

File E132594
Project 08CA52469

August 07, 2008

REPORT

On

COMPONENT - DIRECT PLUG-IN AND CORD CONNECTED CLASS 2 POWER UNITS

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NORTHVALE NJ 07647

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DESCRIPTION

PRODUCT COVERED:

*USR Component - Class 2 Power Supply, Models **GTH51085CC-1404, GTH51085CC-2804, GTH51085CC-0412, GTH51085CC-3711.**

ELECTRICAL RATING:

Model	Input (#)			Output	
	V	Hz	A	V dc	A
* GTH51085CC-1404	100-240	50-60	0.05	0.5-4	0.35
* GTH51085CC-2804	100-240	50-60	0.1	0.5-4	0.7
* GTH51085CC-0412	100-240	50-60	0.1	12	0.3
* GTH51085CC-3711	100-240	50-60	0.1	0.5-10.5	0.35

Note # - The input rating may be marked with any single value within the range specified.

TECHNICAL CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE)

USR indicates investigation to the U.S. Standard for Class 2 Power Units, UL 1310, Fifth Edition, with revisions including and through July 17, 2008.

Use - For use in complete equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.

Conditions of Acceptability - When installed in the end-use equipment, consideration shall be given to the following:

1. The products shall be installed in compliance with the enclosure, mounting, spacing, casualty, and segregation requirements of the ultimate application.
2. The products have been judged on the basis of the required spacing in the Standard for Class 2 Power Units, UL 1310, Par. 24.1, Par. 24.5 to Par. 24.9 and UL 840, Table 8.1 and Table 9.2 under conditions of pollution degree 2 and over voltage category II, Which would cover the component itself if submitted for unrestricted Listing.
3. The power unit is intended for use in indoor use equipment only.
4. The transformer of the unit employs Class A (105) insulation.

5. Input leads are Style 1672, No. 22 AWG, rated minimum 105°C, VW-1, 300 V. One end terminates in PWB and one pin of R1 by mechanically secured before soldering, the other end is in a free end. The suitability of connection shall be determined in each end use application.
6. Output leads are Style 1015, No. 22 AWG, rated minimum 105°C, VW-1, 600 V. One end terminates in PWB and mechanically secured before soldering, the other end is in a free end. The suitability of connection shall be determined in each end use application.
7. Strain Relief and Push-Back Relief Tests have not been investigated. The necessity of Strain Relief and Push-Back Relief Tests shall be determined in each end use application.
8. Impact Test has not been investigated. The suitability of the enclosure as ultimate enclosure shall be determined in the end use application.
- *9. The temperatures measured on enclosure outside surface of Models **GTH51085CC-1404**, **GTH51085CC-2804**, **GTH51085CC-0412** and **GTH51085CC-3711** were 38.4 °C, 50 °C, 44.4 °C and 46.2 °C respectively during the Temperature Test. The necessity of repeated Temperature Test shall be determined in each end use application.
10. The Leakage Current test has been investigated. The necessity of repeated Leakage Test shall be determined in each end use application.

CONSTRUCTION DETAILS:

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

Markings	Printed Wiring Boards
Segregation	Internal Wiring
Abbreviations	Electrical Connections
Blades	Insulation Tubing/ Sleeving
Spacings	Corrosion Protection

Markings - See Sec. Gen., Markings. The Input polarity ("Line" and "Neutral") and the output polarity ("+" and "-") shall be additionally provided.

Illustrations - The following illustrations are included in this Report.

ILL. No.	Description
1	Enclosure construction
2	PWB trace layout and component layout
3	Transformer insulation information
4	Transformer barrier construction

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

*Model Difference - Models **GTH51085CC-1404**, , **GTH51085CC-0412**, **GTH51085CC-3711** are similar to Model **GTH51085CC-2804** except for input rating, output rating and secondary components, see ELECTRICAL RATING and Table I for details.

Table I

Model	D4 Type	R4 rating	R5 rating	D2 rating
* GTH51085CC-1404	SR160	3 Ω , 1/4 W	Not provided	5.1 V, 1/2 W
* GTH51085CC-2804	SR260	3 Ω , 1/4 W	3 Ω	5.1 V, 1/2 W
* GTH51085CC-0412	SR160	3 Ω , 1/4 W	Not provided	12 V, 1/2 W
* GTH51085CC-3711	SR160	2.7 Ω , 1/4 W	Not provided	11 V, 1/2 W

*MODEL **GTH51085CC-2804**- FIG. 1
(ALSO REPRESENTS ALL MODELS)

*General - Fig.1 represents external view of Model **GTH51085CC-2804**

1. Enclosure - R/C (QMFZ2), Sabic Innovative Plastics Japan L L C (E45587), Type SP7602, all color, rated V-0, 80 °C, HWI=0, HAI=2. Overall measures 51 by 26 by 21 mm high, measures minimum 0.95 mm thick. Provided with four cutouts for Input and Output Leads exit, measures 2.5 by 2.3 mm. See ILL. 1 for construction details.
2. Input Leads - R/C (AVLV2), Style 1672, No. 22 AWG, rated minimum 105°C, VW-1, 300 V. One end terminates in PWB and one pin of R1 by mechanically secured before soldering, the other end is in a free end.
3. Output Leads - R/C (AVLV2), Style 1015, No. 22 AWG, rated minimum 105°C, VW-1, 600 V. One end terminates in PWB and mechanically secured before soldering, the other end is in a free end.
4. Potting Compound - R/C (QMFZ2), Dongguan Eatto Electronic Material Co Ltd (E218090), Type 3300A/B, black color, rated V-0, 90 °C at minimum 1.0 mm thick. Completely filled inside enclosure.

