

## COVER PAGE FOR TEST REPORT

Product Category:	Power Supplies for Information Technology Equipment Including Electrical Business Equipment
Product Category CCN:	QQGQ2, QQGQ8
Test Procedure:	Component Recognition
Product:	Power Supply, Built-In DC/DC
Model/Type Reference:	RFF700-48S28XXXXX, RFF600-48S28XXXXX, RFF600-24S28XXXXX, RFF500-48S28XXXXX, RFF500-24S28XXXXX, RFF400-48S28XXXXX, RFF400-24S28XXXXX, RFB400-48S28XXXXX, RFB350-48S28XXXXX, RFB350-48S12XXXXX, RFB350-48S15XXXXXXXXXXXXXXXXX, RFB300-48S28XXXXX, RFB300-24S28XXXXX, RFB300-24S12XXXXX, RFB300-48S28-5-A, RFB250-48S30XXXXX, RFB210-48S28XXXXX, RFB200-24S28XXXXXXXXXXXXXXXXX, where X represents any alphanumeric character or blank.
Rating(s):	<p>Input Voltage: 36-75 Vdc for units with '48' in model designation and 18-36 Vdc for all other models.</p> <p>Output Voltage: 28Vdc for units with 'S28' in model designation and 12Vdc for units with 'S12' in model designation.</p> <p>See Enclosures, Miscellaneous for complete electrical ratings by model designation.</p>
Standards:	<p>UL 60950-1, 2nd Edition, 2007-03-27 (Information Technology Equipment - Safety - Part 1: General Requirements)</p> <p>CSA C22.2 No. 60950-1-07, 2nd Edition, 2007-03 (Information Technology Equipment - Safety - Part 1: General Requirements)</p>
Applicant Name and Address:	<p>ASTECH INTERNATIONAL LTD - PHILIPPINE BRANCH</p> <p>16TH &amp; 17TH FL</p> <p>LU PLAZA</p> <p>2 WING YIP ST</p> <p>KWUN TONG KOWLOON HONG KONG</p>
<p>This Report includes the following parts, in addition to this cover page:</p> <ol style="list-style-type: none"> <li>1. Specific Inspection Criteria</li> <li>2. Specific Technical Criteria</li> <li>3. Clause Verdicts</li> <li>4. Critical Components</li> <li>5. Test Results</li> <li>6. National Differences</li> <li>7. Enclosures</li> </ol>	

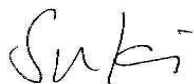
This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of Underwriters Laboratories Inc. ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

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Test Report By:



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Reviewed By:



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## SPECIFIC INSPECTION CRITERIA

BA1.0	<b>Special Instructions to UL Representative</b>
BA1.1	Enclosed electrical schematics, trace layouts, component layouts, transformer diagrams and inductor diagrams are for engineering use only and may only be use by the field representative for reference.

BB1.0	<b>Supporting Documentation</b>
BB1.1	<p>The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:</p> <p>A. Authorization - The Authorization page may include additional Factory Identification Code markings.</p> <p>B. Generic Inspection Instructions -</p> <ul style="list-style-type: none"> <li>i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.</li> <li>ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.</li> <li>iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.</li> </ul>

BC1.0	<b>Markings and instructions</b>	
BC1.1	The following markings and instructions are provided as indicated.	
BC1.2	All clause references are from UL 60950-1, 2nd Edition, 2007-03-27 (Information Technology Equipment - Safety - Part 1: General Requirements).	
Standard Clause	Clause Title	Marking or Instruction Details
1.7.1	Power rating - Ratings	Ratings (voltage, frequency/dc, current)
	Power rating - Company identification	Listee's or Recognized company's name, Trade Name, Trademark or File Number
	Power rating - Model	Model Number

BD1.0	<b>Production-Line Testing Requirements</b>						
BD1.1	Electric Strength Test Special Constructions - Refer to Generic Inspection Instructions, Part AC for further information.						
						Test Potential	
	Model	Component	Removable Parts	Test probe location	V rms	V dc	Test Time, s
	N/A						
BD1.2	Earthing Continuity Test Exemptions - This test is not required for the following models:			RFF and RFB Series			
BD1.3	Electric Strength Test Exemptions - This test is not required for the following models:			RFF and RFB Series			
BD1.4	Electric Strength Test Component Exemptions - The following solid-state components may disconnected from the remainder of the circuitry during the performance of this test:			-----			

BE1.0	<b>Sample and Test Specifics for Follow-Up Tests at UL</b>					
BE1.1	Model	Component	Material	Test	Sample(s)	Test Specifics
	N/A					

