.3	Output Short Circuit Test	TR-AL02003-19
20.) 5.3	Output Overload Test	TR-AL02003-20
21.) 5.3	Abnormal Operating and Fault Condition	TR-AL02003-21
22.) 5.3.1	Fan Malfunction Test	TR-AL02003-22
23.) 5.3.3	Transformer Overload Test	TR-AL02003-23

The test methods and results of the above tests have been reviewed and found in accordance with the requirement in the standard mentioned above.

TEST RECORD NO. 2

GENERAL

The test results reported relate only to the items tested.

SAMPLES:

Samples of Model LPS172 were submitted for review and testing under the TCP.

The following tests were conducted in accordance with U.S. and Canadian (Bi-National) Standard for Safety of Information Technology Equipment, CSA C22.2, No. 60950 / UL 60950, Third Edition, including revisions through revision date March 15, 2002.

The following tests were conducted:

<u>Ref. Clause No.</u>	<u>Test Title</u>	<u>Test Ref. No.</u>
1.) 1.2.8.4	Hazardous Voltage	TR-AL02002-01
2.) 1.2.8.8	Output Power Limitation	TR-AL02002-02
3.) 1.6.2	Input Test	TR-AL02002-03
4.) 2.9.2, 5.2	Humidity and Electric Strength Test for Power Supply	TR-AL02002-04
5.) 2.9.2, 5.2	Humidity and Electric Strength Test for Power Transformer	TR-AL02002-05
6.) 2.10	Creepage and Clearance Distance	TR-AL02002-06
7.) 2.10.2	Working Voltage Measurement	TR-AL02002-07
8.) 4.5.1	Heating Test	TR-AL02002-08
9.) 5.1	Touch Current Test	TR-AL02002-09
10.) 5.3	Output Short Circuit Test	TR-AL02002-10
11.) 5.3	Output Overload Test	TR-AL02002-11
12.) 5.3	Abnormal Operating and Fault Condition	TR-AL02002-12
13.) 5.3.1	Fan Malfunction Test	TR-AL02002-13
14.) 5.3.3	Transformer Overload Test	TR-AL02002-14

The test methods and results of the above tests have been reviewed and found in accordance with the requirement in the standard mentioned above.

CONCLUSION

Samples of the components covered by this Report have been found to comply with the requirements covering the category and the components are judged to be eligible for Component Recognition and Follow-up Service. Under the Service, the manufacturer is authorized to use the Recognized Marking described in the Follow-Up Service Procedure on such components which comply with said Procedure and any other applicable requirements of Underwriters Laboratories Inc. Only those components which properly bear the Recognized Markings are considered as Recognized Components by Underwriters Laboratories Inc.

Reported by:

Reviewed by:

HARRY LIE
Engineer
Conformity Assessment Services
UL International Ltd

KWOK WEI PING
Engineering Team Leader
Conformity Assessment Services
UL International Ltd

Pursuant to the Corporate Services Agreement between UL International Ltd. and Underwriters Laboratories Inc. ("UL"), UL hereby accepts and issues this report.