*MODEL **GTH51085CC-2804** - FIG. 2
(ALSO REPRESENTS ALL MODELS)

*General - Fig. 2 represents external view of Model **GTH51085CC-2804**

1. Printed Wiring Board - R/C (ZPMV2), rated V-0, minimum 105°C. Measures 23 by 33 mm, 1 mm thick. Suitable for direct support of live parts. See ILL. 2 for trace layout and component layout.
2. Fusible Resistor (R1) - Rated 0.33 Ω , 1/4 W. Overall covered by a heat shrinkable tubing, R/C (YDPU2), rated minimum 125°C, 600 V. Secured on PWB by soldering.
3. Thermistor (NTC) - R/C (XGPU2), JOYIN CO LTD (E171531), Type 7S100L, rated 240 V, 68 μ F. Overall covered by a heat shrinkable tubing, R/C (YDPU2), rated minimum 125 °C, 600 V. Secured on PWB by soldering.
4. Bridge Rectifier (D1) - Silicon type, rated minimum 0.5 A, 600 V. Secured on PWB by soldering.
5. Capacitor (C2) - Electrolytic with integral pressure relief, rated 400 V, 4.7 μ F, 105°C. Secured on PWB by soldering.
6. Capacitor (C3) - Electrolytic with integral pressure relief, rated 400 V, 2.2 μ F, 105°C. Secured on PWB by soldering.
7. Inductor (L1) - Rated 0.8 mH. Overall covered by a heat shrinkable tubing, R/C (YDPU2), rated minimum 105°C, 300 V. Secured on PWB by soldering.
8. Diode (D5) - Rated 1 A, 1000 V. Secured on PWB by soldering.
9. Capacitor (Y1) - (Primary-to-Secondary), R/C (FOWX2), Hsuan Tai Electronics Co Ltd (E199069), Type CY, rated 250 V ac, 1000 pF, 85°C. Secured on PWB by soldering.
10. Optical Isolator (U1) - R/C (FPQU2), Lite-on Technology Corp (E113898), Type LTV-817, rated isolation voltage 5000 V ac, 100°C. Secured on PWB by soldering.
11. Capacitor (C4) - Electrolytic with integral pressure relief, rated 16 V, 220 μ F, 105°C. Secured on PWB by soldering.
12. Transformer (T1) - Constructed as follows, see ILL. 3 for detail:
 - A. Core - Ferrite, E-E type, overall 12.8 by 12.5 by 3.5 mm, core wrapped with two layers of polyester tape, each layer 0.05 mm thick, 3.5 mm width. Core was considered as primary part.
 - B. Bobbin - Two flange type, R/C (QMFZ2), Sumitomo Bakelite Co Ltd (E41429), Type PM-9820, black color, rated V-0, 150°C, overall dimension 13.4 mm by 13.4 mm by 9 mm, minimum 0.57 mm thick.

- C. Primary Winding (W1) - Enameled copper magnet wire, measured 0.16 mm diameter by 160 turns.
- D. Secondary Winding (W2) - R/C (OBJT2), Great Leoflon Industrial Co Ltd (E211989), Cat. No. TRW(B), rated 130°C. Measured 0.3 mm diameter by 13 turns. Output leads terminate in pins of D4 and R4 by mechanically secured before soldering.

Winding Insulation:

___Location___	Material	Layers	Total Thickness (mm)
Core Outwrap	Tape	2	0.1
W2 Winding Outerwrap	Tape	3	0.15
W2 Winding to W1 Winding	Tape	3	0.15
W1 Winding Crossover	Tape	1	0.05
Lead Insulation			
W1 Winding to Core	Bobbin	-	0.57

- E. Insulation Tape - R/C (OANZ2), polyester film tape, measured minimum 0.05 mm thick.
- D. Tubing - R/C (YDPU2), Fluo Tech Industries Co Ltd (E175982), Type TFL, rated 150 V, 200°C, VW-1. Provided for secondary winding output leads.
13. Transformer Barrier - R/C (QMFZ2), Sabic Innovative Plastics Japan L L C (E45587), Type SP7602, all color, rated V-0, 80 °C, HWI=0, HAI=2. Overall measures 17 by 13.8 by 10 mm high, measures minimum 0.75 mm thick. Located between transformer core and secondary components. See ILL. 4 for construction details.

TEST RECORD NO. 1

GENERAL:

The test results relate only to the items tested.