## SPECIFIC TECHNICAL CRITERIA

<b>UL 60950-1:2005 (2nd Edition)</b>	
<b>Information technology equipment - Safety -</b>	
<b>Part 1: General requirements</b>	
Report Reference No .....	E186249-A52-UL-2
Compiled by .....	Suki Kwong
Reviewed by .....	Brian Wong
Date of issue .....	2010-05-20
Standards .....	UL 60950-1, 2nd Edition, 2007-03-27 (Information Technology Equipment - Safety - Part 1: General Requirements) CSA C22.2 No. 60950-1-07, 2nd Edition, 2007-03 (Information Technology Equipment - Safety - Part 1: General Requirements)
Test procedure .....	Component Recognition
Non-standard test method .....	N/A
<b>Test item</b> description .....	Power Supply, Built-In DC/DC
Trademark .....	None
Model and/or type reference .....	RFF700-48S28XXXXX, RFF600-48S28XXXXX, RFF600-24S28XXXXX, RFF500-48S28XXXXX, RFF500-24S28XXXXX, RFF400-48S28XXXXX, RFF400-24S28XXXXX, RFB400-48S28XXXXX, RFB350-48S28XXXXX, RFB350-48S12XXXXX, RFB350-48S15XXXXXXXXXXXXXXXXX, RFB300-48S28XXXXX, RFB300-24S28XXXXX, RFB300-24S12XXXXX, RFB300-48S28-5-A, RFB250-48S30XXXXX, RFB210-48S28XXXXX, RFB200-24S28XXXXXXXXXXXXXXXXX, where X represents any alphanumeric character or blank.
Rating(s) .....	Input Voltage: 36-75 Vdc for units with '48' in model designation and 18-36 Vdc for all other models.  Output Voltage: 28Vdc for units with 'S28' in model designation and 12Vdc for units with 'S12' in model designation.  See Enclosures, Miscellaneous for complete electrical ratings by model designation.

**Particulars: test item vs. test requirements**

Equipment mobility .....	: for building-in
Connection to the mains .....	: to be considered in end system
Operating condition .....	: continuous
Over voltage category .....	: to be considered in end system
Mains supply tolerance (%) .....	: No direct connection
Tested for IT power systems .....	: No
IT testing, phase-phase voltage (V) .....	: N/A
Class of equipment .....	: Class III (supplied by SELV)
Mass of equipment (kg) .....	: Less than 18 kg
Pollution degree .....	: PD 2
IP protection class .....	: IP X0

**Possible test case verdicts:**

- test case does not apply to the test object .....: N / A
- test object does meet the requirement .....: Pass
- test object does not meet the requirement .....: Fail (acceptable only if a corresponding, less stringent national requirement is "Pass")

**General remarks:**

- "(see Enclosure #)" refers to additional information appended to the Test Report
- "(see appended table)" refers to a table appended to the Test Report
- Throughout the Test Report a point is used as the decimal separator

<b>GENERAL PRODUCT INFORMATION:</b>	
CA1.0	<b>Report Summary</b>
CA1.1	N/A
CB1.0	<b>Product Description</b>
CB1.1	Component Power Supplies for Building in, DC to DC converter.
CC1.0	<b>Model Differences</b>
CC1.1	<p>All models are similar to each other except for electrical ratings and model no. Each model is provided with a suffix XXXXX or XXXXXXXXXXXXXXXX where X is any alphanumeric character denoting minor non-safety critical circuit differences.</p> <p>Model RFF600-24S28XXXXX consists of two RFB300-24S28XXXXX units.                      Model RFF700-48S28XXXXX consists of two RFB300-48S28XXXXX units.</p>
CD1.0	<b>Additional Information</b>
CD1.1	<p>See Enclosures, Miscellaneous, for external fusing info. and baseplate temperature limits.</p> <p>General product information:</p> <p>All models are DC to DC power supplies with Secondary Input and Secondary Output Converter with Functional Insulation between input and output.</p> <p>(CSA Level 3 type)</p> <p>RFF700-48S28-X-XXXX - Input rating: 36-75 V dc, 25.37 A; Output rating: 28 V dc, 25 A                      Total 700 watts maximum output power.                      Maximum Baseplate Temperature: 95 deg. C</p> <p>RFF600-48S28-X-XXXX - Input rating: 36-75 V dc, 21.75 A; Output rating: 28 V dc, 21.43 A                      Total 600 watts maximum output power.                      Maximum Baseplate Temperature: 95 deg. C</p> <p>RFF600-24S28-X-XXXX - Input rating: 18-36 V dc, 45.45 A; Output rating: 28 V dc, 21.43 A                      Total 600 watts maximum output power.                      Maximum Baseplate Temperature: 95 deg. C</p> <p>RFF500-48S28XXXXX - Input rating: 36-75 V dc, 18.12 A; Output rating: 28 V dc, 17.86 A                      Total 500 watts maximum output power.                      Maximum Baseplate Temperature: 100 deg. C</p> <p>RFF500-24S28XXXXX - Input rating: 18-36 V dc, 37.87 A; Output rating: 28 V dc, 17.86 A                      Total 500 watts maximum output power.                      Maximum Baseplate Temperature: 100 deg. C</p> <p>RFF400-48S28XXXXX - Input rating: 36-75 V dc, 14.50 A; Output rating: 28 V dc, 14.28 A</p>