SAMPLES:

Samples of Models SC1X-040-0350, SC1X-040-0700, SC1X-120-0300, SC1X-120-0350 were submitted by the applicant and subjected to the investigation in accordance with the standard for Class 2 Power Units, UL 1310, Fifth Edition.

The following tests were conducted:

Working Voltage Measurements:	24.2
Leakage Current Test:	26
Dielectric Voltage Withstand Test After Leakage Current Test:	27
Leakage Current Test After Humidity Exposure:	27
Dielectric Voltage Withstand Test After Humidity Exposure:	27
Maximum Output Voltage Test:	28
Normal Input Test:	50.2
Maximum Input Test:	29
Output Current And Power Test:	30
Dielectric Voltage Withstand Test After Output Current And Power Test:	34
Full-Load Output Current Test:	32
Normal Temperature Test - General:	33
Dielectric Voltage Withstand Test:	34
Abnormal Tests:	39
Output Loading Test - Abnormal:	39.2
Dielectric Voltage Withstand Test After Output Loading Test:	34
Transformer Burnout Test (Switch Mode Designs) - Abnormal:	39.3
Dielectric Voltage Withstand Test After Transformer Burnout Test:	34
Component Breakdown Test - Abnormal:	39.6
Dielectric Voltage Withstand Test After Component Breakdown Test:	34

Printed Wiring Board Abnormal Operation Test - Abnormal:	39.7
Dielectric Voltage Withstand Test After Printed Wiring Board Abnormal Operation Test:	34
Transformer Insulating Materials Test:	40
Mold Stress Relief Distortion Test:	Table 25.1

The test methods and results of the above tests have been reviewed and found in accordance with the requirements in UL 1310, Fifth Edition.

Test Record Summary:

The results of this investigation indicate that the products evaluated comply with the applicable requirements in Class 2 Power Units, UL 1310, Fifth Edition, Last Revise date July 17, 2008, therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

TEST RECORD NO. 2

No tests were considered necessary on Models GTH51085CC-1404, GTH51085CC-2804, GTH51085CC-0412, GTH51085CC-3711 with revised models name from Models SC1X-040-0350, SC1X-040-0700, SC1X-120-0300, SC1X-120-0350 respectively due to previously investigation on products Recognized under Test Record No. 1 of this Report.

Test Record Summary:

The results of this investigation indicate that the products evaluated comply with the applicable requirements in Class 2 Power Units, UL 1310, Fifth Edition, Last Revise date July 17, 2008, therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

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CONCLUSION

Samples of the components covered by this Report have been found to comply with the requirements covering the class 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 Marking are considered as Recognized Components by Underwriters Laboratories Inc. Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

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Direct Plug-In and Cord-Connected Class 2 Power Units (EPBU, EPBU2)

PRODUCTS WHICH REQUIRES PRODUCTION DIELECTRIC TEST BETWEEN
PRIMARY CIRCUIT PARTS AND INACCESSIBLE TRANSFORMER CORE
(see Method, Appendix D Page 8)

Product Designation

Procedure Section or Date

Reserved for future use

Direct Plug-In and Cord-Connected Class 2 Power Units (EPBU, EPBU2)

Exceptions

Production-Line Dielectric Voltage-Withstand Test

1. Production-Line Dielectric Voltage-Withstand Test Voltages - For products which have specific testing conditions, the voltage to be used for the Production-Line Dielectric Voltage-Withstand Test on 100% of production is specified below.

Procedure Section or Date	Product Designation	Test Potential V ac	Test Potential V dc	Time Seconds	Applied Between
Reserved for future use					

Comments:

2. Production Exempt From Production-Line Dielectric Voltage-Withstand Test - Based on engineering judgment, this test is not required to be performed on the following products.

Product Name	Product Designation	Procedure Section or Date
Reserved for future use		

3. Components Exempt From Production-Line Dielectric Voltage-Withstand Test - The following components may be disconnected from the remainder of the circuitry during the performance of this test.

Product Name	Product Designation	Component Designation	Procedure Section or Date Fig., Item, Ill.
Reserved for future use			

Direct Plug-In and Cord-Connected Class 2 Power Units (EPBU, EPBU2)

Exceptions

Production-Line Grounding Continuity Test

Based on engineering judgment, this test is not required to be performed on the following products.

Product Name	Product Designation	Procedure Section or Date
All products covered in this procedure		

ISSUED: 11-13-2007

STANDARDIZED APPENDIX PAGES
Subject 1310

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STANDARDIZED APPENDIX PAGE (SAP)
Controlled Document: Direct Request for Revision to PDE for Category

Direct Plug-In and Cord-Connected Class 2 Power Units
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STANDARDIZED APPENDIX PAGES

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PRODUCTS WHICH REQUIRES PRODUCTION DIELECTRIC TEST BETWEEN PRIMARY CIRCUIT PARTS AND INACCESSIBLE TRANSFORMER CORE 1

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Direct Plug-In and Cord-Connected Class 2 Power Units
(EPBU, EPBU2)

APPENDIX A - FIELD REPRESENTATIVE'S RESPONSIBILITIES AND INSTRUCTIONS FOR
EXAMINATION OF THE PRODUCT

FIELD REPRESENTATIVE'S RESPONSIBILITIES

The Field Representative's responsibilities include, but are not limited to:

Examine the construction of production bearing, or intended to bear, the UL Mark or Markings to determine compliance with the description of the product and any other requirements expressed in this Procedure.

Where so specified by Appendix B, select samples to be forwarded to the appropriate UL Testing Laboratory for Follow-Up Tests. The packaging and shipment of samples are the responsibility of the manufacturer.

Where so specified by Appendix D, inspect the test records and facilities of the manufacturer to verify that:

- a. The proper number of samples are undergoing the required tests,
- b. The required tests are being performed correctly and appropriate records are maintained,
- c. The proper information is being recorded and is up-to-date,
- d. The instruments being used for the tests have been calibrated at the prescribed interval and are in good working order.

Report to the manufacturer and the UL Responsible Office by means of a Variation Notice (VN) if:

- a. Variations in construction are found,
- b. The manufacturer's method and/or frequency of test is not as described,
- c. The records maintained by the manufacturer are not as described,
- d. The manufacturer's inspection program is not being performed as described,
- e. The manufacturer's test equipment is not properly calibrated, calibrations are not conducted at the prescribed frequency, or calibration certificates/records do not contain all required information. (Note: Variation Notices written for these issues are to be handled under Field Representative control.).

Direct Plug-In and Cord-Connected Class 2 Power Units
(EPBU, EPBU2)

- f. The calibration of the equipment before any adjustments are made is outside of the required tolerance (equipment manufacturer's accuracy specification), or the equipment is determined to be non-operational, discovered to be defective, or has other features that could affect the validity of previous measurements/test results. (Note: for these issues, the VN shall be issued under a Temporary Acceptance status for analysis by the Variation Notice Handling Office).
- g. Nonconforming test results are witnessed during tests conducted specifically for the Field Representative.

Explain to the manufacturer that a Variation Notice is a means of communication with the manufacturer and forms a record of those items where nonconformance with the Procedure has been encountered.

PROCEDURE IN THE EVENT OF NONCONFORMANCE

When a product does not comply with the Follow-Up Service Procedure require that the manufacturer shall either:

- a. Remove any markings referencing UL from the product, or obliterate these markings where the marking is imprinted, die-stamped, molded, etc., or
- b. Modify all products to bring them into compliance with the Follow-Up Service Procedure, or
- c. Hold shipment pending further instructions from UL.

Direct Plug-In and Cord-Connected Class 2 Power Units
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It is the manufacturer's responsibility to forward a copy of the Variation Notice to the Applicant. If the rejection of the product is questioned by the manufacturer and Applicant, the material may be held at the point of inspection, typically at the factory, pending an appeal. The manufacturer has the right to appeal a decision with which they disagree. Appeals of technical decisions and held shipments should be directed to the Variation Notice Handling Office. To resolve issues involving variations in construction, the manufacturer and Applicant may also be offered the option of contacting a Customer Service Professional.

Should UL grant temporary authorization for the continued use of the UL Mark, such temporary authorization shall only be for the time needed to review and/or process the Procedure revisions, or as otherwise specified to cover a particular lot or production run.

When it is decided that UL Marks are to be removed from products, the manufacturer shall demonstrate that all marks referencing UL are removed from the affected material. Those marks referencing UL not destroyed during their removal from the product shall be retrieved from the manufacturer's control by the Field Representative and either (1) held until the manufacturer demonstrates adequate control of their production to assure the application of the Mark to only those products that comply with requirements, (2) returned to the supporting UL Label Center, or (3) destroyed.

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(EPBU, EPBU2)

APPENDIX B - INSTRUCTIONS FOR FIELD REPRESENTATIVE'S SAMPLE SELECTION

RESERVED FOR FUTURE USE

Direct Plug-In and Cord-Connected Class 2 Power Units
(EPBU, EPBU2)

APPENDIX C - INSTRUCTIONS FOR FOLLOW-UP TESTS AT UL

RESERVED FOR FUTURE USE

Direct Plug-In and Cord-Connected Class 2 Power Units
(EPBU, EPBU2)

APPENDIX D - MANUFACTURER' S RESPONSIBILITIES, CONSTRUCTION CONSIDERATIONS, AND
REQUIREMENTS FOR FACTORY TESTS

The Follow-Up Service Procedure covering the product is loaned to the manufacturer and constitutes the basis on which the product is judged for compliance with the applicable requirements.

MANUFACTURER' S RESPONSIBILITIES

The manufacturer's responsibilities include, but are not limited to:
Control of the UL Mark - Restrict the use of markings that reference UL (either directly by use of the name, an abbreviation of it, or the UL symbol, Classification Mark or Recognized Component Mark, or indirectly by means of agreed-upon markings that are understood to indicate acceptance by UL) to those products that are found by the manufacturer's own inspection to comply with the Follow-Up Service Procedure description. Use of such markings is further limited by the agreements that have been executed by the Subscriber and UL. Confine the application of markings referencing UL to the location or locations authorized in these Appendix Pages or the Follow-Up Service Procedure.