	<p>Total 400 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFF400-24S28XXXXX - Input rating: 18-36 V dc, 30.30 A; Output rating: 28 V dc, 14.28 A Total 400 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB400-48S28XXXXX - Input rating: 36-75 V dc, 14.50 A; Output rating: 28 V dc, 14.30 A Total 400 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB350-48S28-X-XXXX - Input rating: 36-75 V dc, 12.69 A; Output rating: 28 V dc, 12.5 A Total 350 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB350-48S12XXXXX, RFB350-48S15XXXXXXXXXXXXXXXXX - Input rating: 36-75 V dc, 12.69 A; Output rating: 12Vdc, 29.7 A Total 350 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB300-48S28XXXXX - Input rating: 36-75 V dc, 11.16 A; Output rating: 28 V dc, 11 A Total 308 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB300-48S28-5-AXXXXX - Input rating: 36-75 V dc, 12.69 A; Output rating: 28Vdc, 12.5 A Total 350 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB300-24S28XXXXX, RFB200-24S28XXXXXXXXXXXXXXXXX - Input rating: 18-36 V dc, 22.32 A; Output rating: 28Vdc, 11 A Total 308 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB300-24S12XXXXX - Input rating: 18-36 V dc, 22.32 A; Output rating: 12 V dc, 25 A Total 308 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB250-48S30XXXXX - Input rating: 36-75 V dc, 9.30 A; Output rating: 30.20 V dc, 8.30 A Total 230 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB230-48S28XXXXX - Input rating: 36-75 V dc, 8.33 A; Output rating: 28 V dc, 8.21 A Total 230 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>RFB210-48S28XXXXX - Input rating: 36-75 V dc, 7.81 A; Output rating: 28 V dc, 7.50 A Total 210 watts maximum output power. Maximum Baseplate Temperature: 100 deg. C</p> <p>Revisions:</p>
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	<p>No. 1. Add new models RFB400-48S28XXXXX, RFB250-48S30XXXXX and RFB210-48S28XXXXX.</p> <p>No. 2. Add new models RFB200-24S28XXXXXXXXXXXXXXXXXX, RFB300-24S24XXXXXXXXXXXXXXXXXX, RFB300-48S24XXXXXXXXXXXXXXXXXX, RFB350-48S15XXXXXXXXXXXXXXXXXX.</p> <p>Reissue: Upgrading standard from 1st Edition to 2nd Edition.</p>
<b>CE1.0</b>	<b>Technical Considerations</b>
CE1.2	The product was submitted and evaluated for use at the maximum ambient temperature (T <sub>ma</sub> ) permitted by the manufacturer's specification of: 100°C (Baseplate) 95 deg C (Baseplate) - RFF700-48S28, RFF600-48S28, RFF600-24S28
CE1.4	The product is intended for use on the following power systems: TN
<b>CF1.0</b>	<b>Engineering Conditions of Acceptability</b>
CF1.1	For use only in or with complete equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.  When installed in an end-product, consideration must be given to the following:
CF1.2	The following Production-Line tests are conducted for this product: Not required. (Secondary Input and Secondary Output of the power supply has Functional Insulation Only)
CF1.3	The end-product Electric Strength Test is to be based upon a maximum working voltage of: 61V <sub>rms</sub> , 75 V <sub>pk</sub>
CF1.5	The following secondary output circuits are SELV: ALL
CF1.6	The following secondary output circuits are at hazardous energy levels: All secondary outputs
CF1.11	The power supply terminals and/or connectors are: Internal system connection, Suitable for factory wiring
CF1.13	The investigated Pollution Degree is: 2
CF1.18	The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY2 insulation system with the indicated rating greater than Class A (105°C): T1 (Class H) (180°C)
CF1.21	The maximum continuous power supply output (Watts) relied on forced air cooling from: 308 W. RFB300-48S28-XXX is for internal system connection and not hot-pluggable type. Basic Insulation between Secondary input and Secondary Outputs. The DC input of the unit is considered already isolated from 250 V ac main with Reinforced Insulation.
CF2.0	The suitability of the output connectors for disconnect under load has been evaluated in this investigation (200 cycles of connect and disconnect)
CF2.1	Consideration should be given in the end-product to covering the input terminal block if the product is connected to Centralized DC.
CF2.2	If this power supply is connected to Centralized DC, the end-product should be for use in a Restricted Access Location only. : If this power supply is connected to Centralized DC, the end-product should be for use in a Restricted Access Location only.
CF2.3	Consideration should be given to the temperature of the terminal block to determine the appropriate wire type in the end-product application.

CF2.4	Consideration should be given to identifying the type and size of conductor if used for field wiring.
CF2.5	When the end-product is connected to centralized DC, the product should have either an internal circuit breaker in series with the supply or an instruction should be provided in the service manual to indicate that a Listed 50A/min. 72Vdc breaker be installed.
CF2.6	Additional markings should be considered in the end product investigation if the +48V return is either secured to the chassis or to Earth.
CF2.7	The DC input of the unit is considered already isolated from 250 Vac main with Reinforced Insulation, or from DC centralized source. If this power supply is connected to Centralized DC, the end-product should be for use in a Restricted Access Location only. : The DC input of the unit is considered already isolated from 250 Vac main with Reinforced Insulation, or from DC centralized source.