Access to Factory - During hours in which the factory is in operation, provide the Field Representative with free access to any portion of the premises where the product or components thereof are being fabricated, processed, finished or stored, and to the test areas when testing is required in this document. The Field Representative shall be permitted to inspect and witness prescribed tests, prior to shipment, any product bearing or intended to bear markings referencing UL. If product disassembly is required, it shall be undertaken by the manufacturer. Tests required, as part of this Procedure, shall be conducted by the manufacturer.

Corrective Action - Perform a root cause analysis of nonconforming test results reported by UL in order to determine and implement appropriate corrective actions. Upon request, the manufacturer shall submit the findings of their analysis and action plan for review and/or monitoring by UL. For those cases involving questionable test and measuring equipment, the manufacturer shall evaluate and document the effects of the equipment on previous inspections or tests. The manufacturer shall evaluate if the equipment condition could have significantly affected previous inspection or test results and take corrective action as appropriate. The equipment in question shall be removed from service by segregation or prominent labeling and marking.

Production-Line Tests - Conduct the Factory Tests detailed in Appendix D.

Required Records - Maintain records of test performance. Unless indicated otherwise in the Procedure, the information to be recorded should include the model or catalog number, identification of the product, the test conducted, the test date, and the results. The record for a specific lot or group of products may consist only of a statement, without specific details, that the entire lot or group was tested and found acceptable. Generally, a form record sheet should be used to assist in and expedite the record-keeping task. Records are to be retained for at least 6 months and shall be readily available for review by the Field Representative. Note: It is not necessary to keep complete test records when 100% of production is tested, if the manufacturer has an auditable system

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in place to confirm that production is always subjected to the required tests. Instead, exception reports indicating noncompliance and corrective action should be retained.

Test Equipment and Personnel - Provide, at a convenient location, all required test equipment and facilities and any required personnel for conducting all tests that are to be performed at the factory. These shall be available when needed so that the inspection work can proceed without undue delay.

Test and Measuring Equipment and Standards Calibration - The Manufacturer shall determine daily that test equipment is functioning properly. In addition,

- a. Unless specified elsewhere in the Follow-Up Services Procedure, all test and measuring instruments required as part of the Follow-Up Services Procedure or used by Field Representatives in the conduct of inspection activity at the factory shall be calibrated yearly (or whenever it has been subject to abuse such as dropped or struck with an object, or its accuracy is otherwise questionable) for its intended use. Exception 1 - Instruments used as part of processing equipment, i.e. equipment used in the manufacturing of the product, are not generally subject to this calibration requirement unless specifically noted otherwise elsewhere in the Follow-Up Services Procedure. Exception 2 - Measuring equipment such as steel rules, tape measures, protractors, and radius gauges typically only need in-service checks to verify their fitness for use.
- b. For in-house calibrations of weights and gauge blocks, the Standard used for the calibrations shall only be used for calibration purposes and be calibrated by a competent body every three years, or whenever the Standard has been subject to some form of abuse that may affect the Standard's fitness for use.
- c. For other Standards (such as Voltmeters), the Standard shall only be used for calibration purposes and be calibrated by a competent body yearly or in accordance with the equipment manufacturer's specifications, as well as, whenever the Standard has been subject to some form of abuse that may affect the Standard's fitness for use.
- d. All Standards shall be stored per the Standard manufacturer's recommendations to protect them from damage or deterioration.
- d. The calibrated test and measuring equipment, and the Standards used for in-house calibration, should be provided with a label or the like indicating the next calibration due date. The manufacturer must keep records of calibrations. The records are to include information equivalent to that noted in item f.

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- f. When calibration service providers are utilized, who are accredited to ISO 17025 and where the calibration certificates show evidence of this accreditation, it is only necessary for the Field Representative to verify that the instrument is covered by the certificate, is within the calibration period and has been calibrated for the measurements for which it will be used. For calibration service providers who are not accredited to ISO 17025 (including in-house calibrations), the Field Representative shall verify the following information on the certificates provided (or records maintained for in-house calibrations):
1. Title, e.g. "Calibration Certificate", "Calibration Report", etc. (or equivalent)
 2. Name and address of laboratory, and the location where the calibration was carried out, if different from the address of the laboratory.
 3. Unique identification of the certificate (such as serial number), and on each page, an identification in order to ensure each page is part of the calibration certificate with a clear indication of the end of the calibration certificate (such as page numbers and total pages - Page X of Y)
 4. Name and address of customer
 5. Description of the condition of the item calibrated (e.g., received out of calibration, damaged, etc.)
 6. Date(s) of performance of the calibration.
 7. Model number and serial number of the item calibrated or other unambiguous identification of the item calibrated.
 8. The measured value(s) of the calibration with units of measurement(s).
 9. A signature and title, or equivalent identification of the persons authorizing the calibration certificate.
 10. Where relevant, a statement to the effect that the results relate only to the items calibrated.
 11. Evidence that the measurements are traceable to national/international standards.
- g. There should not be any alteration to the calibration data/results without laboratory authorization).
- h. When the certificate or report contains results of calibrations performed by subcontractors, these results shall be clearly identified.

Samples for Follow-Up Testing at UL - If Appendix B specifies that samples are required to be forwarded to UL for Follow-Up Testing, the manufacturer shall forward the samples selected by the Field Representative, to the specified UL Testing Laboratory, within five working days of the Field Representative's inspection visit. Packaging and shipment of the samples are the responsibility of the manufacturer.

Direct Plug-In and Cord-Connected Class 2 Power Units
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SPECIAL REQUIREMENTS

Special requirements that may also apply to some or all of the products covered by this Procedure include the following:

1. Power Supply Cords

Non-Detachable Power Supply Cord -

A non-detachable power supply cord as described in the individual sections of the Procedure must be provided and shipped with the unit in all cases. The power supply cord and any alternatives must be described in each Procedure section or Section General.

Detachable Power Supply Cord -

The detachable power supply cord as described in the individual sections of the Procedure may or may not be shipped with the unit. Use the guidelines in Table 1 in assisting the manufacturer to apply the alternatives under each of the situations described in the notes to Table 1. Table 1 also includes alternative detachable power supply cords that may be shipped with units intended for use outside the USA and/or Canada.

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TABLE 1 - DETACHABLE POWER SUPPLY CORD REQUIREMENTS

The requirements for detachable power supply cords depend on whether the cord is provided.

This table, along with the following notes, details the requirements for each of the possible situations.

Status of Detachable Power Cord	
Provided	Not Provided
Note A or D	(Notes B and C) or (Notes B and E)

NOTE:

- A. The power supply cord should be as described in the Procedure section.
- B. A marking must be provided adjacent to the appliance coupler or at an equivalent location either to inform the user on proper selection of the power supply cord or to see the instruction manual for this information. This marking may be in the form of a tag, nonpermanent label, or product insert that is provided on or packaged with the product so that the marking is visible at the time of installation.
- C. The marking (tag, label, or product insert) or instruction manual must contain complete instructions concerning selection of the proper power supply cord. The reference to the power supply cord must be of a UL Listed detachable power supply cord consisting of the specific configuration of appliance coupler, the cord type, and the electrical rating of the power supply cord as described in the appropriate sections of the Procedure. Refer to Table 2 for equivalent types of cords.
- D. The manufacturer is to supply the Field Representative with information that allows the Field Representative to verify that the products are intended to be sold outside of the USA and/or Canada and that the cord is certified or similarly appropriate for use in the destination country.
- E. The reference to the power supply cord (see Note B) shall include instructions for selection of the proper power supply cord as in the destination country other than the USA or Canada.

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TABLE 2 - EQUIVALENT CORDS

Basic Cord Type	Other Suitable Types
TS	TST
SP-2	SPE-2, SPT-2
SP-3	SPE-3, SPT-3
SV	SVE, SVO, SVOO, SVT, SVT0, SVTOO
SJ	SJE, SJO, SJOO, SJT, SJTO, SJTOO
S	SE, SO, SOO, ST, STO, STOO

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REQUIREMENTS FOR FACTORY TESTS

The following Production-Line Tests shall be conducted on products covered by this Procedure. During production, test equipment shall be checked for proper operation at least once daily.

A. Production-Line Dielectric Voltage-Withstand Test

General - Except as may be noted under Exceptions in Sp. App. D, the manufacturer shall subject 100 percent of production of all products to a routine Production-Line Dielectric Voltage-Withstand Test in accordance with the following.

Test Equipment - The equipment shall provide the following features.

1. The test equipment shall have a means of indicating the test potential, an audible or visual indicator of electrical breakdown, and, if for automated or station type operations, either a manual-reset device to restore the equipment after electrical breakdown or an automatic-reject feature for any nonconforming unit (appliance). When an ac test potential is applied, the test equipment shall include a transformer having an essentially sinusoidal output.
2. When the rated output of the test equipment is less than 500 volt-amperes, the equipment shall include a voltmeter in the output circuit to directly indicate the applied test potential.
3. When the rated output of the test equipment is 500 volt-amperes or more, the test potential may be indicated by (1) a voltmeter in the primary circuit or in a tertiary-winding circuit, (2) by a selector switch marked to indicate the test potential, or, (3) in the case of equipment having a single test-potential output, by a marking in a readily visible location to indicate the test potential. If an indicating voltmeter is not used, the test equipment shall include a visual means, such as an indicator lamp, to indicate that the test voltage is present at the test-equipment output.

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Method - Each unit shall withstand without electrical breakdown the application of an ac potential at a frequency within the range of 40-70 Hz between (1) the primary wiring, including connected components, and accessible dead metal parts, and (2) between the primary wiring, including connected components, and output circuits. If indicated on Sp. App. D page 1, the test potential shall also be applied between primary circuits and the inaccessible transformer core.

For the test, either a sufficient number of control devices are to be closed or separate applications of the test potential are to be made so that all parts of the primary circuit are tested.

The unit may be at intended operating temperature, at room temperature, or at any intermediate temperature for the test.

The test duration and potential shall be:

- A. 1000 Vac for 60 seconds, or
- B. 1200 Vac for one second.

The test potential may be gradually increased to the minimum required value but the full test potential value is to be applied for the specified test duration.

The test shall be conducted when the unit is fully assembled. It is not intended that the unit be rewired, modified, or disassembled for the test.

Exception No. 1: Parts such as snap covers or friction-fit knobs that interfere with performance of the test need not be in place.

Exception No. 2: The test may be performed before final assembly if the test represents that for the completed unit. Any component not included shall not affect the results with respect to determination of possible electric shock from miswiring, defective components, nonconforming spacings, and the like.

Exception No. 3: The test need not be performed using the power supply cord provided with the product. However, if the manufacturer's test method employs a test power supply cord, then the continuity of the test power supply cord conductor connections shall be checked once daily.

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When authorized by the Exceptions in Sp. App. D, solid-state components that might be damaged by a secondary effect (induced voltage surge, excessive heating, and the like) of the test may be short-circuited by means of a temporary electrical jumper, or the test may be conducted without the component electrically connected, providing the wiring and terminal spacings are maintained. Additionally, transient voltage suppression devices other than capacitors connected from primary wiring to dead metal may be disconnected during the test.

Basis for Acceptability: All products shall withstand the applied potential without electrical breakdown.

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B. Production-Line Grounding Continuity Test

General - Except as may be noted on any Exceptions page included with Sp. App. D, the manufacturer shall subject 100 percent of all products intended to be grounded to a grounding continuity test.

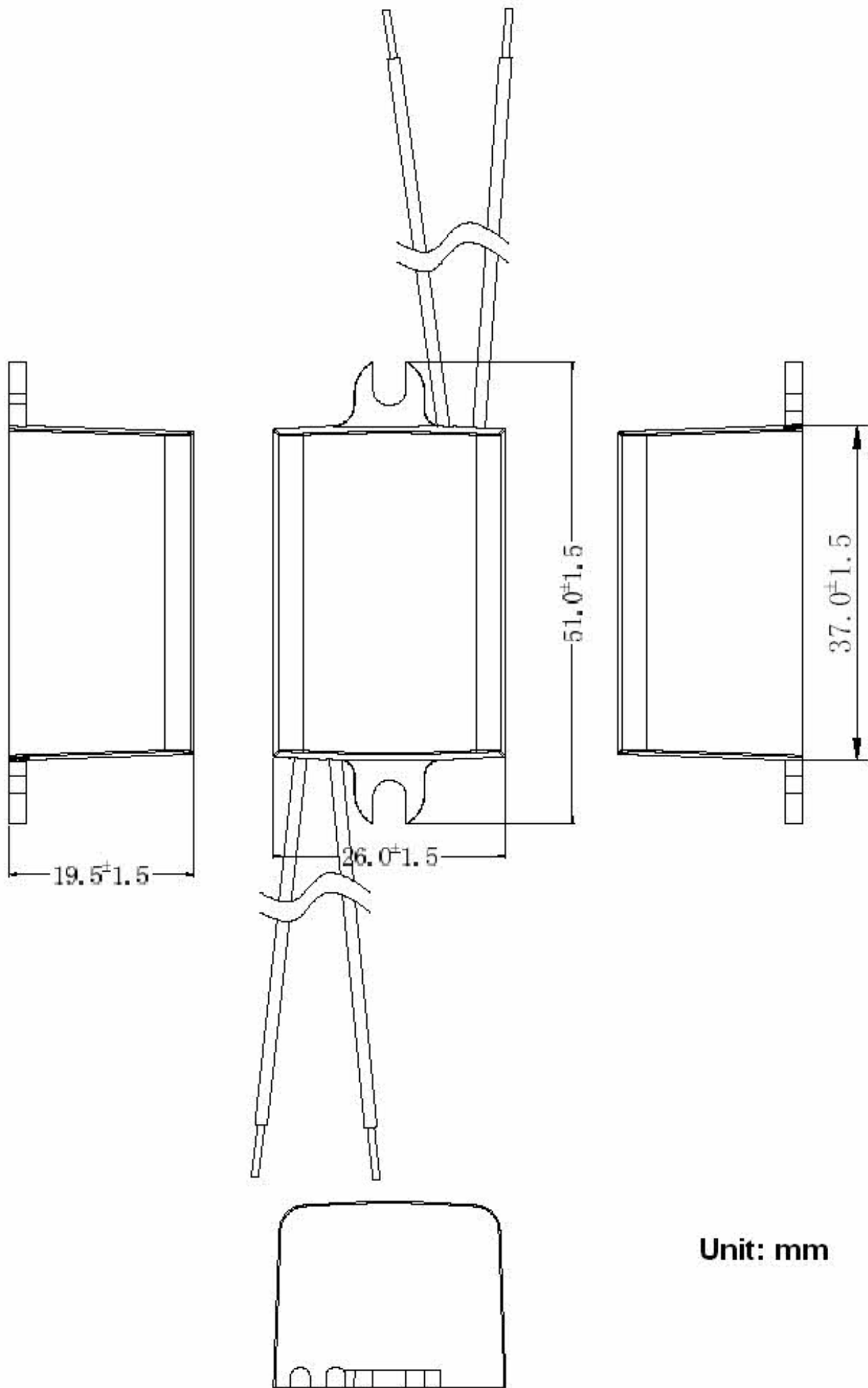
Test Equipment - Any suitable continuity indicating device (such as an ohmmeter, a battery and buzzer combination, or the like) may be used to determine compliance with the Grounding Continuity Test requirements. Additionally, commercial ground continuity testers that pass a current through the grounding path may be used to determine compliance with the same requirements.

Method -

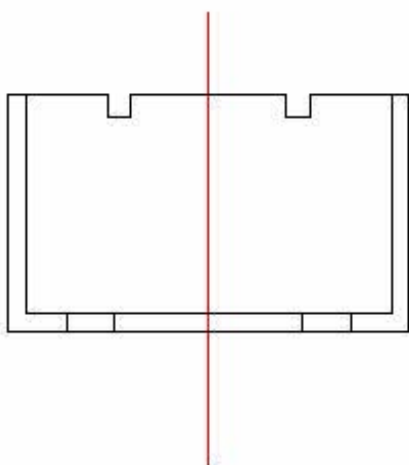
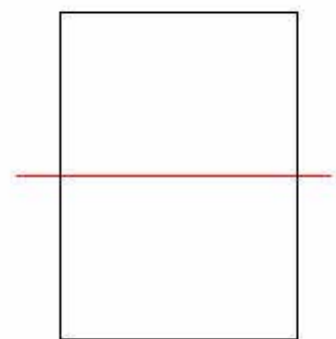
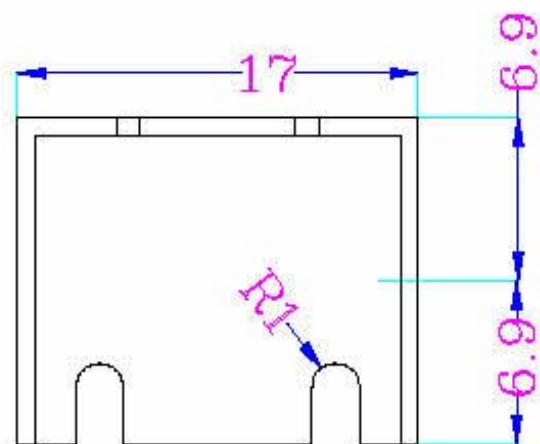
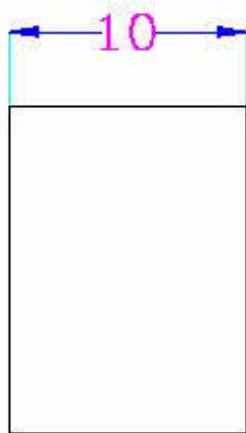
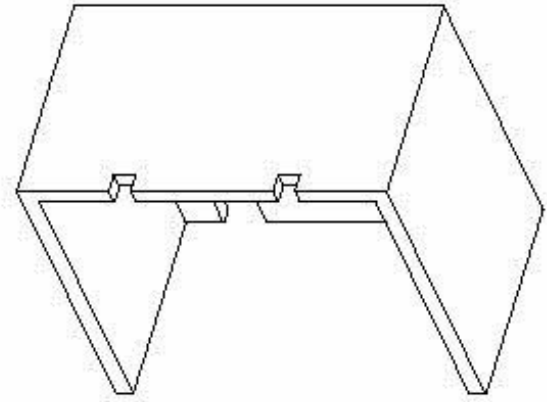
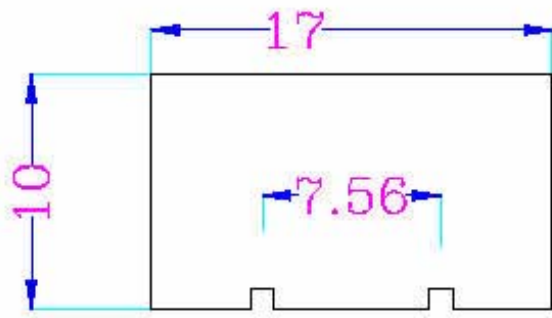
Cord-Connected Units: Grounding continuity shall be determined between the grounding conductor of the attachment plug cap, and/or the designated main grounding point and accessible dead-metal parts of the product, using the test equipment indicated above.

Direct Plug-In Units: Grounding continuity shall be determined between the ground pin and accessible dead-metal parts of the product, using the test equipment indicated above.

Basis for Acceptability - Grounding continuity shall be confirmed between the parts specified.



Unit: mm



Unit: mm



